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"CONSERVATION OF WILD LIFE THROUGH EDUCATION"

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CONTENTS.

NOTES ON DRY-FLY FISHING. No. 2.

By R. L. M., California.

In the first of this series of notes on dry-fly fishing I believe I was, to a certain extent, successful in dispelling the cloud of fog or mystery that surrounds the art in the mind of the average man; but before going any further into the technique of the dry-fly school, I propose to trace the history of this modern method of catching fish, which is described by Emerson Hough as being "the most beautiful form of the most beautiful sport." (Extract from a letter to the author.)

I have already remarked that, if a new fly is dropped on the surface of the water, it will float as long as it keeps dry. It is quite probable that those Macedonian fishermen mentioned by Aelian in "De Animalium Natura" (A. D. 230) were aware of this fact. Since this writer, the first who describes fly-fishing and a method of dressing flies, was not a very accurate recorder, we may take it that practically all his observations on nature were made second hand, consequently, we must not put too much reliance on his description of the flies used. Furthermore, the lengths of rods and lines that he states were used, were entirely too short for any practical purpose.

Scotcher ("Fly-Fisher's Legacy," 1807) makes, I believe, the first mention in print of the fact that a new fly will float. This fact, which

can hardly be called a discovery, is known to every one who has ever fished to any extent with a wet fly. In a little book ("Anglers' Desideratum," 1839) the author, Capt. Clarke, R. N., describes a method of catching fish on hot sunshiny days, which has all the earmarks of dry-fly fishing with the single exception of floating the fly.

The late Emlyn M. Gill in his book "Practical Dry-Fly Fishing" (New York, 1915), writes of Mr. G. P. R. Pulman having "explained dry-fly methods in 1851." This explanation, which appears on page 132 of Pulman's "Vade Mecum" (1851, 3d ed.—the two earlier editions made no mention of the dry-fly) is not of very great length, so I will include it in this brief history:

> Let a dry fly be substituted for the wet one, the line switched a few times through the air to throw off its superabundant moisture, a judicious cast made just above the rising fish, and the fly allowed to float towards and over them, and the chances are ten to one that it will be seized as readily as a living insect.

Although the foregoing leaves very little undone to be a full description of dry-fly fishing, I do not think that in the light of latter-day evidence we can call Mr. Pulman a dry-fly man as the term is understood today. What he really did do was to emphasize the importance of the first cast with a new (dry) fly. His son in a recent letter told me: "I recollect that he (my father) often told me to dry the fly by flicking it about before taking a cast over a rising fish. He invariably fished down stream with two wet flies."

If we leave Mr. Pulman's description on one side as being doubtful, or of the nature of the Scotch verdict "not proven," the first real mention in print of dry-fly fishing is found in "A Book on Angling" (Francis Francis, 1867). Although there are over four hundred and fifty pages in this angling classic, only on three or four of them is there any slight reference to this new art of fly fishing. At the time Mr. Francis wrote this book he evidently did not attach any great importance to dry-fly fishing. David Foster ("The Scientific Angler," 1882) makes occasional references to dry-fly fishing and in some of the later editions there is a colored plate of dry flies. In the "Badminton Library" (1885) Mr. H. S. Hall gives a short but complete treatise of the art, together with the dressings for eighteen dry flies. Both Halford and Foster give Mr. Hall the credit for the invention or adaption of the eyed hook to flies of small size such as are used for dry-fly work.

The literature relating to the art may be said to have still been in an embryotic, if not a chaotic, state, when in 1886 Frederick M. Halford published his first work, viz., "Floating Flies and How to Dress Them." Besides fairly extensive contributions to periodicals devoted to sport, he found time in the following years to produce: "Dry-Fly Fishing in Theory and Practice"; "Dry-Fly Entomology"; "Making a Fishery"; "An Angler's Autobiography"; "Modern Development of the Dry-Fly"; and finally in 1913 "The Dry-Fly Man's Handbook." This last work has somewhat of an analogy to Rudyard Kipling's "Day's Work." Between its covers is epitomized the knowledge and experience of a lifetime devoted to fishing.

Of late years it has become the fashion among a certain class to question and even to ridicule some of his theories, but it should not be forgotten that Mr. Halford never put a line on paper until he had satisfactorily demonstrated its correctness by painstaking attention to detail and laborious study. If I may be allowed to use a distinctively

American colloquialism: "Halford put the dry-fly on the map"; that sums the matter up in a single sentence.

Among the other books devoted to the art I might mention "Fly Fishing," 1899, by Viscount Grey of Fallodon, or as he was known then, Sir Edward Grey.

On this side of the Atlantic besides Mr. Emlyn M. Gill's book already mentioned, the following have appeared: "The Dry-Fly and Fast Water," by George M. L. La Branche (N. Y., 1914); "Fishing with Floating Flies," by S. G. Camp (N. Y., 1916); and possibly one or two others.

The use of the dry-fly in America is of quite recent occurrence. The fact of the matter is that, until lately, our rivers and streams were swarming with fish that seemed only too anxious to rise to any artificial fly that was presented to them; but increasing population and better methods of transportation have brought many more men to the waterside in quest of sport than was formerly the case. The trout have become more wary and greater finesse has to be employed in their capture; consequently the dry-fly has been utilized as a means of overcoming their increased shyness. It is only to be expected that in England, with its denser population, these same conditions arose earlier than they did over here.

There are two rivers in the south of that country which are preeminently dry-fly streams. I refer to the Test and the Itchen. Sometime during the forties or fifties of the last century the dry-fly was first used on these waters. (See "Chalk Stream and Moorland," Russell, London, 1911).

To no single individual can be given the credit for the discovery, invention or development of the art of dry-fly fishing. I believe that what actually did happen is that different men hit on much the same thing about the same time. Their knowledge, which in the beginning was purely local and personal, became in the course of time more general, so that by the time the late sixties arrived, the art can be considered to have been fairly well established on these two rivers and on other streams of a similar character that are found in the south of England.

But although dry-fly fishing was quite common, so much so as to be considered the sole means of catching trout by some; in fact, Mr. Halford states that the dry-fly was used exclusively on the Wandle for the last half century, i.e., since 1863. (See "The Dry-Fly man's Hand Book," p. 66), it was not the universal method that it is today on these typical dry-fly waters.

"The Chronicles of the Houghton Fishing Club" were printed in 1908. This club has been in existence since 1822 and during most of that time leased or owned riparian rights on the Test. From the historical point of view there is not a great deal of information to be derived from a perusal of the Chronicles, which deal chiefly with fish caught and other matters; but we can glean some information both useful and interesting.

In the early days when the May fly (Green Drake) was up, the club members used to catch fish by "blowing." This consisted of using the natural fly as a bait together with a long light bamboo rod and a floss silk line. The wind was allowed to carry out (blow) the bait over the water, and by proper manipulation of the rod the fly was

dropped on the surface just above a feeding trout. (Information contained in a letter from A. N. Gilbey, honorary secretary of the club, to the author; also see chapter XXIII, "Fishing," Vol. I, "Country Life Library of Sport" [London 1905].) "Blowing" was still practiced as late as the early nineties. The first mention in the Club Chronicles of the capture of a trout on the artificial May fly is on June 6, 1888; but a much earlier record of such a feat on the same part of this river is made by Col. Peter Hawker, of Longparish House, in his Diary, viz, June 11, 1817.

The sixties may be regarded as the transition period. During these years the dry-fly was becoming more common and the wet-fly was fast disappearing. Mr. J. Ernest Pain, who has lived at Chilbolton on the Test since the early seventies, told me that an old fly book belonging to an uncle, which was used in 1860, contained nothing but wet flies.

In the seventies the dry-fly was almost universal. Writing about the fishing on the Itchen from 1877 to 1880, Lord Grey remarks: "These Winchester trout taught us the necessity of using fine gut and small flies, and of floating the fly accurately over a rising fish." Even so the wet fly had not quite entirely vanished from these rivers. As late as 1890 a relative of mine who had owned fishings on the Test since 1850, told me that he never used the dry-fly and that he considered it a modern innovation that was quite unnecessary. As he had a number of fine specimen fish mounted in glass cases, his contention would seem to have been fairly proved; but such is not the case at all. My relative did all his fishing on his own private water where the trout were not harried by any one except himself and an occasional friend. There were weeks, nay months, when these fish never had a line cast over them and therefore we can readily believe that they could be taken on a wet-fly. The dining room of his fishing cottage projected over the river. There was a short distance on both sides of the house where fishing was never permitted, but his daughter told me that when her father and the keepers were away she used to catch these trout, with bread for bait, from the window. On the other hand at Winchester where Lord Grey fished, there were always a number of other men fishing and the trout became highly sophisticated. Earlier in his book Lord Grey speaks of the absolute lack of sport he experienced with the wet-fly on these waters, and it was not until he used a dry-fly that he had any success at all. ("Fly-Fishing," p. 108.) I consider that these facts amply prove the contention of most dry-fly men, viz: That fish can be and are caught with a properly presented dry-fly, which would not look at, much less take, a wet-fly.

Before the end of the last century certain rivers in England had become dry-fly waters, i.e., the use of anything but the dry-fly was prohibited, and it was regarded as a heinous offense to do otherwise.

The history of the art on this side of the Atlantic is brief; in fact I might almost say that it is in the making today. Dry-fly fishing has been practiced for some few years on the Catskill and other streams in the eastern states and is occasionally met with on our western rivers; but the necessity for it has not arisen except in a few localities where fishermen are almost as numerous as the fish. I learned the art in the eighties, but for years I fished almost entirely with a wet-fly, only occasionally using a dry-fly for an exceptionally cautious fish. However, of late years I have found the fish much wiser and not so easy to

catch. The automobile is mainly responsible for this condition. Fifteen years ago I used to very rarely meet others bent on fishing, but nowadays I have frequently counted as many as ten men in sight at once lined out along the stream. Consequently I have been, for some years past, using nothing but the dry-fly; and I think it is only a question of time when the dry-fly will be much more generally used on American trout streams than it is at present.

THE YOUNG OF THE BLACK SEA-BASS.*

By Elmer Higgins.

One of the most picturesque fishes of Southern California, well known and appreciated by sportsmen and commercial fishermen alike, is the giant black sea-bass or California jewfish, *Stereolepis gigas* Ayres. It is a common sight to see one of these huge fishes hung up by the jaw before fish markets and on pleasure piers, surrounded by wondering tourists. But although over a million pounds are landed yearly in the markets, the fish caught all range in size from about three to six feet in length. The commercial fishermen never admit having seen a jewfish less than one and a half or two feet in length, and all declare them to be dull black in color and without markings, as are the larger ones.

Imagine our surprise then, when we discovered that certain pretty little bass-like fishes from the hauls of the boat "Albacore" were the young of the jewfish! These resembled the huge, ugly adults neither in form, color, nor markings, as may be seen from figure 1.

Several specimens of the young of the jewfish have been taken in the otter trawls of the "Albacore" in shallow water on the Southern

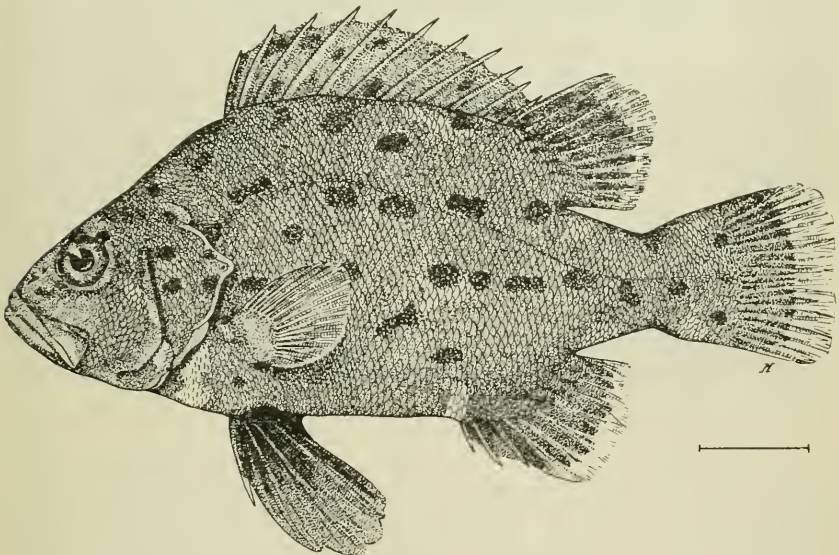

Fig. 1. Young jewfish. *Stereolepis gigas*. Total length 7½ inches. Long Beach, California, September 13, 1919.

*California State Fisheries Laboratory. Contribution No. 13,

California coast at different dates: December, 1918, specimen 1½ inches long; April, 1919, specimens 4 to 4¼ inches long; and September, 1919, specimens 7½ to 9 inches long. The depths were from 4 to 15 fathoms.

The most striking change in the development of the jewfish is that of color and markings. The younger specimens are a rich brick-red in color and marked with conspicuous dark brown or black spots irregularly scattered over the back and sides. There are also white or pale yellow splashes here and there on the body, especially on the throat and ventral side of the tail. The vertical fins are black with conspicuous transparent edges, the ventrals black, and the pectorals pale or transparent. As the fish grows older the body color darkens and the spots become indistinct until the whole color is a uniform dark brown or dull black, except for the light patches on the throat and ventral surface of the tail which often persist even in the larger adults. All the fins become black except the ventrals, which, though black in the young, are lighter than the pectorals in the adult, showing white membrane between the black fin rays.

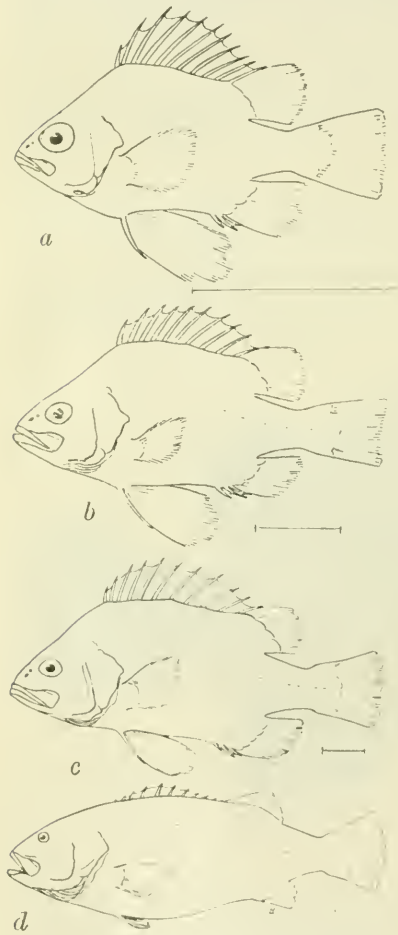

FIG. 2. Changes in the development of the jewfish. Size of specimens: *a*. 1½ inches long; *b*. 4⅜ inches; *c*. 9 inches; *d*. 72 inches (weight 305 lbs).

The change of form in the development of the fish is almost equally as marked. Figure 2, in which all the stages are reduced to one size, illustrates graphically the change in body proportions and size of fins, from the smallest specimen to the largest. It seems that the dorsal fin is practically submerged by the growth of the body, and indeed one or two of the dorsal spines are often entirely covered by the flesh. The remarkable change in the proportions of the pectoral and ventral fins is also evident. In the young the pectorals are about .23 of the body length and the ventrals are .40, while in the adult the pectorals are about .15 and the ventrals .12.

That the young of the jewfish or black sea-bass should be spotted or brightly marked is not surprising when we remember other closely related Serranoids which are brilliantly marked, such as our kelp bass, the striped bass, or the groupers of Florida and the West Indies, and it is indeed strange that they have not been recognized before. But the bright color and the different form of the body combined with the apparent inaccessibility, since they never appear in the markets, have protected the identity of this giant's young from the fisherman and public until the present time.

THE PACIFIC EDIBLE CRAB AND ITS NEAR RELATIVES.*

By Frank Walter Weymouth, Stanford University, California.

The edible crab of the Pacific Coast markets is familiar to most people but there are a number of other species less well known and somewhat likely to be confused with it. It is the purpose of this note to prevent this confusion. Since there are between fifty and a hundred distinct species, many of small size, on the coast, it is a mistake to imagine that any small crab is the young of the edible form. Many are so widely different that even a hasty examination will show the most uncritical that they are not market crabs, but there are four closely related species which are particularly liable to confusion and which will be considered in more detail.

The edible crab, *Cancer magister,* belongs to a genus which includes in the Atlantic two of the edible crabs of the eastern United States and Canada and the edible crab of Europe. On the Pacific coast there are

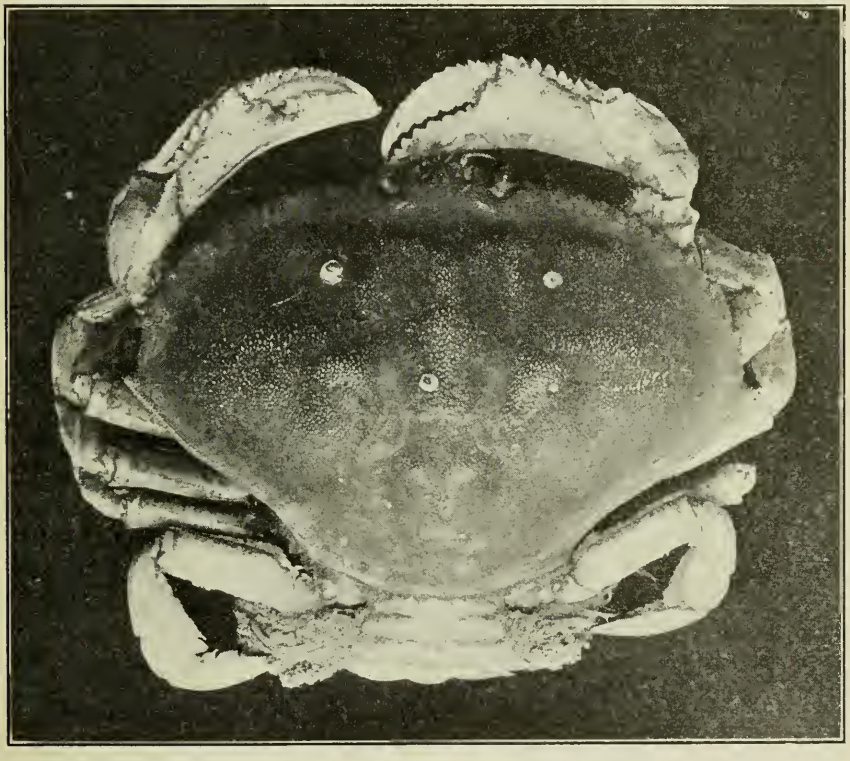

Fig. 3. Edible crab. *Cancer magister.* Egg-bearing female, one-half natural size. San Francisco, California.

nine species of *Cancer,* but most of these are so small or so rare that they need not be considered. Three or four species are large enough to be used for food but only *Cancer magister* is both large enough and abundant enough to be of commercial importance and is the only

*California State Fisheries Laboratory, Contribution No. 14.

species recognized by the protective laws. The following descriptions and figures should serve to distinguish these larger and more closely related forms.

CANCER MAGISTER. EDIBLE CRAB.

Size large, sometimes reaching nine inches in breadth across the back from point to point. The general color of the living animal is not reddish and there is no red on the lower side; the teeth on the front and side of the shell are low and saw-like, those between the eyes are not all of the same size, and the two nearest the eyes are larger and more widely separated from the middle three; the "hand" of the large pincer has conspicuous rows of spines; the "fingers" are not black-tipped; and the last joints or "claws" of the walking legs are slightly curved, broad, thin and fringed with hairs forming swimming paddles. Seldom found between tides but usually in from one to twelve fathoms on sandy bottoms.

FIG. 4. Slender crab. *Cancer gracilis.* Male, natural size. Monterey Bay, California. The last joint of the last walking leg on the right is missing.

CANCER GRACILIS.

Size small, seldom exceeding three inches. General color of the living animal and teeth on margin of shell much as in *C. magister;* the "hand" is rather less spiny and the "fingers" are also not black-tipped; the last joints of the walking legs are long, curved, slender and hairless, thus differing from all the other species here described. In California not found between tides but in deeper water, usually on sandy bottom.

CANCER ANTENNARIUS. ROCK CRAB.

Size moderate, seldom exceeding five inches. General color of living animal reddish, lower side with small red spots not found in other species; teeth on front and sides of shell heavy, projecting and curved forward, those between the eyes much as in *C. magister;* the "hand" is large and entirely smooth, the "fingers" are conspicuously black-

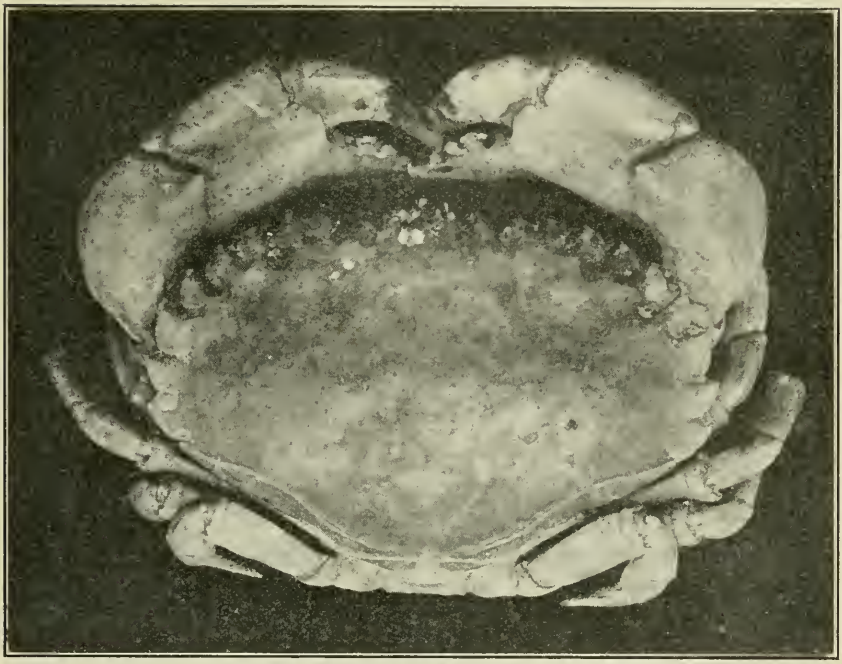

FIG. 5. Rock crab. *Cancer antennarius.* Male, two-thirds natural size. Monterey Bay, California.

tipped; the last joints of the walking legs are stout, nearly straight and hairy. Commonly found among rocks between tides, though also in deeper water.

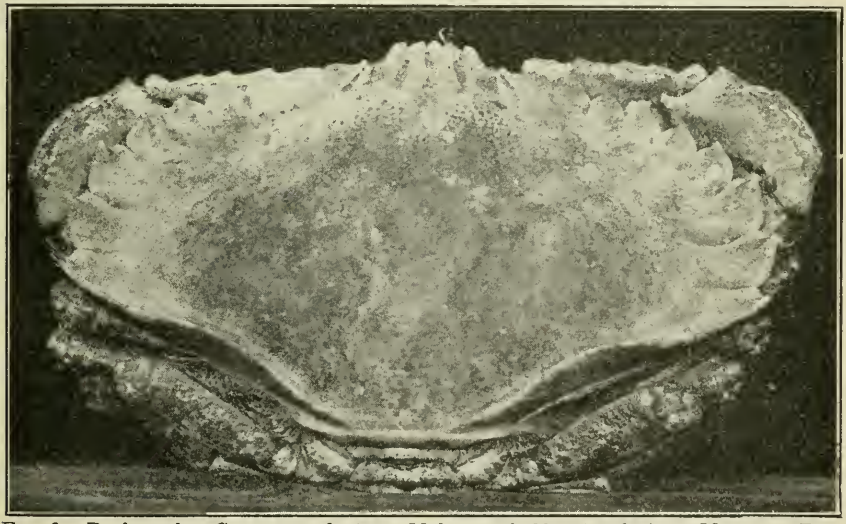

FIG. 6. Rock crab. *Cancer productus.* Male, one-half natural size. Monterey Bay, California.

CANCER PRODUCTUS. ROCK CRAB.

Size moderate to large, reaching seven inches. General color in life as in *C. antennarius* though there are no small red spots on the lower side; teeth on front and sides of shell similar to those of *C. antennarius*, those between the eyes of about equal size and projecting forward in front of the eyes thus differing from all the other species here described; the "hand" is roughened but without distinct spines; the "fingers" are black-tipped; and the last joints of the walking legs are straight and hairy but not flattened. Found usually between tides among the rocks though sometimes in deeper water.

THE PROPOSED INVESTIGATION OF THE SARDINE.*

By Will F. Thompson.

The marvelous development of the sardine fishery in California warrants close attention to it and its prospects of permanency. The sardine has indeed become the most important species among the many utilized in our great fisheries. In 1914 few were canned, but each year has seen steady increase in number of canneries and in the total packed. It is well nigh impossible that this giant industry which has grown up over night should continue to grow at the rate it has in the past, but an increase is surely still to be expected. It is a growth unparalleled within the countries bordering the Pacific, and its effects are consequently well worthy of attention. This attention is especially due from the state, which has legal jurisdiction over the fisheries and is responsible for their continuity. But such observation, it should be carefully noted, is as much for the prevention of hasty and harmful legislation as for conservation.

Moreover, many of the unsolved questions of fishery science and many of the practical questions concerning the course of the annual "runs" of fish may expect at least partial answers from an energetic investigation of the life history, as has been previously pointed out by the writer in Fish Bulletin No. 2 and in California Fish and Game, Vol. 5, No. 2. The trend of the program of investigation, practical as it is, is therefore aimed at a solution of "purely scientific" questions as well as more "practical" and immediate ones.

In order that this program may be formally on record and that it may be open to discussion by anyone, it is hereby published in the form of the principal questions which it seeks to answer. Suggestions and criticism are earnestly desired from every possible source.

The law requiring this work is as follows:

> It shall be the duty of the fish and game commission to gather data of the commercial fisheries and to prepare the data so as to show the real abundance of the most important commercial fishes; to make such investigations of the biology of the various species of fish as will guide in the collection and preparation of the statistical information necessary to determine evidence of overfishing; to make such investigations as will bring to light as soon as possible those evidences of overfishing as are shown by changes in the age groups of any variety of fish; to determine what measures may be advisable to conserve any fishery, or to enlarge and assist any fishery where that may be done without danger to the supply.

*California State Fisheries Laboratory, Contribution No. 15.

1. Will depletion occur?

To answer this we must have:

A. The catches by each boat, their character and the artificial limits affecting them, in order that comparisons may be made of the catches of the various years, and of the seasons.

B. The type of each boat and the apparatus used.

C. The method of the fishery, and the effects of such factors as the moonlight.

D. A knowledge of any decided changes in method or location of the fishery.

E. An answer to the following question, No. 2.

2. Are there great natural fluctuations in abundance, or quality, other than those of depletion?

An answer requires:

A. The same data as are required to answer No. 1.

B. The composition of the catches each year according to size or age, in order that we may discover whether a good catch is due to an exceptional spawning season. This implies a knowledge of the effect of selective fishing on the catch.

C. The variation in the composition of the catches during various parts of the year, so that we may be sure we are comparing the years correctly.

D. The spawning season, and its relation to natural changes in quality or local abundance.

3. Is it possible to foretell fluctuations?

This can not be done unless we know:

A. What changes are invariable each year, such as the spawning migration.

B. What the success of each spawning season is, as evidenced by the abundance of the youngest fish. It may be necessary to judge of this by comparing the abundance of the youngest in separate classes, such as medium or large fish.

C. What the age and rate of growth is, so that we may know how long it takes for the fish of a given spawning season to become fit for use.

4. Do sardines migrate from one region to another?

This question is of importance because of the possible difference in food value of sardines which live in the various regions; because of the possible depletion of one region independently of another; or because of the possible dependence of the supply in one region upon the sardines in another.

The data required are:

A. Extensive measurements to discover any physical differences between schools from different regions. For example, a difference in size of the head would indicate that the schools did not mingle but were independent.

B. The early life history, especially that of the eggs and their drift with the currents.

C. The location of the various age classes of fish at the different periods of the year, so that seasonal migrations may be discerned, and the simultaneous character of fluctuations in different regions may be discovered, if existent.

D. The accessibility of the schools under various physical conditions, to explain any absence which might erroneously be assigned to migration.

5. If depletion should occur, what measures for protection should be adopted?

For the proper solution of this problem, an intimate knowledge of the life-history is necessary, but the following will constitute the most practicable basis for action:

A. Are the sardines in different regions independent? May one region be depleted and another not?

B. When are the sardines worth least as food? When are they most valuable to the species as spawners?

C. Upon what classes of fish does the strain of the fishery fall most heavily?

In answering these questions it is obvious that extensive data must be gathered. We are undertaking the collection of careful statistics regarding the boats and their catches, and are observing the sardines closely throughout their season. This implies the obtaining daily of material from the canneries and fishermen. We trust that this privilege will be cheerfully granted, and the agents of the Commission have been instructed to use the utmost care that no unnecessary inconvenience is put upon any person or firm in the pursuit of duties required of them by law.

THE LIFE HISTORY OF THE SAGE HEN.

By E. H. Ober.

The sage hen is the largest upland game bird found in California. Consequently it is not easily confused with any other bird. As a prominent zoologist has said, "It is not particularly necessary to describe the sage hen any more than the elephant, as its size and its extremely long and pointed tail proclaim its identity anywhere."

The high open plateaus from six thousand to twelve thousand feet in elevation constitute its home, the birds seldom frequenting country where timber grows to any extent. As a rule, sage hens do not migrate from their accustomed locality, no matter what the weather conditions may be. When snow covers the ground they resort to high brush which protrudes through the snow, where it is possible for the birds in severe blizzards to dig or scratch down to the ground at the base of a bush. At such times when the snow is deep and frozen, sage hens fall easy prey to the marauding coyote, lynx, skunk, and various other varmints that follow their scent each winter.

During clear spells throughout the winter sage hens keep on the go searching for food that has been blown over the snow. Strange as it may seem, at such times birds are the very wildest of any time during the year.

Early spring usually finds the birds poor in flesh and shabby in plumage. The females select the sunny slopes and hillsides, near springs or small running streams, for nesting grounds. A feeble attempt at building a nest is made by scratching out a shallow hole in the ground at the foot of a sage bush, or other shrub. Here the eggs are laid, the usual number being about ten. In color, they are greenish and speckled with brown; in size they are about that of a small domestic hen's egg. Old male birds never frequent the locality in which their mates nest and only return when the young birds have reached maturity. The percentage of their brood brought forth each year by the nesting hens is exceptionally good considering the immense disadvantage the birds are subjected to during their nesting period. By this I mean varmints of all sorts, early spring floods, trampling by sheep, cattle, and horses, and last but not least, the man with the gun, who formerly was always to be found following the snow back as it receded from the lower hills. Many young birds fall early prey to varmints, as the parent bird has feeble means of protecting herself or her young.

While the sage hen is nesting, and for a short while after the female comes off with her brood, the food consists mainly of the tender buds and leaves of blue brush, and wild cherry brush. After the young birds have learned to fly, they descend along the larger streams, also frequenting meadowlands, where small, tender weeds and young grasses are added to their diet. At such places the young birds will gather in large flocks and when approached by man, will stand and crane their necks and make a very faint attempt at cackling. When closely approached they usually run rather than fly.

By the last of August or early September the young birds are usually joined by the old male birds, which come off the higher slopes and ridges. These old male birds stay very high up all summer long, quenching their thirst from the snow banks.

The cock sage hen's performances in early spring are most interesting. He struts very much like a turkey, his long pointed pheasant-shaped tail spread out like a fan. The wings trail beside him, the breast nearly rubbing the ground. In some instances the breast does rub the ground, and the feathers are worn off. During the courting antics the male inflates his saffron-colored air-sacs on both sides of the neck and makes a guttural sound, stepping much as does our turkey gobbler. All of this performance is apparently directed to attract the attention of the females, which gather together old and young, big and little.

The sage hen is by nature terrestrial; flying at best is a laborious performance and only resorted to as a last expedient. With much effort a bird lifts itself, but when once in the air it flies rapidly, and I have seen them sail for two miles or more before alighting. Sage hens are not suspicious birds. They generally walk or run away from an intruder, sometimes hiding among the sage bushes, where, owing to their protective coloration, it is quite difficult to detect them without a bird dog.

In October, sage hens congregate in large flocks, and feed almost entirely on sage and soon lose their gamey flavor brought with them from their higher homes.

The principal diet of the sage hen throughout the year consists mainly and almost exclusively of sage and a great portion of bitter brush, along, however, with a certain amount of flower buds and bulbs. It is about the only bird known that can eat with relish, and benefit, the leaves of our common sage brush, and subsist upon that food indefinitely. In fact, there are various kinds of herbage that sage hens are known to pick up during certain seasons of the year aside from sage, but such only in very small quantities.

The sage hen is one of our grandest game birds, a bird that should be carefully guarded to prevent extinction. The young birds are often alert and rise from the ground at some little distance at the approach of man on foot or horseback. If the hunter marks them carefully when they alight he has no trouble in walking within easy shooting distance. When flushed, the sage hen almost always flies behind the hunter making a turn in the air just after leaving the ground, thus making it a large and easy target. Like most of our ground birds it does not fly from cover at the crack of a gun.

The writer recalls about twenty years ago when thousands of sage hens made their homes in Long Valley, which is in the south end of Mono County and just northwest of Inyo County's north boundary line. At that time it was considered mere play for the cowboys to dash with their saddle horses into a large flock of sage hens, one thousand or more, and strike down two or three with their quirts or cow whips before the birds could possibly get out of the way. Conditions now, however, have changed. Of the thousands which a few years ago inhabited our plateaus, now only a few scattered hundreds remain. Indeed, the situation regarding the future welfare of the sage hen throughout California was most alarming until the stringent laws of recent years became effective.

NOTES ON THE LIFE HISTORY OF THE BLACK-TAILED DEER.

By J. D. Coffman.

Though the black-tailed deer, *Odocoileus columbianus,* is well known and widely hunted, yet its habits and life history are but imperfectly known. We therefore offer the following notes, which have been compiled in connection with a report sent the California Fish and Game Commission by the Trinity National Forest, as a contribution to the life history of this notable game mammal.

With the heavy snows on the higher ranges, the deer descend to the lower elevations and during the winter feed on such bunch grass and browse as is available, utilizing moss, mistletoe and branches broken off by snow where the more palatable forms of forage are unavailable. During this period of the year the deer travel in bands. As the snows melt away they follow the snow line back to the higher ranges and during May and June scatter out through the mountains. During the spring they feed on open glades, but after the middle of June most of the deer ascend to the higher slopes, feeding on tender shoots and grasses during the early summer, and almost exclusively on browse, such as hazel, oak and various species of Ceanothus (blue brush, buck brush, wedge-leaf (chaparral), and white-thorn), from early August until the acorns are ripe in the fall. Then mast forms a large proportion of their food within the oak country. In the fall, after the rains have come, deer will also dig for roots and ground shoots, and feed extensively on the edible fruiting bodies of certain species of fungi that develop abundantly in the timber at that season. During the summer season deer use natural mineral springs and salt licks extensively.

It is noted after extremely cold and snowy winters that a few deer appear to die from the effects of the storms, deer so dying being found late in the winter or in the early spring after they have commenced feeding on the open grass lands. For this region (the Trinity National Forest) the rutting season begins early in November and ends about the middle of December, depending a great real upon the altitude where the deer happen to be feeding, the mating beginning several weeks earlier in the lower elevations than at the higher altitudes. On the lower lands within the watershed of the north fork of the Eel River, in the southwestern portion of the Forest, the rutting season begins about one month earlier than the general season stated above.

It is a common belief among the old residents that the first heavy storm during November has considerable influence upon the rutting season. This may, however, simply be due to the fact that these storms appear usually about the time the deer start to run, and the impression may also be due to some extent to the fact that the tracks are so much plainer in the snow that it creates the impression the deer have been running more, and it is probably true that the deer would move around more after the advent of snow even aside from the rutting season.

During the running season the bucks frequently fight each other, and many of the old ones have torn ears from their horned encounters with their rivals. The bucks at this time become thin, as a rule, and

the meat is usually unfit for food even though the buck may appear to be in good condition.

The young are born during the months of May, June and July. The does first breed, therefore, when they are approximately eighteen months old. In their first breeding season they bear but one fawn as a rule, and very often but one during the second season, but thereafter bear two fawns, and in rare instances three. Until such time as the fawns are able to follow the does, they are hidden away in a brush patch or sheltered nook, while the mother feeds near by, returning to them at intervals during the day. After the fawns are able to travel, their beds or hiding places are changed frequently until such time as the fawns are able to follow throughout the day. During the first six weeks the fawns are said to have no scent, the scent glands probably not having developed as yet. This undoubtedly protects them materially from their predatory enemies. Even with this protection, probably not as many as fifty per cent of the fawns reach maturity. Most of the fawns have lost their spots by September and are weaned during the fall. The fawns usually remain with their mother until they are yearlings or until the next fawns are born, and frequently stay with her even for several months longer.

The bucks shed their antlers during January and February. During March they have only a skin covering over the old scar, and the new antlers begin to grow in April. During the months of June, July and August the antlers are in the velvet and are tender, so that the bucks remain in the open timber or around rocky places, and do not frequent brush areas. During the latter part of August and the first half of September they rub the velvet from their horns. About November 1 the bucks' necks begin to swell, and they do considerable traveling around just previous to the rutting season.

The summer coat of all the deer is of a reddish color, and the winter coat is of a bluish-grey color and is heavier than the summer coat, the hair being longer. The winter coat is shed during May, and the summer red is worn until September, when the winter coat begins to come in again. Occasionally a white or albino deer is seen or killed, and also black deer, both being rare varieties of the common local species.

During the latter part of August and the month of September most of the deer range at high elevations and lie in heavy brush thickets as a protection against flies, and perhaps to escape hunters and their other enemies as well.

CALIFORNIA FISH AND GAME

A publication devoted to the conservation of wild life and published quarterly by the California State Fish and Game Commission.

Sent free to citizens of the State of California. Offered in exchange for ornithological, mammalogical and similar periodicals.

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All material for publication should be sent to H. C. Bryant, Museum of Vertebrate Zoology, Berkeley, Cal.

January 15, 1920.

"Game laws are not enacted for the purpose of depriving any citizen of his rights, but rather to prevent such deprivation by assuring a supply."

FIVE YEARS OLD.

CALIFORNIA FISH AND GAME is now five years old. If you are not aware that it has grown in size, compare the first issue with the recent trout number. But physical growth is not everything. We trust that there has been a growth in the so-called "general tone" of the magazine as well. It is to be hoped that each issue acts more and more as an evangel of conservation and that the material presented increasingly convinces the reader that California's wild life resources are worth something and consequently need to be conserved.

CALIFORNIA FISH AND GAME was started as a means of moulding public opinion, for it was believed that: "The effectiveness of game protection is governed by the interest of the people and the spirit of those who hunt and fish." To judge of its effectiveness in this regard is perhaps difficult, but it is certain that there has been a growth of public opinion favoring the protection of wild life resources, and we believe the magazine has helped in this development.

You will find in the volumes completed noteworthy facts concerning the status of fish and game in California and the means being taken to conserve it. The magazine has acted primarily in an educational and publicity capacity, but it also constitutes a record of activities and accomplishments which are of historical value.

In looking toward future numbers what more can we do for the cause? Our magazine has not entered the field of the sporting magazine. Articles seldom appear in story form and the usual hunter's experiences recounted in characteristic fashion are omitted, and for that reason it may not be so readable. The adherence to scientific fact, however, should carry added importance to the reading matter, even if popular and light reading is lacking. It should be remembered that the function of our magazine is quite different from that of a typical sporting magazine.

If CALIFORNIA FISH AND GAME is not living up to its motto "Conservation through Education," let us immediately receive a set of protests from our readers.

WE MUST CAPITALIZE OUR RESOURCES.

More and more we are awakening to the fact that fish and game propagation and protection is a business proposition. One of the most convincing arguments for the conservation of wild life resources is to be found in the attractiveness of fish and game to sportsmen outside of the state, who benefit the state by spending large sums of money in obtaining their sport. It is up to us to capitalize all of our resources—climate, mountain scenery, forests, fish and game. When capitalized it does pay dividends. These dividends, however, continue only when fish and game are properly conserved. Had a sufficient breeding stock of that most valuable of all the fur-bearers, the sea otter, been maintained the state would now be obtaining a return from a splendid industry. The practical extinction of this valuable fur-bearing animal precludes any return. With a little foresight California can so conserve its supply of wild life that it will form a permanent and paying attraction to the pleasure seeker. With a little indifference California can become bankrupt so far as invested capital in natural resources is concerned, with no hope of solvency.

EDUCATION VERSUS LAW ENFORCEMENTS.

Since the beginning of the educational campaign in this state to establish a public sentiment favorable to fish and game conservation, we have continually pointed out

the advantages of the educational method over that of force. The necessity of a patrol force is largely due to the lack of proper public sentiment. The most fundamental way of cutting down the number of violations is to let people know something about the wild life of the state and its needs.

State after state is coming to a realization of just these facts. New York is doing some splendid educational work, Michigan has been devoting a great deal of energy to an educational program, and now we note that Wisconsin has begun an extensive program of education and has been employing speakers to deliver lectures throughout the state. The results have been so much worth while that an enlargement of the program is planned. According to the Wisconsin Commission "it is the one thing that will save the wild life of the state and the work must be pushed vigorously. Until such time as the people become educated to the importance of a united public sentiment for conservation we must pursue the course of warrants, courts and fines and follow the old method of educating with the sledge hammer, teach through force instead of reason and the more rigid the laws and the more severe the fines, the more potent the effect."

FUR RESOURCES ENDANGERED.

That it is high time each state turned its attention to giving judicious protection to fur-bearing mammals is evidenced by the following statements given in a recent Farmers' Bulletin (No. 1079) of the United States Department of Agriculture:

"Recently the supply of peltries has been decreasing at an alarming rate. Raw-fur buyers representing all parts of the country place the decrease at from 25 to 50 per cent during the last ten years. There are no longer any virgin trapping grounds. Even in Alaska the two most important fur-bearing animals, the beaver and the marten, have become so nearly exterminated that they are now being protected by a close period.

"Laws protecting fur-bearing animals are designed to keep a steady flow of peltries coming to market year after year, thereby bringing trappers a reliable income and giving regular employment to thousands of people engaged in dressing skins, manufacturing garments, and distributing them through the various avenues of trade.

"A general protest comes from raw-fur buyers against traffic in unprime skins. The losses caused by killing fur animals when their pelts are not prime are enormous. An educational campaign is greatly needed to prevent this waste and to perpetuate our fur-producing resources."

NEW GAME FISH IMPORTED.

On November 24, 1919, the California Fish and Game Commission received a shipment of ayu eggs on the steamer Shinyo Maru from Japan which were sent through the courtesy of Professor C. Ishikawa, College of Agriculture at Komaba, near Tokyo (Tokyo Imperial University), Japan.

The eggs were deposited on cocoanut fiber and placed in four jars holding about a gallon to a gallon and a half of water each. There were also three tubs about thirty inches in diameter which contained approximately three to four pieces of fiber each. The ayu eggs are very small, not much larger than the eggs of the shad. As soon as the consignment arrived in San Francisco the eggs were hurried to the Brookdale Hatchery and were placed in the hatching troughs at that place, where they are at the present time. Upon arrival the eggs were apparently all dead but since this Commission is very anxious to give this experiment a thorough test every precaution was taken in the handling and placing of the eggs in the hatchery troughs in case any life should develop.

The Commission feels greatly indebted to Dr. David Starr Jordan of Stanford University, who originally corresponded with the Imperial University at Komaba near Tokyo, and it was through his efforts that the shipment was received. The ayu is a sporting fish belonging to the trout family and it will make an excellent fish for the anglers. It reaches a length of 8½ inches; none are to be found in this country.—E. D.

CALIFORNIA FURNISHES STRIPED BASS TO HAWAIIAN ISLANDS

On Saturday, November 15, 1919, the California Fish and Game Commission shipped about 2500 striped bass from 2½ to 3 inches in length to the Fish and Game Commission of the Territory of Hawaii to be planted in streams in the vicinity of Honolulu. Captain H. E. Foster of the patrol launch "Quinnat" had charge of the seining crew which col-

lected the fish on the Benicia flats by means of a beach seine 270 feet long, 12 feet deep, the bag of which was ½ inch mesh and the wings 1½ inch mesh. It took about three days to make the catch.

The fish were held in live cars until sufficient were collected to make the shipment and then were put aboard the Matson Navigation Company's steamer "Maui." Here the fish were distributed in six large salmon tierces that had been arranged on the main upper deck in front of the office of the chief engineer, Alexander Ryan, who took personal charge of the fish on the trip. Each tierce had salt water circulation by means of a small pipe which had been connected up with a pump in the engine room.

In 1874 California received the first shipment of 150 small striped bass from New Jersey. These fish were distributed in the Sacramento and San Joaquin rivers. In 1882 a second shipment of 400 striped bass were sent to this state by the United States Bureau of Fisheries. California has an annual catch of about 1,500,000 pounds of striped bass, with a commercial value of about $150,000. Since so fine a result was obtained with a small number of fish in California the large plant of 2500 fish in the vicinity of Honolulu should assure the rapid establishment of this splendid fish in the Hawaiian Islands.—E. D.

STREAMS NOW STOCKED WITH GOLDEN TROUT.

The angler who visits the Southern Sierras during the next few years will be elated to discover the streams teeming with Golden Trout. Heretofore the "most beautiful trout in the whole world" was limited to a few high mountain streams in the vicinity of Mount Whitney, and the angler was forced to take a long hard pack trip in order to secure this trout. Now, owing to the operations of the California Fish and Game Commission the golden trout is to be found in mountain streams from the southern boundary of the Yosemite National Park to the tributaries of the Kern River.

In the beginning Golden Trout were caught with hook and line and then transported by mule pack train to other streams which were to be stocked. Now the fish are spawned and the eggs hatched at the Mount Whitney hatchery and then distribution is made. During September and October of this year large plants of golden trout have been made in the headwaters of the Kings River, thus extending the distribution of this fish over fifty miles to the northward. Former plants had already extended the distribution more than one hundred miles to the northward. Every effort is being made to extend the range of this notable trout, care being taken, however, to keep a pure strain by planting in barren waters. As results of former plantings have been very successful, it is expected that golden trout will be available to everyone within a few years, and that the lakes and streams of the southern Sierras will be the Mecca of anglers the world over.

IN MEMORIAM.

OSCAR H. REICHLING.

It is with deep regret that we record the death of Oscar H. Reichling, Cashier of the Fish and Game Commission, which occurred on Sunday, November 9, 1919.

Mr. Reichling was appointed a special deputy on October 24, 1903, while living at Jackson, Amador County. Impressed with the frequent flagrant violations of the laws protecting wild life, particularly by the foreign element, Reichling saw that unless the laws were enforced that it would be only a short time until there would be no game or fish. As a citizen, he did what he could to stop the violations, but found that he was handicapped by not having authority to make arrests. He corresponded with Chas. A. Vogelsang, who was then Chief Deputy, and through him received an appointment. While acting as a special deputy, he made an excellent record and when, with the advent of the Hunting License Law, it was possible to employ more regular deputies, because of his record, he was given a permanent appointment, March 24, 1908, with headquarters in San Francisco.

As Mr. Reichling was exceedingly painstaking and accurate and had early training as a bookkeeper, it was found that he could best be used in this capacity and he was detailed to assist the late Judge E. G. Heacock, then in charge of the license and bookkeeping department. Upon the death of Judge Heacock, in 1909, he was again promoted. Later he was given the very responsible position of cashier, the place he held at the time of his death.

Mr. Reichling is survived by his wife and mother and also by three brothers and sisters. He was a member of Excelsior Parlor, N. S. G. W., and is mourned by a host of friends.

—J. S. H.

SAVE KLAMATH LAKE BIRD RESERVATION.

California today is one of the greatest out-of-doors states in the union. Its mountains, lakes, forests, rivers and wealth of bird life attract people from every state in the country. Every man, woman and child in this state owes Theodore Roosevelt something for his far-sightedness and for his efforts in saving the wild birds of the state. They not only owe something in the way of a cash contribution to a memorial for his far-sightedness, but they owe some effort toward saving these greatest living and useful monuments which he preferred to any other kind.

Although Lower Klamath Lake is a federal wild bird reservation by special proclamation and wild birds are carefully protected by both state and federal law, yet the vital defect in the whole situation is the present unfortunate condition which is bringing about the destruction of bird life on a vast scale and the annihilation of this great reservation by the drying up of the lake. The myriads of ducks, geese, wading birds and other wild fowl are at home in the wonderful marsh land, but they can not exist on the alkali flats of the desert.

Picture to yourself the condition a few years ago when Roosevelt created the Klamath Lake reservation. Here was a wide, open, shallow alkaline lake ten or twelve miles long. For miles and miles around the border was a vast tule marsh, white with the nesting multitudes. The beauty of Lower Klamath Lake was in its life, the flying birds that hovered over the wide, treeless area, the calling flocks that from time immemorial have held this as their own. Around the wide border of the lake a wild swamp grass grew, nurtured by sub-irrigation, and a great number of cattle were raised here.

FIG. 7. Lower Klamath Lake, a federal bird reservation, from the west shore of the lake. An abundant tule growth on the east side of the lake forms an especially fine breeding ground for waterfowl and the islands in the lake are used as breeding grounds by cormorants, pelicans and great blue herons. Photograph by H. C. Bryant, June 9, 1914. (Neg. 1269, Calif. Mus. Vert. Zool.)

Then came the land operators and wildcat schemers and advocated the drying up of the lake by cutting off its water supply from Klamath River. They said instead of a marshy waste we could have a great farming area. A dyke was built and a change has gradually taken place. Instead of the waters, we now have desert flats crusted with alkali. The meadows of wild grass owned by stockmen about the lake have reverted to the desert because of the lack of water. The great tule marsh, as dry as tinder, and the peat two or three feet below the surface, was set on fire last spring and is now a gigantic waste, flaming in some places and slow burning under the surface in others. The migratory flocks that have fed and nested here are flying about without homes and resting places.

A. P. Davis, director of the reclamation service, has written Senator Chamberlain that a recent investigation of the marsh lands around Lower Klamath Lake has failed to disclose positive evidence of their value for agricultural purposes. According to his own words "very little conclusive evidence can be found as to the agricultural value of the lands around Lower Klamath Lake."

Here is the most useless piece of destruction of one of our greatest out-of-door resources, and nothing gained. The whole thing can be remedied if the reclamation service will open the dykes and let the water back into Lower Klamath Lake. Every citizen of the state should take this matter up with the reclamation service, our senators and representatives in Washington, or with the Secretary of Agriculture. If immediate action is secured Klamath Lake Reservation could be restored and would remain as a great living monument to Theodore Roosevelt.—W. L. Finley, *State Biologist*, Portland, Oregon.

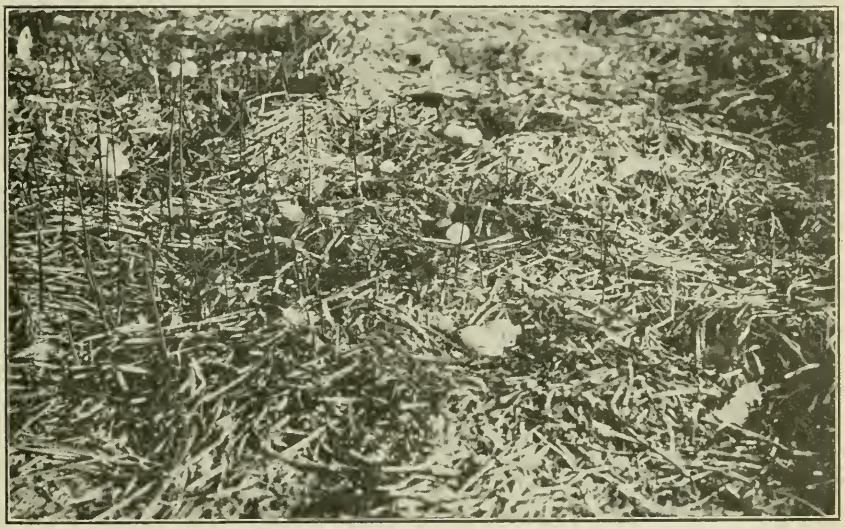

Fig. 8. Nests of pelicans and cormorants on Bird Island, Lower Klamath Lake. Photograph by H. C. Bryant, June 8, 1914. (Neg. 1276, Calif. Mus. Vert. Zool.).

THE HUNTER'S LAMENT.

"Of what earthly use is it to protect waterfowl from overshooting and then take away their nesting grounds, their feeding waters and the places where they rest on migrations? It is of the utmost importance that public waters be preserved, if we are to maintain duck shooting."

So says the American Game Protective Association with reference to the drainage of Big Rice Lake in Minnesota under the pretext of land for the farmer.

So say we all of us with reference to the Klamath Lake Bird Reservation and other wildcat schemes which threaten the extermination of our wild life resources.

SOUTHERN CALIFORNIA FISHERIES FILMED.

In order to inform the people of the state as to the wonderful fisheries which have been developed in Southern California the past few years, the Fish and Game Commission has recently had a film made depicting the outstanding features of the tuna fishery. After spending many days aboard the launch "Albacore," of the Fish and Game Commission, the camera man secured a very fine series of pictures showing the methods of capturing the fish. Visits to the canneries helped to complete the film for here the whole canning process was photographed. In the film, therefore, one may view the entire process from the capture of the fish at sea to the finished canned product. Outstanding features of the film are a scene at Smug-

gler's Cove showing the fishing fleet at anchor, secured after a rough and dangerous landing, and scenes showing a barge being loaded with tuna.

This new film forms a part of the free film service furnished by the Fish and Game Commission. Many splendid films showing wild birds and mammals in their own homes are available through the Fish and Game Commission's educational and publicity department.

SEVEN GRIZZLIES FORMERLY EXISTED IN CALIFORNIA.

Now that the grizzly bear is extinct in California careful studies are being made of the material at hand to find out how many varieties of grizzly bear actually existed in this state.

Dr. C. Hart Merriam has published a review of grizzlies and big brown bears of North America (U. S. Dept. Agric., North American Fauna, No. 41, Feb. 9, 1918) in which it is pointed out that seven varieties of grizzly bear were formerly found in this state. The California coast grizzly formerly ranged in humid coast regions from San Francisco Bay south to San Luis Obispo. The Tejon grizzly was found in the dry chaparral hills of interior coast ranges, between the San Joaquin Valley and Los Angeles. The Sacramento Valley grizzly was limited to the Sacramento (and perhaps San Joaquin) Valley and adjacent foothills. In extreme northern California, along the Klamath River, ranged the Klamath grizzly, while further south in Mendocino County was to be found the Mendocino grizzly. The largest one formerly occurred in the Santa Ana, Cuyamaca and Santa Rosa mountains of southern California. Still another variety roamed over the southern Sierra Nevada, this one being called the Henshaw grizzly. The Southern California grizzly was the largest of all the grizzlies, even larger than the great buffalo-killing grizzly found on the Kenai Peninsula in Alaska. It was of such a huge size that the weight of a male is estimated at 1400 pounds. The height at the shoulder from flat of foot of one specimen measured 4 feet. The sole of the largest foot, without claws, measured 12 inches in length and 8 in breadth. The length of an old female taken in Trabuco Canyon near Santa Ana measured 6 feet 3 inches.

Material collected by the United States Bureau of Biological Survey made possible this paper, which describes eighty-six different varieties of grizzly and brown bears, a large number of which are newly described varieties. Skins and skulls in the California Museum of Vertebrate Zoology at Berkeley were used in the studies made by Dr. Merriam.

WHEN ARE GREENHEADS MOST ABUNDANT?

A recent article by Aldo Leopold in the October number of *The Condor*, entitled "Differential Sex Migration of Mallards in New Mexico," brings up the mooted question as to whether female

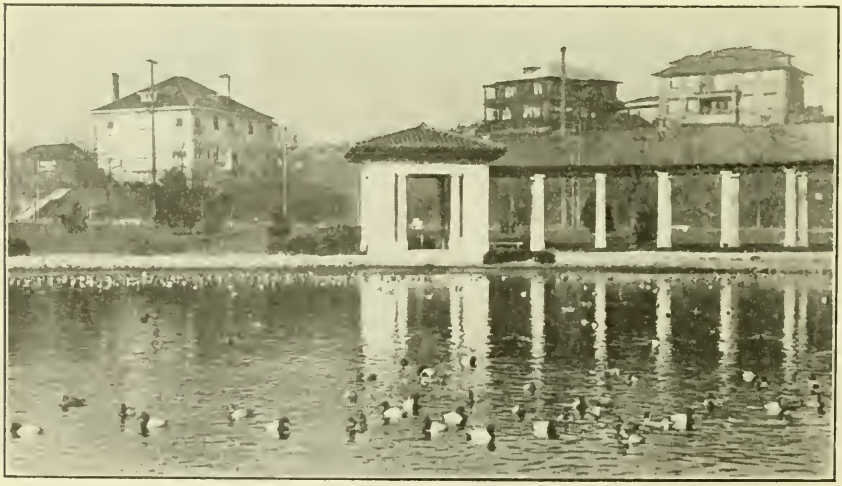

FIG. 9. Canvasbacks on Lake Merritt, Oakland, the first game refuge established in California. Photograph by H. C. Bryant, December 27, 1918.

CALIFORNIA'S GAME SANCTUARIES.

California is assuring a perpetual supply of game by setting aside areas where no hunting is allowed and where game is allowed to breed unmolested. The state is responsible for the creation of most of them, the federal government for others. Certain areas known as game refuges have been set aside by legislative enactment. Others known as state game preserves have been created by the Fish and Game Commission after the owner of the property has ceded all hunting privileges to the state for a period of not less than ten years. The federal government has set aside five bird reservations and protects all of the wild life within the national parks and national monuments. As a consequence game is now absolutely protected on nearly 3,000,000 acres within the State of California, an area roughly equivalent to three per cent of the total area of the state.

GAME REFUGES.

Name	County	Area, acres	Established
1A	Siskiyou	8,960	1917
1B	Modoc	57,000	1917
1C	Modoc	47,560	1917
1D	Trinity	64,000	1915
1E	Shasta	69,000	1917
1F	Lassen	47,580	1917
1G	Tehama	34,400	1917
1H	Plumas	31,000	1917
1I	El Dorado	64,000	1917
1J	Amador	57,600	1917
1K	Fresno	33,400	1917
1L	Tulare and Kern	37,600	1917
2A	Mendocino and Lake	37,000	1917
3A	Santa Cruz	3,400	1915
3B	San Benito and Monterey	13,760	1909
3C	Santa Barbara	39,680	1917
3D	Ventura	125,440	1917
4A	Los Angeles	600,740	1915
4B	Los Angeles		
4C	Orange	76,160	1913
4D	Riverside	69,120	1917
4E	San Diego	51,840	1917
Mount Tamalpais	Marin	28,000	1917
Lake Merritt	Alameda County (Oakland)		1869

STATE GAME PRESERVES.

No. 5	Monterey and San Benito	8,570.57	1916
No. 6	Santa Barbara	42,000	1918
No. 7	Santa Barbara		

FEDERAL BIRD RESERVATIONS.

Klamath Lake	Siskiyou	*22,400	1908
Clear Lake	Modoc	*1,600	1911
East Park	Colusa		1909
Farallon Islands	Pacific Ocean, near San Francisco		1909
Goat Island	San Francisco Bay	141	1916

*Approximate.

NATIONAL PARKS AND MONUMENTS.

Parks—			
Yosemite	Tuolumne and Mariposa	719,622	1890
Sequoia	Tulare	161,597	1890
General Grant	Fresno and Tulare	2,536	1890
Monuments—			
Lassen Volcanic	Shasta, Lassen, Plumas and Tehama	79,561	1916
Muir Woods	Marin	295	1908
*Pinnacles	San Benito	2,080	1908

*Included in State Game Refuge No. 3B.

ducks migrate southward earlier than the males. According to the article female mallards are most abundant in the Rio Grande Valley near Albuquerque during October. By November the preponderance of females is diminished and by December first there is a preponderance of males. The proportion of males and females is about equal among the mallards wintering in the region. The article furthermore points out that a number of ducks banded at Great Salt Lake in Utah have been taken in New Mexico.

It may be that sportsmen in this state can gather evidence which will support or refute the statements made.

CALIFORNIA'S FIRST GAME REFUGE.

Splendid publicity has recently been given the first game refuge established in California through the publication of an article entitled "Wild Ducks as Winter Guests in a City Park," in the National Geographic Magazine for October, 1919. The article is by Joseph Dixon, of the University of California Museum of Vertebrate Zoology, who made a careful study of the bird life on Lake Merritt, almost in the heart of the city of Oakland, and took many splendid photographs of the birds. Lake Merritt was set aside as a state game refuge in 1869, and therefore has the distinction of being the oldest refuge in the state. That the refuge is fulfilling its mission is evidenced by the great flocks of waterfowl which frequent its waters and the surrounding lawns each winter. Furthermore, the number of birds appearing is on the increase, showing that it is being utilized as a safety zone by more and more birds each year. This may in a measure be due to the systematic feeding carried on by the city of Oakland. No visit to Oakland in the winter is complete without an investigation of this bird sanctuary which so well testifies to the worthwhileness of setting aside areas where hunting is prohibited.

PROTECT THE WOOD DUCK.

Fortunately the duck most nearly exterminated in this state is one which can be readily recognized by a peculiar rolling flight quite unlike the flight of any other duck, and by a long, square tail that gives it a different outline and appearance. It possesses iridescent colors and the male has conspicuous markings. Furthermore, it practically never flocks with other ducks. There is no excuse, therefore, for killing this duck, which is protected by both state and federal laws looking towards its ultimate retention as a member of our fauna.

FISHES IN RELATION TO MOSQUITO CONTROL.

The United States Bureau of Fisheries in a recent publication (U. S. Bureau of Fisheries, Document No. 874) tells of investigations to determine the effectiveness of fishes in eradicating mosquitoes. Experiments were made with various species of small fish, and while it was found that some varieties, such as sun fish and gold fish, destroyed the mosquito when confined in small aquaria, they were of little value in large bodies of water where other food was obtainable.

However, by a series of experiments it has been found that the *Gambusia affinis* (Baird and Girard), or top minnow, can be made of practical value in the control of the mosquito pest. Investigations showed that this fish is especially suitable for antimosquito work because it seeks its food at the surface, where the mosquito and its larvæ are found; it is very prolific, giving birth to well-developed young and therefore requiring no special environment for egg culture; and it thrives in areas especially suitable for the support of mosquito larvæ. But experiment also showed that the top minnow must be protected from larger fish, bass especially, its chief protection being the presence of shallow water; and that there are some instances where the top minnow can not be used against the mosquito because the mosquito sometimes breeds in water so badly polluted that the top minnow can not live therein, as in a particular instance of water polluted by chemicals.

The results of the experiments indicate that the top minnow, when planted under proper conditions, completely eliminates mosquitoes, provided the waters are kept free from protective vegetation, such as slightly submerged leaves and stems, or growths which form a floating mass; and that even though protective vegetation exists, the top minnow greatly reduces the number of mosquitoes, the number of fish

required for eradication depending largely, of course, upon the condition of the water with respect to protective vegetation.

BIRD PROTECTION IN ENGLAND.

A committee of the Royal Society for the Protection of Birds has recently investigated the present English laws and has suggested many changes looking toward the reconstruction of the Wild Bird Protection Acts. It is pointed out that there are numerous defects and obscurities in phraseology which have added largely to the complications which have arisen in the working of the six interdependent acts. The law has not been enforced in any general or habitual manner and has failed to protect the rare birds of the country.

The report gives first of all a historical review of bird protection laws in Great Britain, a digest of the present laws with the offenses and penalties, results of the present law, the proposed new law, and international law. Among the recommendations are the setting up of two schedules in the place of one, the general closed season to be from March 1 to September 1. Owners and occupiers are to have power to kill or take birds on their land during the closed season, with the exception of the birds listed in the schedules. Listed among the game birds on schedule A with an open season each year are such birds as the skua, black-throated diver, night jar, peregrine falcon, wood lark, woodpecker and wryneck. On the other hand, among the birds on schedule B which are given total protection are such birds as the avocet, Kentish plover, golden eagle, osprey, spoonbill and most of the owls.

The committee further recommends increased educational work, stating: "In order to protect birds both worker and child must know a little about them. Information regarding their characteristics and habits must be circulated. Bird and arbor schemes or their equivalent must bring light and air into the whole elementary school system. We should be glad to see a Bird Day, devoted to lectures, become a regular feature of the program of every school in this country."

THE FISHING INDUSTRY IN CALIFORNIA.

California in 1915 ranked second among the Pacific Coast states in the number of persons engaged, in the value of its investment, and in the amount and value of its fishery products. There were 4,282 persons engaged in the shore fisheries, 551 in the vessel fisheries, 35 in vessels transporting, and 3,584 persons engaged on shore in canneries, etc., making a total of 8,452 persons connected with the fisheries, as compared with 5,530 in 1904. The increase can be traced mainly to the shore industries.

The total investment in the fisheries of the state amounted to $5,824,263, showing an increase of nearly 55 per cent since 1904. The items making up this total are 73 fishing vessels valued, with their outfit, at $354,375; 20 transporting vessels with a value, including their outfit, of $72,000; 1,429 gasoline boats valued at $1,351,110; 1,169 other boats valued at $104,816; apparatus, in the shore and vessel fisheries, valued at $606,944; shore and accessory property with a value of $2,731,390 and working cash capital amounting to $448,809.

The products of the fisheries of California in 1915 aggregated 93,338,703 pounds, with a value to the fishermen of $2,506,702. This is an increase of about 44 per cent in quantity, but a decrease of about three-fifths of 1 per cent in value as compared with 1904. Among the items in the products of special importance may be mentioned 7,303,933 pounds of chinook salmon, valued at $340,949; 21,024,190 pounds of albacore, or tuna, valued at $316,103; 6,923,563 pounds of flounders, valued at $209,766; 375,774 pounds or 53,682 bushels, of eastern oysters, valued at $165,573; 4,952,692 pounds of salted cod, valued at $161,695; 1,784,488 pounds of striped bass, valued at $146,928; 4,344,254 pounds of rockfishes, valued at $146,216; 892,392 pounds of spiny lobsters, valued at $130,119; 1,414,155 pounds of crabs, valued at $124,870, and 5,761,929 pounds of sole, valued at $108,252.—*Bureau of Fisheries, Document No. 875.*

A CALIFORNIA FOX FARM.

Messrs. Lewis and Kierman, of Nevada, have started a fox farm near Pomin's, on the shores of Lake Tahoe. Six of the best silver black foxes obtainable have been purchased from Prince Edward Isle, at a cost of over $9,000. Four large fox pens

of reinforced heavy poultry wire have been built, each equipped with a strong house for shelter and with runways to the ground. The accompanying picture (Fig. 10) shows the favorite male fox, a little over two years of age, which produced fourteen pups on his second breeding. This fox cost $2,100 and his fur is

FIG. 10. Silver gray fox. A valuable animal imported from Prince Edward Island for use at a newly established fur farm at Lake Tahoe. Photograph by J. Sanders.

exceptionally fine. Messrs. Lewis and Kierman expect to raise furs for the market, and it is rumored that other parties from Nevada intend starting a fox farm in the spring, also to be located in the Tahoe region.—J. H. SANDERS.

HOW MANY SHOOTERS IN THE UNITED STATES TODAY?

Prior to the war it was estimated that we had at least five million sportsmen in the United States. Men in a position to know claim that this year the total will be increased at least one million and possibly more. Many of the boys who before their experience in the army had never fired a gun, will not be satisfied now without their share of the sport.—*Illinois Sportsman*, Nov. 13, 1919, p. 3.

OWNERSHIP OF WILD LIFE.

"Wild life is the property of all the people," says the *Conservationist*. No one attempts to deny this, and least of all the game violator. From his point of view it is not only the property of all the people, but is more particularly the property of him who can get it. The more remote the locality where the law is violated, the more deeply rooted is the idea that the game is there to be taken, regardless of law, and without much feeling of moral obliquity. The violator has a strange feeling that some sort of justification is on his side, though the law may be on the other. The point of view is that of early colonial times, before the state had reason to assert its ownership—when, indeed, game was the property of any one who could shoot straight enough. It is the point of view of an extreme individualist.

Game is still the property of everyone. But, whereas originally the people placed no restrictions upon the use of that property, they have now thrown about it safeguards that are vital for its continued existence. Every citizen has a vested interest in every individual bird, animal and fish, and is defrauded, if the game is taken in any way contrary to the established rules. The point of view of the man who respects the law, and insists upon respect for it in others, is that of collective ownership. His individual right to take game is dependent upon consent to do so from others.

The feeling of collective ownership is still only partly developed. The tendency to wink at violations still decreases as the sense of common ownership of wild life is strengthened.—*The Sportsmen's Review*, Nov. 15, 1919.

THE WARDEN OF GAME.

"The game protectors are the people's appointed representatives in protecting what is the people's own property. Their task is a hard one, but they are doing it well. From year to year, the force is constantly developing in efficiency and effectiveness, and its members are responsible for the conservation of natural resources of untold value. They perform work of the highest public importance and their efforts are deserving of the people's unqualified support and commendation."—*The Conservationist*, May, 1919.

MUSKRAT FARM ESTABLISHED IN OHIO.

The price of furs has continued to rise until the lowly muskrat, which our fathers sold for 10 cents a pelt, now brings about

$1.50. It is not surprising, therefore, that an enterprising man in Port Clinton, Ohio, has purchased 160 acres of marsh land along the river which he expects to turn into a muskrat fur farm. The fact that the bodies of the animals will bring about 25 cents increases the possibility that the project will be a success.

CANADA URGES PROTECTION OF GAME.

One of our two species of swans, a curlew and a crane, are in the gravest danger of extermination now and other species will follow unless everyone helps to keep our promise to protect these migratory birds. Man has exterminated species of birds; but not in all time can he replace a species. A species evolved through millions of years, with its marvelous adaptations to meet its needs, its wonderful beauty or power of flight, can be exterminated by man and disappear from this earth utterly and forever or it can be protected and live on, reproduce its kind, and be a delight and a source of knowledge to man, who may in some distant, wonderful time unravel some of the mystery of its origin which points back to the dawn of life, and to the Creator of all. —*Dept. of the Interior, Ottawa, Canada.*

NEED FOR DOE PROTECTION OBVIOUS.

A pitiful sight that ought to carry an eloquent message to every sportsman who has killed or who may be tempted to kill a doe, was met with by two hunters on October 4, 1919, in Bear River Canyon, about eight miles above Colfax, Placer County. The sportsmen came upon a doe which had the appearance of having been dead two, or perhaps three days, judging from the condition of the carcass and by the hoof tracks of the animal that had been made previous to a light rain that had fallen the day before. The deer had evidently traveled some distance, after having received a bullet in the lower bowels, before she fell.

The lingering death, due to poor marksmanship, in itself appeals to one's sympathy, aside from the fact that the law had been violated; but that is the smaller part of the real tragedy of that lone mountain wood. The doe was a mother, and surrounding her remains were the tiny tracks of her fawn. The doe's bag

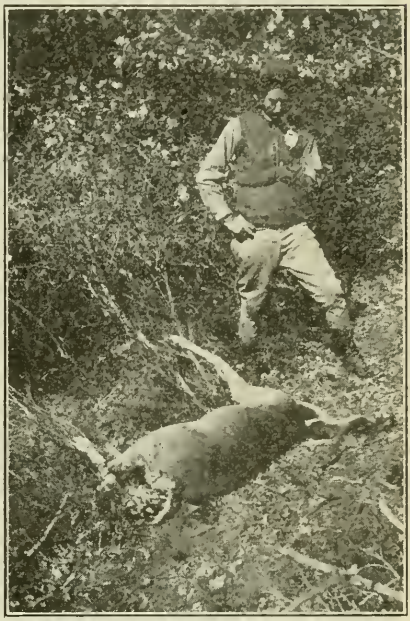

FIG. 11. A reason for the protection of does. Doe, mother of a fawn, killed by law violator. Photograph by E. M. Muse.

still contained milk, and the udders were pink, as though the fawn had nursed, or attempted to do so, up to or after the mother had died.

What became of the little fawn? Like many others that have been orphaned under similar conditions, it perhaps remained beside its unresponsive mother until it fell an easy prey to coyotes; for, not far away from the dead doe, on the dry sand bar at the edge of the river, were the unmistakable stubby-toed dog-like tracks of a large coyote.

It is to be hoped that such instances as this will serve to carry a story home to that brand of *imitation* sportsmen who shoot without care or conscience.—EDWARD M. MUSE, Sacramento, California.

FACTS OF CURRENT INTEREST.

Several San Pedro canneries are paying $155 cash per ton for albacore. Five years ago this variety of fish sold at $40 a ton. In 1918 it was $60 to $90 a ton. Now the fisherman receives $155 per ton. Previous to 1910 albacore could not be given away and tons upon tons were carried to sea to feed the sharks.

Owing to the federal law prohibiting the sale of waterfowl and owing to the aggressive enforcement of the federal migratory bird law, very few illegal shipments of ducks have entered San Francisco during the present open season.

Striped bass fishermen report splendid fishing in the San Francisco Bay region, but the take by commercial fishermen has been below normal.

The Red River Lumber Company recently pleaded guilty to a violation of the water pollution laws and paid a fine of $200. The company has taken proper means to prevent further sawdust pollution.

The Fish and Game Commission has ordered a new patrol boat for use in patroling San Francisco Bay and vicinity. The boat will be thirty-one-foot over all with seven-foot beam equipped with a twelve-horsepower engine, and will be seaworthy in every respect.

Signs that the sardine industry is growing are evident in the recent canning operations of F. E. Booth and Company, at Pittsburg. Sardines caught outside the heads at San Francisco are being canned at the Pittsburg cannery. Although subject to some delay in reaching the cannery, they are said to arrive in splendid condition.

The establishment of a fur farm at Lake Tahoe and the proposed establishment of another in the same vicinity forecasts the beginning of the fur farming industry in California.

During the months of October and November, 1919, Deputy John Burke and Special Deputy Herbert Leahy made 57 arrests in San Mateo County, the fines totaling in all $1,210; 38 of these arrests, with fines amounting to $810, were made by Deputy John Burke, and 19 arrests with fines amounting to $400 by Special Deputy Herbert Leahy.

COMMERCIAL FISHERY NOTES.

N. B. Scofield, Editor.

MANY FISHING BOATS DESTROYED.

For the second time in recent years great damage has been done to the fishing fleet at Monterey because of the lack of proper shelter for the fishing fleet. On Thanksgiving Day, 1919, ninety-two power boats were washed ashore at Monterey. Nor does this include lighters, nets and other gear, and damage done to docks and wharves. The estimated loss to the fishermen alone will run close to $150,000. A further severe loss will be suffered by the canners, as sardines are plentiful at this time and there will be but a few boats to fish for them.

In England and other European countries the government improves small harbors purposely for the use of fishing smacks. It is apparent that our own government in making surveys and plans for the improvement of harbors should take into consideration the need for refuges for fishing fleets. A breakwater which would give proper shelter for the fishing fleet at Monterey is needed, and there are many small bays along our coast which should be improved and made into harbors for fishermen's boats.

FISHERMEN'S UNION AT FORT BRAGG.

During the spring of 1919 the Fishermen's Union at Fort Bragg established and operated their own plant for mild curing the salmon catch. Steep hillside property on the Noyo River was purchased and a 60 by 80-foot shed erected. It was necessary to grade about 800 feet of roadway on the steep hillside to connect the shed with the highway. The construction and grading work was done by the fishermen, most of the labor being donated. By agreement, Small & Urie canned the small salmon for the Union, the Union packing over half the total catch of nearly 3,000,000 pounds, so that

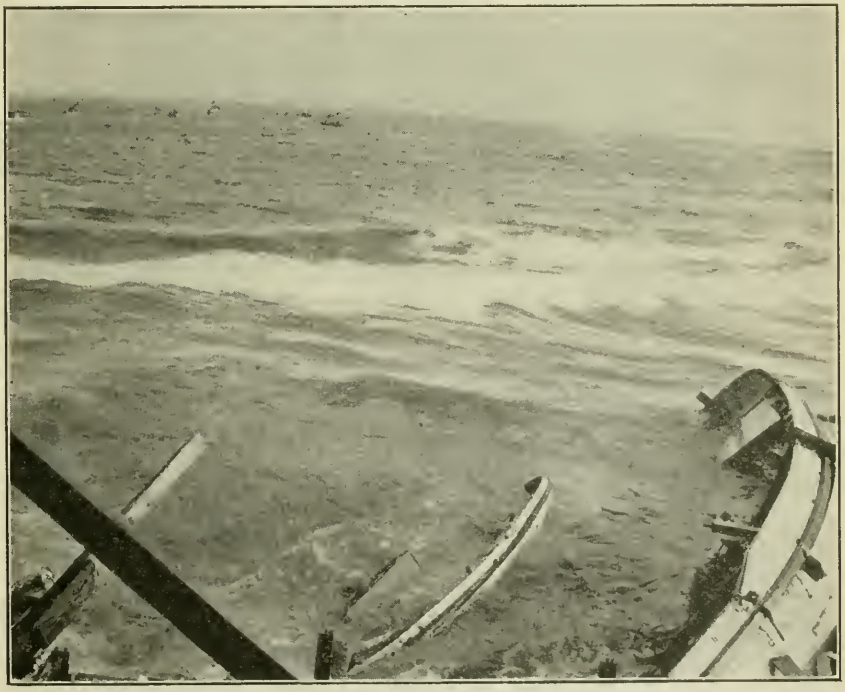

Fig. 12. Monterey fishing fleet piled on the shore after a severe storm on the day before Thanksgiving, 1919. Photograph by Heidrick.

the season at Fort Bragg has been unusually successful compared with other coast points

Encouraged by this season's success, the Union has completed plans for next year at Fort Bragg which include an addition to the Noyo River shed to accommodate a two-line cannery, ice plant and cold storage plant and the building of a mild curing house at Shelter Cove. The proposed cannery will not only handle the small salmon but also pack sardines, which are plentiful in the Fort Bragg and Shelter Cove region.

NEWPORT BAY FISHERIES BEING DEVELOPED.

With work progressing on the breakwater at Newport Bay, Newport bids fair to become one of the important fish shipping points in Southern California. The residents of Newport and Balboa are united in an effort to develop their fisheries asset to the utmost. Already a fish packing plant is under construction and a substantial bulkhead has been built for the accommodation of boats and markets.

Newport is one of the principal smelt shipping points in California, a normal day's shipment consisting of from four to twelve tons of these fish. With the improvement work now under way the scope of the fisheries at Newport will be enlarged greatly. Already a number of fishing boats are planning on making Newport Bay their home port.—C. S. B.

FISHING VILLAGE COMPELLED TO MOVE.

The Pacific Electric Railway Company has served notices on the fishermen and other residents of Port Los Angeles ordering them to vacate their premises on or before January 1, 1920, and already the removal of this picturesque fishing village is under way. The above company has also filed a petition with the State Railroad Commission asking permission to abandon service to Port Los Angeles. It is claimed the wharf is in a rickety condition and that traffic does not justify continued service to this point. It is planned to remove the wharf at once if permission is granted.

The village at Port Los Angeles was established in 1905 by H. Sano and Dick Tododie, two fishermen, and at one time contained approximately two hundred men, women and children dependent upon the fishing business. As high as ten thousand pounds of fish has been unloaded at the wharf in one day by fishing boats operating off Port Los Angeles; but with the development of the fishing industry at San Pedro most of the fishing boats left for the latter port. As a result the amount of fish received over the wharf has decreased until today a normal day's shipment from Port Los Angeles consists only of approximately fifteen hundred pounds. There are still about sixty Japanese and Russian fishermen engaged in fishing at Port Los Angeles and all of them are planning on moving to other points in the near future.

The wharf at Port Los Angeles was constructed twenty-eight years ago by certain interests who planned on making this point the port of entry to Los Angeles. When built it was over five thousand feet long, but damage by storms four years ago caused the removal of about two thousand feet of the pier. It has always been one of the popular piers for anglers who still refer to it as "Long Wharf." During the runs of mackerel, corbina and

Fig. 13. Wharf and picturesque fishing village at Port Los Angeles, which is being moved by order of the owners of the land. Photograph by C. S. Bauder.

pompano, approximately four hundred rod and reel sportsmen could be counted fishing from the wharf.—C. S. B.

SEAPLANES TO LOCATE FISH.

It has generally been known for many years that many sea birds are dependent on their eyesight to locate their food while flying over the water. So what is more natural than for seaplanes to locate schools of fish in the same manner? Needless to say the fish canners of San Diego, who have been somewhat alarmed at the continued absence of sardines which have been appearing in large numbers elsewhere on the Pacific Coast, rejoiced at the suggestion of this idea.

Definite arrangements have now been made with Lieutenant Lincoln, the naval commandant in charge of operations at the Naval Air Station at San Diego, whereby regular seaplane flights will be undertaken by the navy aviators to look for schools of fish. The first flight will take place on December 15 and they will continue to patrol each day any certain portion of the sea that is desired by the canners.

When a seaplane sights a school of fish it will wire back to Rockwell Field from where the information will be telephoned to the Fish and Game Commission office at San Diego for distribution to the several canneries. A submarine chaser always hovers in the vicinity of a flying plane so as to be near in case of an accident. So it may be that the news can be sent to the nearby fishermen the quicker by means of the wireless on these boats.

While these flights may not be of so much value in winter because of the roughness of the weather, they will later on prove of much material benefit to all parties concerned when the larger fish are running. They will also settle the fact of whether certain schools of fish are running in those portions of the ocean further out than the present small fishing boats go, as the seaplanes have a four hundred mile radius of operation. It may thus be the beginning of continued prosperity to all canners and fishermen in this section as well as of aid in the investigation work of the Fish and Game Commission by showing routes, locations, and migrations of different fishes.—L. H. H.

AGAR-AGAR TO BE MANUFACTURED IN SOUTHERN CALIFORNIA.

After two years of diligent research, Mr. C. Matsuoka of Los Angeles has effected an improved process for converting several species of the common marine algæ found on the Southern California coast into agar-agar, and plans are under way for the construction of a thirty-thousand dollar plant at Tropico, California, where this product will be manufactured on a commercial scale. When completed this plant will have a capacity of approximately one ton of dried seaweed per day, and its operation will mark the beginning of a new industry in the United States. Experiments which have been carried on by Mr. Matsuoka demonstrate that agar-agar of a much superior quality to the imported article can be produced from our native seaweeds.

There are approximately fifteen species of marine algæ found on the California coast which may be used in the manufacture of agar-agar. Among the varieties found in sufficient quantities for commercial uses are: *Gelidium corneum*, *Gelcdium cartilagineum*, *Gracellaria conferroides*, *Euchema spinosium*, and various species of *Tenax* and *Gigartenae*.

Practically all of the world's supply of agar-agar is produced in China, Japan, Ceylon, and Malaysia. During the year 1919 there were two hundred and forty tons of agar-agar shipped to the United States from Japan where the manufacture of this product has reached the proportions of an important and well established industry. In the latter country only ten species of seaweeds are found which are used in its manufacture.

It is prepared for the market in two ways. One method consists in drying and bleaching the thallus of the algæ in the sun. The other method consists in making a jelly of the seaweeds, allowing the water to freeze out and cutting the residue into thin strips and drying thoroughly. The American Agar Company intends to use the latter method.

Agar-agar is one of the most useful products obtained from seaweeds. It is used in the manufacture of vegetable isinglass, capsules, candy, paints, and culture media for bacteriological research. During

the European war it was successfully employed in the treatment of war wounds. It is supplied to the drug trade commercially in dry, transparent crystals that are reduced to a coarse powder for medicinal use. It has the natural property of absorbing water and retaining it; and in medicine, the additional property of resisting the action of intestinal bacteria and of the digestive enzymes. It is prepared by boiling and may be eaten with milk or cream, or mixed with any of the ordinary cereal foods with the addition of salt or sugar.—C. S. Baudfr.

NOTES FROM THE STATE FISHERIES LABORATORY.*

By Will F. Thompson and Elmer Higgins.

THE INAUGURATION OF SCIENTIFIC WORK ON THE SARDINE.

The past quarter has seen the inauguration of a definite program of investigation of the sardine. This species has become the most important to our commercial fisheries, and it is necessary that we learn something concerning its habits and that we have as detailed a knowledge as possible of the course of the fishery. A resume of the program will be found in another part of this magazine (p. 10).

In order that desired results may be obtained, Mr. O. E. Sette, formerly stationed in Long Beach as collector, has been transferred to Monterey, where he will observe the sardine run throughout its season, under the direction of Mr. Thompson.

To date (November 28), the sardine run in Southern California has not really begun, only very small fish being in evidence. The shortage in cans has, however, been the only hampering factor at Monterey.

SOME RECENT FISHERY PUBLICATIONS.

A publication of the United States National Museum has recently appeared, describing the guano birds of Peru. As Dr. R. E. Coker, the author, states, "Peruvian guano is indirectly but obviously a product of fish. The birds in this case fulfill a function comparable to that of the American factories that convert fish into fertilizer." He also says "a quantity of more than 10,000,000 tons of high grade guano is reported to have been extracted from the Chincha Islands between 1851 and 1872." The pictures accompanying the report are remarkable, showing the great numbers of birds on the nesting places. The paper should be of great interest both to those interested in birds and those interested in fish.**

Dr. R. E. Coker has also another recent publication to which attention may be called, namely that on the "Freshwater Mussels and Mussel Industries of the United States." These mussels are used for button-making in an extensive industry. The bulletin deals with phases of the industry and describes the species, although it does not review the excellent work which has been done in recent years on the strange life history of these mussels, for the most part by employees of the Bureau of Fisheries.†—W. F. T.

A SNIPE-FISH FROM CATALINA.

The president of the Tuna Club of Catalina Island, Mr. J. A. Coxe, gave the undersigned a very small fish, with a long snout, which he said had been picked up on the beach at Avalon. This fish proved to be identical with the *Macrorhamphosus hawaiiensis* described by Dr. C. H. Gilbert from near Laysan Island, as taken by the United States Bureau of Fisheries steamer "Albatross." A figure of this species may be seen in Volume 23, Part 2, of the Bulletin of the United States Bureau of Fisheries. According to a recent review of the species of the family, the form found in the Hawaiian Islands is the same as a species taken in East Africa, the Indian Ocean, China, and the Medit-

*California State Fisheries Laboratory, Contribution No. 16.

**Habits and Economic Relations of the Guano Birds of Peru, by R. E. Coker. Proceedings of the United States National Museum, Vol. 56, pages 449-911. Plates 53-69. Document No. 2298.

†Fresh Water Mussels and Mussel Industries of the United States, by R. E. Coker. Bulletin of the Bureau of Fisheries, Vol. 36. Document No. 865.

erranean, namely *Macrorhamphosus volitaris* Pallas.‡

If this is true, the species is very widespread indeed. The writer has not had the opportunity of comparing specimens from these various localities, hence it is not possible to state positively that this species is in reality the somewhat cosmopolitan one mentioned above. That from Catalina was compared directly with the type of *Macrorhamphosus hawaiicnsis*. This is a new and most interesting record for our Pacific Coast, this form not being an active swimmer as most recently found "visitors" are.—W. F. T.

THE "RUNNER" FISH IN LOWER CALIFORNIA.

Mr. Gilbert Van Camp of the Van Camp Sea Food Company has in his possession a mounted specimen of the "Runner" of tropical seas, *Elagatis bipinnulatus* (Quoy and Gaimard). It was taken at Cape San Lucas, Lower California, during the spring months of 1919, while its owner was engaged in operating a cannery in Lower California.

This is, in so far as the writer is aware, the sole record of this species from the western coast of North America, although known from the East Indies, the West Indies, Hawaii, India, and occasionally north as far as Long Island on the eastern coast of the United States.

The species may obviously be expected some time to put in an appearance on the coast of Southern California. It is one of those species commonly supposed to be widely distributed, although specimens from different regions have not been closely compared to make the fact certain.

It is to be recognized by the long dorsal and anal fins and by the presence behind each of a detached finlet containing two rays. It belongs to the same family of fishes as does our common yellow-tail (*Seriola*), namely the Carangidæ.—W. F. T.

THE OCCURRENCE OF THE JAPANESE HERRING.

In California Fish and Game for April, 1918, page 4, Professor Starks of Stanford University, in reviewing the herrings and herring-like fishes of California, briefly describes and gives an illustration of the Japanese herring, *Etrumeus microps*. He says in part: "The Japanese herring is a common species in the Hawaiian Islands and in Japan. Specimens have been taken at San Diego, and a few years ago two specimens were sent to Stanford University from that locality with the statement that it was not rare in certain seasons. It should be looked for and its appearance and abundance reported to the State Fish and Game Commission."

A specimen of this species was taken with the sardines caught November 3, 1919, by the boat "Maru," near San Pedro, according to Mr. E. M. Nielsen of the San Pedro office of the Commission. The specimen was forwarded to the laboratory and proved to be the Japanese herring. It resembles the sardine closely enough to be difficult to distinguish, and its appearance may be frequent despite its apparent rarity.—W. F. T.

DEEP SEA "MONSTER" CAPTURED.

Among the strange fishes taken in the fine-meshed nets used on the boat "Albacore" for the collection of young fish, there is none more bizarre in appearance than the great-mouthed ferocious looking little monster, *Idiacanthus antrostomus*, Gilbert. This fish is about three inches long, jet black in color, and of slender worm-like form. A row of luminous spots are placed on each side, supposedly supplying light, for at the depth normally inhabited by this fish, there is little light. The head is large, the eyes small, and the mouth enormous, bristling with fang-like teeth of assorted sizes.

This species has only been recorded by Dr. Gilbert in 1890 as taken off Catalina Island at a depth of 603 fathoms. Our specimens were taken May 6, 1919, at night in but 20 fathoms, one near Catalina and one about 90 miles off shore, near Cortez Bank. Other closely related species have been taken, one in the mid-Atlantic from a depth of 2750 fathoms, and one from off the Chilean coast from 677 fathoms.—E. H.

MEXICAN FISHES IN CALIFORNIA PORTS.

One of the finest food fishes to come into Southern California ports during the last season was the Spanish mackerel,

‡See Regan Annals and Magazine of Natural History, (8) 13, p. 17.

Scomberomerus sierra, which was brought to San Diego from Mexico during October in considerable quantity. These fish are rarely taken as far north as San Diego, but are said by fishermen to be plentiful on the Mexican coast, a considerable distance north of Cerros Island.

Two beautiful specimens sent us by Mr. Helwig of the San Diego office of the Commission, are of interest because of the arrangement and number of orange spots on the sides of the fish, which are more numerous than in any description of the species, and are arranged in about 18 or 20 diagonal rows.

Mr. Neilsen, statistical assistant at San Pedro, informs us that a cargo of these fish was also brought to that port during the summer.—E. H.

FIRST APPEARANCE OF THE "CRESTED BAND-FISH."

On July 25, 1919, a rare and beautiful fish was brought to the laboratory, of so strange a form that it proved quite a curiosity to fishermen and others. The specimen was found to be a species of *Lophotes*, probably *L. cepedianus*, Giorna, the "crested band-fish." The fish was found swimming feebly in the breakers at Long Beach and was caught by a couple of passers-by who waded into the surf and seized it in their hands. It was taken to a photographer by Mr. V. E. Pearl, where the accompanying photograph (Fig. 14) was made, and the fish was then given to us.

The fish is long and much compressed, being about four feet long, eight inches deep, and only one and three-eighths inches wide. The skin is smooth, without scales, except for a single row against the dorsal fin, and of a bright silvery color with purplish tints on the head. The eye is large and placed low; the mouth is small and armed with many small bristle-like teeth; the fins are bright red, the dorsal extending from the head to the tail. The first ray of the dorsal fin is produced, forming a high crest about eighteen inches long. Unfortunately it was broken in making the capture, but was said to bear several membranous streamers which were red like the fins.

This is the first specimen which has fallen into the hands of naturalists in America. Indeed, probably not more than a dozen specimens have ever been taken, and its rarity makes its occurrence in California well worthy of note. The species was first described by Professor Giorna, of the Academy of Turin, in 1803. Like many other pelagic fishes, it is evidently very widely distributed. It has been taken at various other places in the Mediterranean, at the Cape of Good Hope, and in New Zealand. Single specimens of the same or very closely related species

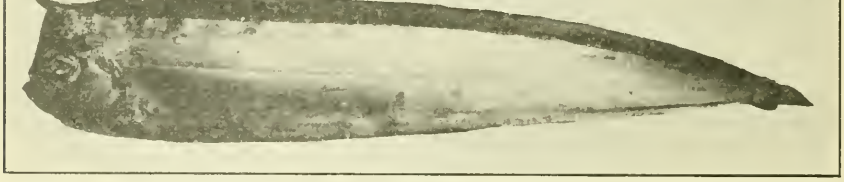

FIG. 14. Crested band-fish. *Lophotes cepediaris*? Taken in the surf at Long Beach, California, July 25, 1919. Photograph by V. E. Pearl.

have also been taken near the Madeira Islands and in Japan. None of the specimens have been taken in the fish's natural habitat which is said to be moderate depths in the open sea, but all have been cast ashore in a greatly enfeebled or damaged condition.

Several species of *Lophotes* have been described but the material for study has been so slight—a single specimen in most cases—that it is entirely doubtful whether more than one or two species exist. Our specimen differs in some respects from the current descriptions of any of the supposed species, but it seems likely that it belongs to the first named, *L. cepedianus* of Giorna. Nor is the relationship of the

family well understood. Dr. Jordan, in his "Guide to the Study of Fishes," remarks, "It is thought that the *Lophotidæ* may be related to the ribbon fishes, *Taeniosomi*, but on the whole they seem nearer the highly modified *Scombroidei*, the *Pteraclidæ*, for example." Thus our fish is placed in the group of mackerel-like fishes which contains such peculiar forms as the pomfret, the dolphin fish, the luvar, and the square-tail—all previously recorded in CALIFORNIA FISH AND GAME.—E. H.

CONSERVATION IN OTHER STATES.

NEW YORK ENFORCES CONSERVATION LAWS.

In a recent New York case a violator of the game laws was held in $1,000 bail and later paid a $500 fine. The fact that nothing but the highest commendation, because of the amount of these sums, has been expressed by the newspapers, is an indication of the growing determination of the public to support the conservation laws. There was a time when case after case of this character was thrown out of court, or sentence suspended, largely, it would seem, from lack of a full comprehension of the basic principles underlying the conservation law; but the striking contrast of recent cases disposed of shows that all over the land there is an awakening interest in game conservation and a determination to see that the game laws are enforced.—*The Conservationist*, Vol. 2, p. 94.

PROTECTION OF SOCKEYE SALMON.

There was signed at Washington on September 2, 1919, a treaty between the United States and Great Britain, having for its object the protection and rehabilitation of the sockeye salmon in the contiguous waters of the State of Washington and the Province of British Columbia. The protection accorded the salmon under this treaty is such as was determined to be necessary by the International Fisheries Conference which held hearings in Washington and British Columbia in 1918.

MINNESOTA AUCTIONS CONFISCATED GEAR.

The official bulletin of the Minnesota Game and Fish Department shows a photograph of a part of the accumulated paraphernalia confiscated during the past three years. The picture shows nets and traps of all kinds and a row of more than a hundred and fifty guns and rifles. The property was disposed of at public auction on August 1 and 2, 1919, the net proceeds accruing from the sale amounting to $2,592.70.

VIRGINIA FAVORS NEW TYPE OF REFUGE.

Instead of setting aside well stocked areas as game refuges, the State of Virginia is planning some game preserves. Owners of tracts from 200 to 400 acres in each of the 400 odd magisterial districts are being sought who will bequeath to the commonwealth exclusive shooting privileges on such tracts. The state will then post the areas and plant thereon mated pairs of quail, which the state will secure from Texas. The quail are to be fed for the first few weeks, but no attempt will be made to keep them within the preserve, on the theory that if they are hunted outside the preserve they will speedily learn the places where they are not disturbed.

MINNESOTA BREAKS RECORD.

During the year 1918 the Minnesota Fish and Game Commission reared 333,792,127 fry and fingerlings. This breaks all records for the state, the output having been about tripled since 1911.

CANADA ISSUES EDUCATIONAL FILMS.

The Ontario government has recently organized the Ontario Motion Picture Bureau for the express purpose of issuing propaganda by means of films. The Bureau now has 200 films, covering 82 different subjects, which are appearing before large audiences throughout Ontario. Of particular interest are two films entitled "Fish as Food" and "Ontario Fisheries." More and more are fish and game resources being advertised by means of films.

LIFE HISTORY NOTES.

FOREST FIRES DESTROY GAME.

The forest fires in the Angeles National Forest during the fall of 1919 were very destructive to game of all kinds. The burned area covers over two hundred thousand acres of the forested canyons and ridges and brush covered hillsides (see Fig. 15).

The carcasses of deer have been found by fire fighters in many places. Gray squirrels and mountain quail have suffered severely.

I have just made a survey of conditions in Pacoima Canyon, and the Little Tujunga and Big Tujunga canyons. In the first two, which are outside of, but adjoining the Game Refuge, I saw numbers of dead rabbits, squirrels and mountain quail. Big Tujunga escaped total destruction, as the flames did not cross to the east side.

No doubt most of the game escaped death by flame and smoke, but the destruction of food will lead to widespread famine later. Fanned by a high wind that blew from the desert side toward the sea, the flames in places swept away every bit of vegetation. The game had no choice but to flee before the flames, toward the foothills, near the towns of San Fernando, Sunland, Monte Vista, Pasadena and Azusa, where they sought shelter in vain, because the fire swept widely, over the entire brush covered hills of the south slopes of the Sierra Madre Mountains.

It was pitiful to see dozens of mountain quail, gathered around a little pool of water in a canyon, their feathers burned and topknots gone. In dozens of places I came across similar groups.

The greatest menace to game comes from the destruction of food. At this time the seeds had all ripened, and the walnuts, pine nuts, acorns and manzanitas were ready to eat. These have been burned over a wide expanse, and the coming on of winter will make it hard for game to exist.

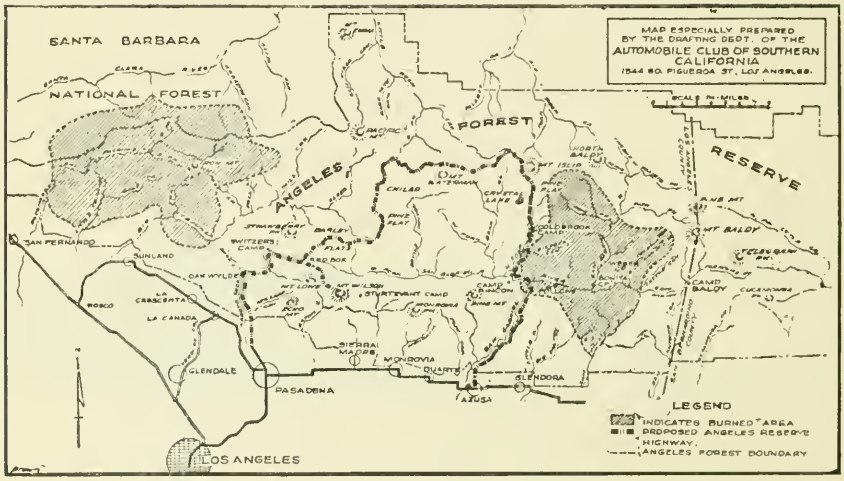

FIG. 15. Map of Angeles National Forest area destroyed by devastating forest fires during the fall of 1919. Severe injury to game was the natural result.

The recent rains in Southern California fell at a very opportune time, and so gently as not to cause any erosion. Three weeks after the rain the burnt over hillsides were becoming green.

A feature of the destruction of covers for game must not be forgotten. Rabbits and quail, I found, are massing on patches of unburned territory. Overcrowding will result, and hunters will find it easy to kill most of the game in such places. A rancher at the mouth of the Little Tujunga told me that hunters had killed sixty-eight rabbits in a forty-acre field

in a couple of hours on the Sunday after the fire, and seventy-eight the following Sunday.

There is a bright side to the picture: a great deal of food was spared in creek beds. A large crop of quail had been raised and enough will be spared for breeding next season, and the early rains have already sprouted the grass and weeds. The game will be restored in time, but nature lovers and sportsmen should work together to prevent a repetition of these fires by enlisting government, state and county aid, building roads and fire breaks and check dams in the mountains, and reforesting the burnt areas.—CHARLES G. STIVERS, M.D., Los Angeles, California.

DOE WITH THREE FAWNS.

During the latter part of August, the writer ran across a doe with three fawns in the lava bed section of the Modoc National Forest. I was able to come quite close to the animals, which showed little signs of fear. I am quite positive that there were no other deer in that immediate vicinity at that time, as I had been fighting fire close by and had been all around the place where I saw the doe and fawns. I thought it unusual to see a doe with three fawns, especially as the little fellows ranged themselves alongside the doe as if they were perfectly at home and belonged there. I stood looking at the three of them and they at me at a distance of not more than thirty feet for about a minute, the old doe stamping her foot at me; then they trotted off leisurely into the brush.—WM. S. BROWN, Alturas, California.

WILD CAT EATS CHICKENS.

I recently opened up two wild cats (*Lynx eremicus californicus*) to see what they had been eating. In the stomach of one I found the remains of two small Plymouth Rock chickens which must have been caught at least five miles from where the cat was killed, and in the other the remains of three mountain quail.—D. W. MAXEY, Gorman, California.

FOOD OF THE BOBCAT.

The wild cat (*Lynx eremicus californicus*) is still found in numbers here, as indicated by the number being trapped in the Monterey district of the Santa Barbara National Forest. Wild cats feed on the smaller game animals and birds. I watched one of these animals in his attempts to secure a breakfast last summer. He stole up on a covey of mountain quail, and as he flushed them, got two. I have found feathers of both mountain and valley quail, which investigation proved were left from a feast by wild cats.—H. H. HUNT.

SOUP-FIN SHARK EATS ABALONE.

In July of last year I was fishing for sharks off the bridge at Ocean Beach when the last shark I caught used my last bait (a small perch). I operated on the shark in an effort to retrieve my bait and was surprised to find an abalone out of the shell and apparently still alive, as it seemed to still have muscular action. Anyway I am positive it was taken out of the shell alive and I wondered how the shark accomplished it. The shark in question was a little over six feet long, weighed I judged about 120 pounds, and is what we call sand shark or soup-fin shark (*Galeorhinus zyopterus*).—A. R. MILLER, East San Diego, California.

DOES THE BARROW GOLDEN-EYE BREED IN THE SIERRAS?

The Barrow golden-eye (*Clangula islandica*) is a rare duck in California, there being less than a dozen records for the state. Furthermore, these records show it to be a winter visitant which occurs almost entirely in the central part of the state. However, this duck being a common breeder in the Rocky Mountain district, and having been found breeding in Oregon and Washington, it would seem possible that it might also breed around the higher Sierran lakes. Evidence that this is doubtless true was obtained this past summer. While on a pack trip from Tahoe to Yosemite, Smedberg Lake, in the northern part of the Yosemite National Park, was visited on August 25, 1919. On the lake were a pair of golden-eyes and six young. The adult birds were closely approached, making identification easy. In that no thought was given to the possibility of these golden-eyes being of the rarer species, no attempt was made to ascertain the shape of the white spot between the eye and

the bill. However, as it is very unlikely that the American golden-eye would be found in such a situation during the summer season, it seems reasonable to record the occurrence of the Barrow golden-eye at the above time and place, thus establishing the first record of summer occurrence.—H. C. Bryant, Berkeley, California.

MEADOWLARKS CONTROL CRICKET PEST.

The State of Washington, with the aid of agents of the United States Department of Agriculture, has been attempting to control the coulee cricket, which devastates large areas in the vicinity of Adrian, Washington. According to Mr. Max Reeher, scientific assistant in the United States Bureau of Entomology, western meadowlarks appeared in great numbers in the Dry Coulee last fall and began eating the newly hatched crickets. So efficient were these birds in controlling the situation that arrangements for a 1919 control campaign were abandoned. The meadowlarks were almost entirely responsible for the complete cleanup of the area.—A. C. Burrill, Forest Grove, Oregon.

REPORTS

SEIZURES—FISH, GAME AND ILLEGALLY USED FISHING APPARATUS.

July 1 to September 30, 1919.

Game.

Deer meat	1,424	pounds
Quail	10	
Ducks	63	
Pigeon	4	
Rabbits	51	
Deer hides	8	
Miscellaneous birds	19	

Fish.

Striped bass	1,321¾	pounds
Black bass	22	pounds
Halibut	5,890	pounds
Catfish	45	pounds
Whitefish	15	pounds
Trout	70	pounds
Salmon	292	pounds
Perch	7	pounds
Barracuda	250	pounds
Crabs	267	
Lobsters	127	
Clams	457	
Clams	675	pounds
Dried shrimps	3,500	pounds
Abalones (dried)	150	cases
Abalones	47	
Nets (illegal)	2	

Searches.

Illegal fish and game	13

CALIFORNIA FRESH FISHERY PRODUCTS—COMPILED BY DEPARTMENT OF COMMERCIAL FISHERIES
JULY, AUGUST, SEPTEMBER, 1919.

Species of fish	Del Norte, Humboldt	Mendocino, Sonoma, Lake	Marin	Solano, Yolo	Sacramento, San Joaquin, Colusa, Tehama, Sutter	Contra Costa, Alameda	San Francisco, San Mateo	Santa Cruz	Monterey	San Luis Obispo, Santa Barbara, Ventura	Los Angeles	Orange	San Diego	Total	Mexico
Albacore											10,175,462	126	2,048,882	12,224,470	
Anchovy							18,070		336,675		24,365		21,670	400,780	
Barracuda							775	2,458	24,087	56,756	616,964	13,714	474,366	1,189,120	127,569
Bluefish								7,728	15,283					23,011	
Bocaccio		80	117,900				32,840	4,515	211,596					466,931	
Bonito									22	18,672	1,331,102	581	156,023	1,506,410	9,568
Carp				225	26,184	1,453	806							28,668	
Catfish				5,323	765	4,018	708							10,814	
Chilipepper							79,061	337						79,398	
Coalfish							176,147	2,762	1,586					180,495	
Cultus cod	6,437	51,679					143,223	18,693	9,830		205			230,097	
Dogfish			308			563	6,320	460	1,050		19,380		205,672	233,755	
Dolphin															
Eels															
Flounder							81,217	79	1,068	2,996	4,192	254		89,806	
Greenfish															
Hake							39,480	1,309	238		609		665	42,391	
Halibut	12,868	81,945	343				3,666	663	13,042	74,557	129,476	14,947	116,451	438,298	898,914
Hardhead															
Herring															
Kingfish							3,910	16,604	14,812	38	19,458	40	404	49,266	
Mackerel	180							1,199	91,493	11,956	585,410	11,694	70,523	771,855	4,105
Martin															
Mullet													109	109	
Perch	143		132			25	3,245	936	1,329		3,417	221	8,169	17,617	
Pike				48		67								115	
Pompano							16	342			1,769		31	2,158	
Rock bass										571	66,152	4,776	113,661	185,160	
Rock fish	7,456	499					248,588	48,757	112,128	11,008	108,965	735	33,373	571,509	6,190
Salmon	505,957	2,489,490	1,884	1,346,809	197,172	1,494,849	1,361,576	14,925	86,491		10			7,501,763	

Sanddab								98,277	29,519	971	1,211	1,265		1,170	132,413	
Sardine			141,700					7,855	2,041,604	31,237,336	54	432,541	25	1,407,669	35,268,784	
Sculpin												7,946	540		8,486	
Sea bass (black)											2,555	19,129	859	19,403	41,949	10,175
Sea bass (white)	124		12,430					5,411	291,683	12,205	22,018	828,112	2,259	63,482	1,237,124	36,490
Sea trout	47											7,218		2,698	9,963	
Shad				1,109	1,003		1,713								3,825	
Shad (buck)																
Shad (roe)				45											45	
Sheepshead												168	842	218	1,228	
Skate								13,445			393	272			14,110	
Skipjack									1,650	1,343		3,835,093		2,440,398	6,278,484	
Smelt	6,849		27,902					27,527	20,528	72,492	2,707	7,517	9,241	1,399	176,162	
Sole	926							1,232,301	81,463	8,593	11,336	9,792			1,344,421	
Split tail							480								480	
Striped bass				12,952	1,539		67,421	33,476		956					116,344	
Stingaree			38,200												38,200	
Suckers																
Surf fish																
Swordfish												17,900		352	18,252	
Tomcod								4,515							4,515	
Trout (steelhead)	17,162														17,162	
Tuna											17	1,640,642	854	121,144	1,762,657	48,482
Tuna (blue fin)												13,292,406		38,398	13,330,804	
Tuna (yellow fin)												345,862		58	345,920	
Turbot								280							280	
Whitebait								1,073							1,073	
Yellowtail												409,988	3,881	1,539,322	1,953,191	6,933
Miscellaneous							21	14,402	2,222	1,976	11,019	47,511	1,092	4,464	82,707	855
Total fish	558,159	2,623,693	340,799	1,366,511	226,663		1,570,613	3,640,550	2,583,836	32,356,232	227,864	33,981,388	66,081	8,890,187	88,432,576	1,149,281
Crustaceans—																
Crab (doz.)	287							1,558	22	26					1,893	
Ecrevisse (doz.)																
Shrimp								271,054							271,054	
Spiny lobster																157,529
Mollusks—																
Abalones									515	32,739	298,255				331,509	
Clam (cockle)			1,225										830		2,055	
Clam (mixed)	4,049	942	6,009					171							11,171	
Clam (Pismo)									100		108,664				108,764	
Clam (soft shell)		732	1,260				68,757								70,749	

CALIFORNIA FRESH FISHERY PRODUCTS—Continued.

Species of fish	Del Norte, Humboldt	Mendocino, Sonoma, Lake	Marin	Solano, Yolo	Sacramento, San Joaquin	Tehama, Colusa, Sutter	Contra Costa, Alameda	San Francisco, San Mateo	Santa Cruz	Monterey	San Luis Obispo, Santa Barbara, Ventura	Los Angeles	Orange	San Diego	Total	Mexico
Cuttle fish								1,570	547	1,337	30				3,484	
Limpets													8,350		8,350	
Mussels	210						564	765			2,096	300	8,425		12,460	
Oysters (shell)																
Eastern No.			482,355					987,975							1,470,330	
Oysters (native)			36,494												36,494	
Snails, sea																
Squid										67,941		79			68,020	
Miscellaneous—																
Frogs (doz.)								23							23	
Terrapin (doz.)						10		21			10				41	
Turtle, sea																82,000

A CORRECTION—In the October issue of CALIFORNIA FISH AND GAME, page 209, in the report on California fresh fishery products for April, May and June, 1919, there was an error in the catch shown for Los Angeles County. The tuna catch was 331,729 pounds and was shown as turbot. The blue-fin tuna catch was 1,659,119 pounds and was shown as yellow-fin tuna.

VIOLATIONS OF FISH AND GAME LAWS.

July 1 to September 30, 1919.

Offense	Number of arrests	Fines imposed
Game.		
Hunting without license	54	$775 00
Refusing to show license on demand	1	10 00
Making false statement on application	1	20 00
Deer—excess limit—close season—killing or possession	31	840 00
Female deer—spike bucks—fawns—killing or possession	39	2,160 00
Illegal deer hides	15	300 00
Failure to retain head and horns of deer	8	425 00
Hunting on posted grounds	7	175 00
Fur-bearing mammals—close season—killing or possession	4	95 00
Nongame birds—killing or possession	3	30 00
Shore birds—close season—killing or possession	1	25 00
Cottontail and brush rabbits—close season—possession	23	520 00
Wild pigeons—close season—killing or possession	4	120 00
Doves—close season—killing or possession	11	225 00
Quail—close season—killing or possession	26	885 00
Ducks—close season—killing or possession	7	155 00
Tree squirrels—close season—killing or possession	1	
Grouse—close season—killing or possession	2	50 00
Total game violations	238	$6,810 00
Fish.		
Angling without license	13	$280 00
Fishing for profit without license	18	275 00
Trout—excess limit—close season—taking or possession	4	150 00
Trout—taking other than by hook and line	1	25 00
Striped bass—close season—sale—underweight—excess limit	16	495 00
Black bass—close season—sale—underweight—excess limit	2	50 00
Salmon—excess limit—Sunday fishing	2	200 00
Crabs—undersized—close season—taking or possession	2	40 00
Clams—undersized—close season—excess limit—taking or possession	6	150 00
Abalones—undersized—close season—taking or possession	3	75 00
Lobsters—under or oversized—close season—taking or possession	4	60 00
Dried shrimps—possession	8	180 00
Illegal nets	5	550 00
Pollution of waters	1	200 00
Total fish violations	85	$2,730 00
Grand total fish and game violations	323	$9,540 00

STATEMENT OF EXPENDITURES—YEAR 1919.

Items of expense	June	July	August
General administration	$2,242 91	$2,714 57	$3,037 71
Research, publicity and education	331 97	403 29	228 49
Printing	308 81	----------	1,476 71
Fish exhibits	----------	----------	569 58
Game exhibits	----------	----------	----------
Tahoe Camping Ground	----------	1,257 71	1,296 17
Mountain lion bounties	160 00	240 00	260 00
Lithographing hunting licenses	----------	1,440 00	----------
Lithographing angling licenses	----------	----------	----------
Hunting license commissions	1,573 90	1,396 30	755 70
Angling license commissions	2,666 10	1,651 00	453 90
Market fishing commissions	7 00	38 50	54 50
	$6,693 72	$9,141 37	$8,132 76
San Francisco district	$6,680 73	$7,196 73	$7,480 37
Sacramento district	5,143 76	5,394 08	5,650 36
Los Angeles district	2,509 20	2,566 81	2,915 85
Launch patrol	1,435 64	1,069 94	2,393 80
Prosecutions (fish and game)	82 30	----------	135 00
Crawfish inspection	200 00	122 58	100 00
Winter game feeding	----------	----------	----------
Accident and death claims	124 04	124 04	284 14
	$16,175 67	$16,474 18	$18,959 52
Hatchery administration	$1,215 11	$1,197 91	$983 65
Mount Shasta Hatchery	2,462 24	5,683 06	6,029 26
Klamath Station	5 00	5 00	617 07
Fall Creek Hatchery	390 95	826 96	442 03
Mount Whitney Hatchery	1,444 29	1,760 91	2,859 33
Cottonwood Creek Station	----------	25 00	----------
Cottonwood Lakes Station	239 00	97 16	----------
Tahoe Hatchery	100 00	5 00	5 00
Tallac Hatchery	372 75	566 13	581 36
Chico Experimental Station	250 00	221 72	30 00
Fort Seward Hatchery	384 10	696 01	630 76
Eel River Station	----------	----------	----------
Ukiah Hatchery	311 01	496 02	139 15
Snow Mountain Station	----------	157 00	----------
Brookdale Hatchery	388 05	492 30	442 98
Scott Creek Station	30 00	31 00	31 00
Feather River Hatchery	----------	----------	----------
Almanor Hatchery	332 70	162 50	149 36
Domingo Springs Hatchery	473 56	1,331 49	992 47
Clear Creek Hatchery	162 57	145 64	1,163 93
Bear Lake Hatchery	269 03	443 52	716 41
North Creek Station	208 25	31 34	----------
Wawona Hatchery	93 76	127 70	----------
Yosemite Hatchery	176 93	284 05	251 64
Kaweah Hatchery	112 51	156 21	180 54
Fish Transplanting	3 00	3 00	3 00
Screens, fishways and water pollution	635 84	686 19	883 30
Special field investigation	----------	----------	----------
	$10,060 65	$15,632 82	$17,132 24
Department of Commercial Fisheries	3,914 92	4,283 53	5,035 21
	$36,844 96	$45,531 90	$49,259 73

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CALIFORNIA FISH AND GAME

"CONSERVATION OF WILD LIFE THROUGH EDUCATION"

Volume 6 | SACRAMENTO, APRIL, 1920 | Number 2

CONTENTS.

THE ABALONES OF NORTHERN CALIFORNIA.*

By Will F. Thompson.

In northern California there are found three species of abalone: namely, *Haliotis rufescens,* Swainson, the red; *H. cracherodii,* Leach, the black; and *H. wallalensis,* Stearns, the northern green abalone. Earnest search has failed to reveal the abalone of British Columbia and Alaska, *H. gigantea,* Chemnitz. But one of these, the first named, is found in numbers rendering it of importance as food. It is exceedingly difficult to gauge the absolute abundance of this red abalone in any place without the aid of diver's apparatus. For that reason it has been judged best to give merely a record of the localities in which specimens were obtained, and a general statement as to the abundance along the various parts of the coast. *H. cracherodii* reaches its greatest abundance to the southward of San Francisco, and it is present in northern California only occasionally.

*California State Fisheries Laboratory, Contribution No. 17.

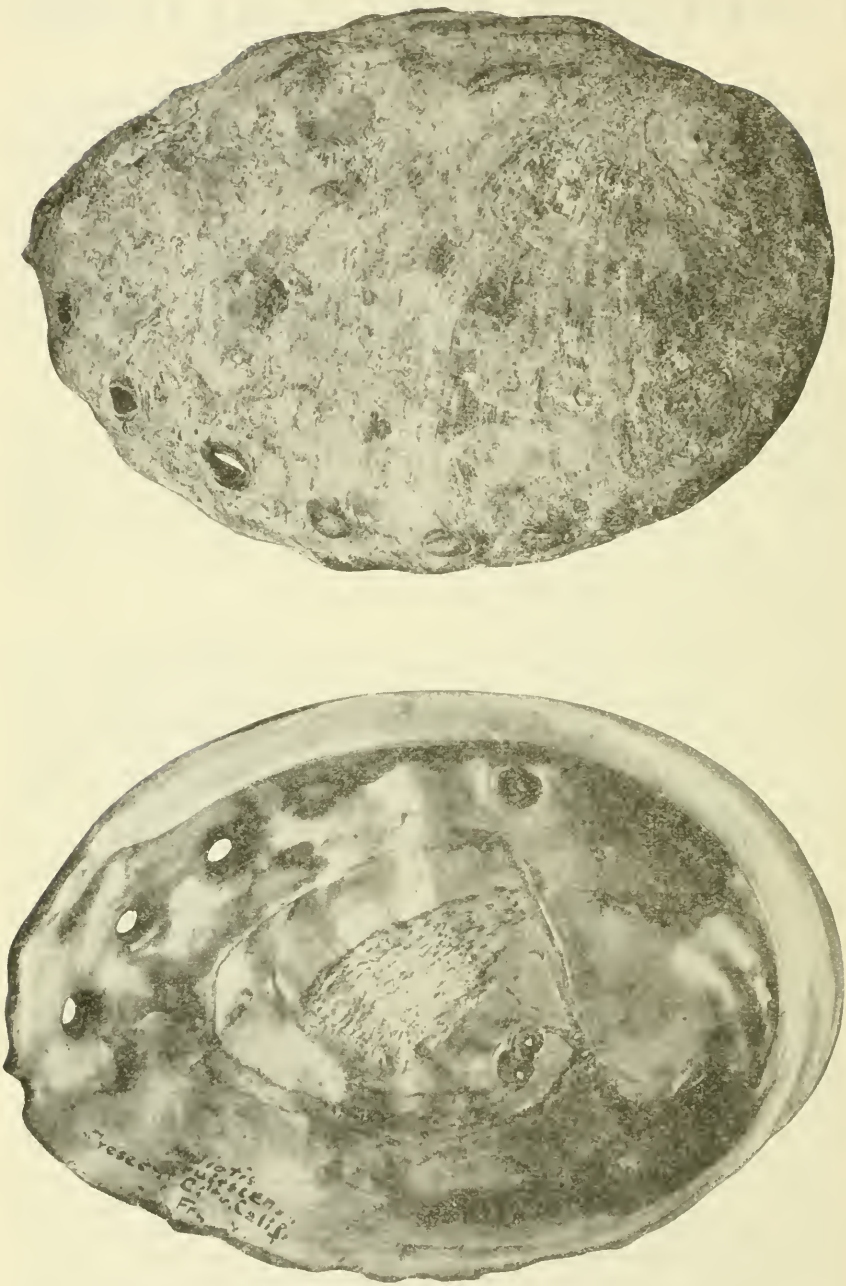

FIG. 16. Red abalone (*Haliotis rufescens* Swainson), from Crescent City, California. Length 8½ inches.

Abalones dwell solely along the outer coasts, but there they dwell wherever they are afforded a foothold on or beneath rocks on a coast free from loose sand and mud. The red abalone is found below extreme low tide line and occasionally a little above, the black is at a higher level and rarely below low tide line, while the northern green abalone is found only at about low tide level as far as known. All species agree, however, in requiring a rocky, surf-beaten coast, and the localities given below are all of this nature.

Haliotis rufescens was found in some numbers in the following localities by others than the writer, if enclosed in parentheses:

(Point Saint George, rarely.)
Patrick's Point, rarely.
Cape Mendocino, rarely.
McNutt's Gulch, near Cape Mendocino.
Mattole River, 1 to 1½ miles north of Cape Mendocino.
(Punta Gorda.)
Spanish Flats, 124 degrees 15 minutes west, 40 degrees 20 minutes north.
(Fraser's Creek, near Cape Mendocino.)
Shelter Cove, abundant.
(Whale Gulch to Needle Rock.)
Bear Landing, in moderate abundance.
Usal, 123 degrees 50 minutes west, 40 degrees north.
(Rockport.)
Hardie's Creek.
(Union Landing.)
Abalone Point, 123 degrees 48 minutes west, 39 degrees 50 minutes north.
Bruhel's Point (McRay's Point).
(Kibesillah Rock.)
(Hare Creek and Beaver Point.)
(Caspar, 39 degrees 11 minutes north, 123 degrees 49 minutes west.)
(Newhaven Landing.)
(Manchester.)
Point Arena, abundant.
Arena Cove.
Buster Beach, 123 degrees 43 minutes west, 38 degrees 57 minutes north, abundant.
(Hayward's Beach.)
Saunders' Landing, 123 degrees 40 minutes west, 38 degrees 51 minutes north.
Bowen's Landing.
Gualala, 123 degrees 31 minutes west, 38 degrees 45 minutes north.
(Del Mar to Stewart's Point.)
Stewart's Point.
(Salt Point.)
(Fort Ross.)
Russian River.
(Bodega Head.)
(Tomales Point.)
Point Reyes, moderate abundance.
Duxbury Reef.
(Bolinas Point.)
(Double Point.)

From Point Saint George, the northernmost record, it was possible to obtain no live specimens, but Mr. Franz of Crescent City contributed a shell which he had kept for some time as an unusual specimen. At Patrick's Point live specimens were taken, and they were abundant enough so that eight or nine might be obtained by searching diligently throughout a low tide. Not until Cape Mendocino was reached were there sufficient numbers to render the species of importance, while at Shelter Cove, about forty miles southward, there was an abundance. From that locality to Point Reyes it might be considered that there was a slight increase in abundance when equally favorable situations were compared, and the effect of the relative amount of local use was considered. At Point Reyes, the abalone has been obtained by divers, with apparatus enabling them to go to considerable depths, and it is probable that such methods could be used as far north as Shelter Cove with success.

Haliotis cracherodii, the black abalone, reaches as far north as Point Arena, where an occasional specimen is found by local men. But one was obtained from that locality. They are also found at Duxbury Reef, and are reputed to be found now and then in the regions between Point Arena and San Francisco, but no actual evidence was obtained. In no locality in northern California do they reach any abundance,

FIG. 17. Black abalone (*Haliotis cracherodii* Leach), from Point Arena, California. Length 6¼ inches.

FIG. 18. Northern green abalone (*Haliotis wallalensis* Stearns), from Abalone Point near Westport, California. Length 4¾ inches.

however, which would justify calling them anything but rarities until Duxbury Reef is reached, and it is safe to say that they will never be of commercial importance.

Haliotis wallalensis, Stearns, is a small species distributed along the coast between Westport and the Russian River, a distance of about a hundred miles. Although it is often found in numbers sufficient to be of importance to local users, it is small and little valued save for the very beautiful shells. Despite the extensive use made of abalones, the species has, to our knowledge, only occasionally been found south of the Russian River, namely at Monterey, where it is regarded as a curiosity.

It is here regarded as a species distinct from the green abalone of southern California, which it resembles in appearance. The type locality of the species is Gualala, where it was found by the writer in abundance, as also at Abalone Point near Westport. A single specimen was obtained at the Russian River, and one was obtained at Monterey from Mr. Ernest Dalder. Local inhabitants often fail to distinguish it from the young of the red abalone. It reaches, however, a length not greater than five and one-half inches, has five or six open holes (instead of the three or four of the red abalone), and the edges of these holes are not elevated.

In conclusion, it is evident that there is but the one species of importance found in northern California, namely, the red abalone. and all the commercially valuable beds of that are found south of Shelter Cove, over slightly more than half the length of the coast between San Francisco and the Oregon line.

SOME NOTES ON DRY-FLY FISHING. No. 3.

By R. L. M., California.

I do not believe that any one will disagree with the statement that it requires a little more skill to cast and deliver a dry fly properly than is needed to throw a wet fly. Such being the case, what are the principal factors that tend to promote or assist the skill thus demanded? There are several, among which the rod is one of the most important.

It is true that Mr. G. A. B. Dewar ("The Book of the Dry Fly," London, 1897) is rather inclined to underrate the efficacy of first-class equipment. He writes: "It is not the rod so much as the hand which wields it that kills the trout." There is no doubt about the correctness of this statement, and if we were all as skillful as the talented author of this book, no more would need be said on the subject of rods.

But unfortunately very few of us are able to devote more than a much too brief period to the delights of angling, and such being the case it behooves us to take every advantage that we can and to obtain

everything that will enable us to meet the trout on a more even footing. Therefore we should equip ourselves with the best that modern ingenuity and skill can produce.

Casting or throwing the line out over the water is performed by the action of the rod which gets its initial impetus from the hand of the fisherman.

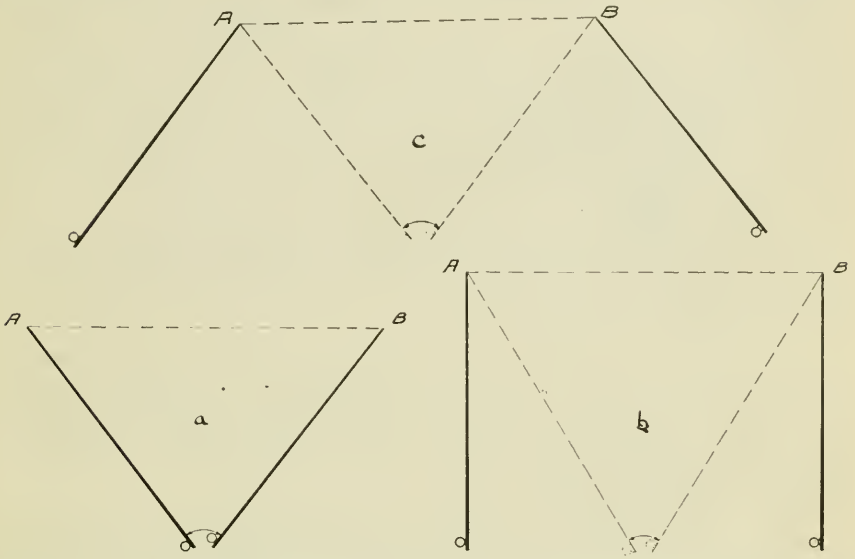

FIG. 19. Diagrams showing the mechanics of fly casting. Although the tip of the rod may be moving at the same speed in a, b, and c, yet in the first instance only would the line be properly cast.

In figure 19 "a" is a diagram meant to represent the rod at two instantaneous moments, viz, at the beginning and the end of the stroke that is made when casting. The tip of the rod, to which the line is connected, moves from A to B. Now if we could move the tip of the rod from A to B with the same speed as in "a," but at the same time while doing this, move the lower point of the rod an equal distance, we should not be able to cast (see "b," figure 19) nearly as long a line as in the first case. And if it were possible to make a motion with the rod similar to that illustrated in "c" of figure 19, we should find that to all intents and purposes we could not cast the line out at all. Yet in all these three cases the tip of the rod (to which the line is attached) would be moving through the air at the same speed. From the foregoing we can deduce that something more than plain motion of the tip of the rod is required in casting, and by regarding "a" again we shall decide that circular, or as it is called in mechanics, an angular motion of the rod is necessary to propel the line. But why does this angular motion produce results when the others fail? The answer is found in "a" of figure 20. The weight of the line and other causes prevent the tip of the rod from moving in synchronism with the lower parts and by the time the end of the stroke has been reached the rod is bent to the fullest extent that is possible for the

particular weight or length of line being used for that individual case. The position of the rod at the end of the stroke is similar to that of a bent spring, ready to fly back to its unstrained or natural position (i. e., straight).

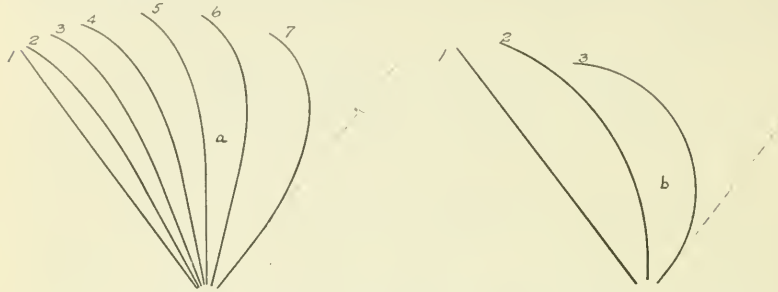

FIG. 20. Successive positions of the fly rod when in action, showing the "snap." It is the recovery of the tip similar to the action of a bent spring that furnishes the necessary impetus to the line. In b the action is too slow to be very effective, due to the bending qualities of the pole.

It is the recovery of this bent spring that furnishes the necessary impetus to the line. An absolutely stiff rod with no bend to it at all would cast a line, but not any length of line to speak of, and it would be a very tiring rod to use. On the other hand a rod with unlimited bending qualities would be too slow in action to be very effective (figure 20 "b").

While we have figure 20 fresh in our memories, and before going on to the other matters, I may remark that this illustration helps to demonstrate the correct manner of making a stroke with a fly rod. The casting stroke (whether backward or forward) should be started slowly, the speed should be continually increased to the end, where a more or less abrupt stop is made. This can only be done if the rod is held tightly or firmly by the hand.

When fishing with a wet fly all that we have to do is to lift the line off the water and cast it back again (figure 21 "a." But when using a dry fly, nine times out of ten we have to dry the fly before returning it to the water. This means that instead of finishing off the forward

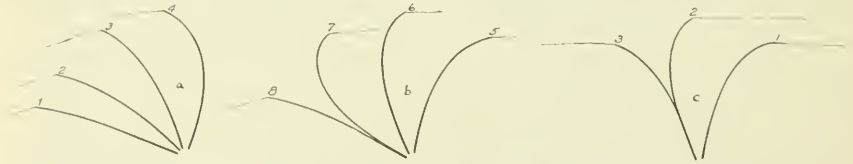

FIG. 21. Diagrams showing the mechanics of the false cast utilized in drying the fly in dry-fly angling. The line is checked before it reaches the water and is returned behind the angler, as in c.

stroke as at "8," figure 21 "a," we must be able to check the line before it reaches the water and return it behind us again. This is what is known as a "false cast" and it may be necessary to make four or five or even more false casts before the fly is dry enough to float once again. Figure 21 "c" illustrates the manner in which the forward stroke is checked when making a false cast.

It is in the making of these false casts that the virtues of a dry-fly rod become apparent. Quite a number of people think that the only difference between a dry-fly rod and a wet-fly rod is that the former costs more than the latter. Such, however, is not the case by any means. If we want a rod capable of extending a line of any length backwards and forwards in the air, we must have a rod that is able to impart the necessary impetus to the line with the least amount of angular motion possible.

In figure 22 I have shown the difference between the actions of a wet and a dry-fly rod; both are supposed to have an equal length and weight of line attached to them. Now it will be noticed that owing to the greater bending of the wet-fly rod, somewhat more vertical motion is imparted to the line than is the case with the dry-fly rod. In practice (i. e., when fishing) this extra vertical motion would mean that when using a wet-fly rod for dry-fly fishing there would be a probability that the fly, when being dried, would either strike the water in front, or

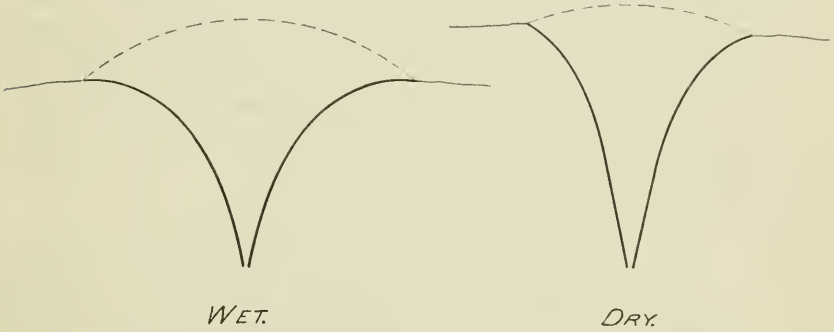

FIG. 22. Diagrams showing the difference in action between the wet and dry-fly rod. Owing to the greater bending of the wet-fly rod a more vertical motion is imparted to the line than is the case with the dry-fly rod.

catch up in the grass behind the angler; whereas, the same length of line could be easily extended in both directions without any danger of such mishaps if a good dry-fly rod was substituted for the wet-fly rod. A dry-fly rod is able to accomplish this because it has more resilience or more snap to its spring than a wet-fly rod has. We may therefore conclude that there is something more than a mere matter of price between a wet and a dry-fly rod. This difference is a structural difference and it consists of making the lower portion of a dry-fly rod much stiffer, i. e., less susceptible to bending than is the case with a wet-fly rod. Then again the middle section should be stronger or stiffer, because in the dry-fly rod the effective bending portion of the rod has to be concentrated within a shorter length than in a wet-fly rod. In both these lower sections the extra or added strength can only be obtained by putting more material, whether cane or wood, into the rod; but when we come to the uppermost portion or the tip, this must be delicate enough to enable us to use the very finest of leaders. It is a fact that a skillful dry-fly man uses finer leaders to land fish of two

pounds and over than the wet-fly man would care to use for the capture of trout of a quarter of a pound or less.

Now when we carefully consider the necessary qualifications demanded of a dry-fly rod together with the fact that the weight must be kept down to very small proportions, is it any wonder that all this refinement means a somewhat higher price for a dry-fly rod than is asked for the other type of rod? I do not want any one to run away with the idea that I am criticising wet-fly fishing. We are all familiar, at least I presume all my readers are familiar, with wet-fly fishing, and I am using wet-fly methods solely as a basis for comparison. For instance, I might say "John is a very tall man." But that does not give any very exact information; but if I said "John is six inches taller than Henry" it would not necessarily mean that Henry was short (he might be a six-footer); but it would give one a very clear idea as to just exactly how tall John really was, provided of course that he was familiar with Henry.

Each method, i. e., wet or dry, has its own particular field of action, and when fish can be caught with the wet fly it is a needless refinement to attack them with a dry fly; but when once a man has used the dry fly successfully, the tendency is, owing to its wonderful fascination, to continue the use of the dry fly whenever and wherever it is possible.

After having thus, successfully I hope, cleared my skirts of imputation of criticism or aloofness to the wet-fly school, I will continue the original theme.

The best length of rod for all-around dry-fly work will be found to be nine feet and six inches. If, however, most of one's fishing will be done on small streams where long casts are the exception, this length can be reduced by six inches. Do not expect to get a rod of the length first mentioned of featherweight lightness. Somewhere between five and six ounces will be as light a rod as it is possible to get and still maintain the necessary strength required. A nine-foot rod will be possibly one ounce lighter. Our grandsires used much longer and heavier rods. Francis Francis ("A Book on Angling," 1867) mentions four rods ranging in weight from 13 ounces, 4 drams to 14 ounces, 6 drams and in length from 11 feet, 7 inches to 12 feet, 8 inches. He, however, preferred a double-handed rod for his own use and he mentions two favorites, viz, 14 feet, 6 inches and 15 feet, 2 inches long. Lord Grey remarks on the wonderful accuracy with which Mr. Francis cast a small fly with such a large rod (p. 113, "Fly Fishing," London, 1899).

The reason why we are today using such shorter rods than formerly is chiefly owing to the introduction of the six-piece split cane rod.

David Foster ("The Scientific Angler." London, 1882) draws a comparison between the length of rods used in Walton's time and that of those which we use now. Charles Cotton, who wrote the second part of "The Complete Angler," and which was incorporated in the fifth edition (1676), gives five or six *yards* as being the best length for a fly rod which should be "made of fir wood for the two or three lengths nearest the hand and of other wood nearer the top." What that "other wood" was history does not relate.

Richard Brookes ("The Art of Angling," 1740) says practically nothing about rods, but Thomas Best, who wrote another "Art of Angling," 1787, specifies in his quaint way.

Ash	7 feet	
Hazel	7 feet	
Yew	2 feet	
Whalebone		6 inches
	16 feet	6 inches

In my copy, which is the fifth edition (1802), the same lengths and materials are given but not in this peculiar form, which reminds one of bookkeeping.

The action of these old-time rods was what we should call "very slow." By that I mean that when bent they were very slow in recovering to a straight position. Such being the case, it was necessary to have a long rod if the fly was to be cast any distance at all to speak of. Furthermore the rods could not begin to carry lines of the weight we use today. In Walton's time hair lines were used; during the early part of the nineteenth century a line of mixed hair and silk was the best that could be got, but when solid braided and dressed silk lines came in all the others were relegated to the scrap pile.

In connection with these ancient rods it is extremely interesting to read about the importance these old-time authors placed on the direction of the wind. It was a *sine qua non* with them to have it at their back. Some of them assert that it is impossible to cast against the wind, but even when they do admit that it can be done, they say it is a very difficult feat to accomplish successfully and warn the beginner against trying to do it. Everybody, however, did not use these double-handed rods. Colonel Hawker, in the fewest possible words, votes for a single-handed rod 12 feet 3 inches long; Pulman ("Vade Mecum," 1841) selects a "small rod about 11 feet long" and Francis Popham, who was a member of The Houghton Fishing Club from 1822 to 1858, was noted as having always fished with a single-handed rod.

Up to the time of the introduction of the close-grained tropical or subtropical woods there was no very great progress made in reducing the length of fly rods; but when these woods made their appearance, rod makers were not long in discovering their adaptability for light fly-casting rods. Greenhart, which is the best of all wood for this purpose (Wells "Fly Rods and Fly Tackle," N. Y., 1885), was first mentioned by Stewart in his "Practical Angler" (1857), but he classes it with logwood as being too "brittle and heavy," from which we must conclude that the greenhart he had in mind was not a particularly good specimen.

Mr. W. A. Hunter, manager for C. Farlow & Company, St. James Square, London, W., writes as follows in connection with this wood:

> Greenhart is not mentioned in the official records of the International Exhibition in 1851, and though our firm exhibited rods then, the kind of wood used is not mentioned, and we have no clear records left of that time.

It would seem from the above (taken in conjunction with Stewart's remarks) "that greenhart was first used in the manufacture of fishing rods somewhere about 1850-1857."

I have quoted Mr. Hunter, because of the fact that Farlow & Company have for years had a very great reputation for their greenhart rods.

A really good greenhart rod is a delightful weapon with which to cast ordinary fishing distances, and some of the men who have used them for a long time can not be induced or made to believe that there is something better than greenhart. The disadvantage of greenhart and all wooden rods is that in our dry climate they may in time become brittle, and when least expected and nearly always at an inopportune time, they have a habit of breaking off short at the junction of the wood and a ferrule. A well-made split cane rod will *never* break if treated as it should be. Whenever a man is seen at the waterside with a broken split cane rod, there are only two possible reasons for the fracture: one is that the rod was a worthless piece of goods to begin with, and the other is that the owner used it for something for which it was never intended.

With the modern six-strip cane rod, owing to its strength and resiliency, it is possible to cast a heavy line, to cast it to distances undreamt of by the earlier generations of anglers, and furthermore to cast across or right into the teeth of any wind short of a hurricane.

The only advantage that a long rod can have over a short one is that more command may be had over a hooked fish; but the rod is *not* the weak link in the chain; the weakest link is the extremity of the fine gut leader; *that* is really the factor that decides how much force we can use, and not the strength or length of the rod.

For comfort in fishing the handle or hand grasp should be made large enough so that no part of the hand is in contact with any metal. Furthermore the diameter of the handle should be such that the muscles of the hand do not become cramped by holding the rod. A rod handle that may seem comfortable enough for wet-fly fishing becomes a veritable torture if used for dry-fly casting owing to the fact that we have to cast so much more frequently. I refer to the false casts necessary to dry the fly. A properly shaped handle does not exactly add to the artistic lines of the lower extremity of the rod, but it *is* an infinitely pleasanter thing to fish with. It is a very great mistake to imagine that a rod can be made *effectively* lighter by paring down the handle. The balance of the rod is obtained by the weight of the reel and frequently, in fact nearly always, the reel and the line on it are not quite heavy enough to give a correct balance. If we take a rod into our hands and, without attaching the reel, we make a few strokes in the air with it, we at once notice that it feels top-heavy, or in other words there is a distinct sensation of weight felt. Now attach a reel or any other form of weight to the reel seat. The heavy feeling that the rod had has now vanished, or else it is not so noticeable. To arrive at a correct balance it is best to attach a moderate weight first and gradually increase it until the top-heavy sensation has completely disappeared. But note this: Sufficient weight must not be added so as to induce a too lively feel to the rod. If this is done the rod will be "over-balanced"

and although the effort required in casting will be reduced to a minimum, the accuracy and control of the line will be to a great extent lost.

The fully equipped rod should balance at a point about three to five inches above the upper end of the handle (or hand grasp). There is no rule or formula by which this point can be found. The only satisfactory way is by the trial of various weights as already explained. When the correct weight has been found, deduct the weight of the reel and line from this, and make up the remainder by an equal weight of soft lead wire, which can be wound on to the empty spool of the reel before the line is wound on. The best type of reel to use is a contracted single action click (adjustable) one. With such a reel the line can be wound in as fast as with a multiplier; the spool is short or narrow but the diameter is large. The best that have been procurable up to the present have been the best grade of English made reels (See "Saturday Evening Post," August 9, 1919; "Very Efficient" Camp in "Fishing with Floating Flies," 1916; Geo. P. Holden "Stream Craft," 1919, says they "are exquisite"), but one of the leading American reel companies will shortly place a first class fly reel on the market.

Charles Zibeon Southand, in "Trout Fly-Fishing in America," 1914, gives a table of lengths and weights of rods and the proper weight of reel to balance them. He bases his table on the supposition that the reel should weigh half again as much as the rod. Using this table as a starting point a four-ounce rod would call for a six-ounce reel. A 3½-inch reel will weigh about five ounces, which gives us one ounce of margin for the line. If this is not enough a slightly smaller reel weighing less could be used. However, it will frequently be found that the very light rods need a lot of counterweight to properly balance them.

A 9½-foot, 6-ounce rod that I use a great deal for dry-fly fishing is perfectly balanced by a total of 9 ounces made up of reel, line and lead wire.

A tapered oil-dressed silk line is the only one to consider in connection with this kind of fly-fishing. These lines are prepared by soaking them in pure boiled, or cold pressed, linseed oil. Mr. Martin E. Mosely, one authority, advocates the former; and a description of his method will be found in Halford's "Dry-Fly Man's Handbook." A copy of this (i. e., the line dressing) appeared in "The American Angler," December, 1918, under the heading "Dress Your Own Line." Another great authority on this subject, viz, Mr. W. D. Goggeshall (an American and past president of The Fly-Fishers Club, London), writes in a recent issue of "The Fishing Gazette":

> Never use air pump; always put line in *hot* oil; heat oil so hot that it will burn your finger, put line in oil, keeping heat up until air bubbles seem to rise; take off the fire and allow line to cool in oil and hang line up to dry. Better to *stretch* line first, though. To get a *perfect* surface apply cold oil when line is stretched and dried. Be sure that *every* coat is *thoroughly* dry before second coats are applied. Rub down smooth and polish with soft rag and talc powder.

Mr. Perry D. Frazier, of Ridgewood, N. J., who is the author of one or two books on angling matters, manufactures oil dressed lines that compare very favorably with the best imported article.

Different methods are used for gauging these tapered lines. Some manufacturers call them "No. 1, 2, 3," etc.; others use the alphabet and specify "D, E, F," etc.; consequently unless we know the *weight* of the line it is not much use saying that such and such a rod should have an "F" or "E" line, as the case may be. The line should fit the rod. By this I mean that the line should be sufficiently heavy to fully develop the casting power of the rod. If the line is not of sufficient weight when the casting stroke is made the rod will not be bent far enough to fully develop its spring (see figure 20) and it will take considerably more effort to cast the line than would be necessary if the proper size or weight of line was used. On the other hand, a line that is too heavy for the rod will in a very short time completely ruin it.

For ordinary occasions, i. e., when the wind is not too strong, a 9-foot tapered leader is advisable. It should be tapered from fairly heavy gut at the upper end down to the "finest undrawn" at the lower extremity. Finest undrawn gut is approximately the same sixe as X drawn gut; but the undrawn gut is about 15 per cent stronger than drawn gut of equal diameter. These undrawn gut leaders are very scarce and extremely hard to get hold of; consequently most of us will have to be content with leaders whose fine points are made of drawn gut. Drawn gut is listed as X, XX, XXX, etc., but anything less than XXX is rather too fine for the sort of fish we hope to catch. I might mention, however, that trout of over five pounds have been caught on XXX leaders.

When a strong wind is blowing the length of the leader should be reduced to 7½ or even 6 feet, but do not make this reduction by cutting off from one or other end of the leader. Get these short leaders made up just the same as the longer ones, i. e., fully tapered from end to end. I do not believe there is any economy in buying gut in hanks and making up one's own leaders. To make up a good tapered leader several hanks of gut would be required.

There are 100 strands in each hank and if they were all made up into leaders we should probably have about 70 or 80 leaders on hand. Gut does not improve with age; consequently long before we got to the end of our leaders we should find that they were beginning to deteriorate and in all probability the last few dozen would have to be thrown away, thus wiping out at once any paper profit that might have been theoretically possible. Some people will tell you that they always make up their own leaders and that bought leaders are no good. There is but one answer to this and it is: Where did they buy these poor leaders? If leaders are obtained from reputable houses and a good price is paid for them they will be all that any one can desire and much better than 99 per cent of us could make for ourselves. I always aim to use up my leaders every season and not to carry any over to the next; then I know that the leaders I am using are the best that can be got and are not weakened in the least by age. There are several substitutes for gut. They generally have queer sounding names and are not as strong as gut of equal diameter. They are more opaque than gut, and when they get wet they become so soft and limp that they do not lay the fly out over

the water properly; therefore, they are not to be thought of in connection with dry-fly fishing.

There are several other appliances peculiar to dry-fly fishing and I will mention them briefly. The first is the "line greaser" which is a little folded leather pad which has several sheets or folds of cloth inside. These are liberally doped with some grease, such as red deer fat, mucilin, vaseline, or mutton fat. Before commencing to fish the line (not the leader) is rubbed down with the greaser in order that when it is cast it will float on top of the water. Then there is the oiling device. This may be a small atomizer, or a little bottle with a small brush, or a small metal box with some felt pads well soaked with the oil used to assist the fly in floating. Oil is not necessary to make the fly float. Before it was used flies were made to float and some men still refuse to use it; but all said and done, oil is a wonderful help. When it is used a fly will never become quite as wet as it will if it has not been annointed, and furthermore a wet fly that has been oiled can be dried much quicker than an unoiled fly. The dry-flies are kept in a box and not in a book, because they should not be crushed. There are numerous kinds of fly boxes on the market and I hope to give illustrations of several of them in one of the future series of these notes.

A landing net is one thing that can not be dispensed with. It should be large and have a handle of fair length. There are a number of folding nets on the market. Some are too small for anything but very little fish. A span of sixteen inches across the mouth of the net is not too much, and the net itself should be at least twenty inches deep. It is much better to have a landing net of the large size than to have one that is too small. Imagine the feelings of a fisherman with a five-pound trout ready to land, and a net so small that it would be difficult to lift out the fish with it even if the fish were dead. The best thing to do in this case is to throw the net away and pull out a handkerchief and, taking this in your hand, lift out the fish; but be quite sure the fish is all in before you try to do so.

And finally there is the creel or basket in which to put the fish we expect to catch. Get a good-sized one, one that will take a two-pound trout without bending the fish. Above all things get one that is not easily opened, for two reasons: if it opens easily it may act without your knowledge and dump some of your fish on the scenery; and if it is easily opened some inquisite stranger may casually open it when there are no fish inside for the I. S. to admire and for the owner to feel proud of.

Having briefly described the implements used in the art, I propose to give a demonstration of their use in the next issue of CALIFORNIA FISH AND GAME, which will be before the public just about the beginning of the vacation season.

THE MULLET FISHERIES OF SALTON SEA.

By Will F. Thompson and Harold C. Bryant.

The Salton Sea is, in reality, a portion of the Gulf of California, cut off by the enlargement of the delta of the Colorado River. It has been, consequently, evaporated to relatively high salinity during each of the long periods when the Colorado River emptied its waters into the gulf. Geologists believe, in fact, that the river has periodically emptied its flood in to the Salton Sea, raising its level, and extending its area, just as it did during 1906. At present the Colorado is prevented from doing this by the dikes along its banks, built in order that the Imperial Valley may be safe, and that it may be irrigated, but the irrigating canals carry a certain amount of waste water into the sea. There are, in addition, fresh water springs, notably one called Fish Spring, which pour considerable amounts of fresh water into the sea.

Little is known about the fisheries of the Salton Sea before the last break in the jetties of the Colorado River. In 1905 the water of the Colorado River poured down what are now known as the New and Alamo rivers in a great flood which carried 160,000,000 cubic feet of water into the sea daily. The result was a great enlargement of the sea and the extensive freshening of its waters. The extension of the sea buried the Southern Pacific lines along its shores, covered the adjacent territory which at that time was beginning to be placed under cultivation, and threatened great financial loss to the Southern Pacific Company, which owned alternate sections of land throughout the territory. In 1906 the break was closed by the Southern Pacific Company, after a spectacular struggle. It was through this break that the fishes now, or recently, present, entered the Salton Sea.

During the earlier portion of the period since 1906, considerable numbers of "carp," if the indentification of others than scientists be trusted, were to be found in the sea, and some eight years ago a promoter started a company with the idea of using these carp, and other fresh water fish, for oil and fertilizer. Having built the proper buildings, installed machinery and launched boats in the sea, the company was unable to operate because it was unable to find sufficient fish. At this time, Captain Chas. Davis, who came originally from New England and was familiar with fisheries of all sorts from an extensive experience on all our coasts, went to Salton Sea to investigate the likelihood of extensive fisheries being built up. His report was adverse. The company for some time endeavored vainly to dispose of the equipment, but was unable to until they accepted Davis' offer of $500. The latter then scrapped all the machinery, turned the buildings into a pleasure resort for the people of the valley, and took up land in the vicinity when the sea had subsided sufficiently. The buildings are now more than a mile from the sea.

However, five years ago, in 1915, mullet (*Mugil cephalus*) began to appear in the sea, and Davis placed weirs of wire netting along the shallow shores of the sea to impound them. He was able to obtain a

large amount of fish at times, but could not develop a market for them at the time, even in Los Angeles and San Francisco. Attempts to sell the fish in the Imperial Valley were fruitless, the fish being named "cow-carp" and regarded as very poor. These attempts, however, laid the foundation for a later very good demand. The approach to Captain Davis' land being cut off by the overflow from irrigation ditches, he was prevented from pursuing the fishery until the last year, but certain Japanese and Greeks did catch considerable quantities, using much of the mullet for oil, and shipping some to market. The Greeks still operate. In the last year Captain Davis has again begun shipping mullet, catching them by means of halibut trammel nets. The catches during the winter months by two men using eight trammel nets of thirty fathoms length each, comprise but 250 or 300 pounds daily, taken in the vicinity of the mouths of the rivers, in shallow water. These fish are landed and shipped from Niland to Los Angeles or San Francisco. Captain Davis receives 15 cents per pound for the fish at the station.

FIG. 23. Captain Charles Davis, a mullet fisherman of the Salton Sea, Imperial County, California. Photograph by H. C. Bryant.

The recession of the sea has made considerable trouble so far as landing the catch is concerned. As the fall is only about four feet per mile, there are great flats covered with water only six or eight inches deep, in which a boat can not easily be moved. Captain Davis has in

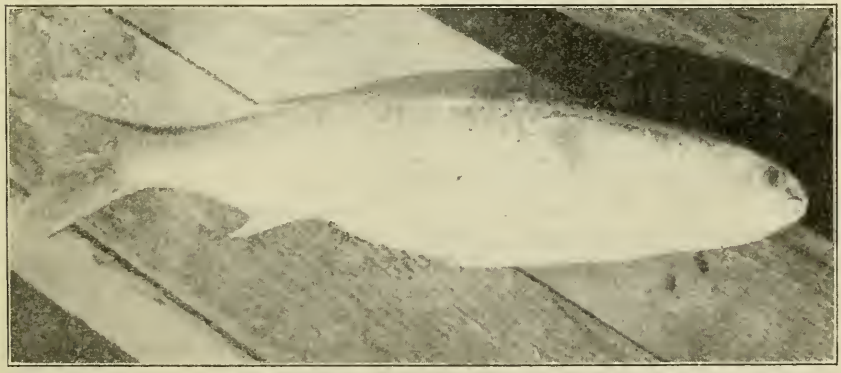

FIG. 24. The mullet (*Mugil cephalus*), a desirable food fish now found in numbers in Salton Sea, Imperial County, California. Photographed by H. C. Bryant.

a measure overcome the difficulty by making a shallow canal, up which his boat can be pulled part way by means of a picket line and the remainder of the way can be pulled with a tow line.

According to Captain Davis mullet are found in different locations in the sea at different seasons. During part of the year they are found in great numbers on the west shore of the sea in grass which grows profusely there and upon which they feed, being vegetarians. On a visit to Bird Islands, on the west shore of the sea, on December 18, 1919, there was no evidence of mullet, and yet at times large numbers are said to be caught in this vicinity.

The fish are at present of very large size indeed, being between two and two and one-half feet in length. The flesh is oily in the extreme, yielding fully a quart of clear oil to the ten pounds of fish. This oil, of a delicate flavor, renders the canned mullet a delicacy, and samples put up by a Los Angeles firm were found to be very palatable. The fact that the fish is delicious should have been expected because of the very high esteem in which it has been held from ancient times, domesticated mullet being known in Europe since the times of the Romans. The species is found all along our coasts, from Monterey southward, and occasional schools are taken in every sheltered lagoon or bay, as well as occasionally up the rivers in what is really entirely fresh water. Its occurrence in the Colorado River is not highly remarkable, and its transference to the Salton Sea would have been expected by anyone familiar with its habits.

FIG. 25. Mullet fisherman with part of his catch. Photograph by H. C. Bryant, December 19, 1919.

There is also present in the Salton Sea a species of top-minnow *Cyprinodon macularius,* which is found in the streams and springs of the desert throughout Southern California and parts of Mexico. They are said to be abundant in the sea at times, and specimens were obtained for us from there and from Fish Spring by Captain Davis.

It is, indeed, very questionable whether the mullet will exist for any length of time. The carp, and other fresh-water fish in the sea, died some years ago, according to Captain Davis' recollection, after a heavy blow which mixed the waters, drifting them ashore in great quantities. During the past two years there have been statements made to the effect that the mullet also have been found on certain shores of the lake in great quantity, apparently dead from poisonous waters. It is certain, moreover, that the sea has been steadily falling, at the rate of 4½ feet yearly, and as the sea is everywhere shallow (perhaps 25 or 30 feet

deep) it is plain that it can not last long at such a rate of fall. Analysis of the water at a distance from river mouths shows it to be three or four times the salinity of ocean water. The water, moreover, is not merely saline. If such were the case, it is probable that the mullet, a salt water fish, would survive indefinitely. But as a matter of fact the water is fed from alkaline springs, and has in the past been alkaline in nature, so that the water must become poisonous rather than merely salty. Regarding this, however, there is some question until chemists are able to analyze fair samples taken annually, but the probability is very great that the mullet will be unable to exist.

The area near the center of the mullet fisheries should prove of great interest to the geologist. Mullet Island is a typical volcanic plug. At the edge of the island a number of hot springs boil out, leaving chemical deposits of several colors, similar to those of Yellowstone National Park. Captain Davis, by impounding the waters of these springs, has succeeded in obtaining two different colored "paints," and in a third reservoir a pure deposit of rock salt Near the island are some mud volcanoes the cones of which are from five to eight feet in height. A spring in this vicinity also is geyserlike in action, boiling out with considerable velocity periodically. Because of these natural phenomena the island is visited by large numbers of people from the Imperial Valley every week.

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All material for publication should be sent to H. C. Bryant, Museum of Vertebrate Zoology, Berkeley, Cal.

APRIL 19, 1920.

"There must be a balance between the agencies of destruction and those of conservation. When there is nothing left to conserve then we must give up all of our ideas of sport."—Emerson Hough.

ADDITIONAL GAME SANCTUARIES.

Through an oversight the list of California's game sanctuaries as given in the January number of CALIFORNIA FISH AND GAME lacks the following:

Name	County	Area	Established
4F	Los Angeles and Kern	23,040	1919
1M	Kern	80,640	1919
3E	Santa Clara	3,840	1919

This adds a total of 107,520 acres which should have been included in the statement, making a total in all of 3,107,520 acres. Sanctuary 4F was set aside especially to protect the few antelope which may still exist in the eastern end of what is known as "Antelope Valley," in northern Los Angeles County.

THE GAME WARDEN AT WORK.

The scene is laid in one of the small national parks in the Southern Sierras. A state game warden, on the look out for violators, is camped within the park for the night. A shot is heard at dusk. The warden gets up early the next morning and goes to the spot from which the shot was heard and there discovers blood upon the ground. A little search also discloses the entrails, head and skin of a doe. The warden hides the head and hide and makes his way to the camp of some woodsmen just outside of the park. A man found at the camp is asked if he has any deer meat. He replies "No." The warden notes on the back of the woodsman's hunting coat a large patch of blood, apparently made by carrying a deer into camp. When questioned the woodsman states that he does not know what caused the spot of blood. The warden asks permission to enter the cabin and make a search and is given this permission. On entering the cabin the warden discovers a flour sack filled with fresh venison. The woodsman then admits that his brother has killed a deer. He is then asked if the deer was killed within the national park and is told that it was not. The game warden then leads the woodsman to the spot where he had hidden the head and hide of the doe and the woodsman is made to admit the fact that the doe had been killed within the national park. The outcome, of course, is a heavy fine to the violator.

In California game wardens can tell you many such stories as the above. The violator is nearly always a man ready to perjure himself and do anything to avoid a court sentence. Talk to a game warden and you will soon discover that it is not the detective alone who must be clever in sleuthing and in the gathering of reliable evidence, for the game warden must not only act as police and prosecutor, but he must also be a clever detective, if he is to bring violators to justice.

DRY YEARS INJURE ANGLING PROSPECTS.

Dry years are coming to be viewed with grave apprehension by the angler, for he knows that his sport is always curtailed by a lack of water in the streams and lakes. Planting activities have been coming to naught as a result of the lack of water. In many streams and lakes where large numbers of fish have been planted, and where a noticeable increase has taken place, there has been a depletion in the abundance of fish due to drought. Two power reservoirs in the Southern Sierras, Huntington Lake and Shaver Lake, although heavily stocked in the past few years, will furnish but poor angling the coming season because of the fact that thousands of fish have died

owing to the present low water and consequent poor food supply. Many streams when they again run bank full will contain but a small proportion of their former stock of fish. Every angler should look with favor on future storage reservoir projects, for in an increase of such reservoirs lies a partial solution of the problem which presents itself with each dry year and its consequent low water.

GOVERNMENT AND FISH AND GAME COMMISSION INAUGURATE FREE NATURE GUIDE SERVICE.

So successful was the summer resort work inaugurated by the California Fish and Game Commission at the Tahoe resorts last summer, that it drew the attention of the federal government, with the result that a similar nature guide service will be installed in the Yosemite Valley the coming summer. The Superintendent of National Parks has secured the cooperation of the Fish and Game Commission to the extent of the commission's furnishing Dr. H. C. Bryant, who instituted the work at the Tahoe resorts, for the work in Yosemite. Dr. Bryant will be assisted by Dr. Loye Holmes Miller, of the Southern Branch of the University of California.

Evening lectures dealing with wild life will be given at the various camps and trips afield will be conducted, including special trips for children. Office hours are to be arranged so that questions regarding natural history can be answered. This summer resort work offers a splendid opportunity for the Fish and Game Commission to employ the educational method in making conservationists out of summer vacationists. In no other way could the commission come in touch with so large a number of people in so short a period of time.

IN MEMORIAM.

CHESTER A. SCROGGS.

We regret to announce the death of Deputy Chester A. Scroggs, whose death occurred January 29, 1920, after a short illness at his home in Loomis, Placer County.

Deputy Scroggs was appointed special deputy June 19, 1908, and regular deputy September 1, 1911. He was attached to the Sacramento Division, and for three years up to the time of his death was in charge of the launch patrol of the district. By his activity and thoroughness he developed this arm of the service up to its present stage of efficiency.

Chester Scroggs was utterly fearless and resolute in the discharge of his duty. He believed the fish and game laws were placed on the statute books to be enforced. There was no obstacle or hindrance too great to deter him from his duty as he understood it. Nothing could deviate him from his purpose. If he had a fault it was over-zealousness—if that can be termed a fault. He had no censure for any but the slacker of duty. Still he was fair and conscientious in his dealings with violators with whom he came in contact. They both feared and respected him.

At the time of his death he was forty years of age. He is survived by a widow and two small children, a boy and a girl, also a sister. He was a member of the Masonic fraternity and the Order of Elks.

He is mourned by his many friends in private life and his brother workers on the Fish and Game Commission.

FOREST NESBITT.

Deputy Fish and Game Commissioner Forest Nesbitt died of pneumonia at his home in Salinas, Friday, March 5, 1920, after only a few days illness following a severe cold contracted while on patrol duty.

Mr. Nesbitt was appointed Deputy Fish and Game Commissioner, December 1, 1917, after qualifying by civil service examination. During his time of service, he proved his fitness for the trust that was placed in him. His training under his father, who has been sheriff of Monterey County for many years, gave him previous experience that was of the greatest value. In every prosecution his fairness was apparent. No one was taken into court unless their guilt was certain. Believing in the strict enforcement of the laws protecting wild life, his influence brought about a better compliance with the law in every section to which his work took him.

To the father, mother and wife and others that were near and dear to him, the Commissioners and fellow-employees extend their heartfelt sympathy.

FOREST OFFICERS' REPORTS.

For several years past the Forest Service has, through the medium of annual reports from each supervisor, furnished valuable information as to the distribution and past and present status of fish and game. During the coming year forest officers are to furnish information according to the following outline recently submitted to them. As can be seen the outline emphasizes knowledge as to distribution and life history of the more notable species.

LIFE HISTORY.

A. Big Game.

Moose, elk, antelope, mountain sheep, white-tailed deer, black-tailed deer, black and brown bear, silver tip or grizzly bear.

Mating and breeding habits, number and care of young, food and range at various seasons of the year, condition and abundance, diseases and effect of climatic conditions, rutting season, when young are born, when are horns shed, any other information bearing upon the desirability of the species or its adaptability for extension work.

B. Game Birds.

Ducks and geese and other waterfowl, if any; grouse, give exact species found; quail, partridge, pheasants, ptarmigan, etc. Anything relative to their breeding and nesting season and habits. When eggs are laid and number of young, abundance or scarcity.

C. Small Game.

Rabbits, tree squirrels. Their relation to forestry and value as game animals, abundance, or scarcity, need for protection, if any.

D. Fur Bearing Animals.

Species found in locality, breeding habits, season when fur is prime and value. Any available information as to the extent of the local trapping industry. Special attention to beavers.

E. Insectivorous and Song Birds.

List various species found together with all interesting information at hand concerning life history and habits.

F. Predatory Animals.

Wolves, coyotes, mountain lions, foxes (various species found), wild cats, lynxes, etc. Specific cases of loss by predatory animals.

Damage done by these species to game. Abundance or scarcity. Range and food at various seasons. Any useful information in exterminating them not hitherto reported.

(Note—Several of the species listed may also be discussed under Fur Bearing Animals.)

G. Predatory Birds.

Eagles, hawks, etc., various species found. Amount of damage they do to game animals and birds. Life history and habits.

H. Fish.

Trout—rainbow, eastern brook, native and others. Bass—small and large mouth. Other game fish—abundance or scarcity of species, spawning season, migration, character of water best adapted to each, use of fish ladders and screens. Information as to any successful device for screening headgates or ditches is especially desired.

Streams needing stocking; number of fish needed for each, with specific shipping instructions. Cost to Forest Service, amount of cooperation, etc.

DISTRIBUTION.

In submitting the above report, information which will extend the known ranges of the following mammals and birds is very much desired. Below you will find a list giving you a brief summary of the range of each species. If you locate definite records of the occurrence of any of these birds or mammals outside of the limits given, do not fail to submit evidence. The best evidence is a specimen. Ship specimens direct to H. C. Bryant, Museum of Vertebrate Zoology, Berkeley, California, by express, carefully marked "specimens for scientific purposes." We are especially anxious to get specimens of deer taken in San Luis Obispo and Santa Barbara counties and throughout the Sierras to outline more accurately the range of various species. Specimens should be taken during the open seasons. Permits will be issued on application for protected species.

White-tailed Deer.

Range—Said to have formerly occurred in extreme Eastern and Northeastern California, chiefly in the Modoc region. Many accounts by hunters, but no verified or recent report.

Columbian Black-tailed Deer.

Range—Northwest coast region, chiefly in the Transition (yellow pine belt) and Boreal (Lodgepole pine belt upward) zones; east throughout the inner coast ranges to the Sacramento Valley, and at the north to and including Mount Shasta and near vicinity; south to the north side of San Francisco Bay.

Southern Black-tailed Deer.

Range—Transition and high Upper Sonoran (chapparal belt) zones south

from San Francisco Bay through the Santa Cruz district, at least into Monterey and San Benito counties.

Rocky Mountain Mule Deer.

Range—Eastern California, including main Sierra Nevada south into Kern County and north to vicinity of Mount Lassen, thence northeast through the Modoc region. Western limit at extreme north, Mount Shasta (Rowley, M. S.). Not in the desert ranges east of Owens Valley except in winter. Occurs in summer on the high Sierras up to timberline; in winter most numerous in the foothills.

California Mule Deer.

Range—Upper Sonoran and Transition zones of Southern California west of the desert proper, from the Mexican line northwest through the San Diegan district at least to San Luis Obispo County, and east through the Tejon region to the Tehachapi Mountains.

Desert Mule Deer.

Range—Imperial Valley.

Northwestern Timber Wolf.

Range—Northern California, and south along the Sierra Nevada. Now rare or extinct. The number of records (e. g., Price, Zoe, 4, 1894, p. 331) and reports from the region specified carries conviction that a wolf of some form has occurred as above indicated. But lack of specimens brings doubt as to the race represented.

Sierra Nevada Wolverine.

Range—Boreal zone on the Sierra Nevada, from the vicinity of Mount Shasta, south through Lake Tahoe region to Monache Meadows, Tulare County.

Yellow-haired Porcupine.

Range—High Transition (yellow pine belt) and Boreal (Lodgepole pine belt upward) zones along the Sierra Nevada, from Mount Shasta to the vicinity of Mount Whitney.

Sierra Grouse.

Range—Common resident of coniferous timber in the upper Transition and Canadian zones of northern California from Mount Shasta south along the inner coast ranges at least to Mount Sanhedrin, and along the Sierra Nevada south through the Mount Whitney region to the Piute Mountains, Kern County. Also on the Warner Mountains of Modoc County, on the White Mountains, Mono County, and on Mount Pinos, Ventura County.

RECORD ANY RECENT OCCURRENCE OF:

Grizzly Bear.

Columbian Sharp-tailed Grouse.

Former range—Occurred formerly as a fairly common resident on the Transition plains of the Modoc region; Canoe Creek, 50 miles northeast of Fort Reading, and upper Pit River; Camp Bidwell. No information is at hand confirming its existence within the state at the present time.

Sandhill Crane.

(Especially record of nesting.)

Range—Fairly common summer visitant to the northward interiorly; at least a few winter in the San Joaquin Valley. Recorded as breeding in the northeastern corner of the state; summer records also from Alpine Meadows of the Northern Sierras (several records), and from the San Joaquin Valley south to the Tulare Lake region.

Breeding of ducks, geese and jacksnipe in the Sierra region.

A BILL TO ESTABLISH GAME SANCTUARIES IN NATIONAL FORESTS.

With the view that certain areas within the national forests may be set apart as game sanctuaries, a bill was introduced in the United States Senate on June 21, 1919, by Senator Nelson, looking toward the dedication of more of the national lands to conservation purposes. The national parks and monuments have for some time been set apart as game refuges, and the bill in question would also set apart sections of the national forests to the preservation of our wild life. This bill covers practically the same points as a bill previously introduced by Senator Chamberlain, but which never came to a vote by the Senate. The Nelson bill covers the following propositions:

Section 1. A federal law empowering the secretary of agriculture to select areas in national forests suitable for game sanctuaries; these sanctuaries to be established by presidential proclamation but with the approval of the governor of each state; and to be so located that they shall not prevent the allowing of grazing or other uses thereof as are in conformity with the laws applicable to national forests.

Sec. 2. Prohibiting the hunting or other destruction of game within such sanctuaries, except as otherwise in the act provided, and providing penalties for the violation of such provision.

Sec. 3. Administration of the provisions of the act to be vested in the secretary of agriculture, with power to regulate the killing of predatory animals.

Sec. 4. Providing for the establishment by the secretary of agriculture of boundaries and for postings showing the location thereof and warning the public of the prohibition of hunting therein.

Sec. 5. Setting forth the purposes of the act: That it is expedient to establish a large number of sanctuaries of medium

size rather than a few large preserves, the ideal condition to be a chain of sanctuaries, with the view of providing breeding places for game which will spread over adjacent and intervening territory, where it will be subject to the regular open season provided by law.

There is crying need for such a law as this, for millions of acres of some of our national forests are utterly destitute of game, and great opportunities to create a vast annual supply of big game are being wasted by lack of intelligent and resolute action. It is to be sincerely hoped that this measure will not, like the Chamberlain bill, be allowed to slumber in the archives of Congress, but that some definite step will be taken.

SAN DIEGO TO MAKE CLEAN SWEEP OF THE ENGLISH SPARROW.

The city of San Diego resolved that she would rid herself of the English sparrow. So in 1916 a city ordinance was passed providing for ways and means for the extermination of this pest and appropriating the sum of $125 for such purpose. The task of destroying sparrows inside the city limits was delegated to one man, and ever since the ordinance became effective he has been on the job. From the first the campaign has been successful and the sparrow pest is now not only under control, but this spring San Diego expects to free herself entirely of the sparrow. The city this year is allowing ten cents each for every sparrow killed, up to $50, and in addition the Chamber of Commerce is also offering ten cents each up to $30. The record for this year shows 250 dead birds, and it is estimated that there still remains about 100 sparrows in the city. It is expected that as soon as the mating season is well under way and the sparrows begin nesting that a clean sweep can be made of all these remaining birds.

Other cities in the state might well follow the example set by San Diego. Even in cities where sparrows are far more numerous the appropriation of a small sum of money and the appointment of an energetic and ingenious man to carry on the work of destruction will lead to a near solution of the sparrow problem. A city that can advertise itself with the slogan "No house sparrows here" adds to its reputation—WEBB TOMS.

FISH PACK, 1919.

In this issue is given a complete report of the canned, cured and manufactured fishery products of the state for the year 1919 (see p. 96). Through the cooperation of the packers throughout the state it has been possible to get out the annual pack more promptly as well as more accurately and in greater detail than ever before.

The total case pack of canned goods in 1919 was a trifle over 42,000 cases less than in 1918, while the estimated value of the 1919 pack is nearly $3,000,000 greater than estimated value of the 1918 pack.

During 1919 the tuna, albacore and skipjack pack was larger than in the previous year, and while the actual case pack of sardines for 1919 was less than for 1918, the pack was of a better quality. During 1919 there were only 41,373 round cans of sardines packed as compared to 420,905 cases of round cans for the year previous.

The pack of mild cured salmon for 1919 was nearly double that of the previous year. The production of meal and oil also shows a large increase. At the close of 1919 we find an increase of twelve plants, 203 employees and over $2,000,000 in valuation of plants, which shows the healthy growth of the fish packing industry of California.—S. H. D.

SPORTSMEN LAND MANY BIG FISH.

The total number of blue-fin and yellow-fin tuna taken at Catalina Island during 1919 was 911, of which 36 weighed over 100 pounds each. The total number of marlin swordfish was 114. No broadbill swordfish were captured, but a number of anglers reported unsuccessful battles with them. The prize for the world's tuna taken on light tackle went to Commodore James W. Jump, the fish caught weighing 145½ pounds. The usual awards have been made by the Tuna Club, prizes now being offered for such other game fish as swordfish, white sea bass, bonito and dolphin.

FOREST OFFICERS TO ACT AS GAME WARDENS.

By an agreement recently signed by the Executive Officer of the California Fish and Game Commission and the United

States Forest Service, forest rangers will act as fish and game wardens and deputy fish and game commissioners as forest firewardens. According to the terms of the agreement forest officers will enforce fish and game laws, make arrests, submit reports and issue hunting and fishing licenses. The force of game wardens will therefore be greatly augmented and better enforcement of the fish and game laws is a certainty. The news that forest officers will handle hunting and fishing licenses will be received with pleasure by sportsmen because of the added convenience. The help of the Forest Service in better posting state game refuges will be another outcome of the cooperation planned. In return for the services of the forestry men, the game wardens of the state will be deputized as forest firewardens and will help in protecting the forests and in developing the right public attitude toward the laws and regulations of the national forests. There is to be a continuance of the annual reports on game conditions in the forests furnished by the District Forester.

This cooperation, which has been carefully worked out between the United States Forest Service and the Fish and Game Commission, will make violation of the fish and game laws doubly difficult and will do much to develop a sentiment favoring game conservation. There follows the agreement in full:

AGREEMENT.

In order to secure closer cooperation with the Fish and Game Commission, the following informal agreement has been executed:

Whereas, the wild life on the national forests of California is a product of the forest and a great resource, which adds materially to enjoyment of the national forests by the public, as well as of great economic value, its protection and perpetuation becomes a public necessity; and

Whereas, the Fish and Game Commission of California is the duly authorized agent for the State of California for the protection and perpetuation of this resource, and the District Forester of the Forest Service, United States Department of Agriculture, for the Department; now, therefore

In order to coordinate the work of these departments in the protection of game, fish, birds, and forests of California, Paul G. Redington, District Forester, for and on behalf of the United States Department of Agriculture, and Carl Westerfeld, Executive Officer of the Fish and Game Commission of California, for and on behalf of the State of California, do agree as follows:

1. That under the state laws no differentiation can be made between violators of the law. The law, therefore, should be enforced equally as to all violators.

2. The forest officers, because of their familiarity with the areas on which a large proportion of the wild life in the state exists, can and should assist, by their own personal actions and attitude, in securing the proper respect and enforcement of the state game laws. All forest officers who, in the judgment of the District Forester, can, because of the character of their work, be of assistance in the enforcement of the state fish and game laws, will be appointed by the Fish and Game Commission of California as deputy state game wardens. All forest officers so appointed shall assume the following prescribed duties:

(*a*) Pay strict attention to the enforcement of the state fish and game laws, and by personal actions and attitude assist in creating the right public attitude and sentiment toward the protection of fish and game within the boundaries of national forests;

(*b*) Report all cases of violations of the fish and game laws to the officer's immediate supervisor, who will in turn report the violation to the Fish and Game Commission of California, San Francisco, California;

(*c*) Make arrests for violations of the fish and game laws committed within the boundaries of the national forests;

(*d*) Furnish all information available which will assist officers of the state in apprehending or prosecuting violators of the fish and game laws, whether such violation was committed within or outside the national forests;

(*e*) Submit such reports as may be called for by the District Forester;

(*f*) Report misconduct or dereliction of duty on the part of any state official employed in the enforcement of the state fish and game laws;

(*g*) Issue hunting and fishing licenses, receiving therefor the commission allowed by law.

3. The District Forester will cause an annual report to be submitted to the Fish and Game Commission which shall contain complete information as to the present condition of wild life in the national forests, and plans for the protection and development of fish and game therein. He will recommend the establishment of such game refuges as seem necessary, the boundaries of which shall not be changed without his approval.

4. The Fish and Game Commission of California will elect a representative of its commission to act on behalf of the Commission with the District Forester on all matters pertaining to fish and game work on the national forests of California.

5. The duly authorized agent of the Commission shall have power to act upon all reports and requests from the District Forester, furnish upon requisition the number of fish plants necessary to stock streams within the national forests, provide proper facilities for transport to places of destination, and properly supervise shipment from hatchery to nearest railroad point; and shall issue proper instructions to forest officers designated to transport fish from railroad point to streams, giving at least two weeks' advance notice of date of arrival.

6. Upon recommendations from the District Forester, deputy game wardens will be appointed state fire wardens, and the Commission or its duly authorized agent will instruct such wardens to cooperate with the Forest Service in the suppression and prevention of forest fires.

7. All deputy game wardens will pay strict attention to the enforcement of state fire laws, familiarize themselves with the regulations governing the use of the national forests, and by personal actions and attitude assist in creating the right public attitude and sentiment toward these laws and regulations.

8. Deputy state game wardens will report, through the State Fish and Game Commission, any misconduct of forest officers on the dereliction of duties in the enforcement of fish and game laws.

9. The Fish and Game Commission will provide the necessary signs, labor, and material, for the proper posting and supervision of existing state game refuges or those which may hereafter be established within or adjoining the national forests.

10. Necessary expenses of forest officers in the investigation and prosecution of fish and game violations will be paid by the Fish and Game Commission upon properly certified accounts on forms furnished by the Commission.

11. Amendments to this agreement may be proposed by either party upon giving thirty days' notice to the other. Amendments shall become operative immediately after they have been adopted by both parties.

12. It is mutually understood and agreed that this agreement shall terminate at the end of any fiscal year in the event that Congress shall fail to make an appropriation for the ensuing fiscal year.

BIRD PROTECTION SOCIETIES.

Due credit must be given associations of bird lovers, such as the Audubon societies, for initiating many of the campaigns which have brought about better protection for wild birds. The National Association of Audubon Societies was the pioneer in the establishment of reservations where birds are protected the year round. The laws protecting the sale of bird plumage were also initiated by the National Audubon Association.

There are at present in the State of California two active bird organizations of this type, the California Audubon Society, with a large membership in Southern California, and the Audubon Association of the Pacific, with a membership in the San Francisco Bay region. The latter organization, which is but a few years old, has been doing some splendid work among juveniles by organizing junior Audubon societies and, by stimulating bird study among the Boy Scout organizations. It is also actively carrying on an educational campaign through the medium of a small monthly periodical known as "The Gull," which is now in its second volume. Besides conveying information regarding the monthly meetings and monthly field trips, "The Gull" has contained a number of interesting articles relating to bird protection and many notes of the occurrence of rare species of birds. This latest addition to organized bird study, the Audubon Association of the Pacific, under the active leadership of its president, Mr. C. B. Lastreto, is carrying out both lines of endeavor expressed in its aims—the study and protection of birds.

GAME ABUNDANT IN EARLY DAYS.

In an article appearing in "The Auk," volume 37, page 35, entitled "In Memoriam: Lyman Belding," Dr. A. K. Fisher says of this pioneer ornithologist, in connection with the subject of the abundance of game in California in early days:

He went to Stockton in March, 1856, and of game seen here and in other parts of California he says: "Game was abundant, including elk, antelope, deer, bear, otter, quail, and waterfowl. Elk have disappeared from the interior valleys of the state excepting a drove on the Miller and Lux Ranch of forty thousand acres in the San Joaquin Valley, and these animals are being captured and distributed to various parks. The elk of this state inhabited the tule marshes mainly, though I have seen many elk horns in the Marysville Buttes, probably left there by elk which came from the marshes of Butte Creek, and I have seen hundreds, if not thousands, of elk horns on the border of the tule swamps north of Stockton. Antelope have entirely disappeared from the Sacramento and San Joaquin valleys. I saw three in the latter valley a few miles west of Princeton in the summer of 1870 and a single one in

Lower California about twenty-five miles south of Tia Juana in the spring of 1887. Deer were mostly in the mountains, with a few along the rivers where there were extensive thickets on bottom lands. They will continue to be common with proper protection."

SURE PUNISHMENT METED OUT TO VIOLATORS OF MIGRATORY BIRD TREATY ACT.

There was a time when violators of the migratory bird treaty act depended upon escaping punishment through a trial in their own county by a jury often composed of friends and acquaintances, under which procedure dismissals reached a large percentage of the number of arrests. However, this is all changed now; for since July, 1918, the power to enforce this law has been vested in the Bureau of Biological Survey, of the United States Department of Agriculture, and instead of a trial in the state court in his own county, the violator is brought into the federal court, where, removed from his sphere of local influence, he meets certain punishment. Here in California, in the district known as the "duck country" of the Sacramento Valley, composed of the counties of Yolo, Sutter, Glenn, Colusa and Butte, prior to 1918 the number of dismissals reached about sixty per cent of the number of arrests. But in that year the arrest and conviction in the federal court of four of the most persistent violators with a substantial fine of $100 each, produced a very depressing effect upon chronic violators, and the sentiment has changed to such an extent that the violator usually begs to be allowed to plead guilty in the state court rather than be taken before the federal authorities. This certainty of punishment of violators, in the "duck country" alone, resulted during the period from October 6, 1918, to January 31, 1919 (almost four months), in 20 arrests, *no* dismissals, and fines aggregating $705; and during the period from October 15, 1919, to December 6, 1919 (less than two months), in 23 arrests, *no* dismissals, and fines aggregating $625. At first glance, owing to the greater number of arrests recorded for the latter period, it might seem that violations were on the increase during 1919, but this is not necessarily true. When it is remembered that since 1918 all United States deputy wardens also became state deputies, the increase in the number of arrests can no doubt be traced to the fact that the patrol service has become greatly augmented and more violations detected.

And it is not only in California that the migratory bird treaty act is being more stringently enforced. Five hundred dollars, the maximum fine, was recently levied by a judge in Michigan against a hunter for selling thirty-two ducks in violation of the act. Another violator of the same law, in Connecticut, who had been guilty of repeated offenses, was sentenced to three months in jail. This offender was not given the alternative of paying a fine. This growth in the number of convictions and enlargement of fines through the country shows the increasing concern with which the courts regard violations of this important statute, designed to protect migratory, insectivorous and nongame birds.

NAVAL AIR STATION FISH PATROL OPENS IDLE CANNERIES.

It will be of interest to know that the fish canneries of Southern California had been idle for four months until the inauguration of the Naval Air Station Fish Patrol. This service was instituted during the latter part of December, 1919, in accordance with an agreement between the Naval Air Station at San Diego and the Fish and Game Commission, whereby seaplanes were to sight schools of fish, wire back the direct location to the naval station, which then would telephone the information to the San Diego office of the Fish and Game Commission, which office in turn would immediately notify all canners and fishermen.

As a result of the first day's radio report locating schools of sardines, fishing fleets were able to procure large quantities of sardines, and since that time have been canning continuously, despite the fact that canneries previously had been idle for four months. Everyone interested in the industry is aware that the best and finest fish are found in deep waters, and fishermen hesitate going to uncertain fields on account of loss of time. But now the seaplane locates the schools and they are no longer a prospect, but a certainty.

Genuine sardines are found only in California waters and those of Southern Europe, and the industry in California has made great progress in the past three years and bids fair to become the sardine canning center of the world. And now with the immeasurable value of the Naval Fish Patrol service a proven fact, it would seem that nothing could stand in the way of this development. And although the seaplanes have been so successful in locating schools of sardines, it is anticipated that they will be of still greater value in locating schools of large fish such as tuna, albacore, yellowtail, amberfish, etc., which are found farther from shore and run from early spring to late fall.

Reports of some of the flights made have revealed to canners the fact that seaplane service is really of as much a necessity to the fish and canning industry as fishing fleets or canning machinery, and it is the concensus of opinion that this fish patrol service must be continued. Here are a few of the reports:

I. Installed in cockpit—Hydroplane H. S. 2 L., as observer, Lieutenant E. P. McKellar, pilot. Third occupant, wireless operator. Took flight promptly 2 p.m. Followed leading hydroplane containing Lieutenant Linkins as official observer. Atmosphere fairly clear—slight haze, no clouds, sun rays direct, fairly stiff wind. Judged altitude plane our flight five to seven hundred feet. Altitude leading hydroplane considerable less. Flew north-northwest to area four, square seventy-three, which is west by north, off the coast of La Jolla about five miles and about twenty miles from San Diego by direct line. In this area of approximately ten miles square, we covered the course in serpentine fashion from south to north and return, from east to west and return. Neither on our flight to this area, nor in this area, did either crew discover a school of fish.

II. In this area, however, saw on four separate and distinct occasions, at intervals and in different locations, one single fish on each occasion. From our altitude, their depth in the water could not be definitely determined, nor could the size or species. Taking into consideration the effect of light upon and through water, the magnifying effect of clear water, the silvery scintillating sheen of fish scales on a moving object in clear water on a bright day, subtract our elevation; concluded these fish to be medium sized bass or yellowtail, although the perspective of distance made them appear in the size of a large sardine.

III. The area thoroughly patrolled, we followed the leading hydroplane east by south to the shore line above and off the coast of La Jolla. In the cove off La Jolla the leading hydroplane sighted three small schools of sardines. The information was immediately radioed to North Island, and all canneries had the benefit of this discovery within ten to twenty minutes thereafter.

IV. Still following the leading hydroplane, which was flying low, we proceeded east by south, following the shore line about one-quarter to three-quarters of a mile off shore; our altitude about 600 feet. Here we were again forcibly impressed by the discovery of the intense visibility possible from this height, to the depths under the surface of the water. The topography of the bottom of the ocean was plainly and distinctly clear to vision, as well as all plant life and formations, this being in many instances three-quarters of a mile off shore. The depth of the water we had no way of estimating, but to hazard a guess would say it was anywhere from forty to sixty feet in depth.

V. We crossed the channel and entrance to San Diego Bay, continuing flight over a great portion of Coronado Bay, where again were impressed with the intense visibility through this water, which is not nearly as clear as the pure ocean streams and currents. Regardless of its muddy and murky appearance, it was possible to see the bed of that bay for great distances. The value of this fact should immediately impress itself on one; for this bay is one of the largest and most favored feeding grounds of the sardine when in season.

VI. We proceeded, returned to our starting point at 4 p.m., elapsed time, two hours.

FACTS OF CURRENT INTEREST.

Two Italians of Thornton, San Joaquin County, were recently arrested for using a gill net on the Mokelumne River, where such fishing is illegal. These men pleaded guilty in court on January 29 and were fined $250 each by Judge Barber.

During the season of 1919, 30,836,000 fish, mostly salmon and trout, were reared and distributed from the twenty-two hatcheries and egg collecting stations operated by the California Fish and Game Commission.

State Lion Hunter Jay Bruce has been successful in reducing the number of lions in the large game refuge in Santa Barbara and Ventura counties.

Beavers have become so abundant on the Merced River near Snelling that damage to agricultural interests have resulted and special permission has been granted to the parties injured to reduce their number.

Whistling Swans (*Olor columbianus*) have again been numerous in this state the past winter (1919-20). Although frequenting the fresh waters of the interior valleys as a rule, this year they have been seen in considerable numbers in Bodega and Tomales bays and at the mouth of the Salinas River.

Of the 4500 commercial fishermen in California, 29 per cent are natives of Japan, 27 per cent are natives of the United States, and 26 per cent of Italy.

Despite the fact that the whale is a mammal and not a fish, the Board of United States General Appraisers have decided in a test case that canned whale meat is fish and is subject to duty.

Although large numbers of herring were captured in Richardson's Bay last year (1919) and canned at Pittsburg, thus far this year they have failed to appear.

The American merganser has been reported in unusual numbers at numerous places along the Californian coast. Specimens have been taken at San Diego, and large numbers seem to be wintering in certain localities in San Francisco Bay, as for instance, near San Rafael.

HATCHERY NOTES.

W. H. Shebley, Editor.

FISH DISTRIBUTION, 1919.

During the season of 1919 the operations of the Department of Fisheulture were more extensive than during any previous year of the Department's activity. The actual number of fish distributed was not as great, perhaps, as during some of the past years, but the fry were given a more careful and a wider distribution than ever before.

The procedure of distribution of fish by the fish distributing cars previously has been to deliver the fish to the various applicants at the designated railroad station, and for the applicants to attend to all of the work of actually planting the fish. In a great many instances this plan resulted in more or less serious losses of fish due to the inexperience of those handling them. A plan was adopted this season whereby a trained assistant was detailed to leave the fish car at the point of delivery and assist the applicants in planting the fish. Necessarily, it was not possible for a special messenger to accompany every lot of fish planted, but an effort was made to send someone with every large consignment, where the transportation and planting of the fish was at all difficult and when the applicants were inexperienced in fish planting.

Many of the applicants, who have been receiving trout fry from the Commission for planting in different sections of the state for several years past, are experienced in the work and no assistance from this Department, in the actual planting work, is necessary. In order to carry on this work it was necessary to employ several extra messengers for the distribution cars, but it is felt that the results obtained fully justify the extra expense.

The accompanying table shows the distribution of the different species of trout fry and salmon from the various hatcheries.

It will be noted that fish were distributed from sixteen hatcheries. In addition to these hatcheries six egg collecting stations, from which no distribution of fry was made, were operated. Thus it will be seen that altogether during the season of 1919 the Department of Fisheulture operated twenty-two hatcheries and egg collecting stations and distributed in the waters of California 30,836,000 fish.

Fish Distribution, Season 1919.

Hatcheries	Rainbow	Eastern Brook	Loch Leven	Black Spotted	Steelhead	Golden	Brown
Bear Lake	748,000						
Brookdale					849,000		
Clear Creek	157,000						
Domingo Springs	220,000				116,000		
Fall Creek	670,000						
Fort Seward	234,000	8,500			538 000		
Kaweah	239,500			46,000	98,000		
Mount Shasta	2,468,500	1,070,000	2,746,000	87,000	1,411,500		320,000
Mount Tallac	51,000			685,000	185,000		
Mount Whitney	1,023,000	93,000	136,000	402,000	474,000	450,000	
North Creek	810,000						
Snow Mountain					230,000		
Tahoe	93,000			351,000		234,650	
Ukiah					600,000		
Wawona	155,000				100,000		
Yosemite	191,500			99,700	96,600		
Totals	7,063,500	1,171,500	2,882,700	1,670,700	4,718,100	684,650	320,000
Grand total, trout							18,510,450
Grand total, salmon							12,326 200
Total of grand totals							30,836 650

Furthermore a great deal of construction and improvement work was undertaken at the various stations and under favorable climatic conditions, during the coming season more trout and salmon fry than has ever before been possible can be handled. This will make it possible to meet the ever growing demand for more and more fish for stocking the streams and lakes of practically every section of the state.

MOUNT SHASTA HATCHERY.

A total of 8,102,000 trout fry were distributed in streams of northern and central California from the Mount Shasta Hatchery during the season by the two fish distributing cars. The work of distributing the fish was carried on from June 23, when the first carload left the hatchery, until October 11, when the last of the fry were planted.

In addition to the propagation of trout at the Mount Shasta Hatchery, the salmon cultural operations were given careful attention this season. The take of quinnat salmon eggs at the United States Bureau of Fisheries stations at Mill Creek and Battle Creek was not as large as had been expected, and therefore as great a number of eggs as usual was not received. The take of eggs at our own Klamathon egg collecting station, located on the Klamath River, was also small. Especial attention was given the fry resulting from the eggs received. The fish were fed and held in the hatching boxes as long as it was possible to give them the proper attention and 6,593,000 were then planted in the upper reaches of the tributaries of the Sacramento River in the vicinity of Sisson, from February 28 to May 13, as conditions for their liberation were favorable.

Three and one-half million salmon fry were then transferred to our three large salmon rearing lakes where they were retained throughout the summer. They developed rapidly under the favorable conditions obtaining therein and when they were liberated, during the latter part of October, they were in perfect condition to commence their long journey to the sea.

Since the construction of hatchery A, the main building at the Mount Shasta Hatchery, in 1909-10, the hatchery troughs have never been renewed. Many of them were in very poor condition, and it was deemed absolutely essential, that the old boxes be removed and new ones put in. Accordingly the materials were ordered and on the ground by the time the last of the fish were taken out and the construction and installation of the new troughs was immediately commenced. The crew has been engaged in this work practically all winter and by the begin-

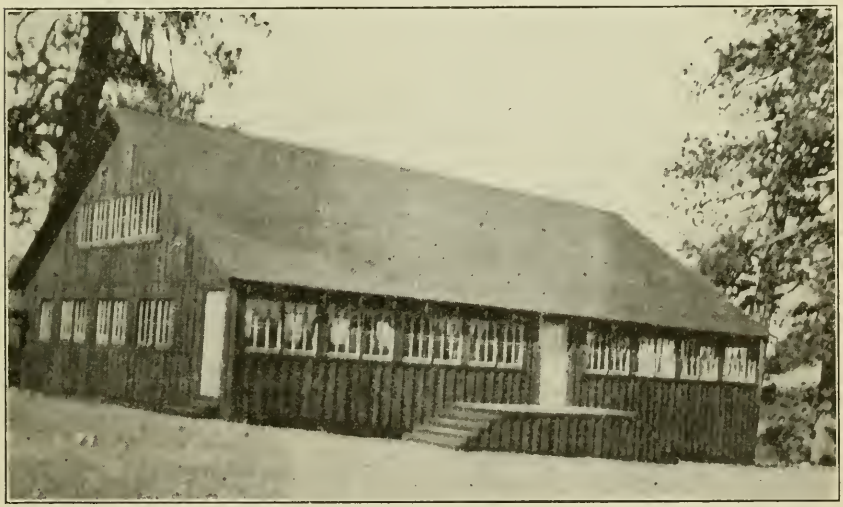

FIG. 26. Bear Lake Hatchery, San Bernardino County, California. Photographed by M. K. Spaulding, November, 1919.

ning of the 1920 fish cultural season the new troughs will be ready for the reception of the eggs. Various other repairs to buildings and grounds have been made during the fall and winter months, and all is in readiness for the beginning of the season's operations.

KLAMATHON STATION.

During the late summer of 1918 the Klamathon egg collecting station was taken over by the California Fish and Game Commission from the United States Bureau of Fisheries and arrangements were made to operate the station that fall. Over one million eggs were taken and these were immediately shipped to the new Fall Creek Hatchery.

During the fall of 1919 this station was prepared to operate at full capacity. Nearly five million eggs were taken despite the extreme drought, which materially affected the run of quinnat salmon in the Klamath River. Had we received the usual amount of rainfall in that section during the months of October and November, the take of eggs would have been greatly in excess of the number obtained. The eggs were transferred immediately after spawning to Mount Shasta and Fall Creek hatcheries.

FALL CREEK HATCHERY.

Fall Creek Hatchery was operated for the first time during the season of 1919. The quinnat salmon eggs received from the Klamathon Station were hatched and reared to a suitable age, when 500,000 were distributed in Fall Creek, a tributary of the Klamath River, during the month of May. The balance of 650,000 were held in the rearing ponds throughout the summer and distributed during the months of September and October. These fish, like the ones retained in the salmon lakes at the Mount Shasta Hatchery, were in excellent condition when planted.

BOGUS CREEK STATION.

All of the rainbow trout eggs taken at Bogus and Camp creeks were "eyed" at the Fall Creek Hatchery. Seven hundred thousand were hatched at this station and reared for distribution in tributaries of the Klamath River, both above and below the dam of the California Oregon Power Company, at Copco. The balance of the "eyed" eggs were shipped to the Mount Shasta Hatchery.

COTTONWOOD CREEK STATION.

During the spring of 1919 the Cottonwood Creek egg collecting station near Hornbrook was operated and an extensive survey made of the creek with reference to the run of rainbow trout ascending the stream to spawn, with the idea of installing more suitable and permanent equipment for egg collecting operations. The investigations and the result of the season's operations demonstrated the value of the site, and accordingly a suitable lease was arranged and adequate facilities for handling the spawning trout during the coming spring installed.

MOUNT WHITNEY HATCHERY.

The operations at Mount Whitney Hatchery for the season were brought to a close during the latter part of October. On September the first, fish distribution car No. 01, was detached from fish distributing work at the Mount Shasta Hatchery and commenced the distribution from Mount Whitney Hatchery. The waters of Southern California were practically all stocked from the Mount Whitney Hatchery this season. Consignments of fish were shipped to Fresno, Inyo, Kern, Los Angeles, Madera, Mariposa, Mono, Riverside, San Diego, San Luis Obispo, Santa Barbara, Tulare and Ventura counties. This was the most extensive distribution ever made from the Mount Whitney Hatchery.

Cottonwood Lakes station was operated and a new record was established for that station, 965,000 golden trout eggs being taken. All of the eggs were immediately transported by pack train over the mountain passes to the Mount Whitney Hatchery as soon as they were spawned, where they were "eyed." A large consignment of the "eyed" eggs was shipped to the Tahoe Hatchery and the balance were hatched and reared for distribution in the streams and lakes of the High Sierras, which were suitable for them.

Two and one-half million trout fry were distributed from Mount Whitney Hatchery this season. All of the fry planted were fine, large fish and the

results of the season's planting to the waters of southern California should be productive of some excellent fishing for the sportsmen during the coming year.

TAHOE HATCHERY.

The hatchery at Tahoe City received shipments of rainbow, black-spotted and golden trout eggs from the various egg collecting stations and a total of over 650,000 fry, of these three species, were distributed in the water of the Tahoe Basin and other streams of El Dorado, Nevada and Sierra counties. During the month of October a consignment of 25,000 golden trout fry were shipped to the Yosemite Valley from Tahoe Hatchery.

MOUNT TALLAC HATCHERY.

The egg collecting operations at Mount Tallac Hatchery last spring were not as successful as usual, owing to adverse conditions of weather at Lake Tahoe during the early spring months. The crew reached the spawning station during the middle of March, but it was April 14th before the first eggs were taken. Two million black-spotted trout eggs were taken during the season and these were "eyed" and shipments of eggs were sent to Mount Shasta, Mount Whitney, Tahoe, Kaweah and Yosemite hatcheries. Nearly 700,000 black-spotted eggs were hatched at the Mount Tallac Hatchery and were distributed together with rainbow and steelhead trout fry in the waters of Alpine, El Dorado and Placer counties.

FORT SEWARD HATCHERY.

A million quinnat salmon eggs were hatched at Fort Seward Hatchery during the spring of 1919 and the resulting fry were distributed in the Eel River and tributaries, Mad River and the tributaries of Humboldt Bay. Rainbow, eastern brook and steelhead trout eggs were shipped to the Fort Seward Hatchery during April and May and these were hatched and reared during the spring and early summer months. A total of 770,000 trout fry were distributed in the streams of Humboldt and Trinity counties during July and August.

As soon as the fry were distributed extensive improvement work at the station was commenced. The site of the hatchery is very isolated and great difficulty has been experienced in keeping assistants employed at the station. The living quarters for the men have been very poor and it was essential that something be done to improve conditions, if the station was to be kept in operation. Accordingly arrangements were made to improve the superintendent's dwelling and two plain, but comfortable, little cottages were put up for the assistants and equipped with necessary furniture for housekeeping.

UKIAH HATCHERY.

A larger number of steelhead trout fry were reared at Ukiah Hatchery for distribution in the streams of that section than have been handled during former seasons. A total of 600,000 trout fry were distributed in Mendocino and Sonoma counties during the summer. In the spring months practically all of the eggs taken at Snow Mountain Station were "eyed" at Ukiah and the results obtained were very satisfactory.

SNOW MOUNTAIN STATION.

During the spring of 1919, 5,400,000 steelhead trout eggs were collected at the Snow Mountain Station. Had it not been for the failure of the water supply and inadequate facilities for handling spawning trout in the holding pens in the late spring, when the water became very warm, a much greater number of eggs could have been taken. A quarter of a million steelhead eggs were hatched at the Snow Mountain Station and distributed in the tributaries of Eel River. During the past month a crew of men at the Snow Mountain Station have been engaged in building new holding pens and making improvements and repairs to the station, that will improve the handling of the fish during the coming season.

BROOKDALE HATCHERY.

Brookdale Hatchery was operated the same as usual during the season of 1919, the steelhead eggs received from Scott Creek being "eyed" for shipment to other stations, with the exception of 850,000 fry, which were hatched and planted during the summer months in Monterey, San Mateo, Santa Clara and Santa Cruz counties.

SCOTT CREEK STATION.

The total take of steelhead trout eggs was only 1,750,000 at Scott Creek during the season of 1919, owing to the drought, which seriously interfered with the extent of our operations in that section. As stated above the eggs were all sent to the Brookdale Hatchery, where they were "eyed" for distribution to various other hatcheries.

ALMANOR HATCHERY.

Two hundred thousand rainbow trout eggs were taken at the Almanor dam of the Great Western Power Company last season, but the water supply for the hatchery failed early in the season and it was necessary to transfer all of the eggs as soon as they were properly "eyed" to the Clear Creek Hatchery near Westwood.

DOMINGO SPRINGS HATCHERY.

Nearly a million rainbow trout eggs were taken at Domingo Springs Station during the season and consignments of "eyed" eggs were shipped to Mount Shasta and Wawona hatcheries. The rainbow and steelhead trout fry reared at the Domingo Springs Station were given a very wide distribution in streams and lakes of Lassen, Plumas and Tehama counties. An auto truck was used for a great part of the distribution and the United States Forest Service at Mineral cooperated in the work of giving the fish a wide distribution. After the fish were all planted very extensive improvements were made to the station and an auxiliary egg collecting station was established at the mouth of Warner Creek If conditions are favorable during the coming season for egg collecting operations in that section, a much larger take of eggs can be looked for than has ever before been obtained.

CLEAR CREEK HATCHERY.

The rainbow trout eggs received at Clear Creek Hatchery from the Almanor Hatchery were hatched and distributed in the streams and lakes in the vicinity of Westwood, Lassen County. It was the first season this station was operated and the results obtained were satisfactory in every respect. After the fish had all been distributed many little repairs and improvements were made and racks and trap were installed in the creek beside the hatchery. A holding pen for the spawning trout was also constructed and during the coming season an effort will be made to collect eggs from the rainbow trout running up Clear Creek to spawn.

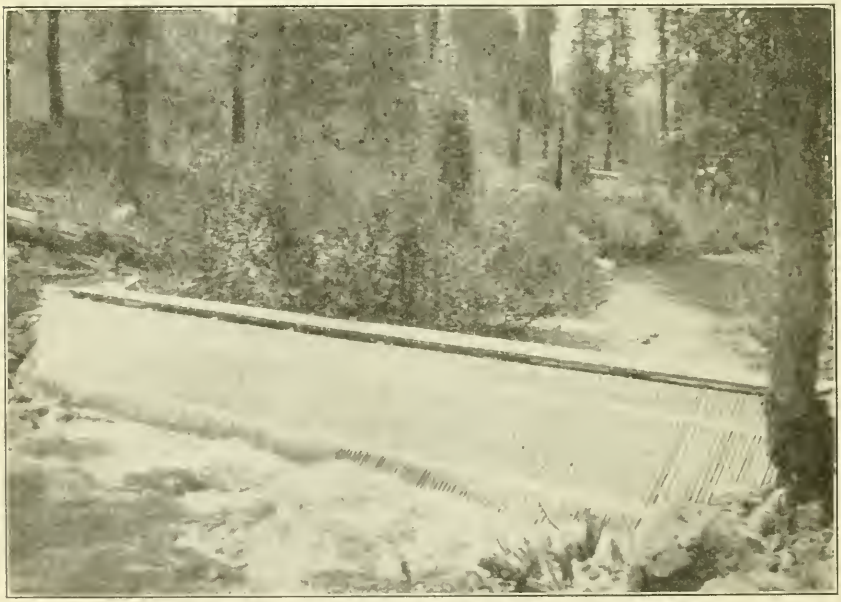

FIG. 27. Fish rack on Warner Creek, Plumas County, California, where many trout were taken for spawning purposes this past year. Photographed by M. K. Spaulding, September, 1919.

BEAR LAKE HATCHERY.

Nearly 5,000,000 rainbow trout eggs were taken at North Creek Egg Collecting Station during the season of 1919, despite the inadequate facilities to handle the work. It was demonstrated that to take advantage of the wonderful possibilities for the collecting of rainbow trout eggs at Bear Lake it was essential that very extensive improvements be made in order to handle the spawning fish properly, that suitable hatchery buildings, properly equipped, be provided at both North Creek and Green Spot Springs, and most important of all, that adequate living accommodations be provided for the foremen and assistants at both places. It is not possible to obtain satisfactory results from a station where the egg collecting paraphernalia is inadequate for the requirements, and poorly constructed; where the hatching troughs are covered only by canvas and where the foremen and assistants in charge of the work are compelled to live at an altitude of 7000 feet above sea level, in a land of deep snow and freezing weather, with only small tents for living quarters. It is neither fair to the men nor to the work to operate under such conditions. Accordingly, as soon as the fish were distributed, a crew of men was put to work on the various creeks flowing into Bear Lake. The beds of the streams were cleaned up and passageways were cut to enable the spawning fish to enter the creeks through the sand bars. Checks were made, racks and traps constructed, and cabins built for watchmen and trap tenders.

The hatchery buildings at North Creek and Green Spot Springs were put in first class shape and suitable living quarters were constructed for the foremen and assistants. The stations are now in excellent condition for the coming season's work, and if there is sufficient snow and rainfall in that section this season, the take of eggs will undoubtedly break all past records.

KAWEAH HATCHERY.

To keep up with the demands of the applicants of Kern, Fresno and Tulare counties for trout fry for the streams of that section, it was decided to establish an experimental hatchery to ascertain the suitability of the water for hatchery purposes. A site was selected near the town of Hammond on the Kaweah River, on one of the main highways. Rainbow, black-spotted and steelhead trout eggs were shipped to the hatchery and the fry hatched were given the very best attention throughout the spring and summer months, careful records being made of water temperatures. The fry reared were strong and healthy and attained a very good size. Three hundred and eighty thousand trout were hatched, reared and planted in the tributaries of the Kaweah River and other streams in that section during the summer. All arrangements have been made and plans drawn for a good-sized hatchery building to be constructed this spring, providing that a satisfactory lease can be obtained for a hatchery site.

WAWONA HATCHERY.

Wawona Hatchery was again operated during the past season. Rainbow and steelhead eggs were shipped in from other stations and a quarter of a million fry were distributed in the streams of Madera and Mariposa counties during the early summer months.

YOSEMITE HATCHERY.

The experimental station located at Happy Isles in Yosemite Valley was operated during the summer. Rainbow, black-spotted and steelhead trout eggs were shipped in from other stations, and the fry resulting therefrom were successfully reared to a good size and were given an extensive distribution in the streams and lakes in the Yosemite Valley, with the cooperation of the officials and employees of the Yosemite National Park. The site was demonstrated as being satisfactory for hatchery purpose, but as it is against the policy of the state to erect permanent buildings on leased land it was decided at a meeting of the Board of Fish and Game Commissioners, held during the latter part of October, to abandon the project. All equipment was therefore removed from the site and transported by auto trucks to the Wawona Hatchery, where it has been used to equip that station for more extensive operations.

COMMERCIAL FISHERY NOTES.

N. B. Scofield, Editor

INVESTIGATION OF HALIBUT FISHERIES PROPOSED.

In the proposed treaty between the United States and Canada to regulate and conserve the halibut fishery it is provided that inhabitants of either of the two countries may not fish for halibut in the North Pacific Ocean from November 16 to February 15, both dates inclusive, this closed season to continue in effect until February 15, 1930. It also provides that the two governments shall cause to be made a thorough joint investigation into the life history of the Pacific halibut. The International Fisheries Commission, appointed by the two governments in 1919 for the protection and rehabilitation of the salmon fisheries of the Fraser River and Puget Sound, is charged with the supervision of the halibut investigation.

It was conclusively shown some six years ago by Mr. W. F. Thompson, who made an investigation of the halibut fishery for the government of British Columbia, that the known halibut banks were being depleted at an alarming rate. This was clearly shown by a decided decrease in the catch per unit of fishing gear and by a marked reduction in the catch of large fish. Since that time the total catch has declined rapidly and it does not need a life history investigation to show that the halibut fishery of the North Pacific is well on its way to commercial extermination. An investigation of life histories is well enough and a necessary part of such an investigation, but it is more important to institute a system of gathering accurate statistics of the catch. We have been slow in learning that the basis of fisheries conservation work must be accurate and complete data of the catch. It strikes us that the two governments are about six years late in starting and that the short winter closed season, during the time the catch is always very light, is totally inadequate.

SLEEPER SHARK CAPTURED.

A sleeper shark, known to ichthyologists as *Somniosus microcephalous* was taken in one of the A. Paladini Company's trawl nets while fishing off Point Reyes on February 26. The length of the fish was only seven feet, which is considered small, as sleeper sharks reach a length of twenty-five feet. The event was not remarkable in the fact that a shark was taken in a trawl net, for the trawl nets catch large numbers of sharks, but in the fact that this is the first sleeper shark that has ever been recorded from California. This adds one more species to the list of nineteen sharks found in California as given by Professor E. C. Starks in October, 1917, and January, 1918, issues of this magazine.

The sleeper shark may be known from the other sharks by the absence of an anal fin and by the absence of a spine at the front of each of the two dorsal fins. This sluggish and clumsy looking shark is commonly found in the Arctic regions and extending down the Siberian coast to Japan and down the west coast of North America to Puget Sound. It is found commonly about Greenland and south to Cape Cod and France. On our New England coast it is known as the gurry shark from its habit of eating fish offal. In Alaska it frequents the region of the salmon canneries where it eats the fish offal thrown away at the canneries. It is reported as attacking whales in a ferocious manner, biting chunks from their hides.

MARKING SOCKEYE SALMON FRY.

The United States Bureau of Fisheries is marking yearling sockeye salmon fry at their Bonneville Hatchery in Oregon. These fry, hatched from eggs obtained at the salmon hatchery at Afognak, Alaska, will be liberated in the Columbia River and a watch kept for their return to the stream to spawn three years hence. A few years ago the Bureau marked and liberated, in the Columbia River, sockeye fry which were hatched from eggs taken at Yes Bay, Alaska. These fry returned at the age of four years to spawn and it was found that they were not like the sockeyes which run naturally in the Columbia River but were like the Yes Bay fish in size and quality, thus proving pretty conclusively that the fish from the

two places are not different on account of a difference in the feed in the two places, but for the reason that the sockeyes of the two regions are distinct races and that size and quality are inherited characters. The sockeyes at Afognak are of still another race whose members are smaller of size and of different quality when compared with either the Yes Bay or Columbia fish of the same species. The return of the fish now being marked will be eagerly awaited for the final and conclusive proof that size and quality are inherited characters.

LOW RIVERS INFLUENCE SPAWNING HABITS OF HERRING.

Ordinarily herring which enter San Francisco Harbor in January and February congregate in Richardson Bay and along the lower end of Angel Island, attaching their spawn to the rocks and sea weeds along the shores of Belvedere as well as along the shore of the main land and Angel Island near the lower end of Raccoon Straits. This year, on account of the low water in the rivers, which permitted the salt water to move further up stream than ever before recorded, the herring have for the first time in the memory of the oldest fishermen, deposited their spawn in the upper portion of the harbor known as San Pablo Bay. They attached their spawn in all suitable places from Point San Pablo to Point Pinole and the schools of herring instead of collecting in Richardson Bay near Sausalito and Belvedere moved on up through Raccoon Straits so that the best fishing was found from Southhampton Shoal to Red Rock.

Very few herring were caught this season in San Francisco Bay for the reason that there was no good demand for them in the markets and under the new law the fishermen were not permitted to catch them for reduction purposes. The San Francisco wholesale markets were not able to dispose of over two or three tons per day. None were salted or smoked as the local demand for salted and smoked herring ended when the saloons closed on July 1. The market for canned herring was off so none of them were canned. Fishermen at the wharf frequently begged for buyers at twenty-five cents per box, and these delicious fish were offered at the fish stalls at from five to seven cents per pound without creating any appreciable demand among those who complain of the high cost of fish. Salmon and striped bass were scarce at the time and extremely high priced, but even that did not help the sale of the cheaper variety.

SALMON PACKERS FEAR SALMON DEPLETION.

With the failure of the sockeye runs in Puget Sound and Fraser River as an object lesson the salmon packers have become alarmed over the future of the salmon industry in Alaska. The interested packers met together and decided something had to be done if the Alaska salmon fisheries are to continue yielding them a profit. A committee was appointed to draft a comprehensive bill for the conservation of the fisheries to be introduced and passed upon by the Congress of the United States. The committee was wisely chosen and is made up of the following members: D. W. Branch of Libby, McNeill & Libby; Carl A. Sutter of the Fidalgo Island Packing Company; Frank M. Warren of Alaska-Portland Packers' Association; Henry O'Malley, Pacific Coast Agent United States Bureau of Fisheries; Dr. C. H. Gilbert of Stanford University; John N. Cobb, Director College of Fisheries, University of Washington; John R. Beegle, of Alaska Fish Commission, and C. D. Garfield, Secretary Alaska Fish Commission. The committee has worked for several months and has finally perfected a bill which is likely to have the backing of the salmon packers, the Alaska Fish Commission, the United States Bureau of Fisheries and all interested in salmon conservation. The main object of the bill is to provide for a larger number of salmon to reach the spawning beds. It also provides for the organization of an Alaska Fish Commission composed of five members to be appointed by the Secretary of Commerce and gives this commission ample power to carry on the conservation work of such a commission. It is estimated that the measures in the bill regulating the fishing seasons and methods of fishing will reduce the salmon catch about twenty per cent.

KAMABOKO BEING MANUFACTURED AT SAN PEDRO.

Among the additions to the fish packing industry at San Pedro Harbor is a plant recently established by Mr. Isona for manufacturing kamaboko. This is a product prepared from white-meated fish by Japanese methods. Barracuda is usually employed in its manufacture but halibut, sea bass and jewfish are sometimes utilized.

Kamaboko is prepared by first removing all bones from the fish and scraping the flesh free from the skin. The meat is then placed in a large, hollow granite bowl where it is ground into a fine paste. Cornstarch, salt, sugar, and the juice made by soaking several fronds of Japanese seaweed (*Arthrothamnus bifidus*) in warm water are added, and the mixture is then moulded into forms and placed on thin wooden blocks about eight inches long. After being steamed for forty-five minutes it is cooled and packed for shipment. For fetes and special occasions the loaves, weighing about one pound, are tinted, red, blue, or green, and resemble very much pieces of pastry. Other forms are moulded and baked or fried in oil without coloring.

The manufacture of kamaboko has developed into quite an industry in Japan, where it is one of the staple articles of food. It is palatable and nutritious and may be eaten as a sandwich filling, or cut into small pieces and added to soups, chowders, or chop suey. The finished product will keep about one week, but plans are now under way to can it for export trade.

The plant at San Pedro has a capacity of approximately five hundred pounds of fish per day. C. S. BAUDER.

Most of those who complain of the high cost of fish know only three varieties—salmon, striped bass and halibut.

* * *

Any official who attempts to satisfy the public on the price of fish has set for himself an impossible task.

* * *

Scarcely one-fifth of California's fish catch goes to the fresh fish markets.

* * *

The wholesale value of last year's fish pack in California exceeded twenty-five million dollars.

* * *

California ranks first among the states in the value of her fishery products.

* * *

If California had depended only on the fresh fish markets its fisheries would now be unimportant.

* * *

The only adequate way to get the public to eat new varieties of fish is to get the fish in cans and give them euphonious names.

* * *

The price of fish does not cut as much figure as the name.

* * *

One of the best food fishes we have in California is the shad, which was introduced some fifty years ago from the Atlantic coast. These excellent fish are now running and are abundant and cheap. We will use less than ten per cent of the catch in this state. The rest will be shipped to Chicago, Boston or New York where they sell readily at three times their price in San Francisco, while we continue to complain of the high cost of fish.

NOTES FROM THE STATE FISHERIES LABORATORY.*

By Will F. Thompson and Elmer Higgins.

A SCIENTIFIC ASSISTANT EMPLOYED.

The Commission has secured the services of Miss Helen M. Edwards as a scientific assistant, commencing January 15. Miss Edwards has had considerable experience as assistant in work of the character now being done by the Commission, having been employed while she was still an undergraduate at Stanford University, by Doctor C. H. Gilbert during his work on the salmon. In addition, she has done scientific drawing, and is a capable stenographer.

W. F. T.

PROGRESS OF THE SARDINE WORK.

Mr. Higgins at San Pedro, and Mr. Sette at Monterey, are engaged under the supervision of Mr. Thompson, in laying the foundation for the future work on the sardine. This preliminary "survey," if such it may be called, consists of a careful and laborious tracing of the character of the sardine "runs" at different times of the year and the ascertaining of the size classes which go to make up the catches. The samples are obtained from the boats as they unload at the canneries, and measurements of length and weight are taken, together with other biological observations on sex and state of maturity. This is expected to give data upon which age may be distinguished, to render it possible to correlate fluctuations in catch with various conditions, to enable the catches of successive years to be compared more accurately from the standpoint of age composition and to indicate the spawning season as nearly as possible. The necessity for such a "survey" and its value in future work have already been amply demonstrated in a number of ways, upon which comment may be expected in the future.

The Commission has been granted the courtesy of accommodations at Hopkins Marine Station, at Pacific Grove, as headquarters for the work being done on the sardine at Monterey, and thanks are due the director, Doctor W. K. Fisher, for his many favors. The work on the sardine is also being carried on at San Pedro, and the Commission is under obligations to the Neilsen and Kittle Canning Company for quarters there. Without their courtesy the Commission would be without adequate facilities for the investigation, as the present laboratory at Long Beach is too distant from the fishery centers.

W. F. T.

*California State Fisheries Laboratory, Contribution No. 18.

OCCURRENCE OF A DEEP SEA FISH AT MONTEREY.

It often happens, especially in deep sea halibut fishing, that cod or halibut trawls are set over water which is too deep, and in such case strange silvery fish are sometimes taken. These fish have snouts projecting in sharp angles beyond the large mouth, their eyes are large, their scales are very rough and silvery, and the body tapers back into a long, thin, pointed tail bordered above and below with fins, but lacking a separate tail fin. These fishes are allied to the cods, and belong to the family Coryphaenoididae. One such specimen was brought into Monterey during January, and preserved by Mr. Oyer, the deputy there. It belongs to the species known as *Nematonurus acrolepis*, one taken in numbers by the United States Bureau of Fisheries' vessel "Albatross" during her work off California, and found along our coasts in depths of 500 and 1500 fathoms as far north as Bering Sea and in Japanese waters. It was entirely unknown to the fishermen, as would be natural considering the depths at which it is usually found. W. F. T.

INVESTIGATION OF THE SALTON SEA.

During the latter part of December, Mr. Crandall of the Scripps Institution, and Doctor H. C. Bryant and Mr. W. F. Thompson of the Fish and Game Commission, visited Salton Sea to investigate the life and the hydrographical conditions of the sea. They were the guests of Captain Davis, who has long been known to the Commission as engaged in shipping mullet from Salton Sea. During the visit, large specimens of mullet were taken by Captain Davis' fishermen, but no other

live fish were observed with the exception of two top minnows taken along the shore. These were of a form usually taken in desert springs and streams, *Cyprinodon macularius*. Later Captain Davis sent to Mr. Thompson samples of small fish taken from the vicinity of Fish Springs at the northwestern end of Salton Sea. These proved to be of the same species.

The existence of the grey mullet in Salton Sea is of considerable interest, as the species must have entered during the inflow of the Colorado River during 1906. If so the mullet must have lived in the Colorado at some distance from its mouth, a fact not strange when the frequent appearance of the mullet in rivers and lagoons bordering our coast is remembered. However, it has taken some time for the species to become abundant in Salton Sea, it having been unrecorded previous to 1915, according to Captain Davis. During the interval it is said that carp appeared in great numbers and then died off. The carp and the mullet are both bottom feeding fish, consuming vegetation, etc., and are not dependent on other smaller fish species. But the mullet is also capable of existing in brackish and salt water—that being its natural habitat in fact—and it is probable that this enabled it to flourish where the carp could not. The ancients used to grow mullet in artificial enclosures, and the flesh was considered a great delicacy.

There are also said to be species of fresh water fish found at times near the outlets of the New and the Alamo rivers, but nothing was seen of these. W. F. T.

THE RECUPERATIVE POWER OF THE ABALONE.

During 1911 Mr. W. F. Thompson carried on a survey of the shell fish of the northern part of the state, and during its course came naturally to handle many specimens of the red abalone, *Haliotis rufescens*. Among these was a specimen remarkable for the evident great recuperative powers. The viscera of the abalone naturally surround the large central muscle in a peculiar way, as a bent cone, and in this case the cone had been cut off by some one attempting to obtain the abalone. The attempt failing, the abalone had evidently succeeded in covering the large mass of dead cut-off parts with pearly layers of shell. But that the animal had been seriously injured could not be doubted, the edge of the shell showing a total cessation of growth for some time previous to death. The shell only was found, the abalone having finally died, possibly as a result of the injury. A photograph of it is presented.

Altered shell formation is not at all infrequent, particularly among clams, where growth is often seemingly totally stopped by some injury, and starts again well in from the former edge. But no instance has ever been seen by the

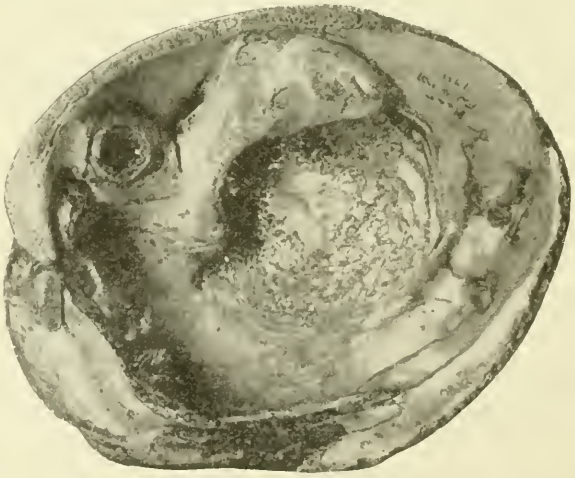

FIG. 28. Shell of abalone (*Haliotis rufescens*) showing part of damaged viscera covered by a pearly layer of shell. Taken near Fort Bragg in 1911.

undersigned where the injury was of such a severe nature as in the case of this abalone, and in which shell formation subsequently proceeded for any length of time. W. F. T.

OCCURRENCE OF THE GREEN ABALONE IN MONTEREY.

Due to the kindness of Mr. Ernest Dalter, who conducts a sea food restaurant in Monterey, it is possible to record the occurrence of the northern "green" abalone, *Haliotis wallalensis*, in the Bay of Monterey. It is undoubtedly a very rare inhabitant of our waters. Mr. Dalter has in his possession a shell of this supposed variety of *Haliotis fulgens* 3¾ inches long. It is hardly to be doubted that it is a distinct species, not a variety of the "green" abalone, the shell much resembling that of the red abalone, never exceeding 5½ inches in length, and usually possessing 6 or 7 open holes. W. F. T.

STREAM POLLUTION IN NEW YORK STATE.

In a recent publication by the Conservation Commission of the State of New York, 1919, Doctor Henry B. Ward of the University of Illinois records the results of his preliminary investigation of polluted streams in New York in their relation to fish life. In this paper he emphasizes the utility of biological work, rather than chemical or bacteriological, in determining the extent of pollution. Bacterial tests are made to determine the effect of the water when used for drinking, but these have little relation to fish life. Chemical tests are of limited use because "we do not by any means always know the effect upon living organisms of a given chemical substance," especially in varying dilutions and relation to other chemicals present. "In order to reach a more accurate measure of the injurious character of polluted waters, one would have to take into account the effects of the prolonged influences of a waste on the fish." The resistance of various species varies widely, as does that of the same species at different seasons. Doctor Ward is plainly of the opinion that "if the character of the water and the bottom have been so modified by the introduction of foreign materials that they no longer afford opportunity for the development of these smaller organisms (food for fish), then by the absence of such forms of life one would demonstrate clearly and positively the fact that water has been rendered unfit for fish existence"—this method to be used, of course, in addition to the observations and tests made directly upon fish themselves.

Californians should be interested chiefly on account of the relation of pollution to salmon and other anadromous fishes, to which the following by Doctor Ward may sometime apply here: "It is hardly a profitable business for the state to raise at such a considerable expense quantities of young fish in order to plant them out in waters in which the chances of existence are unfavorable." Doctor Ward presents a preliminary survey of the water polluted streams, and a series of recommendations, to which the attention of any one interested may be called. He lays much emphasis on the necessity of a careful census, continued study, reclamation of wastes and the education of public opinion to the banishment of wastes from our streams as they have been banished from our streets. There is enclosed with the paper a map showing the great number of establishments in New York from which pollution may be expected.

W. F. T.

GULLS IN MONTEREY BAY.

On account of the fish eating habits of sea gulls, their abundance is a matter of interest to those engaged in the study of fish. At Monterey, where the sardine canneries are located, there are frequently great flocks at rest on the rocks and adjacent quiet waters, which seem to be thickly spotted with the birds as far as the eye can reach. An exceptionally favorable opportunity seemed to present itself on February 17 of this year, 1920, because of the unusual number of birds present, and an attempt was made to estimate the numbers of birds within eyesight of a window in the Hopkins Marine Station. Counting with a field glass it was certain that 3000 were within sight of the naked eye, and it would not be amiss to increase this by another thousand to cover those not seen or in flight. This number, 4000, surely represented a half of the total in the region comprising the waterfronts of Monterey and New Mon-

terey. (Later in the afternoon Mr. Sette counted 2600 from the same position, thus virtually corroborating the previous estimate.)

According to Doctor W. K. Fisher the species dominantly represented were the glaucus-winged, the western, and the herring gulls, in the order named.

There can not be much doubt as to the fact that the birds in Monterey Bay were the majority of those within many miles, and many more than are usually present, so that from the rough figures given some estimate of the maximum amount of fish they might consume can be derived. Taking a pound of sardines a day as all a sea gull would consume, an estimate probably very excessive, and considering them all as fish eaters, the four thousand within sight would be satisfied with two tons. This would be about six-tenths of one per cent of what are taken daily by fishermen at this point. Furthermore it is almost certain that most of the fish eaten by the gulls are the sardines discarded by the boats and canneries, or other species locally abundant. Doctor Fisher calls attention to the fact that gulls are diurnal in habit, and must have trouble in catching live sardines during the light of the day, the more so as they are incapable of diving more than a few inches under the water surface. Naturally, regardless of the exact proportion the gulls in sight were of the grand total, the amount eaten is not one which threatens to deplete the sardine. And as a matter of fact, the presence of so many gulls should be rather a sharp commentary on the waste during the handling of the fish.

These remarkably large flocks of gulls which obtain their food from the sardine industry are supposed to stay at night on some rocky islets at some distance from the canneries, but Mr. Sette who has collected samples of the sardine catch throughout this season, states that he has observed gulls to the number of thirty or more feeding on the sardines lost overboard from lighters unloading about 11:30 at night, hence during total darkness, on January 20 of this year. Whether this is a normal or usual habit with them he does not know. W F. T.

OCCURRENCE OF A RARE CRAB.

Mr. T. Taniguchi, one of the Japanese fishery experts at one time engaged in the albacore fishery for the Fish and Game Commission, has forwarded three crabs taken from a depth of twenty-five fathoms on a rock cod bank about half way between San Diego and the Coronado Islands. They prove to be very interesting specimens of the same species as one taken by the United States vessel, the "Albatross," during her deep sea work on this coast in 1889 at Station 2946, latitude 33 degrees 58 minutes north and longitude 119 degrees 30 minutes 45 seconds west, and described by James E. Benedict as *Galathea californiensis*. The correspondence between our specimens and the one described by him is very close, and no doubt exists concerning the identification.

The present specimens were taken by the boat "Julia," engaged in rock cod fishing, and were inside a silicious sponge, one of the open Hexactinellid type, about three feet in diameter. They were taken February 5, 1920. The largest is 50 millimeters in length from the telson to the tip of the rostrum. W. F. T.

SCIENTIFIC WORK OF THE "ALBACORE" IN DECEMBER.

Early in December of last year, the "Albacore" made its final trip of the season for the collection of data on the life history of the halibut. During the greater part of last year, trips were made at regular intervals for the purpose of collecting data on the distribution of the eggs and young of food fishes and the location of their spawning grounds, as well as the collecting of data on the life history of the halibut, but owing to insufficient equipment a part of this work was discontinued, and now all of it is temporarily stopped, due, in part, to the centering of the attention of the laboratory staff on other and more pressing problems. The results of the December trip are of special interest because they illustrate both the practical or immediate, and the more purely scientific values of such work.

In hauling for flatfish, a special otter trawl modified from the commercial

paranzella or drag net is used, with ordinary manila rope towing warps. This gear is simple and crude, but catches are made averaging from 500 to 1500 pounds of fish and invertebrate animals, including as high as twenty species of fish in one haul. Although the work has been chiefly confined to inshore operations, on December 9 and 10 two hauls, which yielded valuable results, were made in water about 50 fathoms deep on a good trawling bottom off Huntington Beach, Orange County.

Besides taking a commercially successful catch of market fish, red rock cod (*Sebastodes sp.*) halibut, flounders, and sole of various species—these hauls revealed the presence of several species of excellent food fishes not commonly taken in these waters and rare or unknown in the markets. One of these was the sand dab, *Citharichthys sordidus*, so common in the San Francisco markets. These fish are not caught in any quantity in the south, and the southern markets therefore receive their supply from the north.

Another species taken in considerable quantities in the hauls was the yellow-spotted sanddab, *Citharichthys xanthostigma*, recorded for the first time from the California coast in CALIFORNIA FISH AND GAME for April, 1919. This sand dab is a wider, plumper fish, with more meat for the amount of bone than the common dab from San Francisco and would be more valuable if the location of profitable banks were known and a stable supply in the markets insured.

Two species of "sole" were also taken which might be found in commercial quantities in the south if they were sought in deep enough water. These were the slippery or Chinese sole, *Microstomus pacificus*, and the long-finned or rex sole, *Glyptocephalus zachirus*. Both are common in the San Francisco markets where they are often strung with sand dabs in bunches and all sold together under one name, but are unknown in local catches in the south.

Another species taken in these hauls was the sable fish, or Alaska black cod, *Anoplopoma fimbria*. This fish is common north of San Francisco, but is said by naturalists to be rare in southern California and seldom seen in the markets. It is, however, by no means uncommon in the south but is so little appreciated that it is grossly misnamed "hake" by the rock cod fishermen, who take considerable numbers on their lines, but reject it from the catch as worthless because the flesh is rather soft. The United States Bureau of Fisheries has advocated the exploitation of this fish in northern waters, and methods for its use have been devised. It is said to be particularly adapted to salting and drying.

Thus we see that several useful food fish have been added to the list of edible fish taken by the "Albacore" by changing the method of fishing and the locality fished, and it would seem from this that great good could be accomplished by further prospecting and experimenting in deeper water.

Of no less importance than the results recorded above are those of greater scientific interest. Besides supplying data from about 300 halibut concerning their age and rate of growth, their spawning period, and fecundity, several species were taken which extend somewhat the known range of the species, adding to our knowledge of their geographical distribution.

One of the surprising finds was the rare and little known smelt, *Argentina sialis*, Gilbert. This little fish, about three inches long, is our only southern California representative of the family Argentinidae, or true smelts, but is not related to the "smelts" common in the south, which belong to a different family. About 300 specimens were taken and they agree in all essential points with the description of the type specimen, which is the only specimen of this species known. This type specimen was recorded and described by Doctor Gilbert in 1890 as from the Gulf of California, Albatross Station No. 3017, latitude 29 degrees 54 minutes 30 seconds north, and longitude 113 degrees 01 minutes 00 seconds west, in 58 fathoms.* Our specimens were taken December 9 and 10, 1919, in 45 fathoms off Huntington Beach, and this seems to be their second recorded occurrence.

Two specimens of the peculiar little eel-pout, *Lycodopsis pacificus* (Collet), family, Zoarcidae, occurred in one of the

*Proceedings U. S. National Museum, 1890, p. 56.

above hauls. These were immature specimens and differed somewhat in coloration from current descriptions of the species. This species is recorded as occurring rather commonly in water of moderate depth from San Francisco to Puget Sound, so that this occurrence extends the known range considerably southward.

Two other species were taken which are known to occur as far south as Point Concepcion, and although not actually extending their known range appreciably, may nevertheless be listed as rare here at their extreme southern limit. They are the starry skate, *Raja stellulata*, Jordon and Gilbert, and a flounder, *Pleuronichthys decurrens*, Jordon and Gilbert. E. H.

LIFE HISTORY NOTES.

WINTER OCCURRENCE OF THE FULVOUS TREE DUCK IN THE CENTRAL SAN JOAQUIN VALLEY.

In that definite winter records are few in number, it is well to record the occurrence of the fulvous tree duck, *Dendrocygna bicolor*, in the central San Joaquin Valley during the winter of 1919-1920. As late as January 22 of this winter Mr. J. L. Kinnear, of Newman, saw a flock of five of these ducks on the Newman Club grounds; and still later, on January 31, Mr. C. C. Huber, also of Newman, killed two of these ducks on the Newman Club grounds. One of these specimens, mounted, Mr. Huber presented to Mr. Otto Feudner, of the Peters Cartridge Company, 583 Howard street, San Francisco, where it is now on display. The other mounted specimen he still retains in his possession. There were also a few fulvous tree ducks seen and some killed on the Gustine Club grounds during January.—J. E. Newsome, *Newman, California*.

THE POMFRET, NEAR FORT BRAGG.

Two specimens of the pomfret, *Brama raii*, were caught about three miles off the coast near Fort Bragg by W. G. Vossbrink, on July 23, 1919. They were taken on a salmon troll with spoon hook, 35 fathoms of line being out at an estimated angle of 30 degrees The fishes measured 16½ inches and were bright silver in color. Authors have described this species as sooty gray, which appears to be characteristic of preserved specimens only, where the brilliant silvery pigment has been destroyed. An example in the National Museum which was taken off the coast of Washington, offers every evidence of having been like these specimens, as bright as a new dollar. A touch of the finger will often efface the metallic color.—J. O. Snyder, *Palo Alto, California*.

WHERE DO DEER SLEEP.

I have many times observed that mule deer in the Southern Sierras always bed within thick cedars or other forest trees on moonlight nights, whereas the same deer apparently sleep out in the open, as for instance in an apple orchard or among brush, during the dark of the moon. Whether this is a constant habit or one but locally developed I can not say, but it seems reasonable to believe that these various locations are chosen as a means of protection from enemies.—O. P. Brownlow, *Portorville, California*.

UNITED STATES FOREST SERVICE COOPERATION.

FIRE AND OUR FORESTS.

We have lately had a sudden, energetic flare of discussion all over California upon the ancient notions of "Piute forestry" whose deep fire-scars remain upon so many of our giant landmark pines and sequoias. It can be made to sound very plausible: "burn off the rubbish, the dead limbs and 'stubs,' the thick undergrowth and chaparral; clear the way for more forest, incidently get more grass, besides, all the tree-beetles which destroy so much standing timber." All this by light surface fires—variously applied, kept as far as possible under control, and aimed at producing a smooth forest floor.

The Forest Service is solidly opposed to every sort of "light burning" because they have seen it in practice many times,

and under all sorts of conditions; so are the foresters of all other civilized countries. This does not mean, of course, that foresters do not desire to burn "stubs" and dead trees so dangerously apt to be struck by lightning or burn the "tops" after logging wherever that can be done with safety, in the cool season.

The underlying principles of all scientific forestry, however, are these: Save the young growth as well as the mature trees; protect the soil; encourage reproduction; fill up all possible gaps in the forest cover—do not make more by surface fires—fight all fires to a finish. Furthermore, as the forester knows, the fire-weakened, fire-scarred tree becomes almost certainly the prey of forest insects. The main points in all this are reproduction and soil protection from loss of humus and from washes; these last are so important as to deserve another little talk later.

GAME IN THE CALIFORNIA NATIONAL FOREST.

It is generally conceded that the California National Forest contains a larger number of black-tailed deer than any other locality of equal size, and that the conditions on the forest for propagation and protection are unequalled in the west. Embracing as it does large areas of heavy brush which provide protection from natural enemies and almost unlimited forage during the entire year; large glade areas which remain practically snowless during the winter months, providing an abundance of winter feed when not fed too closely by domestic stock; and large areas of open timber, well stocked with succulent weeds and grasses, it can well be said to be ideal as a locality adapted to the perpetuation of this valuable game species.

The mating season for deer on this forest ranges from late September in the foothills, to November at the higher altitudes. The bucks shed their horns from January 15 to March 15, and new growth is noticed by June 1. The horns become hard about August 1, although at the higher elevations they are still found in the velvet during the latter part of August, and even up to September 10. The fawns appear from June 1 to the end of July, and in most cases are in pairs.

There are a few black and brown bear on the forest, but they can hardly be taken seriously as a game animal. In fact they are used by unscrupulous hunters as an excuse to go into the mountains with packs of hounds during the winter season, when there is no doubt that many violations of the game laws are committed. These bears are often very troublesome to sheep permittees and settlers within the forest who raise hogs, as the older ones frequently develop predatory tendencies. It is probable, also, that they are responsible for many of the kills of deer made by panthers, as they feed on the deer killed by the panther and disturb it in such a way that it is no longer palatable to the panther, who makes a new kill.

The most important game bird on the forest is the mountain quail. It is found in all parts of the forest above the brush line which surrounds the forest on three sides, and during the past two years have shown a gratifying increase. This is attributed in part to the destruction of ground squirrels and other small egg eating animals by the United States Biological Survey.

Valley quail are common at the lower elevations, and they, also are on the increase.

The principal fur-bearing animals on this forest, and the numbers caught during the present season so far as shown by the incomplete records at hand, are as follows:

Skunk	459
Fox (gray)	337
Coyote	241
Wild cat	136
Ring-tailed cat	119
Coon	74
Civit cat	25
Fisher	23
Badger	20
Panther	6
Bear	5
River otter	4

During the past two or three seasons there has been a large increase in the number of trappers. It is estimated that there are fifty trappers on the forest during the past season.

REPORTS.

CALIFORNIA FRESH FISHERY PRODUCTS, OCTOBER, NOVEMBER AND DECEMBER, 1919—Continued.

Compiled by Department of Commercial Fisheries.

Species of fish	Del Norte, Humboldt	Mendocino, Sonoma, Lake	Marin	Solano, Yolo	Sacramento, San Joaquin	Tehama, Colusa, Glenn	Contra Costa, Alameda	San Francisco, San Mateo	Santa Cruz	Monterey	San Luis Obispo, Santa Barbara, Ventura	Los Angeles	Orange	San Diego	Imperial	Total	Mexico
Albacore										81		674,826		304		675,211	64,210
Anchovy								23,336		283,210		188,910				495,456	
Barracuda	150							26	28,863	43,425	45,421	129,368	242	104,949		352,444	1,201,366
Bluefish									2,009	12,818						14,827	
Bocaccio								14,799	61,832	181,877						258,508	
Bonito									1,169	2,284	4,969	1,092,999	187	151,203		1,252,811	498,868
Carp				9,933	34,642		4,920	33					1,875	624		52,027	
Catfish		5,587		2,080	4,122		2,771									14,560	
Chilipepper								2,271	6,808	3,149						12,228	
Coalfish								110,384	4,164	5,907						120,455	
Cultus cod	1,477							193,268	24,062	82,821						301,628	
Dogfish			47				46	41,899	544	875		15,652		78,853		137,916	
Dolphin																	
Eels																	
Flounder	353		34	118			38	69,511	1,437	2,677	100	2,847	175			77,290	
Greenfish																	
Hake								45,375								45,375	
Halibut	1,985							9,832	407	889	61,050	224,446	418	90,154		389,181	1,160,200
Hardhead					17,523		211									17,734	
Herring	577		9,160				1,420	4,072	400					100		15,729	
Kingfish			12					1,477	2,055	14,177	300	137,572		1,129		156,722	559
Mackerel			14						2,283	127,190	5,375	651,639	1,944	31,439		819,884	39,226
Marlin																	
Mullet													485	247	4,069	4,801	1,630
Perch	2,648		7,443				155	11,948	14	5,768		43,341		60		71,377	
Pike				30	678		401									1,109	
Pompano								3,928		620		6,306		175		11,023	
Rock bass											1,855	50,954	301	9,895		63,005	649
Rock fish	1,223							202,562	84,396	144,694	7,205	305,440	1,373	120,465		867,358	1,674
Salmon	934,154	941	1,435	29,851	10,838		161,275	159		67						1,138,720	

Sanddab								74,763	12,006	373		1,722				88,858	
Sardine								1,338,093	2,618,900	31,219,905		2,894,703		734,489		38,806,090	
Sculpin												6,929	571			7,500	
Sea bass (black)											333	33,166		15,915		49,414	44,361
Sea bass (white)			14,584					17,360	23,228	6,498	3,589	230,952	21	7,184		303,425	31,852
Sea trout												1,319		15		1,334	335
Shad				3,147	173		6,388	45								9,753	
Shad (buck)							45									45	
Shad (roe)																	
Sheepshead												1,412		1,036		2,448	
Skate								22,875	506			629	4			24,008	
Skipjack									1,523	541		253,975		350,523		606,562	1,450
Smelt	19,090		10,587				4,456	8,854	15,737	24,177	5,190	68,302	34,764	19,652		270,809	3,735
Sole	242							1,458,365	25,280	1,556	4,509	13,674		1,465		1,505,091	
Split tail					108		450									558	
Striped bass				38,594	6,834		47,821	4,788		75						93,112	
Stingaree																	
Suckers					2,154											2,154	
Surf fish																	
Swordfish																	
Tomcod								5,756								5,756	
Trout (farm)																	
Trout (steelhead)																	
Tuna									25	24		20,326		45,746		66,121	53,734
Tuna (blue fin)												937				937	
Tuna (yellow fin)												2,161				2,161	
Turbot			532													532	
Whitebait																	
White fish											1,305	6,324		3,547		11,776	70
Yellowtail												1,521,433	410	375,381		1,897,224	110,736
Miscellaneous			4	106			10	4,504	3,257	3,668	12,010	100,575	271	4,806		129,211	345
Total fish	961,899	6,528	43,852	83,859	77,072		230,407	3,670,292	2,920,893	32,169,346	153,211	8,683,433	103,041	2,149,356	4,069	51,257,258	3,214,970
Crustaceans—																	
Crab (doz.)	296							21,185	1	15	3					21,500	
Ecrevisse (doz.)																	
Shrimp								81,851				107				81,958	
Spiny lobster											14,372	123,894	25,940	32,431		196,637	269,434

CALIFORNIA FRESH FISHERY PRODUCTS, OCTOBER, NOVEMBER AND DECEMBER, 1919—Continued.

Species of fish	Del Norte, Humboldt	Mendocino, Sonoma, Lake	Marin	Solano, Yolo	Sacramento, San Joaquin	Tehama, Colusa, Glenn	Contra Costa, Alameda	San Francisco, San Mateo	Santa Cruz	Monterey	San Luis Obispo, Santa Barbara, Ventura	Los Angeles	Orange	San Diego	Imperial	Total	Mexico
Mollusks—																	
Abalones		225								155,547	19,848					175,620	
Clam (cockle)	786		1,758								460	2,908	498	18		6,428	65,965
Clam (mixed)	7,030	120	5,249													12,399	
Clam (Pismo)											59,957					59,997	
Clam (soft shell)	210	1,124	1,850				60,652	425								64,261	
Cuttle fish								1,033	81	2,639		100				3,853	
Mussels			209				1,248	390			489	1,426	463			4,225	
Oysters (shell) Eastern, No.			248,737					1,389,050								1,637,787	
Oysters (native)			17,615													17,615	
Snails																	
Squid										9,001		586				9,587	
Miscellaneous—																	
Frogs																	
Terrapin																	
Turtle																	171,060

CALIFORNIA FRESH FISHERY PRODUCTS FOR THE YEAR 1919.

Compiled by Department of Commercial Fisheries.

Species of fish	Del Norte, Humboldt	Mendocino, Sonoma, Lake	Marin	Solano, Yolo	Sacramento, San Joaquin	Tehama, Glenn, Colusa	Contra Costa, Alameda	San Francisco, San Mateo	Santa Cruz	Monterey	San Luis Obispo, Santa Barbara, Ventura	Los Angeles	Orange	San Diego	Imperial	Total	Mexican
Albacore										81		11,225,857	126	2,326,961		13,553,025	77,874
Anchovy			284,030					41,896		705,045		576,837		21,770		1,629,548	
Barracuda	150							814	31,321	67,512	137,752	2,533,258	51,796	1,216,249		4,038,852	1,786,105
Bluefish									2,750	55,046						64,796	
Bocaccio		80						61,863	164,630	1,153,078						1,319,651	
Bonito									1,169	2,306	23,714	2,534,433	1,042	341,024		2,963,688	600,353
Carp		7,115		14,154	165,722	80	57,342	14,426				50	1,875	624		261,388	
Catfish		38,625		17,323	71,878		36,322	708								164,856	
Chilipepper								207,159	7,145	17,524						231,828	
Coalfish								319,666	6,926	8,208	18	132				334,950	
Cultus cod	8,468	59,945						773,712	67,236	151,753		2,922				1,063,136	
Dogfish			355	11			885	143,564	1,239	5,177	3,005	62,416		396,031		612,683	
Dolphin																	
Eels								10								10	
Flounder	11,498		1,218	1,453			2,540	368,613	27,504	4,184	3,621	14,610	490			435,731	
Greenfish												2,405				2,405	
Hake								122,913	9,320	948						133,181	755
Halibut	19,844	106,717	808					37,784	4,576	18,584	316,864	1,465,499	60,832	492,387		2,523,895	2,335,603
Hardhead					47,631		1,627									49,291	
Herring	7,146		3,740,518				62,712	478,673	750					100		4,289,899	
Kingfish			44					41,481	35,360	71,355	1,492	449,598	104	9,127		608,561	614
Mackerel	180		14						3,518	450,717	20,294	2,037,581	15,544	126,748		2,654,596	48,086
Marlin																	
Mullet												270	485	356	6,428	7,539	1,660
Perch	27,057		55,901				273	22,495	16,491	9,933		49,839	221	9,101		191,341	1,140
Pike				519	2,840	10	3,141									6,510	
Pompano			2					4,015	1,113	867		54,924	32	471		61,424	
Rock bass											2,484	190,315	5,962	243,794		442,555	7,674
Rock fish	13,503	1,492						1,127,029	305,439	459,426	85,447	1,148,074	4,885	568,890		3,714,185	67,649
Salmon	1,458,162	2,899,603	15,571	1,732,028	314,202	220,309	2,262,509	1,427,137	499,168	2,316,854		10				13,145,553	

CALIFORNIA FRESH FISHERY PRODUCTS FOR THE YEAR 1919—Continued.

Species of fish	Del Norte, Humboldt	Mendocino, Sonoma, Lake	Marin	Solano, Yolo	Sacramento, San Joaquin	Tehama, Glenn, Colusa	Contra Costa, Alameda	San Francisco, San Mateo	Santa Cruz	Monterey	San Luis Obispo, Santa Barbara, Ventura	Los Angeles	Orange	San Diego	Imperial	Total	Mexican
Sanddab								628,206	5,141,869	81,447,280	54	54,600,194	25	11,183,539		153,877,179	
Sardine			141,700					1,362,518	67,885	2,602	1,394	7,830		1,821		709,738	
Sculpin												24,217	1,111	104		25,432	
Sea bass (black)											8,183	67,464	1,825	54,525		126,997	58,273
Sea bass (white)	124		27,904					23,045	317,432	18,934	29,563	1,836,454	2,631	103,650		2,359,737	74,277
Sea trout	47											15,385	15	5,576		21,023	377
Shad				56,363	89,127		26,866	9,251				25				181,632	
Shad (buck)				144,430	14,050		289,821									448,301	
Shad (roe)				176,821	16,752		750,232									943,805	
Sheepshead												7,334	842	9,796		17,972	
Skate								241,811	1,408		543	8,535	479			252,776	
Skipjack									3,173	1,884		4,089,287		2,791,025		6,885,369	12,115
Smelt	46,933		69,665				4,701	138,095	51,641	109,759	9,597	145,693	128,262	47,523		751,870	5,110
Sole	1,178	15						4,914,533	398,245	49,543	71,451	87,899		5,821		5,528,685	
Split tail					12,862		11,420									24,282	
Striped bass			1,581	206,828	72,775		371,865	108,264		1,031						762,345	
Stingaree			38,200					4,000						824		43,024	
Suckers					5,790		43									5,833	
Surf fish																	
Sword fish												17,900		352		18,252	
Tom cod								31,310								31,310	
Trout (farm)																	
Trout (steelhead)	17,217															17,217	
Tuna									25	24	17	1,993,486	854	200,178		2,194,584	263,727
Tuna (blue fin)												14,952,462		38,398		14,990,860	
Tuna (yellow fin)												348,023		58		348,081	
Turbot			1,652					463								2,115	
Whitebait			403					5,512								5,915	
White fish											1,305	18,034		7,852		27,191	70
Yellowtail											191	2,531,973	4,506	2,335,093		4,871,763	133,502
Miscellaneous	356		4	106	599		31	45,320	6,012	8,342	54,450	423,249	2,997	13,413		554,879	15,907
Total fish	1,611,863	3,113,592	4,359,541	2,350,036	814,261	220,399	3,882,331	12,766,286	7,120,345	87,137,997	766,439	103,523,604	286,941	22,553,181	6,428	250,453,244	5,493,871

Crustaceans—																		
Crab (doz.)	1,882							51,935	428	128	3					54,376		
Ecrevisse (doz.)																		
Shrimp								747,023				107				747,130		
Spiny lobster											19,465	167,680	29,852	39,897		256,894	832,571	
Mollusks—																		
Abalones	450	225							740	248,056	509,732					759,203	65,905	
Clam (cockle)	786		15,857								1,020	5,768	1,328	18		24,777		
Clam (mixed)	27,699	1,688	34,605					251			2,228	273				63,744		
Clam (Pismo)									175		417,340					417,515		
Clam (soft shell)	210	8,728	27,945				265,268	425								302,576		
Cuttle fish			36					6,294	1,378	9,663	127	3,984				21,492		
Limpets													8,350			8,350		
Mussels	830		209				4,947	1,155	940	925	11,677	5,424	8,888	100		35,095		
Oysters (shell) Eastern, No.			1,342,828					5,545,468								6,888,296		
Oysters (native)			91,950													91,950		
Snails												653				653		
Squid									92	3,689,299		8,406		445		3,698,242		
Miscellaneous—																		
Frogs (doz.)								328								328		
Terrapin (doz.)	2	64						84			10					160		
Turtle																	255,239	

CANNED, CURED AND MANUFACTURED FISHERY PRODUCTS OF CALIFORNIA FOR THE YEAR 1919.

Compiled by the Department of Commercial Fisheries.

CANNED.

Species of fish	Size of cans	San Diego district, cases	San Pedro district, cases	Monterey Bay district, cases	Northern California district, cases	Total cases
Abalone	1-lb.		105		2,873	2,978
Albacore	1-lb.	5,862	21,236			27,098
	½-lb.	37 855	107 822			145,677
	¼-lb.	4,152	15,325			19.477
Anchovy	¼-lb.	184	32			216
Barracuda	1-lb.		8			8
Bonita	1-lb.	12	2,177			2,189
	½-lb.	4,965	34,634			39 599
	¼-lb.	287	17,108			17,395
Caviar	¼-lb.		395			395
	3-oz.		374			374
Herring	1-lb. oval				28,236	28.236
	½-lb. oval				1,589	1,589
Mackerel	1-lb.	76	1,905			2,061
	½-lb.	17	6 344			6 361
	¼-lb.		988			988
Rock bass	¼-lb.		10			10
Salmon	1-lb. oval			102	725	827
	1-lb. tall				1,941	1,941
	1-lb. flat				9,086	9,086
	½-lb. flat				18,667	18,667
Sardines	1-lb. oval	33,594	113,909	790,724	7,842	946,069
	1-lb. round		11,875			11,875
	1-lb. tall				7,318	7,318
	½-lb. oval	3,878	27,713	11,960		43,551
	½-lb. square	9,543	17,510	7,207		34,260
	½-lb. round	405	25,742	128		26 275
	¼-lb. round	10	3,213			3.223
	¼-lb. square	39,693	31,553	7,789		78,945
Shad	1-lb.				4,350	4,350
Shad roe	½-lb. oval				1,131	1,131
Skipjack (striped tuna)	1-lb.	3 199	750			3 869
	½-lb.	38 229	28,849			67,078
	¼-lb.	2,460	11,351			13,811
Squid	½-lb.			3,538		3,538
Tuna	4-lb.		1,905			1,905
	1-lb.	1,170	33,524			34,694
	½-lb.	14,555	291,453			306.008
	¼-lb.	2,785	119,980			122,765
Turtle		7,407				7,407
Yellowtail	1-lb.	12	350			362
	½-lb.	19.291	8,739			28,030
	¼-lb.	5				5
Total cases canned		229,463	936,969	821,448	83,758	2,071,641

DRIED, SALTED, SMOKED AND MISCELLANEOUS.

Species of fish, size or quantity	San Diego district	San Pedro district	Monterey district	Northern California district	Total
Albacore bellies, smoked, lbs.		4,368			4,368
Anchovy, salted, lbs.		63,150	242,576	24,448	330,174
Anchovy, salted, 5-lb. cans, 24 cans to case			243		243
Anchovy, salted, 5-lb. cans, 12 cans to case			367		367
Anchovy, salted, 24-lb. cans, 6 cans to case			119		119
Anchovy, salted, 12-lb. cans, 8 cans to case			216		216
Anchovy, salted, 1½-lb. cans, 24 cans to case			200		200
Anchovy, salted, 2½-lb. cans, 12 cans to case		1,800			1,800
Barracuda, dried, lbs.	67,102				67,102
Barracuda, smoked, lbs.		2,000			2,000
Bonito, salted, lbs.		68,760			68,760
Bonito, smoked, lbs.		31,003			31,003
Cuttle fish, pickled, lbs.		3,800			3,800
Herring, smoked, lbs.				1,000	1,000
Herring, sugar cured, lbs.				1,450	1,450
Mackerel, salted, lbs.		24,842			24,842
Miscellaneous fish, dried, lbs.	51,037	46,479	15,000		112,516
Miscellaneous fish, salted, lbs.	20,000	59,079			79,079
Rollmops, 10-lb. pails				1,142	1,142
Sablefish, salted, lbs.				7,519	7,519
Sablefish, smoked, lbs.				5,400	5,400
Salachini, 100-lb. tubs			100		100
Salachini, 65-lb. tubs		740	14,370	1,362	16,472
Salachini, 45-lb. tubs			987	358	1,345
Salachini, 30-lb. tubs			4,020		4,020
Salmon, mild cured, casks*			1,044	4,153	5,197
Salmon, hard salted, casks*				30	30
Sardines, dried, lbs.			15,000		15,000
Sardines, salted, lbs.		43,982	260,500		304,482
Sardines, smoked, lbs.				2,200	2,200
Sardines, salted, 2½-lb. cans, 12 cans to case		4,000			4,000
Sardines, salted, 3-lb. cans, 24 cans to case		6,007	200		6,207
Sardines, salted, 5-lb. cans, 24 cans to case			573		573
Sardines, salted, 12-lb. cans, 8 cans to case			739		739
Sardines, salted, 24-lb. cans, 4 cans to case			450		450
Sardines, salted, 34-lb. kegs			1,600		1,600
Sea bass (black), dried, lbs.	26,830				26,830
Skipjack, smoked, lbs.		2,601			2,601
Squid, dried, lbs.			686,159		686,159
Tuna, smoked, lbs.		10,180			10,180
Yellowtail, smoked, lbs.		45,933			45,933
Fish meal, tons	1,674	5,657	3,331	481	11,153
Fish, oil, gallons	26,791	146,298	360,833	46,340	514,262
Number of plants	15	35	28	21	99
Number of employees	1,191	3,928	2,218	905	8,242
Estimated value of pack	$2,599,852	$9,694,482	$6,990,566	$2,132,843	$21,417,743
Value of plants	1,100,700	4,335,657	1,366,189	906,325	7,708,871

*Casks contain 800 pounds net.

VIOLATIONS OF FISH AND GAME LAWS.

October 1 to December 31, 1919.

Offense	Number of arrests	Fines imposed
Game.		
Hunting without license	62	$930 00
Refusing to show license on demand	1	25 00
Making false affidavit on shipment of deer hides	1	25 00
Shipping deer meat without affidavit	3	50 00
Deer—excess limit—close season—killing or possession	22	675 00
Female deer—spike bucks—fawns—killing or possession	7	350 00
Illegal deer hides	1	
Hunting on posted grounds	1	25 00
Night shooting	30	745 00
Trapping without license—close season	4	20 00
Killing a mountain sheep	1	30 00
Protected shore birds—killing or possession	56	1,305 00
Nongame birds—killing or possession	47	916 00
Shooting ducks from power boat in motion	10	150 00
Ducks—excess limit—close season	15	425 00
Quail—close season—killing or possession	36	960 00
Pigeons—close season—killing or possession	3	85 00
Doves—close season—killing or possession	1	25 00
Grouse—close season—killing or possession	1	25 00
Mudhens—close season—killing or possession	1	25 00
Cottontail and brush rabbits—close season	9	110 00
Total game violations	312	$6,901 00
Fish.		
Angling without license	3	$30 00
Fishing for profit without license	4	110 00
Striped bass—underweight—close season	5	120 00
Halibut—underweight—offering for sale—close season	4	75 00
Salmon—excess daily limit	1	
Taking salmon with snag hooks	4	100 00
Operating salmon net in closed district	8	200 00
Trout—excess daily limit—close season	2	50 00
Catfish—undersize—offering for sale	1	20 00
Failure to maintain fish screen	1	20 00
Clams—undersized—excess limit	1	110 00
Female crabs—taking or possession	1	20 00
Abalones—red and black—under and oversized—taking or possession	12	270 00
Lobsters—under and oversized—close season—taking or possession	12	280 00
Total fish violations	58	$1,405 00
Grand total fish and game violations	370	$8,306 00

SEIZURES—FISH AND GAME AND ILLEGALLY USED FISHING APPARATUS.

October 1, 1919, to December 31, 1919.

Game.

	Pounds
Deer meat	1,074
Quail	114
Ducks	1,067
Doves	18
Pigeons	2
Rabbits	17
Avocets	4
Killdeer plover	28
Swans	5
Sandpipers	18
Miscellaneous birds	103
Deer hides	6

Searches.

Illegal fish and game	8

Fish.

	Pounds
Striped bass	6,600
Salmon	852½
Halibut	6,624½
Trout	78
Catfish	5
Sturgeon	39
Barracuda	3,995
Miscellaneous fish	33
Clams (cockle)	916
Clams (Pismo)	456
Crabs	1,627
Lobsters	4,752
Abalones	93
Illegal nets	3

STATEMENT OF EXPENDITURES YEAR 1919.

	September	October	November	December
General administration	$3,170 98	$2,571 00	$2,384 00	$2,103 63
Research, publication and education	931 38	312 78	296 24	419 65
Printing	316 13	1,630 34	111 77	178 25
Fish exhibits	483 78	6,110 55	3 25	
Game exhibits				
Tahoe camping ground	37 23	8 00		
Mountain lion bounties	520 00	520 00	390 00	370 00
Lithographing hunting licenses			300 00	
Lithographing angling licenses		315 00		1,090 00
Hunting license commissions	2,400 50	3,626 80	1,541 60	2,673 90
Angling license commissions	1,322 90	1,471 90	1,242 90	2,186 60
Market fishing license commissions	131 50			149 50
San Francisco District	8,161 99	7,752 01	7,045 73	6,684 94
Sacramento District	5,830 40	5,654 19	5,322 42	5,008 57
Los Angeles District	2,996 46	3,079 82	3,094 65	2,921 47
Launch patrol	5,993 55	1,753 47	2,280 91	1,141 75
Prosecutions (fish and game)	155 89	304 75	276 50	63 00
Crawfish inspection	100 00	100 00	100 00	100 00
Winter game feeding				
Accident and death claims	143 59	278 42	262 65	124 04
Hatchery administration	1,286 55	1,450 51	1,289 72	1,324 73
Mount Shasta Hatchery	2,977 87	1,696 39	2,965 24	2,135 71
Klamath Station	1,339 58	1,151 14	949 72	458 82
Fall Creek Hatchery	422 91	395 49	818 98	939 00
Mount Whitney Hatchery	2,077 83	1,878 63	2,577 64	1,139 97
Cottonwood Creek Station			236 50	
Cottonwood Lakes Station				
Tahoe Hatchery	164 98	334 10	156 11	40 15
Tallac Hatchery	587 66	5 00	8 00	5 00
Chico Experimental Station	63 75		29 00	
Fort Seward Hatchery	1,021 10	1,719 25	910 49	789 23
Eel River Station			93 25	
Ukiah Hatchery		92 00		
Snow Mountain Station	8 50	49 25	11 18	989 17
Brookdale Hatchery	151 33	147 35	156 02	257 74
Scott Creek Station	30 00	31 00	30 00	31 00
Feather River Hatchery				
Almanor Hatchery	7 00	5 00	5 00	5 00
Domingo Springs Hatchery	321 20	57 25	84 43	8 30
Clear Creek Hatchery	203 71	249 06	216 22	
Bear Lake Hatchery	1,119 38	1,432 54	1,229 62	410 50
North Creek Station	403 56	474 78	1,559 45	772 36
Wawona Hatchery			312 87	133 76
Yosemite Hatchery	250 25	219 01	328 29	44 25
Kaweah Hatchery	150 70	92 60	17 00	16 60
Fish transplanting and distribution	1,537 87	1,332 49	1,804 39	319 95
Screens, fishways and water pollution	619 79	698 84	583 86	663 38
Special field investigation		150 35	102 00	
Department of Commercial Fisheries	4,095 72	3,830 81	3,775 18	3,255 76
Totals	$51,409 66	$56,021 07	$44,848 78	$38,898 08

STATEMENT OF EXPENDITURES.

July 1, 1919, to December 31, 1919.

Administration:		
Commissioners	$1,220 59	
Executive officers	14,015 36	
Printing	2,270 70	
Research and publicity	2,591 03	
Accident and death claims	1,159 88	
Total administration		$21,257 56
Commercial fish culture and conservation:		
Superintendence	$6,333 80	
Inspection and patrol	15,400 37	
Research	9,298 34	
Statistics	4,885 79	
Market fishing license commissions	374 00	
Propagation and distribution of salmon	14,461 25	
Total commercial fish culture and conservation		50,756 64
Sporting fish culture and conservation:		
Superintendence	$7,543 07	
Printing	1,596 79	
Prosecutions and allowances	72 00	
Angling license commissions	8,329 20	
Special field investigations	252 35	
Fish exhibits	7,167 16	
General patrol (pro rata share)—		
San Francisco District (40 per cent)	17,757 55	
Sacramento District (40 per cent)	14,990 67	
Los Angeles District (40 per cent)	7,030 02	
Propagation and distribution of sporting fish	73,538 47	
Total sporting fish culture and conservation		138,277 28
Game conservation:		
Printing	$2,396 07	
Prosecutions and allowances	863 14	
Hunting license commissions	12,397 80	
Mountain lion hunting	2,837 13	
General patrol (pro rata share)—		
San Francisco District (60 per cent)	26,636 35	
Sacramento District (60 per cent)	22,486 01	
Los Angeles District (60 per cent)	10,545 04	
Total game conservation		78,161 54
Tahoe camping ground		2,599 11
Total expenditures		$291,052 13

Further information regarding details of expenditures will be gladly furnished upon application to the executive office of the Fish and Game Commission, San Francisco, California.

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CALIFORNIA FISH AND GAME

"CONSERVATION OF WILD LIFE THROUGH EDUCATION"

Volume 6 SACRAMENTO, JULY, 1920 Number 3

CONTENTS.

KING SALMON MARKING EXPERIMENT AT KLAMATH RIVER, 1919.

By W. L. Scofield.

Source of Eggs.

The Chinook or king salmon used in this experiment were from eggs taken by Mr. Hurby of the United States Bureau of Fisheries at the substation on Mill Creek, Tehama County, California, near the town of Tehama about twelve miles south of Red Bluff. Mill Creek is a tributary of the Sacramento River. The eggs were taken about the latter part of November, 1918.

Shipping.

The eyed eggs were shipped in one shipment of 1,153,000 eggs. Though originally billed to the Mount Shasta Hatchery, they were not unloaded but shipped immediately to the new Fall Creek Hatchery on Fall Creek near Copco, Siskiyou County, about sixteen miles from

Hornbrook. The eggs were received at the Fall Creek Hatchery February 13, 1919.

Hatching.

The eggs were hatched at Fall Creek Hatchery from the middle to the end of February, 1919. About July 1, 1919, 25,000 of these small king salmon were placed in the cement-sided pond at Fall Creek Hatchery and the others were liberated in Fall Creek, which is a tributary of the Klamath River, entering just below the California-Oregon Power Company dam at Copco. The hatchery is about a mile up Fall Creek from its mouth.

Mark Used.

The *adipose* and *right ventral* fins were removed by clipping off close to the body with a pair of manicurists' cuticle nippers. The marking, begun November 3 and completed November 15, 1919, was done by L. Phillips of the Department of Fish Culture and W. L. Scofield of the Department of Commercial Fisheries of the Fish and Game Commission of California.

Variation in Size.

Although from the same brood, hatchery practice and rearing pond, there was great variation in the size of the yearlings at the time of marking, the extremes in length being from $1\frac{3}{16}$ to 5 inches, measured from the tip of the snout to the tip of the central rays of the caudal fin. The small fish, roughly those under two inches in length, were not marked but sorted out as the marking proceeded. These small fish were liberated every day or two.

Counting and Separation.

As 250,000 fish had been counted into the rearing pond, no count was made of unmarked fish while marking. The marked fish were carefully counted each day. Mr. Phillips kept tally of his work while marking. Mr. Scofield counted his work at the end of the half day. In each case at the end of the day the fish marked by each person were placed in a separate trough.

Liberations.

The first fish marked were held to the end of the fifth day in the trough to determine the effect of rough handling. As no injury showed in the fish, the first five days marking was liberated at the end of the fifth day and from then on the marked fish were liberated each day or two. All liberations were made in Fall Creek. November 14 the rearing pond was emptied, thus liberating all the unmarked fish of the 250,000 except a few held in the hatchery troughs. The following day all remaining unmarked fish were liberated.

Control.

In order to determine the possible percentage of fin regeneration, a sample of each half day's marking was retained as a control to be held in the hatchery trough. The control from each person's marking was

held in a separate trough. Control fish were obtained by dipping out a few fish with a net and counting out fifty or so without conscious selection. Great care was used in this respect so that the control would be exactly representative of the size classes of marked fish in order that the control might be used for possible future study. The control remained two months in the hatchery troughs from the time of marking until the middle of January, 1920. The control fish were then bottled in formalin and shipped to Professor J. O. Snyder of Stanford University, being received by him January 19, 1920. Through an oversight when bottling the control at the hatchery, the fish marked by Phillips and those marked by Scofield were not kept separate, but since the percentage of regeneration has been found to be almost negligible this attempt to determine the regeneration percentage for each person's marking was scarcely necessary. Roughly, 100 of the control marked by Scofield were shipped to Professor Snyder for his study very soon after the marking and received by him December 1, 1919. Of the 25,850 fish marked 850, or roughly 3 per cent of the total were retained as control, thus leaving an even 25,000 marked fish to be liberated.

Percentage of Fin Regeneration.

To determine the percentage of fins which might be expected to regenerate, the control was examined by W. L. Scofield in February, 1920, with the help of Professor Snyder and Mr. Willis Rich of the United States Bureau of Fisheries. Of the 573 specimens examined but 8 or 1.4 per cent showed signs of possible regeneration and in several of these cases the resulting ventral fin would probably be so deformed as to be recognizable as a mark when found with a missing adipose fin. In no case had the adipose fin shown any sign of regenerating.

Injury from Marking.

But one death was noted among the marked fish soon after marking and none among the control from November 3 to 15, 1919. A report in December from the hatchery stated that the control was apparently perfectly normal and healthy with very few deaths. A few fish were stunned by the rough handling while being marked but when returned to the water would swim off after about one minute and show no further signs of discomfort.

Summary.

Of 1,153,000 king salmon eggs taken in November, 1918, from Mill Creek of the Sacramento, and hatched at Fall Creek Hatchery on the Klamath River in February, 1919, 903,000 were liberated in the Klamath about July 1, 1919, and 250,000 were held in a rearing pond. In November, 1919, the 250,000 from the rearing pond were liberated in the Klamath River after 25,000 of them had been marked by removing *adipose* and *right ventral* fins.

King Salmon Marked at Fall Creek Hatchery.

Date	Number of fish marked	
	By Scofield	By Phillips
1919—November 3	243	1,172
November 4	713	
November 5	595	1,046
November 6	760	1,106
November 7	1,050	1,425
November 8	800	750
November 9	925	1,250
November 10	1,100	1,000
November 11	1,100	1,200
November 12	1,350	1,800
November 13	1,550	1,650
November 14	1,110	1,500
November 15	330	325
Totals	11,626	14,224
Total marked		25,850

Control Counted Out from the Total.

Date	From Scofield marking	From Phillips marking
1919—November 6	50	50
November 9	50	50
November 10	100	100
November 12	125	125
November 13	50	50
November 14	25	25
November 15	25	25
Totals	425	425
Total control		850

Number of Marked Fish Liberated in Fall Creek in November, 1919.

Date	Number
1919—November 7	5,535
November 8	1,425
November 9	4,675
November 10	1,900
November 12	5,200
November 13	3,100
November 14	2,560
November 15	605
Total	25,000

GAME IN THE SAN JOAQUIN VALLEY IN 1853.*

A Little Journal of Incidents Whilst on a Surveying Party with von Schmidt, Deputy Surveyor under Colonel Jack Hays, in the Fall of 1853, on the Tulare Plains.

By Colonel Andrew J. Grayson.

Meeting my friend von Schmidt, a German by birth but raised in the United States, and at that time deputy surveyor, one day as I was walking down one of the streets of San Francisco, and whom I hadn't seen for a long time, I shook him cordially by the hand, when he told me he was just making preparations for a long trip to the Tulare plains and lakes to survey the Standard lines (government survey), and as I had never been in this portion of California, and having heard oft of the great quantities of game in this region of the country interesting to the

*Between the years 1846 and 1869 there lived in California a naturalist and artist of so great attainment that he became known as the "Audubon of the Pacific." This naturalist was Colonel A. J. Grayson. Born in Louisiana, on the banks of the picturesque Ouachita River, hemmed in by pine forests and cane brakes, Grayson spent most of his boyhood days rambling in the woods or along the banks of the river. While still a child he manifested great talent in the drawing and painting of birds and the wild life scenes with which he was so intimately acquainted; but this was most vehemently discouraged by his parents and he was sent away to school to learn to be more practical. After finishing college young Grayson made an attempt at business, but he had no love for the drudgery of mercantile pursuits. He found no pleasure but in the study of nature, so he gave it up and determined to go to California where his longing for new objects of study in nature's unexplored recesses might be satisfied.

And so it was that about the middle of April, 1846, he found himself at the head of a caravan composed of many well known pioneers setting out on the long overland journey to the Pacific. But as they traveled westward some branched off

adventurer, from the fact of its never having been but little explored save by the few wild Indians that live about the lakes, I at once proposed acompanying him on this interesting trip. Von Schmidt was glad to have me go, so I made up my mind to do so, for I hadn't had a hunt for a long time.

So on the evening of the sixteenth of September, 1853, we took the good little steamer "Sophia" from San Francisco bound for Stockton. At Stockton we secured wagon, mules and camping equipment and on September 18 our party started on their journey.

At noon of the second day out we reached the Stanislaus River—at Heath and Emery's ferry—where we had our lunch, forded the river and took the Mariposa road. The day was intensely warm and the road heavy and dusty, as it wound through the low hills, sparsely covered with oak and brush. After a few miles we saw a large track of a grizzly which seemed to have just crossed the road. After tracking him through the woods for a while I came to the conclusion that the old Growler had made tracks to the river to quench his thirst and cool his hide, for the day was melting hot and the hills around parched. I couldn't conceive what brought him so far from water at that time of day—and such a day!

We made an uneventful camp that night and by sunrise the next day (September 20) were on our way. We crossed the Tuolumne River at Dickinson's ferry and camped on a creek that night. On September 21 we reached the Merced River at "Snelings," where we camped and caught our first fish and killed our first game—a few quail. The fish were full of fine bones—the same kind I have seen in all the fresh water streams in California—and a very poor fish to eat.

Leaving the river about six miles farther up, we proceeded toward the foothills. As yet we had seen no game larger than quail, but as we advanced towards the wilds the country became more interesting. On September 26 we reached old Stearns' cabin, where we camped. Here I shot quail and doves and one of the boys killed a hare. On the next day we proceeded toward the Chowchilla River, where von Schmidt received instructions from the Surveyor General and commenced his surveying work. Here I went out hunting in the low hills for antelope and came across a herd of them, but they were so wild I could not get near enough to shoot one. Later we camped on the Fresno, then a dry bed, but with a few water holes. Here we saw a large band of wild horses—probably fifty in number—and they went snorting and charging

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in different courses, notably the Donner party; others fell away; and finally Colonel Grayson, with his wife and child and one horse, completed the journey alone.

Almost needless to say, Colonel Grayson, like almost every one else in those early days of California, went to the "diggings" and was so far successful as to be considered one of the wealthy men of San Francisco at one time. His attempts at mercantile pursuits, however, proved failures, as before. The wilds called to him and he determined to renounce business again and adopt the life of a trapper, which would afford him opportunities for the study of ornithology. One of his best known works is his "Birds of the Pacific Slope," which is profusely illustrated with colored drawings, the work of his own hand. So fine were some of these drawings that the State Fair at Sacramento awarded him a special premium "for superior drawings of native birds of California, exhibited at the Fair, 1855."

This noted artist and naturalist, in his various wanderings for the purpose of studying wild life, accepted in 1853 an invitation from a friend to accompany a surveying party to the plains of Tulare County. The accompanying extracts, slightly revised, are from a diary kept by Grayson which refer to the abundance of game prevalent in that region at the time of the trip. The handwritten journal is deposited in the Bancroft Library, of the University of California, and acknowledgement is here made of the courtesy of the Library in allowing its publication.—Editor.

in a circle around us, and then away over the plains. Here also I saw numbers of antelope, but they were too wild to approach.

On September 30 we forded the San Joaquin at Beals' Indian Farm, where we caught salmon and other fish, which appeared in great quantities. Some five or six miles up the river we saw some whooping cranes, a few ducks, heard a mocking bird, and saw antelope. I shot a duck and a hare.

On October 3 and 4 we passed over rolling land, running due north to the Fourth Standard and passing Kings River Slough. On these days we saw great numbers of antelope and wild horses and also a silver grey fox—the first one I had seen this side of the Rockies. At Kings River Slough we killed some bitterns, also saw ducks, black curlews and various other water birds. Fishing also was good. At this slough also we met Indians, and one of them undertook to conduct us on a hunt for elk. With our Indian guide we went westerly toward the Tularies, between Kings River Slough and Kings River. These lands were literally perforated by gophers, moles and other underground inhabitants, and the air was infested with mosquitoes. On this trip we saw great quantities of quail, also the tracks of a grizzly, but found nothing but the *signs* of elk. Our Indian guide, who was on foot, while we rode horseback, became tired out and we returned to camp on the slough.

Von Schmidt continued surveying operations along the Kings, during which time we saw large herds of antelope. Then we proceeded to the main branch of the Kaweah River, to Woodville, the county seat of Tulare County. All branches of the Kaweah abound with fish, and wood ducks were plentiful. Bear signs were everywhere and we killed a cub while in the Kaweah country.

Later, leaving the Kaweah country, we continued to Tula Swamp, where we found signs of elk, but no elk were actually seen. At Tula Slough Creek we found quantities of fish, and I saw for the first time here a roadrunner. Here we killed a few hares, the only game seen.

On October 16 we began our journey over stretches of alkaline desert, under a sweltering sun, and with mirages mocking us in every direction, toward the great Tulare Lake. We reached this lake early in the evening, in time to kill quantities of ducks, snipe, geese and black curlew before dark. We also killed two antelope and a number of hare. We feasted that night after our desert travels. We found all kinds of waterfowl, antelope and hare in abundance around Tulare Lake. And it was here that I killed our first elk. We had gone on a little excursion from the lake (exactly on the line of the Seventh Standard Parallel, about three miles distant), when I saw a herd of four large buck elk. My first shot brought one down, and the others did not seem frightened nor run, and I am sure we could have shot more, but we did not need the meat.

The Indians on Tulare Lake were greatly perturbed over our visit. They feared that we might contemplate squatting on their land. And they were pleased when we told them (through a Spanish interpreter) that we had no such intentions. In fact, the whole country we had traveled over since we left the Four Creeks (Kaweah River) to Tulare Lake is totally unfit for any purpose and can never be settled by anybody but hunters or Indians. And we assured the Indians they need not fear squatters, as no white man would ever want their land.

On October 31 our surveying operations brought us to the main Kern River. Here we found any quantity of elk and waterfowl, and such a place for hunters I never saw! The mallard duck abounded, but of every description of waterfowl my pen could scarcely describe the numbers, or the excitement they would create in the breast of a sportsman. Your ears are confused with the many sounds—the quacking of the mallard, the soft and delicate whistle of the baldpate and teal, the underground-like notes of the rail or marsh hen, the flute-like notes of the wild goose and brant, the wild ranting of the heron, not to forget the bugle-like notes of the whooping crane and swan and a thousand other birds mingling their songs together—creates that indescribable sensation of pleasure that can only be felt by one fond of nature in its wildest and most beautiful form.

We crossed the Kern and went on to Lake Buena Vista. We found the immediate vicinity of this beautiful lake on the side of our approach (from the west) devoid of life, save for the little ground squirrel and the little desert sparrow. Later, however, we found great quantities of white geese and other waterfowl of every description on the southeast shores of Lake Buena Vista. In fact, so great was the number that out of ten shots fired one hundred and eighty-five fowl were killed.

It was here at Lake Buena Vista that von Schmidt completed his surveying operations and we made a quick and uneventful trip to our homes in San Francisco.

NOTES ON DRY-FLY FISHING. No. 4.

By R. L. M., California.

Scene: In the hills in California. Time: Present.

Dramatis personæ:

Clerk of the Hotel.
Angler.
Tourist.

Clerk: Here comes the angler. He can tell you all about that dry-fly stuff they were discussing last night. Angler, let me make you acquainted with Tourist. He wants you to tell him all you know about these dry-flies.

Angler: Well, I'll do my best. (To Tourist.) Are you going fishing today?

Tourist: No, my party is going up to Pine Lake, and as I have had enough riding in a machine to last me a long time, I'm taking a day off and going to loaf round the hotel—unless something better turns up.

Angler: How about coming out with me, then? We shall have the whole day and you can see just how the game is played.

Tourist: I shall be delighted to do so, and I am sure I shall know something about dry-fly fishing when the day is over.

Angler: When can you be ready to start?

Tourist: I am ready now. We have only three rods in the party, and all three are to be used up at the lake. All I need is to get a lunch put up—that won't take me long.

Angler: Well, let's pull out. We have about half an hour's walk before we get to the best part of the river, but a machine will bring us back in the afternoon.

Not fishing yourself, you will have a good chance to really find out something useful about the art. Usually, when anyone comes out with me, they insist on bringing their own rod. The result is, that after about five minutes of instruction, they want to fish themselves; as a consequence they learn very little.

Tourist: I come from Idaho. There we have very good fishing, provided you get well away from the towns.

While we were sitting around the fire last night, this dry-fly talk came up; it mystified me, for I had never heard of it before. Now, just exactly, what is dry-fly fishing?

Angler: I dare say you have noticed that the various insects, such as flies, beetles, or grasshoppers, always float on the surface of the water. Now, the imitations of these insects, known as artificial flies, are made of silk, feathers, fur and other substances. In order to catch the fish, these materials are ballasted with a hook. Now, as long as we can keep our artificial fly dry, it will float on the surface and thus be in much the same position as the natural insect.

Dry-fly fishing simply consists of keeping the fly dry, and if it gets wet, of drying it again as quickly as possible.

Tourist: It sounds simple, but how can it be done? I know that the first time I cast a new fly into the water it floats, but the second or third cast sinks the fly.

Angler: First of all, we put some oil on the fly to keep the water off it. Then, we grease the line, so that the line itself will float. And then, if the fly does get wet, which is not exactly an uncommon experience, instead of returning the fly to the water, on the next cast, we check the fly before it gets there and make a series of false casts backwards and forwards in the air. These false casts drive off any moisture that has collected on the fly and on the line; so that when we do return the fly to the water, it is practically as dry as it was at first.

Tourist: We got in yesterday and had lunch at the hotel. Afterwards, we drove down in this direction and went fishing. I noticed swarms of grasshoppers on the water. The trout were taking them, but they would not look at our flies. We even caught some 'hoppers and tried them, but it was no good; so we packed up and came back to the hotel. Why was it we couldn't catch any fish?

Angler: Well, when you tried flies, you were trying to coax the fish away from a very tempting morsel—viz, the grasshopper—with something that did not attract them at all. And when you used grasshoppers, I dare say, you noticed that your grasshoppers always sank below the surface of the water, whereas an unhooked 'hopper floated on the surface. Then again, the leaders you were using may have been too heavy or thick. These trout are very wise. They are fished for continuously all through the season; it is only natural to suppose that

they learn a little by bitter experience. If you could have kept your 'hoppers on top of the water and made them float with the stream in a natural manner you would, in all probability, have gotten some fish.

Tourist: We are getting near where we were yesterday. I recognize that grove of pine trees, but I don't see as many grasshoppers in the air as I did yesterday.

Angler: It is a little early yet. In an hour's time you will see just as many flying as you did yesterday.

Well, here we are at the river.

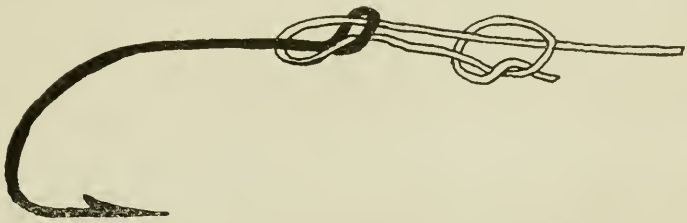

FIG. 29. Proper knot for tying large fly hook to leader.

There surely aren't many 'hoppers floating down yet. But we needn't worry, there will be hundreds later on. In the meantime, I will put my rod together and get ready for the fray.

Tourist: I notice that you have put your reel on with the handle pointing to the left. Are you left handed?

Angler: No, but I hold the rod with my right hand and wind up the line with the left. It is awkward at first, but one soon gets used to it, and I need not point out the advantage of being able to wind up the line without having to change the rod to the left hand, as you will see so many people doing.

Tourist: How long is that leader? Isn't it rather too light to handle a good sized fish?

Angler: The leader is 9 feet long. Although it only has a breaking strain of 2½ pounds, it is quite strong enough for the average big fish

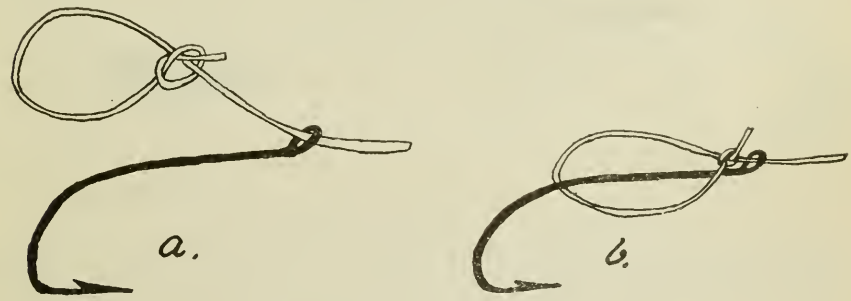

FIG. 30. The "turle" knot, one often used.

hereabouts. I do not expect to get anything much over 5 pounds. Of course, if one got hold of a really big fish, such as 10 or 11 pounds, one would have to be extra careful, but with ordinary luck and management, it is not impossible to land a large trout on a leader such as this.

Let us sit down here and watch up and down stream for the first sign of a feeding fish.

Tourist: Why not begin fishing now?

Angler: Until you see the fish feeding on top, it is not much good trying to get them with a fly. But in a very short time you will see grasshoppers floating down stream and the fish will begin to feed.

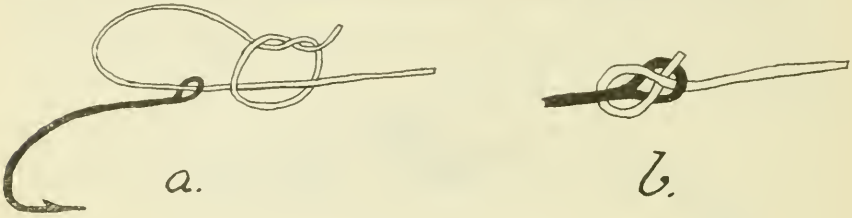

FIG. 31. Jam knots for tying small fly hooks to leader.

Tourist: What kind of a fly are you going to use?

Angler: This one here. I call it "the floating grasshopper fly," and although it does not look very much like a real 'hopper when it is floating on the surface, it has a strong resemblance to a grasshopper in a similar position.

Tourist: How do you tie the fly on to the leader?

Angler: There are several knots that can be used. This first knot is the best for larger flies (fig. 29); then, there is this one (fig 30) known as the "turle" knot, and finally the two jam knots (figs. 31 and 32). These last two are used for small flies.

Now, I will make a cast on that shallow water; you will notice how the fly floats and you must admit that it does look like a grasshopper.

Tourist: Yes, the resemblance is very strong. I see your line is floating as well.

Angler: If you remember, after I had put my rod together and threaded the line through the guides, I pulled off about 40 feet and rubbed the line down with this little pad which is anointed with deer

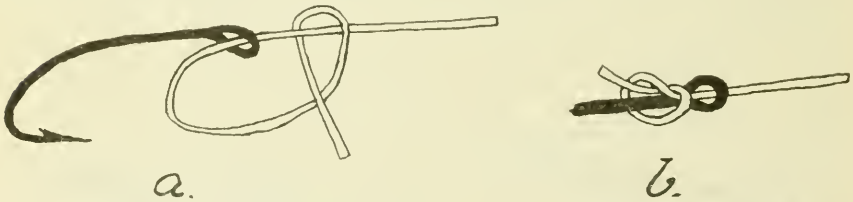

FIG. 32. A simple jam knot suitable for fastening a small fly hook to leader.

fat. That is what makes the line float, and if the line did not float it would be much more difficult to either keep the fly dry or to sail the fly accurately down over a feeding fish. Now, I will drown the fly. It is quite wet now, but just watch while I dry it. I make the forward cast—but well up in the air—and before the fly has time to fall on the water I make the back stroke again. I do this several times. Finally, I cast the fly—you see it is dry now—and it floats. Watch it.

Tourist: That looks easy enough!

Angler: Would you care to try? But before you do, just watch me again and note that I allow the line to become fairly well extended both in front and behind before I make the next stroke. Then, too, I must caution you to make your strokes with deliberation and only to use the wrist and forearm when casting. Now try.

Tourist: Well, what happened then? What made the line strike the water?

Angler: You made your forward stroke too long. In other words, you should have checked the rod before it had gone very far beyond the vertical. Shorten the line a bit and try again.

Tourist: That is better. I seem to be getting on to it now. What was that splash over there, just below that willow?

Angler: That was a fish. We will let him have a few more real 'hoppers before we try him with an imitation one. Until the fish are feeding steadily, they are rather particular as to what they take, but as soon as they have taken a few 'hoppers without any accidents they are willing to look at a fly.

Tourist: Did you see that? He took another.

Angler: Let's crawl up and get a little closer to him—never cast an inch further than you have to. Now we are in position. Watch closely and see just where he takes down the 'hoppers. There, he got that one all right! Now, run your eye up along the surface for two or three feet and locate the spot where the fly should fall so that it will float over the spot where the fish took that last 'hopper. Well, that place up stream is where our fly must fall so that it will come down over Mr. Fish in a natural manner.

Tourist: There, he has taken another!

Angler: Well, here goes. We'll try for him. I make a preliminary cast in the air just above the surface to see if my line is long enough or otherwise. Not quite enough, so I will pull off a little more; that is about right. Now watch the fly. It is getting close. Yes! He has it!

Tourist: That is a good fish. See him jump?

Angler: Will you land the fish when I bring it in? Put the net well down into the water, and with one motion lift the net and scoop out the fish.

Tourist: All right, give me the net.

Angler: All ready? Here comes the fish.

Tourist: Say, that fish must weigh two pounds. Why don't you bring it in?

Angler: Never try to land a fish until it is all in, because if you do, in its struggles, it is very liable to catch the leader on the net and then it will break loose.

Tourist: How can you tell when the fish is played out?

Angler: Whenever you see a fish turn on its side, it is a sign that the fight is over. See that! He showed his side then. He is almost finished. Here he comes. Take your time and don't get excited. Well done! You've got it all right.

Tourist: Why do you knock the fish on the head?

Angler: To kill it. It not only puts an end to the fish's sufferings, but the fish will keep better.

Tourist: How much does it weigh?

Angler: One and a half pounds.

Tourist: Is that all? I should have thought it was fully two pounds.

Angler: You will notice now, there are many more 'hoppers on the water, and look, you can see fish feeding on them all up and down the river. See, there is a fish I want you to catch.

Tourist: Now, tell me just what to do. Where shall I drop the fly?

Angler: The current is a little stronger here, so you had better drop the fly about three feet above the fish. To be exact, just in line with that little willow shoot. But, before you make your cast just cast well off to one side, where there will be no danger of frightening the fish, so as to see how the line is for length.

Tourist: The fly has sunk. Why was that?

Angler: I expect you aimed at a spot on the surface, whereas, you should have tried to cast your fly in the air so as to strike a spot about a foot above the surface. Then, the fly would have fallen on the water gently.

Tourist: Will you dry the fly?

Angler: All right, but watch me closely. I throw the fly straight out in front, then back and keep it moving quickly. Now it is dry. Try again.

Tourist: That is in the right spot. Here it comes over the fish; no good.

Angler: You made a mistake then. When your fly has passed over a feeding fish without any notice being taken of it, let the fly float well down below the fish before you lift the line off the water.

Tourist: Shall I try again?

Angler: No, I guess that fish is scared. We will move on and try for that fish that has just made such a splash behind that weed. But don't try from above; get below the fish and cast up stream.

Tourist: How is this? I think I can reach him from here.

Angler: Take your time; wait till the fish has taken another 'hopper; then you can locate him exactly.

Tourist: There, he got that one, so here goes the fly.

Angler: Ah, that ought to get him. He's got it! But what did you do?

Tourist: The leader broke and the fly is gone.

Angler: I expect you struck too hard. Well, let us move down a bit while I tie on another fly.

When you strike a fish do not strike as though you wanted to throw the fish out; just make a slight upward motion with the rod and as soon as you feel any resistance check the motion; then, keep a tight line on the fish, but do not try to see how much strain the tackle will stand; just keep an even strain on the fish and keep the fish moving.

Striking is really the most difficult thing to become proficient in. If we were using ordinary gut, which is two or three times stronger than what we are using, it would be much easier to successfully hook a fish; but the stouter gut would be much more visible to the fish and in all probability we should not have many opportunities to strike at a rising fish.

Another thing to remember is this, big trout should not be struck as quickly as you would strike smaller fish. The movements of the larger fish are, to a certain extent, deliberate. As a rule, there are no very near neighbors who might snatch the tempting morsel away.

Whereas, a small fish has generally numerous relatives close by, all of whom are on the lookout for anything that looks good.

Now come carefully round this piece of brush and get down and crawl up towards the bank.

Tourist: Well, look at that fish, you can see the spots on him. Try and catch him.

Angler: Wait a minute; let's watch him feed; maybe we can learn something useful by watching him. If you notice, there is a patch of weed that comes almost to the surface. This restricts the stream and makes a little stretch of sharp current close under the bank. The fish keeps his position just at the lower end of this sharper stream and faces up stream watching for 'hoppers. Here comes a 'hopper. See the fish move a little to one side. Then see, just at the right moment he'll come to the surface and take it down.

Tourist: That certainly is a fine fish; look at him! Say, try and catch him.

Angler: All right, here goes. Well, did you see that? There was a real grasshopper a little nearer the fish than my fly was and he took that and never even noticed the fly.

Well, I'll try again when there are no real 'hoppers in sight to distract his attention.

Now is the time: watch the fly.

Tourist: Good, he's taken it.

Angler: Keep down; don't show yourself to the fish till you have to. You go down to that point of gravel and I'll bring the fish in. But don't stand up till you have the fish in the net.

Tourist: He is trying to get into those weeds.

Angler: Yes, he knows that once there, he has a good chance of getting off.

He's beginning to get tired now, but as this is a good sized fish I shall not bring him in until he is quite worn out.

See that? He turned on his side; but it's not quite time yet, he has straightened up again. However, it won't be long now. There, put the net down low in the water and I will bring the fish in.

Tourist: Say, that's some fish! See what he weighs.

Angler: Three and a quarter pounds, and only 18¼ inches long.

Now, I want you to catch something. Before we begin fishing again, I'll break the fly off and tie it on again.

Tourist: Why do you do that?

Angler: Because the gut has necessarily become weakened at the knot. Also you see how slimy and wet the fly is. It does not look as though it would ever be dry again. I'll just slam the fly onto the water and jerk it through a few times; that will wash the slime off. Next I'll press the fly between this little pad. It is almost dry now, but to complete the drying process, while we're walking down to the next feeding fish I'll make some false casts in the air. I am going to cast the fly on that shallow water. What did I tell you? It's absolutely 'bone dry' again.

Tourist: What is that little pad made of?

Angler: It is a piece of *amadou*, which is a fungus with the properties of absorbing moisture very rapidly.

Tourist: Something like blotting paper?

Angler: Yes, only with greater powers of absorption than any blotting paper that was ever made.

Now then, here is a fish you must get. There is just enough stream to ruffle the surface a bit, but it is a steady stream so that you can cast a straight line and not have any reason to expect a drag.

Tourist: What is a 'drag'?

Angler: A 'drag' is that which results from the line moving faster or slower than the fly. If a line is cast in such a way as to make the fly draw or pull against the current and thus leave a wake behind it, the fly is said to 'drag.' I dare say, you have observed that real flies and other insects hardly ever do this. A wary trout might just be on the point of taking a fly, but if the fly suddenly began to move across the surface leaving a track behind it, the suspicions of the fish would be aroused and in all probability he would have none of your fly. However, this fish is easy of access and there is not much danger of drag. Make your fly fall on the water about two feet above the spot where he took down the last 'hopper! Above all, when he takes the fly strike him gently, as though you loved him. Now go to it.

Tourist: That seems a good cast but the fish is taking no notice of the fly.

Angler: Wait a few moments before you cast again; if you are not in a great hurry wait until he has taken another real 'hopper.

Tourist: There, he took that one. I'll try him with the fly again.

Angler: Good cast. Keep your eye on the fly. Oh, he has it! Well done—you have hooked him.

Take your time. Don't get flurried, I will land him when you bring him in.

Tourist: He seems tired out, so make ready. Now, I'm going to pull him in toward you.

Angler: Well, well, that is certainly a nice fish—two and a quarter pounds—and the first you ever caught on a dry-fly.

Tourist: I shall have something to tell the rest of the party when I meet them tonight.

* * * * * * * *

Angler: It is only two o'clock, and the machine won't show up for another half hour. We have caught as many fish as the law permits, not large in numbers, but a full ten pounds; so while we are waiting for the machine I will give you a few more pointers.

As I have explained, the grasshopper fly, which we were using, floats on its side very much as the real insect does.

Water bred flies, on which trout feed, float on the surface with their wings up in the air. I will now put on an olive dun; we need not expect any fish to look at it, because they are far too much taken up with the grasshoppers at present.

Now, will you go up stream about forty feet and kneel down and watch the water closely?

Tourist: How will this do?

Angler: That is just about right. Now watch the surface; I will drop the fly about three feet from the bank. When you see the fly on the water tell me if you notice anything at all about it.

Tourist: Why, the fly is floating with its wings up in the air just like the real thing. How did you do that?

Angler: Now watch me make a cast. Instead of making the backward and forward strokes in a vertical plane, that is, the overhead cast which we used with the grasshopper fly, I make the strokes in a horizontal plane, which throws the line out sideways, and the fly curves around and for a moment the line, leader and fly are motionless over the water; then they fall gently, and the fly falling by its own weight naturally assumes an upright position and floats with its wings 'cocked up.'

Tourist: Why won't the overhead cast do that as well as the horizontal cast?

Angler: Because, no matter how carefully we cast, there is always the chance that the line will still have some slight momentum left in it from the cast; this motion, no matter how slight, may be enough to topple the fly over on its side. On the other hand, the horizontal cast throws the line out over the water, the line becomes extended and for a fraction of a moment all movement ceases, then gravity begins to act and the fly falls very lightly on the surface, as you have seen. Now come and try to do as I did.

Tourist: Let me see you do it again. All right, now let me have a try.

Angler: Try and see how close you can make your fly come to that little bit of rush that shows above the surface. You overshot the mark that time; the fly curled round too far.

Tourist: What made it do that?

Angler: You put just a trifle too much force into the cast. Try again.

Tourist: It was way this side of it. I guess I didn't cast quite hard enough that time. Ah! That is better. You try again.

Angler: This cast is much harder to do accurately than the overhead cast, but when you once learn it well, it is astonishing how simple it becomes.

Tourist: Why, the fly fell within three inches of the rush; I wish I could do that.

Angler: You will soon pick up the knack with practice, but watch this cast. This is the back-handed cast. It is the same as the horizontal cast only is made on the left hand side. The stroke somewhat resembles a back-handed stroke at lawn tennis, hence its name. It looks difficult, but comes just as easy as the other with practice.

Tourist: Well, here comes the machine, and I must thank you for a most enjoyable and instructive day.

Angler: I am glad you got some benefit from my teachings, and I hope you will become a highly proficient dry-fly man in the years to come.

Tourist: It certainly is a great sport. It has added to the charm of fly-fishing in a way that I thought hardly possible. I should like you to meet the rest of my party.

Angler: I will come over to the hotel after supper, about eight o'clock, but you had better take these fish, as there is just a chance that your crowd have not caught anything up at Pine Lake; even if they have, stream fish are always better eating than lake fish.

Tourist: Thanks very much. I have been hungry for trout for some time. Well, so-long till this evening.

CALIFORNIA FISH AND GAME

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All material for publication should be sent to H. C. Bryant, Museum of Vertebrate Zoology, Berkeley, Cal.

JULY 26, 1920.

"The man who illegally takes game or fish decreases food resources and defrauds his country."

A NEW EXECUTIVE OFFICER

Since our last publication Mr. Charles A. Vogelsang has succeeded Mr. Carl Westerfeld as Executive Officer of the Commission. This change is not regrettable in and of itself, for Mr. Vogelsang has had years of previous experience in the office he now holds, and has always enjoyed a deserved popularity for ability and zeal in the performance of his duties. No better appointment could have been made.

The only regret arises from the fact that Mr. Westerfeld's conduct left the Commission no alternative course except declaring his position vacant. A majority of the Board had long been convinced that a continuance of Mr. Westerfeld's services was not desirable. He became dissatisfied with his salary and devoted time due to the State to the maintenance and upbuilding of a private law practice and used the Commission's rooms and stenographer's services to that end. His lack of interest was soon reflected in the laxity of his subordinates; in view of which the majority of the Board came to feel that a change in the office of Executive Secretary was absolutely essential.

He was so advised and was accorded two months time in which to arrange for his retirement. At the end of that period, instead of resigning, he preferred public charges against Commissioners Newbert and Connell, the burden of which was that they were criminally responsible for the mishandling of State moneys. It was not, of course, charged that they had embezzled of misappropriated any of these moneys; that would have been too preposterous. The charge was that they did not remit to the State Treasury, month by month, all moneys arising from the sale of licenses, as the law requires.

The answer of the Commissioners was prompt and complete—that they had deposited these various license funds when, and as they actually became State funds—that canners' licenses, kelp and fisheries tonnage taxes, sold directly by the Commission, were remitted upon receipt; but that hunting and angling licenses, retailed for the greater convenience of sportsmen through a large number of so-called "Resale Agents," were only to be considered as State funds after final settlements with such agents, as they were entitled to refunds for all licenses returned unsold, and their commissions could only be computed upon their actual sales. In this interpretation of the law and of their duties, the Commissioners were wholly justified and fully exonerated by an opinion of the Attorney General of the State delivered in response to the Governor's request for a construction of the law.

Manifestly, but one course was open to the Board after such a baseless attack by a subordinate, and Mr. Westerfeld was ousted from office.

F. M. NEWBERT.
M. J. CONNELL.

OPTIMISM VERSUS PESSIMISM.

We all admire the optimist, the man who believes that all is going well in spite of adverse conditions, but sometimes an "all's well with the world" attitude develops apathy and a disregard of the need of readjustment or reform. There are many sportsmen who, in spite of circumstantial evidence, glibly point out that game conditions are of the very best, that game is continually on the increase, and that there is no need for worry as to the future. Too much of this sort of optimism prevents an awakened public sentiment which would be favorable to an improvement of conditions.

Although pessimism may sometimes mean a reduction of income from the sale of hunter's and angler's licenses, yet pessimism in regard to future game conditions often stirs the public to action. Certainly a study of the game situation in our state would convince anyone that action rather than apathy is the present day need, in so far as fish and game conservation is concerned. We are inclined to believe that there is greater danger toward fish and game in the optimistic point of view than in the pessimistic point of view.

THE VALIDITY OF THE MIGRATORY BIRD TREATY SUSTAINED.

On April nineteenth of this year the United States Supreme Court sustained the validity of the Migratory Bird Treaty, a treaty which was made between the United States and Great Britain for the protection of migratory birds in the United States and Canada. It also declared the Migratory Bird Treaty Act

constitutional which was approved July 3, 1918, to carry out the provisions of the treaty. Those who have appreciated the need for this law rejoice that it has finally been declared constitutional.

As early as 1904 Hon. George Shiras 3d introduced a bill which was defeated. But on March 4, 1913, the Weeks-McLean bill was brought before Congress through the efforts of the Interstate Sportsmen's Protective Association. This association necessarily took an important part in the fight.

The Weeks-McLean bill provided that the United States Department of Agriculture should have the right to make regulations for the taking of migratory birds of all kinds. The principal attack made on this new bill was by some of the Middle Western States, Illinois being one of the most prominent. The argument made against the bill, by Illinois and other states affected, was that it practically eliminated the sport of duck hunting except for those living on the big rivers and lakes, unless there was a great sufficiency of water during the fall season, an entirely uncertain factor. The Weeks-McLean bill was attacked in the Federal Courts and was held to be unconstitutional by several of the judges in the United States District Courts, with the result that the government having been appealed to, from the adverse decision in Arkansas, the case eventually reached the Supreme Court. While the act was under discussion the treaty was made between the United States and Great Britain for the protection of migratory birds in the United States and Canada. This treaty was enacted by Congress and after the law went into effect the federal government dismissed the appeal in the Supreme Court, as the old act was supplanted by the new one.

Before further discussing the Migratory Bird Treaty, a brief summary of the provisions of the treaty is inserted as follows:

(1) The close season on all migratory birds in both countries is between March 10 and September 1.

(2) No open season can exceed three and a half months.

(3) The season is closed the year round on all migratory insectivorous birds.

(4) It is unlawful to sell wild ducks and other water-fowl in the markets in either country.

(5) It is unlawful to rob the nests of the ducks, etc., in Canada.

Returning to the Migratory Bird Treaty Act and the final settlement in the Supreme Court; on July 2, 1919, application was made before Judge Arba S. Van Valkenburgh of the United States District Court, at Kansas City, Missouri, for a restraining order to prohibit United States game wardens from enforcing the Migratory Bird Treaty Act in that state. Judge Van Valkenburgh refused. Acting under the authorization of a joint resolution adopted by both branches of the legislature, Attorney General McAllister brought this case of the *State of Missouri*, Appellant, vs. *Ray P. Holland*, United States game warden before the Supreme Court (No. 609, October Term, 1919). It was on this case that the Supreme Court, sustaining the decision of the lower tribunal, handed down the concluding sentiment which determined the constitutionality of the Migratory Bird Treaty Act. McAllister, leading the fight against the act, maintained that it trod on the rights of the state. The opinion of the court as delivered by Justice Holmes reads as follows:

"The state, as we have intimated, founds its claim of exclusive authority upon an assertion of title to migratory birds, an assertion that is embodied in statute. No doubt it is true that as between a state and its inhabitants the state may regulate the killing and sale of such birds, but it does not follow that its authority is exclusive of paramount powers. To put the claim of the state upon title is to lean upon a slender reed. Wild birds are not in the possession of anyone; and possession is the beginning of ownership. The whole foundation of the state's rights is the presence within their jurisdiction of birds that yesterday had not arrived, tomorrow may be in another state and in a week a thousand miles away. If we are to be accurate we cannot put the case of the state upon higher ground than that the treaty deals with creatures that for the moment are within the state borders, that it must be carried out by officers of the United States within the same territory, and that but for the treaty the state would be free to regulate this subject itself."

In further answer to Attorney General McAllister's stand, and concluding the

delivered opinion of the court, Justice Holmes said:

"The treaty in question does not contravene any prohibitory words to be found in the constitution. The only question is whether it is forbidden by some invisible radiation from the general terms of the Tenth Amendment.

Here national interest of very nearly the first magnitude is involved. It can be protected only by national action in concert with that of another power. The subject matter is only transitorily within the state and has no permanent habitat therein. But for the treaty or the statute, the reason might be no birds for any power to deal with. We see nothing in the constitution that compels the government to sit by while a food supply is cut off and the protectors of our forests and our crops are destroyed. It is not sufficient to rely upon the states. The reliance is vain, and were it otherwise, the question is whether the United States is forbidden to act. We are of the opinion that the treaty and statute must be upheld."

The decree was affirmed, Associate Justices Van Devanter and Pitney dissenting.

SURVEY OF THE FUR-BEARING MAMMALS OF CALIFORNIA.

Many readers of CALIFORNIA FISH AND GAME who do more or less trapping each year will be directly interested in the announcement that on December 1, 1919, the Museum of Vertebrate Zoology of the University of California began an investigation of the fur-bearing mammals of the state. The purpose of the investigation thus undertaken is to secure reliable information as fully as feasible concerning the food, breeding habits and all other points worth knowing in the natural history of our fur-bearers. It is believed that this information is especially desirable at this time so as to determine the economic status of the various species, this being in many cases in doubt to ascertain the annual catch which may be safely taken without endangering the present breeding stock, and further to furnish an adequate basis for sound constructive legislation that will protect and develop the fur resources of our state. The income to the trappers of California from this source now amounts to nearly $400,000 annually.

All wild mammals of California whose pelts are commonly sold for fur are to be considered as fur-bearing mammals in this investigation.

Arrangements have been fully made, and the work is already well under way. Mr. Joseph Dixon, Economic Mammalogist of the above named institution, has spent a large part of the past trapping season visiting the trappers of the state and in securing first hand information relative to fur-bearing mammals. Diagrams to scale, measurements and photographs of breeding dens, notes on life history, together with photographs of the living animals in the wild have already been secured of several of our most important fur-bearers.

Blank records have been sent to the most progressive trappers of the state and these men have responded heartily. Many of them have examined the stomach contents of all the animals that they have trapped, so that we now have, in addition to field notes and collections gathered during the past eleven years by the Museum of Vertebrate Zoology, as a foundation to go on, over 350 definite records, from these reports of food found in the stomachs of practically all the common fur-bearers in this state. The trappers have also sent in all available records of females that they have trapped which have contained embryos (unborn young). This affords an accurate index to the time and rate of breeding of these animals and has a direct value in determining the date when the trapping season should close in order to "protect the crop" for the succeeding trapping season.

An important feature of recent field work has been the taking of paraffin casts of tracks made by live wild animals under natural conditions in the field. Such a cast faithfully reproduces every dimension and contour of the original track and thus affords an excellent idea of one sort of "sign" which may be looked for by trappers

It is expected that at least three years' work will be required before the results of the investigation will be ready for publication. It is planned that this shall be in book form. Arrangements have been made to have this volume illustrated with color plates by America's foremost animal artists. Chapters in the book will be devoted to decrease of fur-bearing mammals, causes and control of this decrease, the fur trapper in California, methods of trapping and curing furs,

legislation relative to fur-bearing mammals, agricultural and game interests versus fur interests, and federal and state forest reserves as permanent producers of fur-bearing mammals.

A general account of each species is being planned for, under which will appear topics such as common and scientific names, marks for field identification, description of pelage, moult, coloration, pads, claws, measurements, weights, skulls, teeth, variation, general distribution, type locality and specimens examined. Other topics, such as mannerisms, gait, posture of body, instances of behavior, timidity, voice, tracks and other sign, sanitation, breeding dens, breeding seasons and habits, number of young in litter, time of birth, precocity of young, paternal care, enemies, nature of food (exact data), feeding and forage habits, relative abundance, estimates of population, changes within history, relation to agriculture, grazing and forestry, and economic status, will be treated in detail.

Suggestions, information and observations of special interest will be welcomed from the readers of CALIFORNIA FISH AND GAME. In order to be of most value, the locality, date, and name of the observer must be given. Address communications to

Museum of Vertebrate Zoology,
University of California,
Berkeley, California.

ADEQUATE GAME PROTECTION.

What will make for better game protective measures throughout the United States is a question which concerns all of the people of the United States who are interested in the conservation of wild life. The *Pine Cone*, the official bulletin of the New Mexico Game Protective Association, in the issue of March, 1920, states that either the inadequate, conventional methods of game protection, in vogue in practically every state in the Union, must go, or the game must go. This is rather too radical a statement, but it is generally conceded that there is a vast need for improvement in the individual state game protective departments of the United States. There are three fundamental precepts which are applicable to the state game departments in general, and which, if striven for, and earnestly adhered to, would assuredly do much to not only solve the problem of more adequate wild life conservation in each state, but would perfect the appended system to the national department on conservation. They are as follows:

First—The slogan in every state should be, "Conservation through education."

Second—Plenary powers should be granted the commissions or departments concerned with game regulation and wild life resources, not with the idea of giving more power, but of avoiding the necessary delay entailed by state legislation. This point is aptly exemplified by again quoting from the *Pine Cone*: The state department of health is a commission to which the state legislature has delegated extensive authority in regulating public health—such as making rules for the sanitary handling of milk, closing public meetings in time of epidemic, etc. Suppose during the influenza epidemic, we had had to wait for a meeting of the legislature before closing public meetings. Yet that is no more illogical than waiting for a legislative enactment to close the season on a species immediately threatened with extermination." And

Third—Departmental duties and discretionary powers should be conscientiously executed. Particularly with regard to—

(1) The granting of permits.

(2) The practice of quantitative distribution of licenses.

(3) The setting aside of game sanctuaries proportionate to the requirements of the state.

In California it is worthy of note and emphasis that 3,107,520 acres—27 game refuges by legislative enactment, 3 game preserves by the Fish and Game Commission, 5 bird reservations, and the national park areas by the federal government—have been set aside where no hunting is allowed, and where game is allowed to breed unmolested. This is, as has been stated before, roughly speaking, about 3 per cent of the total area of the state.

It is by constructive methods, therefore, that the goal of adequate wild life conservation will be reached.

A NATIONAL COMMISSION ON THE CONSERVATION OF WILD LIFE.

In the *Review* of April 17, 1920, there is an editorial suggesting the value of a national commission on the conservation of wild life. The *Review* makes the following statements:

"Good legislation in some narrow corner of the field results, now and then; but permanent advances along the entire line is impossible, so long as the matter is handled in a piecemeal way."

It is very true that greater cooperation in the work of conservation is needed, particularly in the consideration of effective methods of dealing with the problem of migratory species. The starting point for this work is conservation by education in the different states, and from this will develop united public sentiment and greater national benefits.

The United States Bureau of Biological Survey under the United States Department of Agriculture may be considered as the present national organization for the conservation of wild life. It is the beginning of what must necessarily be an actively growing institution. However, notwithstanding the unquestionable value of the United States Biological Survey, a commission would doubtless have much more freedom than the present United States Bureau has, and with a competent, fit body of men, might be able to accomplish more.

The vital point which still remains is that any central commission or national body, no matter how efficient in itself, would be more or less ineffectual unless it has the support of the individual states. Therefore, the effort of each state should be toward education which would lead directly to a cooperative spirit and the unification of endeavor. Without educational methods there will be more chance for misguided legislation, lobbying, aggressive criticism and the accompanying lack of coordinated national strength.

The conclusion is that the idea of a national commission is of paramount interest, but any national organization will be greatly hampered until it has creditable state support.

GUNS USED BY DUCK PIRATES.

Although few of the big guns used by the duck pirates, or night gunners, on Chesapeake Bay and the rivers of Maryland, are in use at the present time, yet occasionally a new capture is made. The collection photographed is a collection

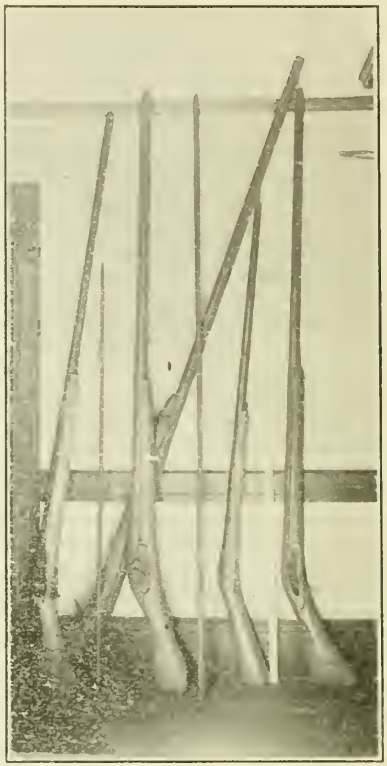

FIG. 33. Large bore guns used by duck pirates on Chesapeake Bay, Maryland. These are similar to those used by duck pirates in California previous to protective laws which put them out of business.

which has been assembled from time to time by the game wardens of Maryland. The guns measure 10 feet and weigh about 115 pounds; they are very crude affairs, some of them having been made by the "village blacksmith." Like guns were used by market hunters in California until legislation prohibited their use.

WM. H. FISHER,
Baltimore, Md.

SALMON FISHING AT MENDOTA WEIR.

Prior to the last two decades, salmon fishing in the upper waters of the San Joaquin River was confined to the use of seines and spears. Following closely

on these methods came the grabhook. This latter method could not be employed until some barrier was constructed which would interfere with the passage of the salmon toward their spawning ground. When such a barrier was devised the fish congregated in large numbers and thus became endangered by two methods of capture. Either, due to their attempts to leap the obstruction, they became a mark for the spearsman, or while massed below a weir under water they became the unseen target for the unscrupulous—so-called—sportsmen, or avaricious fish vendor, neither class caring what method they employed of catching the fish so long as they got them.

In about the year 1910 or 1911, the legislature of California attempted to check the use of grabhooks, but in framing the law, the wording of the protective section has proved to be inadequate. The section which has been the source of many bitter controversies between the officers of the law and the fellow who wanted the fish reads as follows:

"Section 634. Every person who, except with spear or hook and line, said hook and line to be used in the manner commonly known as angling, takes, catches or kills any salmon * * * is guilty of a misdemeanor."

In so far as I know, we have no court interpretation on this section, so the matter is still in dispute.

Passing from the illegal methods of taking salmon resorted to by the unscrupulous fisherman, we have the spoon hook and line method practiced by the many clean true sportsmen, some of whom come from distant places in the state to take salmon. And not infrequently, the sportsman of this type is rewarded by a big fellow taking the spoon in his mouth, which results in a fight that will often last for a half an hour or an hour. Thus the angler is rewarded by a sportsmanly encounter which keeps him on keen edge until the salmon is landed.

Why salmon strike at a spoon is not really known, for they apparently take no food after entering a freshwater stream, the stomach becoming useless so that food would probably not digest even if introduced artificially into the stomach. Then, we are prone to ask, "Why does he strike?" His known fighting qualities and unbounded determination to reach his recognized spawning bed may be an explanation for his actions. One seldom ever hears of a salmon taking a spoon until after he passes the town of Firebaugh, which leads to the inference that he apparently does not strike a spoon, after leaving the sea, until he meets with interference on his journey to his spawning bed. The town of Firebaugh is some six miles below Mendota weir, and very few salmon are taken on hook and line outside of a mile or two down the river, from the latter town. But at the weir, I have noted more than a hundred fish taken in twenty-four hours, fairly caught in the mouth with spoon hooks.

Those salmon which pass the weir travel up the river and pay little heed to lures of any kind, until they reach their final homes or spawning beds, in and near the hills. After reaching the cobble bottoms where they deposit their spawn, they again strike the spoon hook; at this time they furnish the greatest sport for the rod-casting enthusiast. Not only is the angler kept constantly on the alert, but he can find plenty of salmon pools wherein he can "let fly" one hundred and fifty feet of line and then some. The good fishing usually extends from the period prior to the time that they deposit their eggs until sometime in September; but individual salmon continue striking even on through the winter months.

Unless further protection is extended to the salmon very soon, the thrill of a salmon strike in the San Joaquin will be history. We have been very properly forced to give up the fall run of salmon to the agriculturist, and now our spring run is being depleted very rapidly. We lose vast numbers of fry in the irrigating ditches, as they travel down toward the sea. Therefore, unless we extend our best efforts to protect these fish quickly, the salmon of the upper San Joaquin River will pass into history as our elk and antelope have done.

S. L. N. Ellis.

CHEAP SPORT FOR INFLUENTIAL VIOLATORS.

There is many a man who would gladly pay $5 for the privilege of killing a Canada goose, provided he was sure that this was the only penalty he must pay and that he would not be prosecuted and branded as a man unwilling to play fair with his brother sportsmen. Yet there are men in this country today who are enjoying this privilege, or rather stealing it, at the low rate of $2.50 per violation. It was only as recently as September 23, 1919, that William F. Taubel, a wealthy citizen of Riverside, New Jersey, was fined $5 by a United States District Court in Trenton, New Jersey, for violating the Migratory Bird Treaty Act, in that he decoyed to a blind and killed two Canada geese. Since that time the same judge who imposed the fine in the Taubel case has fined other violators of the same law as low as $2.50.

These fines contrast rather glaringly with a fine of $1,000 imposed on October 22 of the same year, also in Trenton, New Jersey, on Emilo Trowti, an alien resident of West Amwell, New Jersey. Trowti was found guilty of violating the New Jersey game laws, and was surely deserving of his punishment, as he was caught with a bag containing forty-eight song and insectivorous birds. However, fines similar to the first ones will surely cheapen the federal law and make difficult the enforcement of the Migratory Bird Treaty Act.

It is gratifying to know that other district judges in the United States do not share the views of the one who imposed these low fines. In Wisconsin three hunters were recently fined $100 each for attempting to kill ducks after sunset, while in Connecticut a violator was sentenced to three months in jail for a violation of the Migratory Bird Treaty Act. It is only by stringent methods that the true intent and meaning of this act can be carried out.

WATCH FOR BANDED DUCKS.

All waterfowl should be carefully examined to ascertain whether or not they are banded. The Bureau of Biological Survey, United States Department of Agriculture, Washington, D. C., and several individuals are making a practice of banding waterfowl, to ascertain their migratory lines of flight, and it is quite necessary that full reports regarding the taking of any banded bird be made to the proper authorities.

QUAIL IMMUNE TO STRYCHNINE POISONING.

Important evidence has been secured regarding the comparative immunity of quail to strychnine poisoning. Field observations and feeding experiments conducted in California showed that one valley quail can eat grain containing enough strychnine to kill 12 ground squirrels without showing the slightest ill effect from the poison. A number of similar experiments on a mountain quail and a bobwhite gave like results. The information thus gained will tend to allay fears in certain quarters that poisoning campaigns against ground squirrels result disastrously to these valuable game birds. Investigations in Saskatchewan, Canada, have proved that grouse are equally immune to strychnine poisoning. *Ann. Rpt. U. S. Dept. Agric.*

BIOLOGICAL SURVEY TAKES OVER WORK OF AMERICAN BIRD-BANDING ASSOCIATION.

The Bureau of Biological Survey, U. S. Department of Agriculture, Washington, D. C., has taken over the work, good will, effects, and records of the American Bird Banding Association, formerly conducted from headquarters at the American Museum of Natural History in New York City. In the future, therefore, the issue of bands and information relative to the work will be from this office, to which all records of birds banded and recovered, should be sent. There will, of course, be no further dues or initiation fees.

In taking over the work of this association, the Biological Survey is particularly desirous of retaining your hearty cooperation, upon which a large part of our success will depend.

The work is to be advanced along two principal lines: first, the trapping and banding of waterfowl, especially ducks and geese on both their breeding and wintering grounds; and second, the systematic trapping of land birds as initiated by Mr. S. Prentiss Baldwin. By maintaining volunteer trapping stations at

intervals over the country, and consistently operating them throughout the year, a mass of valuable data relative to the migration routes, speed of travel, and affinity for the nest site of the previous year, as well as a quantity of life history information about the individual will be acquired.

To do this with any degree of success, the observer should be advantageously located with regard to bird habitats, as it is obvious that traps can not be regularly visited if located at any considerable distance from the operator's usual station during the day, and it is imperative that they be visited at least two or three times daily to prevent the birds captured from injuring themselves against the wires. The fascination of the work, however, will amply repay anyone for the little time and trouble, and for the expense for traps and baits.

Experiments are now under way to determine the most suitable types of traps and the best methods of trapping; and arrangements are being made for a supply of bands.

In the meantime, however, the Biological Survey desires to invite continued cooperation and will welcome any inquiries or suggestions for the advancement of the work. The Bureau particularly desires to get in touch with those advantageously located for the establishment of trapping stations.

NEW ZEALAND ENCOURAGES FISHING INDUSTRY.

Recently the Industries Committee, of the House of Representatives of New Zealand, traveled throughout the Dominion to find out how new and budding industries might be assisted and encouraged. The fishing industry amongst others was investigated and the following interesting recommendations were made:

That the best way to bring about the development of the industry is by organization for catching, distributing and, where necessary, preserving the fish. The only way to provide adequate supplies and prices within the reach of all is by trawling.

It recommended that a separate fisheries department of the government be established with a director and staff.

That the government own and operate steam trawlers, and establish fish-chilling and ice-making plants near the fishing grounds and engage generally in the business.

That the government advances be made to fishermen on the security of their boats and fishing outfit.

That the fishermen's boats be insured by the state office at a low rate.

That a systematic, scientific and practical survey of fishing grounds be undertaken without delay, and that the government purchase a properly constructed and equipped vessel for this work.

That government assistance be given to encourage the canning, curing and commercial preparation of fish food, special attention being given to the canning of crayfish.

That encouragement be given for the manufacture of fish manure and the production of fish oil (other than whale oil).

Several recommendations were made for licensing and controlling the business of whaling, among which were (1) that the whaling company should give guaranty that every portion of a whale's carcass will be used, and (2) that each company be confined to sixty miles of coast and each must take at least a certain number each year.

KARAKUL SHEEP INDUSTRY.

A few years ago considerable publicity was given the fact that some karakul sheep, noted for their fur, had been imported from Siberia. Added interest now pertains to this importation because of the fact that some of the original imported stock has been moved to California from Texas. The Kerman Karakul Sheep Company secured 200 animals from Texas in 1918, and the herd is now considerably larger. The outstanding importance of this breed lies in the splendid fur which is produced. It now appears also that this breed will do well even on scanty alkali vegetation. The karakul sheep will stand on its hind legs and browse high up, and therefore needs less territory as range. The lambs grow rapidly, sometimes attaining a weight of sixty pounds in two months. The mutton has a peculiar gamey flavor, and the large amount of fat (about

twenty pounds to each animal) is valuable. According to P. A. Ingvason, manager of the ranch at Kerman, a

Fig. 34. Karakul lamb showing fur in prime condition. The Karakul sheep industry has spread to California.

better and hardier sheep is obtained by crossing the karakul with a Mexican wool sheep.

A new fur industry is therefore being developed in California. Although the animals utilized are domesticated, yet the increase of furs of this sort should add much to reduce the toll taken of native fur-bearers, and consequently this new project should be looked upon with favor.

SUGGESTED BIRD RESERVATION ON MONO LAKE.

A colony of gulls is located on a large island in Mono Lake where it is customary for them to breed each year. Recently a desert homestead has been taken up with an entry on the lake, and a summer residence has been built there. I understand that the homesteader proposes to stock the island with goats, which may be a fad that will be short lived. However, it strikes me that some attention should be given to the preservation of this colony of gulls, which is somewhat unique on account of the fact that it is situated so far inland, and also because it adds greatly to the interest taken in the Mono Lake region. This territory is rapidly coming to the front among the tourists as a recreation ground, and I feel that all due precaution should be taken to retain the interesting features of the locality. I have had it in mind for some time to advocate the setting aside of a sufficiently large portion of this island as a bird reservation, to insure their continued residence, through the aid of due protection.

No doubt you will be interested in this case, and if you care to take it up further, I will be glad to do all in my power to assist you in the matter. It is quite evident that unrestricted goat raising on the island would have a disastrous effect on the birds.

W. W. Maule.

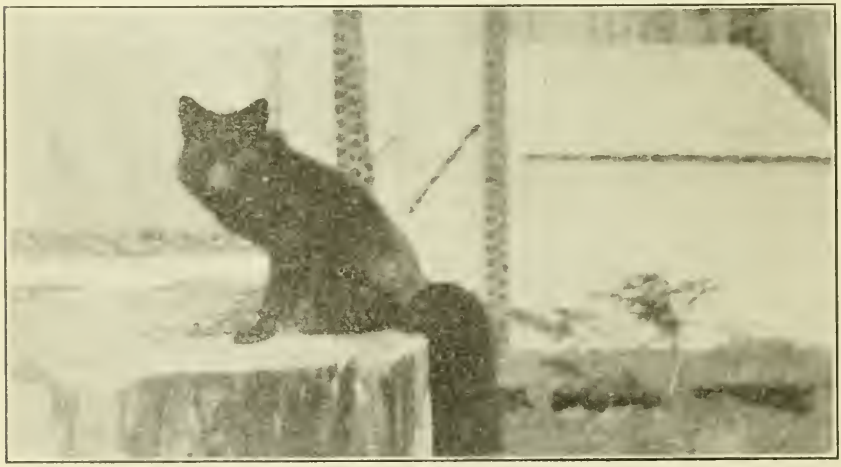

Fig. 35. Black fox at Tahoe Fox Farm.

FOX FARM A SUCCESS.

The foxes at the fox farms of Lewis and Kierman, situated near Pomins, Lake Tahoe, are doing splendidly. The snow and cold, moist atmosphere at Lake Tahoe puts the fur in prime condition. The accompanying photograph is a picture of "Tahoe Queen," a black silver fox at the fox farm of Lewis and Kierman, which is valued at $3,000. The results thus far have been so encouraging that Lewis and Kierman are contemplating enlarging their fox farm of silver black foxes. JOSEPH H. SANDERS.

DEER PROTECTION IN SISKIYOU COUNTY.

There is nothing so abhorrent to the true sportsman as the wanton slaughter of deer, and especially the ruthless killing of a doe. One morning in March, 1919, the writer came upon a spectacle of this kind which so aroused him that he is prompted to utter a protest against such butchery. He was riding on horseback through the winter range for mule deer in Siskiyou County, which extends from the Weed Big Springs road as far north as the foot of Goose Nest Mountain and as far east as Morrison Station on the Klamath Falls line. In this section there are several hundred deer that come from the higher mountains and even from the lava beds to winter. There was about one inch of snow on the ground. Suddenly there appeared in the snow a blood trail with a man's track following. The writer determined to investigate. He did not have far to go when he came upon a sight that made his blood boil. There under a little bunch of pines he found the head of a mule doe and nearby two unborn fawns that the violator had taken from her. It was late in the evening and the writer had no kodak. When he returned next morning to get a picture he found that the coyotes had been there in the night and nothing remained.

This, however, was not the first slaughtered doe that the writer has found. The previous year on this same range he had come upon a mother and two yearling fawns, both does, wantonly killed and left for the coyotes. Furthermore, almost every day of the week shots may be heard in this section and evidence found of deer killed out of season. Game hogs have even gone so far as to build roosts in the trees, that they may have a better vantage point to watch the runaways.

In view of the conditions existing on this range it would almost seem advisable that a special patrol be established here from the first of December until the first of May, by which time the deer will have gone back to their summer ranges and can protect themselves.—EDWIN H. BUSCOMB, Edgewood, California.

BIRD CENSUSES.

In order to better regulate national affairs it is necessary to know the population from year to year so that fluctuations may be noted. Hence the ten year census. Likewise if we would control bird and animal life to better meet our needs it is necessary to obtain figures as to the wild life population. A number of states have recently inaugurated game censuses and the United States Biological Survey is advocating bird counts to gain knowledge of the total bird population and its fluctuations from year to year. Reliable observers the country over are being sought to undertake bird counts during the nesting season and to forward reports. In the hope that some of our readers may be interested in the work, and to show the thorough manner in which the work is undertaken, we are adding the following directions issued in Washington:

The height of the breeding season should be chosen for this work. In the latitude of Washington, D. C. (latitude 39 degrees), May 30 is about the right date for the first count; in the latitude of Boston the work should not begin until a week later, while south of Washington an earlier date should be selected. In any locality the count should be made soon after the end of the migration and during the early part of the nesting season.

What is wanted is a count of the pairs of birds actually nesting within the selected area. Birds that visit the area for feeding purposes only must not be counted, no matter how close their nests may be to the boundary lines.

In making this count, it is a good plan to begin at daylight some morning at the height of the nesting season and zigzag back and forth across the area, counting the male birds. Early in the morning every male bird is usually in full song, and at that season may safely be considered to represent a breeding pair. The results of one day's count should be checked and revised by several days of further work to make sure that every bird

counted is actually nesting within the area and that no species has been overlooked.

The tract selected should represent the average farm conditions, and should not have an undue amount of woodland. It should contain not less than 40 acres—a quarter of a mile square—nor more than 80 acres, and should include the farm buildings, with the usual shade trees, orchards, etc., as well as fields of plowed land and of pasture or meadow.

The final results of the count should be sent to this Bureau as soon afterward as convenient, and should be accompanied by a statement of the exact boundaries of the selected area, so explicitly defined that it will be possible 25 years hence to have the count repeated. The name of the present owner should be given, together with a careful description of the character of the land, including a statement of whether it is dry upland or moist bottom land; the number of acres in each of the principal crops, or in permanent meadow, pasture, orchard, swamps, roads, etc.; the kinds of fencing used; and the amount of brush along fences, streams, roads, or in permanent pasture.

If there is an isolated piece of woodland comprising 10 to 20 acres conveniently near, a separate count of the birds nesting therein also will be useful. In this case the report, in addition to specifying the size and exact boundaries of the area, should state the principal kinds of trees and whether there is much or little underbrush.

A third count desired is of some definite timbered area—40 acres, for instance—which is part of a much larger tract of timber, either deciduous or evergreen.

Still a fourth count, supplementary to these, is needed. The average farm in the Northeastern States contains about 100 acres, and the average count hitherto has been of the birds nesting on the 50 acres of the farm nearest to and including the farm buildings. It is now necessary to obtain counts of the remainder of the farm, the wilder part containing no buildings, especially on the same farms where counts about the buildings have already been made.

Furthermore, counts on any other kinds of land are much desired for comparison.

Persons who have made counts in previous years are requested to repeat the work on the same areas. New areas selected should be such as are not likely to have their physical conditions much changed for a number of years. If succeeding annual counts show changes in bird population, it will thus be known that they are not due to changed environment.

The several kinds of counts are needed for a study of the relative abundance of birds under changing or stationary conditions. It is hoped that many persons interested in bird life will make one or more counts this season. As the department has no funds to pay for this work, it must depend wholly on voluntary observers. A supply of report blanks will be furnished on request. Requests for these should be addressed to Chief, Bureau of Biological Survey, U. S. Department of Agriculture, Washington, D. C.

BEAR PROTECTION FAVORED.

It is reported that interest in black bear protection is always increased at the time of a blackleg epidemic in that the bears can be depended upon to eat up cattle which have died from blackleg, thus helping to prevent the spread of disease. Residents of Tuolumne County in past years have been wide awake to this benefit conferred by the black bear.

FACTS OF CURRENT INTEREST.

Work on the new $30,000 Tahoe Hatchery was resumed May 1 and it will be ready for occupancy August 15.

Ray Morris of Taft, California, was tried on March 10, 1920, on the charge of having deer in his possession during the closed season. He was sentenced to thirty days in jail and fined $250.

Floyd E. Baker of Los Angeles was caught by Deputy Ober in Nine Mile Canyon, Inyo County, while attempting to leave the mountains with twenty-four deer hides and nine sets of antlers which he had secured in Tulare County. He was tried April 27, and sentenced to 150 days in jail and a fine of $350.

Low water conditions have precluded a large take of rainbow trout eggs this season. At some of the best egg collecting stations but small takes of eggs have been secured.

The Fish and Game Commission has carried its educational campaign into the summer resorts of the state. In cooperation with the National Park Service, lectures and field trips are being furnished visitors to Yosemite National Park.

According to records kept by deputy game commissioners and forest employees, 1243 deer were killed in Trinity County during last year. It is estimated the total number was at least 2000, as many hunters come into the county during the hunting season and kill deer, records of which are never kept.

HATCHERY NOTES.

W. H. Shebley, Editor.

On April 30, the application lists for fish for the season of 1920 were closed. Prior to this date application blanks had been forwarded to all sections of the state, in order that interested parties might have ample opportunity of filing applications for fish for the purpose of stocking all streams open to the general public for fishing purposes. The applicants were cautioned that it was very necessary to have their formal applications on file in the office of the Department of Fish Culture prior to the date of closing, in order that they might be assured of receiving a supply of trout fry this season.

Nearly five hundred applications were received, and they came from every section of the state where conditions are favorable for the planting of trout fry. The majority of the applications were received from private individuals, although there were also a considerable number received from boards of supervisors, chambers of commerce, public associations of anglers and fishing clubs.

The season just closing has been a very unfavorable one for collecting trout eggs. Every egg collecting station was in operation this season and every effort was made to obtain a larger number of trout eggs than ever before, as it was realized that the demand for fry would be greater than ever before in the history of the Commission. The completion of the hundreds of miles of new highways and the ever increasing number of anglers is in large measure responsible for the increasing demand.

The drought of the past winter and early spring made it very difficult to obtain even a fair take of eggs at some of the best stations. The streams were so low in some sections that the spawning trout could not possibly ascend the streams to the points at which the egg collecting stations are located. This condition was noticeable at the Snow Mountain Egg Collecting Station on the Eel River, where in normal seasons from four to seven million steelhead eggs are obtained. This season less than one million eggs were taken at this station.

The run of fish in Scott Creek where the Scott Creek Egg Collecting Station is located, was also far below normal and less than half the usual number of steelhead trout eggs were obtained.

In the Bear Lake section, in San Bernardino County, where new racks, traps, holding tanks, etc., have been installed on the streams tributary to the lake, the take of rainbow trout eggs was practically a failure. Where there was every reason to expect a take of from four to six million eggs, only one and one-half million were obtained. In this section the long drought was followed in the early spring months by heavy snows and stormy weather. As the season advanced water in the lake was comparatively warm, while the streams flowing into the lake ran bank full of cold, roily water from the melting snows in the surrounding mountains. Under these conditions the spawning fish, which had gathered close to the mouths of the creeks, would not enter the streams to spawn except in limited numbers. Over retention of the eggs resulted and consequently when the fish were taken in our traps, the majority of the eggs were impossible of fertilization.

At the Klamath River stations in Siskiyou County there was a fair run of rainbow trout and a fair take of eggs was obtained.

Conditions at the Almanor Hatchery in Plumas County were unfavorable for egg collecting operations and we were unable to take any eggs at the station. A fair take, however, was obtained at Clear Creek Hatchery and the Domingo Springs Hatchery promises to turn out a million or so of rainbow trout eggs.

The water levels in Lake Tahoe were far below normal this spring, and while the season has not closed at this writing, it is extremely doubtful if more than a third of the normal take of black-spotted trout eggs will be obtained.

Our extensive system of breeding ponds at the Mount Shasta Hatchery has, however, produced a fine large take of Loch Leven and brown trout eggs and also a nice lot of eastern brook eggs. These eggs have all been hatched, and the resulting fry are thriving well and will soon be ready for distribution.

Under these conditions it will be readily seen that the number of trout fry available during this coming season

will be less than during several previous years, and consequently the allotments to the various applicants will be materially less than usual.

Two distribution cars will start out with fish about the middle of June, and applicants are urged to take every precaution to insure the safe delivery of all the fish allotted to them.

Applicants are instructed to make proper arrangements for meeting the fish cars promptly on arrival of the train as scheduled, provided with adequate transportation to handle the fish from the station to the streams to be stocked. Also that they have on hand the amount of ice required as per instructions mailed to them in advance of the date of shipment. The applicants are further urged to follow instructions carefully in the matter of avoiding delays in order that the work of aeration of the water may be lessened and to insure the fish arriving at the streams at the earliest possible moment and in the best condition. Attention is called to the fact that it is necessary to keep the fish protected from bright sunlight, when removing the covers of the cans for the purpose of aerating the water or inspecting the fish.

On reaching the waters to be stocked the temperature of the water should be equalized by placing a can of fish in the stream and then inclining the top of the can up stream thus allowing the water to flow gently into the can, or by pouring out a portion of the water from the can and filling it with water from the stream to equalize the temperature. Fish should always be planted in shallow, running water, avoiding pools, and should be well scattered.

In the past, in many instances, considerable numbers of fish have been planted by some of the applicants at one or two points on a stream. Far better results can be obtained by distributing the fish a can at each point along a considerable distance of the stream.

FIG. 36. The old Tahoe Hatchery, which will be abandoned when the new hatchery is completed.

In planting fish where it is necessary to carry the cans any distance from the wagon or auto truck, it is imperative that someone remain with the wagon and aerate the water in the remaining cans of fish during each planting. Also when stops are made for meals or other delays someone must be left with the fish to give the water the necessary aeration.

It is hoped that approximately 15,000,000 trout fry will be available for distribution, despite the unfavorable conditions for egg collecting operations this year, and if this number are properly planted, the streams will be provided with an adequate number of fry to insure fairly good fishing next season.

NOTES FROM THE STATE FISHERIES LABORATORY.*

WILL F. THOMPSON, Editor.

THE "DAY" AND "NIGHT" SURF-FISHES OF NORTHERN CALIFORNIA.

It is very obvious that we know comparatively little about the fishes which inhabit the surf, or come there to spawn at the proper seasons. Notes regarding them are all of some value and usually will form valuable additions to our knowledge. The following are made from specimens received from Captain Tibbetts, of Eureka, to whom we are therefore considerably indebted.

In CALIFORNIA FISH AND GAME for October, 1919 (Volume 5, No. 4), on page 203, Captain Tibbetts is quoted regarding two species of fish which are caught in the surf. One of these, known as the "night surf-fish," he believed to be the grunion, but upon our expressing some doubt regarding this, he sent us three specimens, taken a little south of Trinidad Harbor, on the ocean beach. They prove to be a species of the genus *Osmerus*, and its occurrence under the conditions noted is a fact well worthy of attention. What its habits are, and whether it spawns in the surf, is not known.

Captain Tibbetts was also kind enough to send us four specimens of the "day surf-fish." These, as we surmised in the article quoted above, belonged to the genus *Hypomesus*, which is caught in the surf along the California Coast north of Monterey.

THE GRUNION AT MONTEREY.

The spawning of the grunion is not known north of Long Beach, either to scientific men or to others. But, as Mr. Carl L. Hubbs has pointed out to us in a recent letter, the type specimen of the species was recorded as from San Francisco. Jordan and Hubbs in their review of the family *Atherinidæ* state that the original specimen came from San Francisco Bay, in which they supposed the species to live. However, this is improbable, when the life history of the species and its habits of spawning in the sand are considered. It is more likely that the fish was found in the markets, and came from some other locality on the open ocean close to San Francisco. A specimen of the grunion was found, on February 28 of this year, in the Monterey markets among fish taken locally in a seine.

In view of this proof of the presence of the species in these waters, high hopes were entertained that this remarkable species would be found spawning on the beach in northern waters, and attempts were made, in so far as circumstances permitted, to find them or their eggs.

On the night of March 6 Mr. Weymouth and Mr. Sette kept watch on the beach at Oceano, and found no sign of spawning fish, although the tide was the same approximately as that of the first run of the preceding year at Long Beach. Since the beach at Oceano is a splendid one, it was hoped that proof of their presence would be obtained there if any run occurred.

On April 6 a thorough search for eggs was made by Mr. Thompson, Mr. Sette and Miss Edwards along the beach between Del Monte and Seaside in Monterey Bay, but no signs of them were found, although if spawning had occurred to any extent during the preceding full moon tides, which were at their crest on the third of April, they would have been found. Again, on May 5, two nights after the full of the moon of May 3, Mr. Thompson and Mr. Weymouth patrolled the beach during the proper stages of the tide, but saw no signs of the fish themselves. In conjunction with the total lack of popular knowledge of a run, these attempts throw a certain amount of doubt on the occurrence of any extensive spawning run in these waters. It is of course still possible that a small run occurs somewhere near by, perhaps even on Del Monte Beach, or it may be that the specimens to be found here are simply strays. Further search will be made whenever opportunity offers.

*California State Fisheries Laboratory, Contribution No. 19.

ENEMIES OF THE GRUNION AT LONG BEACH.

The normal run of grunion occurred at Long Beach on May 4, 5 and 6, and on the fourteenth Mr. Thompson and Mr. Higgins obtained large numbers of pods of eggs for the purpose of photographing the hatching when the eggs were in the proper stage. Greatly to their surprise, every third pod at least was badly infected with maggots, presumably those of the same fly whose maggots were found the preceding year but of which the species name was not determined. Even the pods set aside as clean were subsequently found to be infected, and it proved impossible to raise the eggs to the hatching stage without great injury. Not one in twenty-five of the eggs would hatch when the proper time came, although they were for the most part alive. As the normal percentage is near 100, this was a considerable disappointment to the photographer. The failure to hatch was undoubtedly due to the maggots, in conjunction with a very extensive infection by a small nematode worm which accompanied the maggots. The sand in which the eggs were was foul and ill smelling.

ALBACORE OFF SAN FRANCISCO IN DECEMBER.

Mr. H. B. Nidever, assistant in the San Pedro office, furnishes the following note regarding the albacore:

F. G. Grotto, of San Pedro, who has fished for albacore here for several seasons, tells me that while he was making a trip on the "Daisy Mathiews," a lumber schooner from San Francisco to Honolulu, he caught two albacore trolling from the steamer about 280 miles out from San Francisco. He said that he saw two schools of fish and that those he caught weighed 18 to 20 pounds and that they had squid in their stomachs. The gonads of the fish were about one foot long and he could see developing eggs about the size of a pin head. They were caught on the eighteenth of December, 1919.

The reader who is interested might refer to a record of the taking of albacore off Northern California, on page 203 of the October number of CALIFORNIA FISH AND GAME for 1919. Such records are interesting as showing extremes of distribution.

OIL ON PISMO BEACH.

Professor Weymouth, engaged in studying Pismo clams for the Commission, reports that on the twenty-first and twenty-second of May, on the beach at Oceano and Pismo, a great many dead sea birds were observed covered with oil, and that many more still alive were lying on the beach with their feathers gummed with heavy oil. Dogs running on the beach chased and killed many of these. Ducks of various species and loons were observed among them. Professor Weymouth stated that he did not observe any clams dead from oil, probably because he was not on the beach at the right time.

The destruction caused among birds and mollusks by floating crude oil has been pointed out several times in these columns, and it is evident that the damage is still proceeding. An article by Professor Weymouth in regard to the destruction of mollusks appeared in CALIFORNIA FISH AND GAME, volume 5, No. 4, page 174.

CONSERVATION IN OTHER STATES.

NEW YORK DISPLAYS COLORED MOTION PICTURES.

Motion pictures in natural colors, showing the Adirondacks in summer and also at the height of their autumnal brilliancy, will form one of the special features of the New York Conservation Commission in carrying on its educational compaign. These natural colored motion pictures, taken during the past season, are the first of their kind ever taken in the Adirondacks, and were produced by an entirely new process.

HEAVY PENALTIES FOR HUNTERS IN MICHIGAN.

Five hundred dollars, the maximum fine, recently was levied by a judge in Michigan against a hunter for selling 32 ducks in violation of the Migratory Bird Treaty Act. Another violator of the same law, in Connecticut, who has been

guilty of repeated offenses, was sentenced recently to three months in jail. This offender was not given the alternative of paying a fine. The Migratory Bird Treaty Act has been in force since July, 1918, and several hundred convictions have been secured. These cases are cited by the Biological Survey, United States Department of Agriculture, which administers the law, to show the increasing concern with which the courts regard violations of this important statute, designed to protect migratory birds, insectivorous birds and nongame birds.

COOPERATIVE INTEREST BETWEEN STATES.

The NewYork Zoological Society offered a reward of $200 for the arrest and conviction of any one killing antelope. On December 11, 1919, the following resolution was passed:

Resolved, that the chairman be directed to notify Mr. Willian L. Finley, State Biologist of Oregon, that the New York Zoological Society hereby authorizes and will pay a reward of $200 for information leading to the arrest and conviction of any one killing wild antelope in the State of Oregon, upon the condition that the Oregon Fish and Game Commission give publicity and post notices to the above effect, and the treasurer of the society is hereby authorized to pay from the funds of the society the stated reward upon satisfactory evidence of such conviction.

The payment of this reward has been authorized and a check for $100 has been sent to Mr. George Tonkin, U. S. Game Warden, box 1531, Boise, Idaho, and a check for $100 has also been sent to Sheriff E. E. Woodcock, Lakeview, Oregon.

The Boone and Crockett Club are about to pass a similar resolution, which will apply to future convictions only.

WATER POLLUTION IN OHIO.

For ten years the water pollution problem was ineffectually dealt with in Ohio. Between 1909-1919 the responsibility of the yearly increasing urgency for action was passed from one department to the other—Health, Fish and Game and the State Chemists. The chemists accumulated much analytical information but they seemed to have found no remedy. In 1919 Mr. A. C. Baxter, Chief of the Ohio department, Mr. J. W. Stuber and Mr. J. T. Travers, Supervisor Stream Pollution, Ohio Department of Agriculture, took hold of the question and now, after having conducted experiments for over a year, Mr. Travers and Mr. E. J. Lewis, a water expert and chemist of Bellaire, Ohio, are ready to demonstrate the satisfactory results of their experimentation.

The process is the treatment of the pollution in vats as it leaves the factory or mine with a chemical having a lime base. This chemical precipitates or controls any organic pollution held in suspension in the vats, and also releases any poisonous gases.

The cost of the treatment is from 2 to 3 cents per thousand gallons, depending on the nature of the pollution, and the cost of installation is about $1,000. It is claimed that the by-products will often more than pay for the cost of installation and operation. The character and amount of polluted matter which is emptied into the Ohio streams daily is as follows:

Steel Mills—Sulphuric acid, three per cent solution. Six thousand gallons per day as an average from each factory polluting streams.

Straw Board Works—Organic matter which generates poison gases that displace the oxygen in the water and causes a sickening stench. Average of 800,000 gallons every 24 hours emptied into adjacent streams at each plant.

Sugar-beet Factories—Deadly organic matter which drives the oxygen from the water and kills every living thing in it. An average of 3,000,000 gallons every 24 hours from each sugar-beet factory in the state that uses a stream as a sewer.

Canning Factories, Cheese Factories and Casein Factories—Deadly organic pollution. Two thousand gallons per day from each factory that empties pollution into a waterway or stream.

Coal Mines—Copperas water containing from 300 to 500 grains per gallon of ferrous sulphate, deadly to aquatic life of all kinds and strong enough to eat up a steel rail in ten days. From 10,000 to 50,000 gallons per day, each mine.

The problem of stream pollution to all State Fish and Game Commissions is one of vital importance because of the exterminating effect of pollution on all forms of aquatic life.

The manufacturers throughout the State of Ohio are planning to install the

system as soon as possible and the opportunity will be open to the other states of the Union to profit by this most valuable discovery.

GAME LAWS IN MASSACHUSETTS.

The game law of Massachusetts makes an open season on deer in that state from sunrise on the first Monday of December to sunset the following Saturday, the bag limit being one deer in a season, and it to be killed with a shotgun. There is no open season in Massachusetts on ruffed grouse, but quail and pheasants may be hunted legally each year from October 20 to November 20. The bag limit on quail is four in one day, or twenty during the season, and on pheasants two in a day, or six in a season.

American Field.

GAME LAWS IN COLORADO.

In Colorado there is no open season on elk, mountain sheep, antelope or beaver, but one is permitted to kill one deer having two or more points on each horn, from October 1 to October 4, both dates inclusive. Aliens are not permitted to hunt in the state or to own or possess firearms. Shipment of game out of or into the state is permissible, providing the shipper has a transportation permit issued by the State Game Commissioner, but not otherwise.

American Field.

LIFE HISTORY NOTES.

A CALIFORNIA CONDOR SEEN NEAR HEAD OF DEER CREEK.

On May 11, 1920, while inspecting a timber sale area at the head of Deer Creek, east of Hot Springs, California, in the Sequoia National Forest, with Supervisors Cunningham and Benedict and Deputy Supervisor Derby, we noted an immense bird circling over the clump of redwoods (*Sequoia gigantea*) on Deer Creek. The bird settled in the top of one of these trees 400 to 500 yards away from us. In flight it was like a buzzard, except that it was entirely too large. It had a brownish beak, a ruff around its neck, a light brownish color on the under feathers of its wings, and it had a very large wing spread. It appeared to be an adult specimen, the white tipped wing coverts and lanceolate feathers about the neck being particularly noticeable. We judged at the time that it must be a specimen of the California condor (*Gymnogyps californicus*), and in looking up the subject on our return to Hot Springs the description for that bird fitted very well the bird we had seen.

PAUL G. REDINGTON.

DUCKS IN THE IMPERIAL VALLEY.

During December ducks were fairly numerous in the Salton Sea at the mouth of the Alamo River, in Imperial County, but they were very difficult to approach and very few sportsmen were able to secure more than five or six birds at a time. A preponderance of shovellers was in evidence. Even with an abundance of ducks good shooting is limited in the Imperial Valley, owing to a lack of suitable shooting ponds. Apparently the best bags are obtained at certain seasons of the year when a high wind is blowing. At such times canvasbacks and "bluebills" are secured along their lines of flight.

UNITED STATES FOREST SERVICE COOPERATION.

STEELHEAD TROUT IN THE CALIFORNIA NATIONAL FOREST.

There are a number of streams in the California National Forest well stocked with fish. Those on the east side, flowing into the Sacramento River, are stocked with rainbow trout; and on the west side, the streams tributary to Eel River, with steelhead trout. A few other varieties, such as Loch Leven, eastern brook and black-spotted trout, have been introduced into the east side streams. It is commonly believed that steelhead trout, after attaining a length of 7 or 8 inches, migrate to the ocean, returning after maturity, being usually from 24 to 40 inches in length and weighing from 5 to 15 pounds. These large steelheads have been coming up the various branches of Eel River only, probably for all time; but until recently they were practically exterminated every year by Indian fishermen. There is one stream on the forest, the north fork of the Middle Fork of Eel River, which has many large, deep holes in which these fish stay all summer if unmolested, and as they readily take a hook they furnish splendid sport. Until the past few years the Indians have systematically netted and blasted these holes until they got every fish. We have been making a determined effort to stop this practice, with some results. During the past season two Indians were caught in the act of using illegal nets, one of whom plead guilty to the charge and a fine of $100 was imposed on him.

DEER SEASON TOO EARLY ON THE EL DORADO FOREST.

The open season on deer in Fish and Game District 1–I is believed by local forest officers to be entirely too early. It had far better be reduced to one month, from September 15 to October 15, than as it is at present. August 15 to September 15 is a very hot period, and many of the deer killed, or large parts thereof, spoil and are unfit for use.

In quite a few of the streams on the north side the fish (trout being the only game species) are pretty well depleted since up to last year little or no replenishing was done. Many of the lakes never have had any in them. At the proper time considerable cooperation can be gotten from interested parties, and the Forest Service should plan to be in position, financially, to help out.

MULE DEER ON THE LASSEN FOREST.

Big game, as it goes in California, is to be found on the Lassen in abundance. The mule deer (*Odocoileus hemionus*) is plentiful in the northeastern part and appear to be on the increase. They winter in the lava beds of Lassen and Modoc counties, and follow the snow to the higher areas in the spring. The bucks do not run with the does during the summer. Both, however, stay at comparatively low elevations until the middle of the summer when the bucks go to the high ridges. They will stay on the summer range until there is considerable snow before moving to the lower elevations. All move out together over well defined trails. The rutting season is November and December and the fawns are born in May and June. They usually are in pairs, one buck and one doe. The game refuge 1–F has been posted and we do not believe that there was any hunting within this area this season. It is well situated and should be a material factor for the increase of the species in its locality. There is considerable controversy as to whether or not the mule deer and Columbia blacktail deer cross. On certain ridges and mountains mule deer but no blacktail deer will be found, while on others blacktail only are found. However, several deer have been killed on the Lassen within the past two or three years that are apparently crosses, having the tail of the Columbia blacktail with no patch of white around the base of the tail, but having all other appearances of the mule deer. One of these is reported to have weighed one hundred and eighty pounds.

The only other species of deer known to be indigenous is the Columbia blacktail. This species is found in every part of the forest but less often in the country where the mule deer abounds. This deer winters in the foothills of the valley and moves to the higher areas as the snow goes off. During the spring and summer the bucks are to be found on the high rough ridges and the does and fawns on the

meadows and flats. Bucks are often seen at the timber line on Brokeoff Mountain and Lassen Peak at an altitude of approximately 9500 feet. At the time of the first snows both bucks and does begin to move to the foothills. Ordinarily they all follow one or two routes. One of the best known of these is down the ridge between Deer and Mill creeks, just north of game refuge 1–G. The last few days of the season dozens of hunters congregate in that area and slaughter the deer as they move out. We are not prepared to make a definite recommendation at this time but it seems that it would be advisable to extend the refuge to include this area. Another well defined deer trail is the ridge between Mill Creek and Battle Creek at Mineral. There are a number of hunters here late in the season too but apparently not enough to warrant the creation of a game refuge. The winter range is the foothills below pine timber. The summer feed is largely browse with a little grass and with acorns. Rutting season is from November 1 to December 15 and the young are born from May 1 to July 1. As a rule, the fawns are in pairs, one doe and one buck. The bucks shed their horns from February 15 to April 1. Deer were fairly plentiful last year, but apparently have decreased 5 per cent in the past twenty years. The area in game refuge 1–G is well adapted for the purpose intended but we are advised that game violations are frequent. Owing to the remoteness of the area from the center of the forest and the press of other work forest officers are unable to give the refuge the protection that it should have. If wardens could be appointed for the area much better results would be secured. During the winter, when the state game wardens are known to be in the rice fields, game trespassers are said to be numerous in the foothills. Very probably an occasional trip by the state game wardens would lessen this form of game violation 50 per cent.

The Lassen offers some of the best trout fishing in California. The rainbow are indigenous to practically all of the streams. In past years rainbow, eastern brook, Lock Leven and black-spotted fry have been planted. Of these the eastern brook and rainbow have done the best. No record has been kept of the relative number of each species planted but it is found that in the streams planted the rainbow have done the best in the deeply shaded canyons while the eastern brook, black-spotted and Lock Leven have done better in the open stream as it flows through meadows. In Battle Creek at Mineral a catch will average 60 per cent eastern brook, 5 per cent Lock Leven, 10 per cent black-spotted and 25 per cent rainbow in the meadow and will run 90 per cent rainbow in the canyon less than a mile away. The part of the stream through the meadow has been more heavily planted than has the part of the stream in the canyon. Several of the small lakes within the forest have been planted. Steelhead were planted in Juniper and Grassy lakes in the summer of 1914. Two and three pound fish were taken from this lake in 1918 and some reported to weigh ten pounds in 1919. There has been considerable discussion as to whether these fish will spawn in the lake as it has no streams running into or from it. Some have contended that as the fish are unable to spawn in their usual habits they will die and that within a few years the lake shore will be covered with dead fish. This has not occurred as yet. The trout planted in most of the streams have remained quite small. The California Fish and Game Commission have established a hatchery and egg taking station within the forest at Domingo Springs on the Feather River and are planning another one on Warner Creek. Both of these streams have a big run of rainbow at spawning time and afford excellent fishing. Steelhead and salmon run up both Deer and Battle creeks from the Sacramento River at spawning time. In both streams there is a high falls that keeps them from reaching the headwaters. However, it might be advantageous to blast out these falls. During the early eruptions of Mount Lassen and the subsequent flood all of the trout in Hat Creek were either washed away or killed. For the past several years there have been practically no fish in the creek. The stream is now becoming clearer, however, and the fish are beginning to appear again. The waters of this stream are largely used for irrigation and the residents prefer not to have the stream stocked so that they will not be compelled to put in fish screens.

REPORTS.

CALIFORNIA FRESH FISHERY PRODUCTS, JANUARY, FEBRUARY AND MARCH, 1920.

Species of fish	Del Norte, Humboldt	Mendocino, Sonoma, Lake	Marin	Solano, Yolo	Sacramento, San Joaquin	Tehama, Colusa, Glenn	Contra Costa, Alameda	San Francisco, San Mateo	Santa Cruz	Monterey	San Luis Obispo, Santa Barbara, Ventura	Los Angeles	Orange	San Diego	Imperial	Total	Mexican
Albacore												3,325				3,325	
Anchovies								225		19,391		4,572				24,188	
Barracuda								61	221		39,378	254,759		136,241		430,660	1,740,664
Bluefish									107	16,501						16,608	
Boccaccio	334							85,755	157,025	272,434						515,548	
Bonito											1,368	56,630	2,452	18,210		78,660	139,090
Carp				2,297	49,895		21,097	224					5,230			78,743	
Catfish	97	16,244		4,645	13,025											34,011	
Chilipepper								56,278	73,607	3,101						132,986	
Cultus cod	291		31				864	156,205	31,473	68,933	365					258,162	
Flounders	3,961		255	3,682			818	131,796	13,775	42	800	1,469				156,598	
Grayfish			160				15	95,080		220	300	108,823		17,077		221,675	12,628
Greenfish												412				412	
Hake								10,700								10,700	
Halibut	1,350							14,062	9,905	351	52,070	544,058	75,062	287,476		984,334	352,393
Hardhead					10,951		55									11,006	
Herring	6,836		65,470				38,120	115,090								225,516	
Kingfish			8					1,108	16,566	15,811	33	153,963	161	2,502		190,152	
Mackerel										24,172	1,226	306,882	593	23,907		356,780	32,251
Mullet														11,525	4,496	16,021	
Perch	17,306		11,727	40			266	11,773	875	8,625	180	8,815	317	135		60,059	290
Pike				55	991		2,843									3,889	
Pompano								24		870		10,613		58		11,565	231
Rock bass											60	8,155	805	2,892		11,912	630
Rockfish	5,664		84					245,664	80,826	165,292	45,575	525,795	4,479	385,721		1,459,100	83,929
Sablefish								346,418	1,625	2,522						350,565	
Salmon	818		759	78,223	21,170	2,461	71,125	16,097	119	146,939						337,711	
Sanddab								207,775	7,006	476	25	2,198				217,480	

Sardines								644,316	1,385,900	21,472,739		24,537,871	378	7,642,187		55,683,391	3,185
Sculpin												4,714	65	989		5,768	
Sea bass (black)												11,025	110	14,994		26,129	27,218
Sea bass (white)								387	15	29	1,097	395,172	467	6,039		403,206	47,159
Sea trout	54											1,044		5,689		6,787	5,562
Shad				6,062	267		12,021	1,360								19,710	
Shad (buck)				15,035	1,529		22,731									39 295	
Shad (roe)				13,116	1,440		21,886									36 542	
Sheepshead											91	1,410		7,099		8,600	
Skates								39,660	1,625			1,737	73	65		43,160	
Skipjack														445		445	
Smelt	15,625	245	20,434				3,226	51,544	152	18,550	27,191	35,412	4,672	11,111		188,162	39
Sole	302			29				982,340	51,276	1,751	2,778	35,906	269	1,741		1,076,392	
Splittail					6,869		5,206									12,075	
Striped bass			2,334	59,769	10,298		82,100	29,706		17						184,224	
Stingaree																	24,885
Suckers					1,568											1,568	
Swordfish														24		24	
Tomcod							48	20,457								20,505	
Tuna												1,395				1,395	
Turbot			440					34								474	
Whitebait			68					34								68	
Whitefish												1,574		3,207		4,781	4,417
Yellowtail												258,195	195	18,582		276,902	68 838
Miscellaneous				14			35	12,556	1,258	3,850	61,927	1,538	287	2,930		84,365	630
Total fish	52,638	16,489	101,770	182,967	118,003	2,461	282,556	3,276,695	1,833,356	22,242,616	234,464	27,277,462	95,545	8,600,816	4,496	64,322,334	2,544,039
Crustaceans—																	
Crabs (doz.)	1,385		286				1	23,499	202	7						25,380	
Shrimps								182,725				171				182,896	
Spiny lobsters											7,649	61,902	7,160	11,140		87,851	316,956
Mollusks—																	
Abalones	225	10	475							31,449	11,291					43,450	29,950
Clams (cockle)	4,115		1,708								700		2,788			9,311	
Clams (mixed)	5,623		11,239				104	1,304					20			18,290	18,500
Clams (Pismo)									325		72,802					72,937	
Clams (softshell)	396	3,469	1,540				22,695	2,301								30,401	
Cuttlefish			64					5,093	3,375	23,895		351				32,778	
Limpets													535			535	
Mussels							2,289	360	1,000		292	577	1,663			6,181	

CALIFORNIA FRESH FISHERY PRODUCTS—Continued.

Species of fish	Del Norte, Humboldt	Mendocino, Sonoma, Lake	Marin	Solano, Yolo	Sacramento, San Joaquin	Tehama, Colusa, Glenn	Contra Costa, Alameda	San Francisco, San Mateo	Santa Cruz	Monterey	San Luis Obispo, Santa Barbara, Ventura	Los Angeles	Orange	San Diego	Imperial	Total	Mexican
Oysters, Eastern (number)			306,702					1,143,750								1,450,452	
Oysters, native			14,630													14,630	
Snails												280				280	
Squid	90									247,544		135,122				382,756	
Miscellaneous—																	2,180
Turtles																	
Scallops													513			513	

All amounts shown in pounds unless otherwise specified.

CORRECTION.—In the April issue of CALIFORNIA FISH AND GAME was shown a report of California fresh fishery products for the year 1919, and on page 94, amounts of sanddab and sardines shown for Santa Cruz, Monterey, San Luis Obispo, Santa Barbara, Ventura, Los Angeles, Orange and San Diego counties were transposed. Amounts shown for Marin, San Francisco and San Mateo counties were correct. Below is shown the correct amounts of sanddab and sardine taken in California during 1919.

District	Sanddab	Sardine
Marin		141,700
San Francisco and San Mateo	628,206	1,362,518
Santa Cruz	67,885	5,141,869
Monterey	2,602	81,447,280
San Luis Obispo, Santa Barbara and Ventura	1,394	54
Los Angeles	7,830	54,600 1.4
Orange		25
San Diego	1,821	11,183,539
Totals	709,738	153,877,179

VIOLATIONS OF FISH AND GAME LAWS.

January 1 to March 31, 1920.

Offense	Number of arrests	Fines imposed
Game.		
Hunting without license	24	$120 00
Trapping without license	5	45 00
Trapping on game refuge	1	100 00
Deer—close season—killing or possession	9	540 00
Female deer—spike bucks—fawns—killing or possession	2	100 00
Running deer with dogs—close season	2	50 00
Illegal deer hides—possession	2	90 00
Beaver—beaver hides—killing or possession	2	125 00
Quail—closed season—killing or possession	3	75 00
Quail in captivity without permit	1	10 00
Ducks—excess daily limit—close season—killing or possession	9	625 00
Shooting ducks from power boat in motion	8	120 00
Night shooting	17	625 00
Doves—close season—killing or possession	1	5 00
Swan—killing or possesion	4	175 00
Pheasant—killing or possession	1	20 00
Protected shore birds—killing or possession	4	85 00
Nongame birds—killing or possession	5	55 00
Tree squirrels—closed season—killing or possession	4	75 00
Total game violations	104	$3,340 00
Fish.		
Angling without license	10	$235 00
Fishing for profit without license	6	125 00
Making false statement on application	1	25 00
Striped bass—underweight—close season	4	45 00
Halibut—underweight—offering for sale	7	155 00
Barracuda—underweight—offering for sale	1	----------
Trout—excess limit—offering for sale—closed season	8	250 00
Lobsters, dried—under or oversized—closed season	15	321 00
Crabs—undersized—closed season	4	40 00
Abalones—red, black and green—under or oversized	33	670 00
Clams—undersized—excess limit	11	260 00
Dynamiting fish	2	----------
Seining in restricted waters	3	600 00
Seining within 750 feet of Redondo Pier	6	650 00
*Seining within one mile of Los Angeles city sewer	3	300 00
Pollution of state waters	1	200 00
Total fish violations	115	$3,876 00
Grand total fish and game violations	219	$7,216 00

*Paid into Los Angeles County treasury.

SEIZURES—FISH AND GAME AND ILLEGALLY USED FISHING APPARATUS.

January 1, 1920, to March 31, 1920.

Game.	
Deer meat	298 pounds
Ducks	780
Gray geese	17
Rabbits	70
Live quail	6
Miscellaneous birds	4
Deer hides	13

Fish.	
Halibut	2,658 pounds
Barracuda	200 pounds
Striped bass	574 pounds
Catfish	50 pounds
Trout	65
Crabs	1,143
Lobsters	955
Lobsters (dried)	131 pounds
Abalones	609 pounds
Pismo clams	566
Cockle clams	1,275 pounds
Little Neck clams	220 pounds
Illegal nets	5

Searches.	
Illegal fish and game	3

Fish and Game Commission

STATEMENT OF EXPENDITURES.

For the Period July 1, 1919, to April 30, 1920.

Administration:		
Commissioners	$1,400 84	
Executive offices	22,031 42	
Research and publicity	4,188 23	
Accident and death claims	1,902 31	
		$32,979 32
Commercial fish culture and conservation:		
Superintendence	$11,105 57	
Inspection and patrol	25,051 65	
Research	15,055 76	
Statistics	8,153 41	
Market fishing license commissions	695 00	
Propagation and distribution of salmon	19,498 83	
		79,560 22
Sporting fish culture and conservation:		
Superintendence	$12,102 31	
Printing	1,861 69	
Prosecutions and allowances	404 55	
Angling license commissions	11,765 70	
Special field investigation	252 35	
Fish exhibits	7,203 91	
General patrol (pro rata share)—		
San Francisco District (40 per cent)	28,780 33	
Los Angeles District (40 per cent)	11,540 18	
Sacramento District (40 per cent)	22,826 26	
Propagation and distribution of trout	101,218 84	
		197,964 12
Game conservation:		
Printing	$2,746 76	
Prosecutions and allowances	1,180 60	
Hunting license commissions	17,952 90	
Mountain lion hunting (and bounties)	6,062 48	
General patrol (pro rata share)—		
San Francisco District (60 per cent)	43,161 57	
Los Angeles District (60 per cent)	17,310 30	
Sacramento District (60 per cent)	34,404 45	
		122,819 03
Tahoe camping ground		2,964 39
Total expenditures		$436,287 11

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CALIFORNIA FISH AND GAME

"CONSERVATION OF WILD LIFE THROUGH EDUCATION"

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CONTENTS.

DISTRIBUTION OF THE GOLDEN TROUT IN CALIFORNIA.

By S. L. N. ELLIS and H. C. BRYANT.

Fishermen and nature lovers who frequent the wild, rugged climes of the southern Sierra are now, most of them, familiar with the golden trout, *Salmo roosevelti*. This fish is known to excel any other species of trout in beauty, not only because of its well-proportioned form, but more particularly because of its exceptionally brilliant and rich coloration.

There are three recognized species of golden trout: the Little Kern golden trout, *Salmo whitei*; South Fork of the Kern golden trout, *Salmo agua-bonita,* and Roosevelt trout, of Volcano Creek, *Salmo roosevelti.* The Kern trout, *Salmo gilberti,* is the parent species from which the three, afore named, were probably derived; and, so far as is

known, all four species are native to the head waters of the Kern River.

The distinctive characteristics of these diversified types is more readily appreciated if the geographical isolation of their habitat is understood. It has been stated that the Kern trout, *Salmo gilberti*, is the parent species of the golden trout, and as may be inferred from the name, is native to the Kern River. This river is of considerable

FIG. 37. Agua-bonita Falls on Volcano Creek, the stream which is the original home of the golden trout. Photograph by W. Y. Kellogg.

width and flows through a most inspiring, deep, rugged, high Sierran canyon, and in ages past, when the glacial period wrought its stupendous changes, the Kern River trout, native then to not only the Kern River but to its tributory streams—Volcano Creek, South Fork of the Kern and the Little Kern and Soda Creek—became isolated in these different streams by the formation of unsurmountable barriers, and each group being acted upon by the influences of its own peculiar environment, with no opportunity for interbreeding of groups, resulted,

quite naturally, in each one developing in its own distinctive, characteristic way.* And the golden trout, *Salmo rooseveltl*, of Volcano Creek, the most radiantly beautiful of them all, became the most individual.

But the changes which Volcano Creek underwent were far more enduring and much more complicated than the changes which occurred in the other streams, for aside from the impassable falls, formed by the wearing down of the stream beds, Volcano Creek, formerly called Whitney Creek, underwent volcanic changes of a more or less unique character, which accentuated the deepening characteristics of the stream, and in all probability temporarily cut it off entirely from the Kern River.

Volcano Creek rises south of Cirque Peak. Several small, clear, mountain streams, having their sources at an elevation of from 10,000 to 13,000 feet, thread their way through picturesque, grassy meadows to the point of confluence. For a distance of about eight miles the creek flows in somewhat of a southerly direction until it enters Toowa Valley, then it turns west in a widening course and joins the Kern River about opposite Soda Spring. The South Fork of the Kern River has its source near that of Volcano Creek and it enters Toowa Valley at about the same place, and in the days when this section of the southern high Sierra was first traversed by white men, the idea was conceived of joining Volcano Creek and the South Fork of the Kern by a tunnel. This was quite possible, for a small ridge less than a hundred yards wide, in parts, and scarcely fifty feet high divided the streams. No doubt at one time the South Fork of the Kern was a natural tributary of Volcano Creek. The tunnel which was made caved in, but in the course of experimentation some of the golden trout escaped into the South Fork. The cut filled up and the two streams again became entirely distinct. Above this tunnel, which is at an elevation of 8600 feet, Volcano Creek flows through meadowy country, the creek bottom being granite sand and gravel; but below the tunnel for a distance of eight miles or so, to the point where the creek enters the Kern River, and at a drop in elevation of 2300 feet, the stream bed is of volcanic character and the stream itself very turbulent. It is not, however, due to the rapids, but to the three falls—Agua-Bonita, with a small fall known as Surby Fall between it and Stewart Fall (second), and the third, Shields—that the trout are barred from traveling from one body of water to the other; and in fact, such natural barriers as these are the cause of fish isolation in the several streams, and of even entire lack of fish in some, where volcanic action and other forces were at play—the streams and lakes are barren, many of them despite a good supply of food.

The value of distributing the golden trout can hardly be overestimated. First, it has saved these beautiful fish from the complete extermination with which they were threatened. Secondly, the trout are being planted in heretofore barren streams and lakes, and therefore they will furnish added fishing grounds for the angler. Too, the fish, without the possibility for interbreeding, will remain the pure type. And third, they are a prolific fish, and, to the delight of all sportsmen, are extremely gamey.

*"The Golden Trout of the Southern High Sierras," by Barton Warren Evermann, 1906. U. S. Bureau of Fisheries Bull. 25, pp. 3-51, 16 pls., 1 map.

The earliest record we have, of the transplanting of the golden trout to streams other than those of their natural hibitat, was in the year 1876. The two Stevens brothers, who had built a small sawmill on Cottonwood Creek, were anxious that the stream be well stocked with fish for their own use. They went over to Mulky Creek, in Mulky Meadows, and procured what in all probability were the *Salmo agua-bonita*, or South Fork golden trout, and planted them in Cottonwood Creek.

In the summer of 1876, Mr. S. L. N. Ellis says: "I was at Mineral King and Mr. Arthur Crowley, former assessor of Tulare County, showed me a single large trout in the creek at Mineral King. He told me that 'uncle' Wiley Watson had brought some trout from the Little Kern via Farewell Gap and had planted them in this stream." The first plant made by Watson reproduced rapidly and furnished the supply for the fishermen at Mineral King until 1894, when the later plants were made. Mr. Ellis caught fish at Mineral King in 1887, while he was out on a hunting and fishing trip in that region. This work was very important for it was the move which undoubtedly interested others in fish planting, and which caused others, later on, to try and accomplish similar plants.

After a lapse of some nine years, G. W. Cahoon contributed his share to the transplanting of the golden trout. Mr. Cahoon was a cattle rancher who during the summer carried butter by pack from the head of the South Fork of the Kaweah over the pass to Inyo County. On his way back he caught the golden trout, *Salmo whitei*, in Soda Creek at Quinn's Horse Camp and planted them in the South Fork of the Kaweah, at Evelyn Lake, where there were no fish.

In 1887, two years after Cahoon had made his plant of *Salmo whitei*, James McIntyre, a sheepman, procured some of the same species of trout at Rifle Creek and planted them in Coyote Creek, a tributary of the Kern.

Again there was a period of trout planting inactivity, but in 1892 Cottonwood Lakes were planted by E. H. Edwards and two friends. Edwards, who was a storekeeper at Lone Pine, desired to improve the fishing conditions in his vicinity, so with James Moffitt and B. H. Dutcher he obtained a catch of *Salmo agua-bonita*, the same variety which had been planted by the Stevens brothers in Cottonwood Creek in 1876, and planted them in Cottonwood Lakes. This plant was apparently very successful, for in 1906 Cottonwood Lakes were reported by the storekeeper of Lone Pine as being unusually well stocked with golden trout.

The year 1892 is especially memorable in the history of the planting of the golden trout in that it was during this season that the first hatchery propagation of the species was undertaken. Too, it was during this year that they were first exhibited to the public. Members of the Visalia Sportsmen's Club had long been desirous that the propagation of this splendid game fish be undertaken, and it was through the interests and efforts of the club that S. L. N. Ellis, equipped with four coal oil cans fitted with baking powder can lids, made a trip to Volcano Creek and procured about a hundred of the fish. These he carried to Lower Funston Meadows. At Funston Meadows he met Lieutenant Deane with a detachment of soldiers patrolling the

Sequoia National Park. Lieutenant Deane detailed two of his men, Sergeant Moffitt and Private Scholberg, to take the fish to Mineral King. There the party was met by J. Sub Johnson and M. L. Weaver, who were members of the club and residents of Visalia. These two men took the fish in a spring wagon to Visalia, and from there they were shipped by train to San Francisco and were delivered to the Fish and Game Commission. The plan was to send the fish to the hatchery at Sisson. However, before the trout were sent on the last lap of their journey, they were exhibited not only at the Midwinter Fair but at Golcher Brothers store in San Francisco. Thirty-six fine specimens were finally shipped to the Sisson hatchery, twenty-one reaching their destination in good condition, but the experiment was not considered satisfactory.

In 1896, the first plant of the true golden trout, *Salmo roosevelti,* was made. All previous plantings had been either of the *Salmo aguabonita* or *Salmo whitei* variety. During the summer of this year Mr. S. L. N. Ellis, accompanied by his son, L. L. Ellis, and a friend, F. J. Hill, planted the North Fork of the Kaweah—known as Dorst Creek—with fish taken from Volcano Creek, the original home of *Salmo roosevelti.* In the same season, Mr. Ellis in attempting to carry some of the fish from Volcano Creek to the North Fork of Kaweah, found that the trout were not standing the trip well and so decided to plant some of them in the Kaweah near Mineral King, and about twenty-five others, which were sick, in Silliman Creek and Willow Meadow. Nothing was ever heard of the latter plants. When in Mineral King, Mr. Ellis met the artist, Petrie, and showed him the golden trout, which were the first that the painter had seen. He was so charmed by their rare beauty that he soon afterwards used the fish as the subject for a painting.

The following year an unsuccessful plant of the golden trout was made by Mr. J. M. Nelson, in Nelson Creek, a tributory of the Tule River. Also some cattle men carried fish from Whitney Meadows and planted them in Rock Creek. Another plant of trout was made in Rock Creek in August, 1900, by Mr. M. W. Buffington, county surveyor of Kern County. He wrote Major George W. Stewart of Visalia that he and a party of other men carried the trout in small lard cans—about seven in each can—to Rock Creek and turned some of them loose; the rest they carried to the trail crossing and placed them there.

From 1897 to 1908 no authentic information regarding the planting of golden trout seems to be available, and that regarding the seasons of 1897 and 1900 seems to be rather incomplete. However, it was at this time that the government became actively interested in the protection of the golden trout. In 1903, according to Dr. Barton W. Evermann, Stewart Edward White, impressed with the possibility of the extermination of these trout, wrote to George M. Bowers of the Commission of Fisheries and to the President of the United States calling their attention to the matter, and on July 13, 1904, Barton Warren Evermann, Assistant in charge of the Division of Scientific Inquiry, Bureau of Fisheries, with a party outfitted at Redstone Park, Tulare County, left for the Whitney country to investigate the trout of the Kern River region. As a result of the investigation, the true golden trout of Volcano Creek was recognized as a new species, and was

named after the naturalist, Theodore Roosevelt, who at that time was president of the United States.

The United States Bureau of Fisheries made an extended study of the trout, and in 1905 an attempt was made to establish a temporary hatchery station on Volcano Creek in order that the eggs of the golden trout might be obtained. But the spawning season was over before operations could be started. Two hundred and sixty-four trout were taken during the season to the Lewis and Clark Exposition at Portland, but as the result of an accident the entire lot was lost. Aside from the year-round, closed seasons for the golden trout adopted at a later date, the general program suggested was as follows: (1) The catch of golden trout should be limited to less than the number allowed for other trout. (2) Fish culture should be promoted, and (3) the limits of the Whitney Military Reservation should be extended to include the whole of Volcano Creek.

That the fish is a hardy fish seems to have been rather well demonstrated in 1906. In March of that year the Fish and Game Commission undertook to collect some specimens of the fish for exhibition purposes at the "Forest, Fish and Game Exhibit," held in San Francisco. About fifty specimens of the trout, *Salmo agua-bonita* were taken from Cottonwood Creek, a stream the temperature of which is about 38°, and were transferred to water which was about 60° in temperature. They lived in their new environment for some two weeks or more. But at the end of the exhibition period, when the fish were sent to the Sisson Hatchery, about three-fourths of them died, evidently due to the added travel and the more or less depleted condition of the fish. Another instance of their adaptability and hardiness was reported by A. D. Ferguson. In 1913, he investigated a plant made by Deputy Bullard, in 1911. Bullard had stocked a small creek at Traweeks, in Fresno County, with golden trout. The stream is at an elevation of 3500 feet and the temperature during the summer months reaches about 75°. Mr. Ferguson says, "I found golden trout of various sizes in considerable numbers in this creek. A specimen some twelve inches in length, I judged to be one of the original plant."

In 1908 the Sierra Club did some splendid work. The club in making their plants used two ten-gallon Buhl cans with airholes in the covers. On July 7, they caught 110 trout with hook and line, the trout ranging in length from four to six inches. They were secured at the head of Long Meadow on Volcano Creek and were packed for about three hours to a lake in Rocky Basin. Only one fish was found to be dead and that was due to the way in which it had been hooked. On July 15, the head Sierra Club packer, Mr. J. Robinson, and his family caught 54 trout in Rock Creek averaging from 10 to 12 inches in length. They had undoubtedly been planted in the creek several years before. These were taken to a lake at the head of one of the branches of Rock Creek. The third plant, made under the supervision of Mr. Wm. E. Colby, Deputy Fish Commissioner, was of 50 trout from the above named creek. They were planted in Whitney Creek.

According to Mr. A. H. Hogue, forest supervisor of the Inyo National Forest, 600 golden trout from Little Whitney or Long Meadows were taken to Gardner Creek during the same season.

It was in the year 1909 that the Fish and Game Commission first took charge of the planting of the golden trout. Previous to this time the work had been done by sportsmen or clubs at their own expense. After the Commission took hold of the work, improved pack cans were provided and the loss of the fish in transportation was much reduced. The work of distributing the golden trout on the east slope of the Divide was carried on by Deputy E. H. Ober, who in the face of many difficulties successfully transferred 1500 trout, ranging in size from two to seven inches, to Independence, over the Hockett trail. There the outfit was divided, half went over to Kearsarge Pass via Lake Charlotte to Gardner Creek and Gardner Lakes, and the other half went to Grouse Meadows on the head waters of the Middle Fork of the Kings River, via Bishop and South Lake on Bishop Creek. The fish for this plant were obtained by diverting the creek at Long Meadows from its course.

District Deputy A. D. Ferguson of Fresno, assisted by Deputy S. L. N. Ellis in the field, directed the work in the Kern River, Kings and Kaweah basins, on the western slope. Mr. Ellis says in regard to his experience:

"On my return trip from Whitney Meadows, I brought back three mule loads of golden trout for planting in Roaring River and nearby streams with scarcely any loss. This was partly due to improved pack cans, but more especially to the fact that I had learned that the fish can not stand too long a trip. Prior to this time I had made eleven or twelve hours a day and had lost as many as 75 per cent of my fish. On this trip I learned from observation that by making short trips—say of five or six hours a day—a much greater percentage of the fish could be saved. Up to seven hours the fish can keep away from the sides of the cans, even though the trail may be very rough, but after this time they become exhausted and are bruised by striking against the sides of the containers. During the stops made, the cans were set in a creek and fresh water allowed to flow over them. Prior to this time my idea had been to hurry the fish to their destination as quickly as possible."

The following year Mr. Ellis' party took 183 adult *Salmo roosevelti* caught with a seine at Whitney Meadows and planted them in the watershed drained by the tributaries flowing in to Roaring River. They lost only six of the trout although they travelled for six days over 100 miles of extremely rough country. Mr. Ober and his assistants, Sam McMurray and George Hall, in the same year covered about 115 miles and stocked Center Basin and Bench Lake as well as the head waters of the South Fork of the Kings. This made the total plant for July and August, 1910, more than 1800 large golden trout distributed among twenty-three lakes and streams in which no fish had previously existed, but which were rich in fish food. In a recent letter Mr. Ober says, "I felt that the waters I had selected would be ideal for fish, and my judgment seems to have been good, for in 1918 I took two golden trout out of Bench Lake that weighed three pounds each."

The following summer Mr. Ellis and Mr. Ferguson, with a group of friends and assistants, secured over 1300 *Salmo roosevelti,* by changing the course of the stream at Little Whitney Meadows and by hook and

line. Ferguson at this time procured twelve or thirteen *Salmo agua-bonita* golden trout from Cottonwood Lakes and Creek. All of the trout were delivered to the Fish and Game Commission's fish car at Lone Pine and were shipped to the Sisson Hatchery. A few of the *Salmo agua-bonita* were exhibited in Sacramento. Deputy Bullard, who had helped with the pack, took, in the course of the return trip, a hundred trout from Volcano Creek, which he planted in the North Fork of the Kaweah, Indian Basin and Traweek Creek.

Those who visited this great wonderland of the southern Sierra Nevada began to find not only the ordinarily beautiful trout, but in previously uninhabited streams they saw darting forms of gold and silver, and the fishermen rejoiced. However, in order that the pleasure of golden trout fishing might be better assured to the ever-increasing numbers of fishermen, the law which is incorporated in the penal code is as follows:

"633. Every person who, at any time between the first day of October and the thirtieth day of June of the succeeding year, takes, catches, kills, destroys, or has in his possession, any variety of golden trout; or who, at any time, takes, catches, kills, or destroys, any variety of golden trout other than with hook or line; or who, at any time, takes, catches, kills, destroys, or has in his possession, during one calendar day, more than twenty golden trout, or has in his possession any variety of golden trout of less than five inches in length, is guilty of a misdemeanor. Every person found guilty of any violation of any of the provisions of this section must be fined in a sum not less than twenty dollars or be imprisoned in the county jail, in the county in which the conviction shall be had, not less than ten days, or be punished by both such fine and imprisonment, and all fines collected for any violation of any of the provisions of this section must be paid into the state treasury to the credit of the fish commission fund. Nothing in this section shall prohibit the Fish Commission of this state from taking at all times such golden trout as they deem necessary for the purpose of propagation or for scientific purposes."

In 1912 the packhorse distribution work was confined to Madera and Tuolumne counties, so that it was not until 1913 that Deputies Ellis and Smalley, with a splendidly equipped pack train, proceeded with the program for the transplanting of the golden trout. On September 1, Ellis and Smalley left Whitney Meadows with 821 *Salmo roosevelti* to plant Roaring River and tributaries. It had been an unusually rainy season in the mountains, and all during their previous golden trout plants they had been handicapped by finding trails obstructed and streams swollen. The fish, too, were difficult to catch. But undaunted they left Whitney Meadows with the 821 trout, descended the Kern River Canyon, crossed the Kern-Kaweah Divide to Mineral King, ascended Timber Gap, descended again to the Kaweah Canyon, and on over the Kings-Kaweah Divide via Elizabeth Pass to Roaring River. Some of the trout had been in the cans fourteen days, yet despite the hard travel and circuitous route only five trout were lost. At the close of the season 87 plants had been made of the species and with no exception the species used by the Commission in the golden trout plants had been the *Salmo roosevelti.*

About 5000 adult golden trout, *Salmo rooscvelti*, were taken with hook and line in 1914, and were transplanted to barren waters. Thus the range of the trout was extended for more than 150 miles along the summit of the Sierra from Volcano Creek.

One thousand nine hundred seventeen marked a new step in the distribution of the golden trout. In that year it was decided to undertake the propagation of the golden trout. Cottonwood Lake, though situated in an inaccessible part of Inyo County, was decided upon for the spawning station, and despite the difficulties which had to be surmounted 500,000 eggs were taken and were successfully transported by pack animal to the new Mount Whitney Hatchery. At the hatchery they were "eyed" and afterwards were distributed in the waters of that section. It is from the Mount Whitney Hatchery that the more recent plants have been made, and Mr. Ober reports that during September and October of 1919, he made plants of the trout in two beautiful lakes at the head of Woods Creek, Little Pine Creek and South Fork Lake on Big Pine Creek. Several plants have also been made in Yosemite National Park.

FIG. 38. Spawning golden trout at Cottonwood Lakes. Photographed by N. M. Scofield.

Thus it is that through long endeavor and splendid cooperation this marvelously beautiful golden trout, a fish that appeals to every sportsman, has been protected, and distributed in one of the most inspiring sections of the Sierra Nevada Mountains.

TABLE SHOWING PLANTS OF GOLDEN TROUT.

Date planted	Lake or stream	By whom planted	Source of supply	Species
1876	Cottonwood Creek	A. C. Stevens, S. V. Stevens and Thos. George.	Mulky Creek in Mulky Meadows	*Salmo agua-bonita*
1876 or 1875	East Fork of the Kaweah at Mineral King.	Wiley Watson and others	Upper Little Kern	*Salmo whitei*
Late 70's	Lady Franklin Lake	Arthur Crowley, W. A. Ward, Wiley Watson.	Little Kern, "over the divide"	*Salmo whitei*
1880	Upper and Lower Monarch Lake and Mineral King Creek.	Mark Lavelle and "Nick" Wren	Little Kern, "over the divide," or Farewell Gap.	*Salmo whitei*
1885	Head of South Fork of the Kaweah near Evelyn Lake.	G. W. Cahoon	Soda Creek at Quinn's Horse Camp	*Salmo whitei*
1887	Coyote Creek (tributary to Big Kern)	Jas. McIntyre	Rifle Creek	*Salmo whitei*
1892	Cottonwood Lakes	E. H. Edwards, Jas. Moffitt, B. H. Dutcher.	Cottonwood Creek	*Salmo agua-bonita*
1892	Wet Meadows (head of South Fork of Kaweah).	G. W. Cahoon	Little Kern	*Salmo whitei*
1892	Exhibited in San Francisco; taken to Sisson Hatchery.	Caught by S. L. N. Ellis; delivered at Lower Funston Meadows to Sergeant Moffitt and Private Scholberg; Mineral King, M. L. Weaver and J. Sub Johnson.	Volcano Creek, above bridge	*Salmo roosevelti*
1896	North Fork of the Kaweah (known as Dorst Creek).	S. L. N. Ellis, L. L. Ellis and F. J. Hill	Volcano Creek	*Salmo roosevelti*
1896	Marble Fork of the Kaweah(?) Siliman Creek.	S. L. N. Ellis	Volcano Creek	*Salmo roosevelti*
1897	Nelson Creek (tributary of the Tule River)	J. M. Nelson	Volcano Creek	*Salmo roosevelti*
1900	Rock Creek	M. W. Buffington	Volcano Creek(?)	*Salmo roosevelti*
1906	Exhibited in San Francisco; taken to Sisson Hatchery.	R. W. Requa	Cottonwood Creek	*Salmo agua-bonita*
1908	Whitney Creek	Sierra Club	Whitney Meadows	*Salmo roosevelti*
	Crabtree Meadows	Sierra Club	Whitney Meadows	*Salmo roosevelti*
	Rock Creek	Sierra Club	Long Meadow	*Salmo roosevelti*
	Lake at head of Rock Creek	Sierra Club	Rock Creek	*Salmo roosevelti*
1908	Gardner Creek	George Hall, Ben Ransom	Little Whitney Meadows	*Salmo roosevelti*
1909	Gardner Creek (South Fork of Kings)	E. H. Ober, Geo. Hall, Ben Ransom, Frank Lenott and Sam McMurray.	Little Whitney Meadows	*Salmo roosevelti*
1909	Grouse Meadows and lakes in vicinity	E. H. Ober, Henry Bell	Whitney Meadows	*Salmo roosevelti*
1909	Crabtree Fork of Big Kern	S. L. N. Ellis	Whitney Meadows	*Salmo roosevelti*
	North Fork of Kaweah	S. L. N. Ellis	Whitney Meadows	*Salmo roosevelti*
	Whitney Creek	S. L. N. Ellis	Whitney Meadows	*Salmo roosevelti*
	Guitar Lake	S. L. N. Ellis	Whitney Meadows	*Salmo roosevelti*

	Rock Creek	S. L. N. Ellis	Whitney Meadows	*Salmo roosevelti*
	Lakes on Rock Creek	S. L. N. Ellis and J. H. Shallenberger	Whitney Meadows	*Salmo roosevelti*
1910	Waters flowing into Big Kern from east; Lake South America; Rock Creek: Perrin Creek; Table Creek; Guyot Creek; Lake Monotha; Monotha Creek; Lake Bernice; Neds Lake; Lake Aldula; both branches East Fork of Big Kern; Crabtree Creek; Lone Pine Creek; Kaweah Deadman's Creek.	S. L. N. Ellis, E. C. Ferguson, Ray C. Ellis.	Whitney Meadows	*Salmo roosevelti*
1910	Clover Creek; Boggy Meadows; Freeman Creek: Lloyd Meadows; Peppermint Creek in five places.	A. D. Ferguson, S. L. N. Ellis, Ray C. Ellis.	Little Kern	*Salmo whitei*
1910	Headwaters of the South Fork of Kings River, upper basin; Bench Lake, center basin; head of Bubbs Creek, East Vadette Meadows	E. H. Ober, George Hall, Sam Murray	Volcano Creek	*Salmo roosevelti*
1911	North Fork Kaweah; Indian Basin Creek; Trawerk Creek.	F. A. Bullard	Volcano Creek	*Salmo roosevelti*
	Sisson Hatchery	Jack Broad, K. L. Hughes, S. L. N. Ellis, F. A. Bullard, A. D. Ferguson	Volcano Creek	*Salmo roosevelti*
1913	Unnamed lakes and small streams of Kern River: watershed lying west of Whitney Divide and drained by Tyndall Creek, Whitney Creek, Crabtree and East Fork of Kern.	S. L. N. Ellis, E. W. Smalley	Big Whitney Meadows	*Salmo roosevelti*
1913	West Fork of Roaring River (tributary to South Fork of Kings River) and streams and lakes tributary to Deadman's and Sugar Loaf creeks.	S. L. N. Ellis, E. W. Smalley, F. A. Bullard	Whitney Meadows	*Salmo roosevelti*
1914	Desolation Lake; unnamed lakes on south side of Piute Creek; Piute Creek; Freneh Canyon Creek.	S. L. N. Ellis, E. W. Smalley, A. D. Ferguson, P. G. Redington, F. A. Bullard, O. P. Brownlow and others.	Whitney Meadows	*Salmo roosevelti*
1914	Heart Lake; Marie Lake; headwaters of Bear Creek; Shadow Creek.	F. A. Bullard, O. P. Brownlow	Whitney Meadows	*Salmo roosevelti*
1914	Shadow Lake; Garnet Lake: streams in vicinity of Thousand Island Lake, tributary to South and Middle forks of San Joaquin; Middle Fork of San Joaquin at Agnew Meadows.	F. A. Bullard and O. P. Brownlow	Whitney Meadows	*Salmo roosevelti*
1914	Tributaries of upper Big Kern; lakes in vicinity of Mount Geneva: Craig Ericson: Cliff Creek; Middle Fork of Kaweah: Lone Pine; Meadow Lake; Tamarae Lake.	Carl Westerfeld, R. D. Duke, A. D. Ferguson, S. L. N. Ellis, F. A. Bullard, O. P. Brownlow and others.	Whitney Meadows	*Salmo roosevelti*

Date planted	Lake or stream	By whom planted	Source of supply	Species
1914	Horse Corral Creek; Lewis Creek; Wildman Creek; Slide Creek; Kennedy Creek and tributary lakes; lake at head of Lost Canyon; Grizzly Creek at Burns Meadows.	F. A. Bullard, Walter Williams	Whitney Meadows	*Salmo roosevelti*
1917	Vicinity of Mount Whitney Hatchery	F. A. Shebley	Spawning station to Whitney Hatchery (station is on Cottonwood Lakes).	*Salmo agua-bonita*
Sept., 1919	Head of Little Pine Creek; South Fork Lake on Big Pine Creek.	E. H. Ober	Mount Whitney Hatchery	
Oct., 1919	Two lakes at head of Wood's Creek; Southeast Fork of Kings.	E. H. Ober	Mount Whitney Hatchery	

THE GROWTH OF THE SWELL SHARK WITHIN THE EGG CASE.*

By Helen M. Edwards.

On March 17, 1920, a young shark in the egg case was received from Mr. Kiati Nasu, secretary of the Southern California Fishermen's Association, through the kindness of Mr. E. M. Nielsen, of the Fish and Game Commission at San Pedro, and of Mr. Lingle, of the Bureau of Fisheries, who brought it to Hopkins Marine Station, Pacific Grove. The development of the fish has been watched with much interest, because the species was unknown and the process of development had not been seen in any of our western sharks.

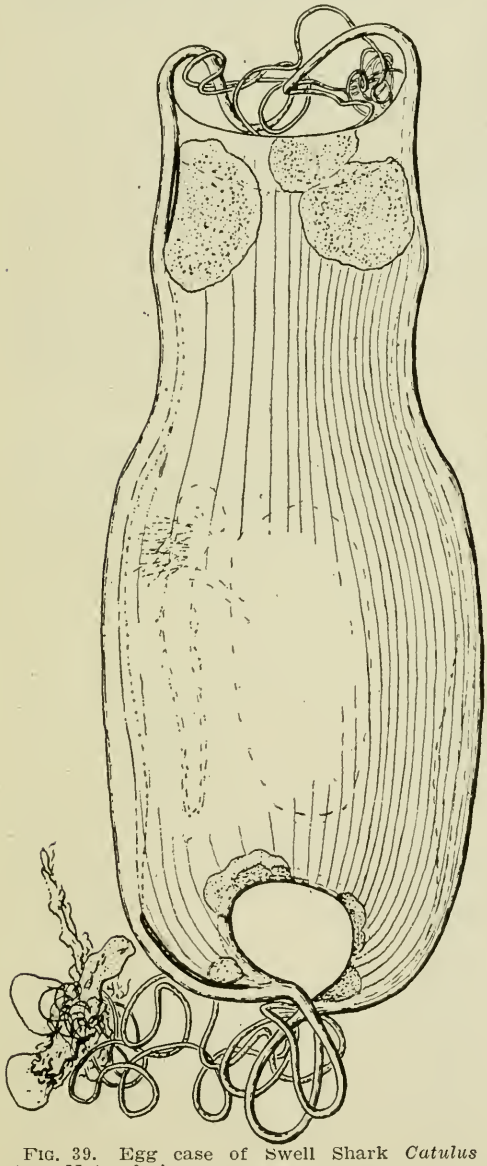

Fig. 39. Egg case of Swell Shark *Catulus uter*. Natural size.

Upon receipt of the shark it was placed in a small salt water aquarium with running water, where it was kept during its development. At various times the aquarium was out of order, which made it necessary at such times to change the water on the fish two or three times a day or to move it into another aquarium. It is a question whether or not the process of development was retarded or hindered in any way by these disturbances. We are under obligation to Stanford University and to Dr. W. K. Fisher, the director of Hopkins Marine Station, for the use of the aquarium.

The case, as shown in the accompanying drawing, was 116 mm. long and 49 mm. wide. One end, comprising about one third of the length of the case, was considerably smaller, and of a different shape from the larger end. The acute angles of the latter met and continued in long slender tendrils, for the purpose of attaching to seaweed, while similar tendrils were also given off from the angles

*California State Fisheries Laboratory, Contribution No. 20.

at the smaller end. The position and size of the fish and yolk, as seen through the opaque, dark brown, leathery case, are indicated in the drawing by broken lines. The fish was probably very young, for its length at the time of receiving was 43 mm., which exceeded the yolk by only 3 mm. The egg case had growing on it at each end colonies of bryozoans, which died and had soaked off by the end of four months.

At first there were no apertures in the case which could be detected, although each end contained two slight grooves, shown in the figure, situated on opposite sides of the case. To one facing the egg case, with the smaller end up, one groove was visible at each end on the left hand side. The other two grooves could not be seen without turning the case over, which would bring them on the left hand side. Those at the larger end were about 20 mm. long, and those at the smaller about 11 mm. On April 3 a small air bubble was visible inside the case, which proved the presence of an aperture. Upon examining the case and squeezing it gently it was found that water squirted out through a small slit at the larger end, which was one of the grooves beginning to open. By April 15 the other groove at the larger end and on the opposite side had opened. A little carmine was placed with a pipette near the apertures, but no marked current was visible. By May 20 both of the grooves at the smaller end had opened. These apertures, when completely opened, were about 1 mm. wide.

Attempts were made to measure the fish, but the results are only approximate on account of the opacity of the egg case, and of its constant activity, especially at first. The measurements were not taken at regular intervals, but the following table will give some idea of the rate of growth:

Date—1920	Length of Fish	Width of Head
March 17	43 mm.	
April 15	60 mm.	
April 29	67 mm.	
May 20	81 mm.	
May 25	87 mm.	16 mm.
June 7	104 mm.	19 mm.
June 17	115 mm.	22 mm.
June 24	123 mm.	25 mm.
July 6	130 mm.	26 mm.
August 19	155 mm.	27 mm.

Measurements were also taken of the yolk, the diminution of which is shown by the following table:

Date—1920	Length of Yolk Sac	Width of Yolk Sac
March 17	40 mm.	
April 15	37 mm.	
April 29	37 mm.	
May 20	35 mm.	
May 25	31 mm.	20 mm.
June 7	27 mm.	17 mm.
June 17	24 mm.	13 mm.
June 24	20 mm.	12 mm.
June 28	17 mm.	
July 1	14 mm.	
July 6	10 mm.	
July 17	5 mm.	
July 28	3 mm.	

Up until April 15, the yolk, though shortening, had kept the same general oval shape. At this time it became narrower and somewhat

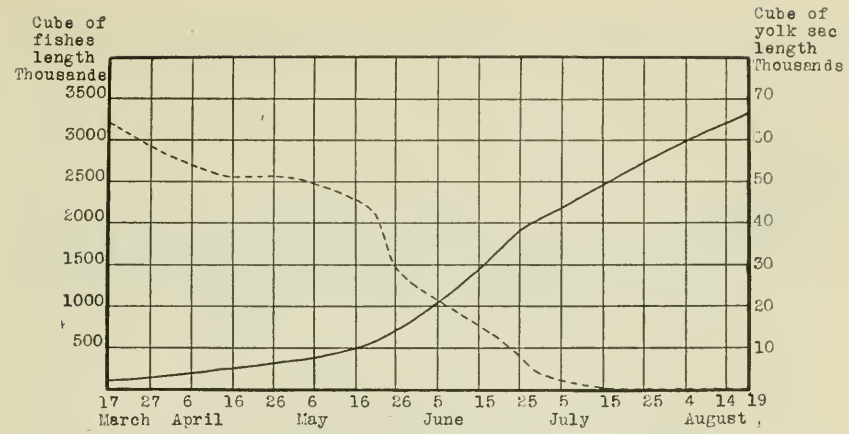

FIG. 40. Rate of growth of body and diminution of yolk of Swell Shark.
——————— Bulk of fish according to cube of length.
– – – – – – Bulk of yolk according to cube of length.

irregular in outline, but resumed the more oval appearance about May 25. By July 17 the yolk seemed to be entirely absorbed, leaving only a small round sac at the end of the umbilical cord, which was only about one-half of its original length, and by July 28 was reduced to less than an eighth of an inch and gave the appearance of a tiny knob on the ventral side of the fish. After hatching the only evidence of the cord was a little spot about the size of a pin head.

The rate of growth of the fish and the diminution of the yolk are shown in the accompanying chart. It will be noted that after the external yolk had been absorbed, about July 17, the fish continued steadily to grow, due probably to an internal supply of yolk. (See diagram.) Note also that from April 15 to 26 there was no change in the yolk shown in the curve, probably due to the fact that at this time the yolk was changing in shape somewhat and becoming narrower, while the length remained constant.

By May 20 the gill filaments, which were long and kept in constant motion by the movements of the fish, had entirely disappeared. They had been present in each gill slit and in the spiracles. Subsequent to this the breathing motion of the mouth was observed.

The color of the fish in the early stages was a uniform whitish. On May 25 a few dark spots were observed on the fins and by June 7, over ten weeks

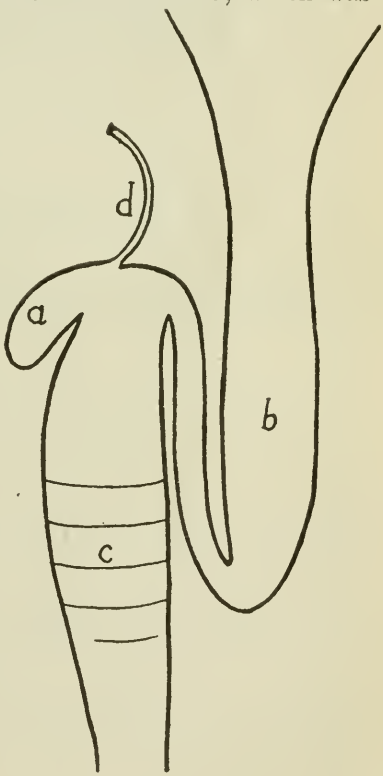

FIG. 41. Diagram showing internal attachment of so-called umbilical cord. *a*. Solid body filled with yolk. *b*. Stomach. *c*. Spiral valve. *d*. Umbilical cord.

before hatching, nearly the whole body was covered with about eight or nine pairs of black bands. At the time of hatching this distinct band effect was somewhat destroyed by the round black spots scattered on the bands.

The fish showed extreme activity at first, wriggling constantly and rhythmically, so that the taking of measurements was quite difficult. The most persistent motion was the back and forth movement of the tail, but occasionally the fish would curl itself into a tight knot and sometimes exhibit such violent activity, wriggling, squirming and flopping about, that it seemed likely to wrench itself loose from the yolk. Such violent activity usually lasted only a few seconds. Most of the time the movements of the tail back and forth were quite regular, while at other times they were very irregular and jerky. These were counted at various times and under various conditions. They seemed to be fewer and more regular in the shade than in sunlight. The experiments were as follows: when the fish was put in a shallow pan and placed in the shade, the tail moved very regularly back and forth from 60 to 70 times per minute; then when placed in the sun the motion became irregular and the count increased to as many as 120 per minute; the fish being placed in the shade again they were irregular and many at first, then dropped down to 78 per minute and became very regular; the pan being again placed in the sun, the movements were only 63 and very regular at first, but soon increased to 115 and were irregular; put back in the shade they decreased to 94. The probable purpose of the movements of the tail was to aerate the water by keeping it in circulation. By May 25 the fish did not show such constant activity. There would be long intervals of very little movement, if any, but at this time when the tail was in motion there were 110 movements counted per minute.

The night of May 25 the fish was left in the shallow pan on the table over night, on account of the failure of the water supply, and the next morning the sun had been shining upon it for some time until the water was almost hot. The fish was stretched out on its back with its mouth wide open, and showed no signs of life whatever. The water was cooled gradually, and within an hour the fish was as active as ever.

As the shark grew larger the activity decreased decidedly. By June 7 it was very inactive. Immediately after it was transferred from the aquarium into a glass jar, there were counted 125 movements per minute of the tail, and then all motion ceased until the fish was placed in the sun, when the activity was resumed. The light of the sun seemed always to increase the activity. When the egg case was handled or poked the fish would curl its tail around the yolk, then remain quiet. By June 17 the tip of the tail when curled around the yolk would reach the tip of the snout. During the last two months of its existence in the egg case, the fish was most inactive and the mouth movements were not always perceptible. At such times it was doubted if the fish were still alive. It was usually, however, with the exception of the last two weeks, sensitive to a jar of any kind. There was evidently more activity than was observed, for the head of the fish was not always in the same end of the case.

The evening of August 19, five months after having been received, the egg case was hanging perpendicularly in the water with the smaller end up, and the head of the fish toward this end. During the night the shark struggled up through this small end, splitting it entirely across the top, freed itself from the case, and was found the next

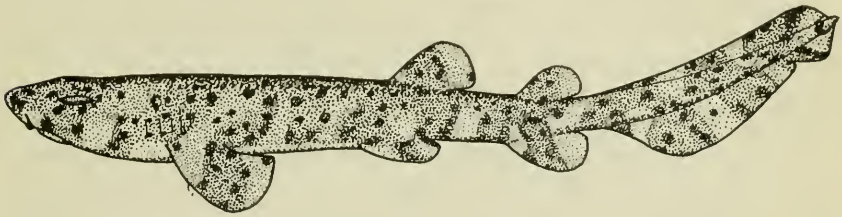

FIG. 42. Swell Shark, *Catulus uter*, the day after hatching. Natural size.

morning reposing on the bottom of the aquarium. The egg case was then examined and it was found that beyond this opening through which the fish had slipped the case was unbroken. One of the slits at this end had aided in making the exit a little larger. The shark was very inactive and remained in one place for a long while, only occasionally moving the fins or tail slightly. During the day it moved about somewhat on the bottom of the aquarium. The next day it was taken out and identified as *Catulus uter*, Jordan & Gilbert.

Figures showing the egg case and the fish immediately after hatching accompany this article.

NOTES ON DRY-FLY FISHING. No. 5.

By R. L. M., California.

SCENE: Camp fire in front of the hotel.

TIME: Evening of the day described in the July issue of California Fish and Game.

Dramatis personæ:

ANGLER.
TOURIST.
MRS. TOURIST.
SECOND TOURIST.
THIRD TOURIST.

Tourist: Here comes Angler. He promised to come around after supper. Angler, let me introduce you to my wife and the rest of our party.

Mrs. Tourist: Those trout we had for supper were delicious. They were so very much better than those that we caught at Pine Lake. I wonder why?

Angler: The fish we caught were stream fish and were in the pink of condition, for they had been feeding on insects, which is the best kind of food for a trout. Furthermore, they were in their natural

environment. On the other hand, the fish in Pine Lake were Steelhead trout that, due to the formation of the country, can not run to the sea. The result is that their natural period of spawning is delayed, and I expect you saw the fish that you caught were not so plump as the stream fish were.

Second Tourist: They did not seem to put up much of a fight when hooked. They just gave one jump and then were brought in without any further struggle.

Third Tourist: Don't the fish in Pine Lake ever get into good condition?

Angler: In about six weeks time there will be a great change in them. It takes time for them to recover from spawning, particularly so as they have to get back into condition in a fresh water lake, rather

FIG. 43. Proper method of holding dry-fly rod. Photograph by R. L. M.

than in their real environment, the sea. Early in the season they are good, but they begin to fall off about the middle of June, and it is not until the latter part of August that they become fit again.

Mrs. Tourist: My husband has been telling us of the wonderful sport you had today. I wish we had been along instead of going over that rough road to the lake.

Second Tourist: Why didn't you begin to fish as soon as you reached the river? Tourist tells me that you waited for nearly half an hour before you began fishing.

Angler: When trout are not feeding on the surface it is very difficult to induce them to rise to a dry fly. One or two authorities on the art have stated that when the exact position of a fish is known, it can sometimes be coaxed to take a dry fly, if the fly is floated over it

a number of times. In order to be successful, it is necessary to cast as many as twelve or more times over the fish. Each cast has to be letter perfect and the fly should not be lifted off the water until there is absolutely no chance of frightening the fish. One mistake spoils everything. If the suspicions of the fish are once aroused, he loses all interest in the proceedings.

The theory is that by making a number of casts over the fish, you create in his mind the belief that there is a hatch of some fly coming on, and so long as no mistakes are made, the effort may eventually be successful. The fish in this river, however, seem to feed mainly on grasshoppers, and during the time that the grasshoppers are present in large numbers they pay very little attention to anything else.

Third Tourist: Don't the fish feed in the evenings, when there are generally lots of flies on the water?

Angler: Not during the time of the harvest of 'hoppers. You will notice a lot of small fish and some chubs feeding on these flies; but the larger fish are resting while their heavy meal of 'hoppers is digesting. Whenever you happen to be fishing in a stream where you know there are good-sized trout and you catch nothing but small ones, you can make up your mind that the big fellows are not feeding. When they do feed the little trout keep out of the way.

Second Tourist: Then as I understand it, when the fish are not feeding on the surface, a dry fly is not much good.

Angler: That is correct with one exception—there is of course the possibility of getting an odd fish by creating an artificial rise of fly. When the dry fly does not produce results, then we change over and fish with a wet or sunk fly and quite possibly get some fish.

Third Tourist: Why didn't you fish with a wet fly while you were waiting this morning?

Angler: First of all, I knew it was only a question of a comparatively short time before the 'hoppers would begin to fly. Then, again, these fish are shy. They are very wary and not easy to catch, as the result of the continual fishing that goes on day after day throughout the entire open season. I considered it best not to add still further to their education by raking the water with a wet fly when I was so sure that they would soon be feeding on the top.

Tourist: You remember speaking about "drag"? Should a dry fly always float with the stream and never move at all on the surface?

Angler: In general, yes. But there are times and occasions when a deliberate drag, that is, a drag produced by the fisherman himself, may get a fish to rise, when possibly if no drag had been made, he would pay no attention to the fly.

Second Tourist: This sounds interesting. Can you give an example from your own experience where a forced drag was successful?

Angler: Yes. A few weeks ago I was fishing farther north. During the latter part of the afternoon a lot of small sedge flies hatched out and got onto the water. These flies belong to a different family than that to which the majority of the flies that we see belong. The sedge flies light on the surface; fly up a short distance and light again. When they are on the surface, they frequently move, sometimes even

running along the top of the water for a short distance. In olden times the antics they performed earned them the name of "caperer." On several occasions on this trip I placed my fly over a rising fish without any result. The fish was not "put down," because it went on rising. Finally, I decided to see what effect it would have if I made my fly copy the motions of the flies on which the fish were feeding. I had already cast three times for the particular fish that I was going to experiment on. However, I cast and as soon as the fly got near the place where the fish was feeding, I deliberately made the fly move slightly on the surface of the water. Well, the fish fell for it and I got him all right.

The same scheme worked again successfully once or twice, but until it has been further tested, it can not be regarded as a standard tactic to adopt. There will always be the doubt, "would not the fish have taken the fly without the artificially-produced drag?"

The fish in that section were harder to catch than the fish here in the river.

Second Tourist: Well, all I can say is—they took "some" catching if they were harder to catch than these boys here. Yesterday I fished for fully two hours, and never got a single bite. At home, I can always get a mess of trout without any trouble at all.

Third Tourist: Back where we come from, we never see as many people fishing as we have seen here. I expect that has something to do with it.

Second Tourist: You spoke of "drag" just now. I don't quite get you. What does it mean?

Angler: "Drag" is a term used to define the unnatural movement of the artificial fly on the surface of the water. The duns and spinners, Ephmeridæ, do not move on the surface, they merely float quiescent. Now, if an artificial fly that is intended to represent one of this family should suddenly start across the water leaving a wake behind it, the suspicions of the trout would be aroused at once and it would undoubtedly let "that queer acting fly" pass on. If they are very wary, they stop feeding for awhile, or as the expression goes they are "put down," which means that they gently sink to the bottom of the stream and do not come up again for some time.

The water, where I experimented with a forced drag, was very slow moving, so much so that to all intents and purposes, there was no current at all. The surface was like polished glass. Unless there is a breeze to ruffle the water the fish are always difficult to approach under such conditions. The forced drag was successful when there was no air stirring. As I remarked before, the fish were feeding on a small sedge fly. I had only one fly of this type with me, namely, "the Welshman's button." The fly was so totally unlike the natural one that I did not expect to do any good with it. However, I had lately been reading a book by "Red Quill" (James Englefield), who is an authority. He stated that he fished an entire season with only one pattern of fly, namely, the "red quill." He used it rain or shine, when the fish were rising to duns or spinners, and also when they were feeding on sedge flies. Thinking of his success I put on a small red

quill and had some very satisfactory results from it. I also tried a Wickham's fancy, and was not exactly disappointed with what took place.

Third Tourist: But tell us, what causes "drag" and how can you prevent it?

Angler: There is not much danger of a "drag" where the surface currents are steady. But if the stream is faster or slower at the spot where the feeding fish lies than it is between that spot and the place where you are standing, there is bound to be a drag if your line falls straight across the water.

Third Tourist: But why?

Angler: Because as soon as the line begins to float down, the swifter portion of the surface makes the line belly out. This causes the fly at the end to move toward the belly of the line, in other words, to "drag" on the surface. This can be corrected, to a certain extent, by causing the line to fall in a curve, either up or down stream, as the current requires.

Second Tourist: But how can you make the line fall as it should?

Angler: By making the cast in a horizontal plane—side stroke—instead of a vertical plane, or overhead stroke.

Third Tourist: Tourist tells me that you hold your reel with the handle pointing to the left. Don't you find it rather awkward to wind up the line with the left hand?

Angler: Not so that you would notice it. I have brought some of my junk along and by using it to demonstrate with, I may be able to explain why I do this. Incidentally, I might remark that professional opinion tells me that my method is the right way, or as an authority recently told me, it is "academically the right way to fish."

Mrs. Tourist: What do you call "professional opinion?"

Angler: The expressed views of some of the leading manufacturers of fishing tackle.

Now, here is my rod with the reel on it. (See Fig. 43.) You will observe that I hold the line with my second finger. It has the longest reach and consequently I can, without moving the rest of my hand, get hold of the loose line and secure it with less trouble than any of the other fingers. To release the line, when I have hooked a good, gamey fish, I merely straighten out my finger for a moment. If I use the reel in this manner I am never bothered with slack line, for as soon as the fly is delivered, I wind up any line that may be hanging in a loop. The second finger reaches out and hooks onto the line and brings it down to the hand grasp as you see now. If the handle of the reel stuck out to the right I could not do this, unless I had a third or supplementary arm and hand on the right side. I will admit that with one exception all the angling writers advocate the handle of the reel to the right, but anyone who has tried the other way and learned how to wind with the left hand, which is extremely easy to do, never goes back to the other position.

Third Tourist: There is something in that. But don't you find that you lose more fish your way?

Angler: My experience has shown me that adopting my method produces just the opposite result. For instance, I was fishing in a place where the fish, although they were large, were few and far between. One day I kept careful count of the rises I had. They totalled exactly three; not thirty-three, but three. How many of those rises do you suppose I hooked?

Tourist: One out of three would be a fair average. Two out of three would be remarkable. How many did you hook?

Angler: All three. Two of the fish were landed; the third got off by coming a few feet towards me and darting off under a sunken log. I couldnt keep him out because the only possible method would have been to push him away with the line, which was impossible.

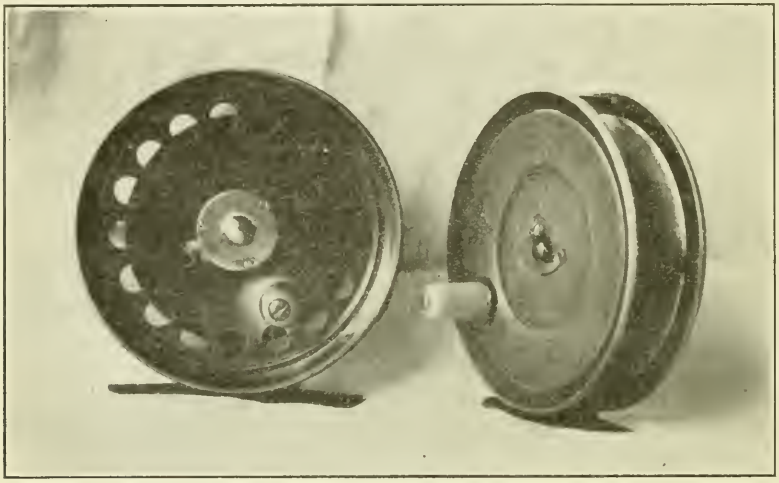

FIG. 44. A good type of reel for a dry-fly rod. Photograph by R. L. M.

Second Tourist: Won't you show us the rest of your paraphernalia?

Angler: Here are a couple of modern fly reels. (See Fig. 44.) They are short length spools of large diameter. Consequently, you can wind up line very fast with them.

Third Tourist: Did you ever use an automatic reel?

Angler: No. I do not think that they are satisfactory. The reel, besides being used as a device to care for the spare line, acts as a counter weight and balances rod. The weight of an automatic reel is so great that it overbalances any normal fly rod.

Here is an old-time fly box. This is known as the "Houghton" fly box and has been made for a number of years. I have had this particular one ever since 1899, but it is still in fair condition.

Tourist: Why the "Houghton"?

Angler: It is named after a famous old fishing club of that name. Ever since 1822, the club has leased or owned riparian rights on the

Test, a river in the south of England, which is noted for its trout fishing and more particularly for the dry-fly branch of that art.

Mrs. Tourist: You have quite a nice collection of flies in that box. I notice that they seem to be graded from quite dark flies to some that are nearly white in their general makeup. Is it necessary to have many different kinds of flies?

Angler: Not absolutely. There are twelve different patterns there. As a general rule, there is sufficient variety in such a collection to find the right fly for the fish. The grasshopper fly is not there, but

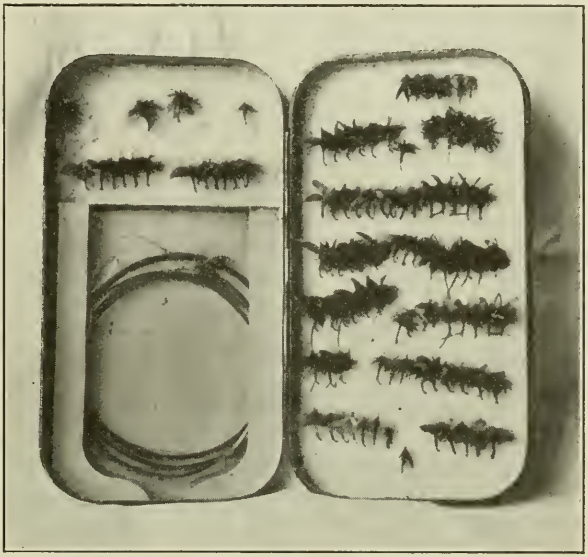

FIG. 45. Fly box and dry flies. Photograph by R. L. M.

that fly is more or less a purely local pattern. By that I mean, it would be worse than useless, unless, the fish were feeding on 'hoppers.

Mrs. Tourist: What are the names of your flies?

Angler: Well, here I have the red quill. These are Wickham's fancies. For a very light-colored fly, I use this, which is called Kingsley's cocktail spinner. The opposite, or the prince of darkness, is this one, which is known as Greenwell's glory. This is the medium olive dun, and this one is the witchurch dun. Then here is that old standby the hare's ear. This fly won distinction, for it was with it that the largest trout ever caught with the dry fly was hooked.

Third Tourist: How big was it?

Angler: It weighed twelve and three-quarters pounds and took one hour and a quarter to land. Its fortunate captor was the Reverend S. E. V. Filleul of Wareham.

Third Tourist: Some fish, I'll say so!

Angler: This fly is the whirling blue dun, and here we have the pink lady, the invention of Mr. George M. La Branche of New York. This animal with no wings is Tup's indispensable, which is supposed

to represent the fly just at the moment it reaches the surface, before it has gotten rid of its outer skin and put its wings out. Finally, here we have the "whole dam dun family" and the "blood relation" or "first cousin" to the "dam dun family."

Second Tourist: Why such a name for a poor inoffensive fly?

Angler: This fly is intended to be a composite portrait of all the duns. Its cousin is a slight variation with woodcock wings and is very useful when the march brown fly is on the water. These two are my own design.

Second Tourist: Are they any good?

Angler: Well, the first time I used "the family" I got hold of a big trout that escaped by promptly getting down between some rocks and sawing off my leader. The next day at almost my first cast with the same fly I got a three-and-a-half-pound fish and long before it got dark or even the cows came home, I had caught the limit.

Mrs. Tourist: Which is your favorite fly?

Angler: The grasshopper, when the fish are feeding on it. But when they are feeding on small flies I have no first choice. The fact of the matter is that one fly is as good as another provided the size is right. The most important thing is to have confidence that the fly you are using is the one and only fly to use. If you can attain to this degree of perfection then you will catch fish. However, we are human and we have our doubts and in order to be on the safe side it is just as well to have a variety of flies along, even if you do confine yourself to only one or two patterns.

Mrs. Tourist: Well, we have had a most delightful visit, and if ever you come our way you must certainly come out to the ranch and have some fishing where there will not be so many people fishing all around you.

Angler: Here are a few grasshopper flies that may be useful in the future.

Tourist: Many thanks. And good luck to you.

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OCTOBER 28, 1920.

It cannot be expected that wild life resources, if left to themselves, will continue to yield food and sport indefinitely. A constant supply can only be maintained through carefully planned protection and propagation, and the necessary expense involved in such an undertaking is justified by any results which are as outstanding as those of fish and game.

COMMISSION'S DUTY TO PROTECT FISH AND GAME.

We often hear unjust criticism of the Fish and Game Commission, because of the wrong attitude taken by many sportsmen. There are many persons who seem to think that the hunter or fisherman is better qualified to dictate as to what the law should be than the Fish and Game Commission. They fail to realize that they view questions from rather a selfish point of view. The members of the Commission are in a better position to know conditions and to judge as to needs than any individual or group of individuals, for it is their business and not simply their hobby. The Fish and Game Commission must stand as a barrier to protect fish and game. It takes into account the safety of the different species more largely than the desire of the man who hunts and fishes.

SUMMER RESORT EDUCATIONAL WORK.

The educational work in the Yosemite National Park carried on under the joint auspices of the National Park Service and the California Fish and Game Commission this past summer proved to be very popular and very much worth while. The work was designed to bring useful information regarding wild life and the methods of conserving it to the summer vacationist. The term "Nature Guide Service," applied to it, but partially explains the different fields of endeavor. In addition to the scheduled field trips for both adults and children, formal lectures and campfire talks were given at the various resorts. Such game birds as the band-tailed pigeon, mountain quail, Sierra grouse and spotted sandpiper encountered on the different field excursions gave splendid opportunity for the discussion of the present status and the methods for the conservation of these different game species. Wild life films and stereopticon slides were used to illustrate the lectures. An office hour held at the National Park Service office gave Yosemite visitors a chance to have questions answered. A total or nearly 1400 persons, a large number of whom were children, were given first hand information regarding birds, mammals and fish through the medium of field trips, and over 25,000 persons through the medium of lectures. Thus does the plan grow for making "conservationists out of summer vacationists."

THE GRIZZLY.

In the Conservationist for August, 1920, Mr. Enos Mills has contributed a short appeal on behalf of the vanishing grizzly. The need for the protection of this splendid animal in California was not appreciated soon enough. California, where the grizzly was but a short time ago found in considerable numbers, is now without a single representative, and it is to be trusted that the people who live in the sections of our country where he is still to be found will not be so short-sighted.

Mr. Mills says: "The grizzly is distinguished by keenly developed senses, alertness, sustained curiosity, and superior mentality.

"Although the grizzly in not ferocious, and although he does not eat human flesh, most people unfortunately believe the contrary. One is as likely to be assaulted by a jack rabbit as by a grizzly, and far more likely to be chased by a tame cow or a civilized dog.

"The grizzly destroys many pests—rats, mice, rabbits and grasshoppers. Most of his food habits are economically beneficial to mankind. Exceptional grizzlies have turned cattle killers; but cattle or big game killing is confined to exceptional individuals and not to exceptional doings of all grizzlies.

"The grizzly has courage, loyalty and individuality. * * * Our race loses if the grizzly goes. He is the master touch to arouse the imagination, to perpetuate the strange primeval memories, to give the wilderness its supreme spell."

We hope that the conservationists who are interested in the protection of this monarch of the wilds will be successful in spreading the gospel of their conservation and that early attention will be given the black bear that it may not follow the grizzly.

BEAVERS INCREASE IN THE ADIRONDACKS.

A careful study of the beaver in the Adirondacks has shown that this fur-bearer is now so abundant that an open season is not only safe but necessary to prevent too much damage being done to timber and cultivated crops. In the day of the trapper the annual exportation of beaver pelts from New York State alone amounted to 8,000. This was in the days of the beaver hat, in the year 1663. By 1820 beavers were so reduced in numbers that they probably numbered a little more than 1,000 in the Adirondacks. In 1895 it has been estimated that there were not more than five or ten animals left in this same region. About this time efforts were made by sportsmen to not only protect the beaver, but to restock some of the streams. In 1906 some actual restocking took place, 34 beavers in all were released during the restocking period, and at the present time, 14 years later, the beaver in the Adirondacks are easily estimated at from 5,000 to 10,000. Beavers are now so abundant that considerable damage is caused by flooding timber areas and obstructing navigation.

The simple remedy for the conditions as they now exist is to ask the New York Legislature to open the season on beavers, and this will be done.

This is another case similar to that of the deer in Vermont, where restocking proved eminently successful. Wild animals have wonderful powers of recuperation and if given a chance will quickly restock the area. Better, however, than restocking is the conservation of a sufficient breeding stock.

STATE FAIR EXHIBIT.

The exhibit at the State Fair which drew so much favorable attention last year was remodeled and improved for the 1920 fair. The observation platform was moved farther away, additional foothills were added and a miniature electric train, with bridges and tunnels, was installed and better lighting effects supplied. It will be remembered that the exhibit is a cyclorama, showing the Sierra from Mount Shasta on the north to Mount Whitney on the south, with miniature hatchery buldings in the foreground, and still nearer in the foreground a large lake containing live trout. Of particular interest this year were the added cloud effects. While changing colors which light the mountains show the change from day to night, clouds sweep across the sky and later the stars appear. This is followed by the rosy tints of morning.

Visitors to the fair unhesitatingly stated that this exhibit was not only the finest exhibit on the fair grounds but the finest ever shown in the West, even exceeding any of those shown at the Panama-Pacific Exposition.

As in previous years there was a splendid aquarium display of food and game fishes, including the famous golden trout.

LAW LEGALIZES CARRYING OF GUN IN CLOSED SEASON.

At the last session of the legislature jack rabbits were placed on the predatory mammal list, thus not only allowing killing at all times but allowing the killing of them without a hunting license. Granting that the jack rabbit is a pest and needs no protection at the present time, yet this law gives the alien hunter and violator a chance to carry a gun the year around, thus making law enforcement particularly difficult. More and more it becomes evident that the carrying of a gun during certain seasons of

the year should be sufficient cause for arrest. Otherwise, on the plea of hunting jack rabbits, the violator has a chance to be in the field during the closed season for quail and other game. All sportsmen should be alive to the danger if this law continues to stand on the statute books.

MORE TRAINED CONSERVATIONISTS.

That there is increased interest in wild life is clearly shown by the educational opportunities offered in institutions of learning. Cornell University has been offering splendid courses on game propagation and more recently there has been formed at McGregor, Iowa, the American School of Wild Life Protection and Propagation. The aim is to establish an institution that will not only fill the interest and needs of the individual student, but one which will at the same time further the discussion and elucidation of large questions, such as water supply, despoliation of forests and the indiscriminate draining of lakes. It will be remembered that there has been considerable agitation for a national park in the near vicinity of McGregor, consequently the location of this school is ideal. The faculty will be made up of noted scientists connected with Iowa State University, Morningside College, Cornell College and Iowa State College.

With a new fisheries college established at the University of Washington and the two institutions mentioned above, there should be no lack of trained men to fill situations connected with our conservation departments. It is to be hoped that there will be a larger body of trained men and that other institutions will be forced to offer work of a similar nature.

MUD-HEN STEW "HUNTER STYLE."

Many a hunter having bagged a mud-hen throws the bird away because he does not realize its food value. When properly cooked the mud-hen is delicious, only surpassed in flavor by the better ducks. Mr. W. W. Richards offers the following recipe, which has been used for many years at "Green Lodge", his duck preserve on the Suisun marshes:

Mud-Hen Stew.

Mud-hens.
½ pound salt pork.
1 medium sized onion.
Potatoes (as desired).
½ dozen cloves.
Half a bay leaf.
Salt.
Pepper.
1 teaspoon curry powder.
2 tablespoons flour.

Skin the birds—*do not* pick them—and soak them a few hours, or all night, in water to which has been added a little salt. Then remove the birds from the salt water and put them in a kettle containing sufficient water to cover them. Let the water come to a boil, then pour the water off; add half a pound of salt pork, cut in dices; cover with hot water, and let boil about one hour. Then add half a dozen whole cloves; one medium sized onion cut up fine; half a bay leaf; salt and pepper to taste; and peeled potatoes as desired.

Mix one teaspoon of curry powder and two tablespoons of white flour with enough water to make a smooth paste, and add this to the stew and let it cook about half an hour longer before serving it.

Serve with boiled rice as a side dish, if desired.

MAKING CONSERVATIONISTS.

What more unpleasant reflection could be made on the sportsmen and the people of the United States generally than in the statement quoted: "Though game protection in the United States is now more than two hundred years old, it has not protected the game?" As early as 1709 there was a closed season placed upon deer, wild turkeys, heath hens and partridges, in the state of New York, with a fixed penalty for violations of the law; and today the most important game animal in New York State is the rabbit. The wild turkey and heath hens are extinct and the deer and partridges are maintained only under the protective measures of the State Conservation Commission. However, such demoralizing evidence is of inestimable value if it makes the people of each and every state think of its own wild life and the best

ways and means of affording it protection. New York has arisen to its responsibilities and can well be a splendid example to most states. Mr. Pratt of the Conservation Commission of New York believes that the crux of the whole problem is to be found in having laws, based on exact knowledge and biological investigation, carried out by an efficient game protective force.

There is no doubt that the value of having an intelligent, efficient, nonpolitical body of men as game wardens can hardly be overestimated. But of what lasting value was the Prussian military system without the united support of the entire populace? Of what value is any system without cooperation? Of major importance is the development of moral force, and this is accomplished through the education of the people. If the state game wardens can stand as educators of the people then, indeed, they can be even more justly proud of their worth. Make it the people's affair, the people's interest, the people's pride to protect the wild life in the state, and the people, not a small struggling minority, will protect the wild life of the country.

New York is visualizing the cause by an emblem designed for permanent use, a small celluloid card interpreting the emblem being given with each one. The cause is becoming popularized, and the creed is one which we should all stand for:

"I believe that 'God has lent us the earth for our life. It is a great entail. It belongs as much to those who are to come after us as to us, and we have no right, by anything we do or neglect, to involve them in any unnecessary penalties, or to deprive them of the benefit which was in our power to bequeath.'—Ruskin.

"That, in a great democracy of free people, the protection of wild life and the preservation of all other natural resources, which underlie national prosperity and happiness, must depend, finally, as does the stability of the government itself, upon the support and willing service of every citizen.

"I therefore declare my adherence to these principles, and have enrolled myself as an active Conservationist of the Empire State."

When the people carry this creed in their hearts rather than on a celluloid card in their vest pockets, the conservationist will have won his hard earned struggle. M. K.

PRESERVATION OF INLAND MARSHES.

Mr. E. W. Nelson, Chief of the United States Biological Survey, has recently pointed out the importance of furnishing migratory waterfowl with places where they can stop to rest and rear their young. Certainly one of the most important factors in the decrease of waterfowl is the reclamation of swamp land, which has furnished a food supply and safe breeding place for these birds. In the propagation of domestic birds we all know that the most necessary things are food supply, shelter and safe breeding sites, and it is not hard to see that wild birds are dependent for their existence on these same three things. The desire of the American people to commercialize absolutely everything is leading to the reclamation of marshes which in reality are more valuable as breeders of waterfowl than as agricultural producing areas. As Mr. Nelson has pointed out, the marsh lands under intelligent management will yield abundant returns to the community, as indicated in the following summary of their productiveness:

1. Production of food and game fishes.
2. Wild fowl, shot for sport and food.
3. Furs, from such fur-bearers as the muskrats, skunks, and raccoons which frequent their borders.
4. A natural ice supply.
5. A definite and invaluable help in maintaining the underground water level in various parts of the state, and in helping to hold back the runoff of rainfall to prevent excessive erosion.
6. Opportunities for healthful and interesting recreation for the citizens of the state.
7. Where such water areas are included in state parks or reservations, they lend themselves admirably to educational uses, and help interest the people of the state in out-of-door life and in the natural resources of the state in the form of plant and animal life.

That some states are becoming alert to the danger, arising from the demand to drain many bodies of water, is shown by the fact that the Conservation Commission of Iowa is working out plans

which will permit the saving of desirable water areas from ill-considered drainage, and Minnesota recently, under the decision of the state courts, has saved water areas from drainage, on the ground of their value to the public in their natural state.

It is high time that California should be aroused to the danger which threatens the wild life of the state by the continuous drainage of water and marsh areas. Discussion along this line is timely and immediate effort must be made, if suitable areas for waterfowl are to be maintained.

ANOTHER SPORTSMEN'S CREED.

1. I deem it a point of honor never to shoot a sitting bird (except cripples). I will not pot-shot, and I will not stand for it in my party.

2. I will measure the success of my day afield not only by the size of my bag, but by the number of cripples I leave behind me. I would rather get a mess of game with no lost cripples, than to kill the limit and leave the woods full of lost game. Accordingly, I will shoot to kill, and *I will not shoot out of range.*

3. I am against "piecing out" the other fellow's limit. I am against the "dummy license." The legal limit applies to the man, not to the party. If I can't kill my own game I don't want anyone else to kill it for me, and I expect my hunting partners to look at it the same way. If they don't, they don't need my company.

4. I will not clean out a covey. "Leaving some for seed" is one of the first principles of sportsmanship.—"*The Pine Cone*," July, 1920.

THE AIRPLANE VIOLATOR.

Not long after the invention of the airplane, it was found that a man-made machine could easily overtake flying waterfowl and that hunting was thus made easy. Hunting from an airplane has grown in popularity and more than one state has found that some restriction must be placed in the game laws to prevent too great a toll being taken. Game law violators who ride in airplanes are difficult to apprehend, as are also the automobile violators. It will be remembered that at the last session of the legislature California prohibited the shooting of game from airplanes, automobiles, and sailboats, as well as from power boats while in motion. Of no less importance than hunting from an airplane, is the stopping of the shooting of hawks and other birds from an automobile. Not only are many hawks and other valuable birds killed by the man desiring something to shoot, but persons traveling along the same road are endangered.

FRANCE DEMANDS GAME REPARATION.

France is awake to the fact that part of the reparation owed her by Germany is to be found in the game destroyed in the regions where heavy fighting took place and in that which Germany took to augment her diminishing food supply. An association of French sportsmen have demanded that Germany repay the gunners of France by restocking the game reserves so entirely depleted by German invasion, rather than by making reparation with money. The sportsmen were so insistent in their demands that they convinced the reparation council of the importance of their stand, and France is now to demand from Germany and Austria live game to the value of 35,000,000 francs. Germany and Austria must each furnish, in four half-yearly installments, 250 stags, 1000 hinds, 200 male and 400 female roe deer, 200,000 male hares and 400,000 female and 3,000,000 brace of partridges. In addition, Austria must furnish 1,000,000 pheasants. The greater proportion of the game will be liberated immediately upon arrival, under the supervision of experts. The balance will be held on game farms as breeding stock, these farms to be controlled and operated by the French government.

FACTS OF CURRENT INTEREST.

Salmon have been caught on hook and line as far up the Sacramento River as Sacramento this season. It seems probable that the exceedingly low water, combined with an invasion of salt water far up the river, has had something to do with the unusual catch.

Angling interests have been threatened owing to the drying up of many trout streams and lakes during the past summer. It has been impossible to stock many streams which have heretofore been stocked annually, because of the lack of water.

Hunting is growing more and more popular as is evidenced by the report of the sale of hunting licenses.

The Fish and Game Commission's State Fair exhibit proved to be the most attractive one of the 1920 fair. The one complaint was that people were unable to see the exhibit owing to the crowds.

Live golden trout were displayed again this year at the State Fair.

A new state fisheries laboratory is now assured, as the city of Los Angeles has furnished the Fish and Game Commission a long-time lease on a site at Fish Harbor, San Pedro.

The normal kill of deer has been made during the past open season, and reports show that deer are on the increase in many sections.

Twenty-five to fifty persons registered daily at the Tahoe camp ground this past season.

The new Tahoe Hatchery constructed at Walker Springs at the north end of the lake has been completed and is ready for occupancy.

HATCHERY NOTES.

W. H. Shebley, Editor.

TROUT DIE IN BEAR LAKE.

As is the case in most dry years, there has been a great loss of fish due to the drying up of lakes and streams. Stocking operations in many streams have had to be suspended this year because the streams were absolutely dry. Anglers in southern California have been justly disturbed over the death of thousands of fine large trout, many from three to ten pounds in weight, in Big Bear Lake in the San Bernardino Mountains. What the future of fishing in this lake, which has heretofore been the mecca of most of the anglers of Los Angeles and nearby counties, will be, remains to be seen. Many are the theories advanced as to the cause underlying the destruction of fish. No matter what the immediate cause, whether bacteria or chemical poisoning, the underlying cause is doubtless to be found in the dearth of water.

SMALL TAKE OF EGGS.

Low water in the streams where spawning operations are carried on has prevented a large take of eggs for the hatcheries. In many instances streams were so low that fish were unable to proceed up stream far enough to reach the spawning station. At the Snow Mountain egg collecting station, where a large take of steelhead eggs is usually made (from 4,000,000 to 6,000,00) less than one-fourth of the usual take was secured—750,000.

GOLDEN TROUT LACKS HARDINESS OF OTHER TROUT.

Although golden trout eggs are being successfully hatched and the fry reared in our hatcheries, yet the adult golden trout appears to be a difficult one to keep in breeding ponds. Several attempts have been made to keep the golden trout at the Mount Shasta Hatchery but without success. Golden trout exhibited at the State Fair at Sacramento last September were moved to Sisson, but all died. Just why this species should succumb while others thrive is a mystery, as shipments from Inyo County come through in good condition and no trouble is experienced in keeping them in aquaria at the State Fair.

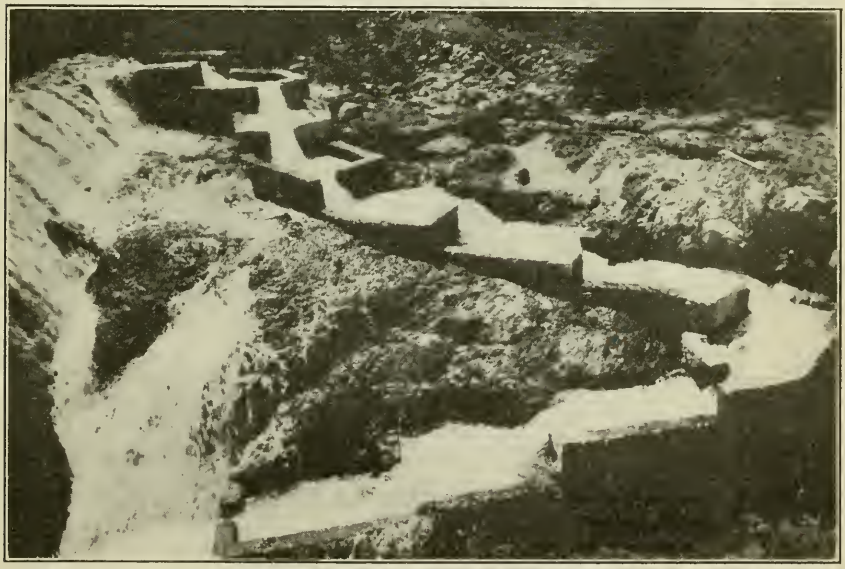

Fig. 46. A fine type of fish ladder. Inskip Dam, South Butte Creek, Tehama County, California. Photograph by A. E. Culver.

THE TAHOE HATCHERY.

The new Tahoe Hatchery is now completed and ready for occupancy. It has become more and more evident for several years past that the supply of water at the old hatchery site was entirely inadequate, and several years ago property about one mile east was secured, together with the water rights to Walker Springs. In fact the site secured is the only one available at the present time. The springs furnish a purer and colder water supply than any stream flowing into the lake. Furthermore, a supply of water from springs is more dependable than that from a stream, in that there is less danger of lack of water during a dry season. The new hatchery contains sixty-four troughs and will have a capacity of about two and a half million trout. Provision has also been made for breeding ponds and nursery ponds. A superintendent's cottage is being built.

This new hatchery is made the more necessary because of the lack of water at the Tallac Hatchery during the past few years. The new Tahoe Hatchery is of sufficient size to handle practically all of the black-spotted trout operations.

The old hatchery building will be utilized as a laundry and community center in connection with the camp ground.

THE OLD AND THE NEW.

In 1888 the Mount Shasta Hatchery consisted of one building, forty by sixty feet, containing forty-four troughs. Its capacity was a few hundred thousand trout and salmon. At the present time the Mount Shasta Hatchery comprises seventeen acres with five large hatching houses containing 450 troughs, together with superintendent's cottages, spawning house, kitchen, barn, sheds and garage. Fifty large rearing ponds for trout and three larger ponds for salmon complete the equipment. The hatchery output averages more than 10,000,000 trout and salmon per year.

FOOD FOR TROUT INTRODUCED.

The Department of Fisheulture is endeavoring to conserve the fish supply by introducing new trout food in the lakes of the southern Sierra and Tahoe basin. Insects, such as salmon flies; crustaceans, such as gammarus; and aquatic plants are being introduced.

COMMERCIAL FISHERY NOTES.

N. B. Scofield, Editor.

THE STATUS OF THE TUNA.

The Fish and Game Commission recently received a letter from one of our leading sporting magazines calling attention to the fact that a seaplane had been used at San Pedro in locating schools of tuna. They also sent this Commission a letter which they had received from a Californian protesting against this "contemptible practice" as they called it, and stating that the "fish canning companies of the state by this method are destroying this wonderful Pacific Coast fish, the tuna."

As this is the kind of opposition which any new method of fishing receives whether it is actually destructive or not, the reply made is appended:

The tuna has been recognized as a commercial fish for many years in Europe. The only reason it has not been recognized as a commercial fish on the Atlantic and Pacific coasts of the United States is because we have not appreciated its value as a food fish. So far the tuna, which we call here the blue-fin or leaping tuna (*Thunnus thynnus*), has been taken in commercial quantities only a couple of years, and we are quite sure that the species is in no immediate danger of being exterminated or of being seriously depleted.

The albacore, which the United States Bureau of Food and Drugs permits our canners to label as long-finned tuna, and which is the whitemeat tuna found in the markets, has been taken commercially in large quantities for the last seven or eight years. The albacore is taken with hook and line only but the quantity taken in one season has been as high as thirty million pounds, or six times the weight of blue-fin tuna taken in any one year.

This Commission has been employing fisheries investigators for the past three years to make a thorough investigation of the albacore to determine if it was being overfished and likely to become seri-

ously depleted in numbers. At the beginning of this investigation three years ago, there was available accurate data of the catch for three years preceding, so that now we have had six years accurate data of the catch upon which to pass an opinion as to whether it is being overfished. The evidence is quite conclusive that the albacore is not in danger of being depleted and we consider that it needs no protection as yet. The tuna which is mentioned in your letter is a closely related fish belonging to the same genus and it is not at all likely that it will be taken in large enough quantities to seriously deplete the supply for at least several years to come.

This state is collecting accurate data of the catch of each commercial species of fish and this data shows not only the total catches of each variety but the catch per unit of fishing gear. By means of this data we are keeping a better watch on the fisheries than is any other state and we will be able to detect depletion of any species before such depletion has advanced beyond the danger point. We are not taking it for granted that the resources of the sea are inexhaustible; we are going on the assumption that any species may be exhausted if we catch it in large enough quantities. We are watching the tuna fisheries as well as our immense sardine fishery very carefully and we wish to assure you that there is no cause for alarm in the fact that an occasional seaplane is used to locate schools of tuna.

As yet there is no demand in the markets for the canned blue-fin tuna, in fact, there is not the demand there should be and it is not likely that the fishing for blue-fin tuna will need restricting until the public do come to appreciate it as a valuable food product.

We do not consider the use of seaplanes in locating schools of fish as a "contemptible practice." This method of locating fish has been used but little on this coast. On the Atlantic coast, as you may know, the United States Government, with the sanction of the United States Bureau of Fisheries, is aiding the fishing industries to locate fish by this means. Seaplanes were used last fall at San Diego in locating schools of sardines. These seaplanes were furnished by the United States Navy and had the sanction and assistance of the State Fish and Game Commission.

BUREAU CHIEF INSPECTS CALIFORNIA FISHERIES.

Dr. H. F. Moore, Deputy Commissioner of Fisheries, made a tour of inspection of California fisheries and the United States Bureau of Fisheries' Preservation Laboratory at San Pedro during September on his return from the Pan-Pacific Science Congress at Honolulu. This is Dr. Moore's first visit to this coast for several years. A full week was spent on a survey of the fisheries, this being occasioned by the recent rapid growth of our fisheries and more especially by the fisheries conservation work now being done by the State Fish and Game Commission. Dr. Moore has expressed himself as being very favorably impressed with the conservation work under way in this state.

TUNA FISHERIES INVESTIGATED.

A recent visitor to this coast is Dr. Kamakichi Kishinouye, of the College of Fisheries, Tokyo Imperial University, Japan, who is making a special study of the comparative anatomy of the Scombroid fishes, or in other words, the fishes of the mackerel family. He finds that the yellow-fin and the blue-fin tunas have a remarkable set of blood vessels which surround the liver and extend into the strip of dark meat along the side of the fish, which strip is so noticeable in the fishes of the mackerel family. The albacore, or long-finned tuna, does not show this unusual development, at least in such a marked degree.

The remarkable part of this is that this particular arrangement has never been described by anatomists or fish investigators. It is believed to have some direct bearing on the fish's ability to withstand cold water.

Dr. Kishinouye is spending some time in southern California in order to make a study of this structure in the three species of tuna found in those waters, *i.e.*, blue-fin, yellow-fin and long-fin tuna. He also wishes to determine if these three fish are of the same species as those found in Japan. He suspects, from work he has already done on the anatomy of these fishes, that the Japanese blue-fin tuna is a different species from the one found in the Mediterranean Sea. Heretofore these two, as well as the blue-fin tuna found in California, have been considered the same species.

In Japan the blue-fin and yellow-fin tuna are caught by immense trap nets placed rather close inshore. The long-finned tuna, or albacore, cannot be caught in this manner as they do not approach the shore, living only in quite deep water. The albacore is taken to some extent in

gill nets but the principal method of catching is by the use of long lines, similar to the lines used by the California Fish and Game Commission in its experimental fishing for albacore in southern California waters a year or so ago. They have found this the most successful way of catching albacore and the most economical. The principal bait used is fresh squid. The method of using hand lines and lines on short poles, as employed in California, is used only to a limited extent in Japan. It is his idea that the use of the short poles, which is known to our fishermen here as the "Jap pole method," is only successful at times when the albacore are very plentiful. The long lines, he states, are most successful in catching albacore in the spring and fall of the year, and these are the times when the albacore catch is the largest.

It may be of interest to note here that the experimental fishing done by this Commission some time ago demonstrated the fact that by the use of long lines the albacore may be taken at times when they are not feeding at the surface and consequently cannot be taken by surface fishing methods such as the use of short hand lines and the "Jap pole method." The blue-fin tuna also takes the long line and hooks quite freely.

UNITED STATES BUREAU OF FISHERIES, SAN PEDRO LABORATORY.

The work of the United States Bureau of Fisheries Preservation Laboratory at San Pedro is being temporarily continued by the Fish and Game Commission until funds can be obtained by the Bureau. There is hope that the bureau will get an appropriation which will enable it to continue the laboratory from the first of January and to reimburse the state for what it has spent; although this last, while possible, is hardly probable. The bureau continues virtually to direct the work although the state, in order to get due credit, appears as the operator and will publish the preliminary reports of the work. The Commission entered into this arrangement believing that by so doing it would aid in the expansion of our fisheries and would prevent the almost total loss of the laboratory's preceding year's work. It was believed that by so doing the fish canners of the state would be pleased and all others interested in the wellfare and development of the fishing industry.

In helping to this extent there was the desire to aid a federal bureau which stands for the development and conservation of the fisheries as does no other bureau—a bureau which for many years has carried on fisheries conservation work in this state and which it is hoped will continue to carry on in the future.

The laboratory, a year ago, undertook fish canning experiments which for good and sufficient reasons were scheduled to continue over a period of two years before their completion. It was necessary to continue this work for the bureau in order to tide it over a temporary financial depression and thus preserve to the state the bureau's well-equipped laboratory and the bureau's inclination to continue this valuable line of research work. If we had not done so the years' work would have been lost as well as the $20,000 already expended.

The United States Bureau of Chemistry has established a laboratory at San Diego for work similar to that which is being done in the preservation laboratory of the United States Bureau of Fisheries at San Pedro. There is plenty of work for both laboratories and each should receive encouragement. The Commission is doing all it can to prevent duplication of work by the two bureaus and to bring about a correlation of their activities. Mr. Almy, who will supervise the work of the laboratory of the Bureau of Chemistry, and Dr. Alsburg, head of the bureau, have assured the Commission that they desire to cooperate to a sufficient extent to avoid unnecessary duplication of work.

OCTOPUS FISHING IN JAPAN.

Recently several octopi were brought into the San Francisco markets which had been caught by the local rockcod fishermen on rockcod gear. In a recent visit from Dr. Kamakichi Kishinouye of the Tokyo Imperial University, Japan, some very interesting information concerning the methods used in fishing for octopus in Japan was gained.

One method used is as follows: Long lines are let down to which are attached earthenware pots or vases of the right size to accommodate the octopus for which

they are fishing—we should judge these pots would average 1½ to 2½ feet deep and from 8 to 14 inches in diameter. Some of these pots are suspended with the mouth down, others suspended with the mouth up from the long horizontal line. Each pot has a small hole in the bottom to let the water easily escape when the pots are raised. The pots are not baited, and since it is the habit of the octopus to find a hiding place in the rocks, they crawl into the mouth of the pot and remain there until they are pulled out. The pots are set one day and pulled the next; one boat will handle about 200 pots. Ordinarily buoy floats are not used to locate the lines but they are picked up with a grappling hook, for it is believed that the floating buoy disturbs the pots and prevents the octopus from entering.

They are also caught by means of hook and line. In this method the fisherman baits the hooks, several of them on a long line, and when they have lowered them until they come in contact with rocks, they continually jerk the lines. The octopus, in feeding, reaches out its arms to get the bait with its sucking discs and the jerking of the hooks catches the arms or tentacles.

SILVER SALMON AT MONTEREY IN 1920.

Since the last two seasons in California have shown relatively poor catches of king or Chinook salmon there is an increased interest among fishermen and packers in the other possible species of salmon that might serve to fill in the breach, especially during bad years. The most abundant of the lesser species is the silver salmon, a fish of lower oil content than the king and therefore less desirable for canning, although it sells readily on the fresh markets. Along our northern coast it forms a large per cent of the salmon catch. The southern boundary of commercial salmon fishing (Monterey) seems to be almost out of the range of the silver salmon. The salmon investigation now being conducted by the Commission has gathered some information as to the relative abundance of the two principal species and from time to time further notes on their occurance, seasons, abundance and worth on the markets will be published.

In a recent number of *California Fish and Game* (Oct. 1919) it was noted that the silver salmon in 1919 did not appear at Monterey, just for a few days, but that they were caught in small numbers over a period of eleven weeks with a heavy catch on four or five days during the period. Detailed notes were kept in the 1920 season's run in Monterey Bay and it was found that the appearance of silver salmon in small numbers extended over a longer period this year and that they were not caught in great numbers during any four or five consecutive days as was true in 1919. At no time this year did they outnumber the king salmon. In 1919 the first silver salmon was noted on May 10, while in 1920 the first was caught on April 19. During the remainder of April, 1920, a few were caught each day averaging between four and five pounds apiece. For instance, on April 23, the silvers made up 4.4 per cent of the catch in number of fish and 1.6 per cent in weight, the rest of the catch being kings. During May there were very few silvers caught at Monterey, but on June 1, they formed about one-fifth of the catch. On June 2, the silvers were 18 per cent in number and 8.2 per cent in weight of the catch and averaged a little less than 7 pounds apiece. June 3, and 4, the silver catch was somewhat less and from the fifth to thirteenth of June there were only a few silvers caught. On June 14, the silvers picked up to 15.3 per cent in number of fish and 7.7 per cent in weight in the catch. By June 17 they were 24.2 per cent in number and 17.5 per cent in weight in the catch and averaged 7.8 pounds each. From June 18 to 21, the silvers averaged about 7.9 pounds but the per cent in the catch dropped off. On June 22, the silvers in the catch were 19 per cent in number of fish and 8.8 per cent in weight with an average weight of 7½ pounds and the average weight dropped to 7 pounds for the following week. By this time the king salmon season was about over so that the silver salmon caught, although few in number, formed a relatively higher proportion of the catch. For example, on June 24, the silvers in the catch were 33 per cent in number and 22.8 per cent by weight. June 25, the per cent of silvers dropped to 18 and from then on for the remainder of the season there was only an occasional silver salmon caught.

W. L. S.

OCEAN AND STREAM SALMON CATCHES.

Frequently the question is raised as to the relative importance of trolling and stream netting for salmon in California so that a summary of the figures of total salmon catch may be of general interest. The 1920 figures are not yet complete. The following figures, in round numbers, represent yearly total salmon catch of the state in pounds of fish in the round.

	River caught.	Ocean caught.	Season total.
1919	5,987,000	7,158,000	13,145,000
1918	7,173,000	5,920,000	13,093,000
1917	5,493,000	5,563,000	11,056,000
1916	5,342,000	5,501,000	10,843,000

There are three chief trolling regions: (1) Shelter Cove, (2) vicinity of San Francisco, (3) Monterey Bay. The two chief netting regions are the Sacramento river and the northern coast streams such as the Eel, Klamath, and Smith rivers. The 1919 salmon catches for these regions expressed in percentage of the total catch of the state are as follows:

Region.	Per cent	
Ocean—		
Shelter Cove	22	
San Francisco	11	
Monterey Bay	22	55
Stream—		
Sacramento River	35	
Northern Rivers	10	45
	100	100

The salmon caught at Monterey, outside San Francisco, and in the Sacramento River are generally classed together as a unit since it is assumed that they result from spawning in the Sacramento. At present a possible restriction of the trolling and netting of salmon is being discussed. A contrast in the catch by these two methods is shown by the following table of catch in round numbers of pounds:

	Mont. Bay.	Outside S. F.	Troll fish.	(Taken with nets) Sac. River.
1919	2,816,000	1,443,000	4,259,000	4,529,000
1918	2,893,000	1,929,000	4,822,000	5,938,000
1917	3,880,000	1,280,000	5,160,000	3,971,000
1916	5,231,000	263,000	5,494,000	3,451,000

There are changes from year to year in the importance of the salmon fishery of any one locality. For example, the catch at Monterey has dropped off while the Noyo-Shelter Cove catch has been steadily increasing due to the recent development of the industry at those northern trolling points. In 1917 the total from the Noyo-Shelter Cove region was less than a half million pounds, in 1918 over one million and in 1919 only a little less than three million pounds. A minor item of interest is that each year a few salmon are caught by trolling and netting along the coast of the southern counties far to the south of Monterey. Last year 10 pounds were reported, in 1918 one thousand and in 1917, 2000 pounds. W. L. S.

THE SALMON SEASON AT MONTEREY.

The Monterey salmon season of 1920 was even poorer than last year. The catch is roughly estimated at one-fourth of the normal or about one-half of last year's catch. In round numbers the Monterey catch (exclusive of Santa Cruz) was 1,290,000 pounds, this year as opposed to 2,316,000 pounds in 1919. The early season's catch this year was better than a year ago, but there was not the customary large run during the latter half of May and the first two or three weeks of June. The season practically ended in June, but there was a small catch on two or three days near the end of July. The local trolling fleet was about quadrupled by the addition of boats from northern points, but the poor catch was so discouraging that many fishermen returned to San Francisco during the middle of the season.

In spite of the fact that each year has seen a steadily increasing number of boats trolling for salmon in Monterey Bay, the yearly catch has been dropping off, as shown by the following figures, in round numbers, of pounds of salmon caught in the bay.

1919.	1918.	1917.	1916.
2,816,000	2,893,000	3,879,000	5,231,000

As stated above, the 1920 catch is little more than half that of 1919.

W. L. S.

NOTES FROM THE STATE FISHERIES LABORATORY.*

WILL F. THOMPSON, Editor.

THE FISHERIES LABORATORY AND ITS WORK.

At the time these notes go to the editor, considerable progress has been made toward the establishment of a permanent laboratory building for our work. The most encouraging advance in that direction has been the granting by the city of Los Angeles to the Fish and Game Commission of a long-term lease to a site at Fish Harbor, San Pedro. It is situated at the intersection of Seaside avenue and Tuna street, and will be most accessible to all canners and fishermen who may be interested.

A description of the site and the discussion of the plans for the building, of which rough sketches are at hand, may await the time when the plans are in finished condition, but it will be well to state now as clearly as possible those ideals to which the Commission is planning to dedicate a unique institution. Such a statement may save misunderstanding and opposition, and should give to those interested an appreciation of the underlying purposes such as will enable them to comprehend the reasons for the choice of site and for the plans adopted. The site was chosen because of its proximity to the canneries and the fish wharves, making it possible to follow easily the progress of the fishery. The plans adopted are intended to give good working room for a statistical and biological study of the fisheries for the purpose of conservation and adequate utilization and at the same time to allow an exhibit to those interested of the purposes of the work and its relation to the fisheries.

That the primary purposes of the investigations of the California Fish and Game Commission are conservation and adequate utilization has been stated many times. But such purposes have been repeatedly avowed by investigators, whose programs when adopted have betrayed a primary interest in general natural history, and have shown little relationship to the problems to be solved. The scientific program of the Commission has, however, been planned very specifically to meet the problems which are involved in governmental control of the fisheries, and are adapted to meet the responsibilities of the state as legal guardian of those natural resources. The machinery for the execution of this program is, in fact, already operating in part, and its purposes are stated very clearly in the laws of the state as duties of the Commission. Section 1 of the particular law referred to is as follows:

"It shall be the duty of the Fish and Game Commission to gather data of the commercial fisheries and to prepare the data so as to show the real abundance of the most important commercial fishes; to make such investigations of the biology of the various species of fish as will guide in the collection and preparation of the statistical information necessary to determine evidence of overfishing; to make such investigations as will bring to light as soon as possible those evidences of overfishing as are shown by changes in the age groups of any variety of fish; to determine what measures may be advisable to conserve any fishery, or to enlarge and assist any fishery where that may be done without danger to the supply."

The law then goes on to make provisions for the statistical system now in use as one of the bases for the scientific work. This system is to the best of our knowledge one without parallel in any country, and it has already proved itself superior to any statistical system we are acquainted with. It registers the catch of every boat, leaving its record for subsequent study by scientists in conjunction with other records by which changes in apparatus and economic conditions may be discounted, in order that there may be obtained a measure of the fluctuations in abundance of fish from year to year. It will be inevitable, in the future, that any scientific program carried on by the possessors of such complete records as by this law we shall eventually have, will be a program designed to discover the meaning of such records in terms of abundance and scarcity of fish. That there are faults in the system must be granted, but the faults are infinitesimal compared to those of statistical systems depending

*California State Fisheries Laboratory, Contribution No. 21.

upon estimates and hearsay. The laboratory will provide for the filing and the study of these records.

But this statistical work is only a part of the program, and in formulating both this and the biological, which is in a way the more important, the Commission has had before it the several programs adopted during the last two decades in other countries, notably in those bordering the North Sea and our North Pacific, and from these programs and their results it has been possible to decide within somewhat narrow limits what knowledge is necessary to competently legislate for our fisheries. The failures and successes of others during the recent great advances in fishery science have profited us. And in this fact is seen the reason why the program for the proposed laboratory will be a really vital one, *dealing with questions which actually face the legislator and the men interested commercially.* It will lack the vagueness of random natural history investigations, and it will avoid the limitation in value of technological research. In the future we may justifiably hope that the investigations carried on in the new laboratory will further define and clarify the many problems to be met with.

And in thus reviewing the work in other fields perhaps the most obvious fact has been the absolute necessity of access to the vast store of specimens and data to be furnished by the commercial fisheries. No agency could afford to duplicate this store, despite its vital importance to any investigations. And this has, in fact, determined the location of the laboratory and dominated in the construction of its plans. Another obvious conclusion to be drawn from the work of others has been the necessity of obtaining popular support by exhibiting to those interested the purposes of the work, and its achievements, as well as by showing graphically the necessity for it. Because of this there has been planned an exhibit room.

The great scientific value of this work may not be immediately obvious to the scientist who is interested in some of the more basic laws of biology. It may appear too practical. Yet this definition of aim, and practical trend actually heightens the value of the work from the standpoint of general science. The problems faced by the legislator are, in striking degree, the same as those in which the student of geographical distribution, and of evolution is or should be interested, and the material offered by the commercial fisheries far exceeds in extent that which can be obtained through other sources. The degree of isolation of different races and the extent to which it leaves its traces on the morphology or habits of the species is of great importance to one pondering the value of protection to a species overfished in a particular locality, just as it is to the man interested in the formation of races and species. The rapidity of growth, the distribution of pelagic ova or larvæ by currents, the response of the species to changes in surrounding conditions, all affect both the conclusions of the naturalist and those to whom the apparent abundance of fish is vitally important. Above all, however, our program will be most vital to the progress of hydrographical science in its relation to the food supply of man, through what is in reality the most essential purpose of our work—the measurement of the actual abundance of fish in the ocean. The effect of hydrographical conditions on fish can not be measured without a knowledge of the real abundance of fish, of the rate of growth, and the habits. So, in addition to being dedicated to the service of competent legislation for conservation and utilization, the laboratory will be in a very real way an essential part in the progress of more general scientific knowledge.

W. F. T.

PROGRESS OF THE ALBACORE WORK.

During the past summer Mr. Thompson has been pursuing in so far as possible the study of the albacore, with particular reference to its age and rate of growth. Mr. Rich and Mr. Sette have been stationed since June at San Diego and San Pedro for the purpose of collecting for Mr. Thompson certain measurements and statistics bearing on the various problems.

The study of the age has progressed to a point where the results are being prepared for publication. The age marks on the scales being illegible save in part, a special technique was necessary in order to decipher them. This was the more necessary in that serious questions have arisen in some quarters regarding the ac-

curacy and care with which age readings have been made in the cases of other species—and indeed, well-known biologists have openly challenged the fact that scales and otoliths actually do show age. The work on the age of the albacore has demonstrated clearly and unmistakably the absolute correspondence of the actual age of the fish and the marks on the scales by a method entirely free from the influence of the worker's personal judgment. Painstaking and time-consuming as the work has been, it has proved entirely worth while, and is the first direct knowledge we have of the age of any of the species of the mackerel family on this coast.

These results show the albacore to be a fast growing species, with all that implies regarding the effect of commercial fisheries upon it. Their discussion must await the final publication. But attention may be called to the fact that with their aid conclusions have been tentatively reached regarding the migration of the albacore. It is believed that the species shows a gradual migration to the northward through a period of years, but that the migration of any one year class is in general limited. The seasonal migrations are the most prominent and striking.

The summer's work has also continued to add to our material bearing on the migrations and the fluctuations in the run of fish and on the relationship of catch to temperature or some allied factor, thereby placing certain facts beyond dispute. These can not be treated very fully here, and it is hoped that as soon as the work on the age is out of the way, attention may be turned to these data, which will, it is believed, prove highly interesting. The data at hand are exceedingly extensive, perhaps more so than the data available for any other fishery, as the records for the whole industry from its beginning have been collected. The results are already well defined, but remain to be placed in shape for publication.

It will be recalled that we have analyzed the relative abundance of fish during past years (see Pacific Fisherman Year Book, 1919) and found a steady fall in the catch of the same unit of gear from year to year. We ventured to say, however, that this fall was not, judging from various things, due to depletion, and the events of this summer have reassured us in this regard. The catch has shown an increase and the reappearance of younger classes of fish, both encouraging signs. The possibility that overfishing may occur is not, however, eliminated.

W. F. T.

PROGRESS OF THE CLAM WORK.

Since April, 1919, F. W. Weymouth has been devoting a portion of his time to the completion of a survey of the shellfish of the California coast commenced several years previously by Will F. Thompson. A report is now ready for the press embodying all the collected data. The primary purpose of the survey has been to put on record the number and abundance of the species of commercial importance and the location and condition of the beds at present being utilized. The scope of the report has been extended by the inclusion of descriptions and figures, together with a key for ready identification of some forty species of present or possible commercial value. Heretofore no such key has been available, and it is hoped that by this publication, campers and amateur clam diggers can be made acquainted with the edible bivalves of the coast. Besides the description and range of each species an account of its habits has been included. Though many collections of attractive and interesting "shells" have been made, there are few observations on the varied habits of these animals and it is hoped that those recorded in this report may lead to more study of the remarkable ways in which the bivalves are adapted to the diverse conditions of life under which they are found.

In connection with this survey certain important points have developed. One is the need for a more detailed study of the life history of at least some of the more representative and important species. At present, though several of the eastern species have been carefully investigated, no facts concerning the age or rate of growth of a single native Pacific species are known.

In an attempt to remedy this lack, data have been collected throughout the year on the Pismo clam, one of the most important California species, and these are now being carefully studied. The preliminary work indicates the main features of the age and as soon as it can

be completed it will be put in form for publication. It appears that the growth is less rapid than has been supposed and that a considerable age is reached by the larger specimens met with.

A careful survey of the coast has forced the conclusion that few of the native species can be materially increased by artificial means, but that in certain suitable bays the "farming" of the introduced soft shell or long clam might be made very profitable. Its culture has passed the experimental state on the eastern coast and profiting by this experience many acres of otherwise barren tide flats might be made to yield as sure and valuable a crop as a wheat field. It is hoped that in the future the question of the control of suitable tide lands may be put on as secure a basis as is the management of existing oyster lands, thus making such clam farming a practical possibility.

F. W. W.

PROGRESS OF THE SARDINE WORK.

The investigation of the sardine fishery is being continued along lines laid down in previous publications in this magazine (Volume 6, No. 1, pp. 10-12), and in Fish Bulletin No. 2. Mr. Elmer Higgins has, during the past season, been made responsible for the carrying out of the program at San Pedro, while Mr. O. E. Sette has been, until this last June, responsible for the same at Monterey, both under the direction of Mr. W. F. Thompson for the present. Mr. Sette, who is leaving this fall for a resumption of his college work, will continue his sardine work while at college. The principal attention of both of these workers has been concentrated on the discovery of the rate of growth through a study of the frequency of occurence of various sizes of fish, and the following of fluctuations in average size, sex, maturity, quality, etc., during the fishing season. In view of the importance of the sardine industry, somewhat more attention is given to an exposition of this work than is the case with the other fisheries with which we are dealing.

The program under which the work has been done contemplates (1) the discovery of depletion if it should occur; (2) the discovery of any great natural fluctuations in abundance or quality other than those due to overfishing; (3) the foretelling of these fluctuations, which in other fisheries have at times caused great damage; (4) the deciphering of those habits of the species which are of importance to the canner and fisherman, such as migration, and (5) a knowledge of such facts as will aid the legislator. The absolute completion of this program is without doubt well removed, but contributions to it of great value will be made in the very near future, enabling us to make at least provisional answers, a thing impossible now. Among these we may list the age and rate of growth, the breeding season, and the degree of independence of the sardines in different regions. That the foretelling of fluctuations is not visionary may be seen from the work of the Norwegian fishery authorities on the herring. The other elements of the outline given are dependent entirely upon the records we obtain—and we are acquiring the very best possible.

A certain amount of preliminary work had been done by Mr. W. F. Thompson, assisted by A. W. Warnock and others before the inauguration of the present investigations a year ago. In this preliminary work the breeding season had been observed at San Pedro (as mentioned by Mr. Higgins below), a series of scales collected for the study of the age, and a set of careful observations made on the differences between the sardines from San Diego, San Pedro and Monterey. The latter observations, as bearing on the possibility of the interdependence of the sardines in different regions, have been completed by Mr. Higgins in addition to his own work and reports on the conclusions may be expected in the near future.

PRESENT STATUS OF THE SARDINE INVESTIGATION IN THE SAN PEDRO DISTRICT.

In the study of the sardine fishery, as distinct from that of the fish itself, the course of the run at San Pedro—the abundance or availability of the fish from day to day throughout the season—has been studied by analysis of the daily average boat catch. This was determined by tabulating and averaging the individual catches of each boat day by day, the data being obtained from the filed carbon copies of the original fish receipts issued by the canners to the fishermen at the time of

delivery. This tabulation and analysis of the average boat catch, including the records of some 110 boats, is in course of completion. Careful consideration, however, has been given such artificial factors as market or labor conditions in arriving at a conclusion as to the daily abundance of the species and an effort has been made to take them into account.

The character of the season's run has been studied by taking a twenty-pound sample of the fish from the individual boat loads day by day at the time of unloading at the canneries, together with data on the locality and time of the catch. To date, 182 such samples have been taken from boats unloading at seven canneries in San Pedro and Wilmington, and from them the average weight, average length of the fish in each boat load, the size or age groups represented, sex and degree of sexual maturity, were determined. From these samples about 5000 individual fish have been specially measured and sexed. And from these data the spawning habits, the class of fish taken, and the variation in the catch have been studied. The degree of mixing of age or size groups, or the degree of uniformity of size in different schools is also being investigated.

The measurements of the large series of fish above mentioned, in addition to indicating the character of the run, have been tabulated to show the frequency with which fish of each length occur. This tabulation of length-frequency is the oldest reliable method of determining the age of fishes (see *California Fish and Game*, Vol. 5, No. 2, p. 53), and the curves or graphs prepared from our figures give undoubted indications of the ages of the various sizes of commercial importance.

The study of the maturity and spawning habits of the sardine at San Pedro was begun two years ago when Mr. Thompson and assistants made series of examinations of the condition of the roe during the spring of 1918 and 1919. The results of these observations were published in this magazine in July 1919.* The same observations were repeated during the past spring season by the writer and in addition to the records of spent and relatively mature fish, the roe of about 140 fish was preserved at weekly intervals and deposited in the laboratory collections for future microscopical study. The records of the maturity obtained while measuring the large series of fish mentioned above have also been tabulated and curves drawn to show both the relative numbers of immature, relatively mature, and spent fish present in each size group, and also the per cent of mature fish at each length.

The same series of measurements has been studied to determine the relative numbers and sizes of the two sexes, in regard to possible selective migrations, relative mortality, and differences in rate of growth. E. H.

*California Fish and Game, Vol. 5, No. 3, p. 159, July, 1919.

THE SARDINE PROBLEM IN THE MONTEREY BAY DISTRICT.

That the Monterey sardine fishery has increased in volume to eight times that of three years ago is evidence enough that the possibility of depletion can not be much longer ignored. The value of the present annual pack, about five and half million dollars, warrants the concentration of attention on this problem. Consequently, in the summer of 1919 the work was commenced.

The investigation was begun November 12, 1919, and was carried on energetically to the end of the season in March, 1920. The work was necessarily of the nature of a preliminary survey and involved the taking of extensive daily records of the various aspects of the daily commercial catch. Samples from about six boat loads were taken daily as the fish were unloaded at the canneries. An average weight of sardines in the respective catches was ascertained by the weight and count of the fish in these representative samples, the locality of the catch was obtained in most cases by a personal interview with each fisherman, and a number of fish were reserved from each sample for further examination. This remaining work was done at Hopkins Marine Station, where the Fish and Game Commission was courteously granted the use of quarters and facilities. This made possible the taking of accurate measurements of the sardines and a dissection for the purposes of determining sex and the development of spawn in the fish. During the season 345 samples were taken, 7534 fish were measured and sexed, and about 200 ovaries were preserved for study of the egg development.

A partial analysis of this data shows

that we have definite clues to the answers of the vital questions, and it but remains for a more extended study to corroborate and substantiate facts which we have concerning the age, rate of growth, migration and spawning. A complete report of findings will be published by the fisheries research laboratory at an early date.

Of course large questions of yearly fluctuations in abundance and sizes, with their important bearing on depletion, can not be comprehended in the results of one season's data, but the data taken this last season are invaluable as the first of a series of consistently comparable scientific observations of each season's catch, without which nothing concerning depletion can be detected before the harm is already done. It now remains for continuance of this study to solve all of the problems concerned, and insure the perpetuity of our great resource, through the adoption of intelligent conservational measures. O. E. S.

LARGE TUNA.

A large proportion of the blue-fin tuna caught during the month of August this year was of unusually large size. A six-ton load of excessively large ones was brought in to San Pedro by the boat "Little Perina" on August 16. The fish averaged 113 pounds, the largest tuna weighing 182 pounds and measuring five and a half feet in length, and the smallest measuring over four and a half feet in length. The average weight of tuna, and the size most convenient to handle, varies around 30 or 40 pounds. The fishermen complain of much damage to their nets by the large tuna, the meshes not being strong enough to withstand the assaults of these monsters. O. E. S.

LIFE HISTORY NOTES.

BAND-TAILED PIGEON NESTS IN SEQUOIA NATIONAL FOREST.

On September 1, 1920, Guard Arnold and myself, while working on the head waters of Deer Creek, Section 35, T. 23 S., R. 31 E., M. D. M., at an elevation of approximately 6500 feet, discovered the nest of a band-tailed pigeon, *Columba fasciata fasciata*.

The nest consisted of a few small dry fir limbs and twigs about 10 feet from the ground in a dogwood tree. The nest was so rudimentary that it did not seem possible that it could be a nest at all. On it was one small squab about one-fourth the size of the parent bird. It was naked except for a few sparse reddish-brown hairs on the head and back. We saw eight adult birds near where we found the nest and they acted as if they had nests near by. W. F. DERBY.

LARGE MACKINAW CAUGHT IN DONNER LAKE.

On July 10, 1920, Mr. J. C. Purdy of Sacramento, California, caught a fifteen-and-a-half-pound mackinaw trout in Donner Lake. This large fish was caught with a trolling tackle. The mackinaw trout was first planted in Lake Tahoe in 1895 and a year later in Donner and other nearby lakes after the successful hatching of a shipment of eggs. Although fish of this species are occasionally caught in lakes of the Truckee Basin, the mackinaw, or Great Lakes trout as it is sometimes called, has never thrived to the extent expected when introduced into this part of the country.

FIG. 47. Mackinaw trout caught by J. C. Purdy, in Donner Lake, Truckee, California.

SPARROWS DESTROY GARDENS.

The damage to fruit by the house finch and the damage to fall and winter gardens of the city and suburbs and some country districts by the intermediate sparrow are responsible for most of the bad feeling which some people hereabouts have for "birds." Owing to the flocking and cover-loving habits of this sparrow the damage to gardens is confined to those near which the birds find ready cover. For example, a garden in the open or even a hundred feet from a hedge or brushy canyon is perfectly safe. Plots that suffer are little home gardens in the thinly settled parts of city and country.

The vegetables eaten are lettuce, peas, string beans, turnips, radishes, beets, the things planted here from October to April when this sparrow is one of our most abundant birds. Onions are untouched, and I believe carrots also, and potatoes very seldom if other stuff is present; besides the potato grows too fast to be greatly damaged. But where the birds have congregated they will practically clean up small gardens of growing tender vegetables. Trapping is of no avail, owing to their numbers. Screens of wire or cloth are effective but people dislike the trouble and expense. Often they give up in despair until April. Frightening birds away with clods only drives them to a friendlier place. The only solution of the problem I know is to plant after October 1 what the birds will not eat and cover up other tender things until April. CARROLL DEWILTON SCOTT.

REPORTS.

STATEMENT OF EXPENDITURES.

For the Period from July 1, 1919, to June 30, 1920.

Administration:		
Commissioners	$1,672 70	
Executive offices	26,217 67	
Printing	3,824 84	
Research and publicity	5,030 44	
Accident and death benefits	2,765 19	
		$39,510 84
Commercial fish culture and conservation:		
Superintendence	$13,639 99	
Inspection and patrol	29,693 55	
Research	18,122 68	
Statistics	9,662 74	
Market fishing license commissions	765 00	
Propagation and distribution of salmon	22,703 34	
		94,587 30
Sporting fish culture and conservation:		
Superintendence	$14,510 34	
Printing	1,909 94	
Prosecutions and allowances	655 05	
Angling license commissions	15,324 20	
Special field investigation	252 35	
Fish exhibits	7,208 91	
General patrol (pro rata share)—		
San Francisco District (40 per cent)	34,545 05	
Los Angeles District (40 per cent)	14,148 00	
Sacramento District (40 per cent)	27,303 76	
Propagation and distribution of trout	121,102 29	
		236,960 89
Game conservation:		
Printing	$3,879 17	
Prosecutions and allowances	1,225 38	
Hunting license commissions	21,131 20	
Mountain lion hunting and bounties	6,950 23	
General patrol (pro rata share)—		
San Francisco District (60 per cent)	51,580 75	
Los Angeles District (60 per cent)	21,222 05	
Sacramento district (60 per cent)	40,956 68	
		146,945 46
Tahoe camping ground		3,152 98
Total expenditures		$521,157 47

CALIFORNIA FRESH FISHERY PRODUCTS, APRIL, MAY AND JUNE, 1920.

Species of fish	Del Norte, Humboldt	Mendocino, Sonoma, Lake	Marin	Solano, Yolo	Sacramento, San Joaquin	Tehama, Colusa, Glenn	Contra Costa, Alameda	San Francisco, San Mateo	Santa Cruz	Monterey	San Luis Obispo Santa Barbara, Ventura	Los Angeles	Orange	San Diego	Imperial	Total	Mexican
Albacore												391,103		513,018		904,121	
Anchovies			3,092					119,160	150	12,356				16,060		150,813	
Barracuda								97			912	2,258,943	27,783	601,753		2,889,488	21,604
Bocaccio		15						24,677	43,615	200,745						269,052	
Bonito												7,718	10	1,538		9,266	
Carp				7,121	22,621		7,615	2,524								39,881	
Catfish		5,019		11,963	24,110		15,905									56,997	
Chilipepper								24,784	70,875	525						96,184	
Cultus cod	699	12,383						50,757	17,055	12,777		13				93,684	
Flounders				6,401			552	263,997	13,675	530	2,141	989	4			288,289	
Grayfish							535	7,250		70		19,565		272,635		299,915	
Hake								37,025	500							37,525	
Halibut	6,951	11,799	700					12,363	579	3,539	97,272	398,093	43,006	407,290		981,592	122,689
Hardhead					1,380											1,380	
Herring			810													810	
Kingfish								6,538	40,360	77,125	259	35,936	216	447		160,881	
Mackerel									842	38,227	519	852,693	7,442	79,373		979,096	515
Mullet														55		55	
Perch	3,432		12,710				9	10,840	3,331	7,222	1,520	5,876	170	625		45,735	
Pike				630	779		292									1,701	
Pompano								1,214	1,218	679		5,681		27		8,819	
Rock bass											340	37,404	3,562	19,342		60,588	210
Rockfish	2,742	3,555						146,870	84,439	97,312	22,818	145,470	4,515	151,061		658,782	170
Sablefish								135,960	5,446	12,212						153,618	
Salmon	27,602	626,951	4,098	447,699	117,996	77,880	400,696	21,765	167,794	1,098,533						2,989,814	
Sanddabs								240,654	38,969	4,750		2,403				286,776	
Sardines			113					5,550	625	1,597,662		3,566,582		3,611,229		8,781,761	
Sculpin												12,208	63	665		12,936	
Sea bass (black)											495	5,117	200	21,975		27,787	550
Sea bass (white)								213	521	177	20,353	777,062	1,964	124,641		924,931	9,845
Sea trout								187				8,901	250	615		9,953	
Shad			100	748	72		6,968	28,795	142	104						36,929	
Shad (buck)				174,571	24,028		206,666	1,075								406,340	
Shad (roe)				287,555	39,253		539,680	1,398								867,886	
Sheepshead												63		1,088		1,151	
Skates								15,647	1,250			600	22			17,519	

Skipjack																10,844
Smelt	17,710		7,961				3,551	29,888	18,757	10,792	17,208	21,167	6,203	509	133,746	
Sole	25							680,160	156,150	9,663	6,129	6,257	83	550	859,017	
Splittail					544										544	
Striped bass			780	97,214	27,059		104,092	67,253	40						296,438	
Stingaree			120,300	170										170,817	291,287	
Suckers					593										593	
Surf fish												10			10	
Swordfish												163			163	273
Tomcod								8,782							8,782	
Trout (steelhead)	10														10	
Tuna												17,062		4,109	21,171	10,844
Tuna (bluefin)												4,340			4,340	
Tuna (yellowfin)												310			310	487,119
Turbot			13												13	
Whitebait			10					58						60	128	
Whitefish												6			6	
Yellowtail												548,766	37	73,512	622,315	20,890
Miscellaneous				205			55	13,713	3,385	1,271	385	10,910	1,661	1,260	32,845	
Total fish	58,571	659,722	150,688	1,023,677	258,435	77,880	1,286,476	1,959,194	669,718	3,186,265	170,351	9,141,411	97,131	6,074,254	24,823,773	685,553
Crustaceans—																
Crabs (doz.)	1,032		166					11,682	259	9					13,148	
Shrimps								250,910				99			251,009	
Spiny lobsters																320,743
Mollusks—																
Abalones	180							35		165,324	59,729				225,268	1,509
Clams (cockle)	490	80	2,214								100		2,870		5,754	
Clams (mixed)	2,700		13,645					204					465		17,014	7,057
Clams (Pismo)											79,370				79,370	
Clams (soft-shell)	44	3,899	2,050				40,475	1,857							48,325	
Cuttlefish								12,146	4,343	3,297		375			20,161	
Limpets													10,500		10,500	
Mussels		510					1,871				28		13,575		15,984	
Oysters:																
Eastern (No.)			161,325					913,400							1,074,735	
Native			26,380												26,380	
Squid									145	93,281		280			93,706	
Miscellaneous—																
Terrapins (doz.)				6											6	
Turtles																38,399
Scallops													230		230	

All amounts shown in pounds unless otherwise specified.

VIOLATIONS OF FISH AND GAME LAWS

April 1 to June 30, 1920.

Offense	Number of arrests	Fines imposed
Game.		
Hunting without license	7	$125 00
Trapping without license	3	35 00
Deer—close season—killing or possession	20	805 00
Female deer—spike bucks fawns killing or possession	3	100 00
Illegal deer hides possession	3	700 00
Brush and cottontail rabbits closed season killing or possession	5	125 00
Quail—in captivity without permit	2	100 00
Doves—closed season—killing or possession	7	175 00
Ducks—closed season killing or possession	3	75 00
Nongame birds—killing or possession	5	35 00
Protected shore birds—killing or possession	1	25 00
Pheasant killing or possession	1	
Possession condor wings	1	10 00
Total game violations	61	$2,310 00
Fish.		
Angling without license	27	$690 00
Fishing for profit without license	13	120 00
Striped bass underweight—excess limit and offering for sale—closed season	6	190 00
Black bass closed season—taking or possession	7	260 00
Sunfish—closed season taking or possession	3	60 00
Perch—excess limit taking or possession	1	20 00
Trout—excess limit closed season taking other than by hook and line	7	100 00
Clams—undersized excess limit	7	175 00
Crabs—undersized excess limit	13	70 00
Abalones—under or oversized closed season	45	1,400 00
Shrimps—dried—possession	5	100 00
Fishing in restricted waters	4	50 00
Illegal fishing apparatus	10	750 00
Pollution of state waters	1	
Total fish violations	149	$3,895 00
Grand total fish and game violations	210	$6,205 00

SEIZURES—FISH AND GAME AND ILLEGALLY USED FISHING APPARATUS.

April 1 to June 30, 1920.

Game.

Deer meat	243½ pounds
Doves	8
Rabbits	1
Miscellaneous game	1
Deer hides	3
Deer heads	1

Fish.

Sturgeon	210½ pounds
Trout	27 pounds
Black bass	25½ pounds
Striped bass	180¾ pounds
Barracuda	2,100 pounds
Halibut	1,300 pounds
Salmon	14 pounds
Dried shrimps	1,000 pounds
Crabs	617
Abalones	780
Clams (Pismo)	369
Clams (cockle)	606 pounds
Illegal nets (including 26 fyke nets)	34
Crawfish traps	10

Searches.

Illegal fish and game	7

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CALIFORNIA FISH AND GAME

"CONSERVATION OF WILD LIFE THROUGH EDUCATION"

Volume 6 Sacramento, January, 1920 Number 1

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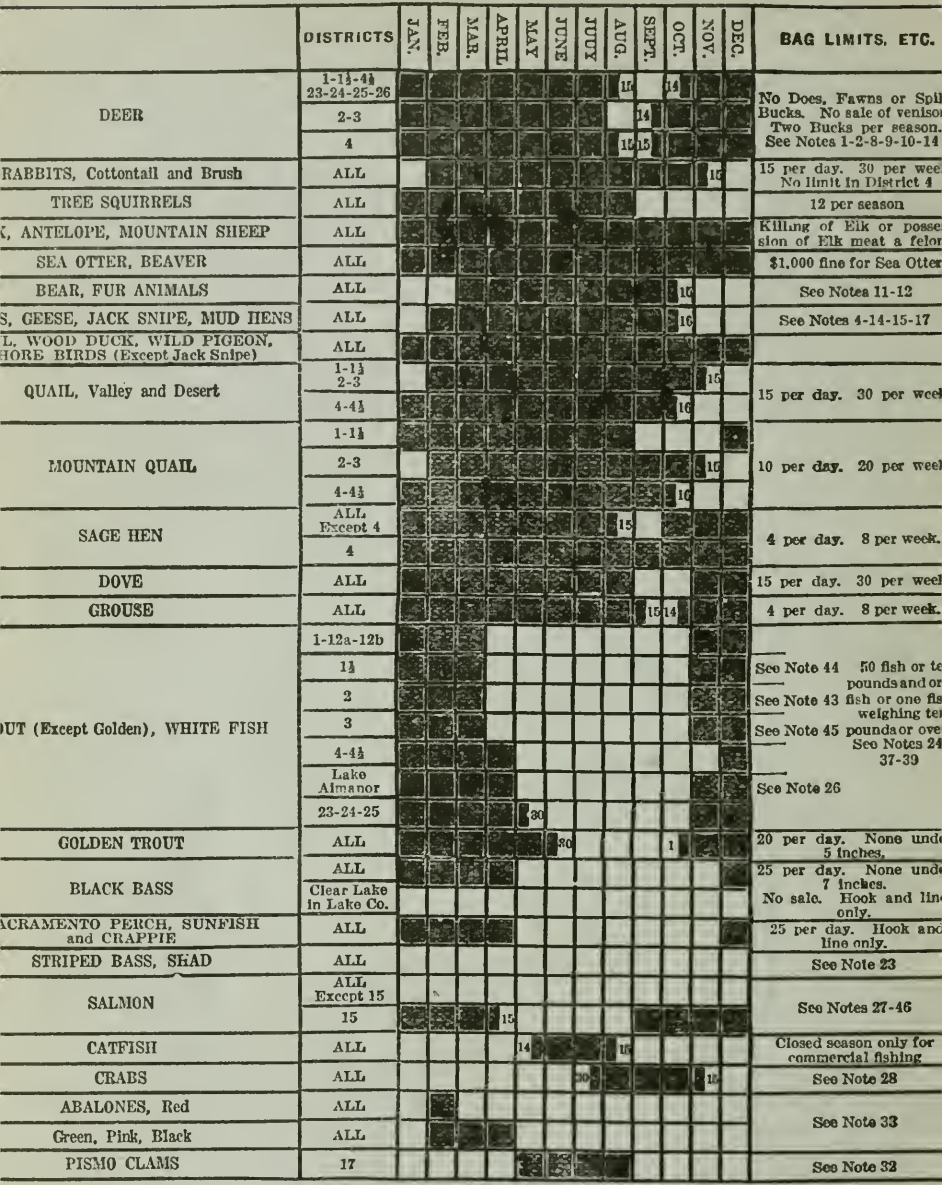
1919 ABSTRACT CALIFORNIA FISH AND GAME LAWS 1920

WHITE SQUARES INDICATE OPEN SEASON

NUMBERS IN SQUARES ARE OPEN DATES



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License Year from July 1 to June 30

Residents, $1.00. Non-residents, $10.00. Certain Aliens, $10.00. Other Aliens, $25.00.

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CALIFORNIA FISH AND GAME

"CONSERVATION OF WILD LIFE THROUGH EDUCATION"

Volume 6 Sacramento, April, 1920 Number 2

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1919 ABSTRACT CALIFORNIA FISH AND GAME LAWS 1920

WHITE SQUARES INDICATE OPEN SEASON

NUMBERS IN SQUARES ARE OPEN DATES

	DISTRICTS	JAN.	FEB.	MAR.	APRIL	MAY	JUNE	JULY	AUG.	SEPT.	OCT.	NOV.	DEC.	BAG LIMITS, ETC.
DEER	1-1½-4½ 23-24-25-26								15		14			No Does, Fawns or Sp Bucks. No sale of venis
	2-3									14				Two Bucks per seasor
	4							1	15	15				See Notes 1-2-8-9-10-1
RABBITS, Cottontail and Brush	ALL											15		15 per day. 30 per we No limit in District 4
TREE SQUIRRELS	ALL													12 per season
LK, ANTELOPE, MOUNTAIN SHEEP	ALL													Killing of Elk or poss sion of Elk meat a fel
SEA OTTER, BEAVER	ALL													$1,000 fine for Sea Otte
BEAR, FUR ANIMALS	ALL										15			See Notes 11-12
KS, GEESE, JACK SNIPE, MUD HENS	ALL										16			See Notes 4-14-15-17
AIL, WOOD DUCK, WILD PIGEON, SHORE BIRDS (Except Jack Snipe)	ALL													
QUAIL, Valley and Desert	1-1½ 2-3											15		15 per day. 30 per we
	4-4½										16			
MOUNTAIN QUAIL	1-1½													10 per day. 20 per we
	2-3											15		
	4-4½										16			
SAGE HEN	ALL Except 4								15					4 per day. 8 per week
	4													
DOVE	ALL													15 per day. 30 per we
GROUSE	ALL									15	14			4 per day. 8 per week
ROUT (Except Golden), WHITE FISH	1-12a-12b													
	1½													See Note 44 50 fish or pounds and
	2													See Note 43 fish or one f weighing t
	3													See Note 45 pounds or o
	4-4½													See Notes 37-39
	Lake Almanor													See Note 26
	23-24-25					30								
GOLDEN TROUT	ALL						30				1			20 per day. None un 5 inches.
BLACK BASS	ALL													25 per day. None un 7 inches.
	Clear Lake in Lake Co.													No sale. Hook and li only.
SACRAMENTO PERCH, SUNFISH and CRAPPIE	ALL													25 per day. Hook a line only.
STRIPED BASS, SHAD	ALL													See Note 23
SALMON	ALL Except 15													See Notes 27-46
	15				15									
CATFISH	ALL					14			15					Closed season only fo commercial fishing
CRABS	ALL							30				15		See Note 28
ABALONES, Red	ALL													See Note 33
Green, Pink, Black	ALL													
PISMO CLAMS	17													See Note 32

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CALIFORNIA FISH AND GAME

"CONSERVATION OF WILD LIFE THROUGH EDUCATION"

Volume 6 Sacramento, July, 1920 Number 3

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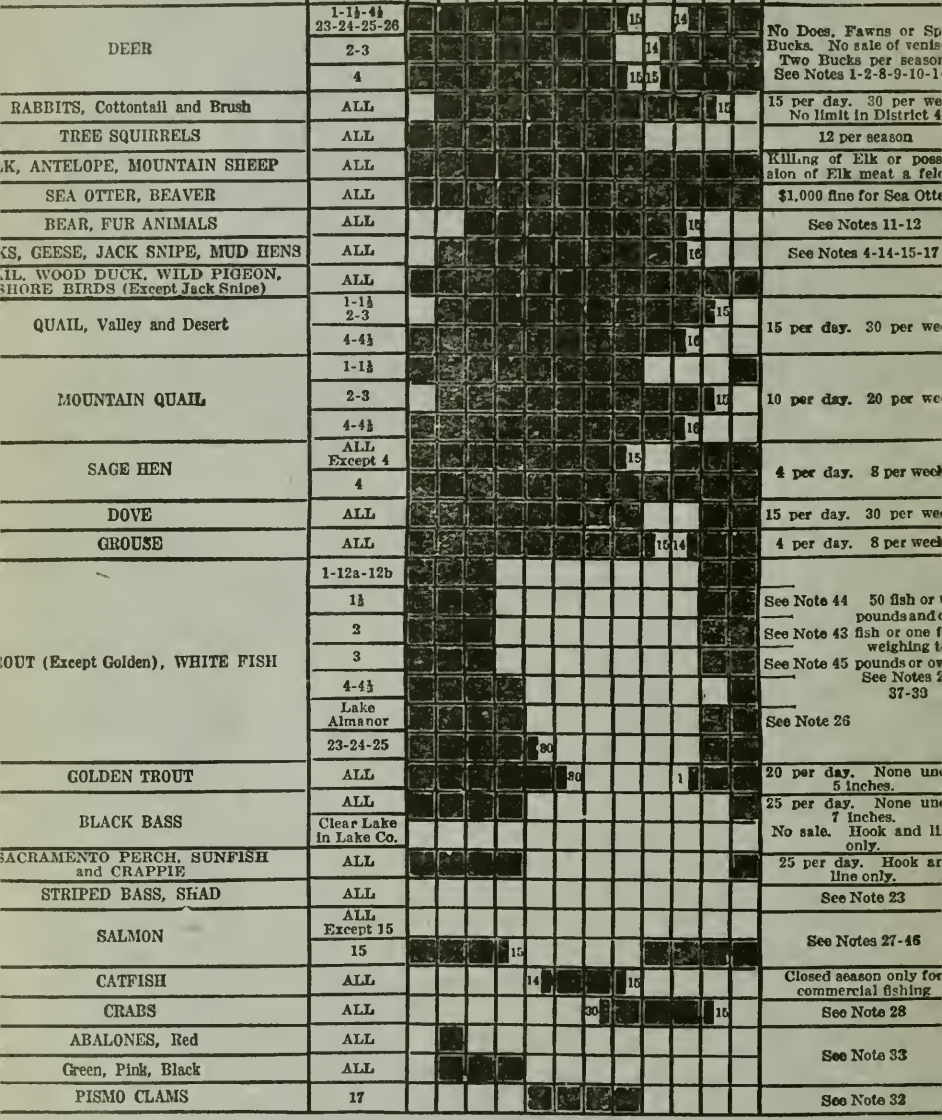
1919 ABSTRACT CALIFORNIA FISH AND GAME LAWS 1920

WHITE SQUARES INDICATE OPEN SEASON

NUMBERS IN SQUARES ARE OPEN DATES



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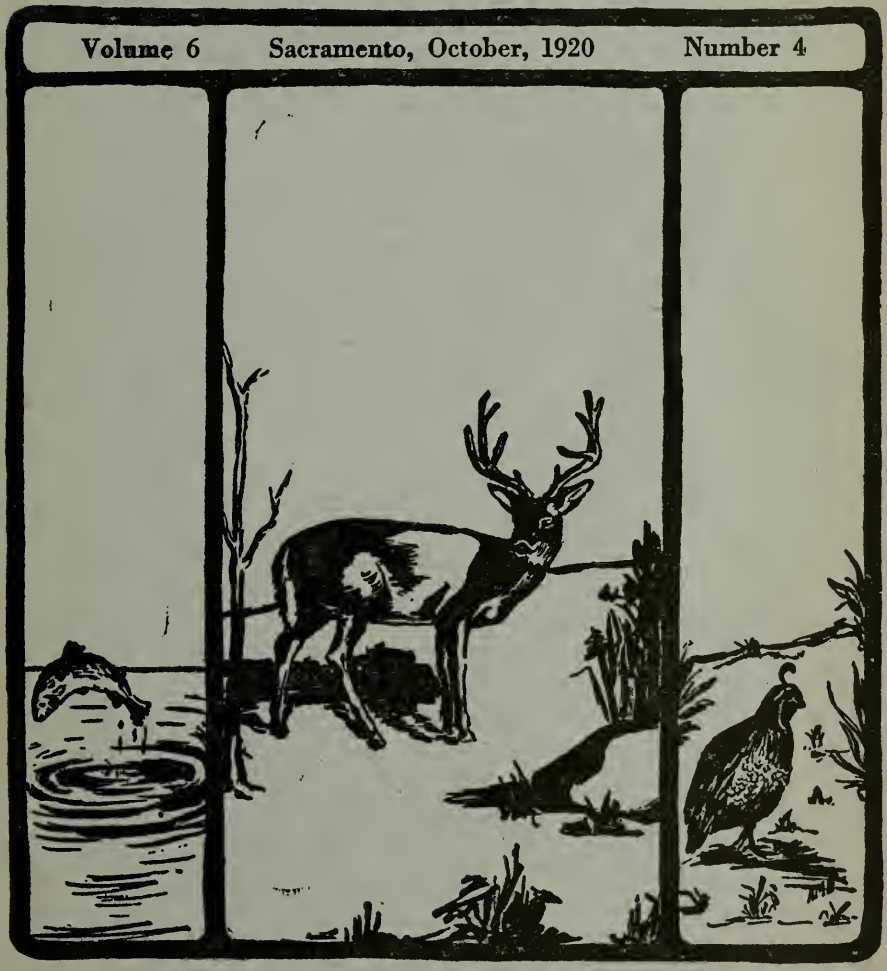
CALIFORNIA FISH AND GAME

"CONSERVATION OF WILD LIFE THROUGH EDUCATION"

Volume 6 Sacramento, October, 1920 Number 4



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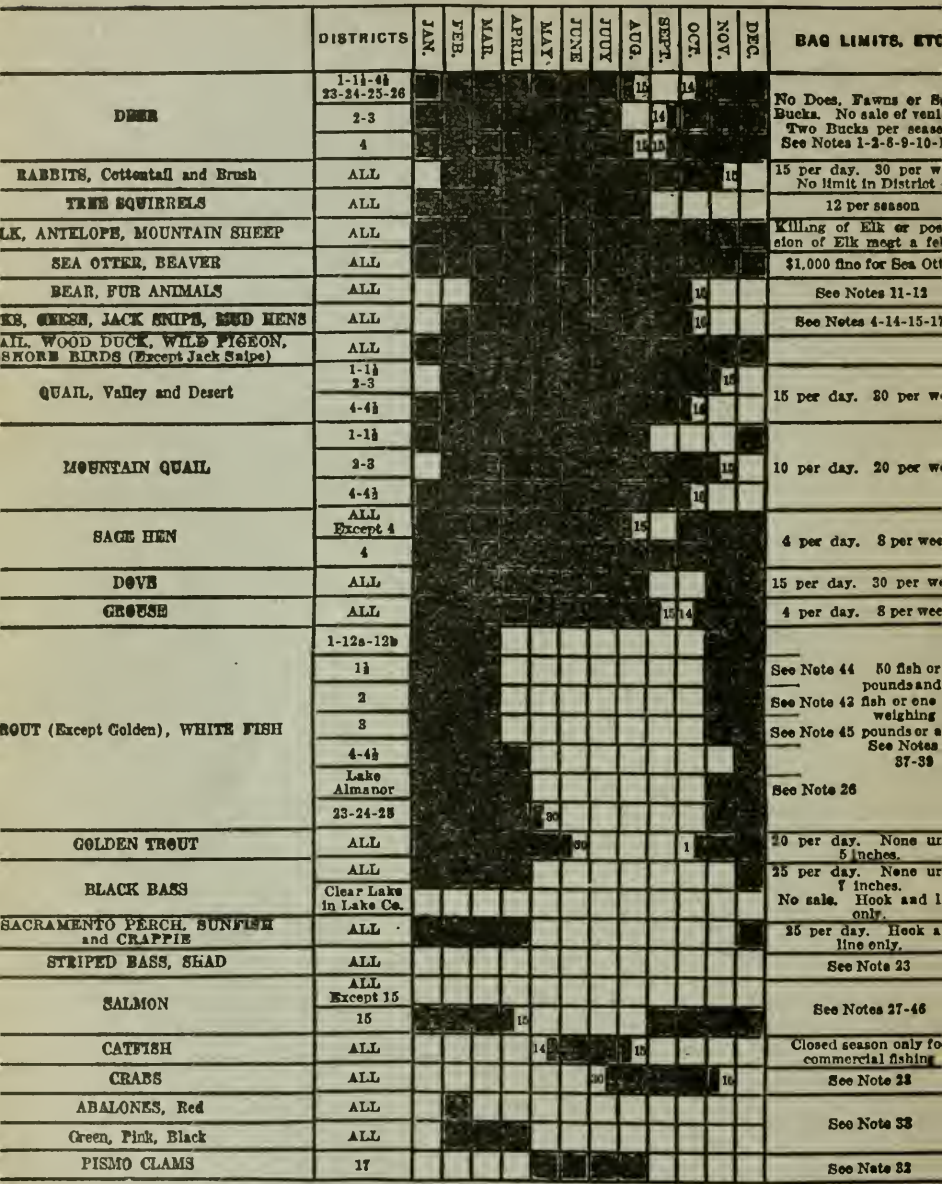

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