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CALIFORNIA FISH AND GAME

"CONSERVATION OF WILD LIFE THROUGH EDUCATION"

Volume 4 SACRAMENTO, JANUARY, 1918 Number 1

CONTENTS.

THE SKATES AND RAYS OF CALIFORNIA, WITH AN ACCOUNT OF THE RAT FISH.*

By Edwin Chapin Starks.

This account of the skates and rays of California may be considered a continuation of the account of the sharks† that appeared in the last number of this journal, for the skates and rays are closed related to the sharks, and may be regarded as an offshoot developed from them. The appearance of the skates on the earth was much later than that

*This is the second of a series of articles the first of which was entitled "The Sharks of California." Attention is called to still another shark, commonly called the bonito shark (*Isuropsis glauca*), which should be included among the sharks of our coast. It resembles the mackerel shark and the great white shark in having a projecting keel on each side of the tail. It may be known from the white shark by the smooth-edged teeth, and from the mackerel shark by the first dorsal being behind the pectorals instead of almost directly over them. It is more slender than the mackerel shark. A specimen thirteen feet in length was taken at Santa Catalina Island a few years ago, where small ones are reported by the late C. F. Holden to be common. It is otherwise known from Japan and the Hawaiian Islands.

†The author wishes to also call attention to a mistake made in printing the article on sharks that appeared in the last number of CALIFORNIA FISH AND GAME. The first three lines on page 153 should be below the next six lines instead of above them. In the copies of the article that were separately printed the mistake was corrected.

of the sharks, fossils of which are known back almost to the first of the animals with a backbone.

Though the typical sharks and the typical skates do not look at all alike, we have sharks that do look very much like the skates, such as the angel-shark; and skates, on the other hand, that are rather shark-like. The character that may be most readily used to separate them is the position of the gill slits. In the sharks the gill slits are on the side of the body; sometimes extending down on the lower surface, but the upper end is always on the side. The skates and rays have the gill slits altogether on the lower surface of the body. There are several other characters that separate the sharks from the skates and rays, but they are internal and need not be considered here.

The skates and rays are specialized for life on the sea bottom. They are not swift swimming fishes like the sharks that feed on other fishes, but they depend on crabs and clams and such forms of animal life for their food. The body by the development of the pectoral fins, which extend forward along the side of the head, is flattened and disk-like. The caudal fin may, or may not, be present. When it is not the tail is more or less whip-like. None of them have an anal fin, and in many the dorsals are also absent. When present the dorsals are far back on the

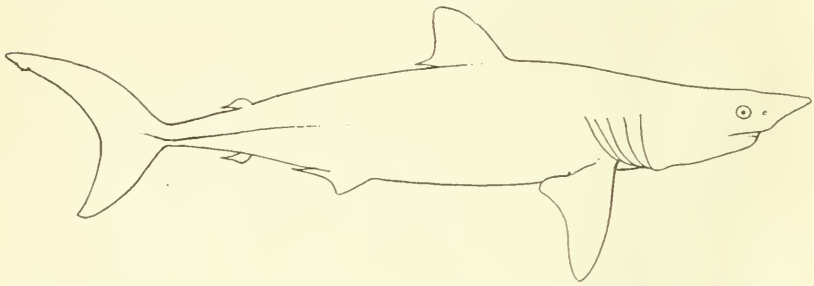

Fig. 1. Bonito shark. *Isuropsis glauca.*

body or tail. The teeth may be in the form of a pavement, sometimes being perfectly flat for crushing, or they may be with fine points. The spiracle, which in the sharks is a small pore behind the eye, or else is entirely absent, is in the skates and rays a large opening through which water is introduced to the gills for breathing purposes. This avoids the introduction of sand or sediment into the gill chamber as would probably happen did they take water through the mouth (as the sharks do) when they lie flat on the sea bottom.

The skates like the sharks have claspers in the male. These in the young extend scarcely past the ventral fins, but in the adult they develop to a large size (see figs. 5, young, and 10 and 11, adult).

I have changed the form of this paper from that on the sharks by giving first a description of the different families of the skates and rays. This saves repeating all of the characters under each species. Hence in identifying any fish of this group it will be necessary to first find its family.

FAMILIES OF CALIFORNIA SKATES AND RAYS.

Caudal fin developed. Tail thick and with two dorsal fins on top of it. Ventral fins not notched on outer edge‡ (see fig. 6 for notched ventrals). Skin rough with scattered spines. Color not uniformly black.

1. The Guitar Fishes (family Rhinobatidæ). Page 4.

Caudal fin developed. Tail thick and with two dorsal fins on top of it. Ventral fins not notched on outer edge‡ (see fig. 6 for notched ventrals). Skin everywhere perfectly smooth. Color uniformly black.

2. The Electric Rays (family Narcobatidæ). Page 6.

Caudal fin absent, or represented only by a slight fold of skin. Two dorsal fins crowded together near tip of tail. Ventral fins notched on outer edge (as in fig. 6). Skin rough with scattered spines.

3. The Skates (family Rajidæ). Page 7.

Tail slender, often whip-like. No dorsal fin. Caudal fin present or absent. Back of tail with a long spine or sting (sometimes duplicated, occasionally absent.) Eyes not at edge of head.

4. The Sting Rays (family Dasyatidæ). Page 11.

Tail whip-like, without caudal fin. A single dorsal fin just in front of sting. Sting often duplicated. Eyes at edge of head. Teeth large and flat, forming a tile-like pavement.

5. The Eagle Rays (family Ætobatidæ). Page 13.

Tail whip-like, without caudal fin. A single dorsal fin opposite ventral fins. Sting behind dorsal or absent. Eyes at edge of head. Teeth small and numerous. Head with a pair of horn-like arms just under the front of it. Size enormous.

6. The Sea-Devils (family Mantidæ). Page 13.

GLOSSARY.

The names of the fins may be learned from fig. 2.

Claspers. Rod-like organs, one attached to the inner edge of each ventral fin in the male. Not projecting beyond the fin in the young.

Disk. The flattened part of the body made by the projecting pectoral and ventral fins.

Rostral ridges. The ridges running forward from in front of the eyes to the tip of the snout.

Shagreen. The skin when it feels like fine sandpaper.

Snout. The part lying directly in front of the eyes.

Spiracle. The hole just behind the eye.

‡Do not mistake the notch formed by the presence of a clasper in the male for a notched fin.

1. THE GUITAR FISHES

(*Family Rhinobatidæ*).

The Guitar Fish (Rhinobatus productus).

This is often called shovelnosed shark, especially on the southern coast. This name should be discouraged, as it is not a shark, and as we already have a shark (*Hexanchus*) known by this name.

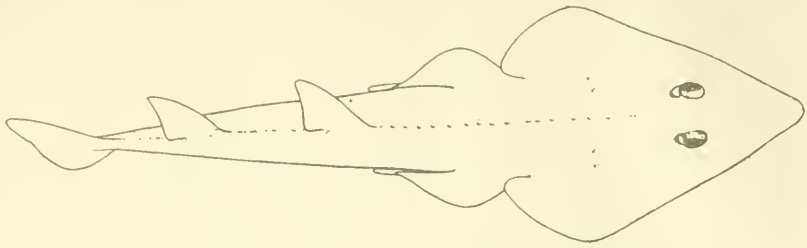

Fig. 2. The guitar fish *Rhinobatus productus*. Adult male.

The guitar fish is not much expanded and disk-like, being sharply wedge-shaped in front and tapering into a thick tail behind. Two dorsal fins and a caudal fin are well developed. The body is covered with shagreen and there are rows of hooked spines along the middle line of the back and tail, and a small bunch at the shoulder. The young fish has small spines around the inner border of the eye and along the rostral ridges. The color is uniform dull brownish on the upper surface and white on the lower.

This fish is found from San Francisco to San Diego and southward. South of Point Concepcion it is very common. It reaches a length of 3 or 4 feet.

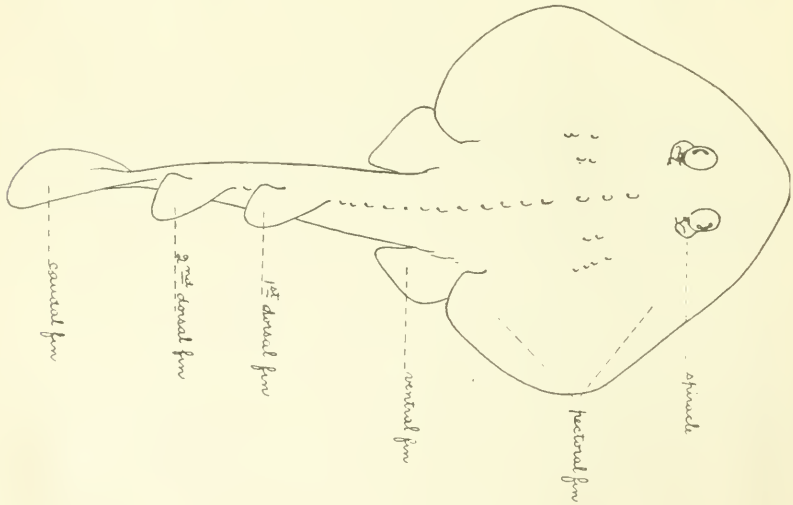

Fig 3. The prickly skate *Zaptcryx exasperatus*. Young female.

The Prickly Skate (Zapteryx exasperatus).

The front margins of the disk are undulating and together form an angle less than a right angle. The snout is prominent but blunt at the tip. The front of the first dorsal fin is only a little behind the hind edge of the ventral fins. The upper surface of the body is covered with close-set prickles of different sizes, rather than shagreen as in the next species. There is a row of enlarged spines along the middle of the back and the tail, and 2 short rows on each shoulder of 2 or 3 spines each. There are no spines on the sides of the tail. The color is grayish brown with indications of clouded crossbars. There is a large black blotch on the lower surface of the pectoral at its hind end.

This species has been recorded only from southern California, being scarcely known outside of the bay of San Diego. Nearly 38 years ago, when this fish was first described, males were reported to be abundant in San Diego Bay. No female has ever been recorded until now. Recently I was loaned two young specimens by Dr. Ritter of the Scripps Laboratory at La Jolla, one of which was a female. Aside from the absence of claspers, it is identical in all of its characters with the male. It is 7½ inches long and is the specimen here figured. This species reaches a length of nearly 3 feet, and appears to be very rare.

The Round Skate (Platyrhinoidis triseriatus).

This species may be known from the other members of its family by the disk being rounded in front; the curve being unbroken by the snout. The front of the first dorsal fin is nearer to the beginning of the caudal fin than it is to the point where the ventral fin joins the body. Both surfaces of the body are covered with shagreen. Coarse prickles follow

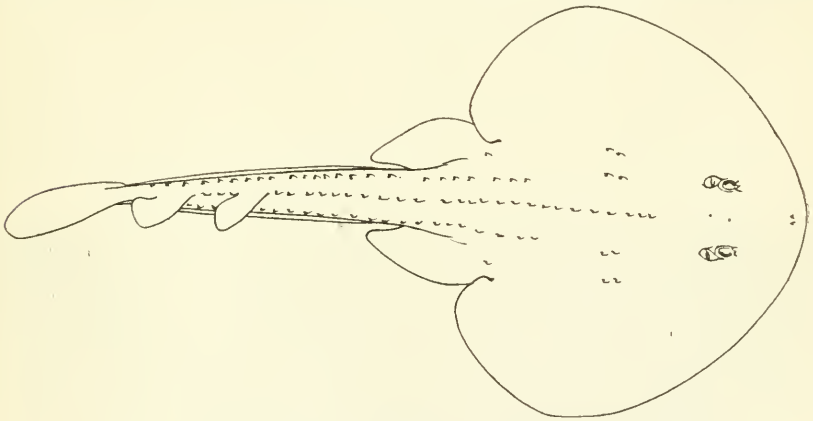

Fig. 4. The round skate *Platyrhinoidis triscriatus*. Adult female.

the front margin of the pectorals. There is a small bunch of spines at the tip of the snout, and a few around the inner margin of the eye. A long series of spines follows the middle line of the back and tail, and a row at each side of it on the tail. There are 2 small bunches of spines on each shoulder of 1 or 2 spines each. It is grayish brown in color.

This species reaches a length of 2 feet, and is found in some abundance in the bays on the coast below Point Concepcion. It has been taken once or twice as far north as San Francisco.

2. THE ELECTRIC RAYS

(Family Narcobatidæ).

The Electric Ray (Tetronarce californica).

This is the only member of its family on our coast, and may be recognized by its broad circular disk, covered with smooth black skin without spines or prickles anywhere, and by its well-developed caudal fin and two dorsal fins. The eyes are very small, and the small mouth is provided with fine sharp teeth. It is blue-black, or dark lead color, above and white on the lower parts.

The electric ray is said to reach a length of 3 feet, though it is seldom seen much over a foot in length. It is known from central California southward to the Santa Barbara Channel, being rather common in deep water in Monterey Bay.

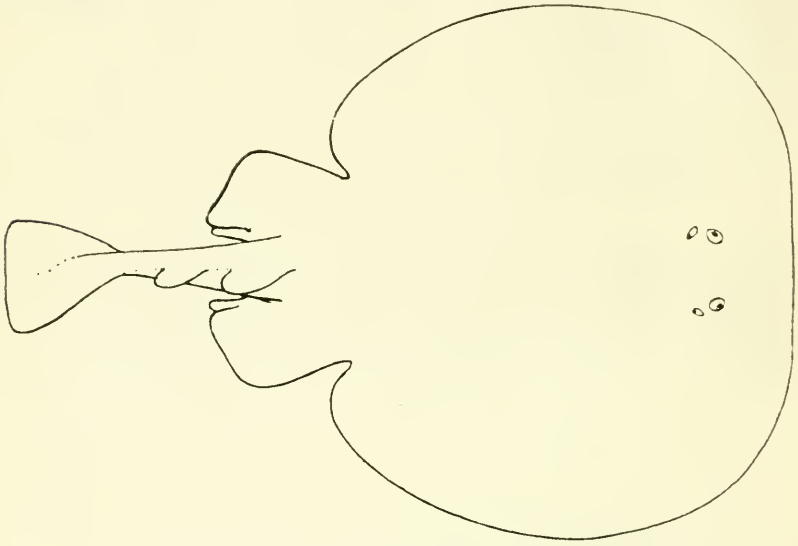

Fig. 5. The electric ray *Tetronarce californica.* Young male.

This ray is provided with an electric organ composed of hexagonal cells, reaching from the skin of the upper surface to that of the lower, and situated at each side of the head and gill chambers. The electricity discharged from this ray has the properties of other electricity, such as rendering an iron bar magnetic, decomposing chemicals, and producing a spark. Stories vary as to the volume of the discharge, but even a small ray is capable of inflicting considerable pain. After a few discharges the fish becomes exhausted and must rest before its electric organs are again functional. It is of interest to note that the first record we have of the application of electricity is of the time of Anthony and Cleopatra, whose court physician recommended the electricity of an electric ray for medical purposes, especially for pains in the head. Later it was prescribed for the cure of gout.

3. THE SKATES

(*Family Rajaidæ*).

The Long-nosed Skate (Raja rhina).

This skate may be known by the long projecting snout, making the front outline of the disk deeply concave. (Compare the straight line drawn from the tip of the snout to the outer pectoral angle, in its relation to the outline of the front of the disk, in the figure of this species with that of the next.) When the front edge of the ventral fin is held at a right angle with the tail its outer edge is concave as in fig. 7. The rostral ridges are grown together along their front half. Very small spines are scattered over the outer edges of the body and back behind the shoulders, but leaving large areas of smooth skin. Coarser

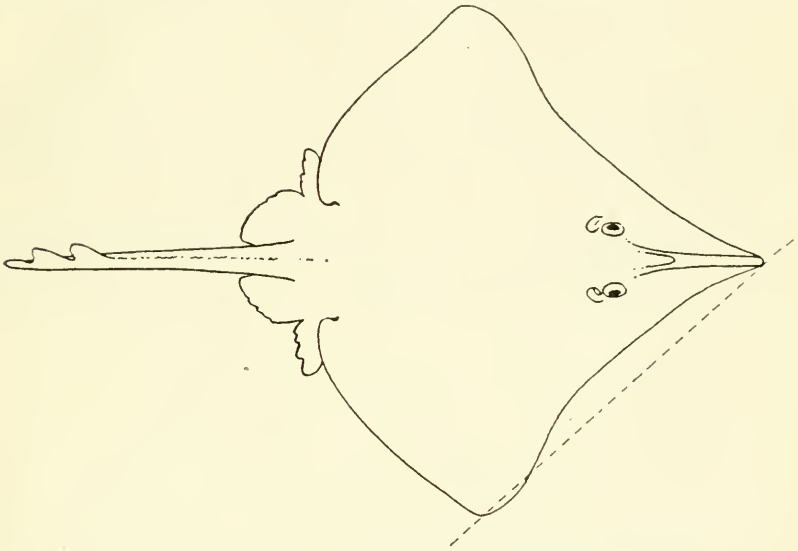

Fig. 6. The long-nosed skate *Raja rhina*. Adult female.

ones at front edge of body, snout, and between eyes. Enlarged spines around inner edge of eyes, along middle of back (usually absent in large specimens) and on back of tail. The male has a row of long, sharp spines near the outer angle of the body. The color is dark sienna-brown with irregular dark blotches sometimes present. There is a spot at the base of the pectoral in the form of an irregular ring, always present in the young and sometimes in the adult, but usually present as an indistinct spot. This is never wider than the space between the eyes.

This skate is found from the Gulf of California to Alaska, and on the California coast is common nearly everywhere. It reaches a length of 3½ feet. The egg cases of this skate are 3 or 4 inches long, and usually contain only a single egg.

The Common California Skate (Raja inornata).

The snout in this skate is not so projecting as in the long-nosed skate. The region at each side of the snout is concave, as is the region toward the outer angle of the pectoral, while the region midway between these

points is convex. When a straight line is drawn from the snout to the outer angle of the pectoral the middle of the line nearly, or quite, touches the body. Ventral fins as described for the long-nosed skate

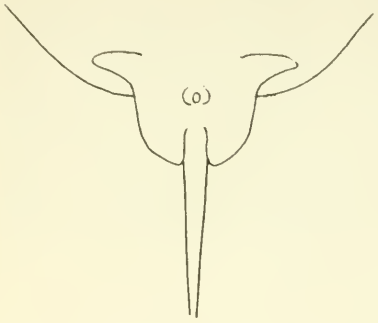

Fig. 7. Ventral fins of *Raja inornata*, showing the front edge of the ventral fin held at a right angle with the tail making the outer edge concave. Fig. 9 shows the fin notched as in normal position.

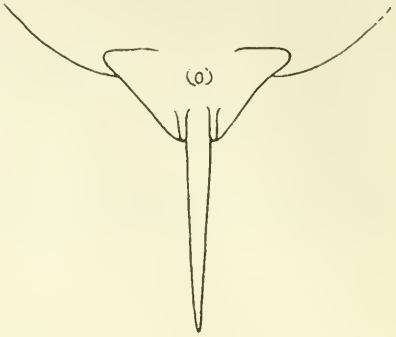

Fig. 8. Ventral fins of *Raja binoculata*, showing the front edge of the ventral fin held at a right angle with the tail, making the outer edge nearly straight. Fig. 10 shows fin concave as in normal position.

(see fig 7). The rostral ridges are grown together along their front half. Small prickles are scattered over the outer edges of the pectorals and along the middle line of the back. Larger ones are on the snout and between the eyes. Enlarged spines are around the inner edge of

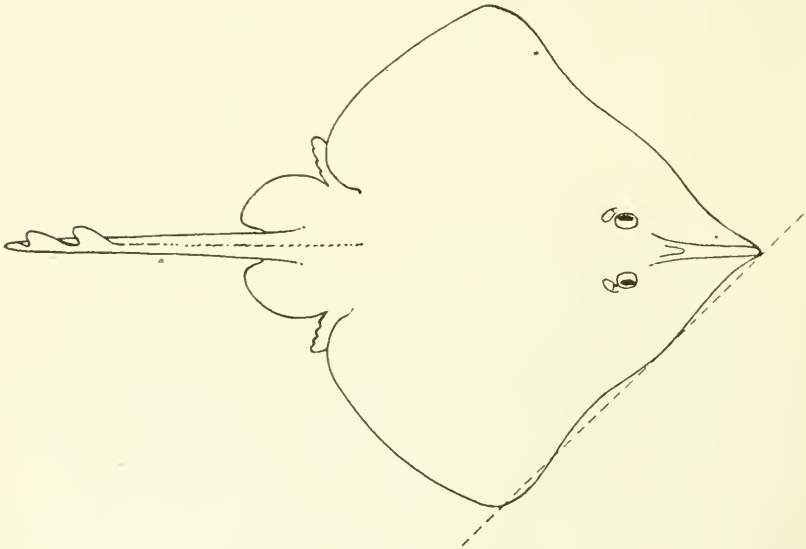

Fig. 9. The common California skate *Raja inornata*. Adult female.

the eye, and from 3 to 5 rows of them on the back of the tail. The color is dark brown, with usually a small ring composed of irregular spots at the base of the pectoral.

This skate is known from San Diego to San Francisco and somewhat northward, but has never been recorded beyond the California coast. It reaches a length of 2½ feet.

The Big Skate (Raja binoculata).

This skate may be known from any others of its family by the shallow notch in the ventral fins. When the front edge of the ventral fin is held at a right angle with the tail, its outer edge is nearly straight, as in fig. 8. The rostral ridges are grown together along their front fourth only. The upper part of the body is everywhere covered with very small prickles, uniform in size, and as fine or finer than those that compose shagreen, but not nearly so closely placed. These are absent in the young. There are from 1 to 3 rows of irregular spines along the back of the tail. The color is dull olive brown, or drab, with a large dusky spot at the pectoral base blended into the body color. Light

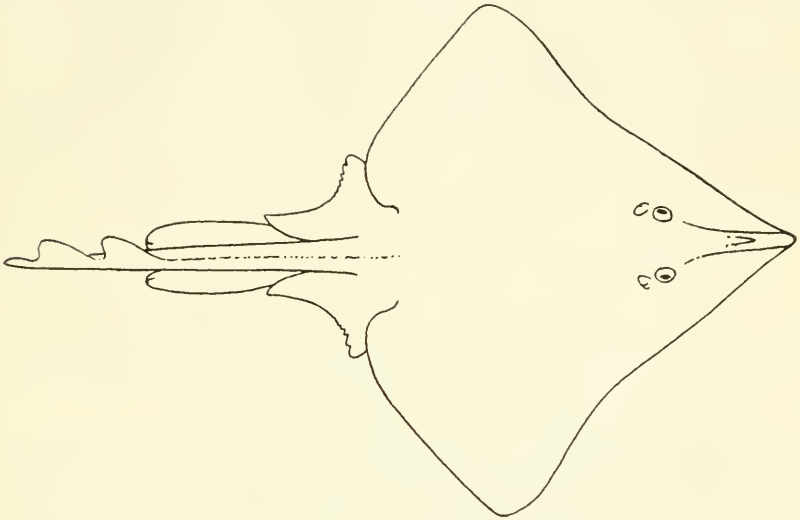

Fig. 10. The big skate *Raja binoculata*. Adult male.

spots as large as the eye are scattered over the body and form a ring around the pectoral spot. The diameter of the ring is always much greater than the space between the eyes.

This skate is common from Monterey Bay northward to Alaska. It reaches a length of over 6 feet. Its egg cases are nearly a foot in length, and each contains from one to six eggs or young.

The Starry Skate (Raja stellulata).

This skate may be known from others of its family by the almost entire absence of the rostral ridges, the rostral cartilages being very slender rods that can scarcely be detected. It also differs from all but the rock skate in having the body at each side of the snout convex instead of concave, and in having a straight line drawn from the tip of the snout to the outer pectoral angle, everywhere passing inside of the outline of the body. Small sharp prickles are scattered everywhere over the upper surface of the body, and a series of enlarged spines runs down the middle of the back and tail. The color is grayish brown with small dark spots scattered over the back. A large, irregular, yellow spot ringed with brown is sometimes just behind the middle of the body

on base of each pectoral: a smaller, round one, just inward from it, and a third one just outward from the eye. These spots are often absent.

This skate is found in rather deep water from southern California northward to Alaska. It reaches a length of $2\frac{1}{2}$ feet.

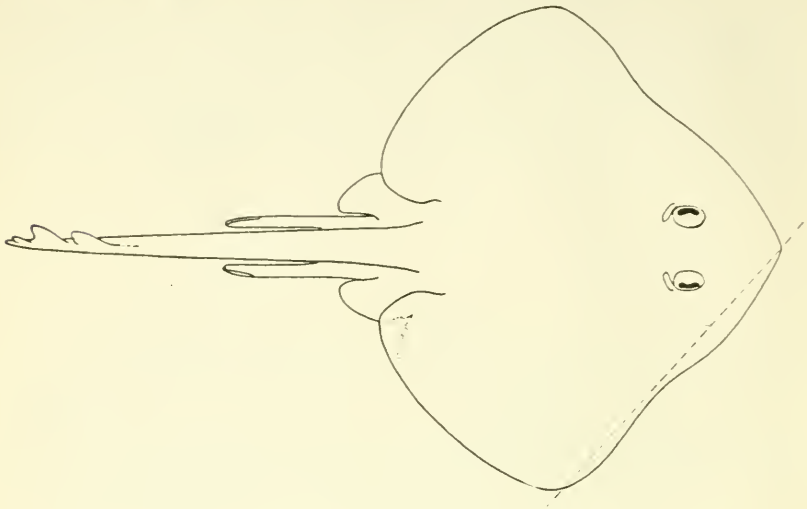

Fig. 11. The starry skate *Raja stellulata*. Adult male.

The Rock Skate (Raja montereyensis).

This skate resembles the starry skate in having the region at each side of the snout convex in outline, and in having a straight line (if drawn) from the snout to the outer pectoral angle included within the outline of the body. In all of the others such a line would pass outside of the outline. It may be known from the starry skate by the rostral ridges,

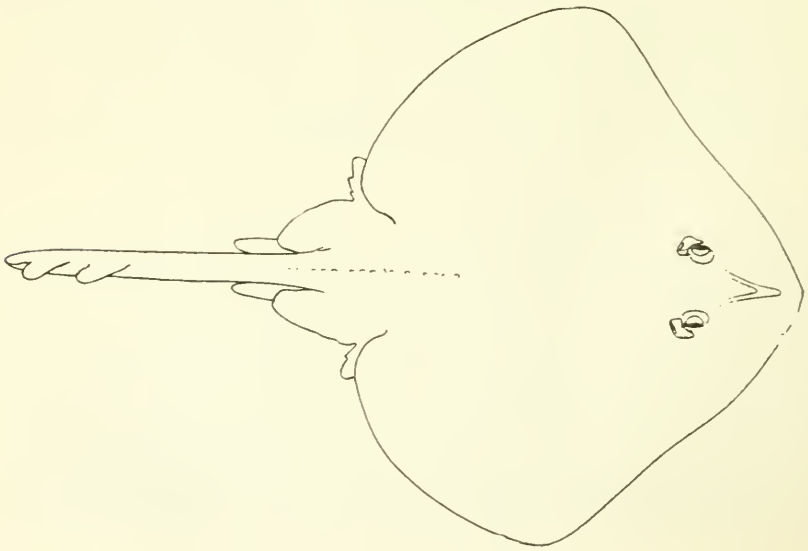

Fig. 12. The rock skate *Raja montereyensis*. Adult male.

which are strong and well developed as in the other skates. The rostral ridges meet close to their tips. The upper surface is everywhere covered with prickles, which are coarsest and most numerous on the middle of the back and between the eyes. A band of larger spines follows the front outline of the body. Two or three enlarged spines are around the inner edge of the eye, or they may be absent in large specimens. A row of enlarged spines follows down the middle line of the back and tail, and may be present on each side of the tail. The region in front of the mouth is rough on the under side of the body. The color is slaty brown with some darker mottlings. Small dark spots make irregular bars across the space between the eyes. A dark spot surrounded by a broken ring of small spots occupies the base of the pectorals. A short distance behind this is a small white spot.

Little is known as to the distribution of this skate, as it has only recently been recognized by science, though it seems to be known to fishermen, who pronounce it the best table fish of all of the skates. It does not reach a large size. The only specimens known have been taken in deep water off Santa Cruz.

4. THE STING RAYS*

(*Family Dasyatidæ*).

The Round Sting Ray (Urolophus halleri).

This is sometimes called the little sting ray. It may be known from other members of its family by the tail being shorter than the rest of

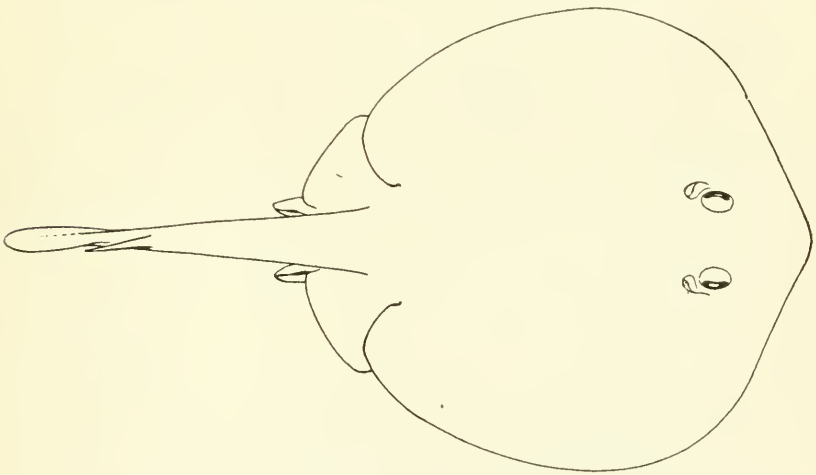

Fig. 13. The round sting ray *Urolophus halleri*. Adult male.

the body, and the width of the body being less than the entire length. The outline of the disk is circular, and the skin is smooth or without spines. A narrow, long caudal fin is present, but no dorsal fin. The color is dark brown or slaty brown above, and is usually with lighter

*Should a person be so unfortunate as to be stung by one of these rays, he will appreciate the advice to hold the wounded part in hot water. This will usually take the pain away immediately for as long as the treatment is continued, and the patient will be very ready to continue it, even for several hours, to escape the almost unbearable pain. The wound should, of course, be disinfected.

spots, but not always. The spots may be clear cut and separated, or blended and more or less run together.

This is the smallest of our sting rays, but its numbers and activity make it one of the most dreaded by bathers. It scarcely exceeds a foot in length, and is found on the coast south of Point Concepcion and southward to Panama. In sheltered bays on shallow sand or mud flats it occurs in almost countless numbers.

The Rat-Tailed Sting Ray (Dasyatis dipterura).

This is known from other sting rays of California by its long whip-like tail, longer than the rest of the body, and in addition the eyes are on top of the head, not near the edge of the disk. There is no dorsal or caudal fin, but the tail is provided with a long vertical fold of skin above and below. The outline of the disk is somewhat circular, though the front edges are nearly straight and meet at a slight angle at the snout. The skin is very slightly rough to the touch, and large specimens have a row of enlarged spines along the middle of the back, and a couple of spines at the shoulder. The color is plain bluish brown without spots.

This ray is found in southern California and is rather abundant in San Diego Bay. It reaches a length of 6 feet.

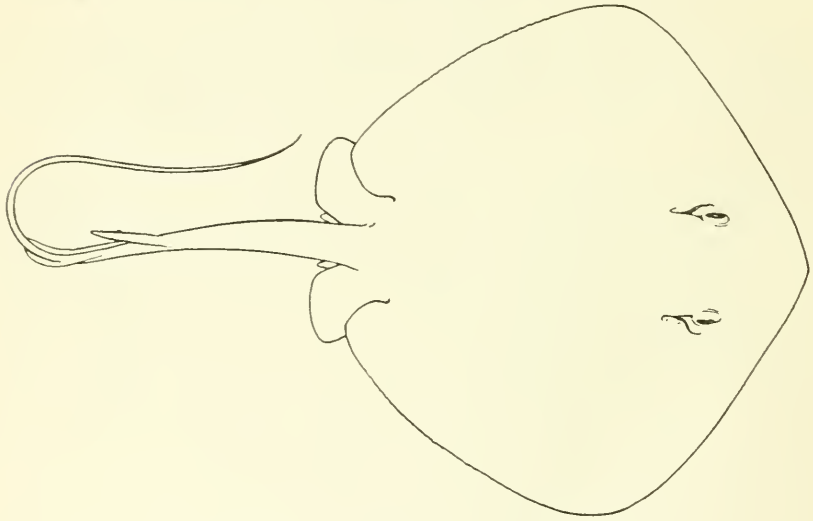

Fig. 14. The rat-tailed sting ray *Dasyatis dipterura*. Young male.

The Butterfly Sting Ray (Pteroplatea marmorata).

This may be known from all other skates and rays by the great width of the disk and the very short tail. It is very much wider than the entire length of the body and tail. The tail is flattened and has a slight fold of skin above and below, but no dorsal or caudal fin is developed. The skin is perfectly smooth and no spines or prickles are developed anywhere. The sting is very small or frequently absent. It is dark brown in color and mottled with small light drab spots and short irregular lines formed by spots running together.

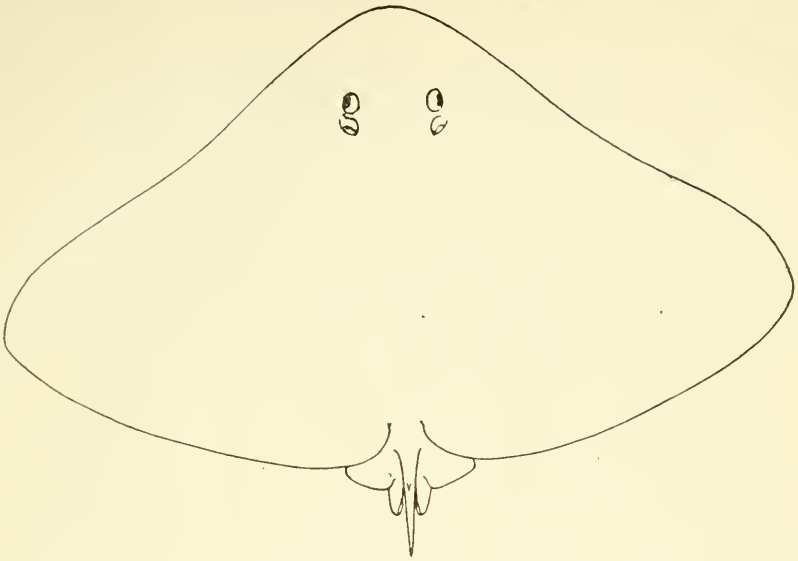

Fig. 15. The butterfly sting ray *Pteroplatea marmorata*. Adult male.

This ray is common south of Point Concepcion, frequenting the shallow tide flats of sheltered bays. It reaches a width of 4½ feet. Its sting is short and the small movement it is able to give its tail makes it one of the least dangerous of the sting rays.

5. THE EAGLE RAYS

(*Family Etobatidæ*).

The Bat Fish or Eagle Ray, Sometimes Called California Sting Ray (Myliobatis californicus).

This is the only representative of its family on our coast. The head stands above the disk at each side, and the eyes are on the side of the head close to the edge of the disk. The pectorals fins are sharp at the outer angles, and a single dorsal fin is present just in front of the sting. The tail is long, slender, and whip-like. The skin is perfectly smooth without spines or prickles. The teeth are flat and pavement-like, resembling a tile floor. It is a uniform dark slate color above and white below.

This sting ray reaches a length of 3 feet and is common south of San Francisco. It is very destructive to oysters, crushing them between its wide flat teeth. Its depredations in this way have caused the owners of oyster beds in California to protect their property by fences of closely set poles driven into the mud around the beds.

6. THE SEA DEVILS

(*Family Mantidæ*).

The Sea Devil (Manta birostris).

This is a gigantic ray that may be known at once by a pair of projecting arms from under the front part of the head. The body is shaped much as in the bat fish (*Myliobatus*) with a long whip-like tail and a single dorsal fin. The teeth are small and in many series.

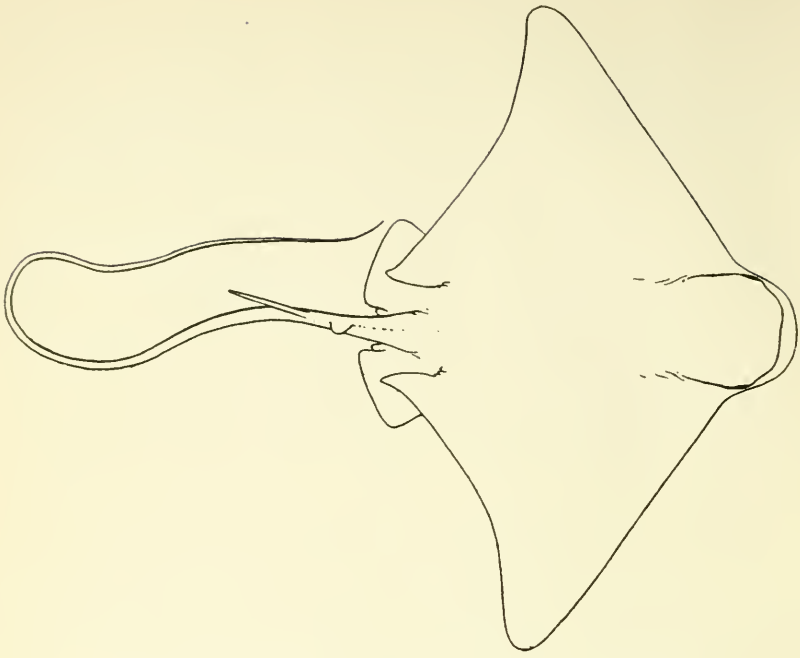

Fig. 16. The eagle ray *Myliobatis californicus.* Young male.

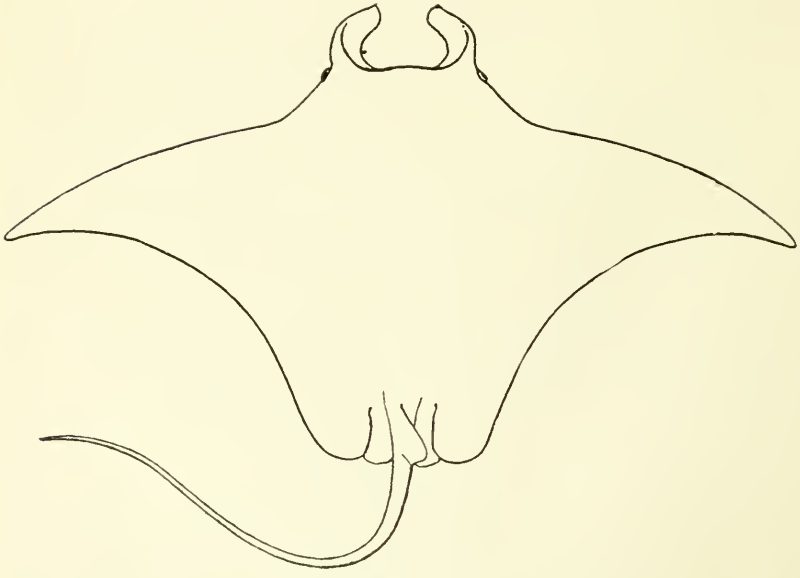

Fig. 17. The sea devil *Manta birostris.* Adult female.

This giant ray has been seen in our region only by fishermen, who have reported an immense ray off the coast of San Diego. It is known from tropical American waters, and is not uncommon on West Indian and Florida coasts. It reaches a length of 20 feet.

THE CHIMÆRAS.

The group that includes the sharks and skates is usually subdivided into two groups. The sharks and skates form one group and the chimæras the other. Little as the chimæras resemble the sharks their relationship is distinctly with them as is shown by their anatomy and development. We have on our California coast one representative of this group.

The Chimæra or Rat Fish

(*Chimœra colliei*).

The gills have only one external opening as in the majority of fishes. The skeleton is of cartilage. The skin is thin, smooth, and sealeless. The body is robust in the forward part, but tapers behind into a long tail ending in a fine point. The mouth is small under a blunt projecting snout, and is armed by thin plates formed by the united teeth. The first dorsal fin is triangular and has a long, sharp spine at its front edge,

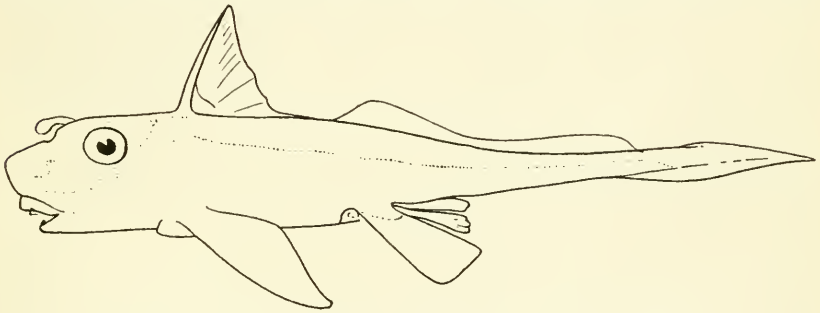

Fig. 18. The chimæra or rat fish *Chimœra colliei*. Adult male.

while the second dorsal is long and low with a wide rounded notch at its middle that nearly divides it into two parts. The caudal fin is narrow, with the tail projecting from it in a point. The anal is absent and the pectorals are long and wing-shaped. A series of channels and pores forms a crooked line along the side and branches over the head. The male has several appendages that are absent in the female. One is club-shaped, curving downward on the forehead, and is armed with sharp spines; one protrudes from a sheath of skin in front of each ventral fin; and behind each ventral is a pair of claspers. The color, when the fish is alive, is silvery but reflecting golden metallic hues, and pale green, rose color and blue. The pupil is a beautiful pale greenish blue. Out of the water its brilliant colors soon fade.

This peculiar fish is common along our entire coast, but as we go southward it is found in deeper and deeper water. In Puget Sound and northward it is taken in very shallow water. In Monterey Bay, though it is sometimes taken in shallow water, it is commonest in fifty or more fathoms. Below Point Concepcion it is never found in shallow water. It reaches a length of nearly 2½ feet.

THE QUINNAT SALMON IN NEW ZEALAND.

By N. B. Scofield.

During the last twenty or more years, efforts have been made to introduce the quinnat salmon of California into the waters of New Zealand. The method of introduction has been to take the salmon eggs from the hatcheries in this state, at a time when they have developed to such an extent that the eyes are plainly seen through the shell of the egg, but still a month at least before the time they will hatch. They are packed in specially-constructed crates in which they are kept at a low temperature to retard development. In this way they may be shipped to even more distant points than New Zealand. Upon arrival at their destination the eggs are kept in water at one of the fish hatcheries until they hatch out, and when the young fish are able to care for themselves they are liberated in the stream.

The following interesting account showing the success of the experiments is taken from the report of L. F. Ayson, Chief Inspector of Fisheries, New Zealand, for the year 1916–17:

"The number of [quinnat] salmon eggs collected last spawning season was 1,106,000; 866,000 were collected at the Hakataramea Station and 240,000 from the Dobson River. An effort was made to net the Ahuriri River for spawning salmon, but on account of the heavy current and freshets the attempt was not successful. The salmon eggs were disposed of as follows: 25,000 were supplied to the Tasmanian Government, 1,000,000 were sent to the West Coast to stock the Hokitika River, and 81,000 were hatched out at Hakataramea.

"I estimate that quite four times as many salmon came up the Waitaki last spawning season as during the season of 1915; the collection of eggs was more than four times the quantity taken the previous year.

"With regard to the time that these salmon commence to run in from the sea, the first fish this season was taken during the last week of January. A very large run came in during the last two weeks of February, and all through the month of March. In the Waitaki they were taken freely by trout-anglers; the number landed in this way is estimated at about 400 fish, averaging about 16 pounds in weight; and about the same number are reported as having been taken in the Rangitata, averaging about 17 pounds. The run of salmon in the Waitaki this spawning season is far ahead of last year's run. From the number of fish which are now running in the Hakataramea, and judging the other three large tributaries by the number of salmon which myself and assistants have seen in the Ohau River, it is no exaggeration to say that the salmon in the Waitaki and its tributaries this season must number tens of thousands.

"As it has been proved that salmon eggs can now be collected in large quantities, the department has decided on a vigorous policy with regard to stocking other suitable rivers throughout the Dominion. During the past summer a hatchery capable of dealing with half a million eggs was erected on a tributary of the Wairau River (Marlborough), and a site for a hatchery has been secured at Wanaka Lake, where temporary arrangements will be made this season for the purpose of hatching out half a million eggs for the purpose of stocking

the Molyneux River. It is intended this season to allot half a million eggs to each of the three rivers which the department has now in hand—viz: the Hokitika, Wairau, and Molyneux. The result of the inquiries made goes to show that the salmon have spread along the coast north as far as the Wairau (North Canterbury), and south to the Taieri River. The Taieri is at times rather badly polluted by gold mining, but from an examination of the tideway at its mouth, and its condition in the gorge above Outram, I think it is quite possible for salmon to make their way up to the clear tributaries beyond where the races from the sluicing claims join the main river.

"The very rapid increase of the quinnat salmon must be considered as most satisfactory, and the time is very near indeed when they will be placed on the market, and the people of the Dominion will have New Zealand-grown salmon on their tables. New Zealand has the distinction of being the only country in the Southern Hemisphere which has successfully acclimatized salmon, and on the authority of experts it is said to be the only country in the world which has been successful in acclimatizing this salmon away from its native habitat. The success attained in acclimatizing this fish is undoubtedly due to the systematic and vigorous effort made by the Marine Department, commencing in 1900. Had any of these prolific fish survived from the spasmodic efforts made to acclimatize them previous to 1900, they would have declared themselves long before the department commenced its importations in 1900."

BIGHORN SHEEP IN THE VICINITY OF CLAREMONT, CALIFORNIA.

By Leon L. Gardner.

(*Contribution from the Department of Zoology of Pomona College.*)

That mountain or bighorn sheep still exist in small bands in various parts of the California mountains is a fact well known. It, however, comes as a welcome surprise to find them living, breeding and at least holding their own in numbers, in the mountains not farther than thirty miles from Los Angeles. Vague reports from old hunters that in certain parts of the ranges near Mount San Antonio, commonly known as "Old Baldy," there were "wild goats and sheep," and that they were "mighty hard to get near to," furnished the incentive for investigations which have demonstrated that one species of bighorn sheep occurs in the ranges north of Claremont, Los Angeles County. Whether or not this is the Nelson bighorn (*Ovis nelsoni*) is an open question which can be decided only by the collection and study of specimens.

The rumor relating to the occurrence of wild goats is undoubtedly based upon the observation by hunters of the females and young sheep with their smaller horns. A case in point is the sheep's head found in Ice House Canyon in the spring of 1916. The severe rains of the year had washed it down from the mountainside and it was found at the canyon bottom and brought into Camp Baldy. Word went out that the head of a mountain goat had been found, and the writer immediately

hastened up to the camp to see it. It proved to be the head of a young bighorn, but on account of the short horns and hair, now bleached nearly white through weathering, the mistake had been very natural.

The mountains of the region are much like all the southern California mountains, with brush-covered, south-facing slopes, while the shaded north-facing areas are fairly well wooded. The outstanding feature of this particular region is Mount San Antonio, or better known as "Old Baldy," which stands 10,080 feet above sea level. From it radiate great mountain ridges to the north, east, west and southwest, much as spokes from the hub of a wheel. The whole system is thus connected up by continuous ridges. In this great extent of territory the sheep occupy a very definite area. This includes Ontario, Cucamonga and Telegraph peaks, with their intervening ridges, also Iron Mountain and

Fig. 19. United States Geological Survey topographic map, showing the distribution of big-horned sheep in the vicinity of Mount San Antonio (Old Baldy).

its connection with "Old Baldy," and the ridge between this latter peak and Telegraph (see fig. 19). In the writer's opinion, this is the area of their widest distribution, their favorite haunts being the region around Ontario, Cucamonga and Telegraph peaks.

To seek out and study the sheep in this array of jagged spurs and protecting hollows is a task difficult in itself, and is made none the easier by their timidity. Their wariness was impressed upon the writer by an encounter on June 12, 1915. The approach to Telegraph Peak was made by the ridge from "Old Baldy." While this peak was yet a considerable distance away, the writer's attention was attracted to a spot near the summit by a clear, thin rattling caused by a rock slide down the steep slope. It was apparent that some large animal was the cause of it, and close scrutiny disclosed three heavy-bodied animals bounding up the mountainside with great speed, and with no regard to

the great quantities of stones dislodged. As each sheep in turn reached the summit, curiosity gained the upper hand, and it turned, gazed down in a bland, questioning way, and then with a quick turn, head erect, trotted stiffly over the top and disappeared to view. On account of the hard soil, the tracks could not be followed and pursuit was impossible.

Just what the sheep were doing on that barren rock slide is hard to say. They could hardly have been in the act of quitting the peak, for that particular spot was some distance from any ridge, being on a slope that ended only in the canyon a considerable distance below. If it was food they were seeking, they were certainly going to a great deal of extra effort, for there was plenty at the summit. This was quite evidently a stray trio of more adventuresome or restless females or young males, for no big-horned ram was with them. They might very possibly have been members of a larger band on the other side of the mountain. This seems the more likely in view of the fact that about an hour later, in a location not so very distant from where the sheep were seen, the writer came across fresh tracks of a whole band of sheep.

Just how the sheep detected the presence of a human being is an interesting question. The air was quite still, so they could have received no warning through a telltale scent. It seems more likely they were given notice through the sense of sight. If so, their vision is very acute, for the writer was alone, dressed very inconspicuously and still at a considerable distance.

Another definite encounter occurred in September of 1914. This one was purely fortuitous. A fruitless hunt for deer had at last led to the outermost point on Ontario Peak, and here a rest was taken on the top of a big rock. About midafternoon the silence was broken by faint yet unmistakable sounds, which could have only been made by a whole troop of animals. There was the sound of twigs snapping, the bleating of lambs and the peculiar shuffling sound caused by the tramp of many feet. It was very evident that a band of sheep was approaching. A cautious observation over the edge of the rock disclosed a very interesting sight. Coming along the top of the ridge was a party of sheep, an individual stopping here and there to nibble at the vegetation. The rams, with their great curling horns, were a majestic sight, while the young of the year were exceedingly playful and altogether charming. Unfortunately at this stage a scent warned the sheep. In a second the whole band halted, heads up, noses questioning, then at an invisible signal they all wheeled and made off in jerky, stiff-legged, bouncing leaps, and quickly disappeared from view.

At various other times sheep were seen, but under very unsatisfactory conditions. Either the distance was so great that nothing could be learned, or but a very fleeting glimpse was caught of the band in flight. One is often given the aggravating impression that he comes too late or that the sheep were too sharp-eyed and had taken to safety.

However, although themselves difficult to locate, unmistakable traces of the sheep are to be found if carefully sought. Here one sees the grass cropped, the bushes nibbled, there the scattered droppings, and in spots where the soil is powdery enough, or by a moist stream bank, the clear large footprints in great abundance. One might almost study the distribution of the sheep through this means alone. Thus the writer

one day came across a well-beaten sheep trail on the ridge between Ontario and Telegraph peaks. In most places the soil is too hard and rocky to take a print, hence tracks are not as abundant as one might suppose.

Regarding the general habits of the sheep, several points seem clear. As before noted, they are very shy and alert, despite years of freedom from pursuit by man. From the fact that tracks when found are usually in great abundance, and from direct observation, it is evident that they travel most often in bands. However, the occasional sight of one, two or three odd sheep perhaps points to the conclusion that certain individuals at times stray from or are cast out of the band. This might occur in the case of several males striving for the leadership of the band. It seems very possible that adventuresome young, especially males, not yet arrived at the breeding age, might stray from the herd.

From the appearance of the lambs in late September, at which time they are quite active, the writer would put the lambing season in late February and early March.

The question of water is not a serious one for the sheep. Not only is water accessible in the headwaters of the canyon streams, but springs issuing from the sides of Ontario Peak, at some places within 200 feet of the top, give a ready supply. This whole region in winter is covered with a heavy blanket of snow, and this, when melting in the summer, often forms large pools of clear water. That the sheep move about and drink at night is evidenced by one observation, when several of them were seen one moonlight night to slip down to one of the springs on Ontario and drink.

What constitutes their food can not readily be told without long-continued observations during feeding (a very difficult and well-nigh impossible task) and by a study of the stomach contents. There is no doubt, however, that the following plants form an important part of the diet: the leaves of the chinquapin (*Castanopsis sempervirens*), a wild parsnip (*Palpinacea sativa*) growing around water holes, berries of the manzanita (*Arctostaphylos*), twigs and leaves of *Rhus trilobata* and *Rhamnus crocens californicus,* and finally grass growing near springs and streamlets.

All that has been said applies to the sheep only during the warm season of the year. What becomes of them in winter is not known. They are certainly not at the mountain tops. The heavy snow blanket covering the mountains thaws during warmer spells only to freeze again into a solid sheet of ice. At such times they become exceedingly slippery and dangerous, and it seems inconceivable that the sheep or any living creature of large size could avoid sliding off into the canyons below.

There are two places that give great promise as wintering areas. These are the spurs to the northeast of Cucamonga and Telegraph peaks, respectively. They drop low enough to receive only an occasional, transient snow covering. This region is exceedingly wild, trailless, and not visited by man, and would seem to present all the requirements of winter quarters for the sheep.

Regarding the number of sheep living in this territory, it is not possible to say definitely. If all the sheep are in one band, then their number is between fifty and sixty head. There is, however, no evidence

to show that there are not dozens of sheep scattered all over the range, or that there are not two or more bands of varying sizes. The writer is inclined to feel that there is but one band, with only a few outlying stragglers. Much can be done toward answering these points if the sheep could be found in the winter, when their range is greatly restricted.

A study of this kind presents many other questions of great interest. It would, for instance, be very interesting to obtain, if possible, a history of these sheep. How long have they been known in this section, and are they remnants of a one-time larger band that was more widely distributed? It also seems very possible that there are other bands of sheep in favorable localities, such, for instance, as North Baldy and the series of nonfrequented peaks in connection with it. Even the species is unknown, and from this as a starting point the problems extend endlessly.

With a wise and rigorously protective state law and a range that will not for years to come be encroached upon by man, there is everything in favor of a bright future for the mountain sheep of eastern Los Angeles County.

DEER LICKS OF THE TRINITY NATIONAL FOREST GAME REFUGE.

By Harold C. Bryant.

Heretofore, we have had to base our judgment as to the value of a game refuge largely upon the results obtained in The Transvaal in South Africa, and in other states. Convincing evidence of results to be expected from game refuges in California is now available, in that the first of the large state game refuges placed in a national forest has been in existence long enough to demonstrate possibilities.

Trinity Game Refuge was established by legislative enactment in 1911. Comprising 65,000 acres of brush and timberland, with abundant water and feed, and salt licks convenient, the region affords ideal conditions. A visit to this refuge at the present time will attest the worthwhileness of a sanctuary for deer and other game.

Although in a county where violations of the fish and game laws are frequent, the residents respect the game refuge. The people of the county wanted the refuge in the first place, and although it set aside much of the best deer country, everyone concerned is willing to be inconvenienced and to hunt elsewhere. Originally reporting the largest deer kill of any county, a noticeable decrease for several years brought a realization that something needed to be done to save the situation. The result was a demand for a game refuge. The interest taken by the United States Forest Service has had much to do with the attitude of the residents and the enforcement of the game laws.

Within the refuge are many famous deer licks, where in former years deer were killed by the thousands. Residents estimate that there were 10,000 deer killed at the licks near the north fork of Trinity River, up to the time of the creation of the refuge.

Fig. 20. View of portion of Trinity Game Refuge on the Hayfork River. Photograph by H. C. Bryant.

The writer visited the Trinity refuge during the latter part of May, 1917. Trips were made to the licks along the Trinity River near Helena, and also to the numerous licks along the Hayfork River, about ten miles from the town of Hayfork. At both of these places there was plenty of evidence that deer were very numerous and very tame.

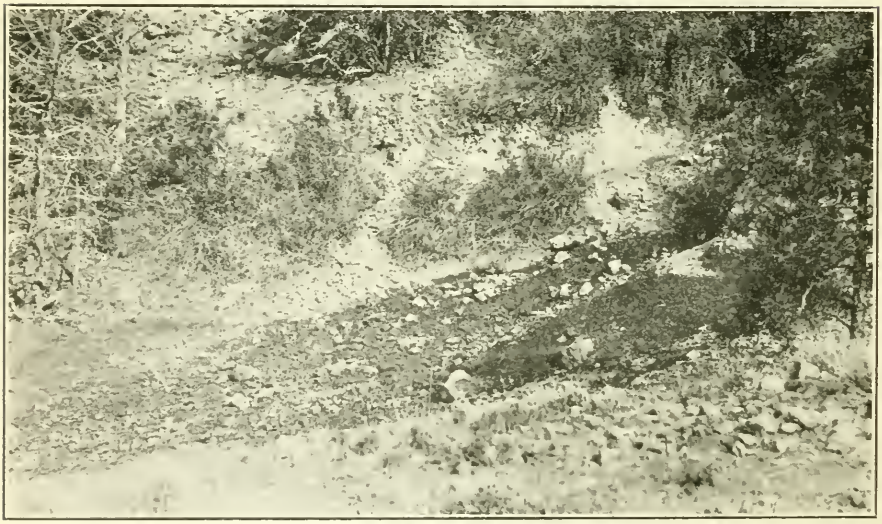

Fig. 21. A typical deer lick comprising a mineral spring on the Trinity River near Helena, Trinity County. Photograph by H. C. Bryant.

On May 23, Deputy G. O. Laws and I went early to the large lick about two miles down Trinity River from the town of Helena. We seated ourselves about thirty-five yards away, but in plain sight of the approach and the hillside in the background. After waiting for some time we were rewarded, not only by seeing ten deer within good range along the hillside, but also had the pleasure of having two does come to the lick and spend several minutes there. We attempted to photograph them, but the early morning light was not sufficient to make the pictures successful. It was only after we had stood up to take the third photograph that the deer became sufficiently frightened to leave the lick. Even then they did not run, but simply walked back up the hill. The sand next to the river showed that large numbers of deer

Fig. 22. Doe at deer lick on Hayfork River in Trinity Game Refuge. Photograph by H. C. Bryant.

had been at the lick during the night. All of the deer seen at close range were does; tracks also indicated a large percentage of does. When about to leave, four deer came over the hill and started toward the lick, but they "winded" us before they had gone half way down the hill, and turned back.

A trip, in company with Mr. Shock, to the numerous licks along Hayfork River, about ten miles from the town of Hayfork, gave even better results. One large lick inspected (Sulphur Spring) had been used during the night, and it was evident that a number of deer had been frightened away upon "winding" us. Even so early in the year trails were cut three and four inches deep. The tracks here indicated a large percentage of bucks.

Farther down the river, we seated ourselves on the bank of the river opposite what local residents have often termed the "Big Lick." We had been there less than five minutes when two deer appeared and spent

some time at the lick. A screen of tree branches prevented photographs being taken. After these deer had left we moved our location, taking up a station directly across from the lick. We were in plain sight and but thirty-two yards away. During a wait of a little over two hours we were rewarded by seeing a dozen deer come to the lick. Several of the animals saw us, and at each click of the camera the head was raised and the ears pointed forward, and yet there was no sign of fright. The climax came when at 10.15 in the morning two bucks and two does came to the lick, and spent five or ten minutes there. (See fig. 24.)

Fig. 23. Deer startled by the click of the camera at "Big Lick" on the Hayfork River in Trinity Game Refuge. Photograph by H. C. Bryant.

The antlers of the bucks at this time of the year were from four to six inches in length, the knob at the end just beginning to indicate a branching. Bucks were most in evidence at this lick, only three or four does being seen.

Probably nowhere in the state is it possible to find so many deer, or find them so tame, as in this Trinity refuge. Evidently the refuge forms a great game farm where the animals increase in numbers and then spread out to surrounding localities, furnishing food and sport for all those who wish.

Natural conditions are of the best. Artificial means may, however, improve the annual crop. Deer in this breeding area, although safe from attack by man, are still subject to attack by many predatory animals. Some work is being done by the United States Department

of Agriculture to reduce the number of coyotes and mountain lions, but still more work along this line needs to be done. Refuges of this kind, even though they have proved their worth, should be more than refuges on paper. They need to be well guarded and at the same time made more effective by the destruction of predatory animals. Attention needs to be paid also to every means of making the deer more prolific.

Fig. 24. Four deer at "Big Lick" on Hayfork River, Trinity Game Refuge. Photograph by H. C. Bryant.

It may be that salt bricks placed in certain parts of the refuge would aid in keeping the animals in good health. This area, at several different times, has been ravaged by a disease which killed off great numbers of deer. Investigations as to the cause and the cure of this disease would also be of value in increasing the effectiveness of the area. During certain years winter feeding might prove worth while.

The creation of the Trinity Game Refuge has assured a permanent supply of big game to Trinity County and is demonstrating to the whole state the benefits which accrue as a direct result of proper game protection.

UNAPPRECIATED FRIENDS.*

By John G. Tyler.

It is a well established fact that any disturbance of natural conditions in a given area, whether brought about by drainage, irrigation, deforestation or a change in crops or natural products, has a marked, and sometimes immediate effect, upon the Flora and Fauna of that region, and this has been demonstrated in a very striking manner in the San Joaquin Valley, where we are accustomed to do large things and to do them quickly. In this valley, when we speak of an irrigation project, it is usually not in terms of acres or hundreds of acres, but of thousands of acres. The effect of draining large areas of marsh land and converting such tracts into grain fields has been to metamorphose completely the wild life of such places, while the constant transformation of previously uncultivated tracts into fruit orchards and alfalfa fields has brought about equally startling changes.

In days not long passed stock raising was the principal occupation in many parts of the San Joaquin Valley and among our older residents there are still not a few who can recall the time when magpies were as common as sparrows and the sight of glistening flocks of snowy egrets was an everyday occurrence. Then, too, the great California vulture, or condor, swept over the valley searching for carrion on which to feed before returning to its favorite cliffs in the Coast Range Mountains. Dr. Heermann, a naturalist with one of the parties of the Pacific railroad surveys, recorded in 1859, that they found the bald eagle in the Tulare Valley, on the borders of large lakes, and in one place counted three nests within sight of each other. The accounts of these explorers are most interesting reading, but we can not escape a feeling of sadness as we realize that these and many other birds have all but disappeared forever from nearly every section of our country.

The stock men did not hesitate to destroy eagles at every opportunity because occasionally a lamb was carried away or a weakling calf was killed, albeit the eagle much preferred a diet of fish or the ducks and coots which he could pick up along the streams and ponds. The destruction of magpies and condors, however, was brought about by wilful carelessness and indifference, for the condors, especially, lived almost entirely upon carrion and could not be charged with destroying either stock or wild game. It was poison indiscriminately placed in the carcasses of cattle and sheep to kill coyotes, lions and other animals that decimated the ranks of these splendid birds, and had not stock raising given away to grain farming, California would soon have lost its right to claim the largest North American bird.

With the advent of vast fields of grain a new set of problems began to confront the settler and the large carnivorous animals were no longer a menace. However, new enemies soon appeared in the shape of ground squirrels, gophers, mice and rabbits which annually destroyed untold bushels of grain. But, here again a lack of foresight was manifested, for instead of exterminating these rodents, we began a concerted persecution of the very creatures that fed upon them. Golden eagles and the large slow-flying hawks sought the squirrels by day, and at night several

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species of owls preyed upon the smaller mammals; yet every man's hand was against these useful birds and when an occasional fowl disappeared as a result of a visit from some swift-winged falcon, the event was heralded far and wide as absolutely indisputable evidence that all large birds are blood-thirsty destroyers of poultry, and even when a very small amount of investigation would have shown that a weasel or fox was responsible for the loss, it was much easier to place the blame on a "hen hawk" and wage unceasing persecutions on all members of the hawk family, both large and small.

In 1878 Lyman Belding, one of the pioneers in San Joaquin Valley ornithology, secured several specimens of the white-tailed kite, which were sent to the United States National Museum for examination and study. In describing these Mr. Belding wrote as follows: "This is a common constant resident of Stockton, where I have seen as many as twenty at the same moment within a circle of half a mile. The specimens I sent were stained * * * from catching mice in a large alfalfa field in the reclaimed tule ground."

In 1915, Dr. Joseph Grinnell of the University of California, after exhausting every means for obtaining information regarding this species, was forced to say: "It is now everywhere very much reduced in numbers and restricted in range, with promise of early extinction." What a pity it could not have been spared to continue its useful work.

But even now when the grain fields have been replaced, to a large extent, by vineyards; when alfalfa fields spread a green carpet over acre after acre, and when the blossoming fruit trees impart a fragrance and beauty to the entire valley, the conservationist has difficulties to face; for with far too many of our farmers it is the rule to regard with suspicion any small bird seen about the farm, and even the wholly insectivorous species are given scanty welcome. Any bird seen on the ground in the gardens or fields is put down as having been caught in the act of digging out seeds or pulling up sprouting grain, and if it ventures near the orchard it is immediately charged with picking off buds or eating fruit.

It is inevitable that in the evolution of a vast empire like the San Joaquin Valley from virgin soil to the most productive area of equal size in the world, we must lose certain species which, from the esthetic standpoint it is highly desirable to preserve; but we can not expect the practical, up-to-date agriculturist to give heed to any argument which embraces nothing more than mere sentiment. Fortunately, however, many farmers have come to realize that from a cold dollars and cents point of view they can not longer afford to be uninformed regarding the economic value of each and every wild creature in their neighborhood. It is too late now to waste time in idle regrets over past mistakes and neglected opportunities, but no well-informed student of these problems would gainsay the fact that our farmers might have been saved many thousands of dollars during the past few years if all concerned had been better informed along these lines.

A short time ago we read of a commissioner being sent to a foreign country, at an expense of several thousand dollars, to discover, if possible, an enemy that would prey upon a certain insect pest. This necessity might possibly never have arisen had our native birds been allowed to carry on the work which nature intended for them.

Even now we are in the midst of a far-reaching and expensive campaign against the destructive ground squirrels, which have increased just in proportion to the decrease of their natural enemies, the raptorial birds. Our horticultural commissioners, too, are searching far and wide for new insecticides and sprays for the control of insect pests, and when we recall in connection with this latter statement the fact that the stomach of a single Brewer blackbird, taken for examination, was found to contain 374 larvæ, 65 pupæ, and three adult alfalfa weevils, besides several other bugs, we can not but reflect that possibly our efforts were too much in one direction.

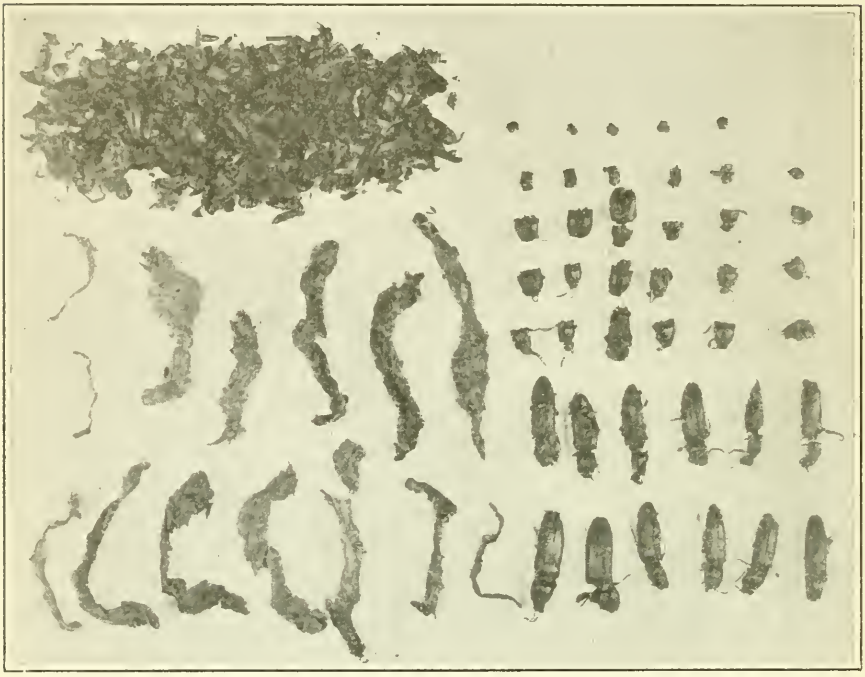

Fig. 25. Photograph showing stomach contents of a western meadowlark. This stomach contained thirteen cutworms, twenty-six elaterid beetles, the larva of which is the wire worm, and ten small ground beetles. Photograph by H. C. Bryant.

Lest some might misunderstand the author's purpose in presenting this article, let it be understood that this is not a plea for mere indiscriminate protection to any and all wild birds, for such a course would be, in a measure, almost as ill-advised as the one we have been pursuing.

There is urgent need in the San Joaquin Valley for a thorough and systematic study of our birds in relation to the farmer and his crops. This is one phase of our instruction in scientific farming that has apparently fallen just between the work of the farm adviser and the duties of the horticultural commissioner, with the result that we are still woefully in the dark when we seek information along this line. Several of the eastern states have recognized this need and are meeting it by appointing a competent official whose duty it is to carry on field

and laboratory investigations, giving advice to farmers, and to issue bulletins from time to time giving the results of his studies. In carrying on such work it is sometimes necessary to destroy a limited number of birds in order to make a correct analysis of the food that has been eaten, but this loss is more than compensated for if the skins of such be preserved as scientific specimens, as they serve a useful purpose in assisting farmers to identify the various species with which they come in contact, and are always of great value for school work. The cost of equipping a small museum and laboratories and of carrying on the necessary work is but the merest trifle when compared with the far-reaching and lasting benefits to be derived.

Because of geographical and climatic conditions the San Joaquin Valley offers peculiar problems. We can not take advantage, to any extent, of the knowledge gained in other states as our avian population differs even from that of other parts of California. Several species have gone forever; others are becoming more scarce each year, but we can not hope to create a widespread public sentiment in favor of their protection until we can show conclusively that it is to everybody's advantage to encourage their presence.

Shall we continue to neglect this important work until some insect outbreak forces us to action, or shall we acknowledge our obligation to ourselves and the future settlers of the San Joaquin Valley?

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

January 28, 1918.

"More fish and better fishing; more game and better hunting; more sport and better sportsmanship."—GOV. JAS. WITHYCOMBE, of Oregon.

FISH AND GAME ENDANGERED.

These are the times when wild life is greatly endangered. Market hunters in New York and in other states are attempting to again establish the sale of game. Selfish hunters are advocating the free killing of fish and game in order to furnish increased food supply during the period of the war. Even officials, forgetting the need of conservation for the future, are being persuaded to let the bars down. A telegram recently referred to the California Fish and Game Commission and signed by a government official advocated the setting aside of protective laws for sea fish during the period of the war. This request is particularly interesting in view of the fact that with no protection, salmon, striped bass, shad and many other anadromous fish could easily be exterminated within a few years, and furthermore that the larger markets have been so glutted with marine fishes that tons have been sent to the fertilizer works and fish meal factories. We may expect still greater pressure by selfish interests and by those who forget in the emergency that now of all times there should be a strengthening of protection, rather than a lessening. Unless every conservationist stands squarely for sufficient protection to perpetuate game species, the enemies of wild life will make short work of our wild life resources by taking advantage of the present situation.

RICE DAMAGE BY DUCKS.

There has been much newspaper publicity given to the depredations of ducks in the rice fields of the Sacramento Valley. It appears that some of this publicity has been the work of selfish hunters desiring to hunt ducks before the season opens. Proof of this is apparent in the fact that most rice growers will not allow duck hunters in their fields. On the other hand, it appears that some growers have received severe loss from ducks. Certain it is, also, that many of the ducks shot this season had their crops filled with rice. The Fish and Game Commission realizes that the problem of protecting the rice fields in the Sacramento Valley is a serious one and it is anxious to reach a solution fair to both the grower and the hunter. Especially is it desirable to rightly settle the controversy, owing to the food situation. Consequently, the Commission plans to hold in the near future a conference with rice growers to obtain their point of view. Furthermore, during the fall of 1918, a special investigation will be made in those districts where depredations are reported.

NEW PATROL BOAT FOR SOUTHERN CALIFORNIA.

During the last part of December the new patrol boat, which is to be named the "Albacore," will be launched from the Fulton Shipyard at Wilmington. This boat is to be used for patrol work and scientific investigation along the coast of southern California. Although designed on lines similar to those of the tuna boats, it is nevertheless suitable for special work, ample deck room being made for handling nets and other apparatus used in investigations (see Fig. 28). The boat is built of wood, has a length of sixty feet, a beam of twelve feet and a draft of five feet. The interior arrangement provides for a large stateroom giving comfortable quarters for four, and a laboratory.

A 65 h. p., four-cylinder, Acme gas engine will furnish the motive power.

This engine will be installed during the month of January. Mr. H. B. Nidever has superintended the work of construction and has seen to it that the boat meets the requirements in every respect.

BOUNTIES.

Some interesting bounty figures from the State of Wisconsin convincingly prove the ineffective and wasteful system instituted in many states to reduce predatory animals. Did Wisconsin get its money's worth between 1906 and 1916 by paying the following amounts in bounties on wolves, lynx and wildcats? Nor do these figures give evidence of the fraud which invariably accompanies the bounty system.

1906	$61,522
1907	51,068
1908	49,248
1909	47,706
1910	40,428
1911	35,934
1912	35,506
1913	38,126
1914	42,928
1915	42,764
1916	39,198
Total	$480,428

We very much doubt whether the saving was anywhere near commensurable with the amount paid, and yet not a session of the legislature goes by but a bounty system is proposed for our own state.

ATTENTION, TRAPPERS!

In order to give proper protection to fur-bearing mammals before it is too late, a trappers' license law was passed by the last legislature. It is now necessary for all trappers over eighteen years of age "who trap for profit" to obtain a trapper's license (citizen, $1.00; alien, $2.00). Those under eighteen years are required to obtain a license, although no fee is charged. Each licensed trapper is required to report his catch before July 1 of each year.

The more notable provisions of the law are as follows:

Open season for black or brown bear, ring-tail cat, coon, pine marten, fisher, wolverine, mink, skunk, river otter, and fox November 1 to March 1.

No open season for beaver or sea otter.

It is unlawful to use poisons in taking

Fig. 26. Joint exhibit of the United States Forest Service and the California Fish and Game Commission at the State Fair, 1917. Courtesy U. S. Forest Service.

fur animals or to dig or smoke out skunks from dens.

Fur-bearing animals may be killed at any time when destroying property.

Seals and sea lions are protected at all times in Game District Nineteen.

There are no legal restrictions to the propagation of fur-bearing mammals in the state.

FORESTRY AND FISH AND GAME EXHIBIT AT STATE FAIR.

The odor of mountain forests and the sound of running water greeted the visitor to the joint exhibit of the California Fish and Game Commission and the United States Forest Service at the State Fair, held in Sacramento, September 8–16, 1917. Avoiding artificiality as far as possible, the exhibit took the form of a miniature forest, in which was to be found a Forest Service lookout tower, aquaria containing several varieties of fine large trout, a model hunter's camp, with bags of different varieties of game hanging nearby, and a pond with thirteen different species of waterfowl upon it.

Pine, fir and cedar trees were brought from the Tahoe National Forest, near Grass Valley, and a space fifty feet square was turned into a forest. On entering between rows of pines and firs, the visitor was invited to inspect the lookout tower, where an attendant explained the manner in which forest officers discover and locate forest fires. There was also on exhibition a heliograph, an instrument utilizing the sun's rays to flash messages.

Beneath this lookout tower an ingenious method of showing the five principal causes of forest fires was to be found. The rotation of a wheel-like structure brought in view a series of small models showing automobilists dropping cigarettes and matches, homesteaders burning brush, campers leaving a camp fire still burning, lightning striking a tree and a railway train, from which sparks might start a fire. A touch of realism was added to the lightning scene by the use of an induction coil and a piece of tin, with which a semblance of lightning and thunder was obtained, and to the forest fire by the use of volumes of smoke.

Fig. 27. Part of educational exhibit of California Fish and Game Commission at State Fair, 1917. The mountain lion is represented as killing a fawn, and details as to the destructiveness of this animal are given on the accompanying placard. To the right is shown canned fishery products and data on California fisheries. Photograph by H. C. Bryant.

The fish exhibit consisted of a model fish ladder and a fish screen in operation, a small cement pond containing many of the food fishes which have been introduced into the Sacramento and San Joaquin rivers—crappie, bluegill sunfish, black bass and carp, and two large glass aquaria containing rainbow, Loch Leven and eastern brook trout. Hatching troughs contained trout and salmon fry.

Inside the tent, which represented a hunter's camp, was an educational exhibit. Attracting most attention were several mounted groups; a mountain lion killing a deer, a Cooper hawk killing a quail, and a barn owl with a gopher. These groups appeared to impress every visitor and even had they not been

labeled, the meaning of each would have been self-evident. Some fine photographs of birds, furnished by W. L. Dawson, of Santa Barbara, an exhibit of different varieties of tuna and sardines canned in California, and an exhibit showing the were a pair of wood ducks and a pair of fulvous tree-ducks, the latter birds more like geese than ducks, and often known as "Mexican ducks." Although nesting in the San Joaquin Valley, they are seldom seen during the open season on water-

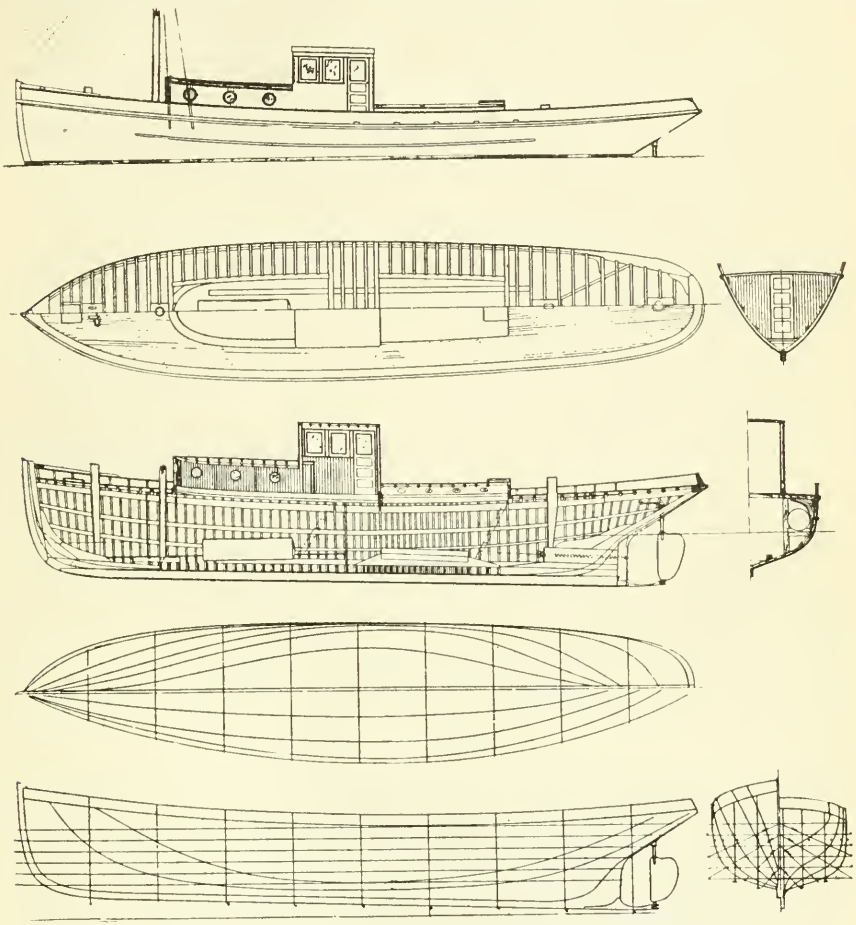

Fig. 28. Working drawings of new commercial fisheries patrol boat. This boat will be used in connection with fishery investigations and patrol work in southern California.

food habits of some of the non-game birds, together with charts and maps, completed this part of the exhibit.

A pen containing a pond, on which were to be seen thirteen different varieties of wild ducks and geese, gave those interested a fine chance to test their ability to recognize the different species in the wild. Of more than usual interest fowl, and consequently are little known by sportsmen.

That visitors were really interested in the work of the two organizations concerned with the conservation of forests and wild life was evidenced in the great demand for literature, and by the many questions asked of the attendants. The exhibit demonstrated methods of conserv-

ing natural resources and showed what the Forest Service and the Fish and Game Commission are doing to perpetuate California forests and California fish and game. The educational value of such an exhibit can not be overrated.

THE COST OF RAISING PHEASANTS AND DUCKS.

In that such game birds as pheasants and wild ducks are fast coming to find a place in the market, and in that there is increased interest in game farming, attempts are being made to estimate the cost of rearing such birds. Samuel Evans, the largest commercial game breeder in the United States, figures the total cost of rearing a pheasant as somewhere between one dollar and a half and two dollars. Mr. Dunn, of the Clove Valley Rod and Gun Club, maintains that one dollar and a half is close to the correct figure for the rearing and maintenance of a pheasant for a full period of twelve months. Mallard ducks can be reared for a slightly less cost.

THE ENABLING ACT OF THE FEDERAL MIGRATORY BIRD LAW.

The Federal Migratory Bird Law became effective March 4, 1913. Because it was claimed that this law was unconstitutional, it has been difficult of enforcement. While the case was still pending before the Supreme Court, the United States and Canada ratified a treaty protecting migratory birds, which in effect made the Federal Migratory Bird Law apply over the greater part of North America. It is still necessary that an enabling act be passed to reinforce this law. Such an act was introduced in the House of Representatives, but failed to come to a vote before the term of Congress expired. The bill was reintroduced in the next session and was passed by the Senate on July 30, 1917, by a large majority. Action by the House was prevented owing to the pressure of war legislation, but doubtless the bill will be passed before the session closes. The Canadian Government has already passed its enabling act.

SAVING DEER FOR FOOD.

The United States Department of Agriculture, along with other recommendations, suggests the following ways of more largely utilizing the deer kill. Fortunately, some of the suggestions are enforced by law in this state:

"Do not kill a spike buck or doe when you can obtain a full-grown buck.

"Do not kill deer when weather conditions or difficulties of transportation prevent saving the meat.

"Save every pound of meat.

"Save the skin and the head also if the antlers are in good condition.

"Do not shoot deer at night, or in the water, or unless you can clearly see that the animal aimed at is a full-grown buck. Failure to observe this rule usually results in a violation of the game laws and often in the loss of human life."

Fig. 29. The results of a hunt at the opening of the season in Mendocino County. Each of the nine men in the party secured a buck.

NOVEL FISH AND GAME LEGISLATION.

A recent publication of the United States Department of Agriculture (Farmers Bull. 910) in giving a summary of the game laws for 1917 calls attention to the following novel game legislation:

The first game law placed on the statute books of any state through the medium of an initiative petition was adopted in Arizona at the general election in November, 1916.

Hunting game with flying machines has been made illegal in North Carolina by a law prohibiting shooting waterfowl on any of the waters of the state from an airplane.

Pennsylvania has imposed, as a penalty for conviction for a second offense under the game law, imprisonment equal to one day for each dollar of the fine and denial of license to hunt for two years.

Utah has passed a law prohibiting aliens from hunting in the state.

Wisconsin has extended its provision relative to seizure of paraphernalia used in violation of game law to include automobiles, which, when used by persons hunting illegally, may be confiscated by conservation officers.

The law in New Hampshire authorizing the payment of damages for injuries to live stock caused by persons hunting deer has been modified so that in future such damages will be assessed by the commissioner of agriculture and paid from the fish and game fund.

In South Carolina a specific tax on game preserves was imposed on all holdings in excess of 5,000 acres, except in Berkeley County, the rate of taxation being 2 cents an acre for tracts of 5,000 to 30,000 acres, 4 cents from 30,000 to 55,000 acres, and 5 cents for larger tracts.

Wyoming has provided for the establishment of zoological gardens in cities and towns and authorized the game commission to supply birds and animals for the collections.

Hunting on Sundays is prohibited in all states and provinces east of the one hundred and fifth meridian except Illinois, Louisiana, Michigan, Texas, Wisconsin, and Quebec.

Section 8 of the Canadian Migratory Birds Convention Act reads: "All guns, ammunition, boats, skiffs, canoes, punts and vessels of every description, teams, wagons and other outfits, decoys and appliances of every kind, used in violation of or for the purpose of violating this act or any regulation, and any bird, nest or egg taken, caught, killed or had in possession, in violation of this act or any regulation, may be seized and confiscated upon view by any game officer appointed under this act, or taken and removed by any person for delivery to any game officer or justice of the peace."

RECREATION.

I know there is not a man living who is tossed about month after month in the bustle and bang of business life who does not need a vacation; he needs it for his mental, moral and physical development; he needs the woods, the music of our streams, the warbling of the birds, and a chance to drive out the fetid air of a stuffy office and dusty street and to fill his lungs with pure, vigorous ozone found in the woods and open fields.

It is a misfortune to a man who does not enjoy Nature's greatest tonic, which she presents so freely in outdoor life. Sometimes there comes a longing to all of us for a camp fire in some shaded spot close to some good spring of pure water, with a frying pan over the coals, from which comes the scent of bacon. All of this can be found only in a life in the broad and health-giving open.

The greatest charm of nature is its wild life. The beauty of the hills and the mountains would be cold and desolate without the birds and animals that have delighted man since the beginning of time; music of the rivers and streams would be sad were it not for the sport of "going a-fishing."

Society is unconscious of the contentment to be found under the open sky and in the silent places. Natural things are wholesome, and a finer view of life and deeper sympathy with and for all living things is found along the primitive paths. Men and women all over the world are yearning for the simplicity of other days; are groping to find greater moral and physical strength and true happiness, which is apparently lost.—*Biennial Report, 1914–1916, Kansas State Fish and Game Warden.*

MUDHENS GOOD FOOD.

Believing that "conservation" means making use of every valuable food-product, the California Fish and Game Commission has launched an extensive publicity campaign in behalf of the common coot or "Mudhen," which already has established itself as a valuable bird in the South and parts of the East, but in the presence of so great a supply of more choice wildfowl, thus far has failed to find general recognition in the Golden State.

This is a time when everything edible should be given careful consideration; for months the Fish and Game Commission urged upon the people the greater use of fish, and in the present phenomenal increase of demand is seen a considerable ripening of the fruit in whose cultivation the commission was a pioneer on the Pacific coast.

The using of all perishables, and becoming better acquainted with every novel food product has become a patriotic duty wherein all may render aid of daily value. Realizing that only through wide publicity could the people be made familiar with the many good foods that annually go to waste, the State Board has been stimulating all possible the use of birds that most hunters throw away —a thing for which there can be no excuse, as if not worth using, why kill, or waste costly ammunition that could serve better purpose?

The worst thing about the "Mudhen" is its name, and the prejudice that this has built up against it. "Give a dog a bad name" has proved its truth. As a matter of fact, there is nothing new in the use of mudhens on this coast. Leading hotels have served them as "water chicken" in San Diego for years; and as "tule hen" they appeared on Fred Harvey's celebrated bills of fare regularly. Known South as "Poule d' Eau" and served a la Creole, they attained a more than local fame down New Orleans way, great center of bon vivants that it is.

Mudhens are perhaps better relished by their French name which is more truly descriptive of their habits, as they are a water bird rather than a mud frequenter. Their diet is identical with that of ducks, and in dry seasons when there is not much grass the flesh stays hard. In general they are to be handled like rabbits in preparation for the table. Stews are the general method of cooking; but those willing to pluck fat ones can roast them and have a bird little inferior to duck except milder in flavor, hence relished by some to whom the gamy flavor of a duck is not acceptable. They are easy to skin, but the process removes the rich and valuable fat, so is to be condemned, as all such fat should be made useful. To add other fats, such as bacon, is needless extravagance.

Soaking the birds several days in cheap claret imparts a most delicious flavor, and is a method followed by some of the most celebrated cooks, one of whom has been serving "mudhens" in his cafe for nearly twenty years in Los Angeles as "Salmi of Duck," delighting thousands who never suspected that they were eating the same mudhen that had been left to lie before their guns as supposedly worthless.

Nowadays, as a result of publicity, one sees strings of the blackish birds, nor are sportsmen ashamed to admit their shooting them either; for the making use of anything hitherto wasted is realized to be a most practical form of patriotism, and to be a proper source of personal pride.

The common ruddy duck or "wiretail" is a delicious bird on the mountain lakes when fed on the rich, sweet aquatic food-plants so relished by the big ducks, and sportsmen are also making wide use of these fat little fowl this season.—Edwin L. Hedderly.

WILDFOWLERS LUCKY.

Favored by the wonderful balmy weather of a typical southern California winter, sportsmen have played in phenomenal luck throughout the present season until a week before Christmas finds the mountain lakes still open; the highways and by-ways still easily passable everywhere; a goodly supply of waste grain, weed-seeds and much natural food for wild game still unspoiled by rains. With the greatest duck and goose flight of any recent year reported from the interior valleys along the great rivers, and a good supply of birds on the mountain lakes which remain open to the

licensed hunter legally as well as climatically, the vast army of wildfowlers who are unattached to any clubs find themselves favored indeed by the continued delay of storms, which, although making better shooting, render the grounds difficult of access to the motorist who is willing to travel 150 or more miles for his week-end outings. The growth of the "good-roads" movement in California has greatly increased this class; until today, considering the comparative ease of access to the vast open shooting-grounds of the interior, the charge no longer rings true that one "must belong to an expensive gun-club to enjoy duck-shooting in southern California." There never was a time that men could not find better shooting away from the clubs, but it was not so accessible as now; and this year the clubmen have had a bad deal indeed from Nature. The scarcity of food in the extreme south where none of the clubs appears to have attacked the problem from a duck's point of view, has been accentuated by the increase of beet and bean farming which largely has replaced the barley-growing which used to provide sprig and wigeon with their principal staff-of-life hereabouts; and the clubmen have failed to provide any practical pond-growing substitute to take its place. Over-shooting and under-feeding are an impossible combination especially when coupled with mild weather, which offers no reason for ducks leaving the favorable feeding conditions of the great interior valleys, which have become more attractive since rice-growing was proved practicable, and now constitute such a paradise for wildfowl as probably can not be equalled anywhere else in the world.

California long since became famous among wildfowlers who watch their favorite sport in a broad, nation-wide way. From the days of '49, the vast inland waterways of this state have ranked as immense producers of wild game for food and sport. Today, despite a winter of typically Californian mildness, the entire interior of the state is swarming with ducks and geese of every coastal variety. The demonstration of formerly waste overflows as the best of rice land has added an enormous pulling power to the already proved attractions of the Sacramento and San Joaquin, Owens and Imperial valleys. Sportsmen well may be proud of their state, and glad to cheerfully contribute their license-dollars toward keeping up its gunning attractions, which draw the interest of their fellows of like mind with a magnetic power only to be appreciated by those in whom the love of wild life and healthful sport in the great outdoors still surges with primitive enthusiasm.

In the day of our National need, when this vast plenty of choicest wild meat lies open to the people free to whomsoever has the energy, experience and ability to "reduce to possession" these assets which belong equally to all until the superior prowess of some has rendered them personal possessions, the state's game has developed a peculiar and direct value, as a thing to be used wisely like an investment, its taking limited to the annual increase, lest a day of direr than present need develop when a greater than present supply must do its first duty by the people in the replacing of shipable meats. To this end exist all our restrictive laws; and those whom the limit seem to hit hard must uot forget the reasons underlying it; nor the liberal privileges they enjoy when compared with the all but gameless states of the east, where drastic closed-seasons and small mess limits have utterly failed to stay extermination in the face of advancing agriculture and closer, more intensive farming methods. The game is given us to use wisely; not to set up on a pedestal of affectation as a monument to posterity; but for the best and widest present use compatible with maintaining the supply on a business basis for the future, exactly as any business man aims to handle his working capital.—Edwin L. Heddderly.

HOW TO DYNAMITE A STREAM.

Newspapers have been one of the most powerful forces in crystalizing sentiment in some of the states for the protection by proper laws of fish and game as important resources of the commonwealth.

A New Jersey editor, a thorough sportsman, recently received from a

reader who desired to take fish by questionable means a query saying:

"Please advise me how to dynamite a stream."

The newspaper man sent the following advice:

"Four sticks of dynamite are sufficient. Tie them securely around your neck, attach fuse, light it and run as fast as you can away from the water to avoid injuring the other snakes and reptiles." —*Wild Life*, September, 1917.

MT. WHITNEY HATCHERY GROUNDS TO BE IMPROVED.

Mr. John McLaren, the well-known landscape gardener of Golden Gate Park, San Francisco, recently made a visit to the Mount Whitney Hatchery for the purpose of offering suggestions as to the improvement of the grounds. The large amount of water which passes through the hatching troughs is to be utilized in beautifying the surroundings. The natural boulders, so numerous in the vicinity, will be utilized to form cascades, and shrubbery and trees will be planted to give a suitable background. Mr. McLaren gave helpful information as to the grouping and kinds of trees and shrubbery to be used.

FIREWORKS USED TO FRIGHTEN BIRDS IN RICE FIELDS.

Some experiments to determine the effectiveness of fireworks in frightening birds from rice fields have recently been made in the Sacramento Valley. The location selected was on the Gingg and Cooper ranch, four miles west of Live Oak, where birds did considerable damage last year.

In talking with Mr. Cooper in September regarding cooperation by the Fish and Game Commission in order to find a remedy, and knowing the effect of black powder, which is both loud and smoky, we suggested to him the use of some form of loud explosive that would carry fire and smoke. We secured several samples of rockets and bombs from San Francisco and commenced the experiment by setting some of them off after dark. However, the birds were still numerous on the rice fields at daylight in the morning. We then fired more bombs and still more while the birds were in the air. To say that the ducks were demoralized does not convey an idea of how much they were frightened.

Mr. Cooper was so impressed with the effectiveness of the bombs that he sent for four dozen of the kind selected, at five dollars per dozen. After using half of this number night and morning there was not a bird of any kind to be found on his fields. In a few days some mudhens and ducks returned, presumably new ones. He then used the balance of the four dozen effectively, and sent for five dozen more for emergency use. On September 26 Mr. Cooper stated to us that he had had no occasion to use or open the last five dozen, as at that time there was not a bird on his fields and he had not suffered a particle of injury. Judging from this, the experiment may be said to have been a success.

Conditions on Mr. Cooper's fields made it harder to protect them from the birds than any other fields in the district, the water being deeper in spots, which induces the birds to congregate there. Of course, when the birds were driven from the Gingg and Cooper grounds, some of the other growers certainly suffered from the addition of these birds. This only demonstrates that entire relief for all growers can only be had through the cooperation of all the growers. Each can protect his fields, but the one who does not will be the greatest sufferer.

We are certain that the experiment referred to above is the only logical remedy, although many other methods have been suggested. Some rice growers, and many who are not growers (and, by the way, the last named class is the loudest in its complaints) have advocated an earlier open season for ducks. This positively will not remedy the situation. It might, if every one would kill blackbirds and mudhens, as well as ducks, but they want to kill ducks only, as the other birds are not considered good eating. So by killing ducks only, the worst menace would still remain. Again: The rice grower will not permit trespassing on his fields, as the hunter will do more damage at this time than the birds. Many of the rice farms are posted with signs prohibiting shooting and trespassing. Further, if the season was opened earlier than at present, a large number

of club members would be out shooting at the club grounds, which are not on the rice fields, but on open water and tule marsh lands adjacent thereto. Thus the ducks would be driven from the club and open shooting grounds back to the rice fields, where the rice farmer does not permit trespassing while the rice is growing. Consequently, the club members would be the only ones benefited by an early season, while the rice would suffer more than at present.

Before night shooting was prohibited, and before the use of smokeless powder, some of the best duck shooting ponds have been spoiled by shooting after dark and by using black powder. Any duck hunter of long experience can testify to this. Ducks will not return to a pond that has been shot on at night. The idea of using bombs came from this experiment. Smokeless powder is used in fixed ammunition because it does not frighten game, for it makes very little noise and smoke. The use of smokeless powder to scare ducks is money wasted. This form of ammunition is made to kill, not to frighten, but it has been used by the rice grower and he receives no relief except from the bird he kills.

Although the experiments above outlined were tried on a limited area only, they demonstrated that there is a feasible method of protecting crops from the depredations of birds.

We are sure that if the rice growers themselves will cooperate, a plan of defense can be worked out as suggested, which will make it unnecessary to threaten the extermination of the wild duck without obtaining relief from the other birds which are the worse menace. But the growers should eliminate the voice of the man who is not a rice farmer, and who only takes up the cry for the purpose of slaughter. He does not kill mudhens or blackbirds, because he does not eat them and cannot sell them.—George Neale.

BLACK BEAR WORTH PROTECTING.

The recently enacted "bear law" was one of the best measures the Fish and Game Commission has ever succeeded in placing before the state legislature. It will effectually put a stop to the ruthless slaughter of these animals at a time when they are utterly valueless. I have heard owners of two-bit "bear hounds" boast of having killed as high as forty bears in one summer in order not to "spoil" the pro-German dachshunds who had treed them. One bear is of more value to the community than a dozen of these worthless sausage hounds, who make the night hideous with their fiendish howls, as they chase the does and fawns up and down the mountainside.

To the average mountaineer bear meat is preferable to venison. To mention bear meat in their presence is to cause a sensation similar to that produced by the mention of "sweet 'taters an' 'possum" in the presence of the congregation at a colored camp meeting.

The meat, lard, and pelt of a three-hundred pound bear in prime condition represents an actual value of over thirty-five dollars. In addition to this, outside hunters whose love of bear hunting attracts them to the mountain regions doubtless spend in transportation, license, food supplies and indicentals, an actual value of over one hundred and thirty dollars to the community. The small amount of damage done by an occasional "hog killer" is greatly offset by his value as an asset to the state, and as a source of food supply to the residents of the districts he frequents. The lard and oil extracted from a bear in good condition sometimes amounts to as high as fifteen gallons, but five gallons is probably the general average. This lard and oil, if used for culinary purposes, will prove very acceptable to the delicate stomachs of those afflicted with dyspepsia or other stomach ailments.

During the open season there will undoubtedly be many hunters who will kill bear for the pelt alone, and the meat will be left as food for coyotes. At any time and more particularly at the present time, when it is our duty to conserve the nation's food supply, it is a crime to allow this meat to become a total waste, and we sincerely hope that immediate steps will be taken to prevent it.—Frank B. Hoffman.

A WAY TO CURB HUNTING ACCIDENTS.

In looking over a list of the hunting accidents for 1916, it occurred to us that some method should be devised whereby these could be curtailed.

How would it be to require answers to a printed list of questions to be furnished to all parties applying for hunting licenses—a sort of examination; for instance:

1. In getting through a fence, how would you handle your gun?

2. While riding in an auto or other vehicle, would you have your gun loaded or empty?

3. Would you ever, under any circumstances, get into a boat or vehicle with a loaded gun?

4. Would you ever point an empty gun at another person?

5. Would you ever permit any part of your person in front of the muzzle of your gun?

6. If hunting in brush or thicket, would you shoot if you saw a movement of the brush?

It seems to us if all applicants were given a good quiz along this line, it would save many lives and limbs.—O. S. PHILLIPS.

HUNTING ACCIDENTS.

Out of forty-eight fatal hunting accidents last fall in Illinois, Indiana, Iowa, Michigan and Wisconsin, recorded in the Chicago *Tribune*, twenty-two occurred in Michigan as against only six in Wisconsin. The reason for the disparity is simple; bucks only might be killed by deer hunters in Wisconsin, but in Michigan they did not have to wait to see the horns.—*Recreation*, November, 1917.

FAWN SUCCESSFULLY REARED.

On July 8, 1917, Mr. George C. Walker discovered a dead and partly devoured doe in the vicinity of Squaw Valley. Nearby lay a baby fawn about a week old, in a starving condition. Mr. Walker immediately took care of the fawn and carried it to his home at Illikee, on the banks of the Truckee River, where he carefully fed it on a bottle, and in less than thirty days the fawn was able to be up and around.

Mr. Walker applied for and received permission from the Fish and Game Commission to keep the fawn, which was duly christened Tillicum (in the Indian language "Good Luck"). Mr. Walker's airedale dog and the fawn became great pals, and the two roamed the hills at large, always returning, however, for meals. In a short space of time the fawn became such a pet that at times it was almost a nuisance (see fig. 30).

Fig. 30. Orphaned fawn successfully reared on a bottle. The airedale dogs are good friends of the fawn. Photograph by Geo. C. Walker.

When Mr. Walker returned to his winter residence in Oakland about the last of September, he shipped the fawn down there, where it has attracted considerable public attention, especially because of its tameness.—JOSEPH H. SANDERS.

FACTS OF CURRENT INTEREST.

The season's record albacore taken at Avalon, Catalina Island, November 13, 1917, weighed 54½ pounds and took 27 minutes to land on light tackle. The second largest albacore for the season weighed 41 pounds.

Fishermen in southern California have been on a strike, demanding $18 a ton for sardines, instead of $12 as formerly.

Ducks appear to be more numerous in the Sacramento Valley this year than for several years past.

On Thursday, November 1, 1917, fishermen at San Francisco secured the largest catch of flat fish (sandabs, sole) ever made at this port—2,000 boxes, or approximately 770 tons.

Crab fishermen of San Francisco report that crabs are unusually abundant and that they could easily exceed their contract, which calls for 600 dozen per day.

The deer season was a great success. There were apparently just as many, if not more, hunters in the field, despite the draft.

Quail have been abundant and hunters have reported good bags almost everywhere.

Schools of mackerel have been abundant along the Southern coast during the past few months, and pier anglers have enjoyed rare sport. Large net hauls have been made off the Long Wharf, Santa Monica.

The Long Beach Tuna Canning Company is planning to make a business of putting up whale meat.

The reported kill of deer in California during 1916 was 8,117. Altogether, probably not less than 12,000 deer were killed, furnishing somewhere near 450 tons of fresh meat.

Duck clubs in California have been "Hooverizing" by either stopping the baiting of ponds entirely, or by using screenings and other waste foods.

That good deer hunting is to be had in California is evidenced by the fact that, of a party of nine, hunting near Cloverdale, Sonoma County, on the opening day of the season, each obtained a buck.

FAIR PLAY.

(A page of criticisms and answers.)

MISDIRECTED PURPOSES OF GAME CONSERVATION.

Editor The Chronicle—Sir: I have been reading with a great deal of interest certain editorials appearing in the several daily papers relative to the action of the California Fish and Game Commission and the operation of the laws governing them in the discharging of their duties. I have been an ardent sportsman in the past and still hold a marked interest in both fishing and hunting. I commend the intention of the laws that are for the preservation of both fish and game. However, in the last few years things have come to such a pass that the liberty of the individual has materially lessened until the favored few derive all the benefits from the present laws. Most of my fishing and hunting have been done in the mountain counties of Siskiyou, Trinity and Shasta, particularly in Siskiyou, and I believe I know the needs and desires of the people in the last named county pertaining to fish and game. In this article I wish to bring before the public the conditions under which the law operates and the injustice of its operation. Until the last session of the legislature the open season for trout with hook and line was from May 1 until December 31. Satisfactory to all the fair-minded fishermen. Without the consent or wishes of the people, the law was changed to April 1 to November 1. By that method they have deprived the fishermen of two months' fishing. The steelhead trout does not begin to run in any numbers in the Shasta River until November 1, and this year the run was almost absent on account of the low water and lack of rain. The big run does not come until after the first big rain. Shasta River has always been a wonderful stream for steelhead during the months of November and December, and many people and especially the poor people use this particular fish for food, depending in part upon it for their food supply during the winter months. This year they are deprived by law and the activities of the Fish and Game Commission from securing even a portion of their usual supply. None of these fish are used for commercial purposes. No one makes a business of shipping or selling, and none is wasted. It seems to the majority of the fishermen and the people in general a very unjust discrimination, particularly when they allow fishing with hook and line in all the coast streams. During a time as at the present when food conservation is such a vital issue, it seems as though some means might be obtained to correct this state of affairs whereby those desiring to take fish for personal use would be allowed to do so to a limited degree during the present season when they could be taken at their best. These fish begin to spawn in the early spring and when the legal time for taking them is at hand they are of no value as food. I brought this matter up with one of the members of the commission a day or two ago, but was informed that the law would be enforced to the letter and all persons caught with trout in their possession would be severely dealt with. It will be a favor to the people in this particular district if you will publish this letter, showing the attitude of the Fish and Game Commission. Some method should be devised to correct such an unfair and unpopular law. N. A. Hawkins.

Yreka, November 12, 1917.

—S. F. *Chronicle*, Nov. 27, 1917.

AN ANSWER.

November 23, 1917.

Mr. N. A. Hawkins, Yreka, Cal.

Dear Nort: After our friendly chat several days ago regarding fishing conditions in Shasta and Siskiyou counties, I was very much surprised and rather hurt to read in the San Francisco *Chronicle* your letter criticising the work of the commission, and making statements regarding the fishing laws, which, coming from you, were a great surprise to me.

Before writing such an article you should have looked up not only the present laws, but the past.

First: You claim that the favored few derive all the benefits from the present laws. Such a statement is absurd. You have been an ardent fisherman for years

and you should know that it has been the desire of the Fish and Game Commission to suggest to legislators at Sacramento seasons to suit both the fly and bait fishermen.

Last winter, before the legislature met at Sacramento, several meetings were held, called by the commission, where suggestions were made by many sportsmen acquainted with conditions throughout the state, after which the commission prepared a bill and same was passed.

Mr. Henry Ream, your very able representative in Sacramento, went over the bill with me personally, and was more than satisfied, claiming that the people in his district wanted the season opened April 1 instead of May 1 as formerly, and that they did not care for November fishing, as it was very seldom the weather conditions would allow fishing during that month.

You personally know that it is very seldom that the Shasta River is in condition to fish with a rod during the month of November. You, in our conversation a few days ago, stated that you personally had always put up your rod in October. I know it to be a fact, as well as you, that fishing done in November or December in the Shasta River, or any other river in the northern part of the state, is not with a rod, but what fish are caught are caught with a spear or gaff.

Second: To show how unfamiliar you are with the laws governing fishing now, or in the past, you put yourself on record by stating that prior to the last session of the legislature, the season opened May 1 and closed December 31, and that this was satisfactory to all fair-minded fishermen. You are mistaken when you state the season ran to December 31. The trout season in California has never run later than November 30.

You also stated that the fishermen have been deprived of two months' fishing. During the year of 1916 and this year we had seven months' fishing, viz, from May 1 to November 30. This year the law has been changed and the 1918 season will open April 1 and close November 1. Where you can claim that the season has been cut two months I would like to know. You claim this was all done without the consent or wishes of the people.

Third: You state that the Shasta River has always been a wonderful stream for steelhead during November and December. I am well aware of this; but you certainly know, having fished the stream for years, that the stream is not fit for the rod during these months. This year on account of the lack of rain a few fish may be caught.

In the past you have always, when I met you, suggested that I should not fail to come up and visit you at Yreka and have some of your fine September steelhead fishing.

The real basis of your complaint is our enforcement of the law, rather than the law itself. Trout (steelhead), both under the present law and the former one, may only be taken with hook and line. Salmon, however, may be taken with spear, and you must know that the native along the Shasta River takes his fish in fall with the spear. In past years all fish that came to the spear were salmon, according to him. Now, that there is a deputy who enforces the law, the law is wrong.

It is all very well to bring up the excuse of the high cost of living now; but we know, and I am certain that you do, that for years these people have been in the habit of catching steelhead in the closed season and salting them down.

I will quote you the law on this subject:

> "Every person who takes, catches, kills or has in his possession during one calendar day more than fifty trout, or ten pounds of trout and one trout, or one trout weighing ten pounds and over, is guilty of a misdemeanor."

You will find in all districts a certain class who wish the laws made to suit their own convenience, and when they can not have their own way immediately start in to criticise the Fish and Game Commission.

I believe that you will find that it is our duty to see that the fish and game laws are obeyed. We do not make the laws, but at times are requested to make suggestions regarding changes, etc., and whenever we do so, believe me, it is always for the conservation of the fish and game.

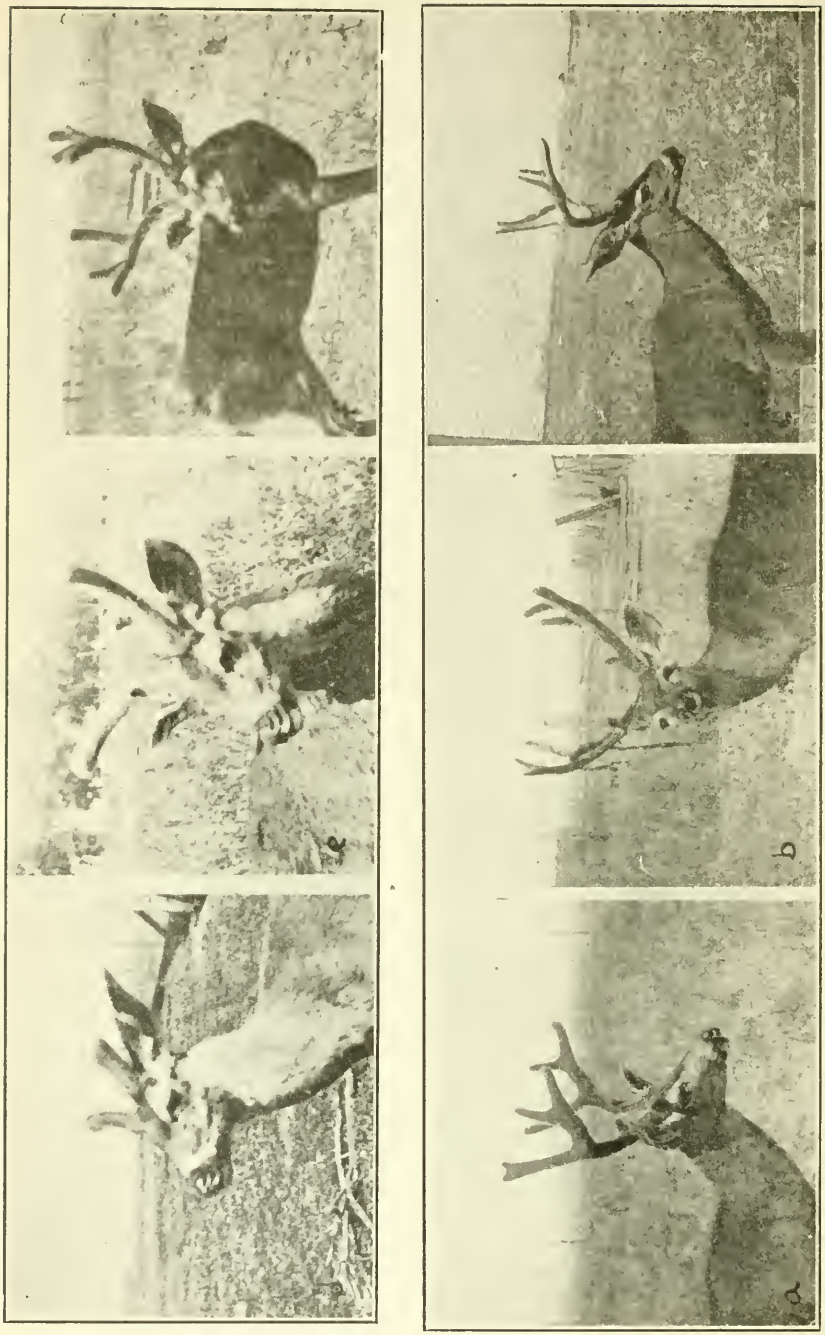

Fig. 31. The growth of antlers of a deer. This splendid series of photographs was secured by Superintendent William Dirks of the State Game Farm. d, May 3, 1917; e, June 6, 1917; f, July 6, 1917; a, August 6, 1917; b, Sept. 1, 1917 (?); c, Sept. 10, 1917.

You say in your letter you "commend the intention of the laws that are for the preservation of both fish and game." If so, would it not be well for you to assist us in our work by talking to the people in your district where, you know for years, both fish and venison have been salted down in large quantities: and do not rush into print condemning us for something that you have shown plainly you are not familiar with.

Knowing you as I do, I feel it my duty to call your attention to many misstatements in your letter published in the *Chronicle*. The public is often misled in this way and the Fish and Game Commission is unduly criticised.

Yours truly,

(Signed) E. L. Bosqui.

HATCHERY NOTES.

W. H. Shebley, Editor.

TROUT AND SALMON DISTRIBUTION FOR 1917.

On November 6, Fish Distribution Car 01 completed the distribution of the last consignment of fish from Mount Shasta Hatchery for the season of 1917, when the streams of Marin and Sonoma counties received their annual allotments of trout fry.

The season past has been one of the most successful in the history of the California Fish and Game Commission. As shown by the following table, a total of 26,386,000 trout and salmon fry were distributed. This included a shipment of 100,000 steelhead trout eggs, which were shipped from the Brookdale Hatchery to the Minnesota Game and Fish Department to be hatched and distributed in the streams of that state. This consignment of eggs was shipped in exchange for a consignment of German brown trout eggs received from the Minnesota Commission during the season of 1916.

Trout and Salmon Distributed in 1917.

Mt. Shasta—	
Rainbow	3,073,500
Eastern brook	1,613,500
Loch Leven	1,500,000
Black-spotted	987,000
Steelhead	3,000,000
Total trout	10,174,000
Salmon	6,862,000
Mt. Whitney—	
Rainbow	300,000
Black-spotted	250,000
Steelhead	700,000
Total trout	1,250,000
Tahoe—	
Rainbow	241,000
Black-spotted	763,000
Total trout	1,004,000
Tallac—	
Black-spotted	1,946,000
Fort Seward—	
Rainbow	140,000
Steelhead	1,322,000
Total trout	1,462,000
Salmon	491,000
Almanor—	
Rainbow	355,000
Domingo Springs—	
Rainbow	126,000

Brookdale—	
Steelhead	980,000
Ukiah—	
Steelhead	445,000
Snow Mountain—	
Steelhead	202,000
Bear Lake—	
Rainbow	874,000
Wawona—	
Rainbow	147,000
Steelhead	68,000
Total trout	215,000
Total trout	19,033,000
Total salmon	7,353,000
Grand total	26,386,000

Immediately upon the completion of the distribution of fish from the different hatcheries, preparations were commenced for the coming season's operations.

The usual work of repairing and painting the hatching troughs and buildings at the Mount Shasta Hatchery is well under way, and the ponds and grounds have received their annual overhauling.

Eastern brook and Loch Leven egg collecting operations were commenced during the latter part of October, and to date 1,271,000 Eastern brook and 1,748,000 Loch Leven eggs have been taken.

Arrangements are being made to ship 75,000 Loch Leven trout eggs to the new Mount Whitney Hatchery in Inyo County from Mount Shasta Hatchery as soon as they can be safely packed and shipped. The Loch Leven eggs, together with 100,000 of the Eastern brook trout eggs, which have been ordered from one of the Eastern hatcheries, will be hatched at the Mount Whitney Hatchery and distributed in the streams of southern California.

Following the plans for bringing up the fishing to the trout rearing capacity of Bear Lake, a crew of experts has been busy taking advantage of the fine fall weather to install 30 troughs, together with the necessary flumes, fishways, live cars, covering frames, etc., as well as constructing a temporary tent house to shelter them while the negotiations for the necessary long-term lease with the North Estate are being concluded, when a permanent structure will be built.

The Bear Lake Egg Collecting Station on North Creek will have a capacity of 6,000,000 eggs. The lake is now six feet lower than last year. A normal rainfall will raise it four feet, in which event the sexually mature trout will again come to North Creek to spawn; but should the

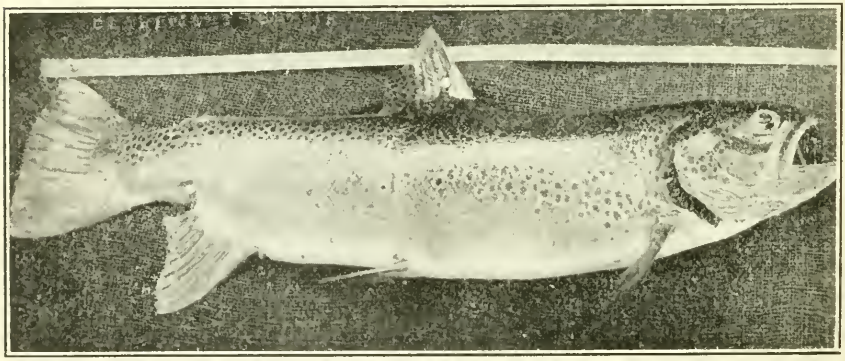

Fig. 32. A seven and one-half pound Lock Leven trout caught by Mr. A. Lunde in September, 1917, in Big Bear Lake, San Bernardino Mountains. Photograph by W. M. Pierce.

winter be dry and lake levels remain low, the spawners will scatter to the mouths of the other creeks and deposit their eggs, decreasing greatly the egg-taking opportunities of the "strippers" at North Creek. All preliminary arrangements have been completed at this station, and everything is now in readiness for the commencement of egg collecting operations as early in the spring as it is possible for the crew to get in through the desert pass.

Tahoe Hatchery has been shut down for the winter, and a ten years' lease has been secured from Mrs. Anita Baldwin on Tallac Hatchery, which is unique as the only available place for collecting and hatching the eggs of the black-spotted trout.

The Commission is also negotiating for the purchase of three acres of the Frank X. Walker property, near Tahoe City, which includes three natural springs. It is planned to abandon the old Tahoe City Hatchery, and erect a modern hatchery with a capacity of three to four million trout.

Plans to improve Wawona Hatchery are pending. We are waiting for a lease from the Wawona Hotel Company, who have promised us all that we have requested in the shape of land and water rights.

Almanor and Domingo Springs hatcheries were closed during the latter part of September, after being put in readiness for the spring egg collecting operations, which will probably be commenced during the fore part of March.

Salmon egg collecting operations at Bryans Rest on Eel River, Humboldt County, have not proved a success. After a two-foot rise in the river, a few salmon reached the racks, and 350,000 eggs were taken. The opinion of our assistants in charge of the operations is that the market fishermen were catching nearly all of the fish in the lower reaches of the river. The racks, traps, etc., were carried out by the flood waters following the last storm, but fortunately practically all of the material was saved, and can be used for future operations.

The Fort Seward Hatchery has been given a thorough overhauling and is in excellent condition for next season's operations. The salmon eggs taken at the Bryans Rest Station will be hatched and reared at Fort Seward Hatchery, and distributed at the proper time in the tributaries of Eel River.

Ukiah Hatchery and Snow Mountain Egg Collecting Station will be repaired during the month of December. The fishway and trap on the Snow Mountain Dam were damaged by the water last season, and must be repaired before the steelhead trout begin to run.

A few minor repairs are necessary at the Brookdale Hatchery, and this work will be completed during the month of December.

Scott Creek Egg Collecting Station is in readiness for the season's operations.

A HATCHERY FOR YOSEMITE VALLEY.

If negotiations now pending with the Department of the Interior relative to a water supply and site are successful, it is proposed to erect a suitable hatchery in the Yosemite Valley this coming season. The ever-increasing number of visitors and pleasure seekers to this wonderful section, and its easy access by automobile, has made it necessary to heavily stock the streams and lakes of this region. The long distance that the fish have to be carried from Mount Shasta or the Mount Whitney hatcheries to the Yosemite region does not meet the demand, as the number that can be shipped so great a distance is limited. It will be a better policy and more economical to hatch and rear the fish in the Yosemite Valley, where they can be distributed by the park service. In addition, a hatchery in the Yosemite would be of great educational value as it would be visited by most of the 30,000 persons who visit the valley annually.

INSECT FOOD FOR TROUT INTRODUCED.

A most important work has been undertaken by the Fishcultural Department in the collecting and distributing of aquatic insects upon which trout feed. *Cordyalis* larvae being taken from the Klamath River to streams tributary to Lake Tahoe, and 500,000 of the valuable *Gammarus*, or fresh water shrimp, being brought from the state of Nevada to plant in Tahoe and Donner lakes. The planting of suitable food should keep pace with the distribution of young fish,

carrying this idea even to the introduction of aquatic plants upon which such insect life can multiply. Many Sierra lakes, otherwise ideal, are barren of fish because they produce no feed, and must first be built up to support fish life, after which trout can be established in a very short time. It is the plan of the Department of Fishculture to begin systematic operations, on a large scale, to introduce aquatic plants and insects in the barren waters of the more important lakes in the high Sierras during the coming season. This work must be done by persons familiar with the habits of the insects and fish as well as the conditions that prevail in the lakes that are to be stocked. As soon as the insects are introduced and are thriving, the lakes will be stocked with trout fry.

SUCCESSFUL INTRODUCTION OF SALMON IN NEW ZEALAND.

The Fishcultural Department has received a letter from the Honorable L. F. Ayson, Chief Inspector of Fisheries for New Zealand, that will be of interest to all fishculturists interested in the propagation of salmon. It also puts some new light on the "parent stream theory" regarding the habits of the salmon. Evidently the salmon have not confined themselves to the stream in which they were planted in New Zealand. The efforts of the New Zealand Government to establish a run of salmon in New Zealand began in 1873, when the first salmon eggs were shipped from California to New Zealand. At different times from 1873 to 1900, shipments of salmon eggs were made to New Zealand, but no results were obtained. In 1900, G. H. Lambson, then Superintendent of Baird Hatchery on the McCloud River, took a consignment of salmon eggs from McCloud River, California, at the request of Honorable L. F. Ayson, Inspector of Fisheries, to New Zealand. Mr. Lambson personally attended to the collection and preparation of these eggs, and cared for them en route, and on their arrival in New Zealand, arranged for the hatching and rearing of the fry. From this and subsequent lots taken by Mr. Lambson, dates the introduction of the quinnat salmon into waters of New Zealand. Following is an extract from the letter of Mr. Ayson regarding the salmon in New Zealand:

"W. H. SHEBLEY,
Dept. of Fishculture,
San Francisco.

DEAR MR. SHEBLEY: I was very pleased indeed to get your letter of the 7th February, and also the copy of your biennial report, which you kindly sent. The report contained a great amount of most interesting and useful information. There is no mistake about your fish culture work progressing and on modern lines.

With regard to the spread of salmon along our coasts, the Waitaki is the only river on the east coast of the South Island in which salmon have been planted, and now they have spread from there into five rivers north along the coast, for a distance of fully three hundred miles, and south from the Waitaki for a distance of about 120 miles. There is a strong ocean current running from south to north along that coast which no doubt accounts for the salmon traveling further north than they have done south.

The first river suitable for salmon is the Rangatata about ninety miles north of the Waitaki, and they made their appearance there five years after the first fish were taken in the spawning season, in a tributary of the Waitaki, and now nearly as many run into the river as into the Waitaki. In each of these rivers over three tons of salmon were caught by trout anglers in five weeks last autumn. In New Zealand, at any rate, salmon have of their own accord spread along the coast and ascended and spawned in rivers where no salmon have been planted.

In this country the trout fishing is controlled by Acclimatisation Societies, and as the salmon come in, in the autumn, when the run of trout is over, anglers have had splendid sport catching these fish with spinning bait after the trout fishing is finished. This has considerably increased the number of anglers, and the Societies' revenue from angling licenses, and they are now making a big bid to get the control of the salmon. This, of course, I am strongly opposed to for reasons—(a) that the State found all the money and did all the work of introducing these fish, (b) that the Societies at first opposed the introduction of this salmon because they said "it was no sport fish and not desirable fish to introduce," and (c) that the Societies' administration and fish cultural methods are wasteful, inefficient and not to the best interests of the majority of our people.

Yours very sincerely,
L. F. AYSON,
Chief Inspector of Fisheries."

COMMERCIAL FISHERY NOTES.

N. B. Scofield, Editor.

OUTPUT OF CALIFORNIA'S FISHERIES DOUBLED.

An appeal has gone out from the government, through the Food Administrator, urging that all kinds of food production be speeded up. It has been especially desired that the production of the fisheries be increased in order that the more concentrated meats may be released for shipment to Europe. No other state has responded as has California. The catch of fish during the year just passed is double that of the previous year. The large take of sardines and herring during the closing months of the year is certain to send the year's catch above the two hundred million pound mark. This increase has been accomplished without suspending fishing regulations and restrictions. In most of our seacoast states there has been a decreased catch of fish during the last year, which in some cases was due to the use of the larger fishing vessels for other purposes, while in other cases it was due to impoverishment of the fish supply. This impoverishment is most striking in the case of halibut and salmon along our north Pacific Coast and Alaska as well as British Columbia. The companies operating in this region are not asking that all fishing restrictions be removed for they have at last awakened to the fact that the halibut and salmon supply is not inexhaustible and that the present restrictions are inadequate to safeguard the future and keep these fisheries up to their full capacity. After years of indifference as to the future, they are now "demanding" conservation.

Although the fisheries of California have done so well in the present crisis, we should be able to increase their production very greatly during this coming year. We should not lose sight of the fact that nearly all of our fishery products are used outside of the state and that a large part is even sent outside of the United States.

The people of the Nation are being urged by the Food Administrator to use foods that are near at hand in order to relieve our congested railroads. It is a patriotic duty, therefore, for the people of this state to use more of our fish which are here in such quantities close at hand.

Such a small quantity of fish is used locally by the people that the fresh fish dealers are unable to sell at a low price. Experience has taught these dealers that reducing the price does not result in a corresponding increase in consumption and that their business can be made to pay only by charging a relatively high price. With the great expense that is required to furnish a small amount of fish on but one day a week, it is a wonder that the price is as low as it is. The butchers are complaining that the meatless Tuesday so increases their overhead expense that their business is not profitable and that they will have to raise prices. Fresh fish dealers have been struggling along with six fishless days a week. If people would use fish on each day of the week as they do meats, fish stalls would increase in number, competition would develop, marketing and transportation conditions would improve and fish would become our cheapest article of food.

THE SALMON CATCH ON EEL RIVER.

The Eel River salmon season opened on October 8 with several companies competing for the fish and nearly 150 boats with gill nets fishing in the lower five miles of the river. The first night's catch was nearly 200,000 pounds, and then for several days very few were caught. The stream is usually low at this season and the salmon congregate in the pools in the lower river for two or three weeks before the opening of the season. As it has been claimed that a great many steelhead are taken at the first of the season, a sharp lookout was kept for these fish, but only seven were taken the first night. The season closed on December 7 with a rather poor season's catch. The river remained very low until just before the close when a rain brought a four foot rise. It came too late, however, to start the fish before the closing day. That the diminished catch was due to late runs and not to a depleted fish supply, is borne out by the fact that the silverside

salmon which usually appear by the first of November and reach their height about December 1, did not put in their appearance until a few days before the end of November. Steelhead were also late and less than 10,000 pounds were taken which is about one-third of the amount taken last year. The fishermen are endeavoring to get the river opened again during the month of January, arguing that the river can furnish 100,000 pounds of steelhead during that month without injury to the steelhead supply. Fishermen on Smith River, Del Norte County, claim the same for that river.

SEA FOOD WASTED.

Recently nine hundred pounds of fish were sent from San Diego, California, to El Paso, Texas, to be used by the people of that city on Friday, the day which has been inherited as fish day. The shipment arrived too late for Friday's market and as the next Friday was too far off, the lot went to the city disposal plant after waiting three days for buyers who were willing to take a chance at them on a day other than Friday. The El Pasons did not see the humor of it, but berated the express companies for causing a waste of food in these war times.

NO FIXED PRICE ON SALMON.

At the request of the State Market Director, the fishermen, dealers, canners and others interested in salmon, met at his office on December 6 to discuss the matter of fixing the price of fresh salmon this winter. Detailed figures were presented by the Monterey Bay and Sacramento River fishermen, which showed that at any price the market is likely to pay, the fishermen will not make expenses during the winter or off season, which extends from November to April. Under the circumstances, the Market Director determined it would be unjust to fix the price at this time.

KELP HARVEST FOR 1917.

The amount of kelp harvested on the coast of California during 1917 was 398.-898 tons. From this kelp was produced 6,000 tons of potash (K_2O) with a value of $2,100,000.00. Other products are being produced from the kelp, such as acetone, several esters, chetones, sodium alginate, and potassium iodide.

LIFE HISTORY NOTES.

DUCKS DIE AT SALTON SEA.

From about August 15 to the last of October, 1917, large numbers of ducks and other water birds died at Salton Sea, in the Imperial Valley. In the early part of October pintail ducks died by the hundreds and formed a windrow along the shore. I counted forty dead bluebills and fifteen canvasbacks in a distance of fifty rods along the shore of the lake on October 14. The birds lose the use of their legs and then of their wings, and finally are absolutely helpless. After developing these symptoms they are certain to die in from one to four days.

Although cormorants and white pelicans are numerous, they do not appear to be subject to the disease. Geese also, though abundant, do not seem to be affected.

Several persons have eaten the meat of the diseased ducks with no ill effects, and cats feeding upon the dead birds show no symptoms of poisoning.

All evidence points to the view that this is the same sort of disease that has appeared at Tulare and Buena Vista lakes in California and at Great Salt Lake in Utah.

Apparently ducks affected with the disease are benefited with a change to fresh water. My man and I have picked up a great number of birds so affected and have placed them on sandbars at the mouth of the river. Here they appear to do better, but most died or were eaten by coyotes, which are plentiful here.—CHARLES E. DAVIS.

CANADA GEESE BRED IN ALAMEDA COUNTY.

Six or seven years ago I bought six Canada geese (*Branta canadensis canadensis*) at Hawthorne, Esmeraldo

Fig. 33. Shore of Salton Sea showing numerous ducks which have died from a peculiar disease. Each of the black spots in the photograph represents a dead duck. Photograph by J. K. Heath.

County, Nevada. They were caught in Walker Lake with a net, during the molting season, and were placed inside a wire enclosure at my place near Alvarado, Alameda County, California, along with some black swans. The swans immediately attacked the geese, killed one of them and injured another so that it died soon afterwards. Of the four geese that were left, one was a female and the other three males. About a year ago last August the female escaped by rising on a high wind, but returned to me two or three months later, joining the other three geese.

The enclosure in which they are kept has a little artificial lake about 150 feet in diameter, with an island in the center about fifteen feet in diameter. Last Spring (1917) my caretaker observed the female trying to make a nest on this little island. He accordingly gathered some grass, weeds, etc., and placed them on the island, with the result that the goose laid six eggs, five of which hatched, and four of the goslings are now fully grown, making eight geese altogether.

This appears to be the first instance of wild Canada geese being bred at lower elevations.—F. M. Smith.

WHITE DEER IN TRINITY COUNTY.

Hardly a season passes that a white or cream-colored deer is not reported as having been seen in Trinity County. Nor are these reports unfounded, for there are many well authenticated instances and several skins are in existence. The Indians of the Hoopa Reservation have long utilized white deer skins in one of their religious ceremonies and at least one skin procured in late years has become the property of an Indian on the reservation. I saw a white deer many years ago on the upper Hayfork River. This animal was later shot by the Shock Brothers of Hayfork, who report that they have killed two other white deer. Albinos have been seen by eight different people whose names I have in my possession. A few years ago George Grieg of Junction City killed a white spiked buck. He was arrested, fined twenty-five dollars and the confiscated skin was sent to the Fish and Game Commission. The most recent report of a white deer is of one seen by Henry Morris and Charles Knowles in May, 1917, on Redding Creek, near Junction City.

In my opinion white deer should be protected by law, because of their rarity and unusual interest. Owing to the greater value of the skin, there is increased incentive to kill such animals, and consequently danger of exterminating them.—G. O. Laws.

REPORTS.

CALIFORNIA FISHERY PRODUCTS FOR THREE MONTHS ENDING SEPTEMBER 30, 1917.

Species of fish	Del Norte, Humboldt	Mendocino, Sonoma, Lake	Marin	Solano, Yolo	Sacramento, San Joaquin	Alameda, Contra Costa	San Francisco	Santa Cruz	Monterey	San Luis Obispo, Santa Barbara, Ventura	Los Angeles	Orange	San Diego	Imperial	Total
Albacore										482	20,904,452	190	4,901,579		25,689,255
Anchovy							87,525		97,795		33,759				219,079
Barracuda									5,657	37,367	300,796	12,718	169,926		526,464
Bonito								2,127		4,448	102,798		15,506		124,879
Bocaccio		196				50	4,938	12,525	58,707						76,410
Bluefish							145,361	2,645	6,214						154,220
Chilipepper							128,710	50,480	8,093						187,283
Carp				968	6,610	4,845	15,888		8		15,807				44,123
Catfish		50		1,420	2,797	4,044	994								9,305
Coalfish		462					296,201	25,018	220		992				322,893
Cultus cod	827	30,476	125			420	141,936	9,486	12,513		42				195,825
Dogfish		3,150	6,465			50	5,936				7,887		8,462		31,950
Flounder	413					75	222,657	7,700	120						230,965
Halibut	14,285	80,025					11,606	3,108	21,316	24,903	47,917	11,908	774,744		989,902
Hake							23,284	16,555		275	8,365		235		48,714
Herring										520	760				1,280
Kingfish							51,814	7,541	49,975	308	25,641		2,626		137,905
Mackerel								66	265,764	10,181	712,106	5,718	74,078		1,067,913
Mullet														8,946	8,946
Pike				4	195	335	1,908								11,418
Pompano							15	530	54	68	2,131		211		3,009
Perch	3,842		1,278			8	58,856	1,375		275	1,481				67,115
Rock bass	3,750									478	85,879	5,278	99,667		195,052
Rockfish		1,826	202			30	231,833	244,009	211,418	10,033	398,654	584	136,995		1,235,697
Sole		34				187	1,915,040	1,113,779	9,304	13,553	211				3,052,108
Salmon	245,257	367,229	36,792	2,873,454	731,635	982,396	1,215,042	16,958	456,713		1,510				6,928,016
Smelt	2,014		12,457			257	98,276	58,860	79,068	11,249	14,022	17,834	9,398		303,654
Sea bass (white)			5,074			263	854	873	3,955	2,405	107,085	2,391	176,596		299,496

Sea bass (black)									150	305	4,979		15,606		21,040
Sandab							432,099	234,155	5,000		4,057	75			705,446
Striped bass			13,483	21,144	29,458	44,089	79,021	92							187,287
Shad				7,262	33,480	12,986	4,779		1,792				114		60,416
Sturgeon					125		125								250
Sardine							26,835	1,370	16,560,483		3,970,527		2,097,962		22,657,177
Skate							61,636				85				61,751
Sculpin							150		29		1,112				1,291
Sea trout											371				371
Tom cod							4,452				560				5,012
Trout (lake)											75				75
Trout (steelhead)	1,530					12									1,542
Turbot		17	430							26					473
Whitebait			125				69,482								69,607
Yellowtail								3,477	11,311		355,524	200	1,105 541		1,477 053
Miscellaneous		16,451		100	120	406	59,615	875			23,477		9,534		110,578
Total fish	272,918	499,910	76,431	2,904,352	804,450	1,050,486	5,379,140	1,812,558	17,805,719	116,896	27,133,662	56,896	9,567,108	8,946	67,540,321
Crustaceans—															
Crab (dozen)	54,664						145,512	5,220							205,423
Spiny lobster											1,330	29,374	45,150		75,854
Shrimp							218,705								218,705
Total															499,985
Mollusks—															
Squid									114 730						114,730
Cuttlefish			58				2,385	3,449	1,582						7,474
Clam (Pismo)										113,485	1,070				114.555
Clam (cockle)		751	21,261								5,760				27,772
Clam (softshell)		865				8,830	13,950								23,675
Clam (mixed)	11,430	52	26,461			4,930	15,470	500			2,550				61,393
Oysters (native)							7.230								7,230
Oyster (shell)			42				608.350								608,392
Abalones		6,358							265,960	1 692					274 010
Mussels	1,400	1,951				399	18,919		384		875				23,928
Total															1 253,159

VIOLATIONS OF FISH AND GAME LAWS.

June 1 to October 31, 1917, Inclusive.

Offense	Number of arrests	Fines imposed
Game.		
Hunting without license	74	$1,125 00
Failure to produce license on demand	2	
Deer, close season, killing or possession spike-buck	40	1,525 00
Deer horns and skins—failure to produce	8	175 00
Female deer and fawns—killing or possession	16	600 00
Illegal deer hides	4	140 00
Deer not properly tagged (close district)	2	30 00
Quail, close season, killing or possession	16	395 00
Ducks, close season, killing or possession	55	1,290 00
Doves, close season, killing or possession	15	380 00
Cottontails, close season, killing or possession	16	350 00
Brush rabbits, close season, killing or possession	3	25 00
Nongame birds, close season, killing or possession	3	35 00
Fur-bearing mammals, close season, killing or possession	3	25 00
Shore-birds, close season, killing or possession	14	125 00
Sage-hens, close season, killing or possession	3	75 00
Cranes, close season, killing or possession	1	25 00
Grouse, close season, killing or possession	1	5 00
Night shooting, close season, killing or possession	11	175 00
Total game violations	287	$6,560 00
Fish.		
Angling without license	23	$420 00
Fake statement on application	3	30 00
Fishing for profit without license	13	205 00
Trout, close season, taking or possession	1	5 00
Trout, sale undersized	1	20 00
Trout, taking other than with hook and line	6	170 00
Trout, excess bag limit	3	55 00
Catfish, offering for sale undersized	2	170 00
Barracuda, offering for sale underweight	1	20 00
Spot-fin croaker, offering for sale, close season	1	25 00
Sacramento perch, excess limit	1	100 00
Black bass, close season, possession undersized	3	70 00
Striped bass, close season, sale, possession, underweight	9	40 00
Salmon, close season, taking or possession	6	200 00
Crabs, close season, taking or possession	7	20 00
Crabs, female, undersized		
Abalones, close season, taking or possession, undersized	6	95 00
Clams, undersized, excess bag limit	14	267 50
Dried California shrimp in possession	3	1,020 00
Dynamiting fish	2	200 00
Illegal nets	8	50 00
Fishing within two-mile limit	1	
Total fish violations	114	$3,182 50
Grand total fish and game violations	401	$9,682 50

SEIZURES—FISH, GAME AND ILLEGALLY USED FISHING APPARATUS.

June 1 to October 31, 1917, Inclusive.

Game.

Ducks	862	
Quail	52	
Doves	99	
Geese	9	
Cottontails	13	
Brush rabbits	19	
Grouse	2	
Sage-hen	5	
Crane	1	
Shore birds	71	
Deer meat	934½	pounds
Deer hides	4	
Bear hides	1	

Fish.

Trout	477½	pounds
Salmon	4,045	pounds
Striped bass	588½	pounds
Barracuda	2,200	pounds
Sturgeon	115	pounds
Spot-fin croakers	1,726	pounds
Catfish	26¼	pounds
Crabs	1,385	
Abalones	46	
Clams	1,385	
Clams	127½	pounds
Lobsters	125	pounds
Dried shrimp	6,500	pounds
Nets, traps and fishing outfits	11	

Searches.

Illegal fish and game	25

STATEMENT OF EXPENDITURES FOR THE MONTHS OF MAY, JUNE, JULY, AUGUST AND SEPTEMBER, 1917.

	May	June	July	August	September
General Administration.					
General administration	$2,036 97	$1,796 32	$2,321 85	$1,815 47	$1,954 02
Research publicity and educational (game)	249 54	220 48	233 92	211 53	204 63
Printing	744 01		361 94	579 32	
Fish exhibits	5 50				305 84
Game exhibits					74 99
Game farm	212 21	228 55	309 30	191 80	307 17
Mountain lion bounties	180 00	220 00	100 00	260 00	320 00
Lithographing hunting licenses		950 00			
Lithographing angling licenses					
Hunting license commission	810 70	1,475 30	1,033 20	1,001 20	2,764 80
Anglers' license commission	1,098 00	835 26	2,027 76	798 96	1,515 60
Market fish license commission	246 50	234 50	15 50	61 50	96 50
Paper Mill Creek Dam					
Totals	$5,583 43	$5,960 42	$6,078 41	$4,919 70	$8,085 55
Patrol.					
San Francisco district	$4,703 94	$3,360 68	$5,327 03	$5,445 92	$5,338 64
Sacramento district	3,642 59	3,550 27	3,927 12	3,759 33	3,745 40
Los Angeles district	2,188 90	2,080 71	2,143 51	2,165 54	2,159 19
Launch patrol	895 84	744 02	767 63	1,149 78	1,008 03
Prosecutions (fish and game)	161 00	20 00	70 60	46 00	209 05
Crawfish inspection	300 00	300 00	200 00	300 00	398 82
Winter game feeding	3 10				
Accident and death claims	155 05	124 04	200 64	200 64	305 39
Totals	$12,050 42	$12,179 72	$12,676 53	$13,067 21	$13,163 92
Department of Fish Culture.					
Hatchery administration	$801 78	$729 06	$873 25	$908 18	$760 19
Mt. Shasta Hatchery	1,427 93	2,495 66	2,230 15	1,548 36	2,641 71
Klamath Station	262 19	250 00			6 25
Mt. Whitney Hatchery	477 22	1,063 26	393 96	607 26	790 22
Rae Lakes Station		30 00	537 45	244 19	4 62
Cottonwood Station				43 50	10 00
Tahoe Hatchery	400 13	382 30	310 84	255 81	317 56
Tallac Hatchery				103 28	52 68
Markett Carson Hatchery					
Fort Seward	428 87	550 30	705 21	420 84	474 05
Ukiah Hatchery	185 71	282 72	115 62	47 44	11 04
Snow Mountain Station	528 98	12 70			36 00
Brookdale Hatchery	208 81	230 92	230 90	111 44	114 10
Scott Creek Station	102 25	70 25	40 25	75 85	30 00
Almanor Station	452 45	594 87	370 77	10 09	26 58
Domingo Springs				445 93	299 48
Bear Lake Hatchery	394 55	783 14	294 21	233 92	101 82
Wawona Hatchery	78 10	90 00	75 00	75 00	
Yuba City Station		51 01			
Fish distribution	15 00	737 28	2,914 59	1,385 46	1,476 11
Fish transplanting	7 47		143 65		
Screen fishway and water pollution	386 91	659 95	585 74	485 14	527 33
Special field patrol					50 00
Totals	$6,160 35	$8,705 92	$9,620 99	$7,001 69	$7,729 74
Commercial Fisheries Department.					
Fishery research and patrol	$431 72	$559 93	$1,302 04	$1,109 75	$1,412 74
Department of Engineering.					
Mt. Whitney Hatchery	$207 16				
Grand totals	$24,433 08	$27,465 99	$29,677 97	$26,098 35	$30,391 95

CALIFORNIA FISH AND GAME

"CONSERVATION OF WILD LIFE THROUGH EDUCATION"

Volume 4 SACRAMENTO, APRIL, 1918 Number 2

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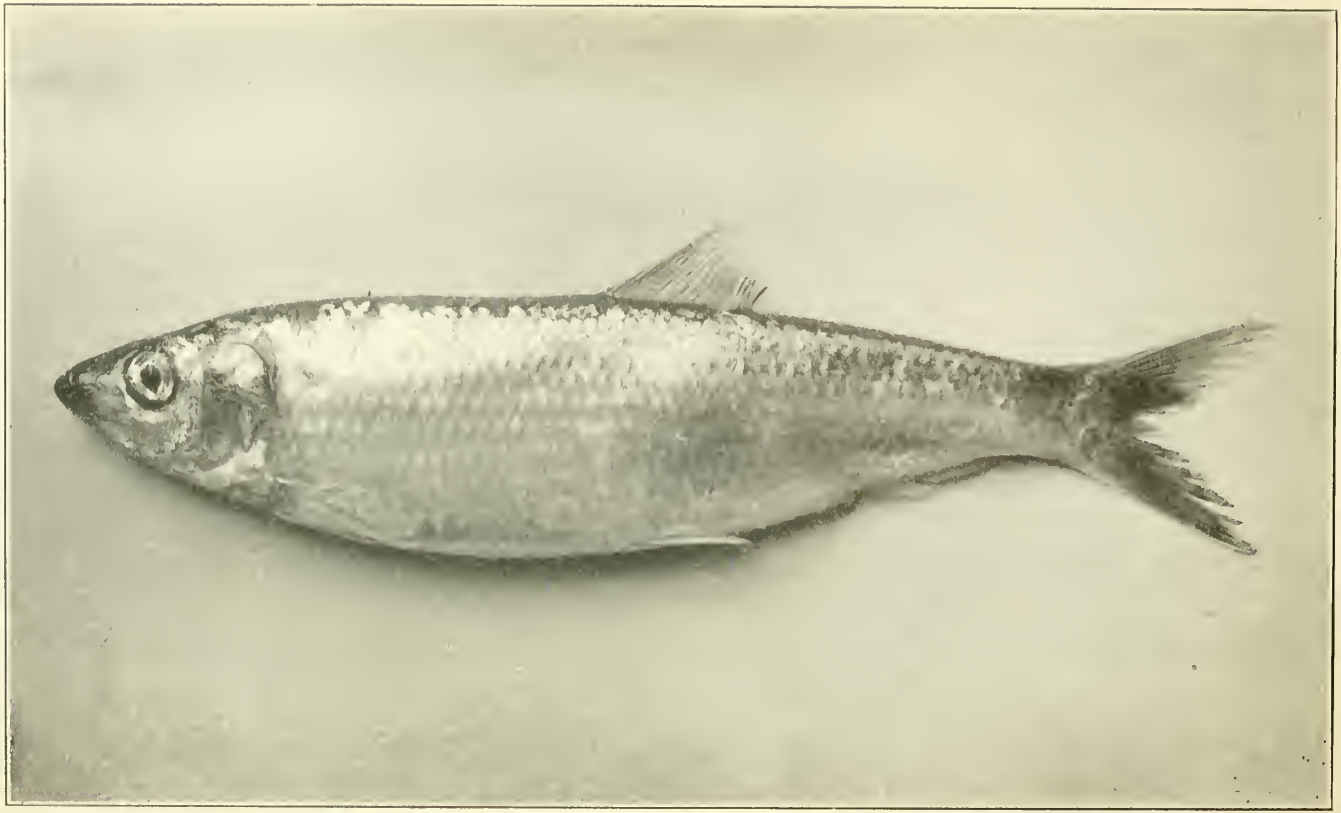

Fig. 34. The herring (*Clupea pallasii*). One of the most abundant small fishes found along our coast. Along with the sardine it is now becoming an important food fish.

THE HERRINGS AND HERRING-LIKE FISHES OF CALIFORNIA

By Edwin Chapin Starks, Stanford University.

This account includes the lady-fish, the herrings, the sardine, the shad and the anchovies. These fishes, though considered in three separate families are, nevertheless, rather closely related to each other. They are well separated as a group from other fishes, but mostly by internal characters that are of too technical a nature to be here included. They are rather closely related to the trout and trout-like fishes but lack the adipose dorsal fin.

Other groups of fishes contain more species than this group, but no other is represented by such a great number of individuals. They swim in immense schools in temperate and tropic regions. The world over they hold first place in commercial importance, though on our California coast this has only recently been true, for within a year or two the sardine has supplanted the salmon and tuna (albacore) in value.

The herrings and herring-like fishes are bright silvery, the head without scales, but the body covered with thin scales that are easily rubbed off. There is a single, short dorsal fin near the middle of the back. The ventral fins are back on the belly and not close under the pectoral fins as in the bass-like fishes. The fins are without spines and consist of soft rays only.

Considerable doubt seems to exist as to the relationship between the herring and sardine. The sardine is a herring but all herrings are not sardines. It belongs to the herring family (*Clupeida*) and hence may be correctly considered a herring.

GLOSSARY.

Anal fin. The single fin on the lower side toward the tail.

Caudal fin. The tail fin.

Dorsal fin. The single fin near the middle of the back.

Length of head. The distance from the tip of the snout to the hind edge of the gill cover.

Maxillary. The bone bordering the mouth above and extending backwards.

Opercle. The last bone of the side of the head covering the gills.

Pectoral fins. The paired fins just behind the head.

Ventral fins. The paired fins back on the abdomen.

In identifying any fish in this group it will be necessary to first find the family in the following key:

Families of California Herrings and Herring-like Fishes.

The body nearly as wide as it is deep. The snout pointed, cone-shaped, and projecting beyond a small mouth. The maxillary not reaching backwards behind the eye. *The Lady-Fishes (Family Albulida): Page 60.*

The body deeper than wide. The snout not cone-shaped and not projecting beyond the mouth in front. The maxillary not extending backwards behind the eye. *The Herrings (Family Clupeidæ). Page 60.*

The mouth extremely large, with a pointed snout projecting beyond it. The maxillary reaching backwards behind the eye nearly to the gill opening. *The Anchovies* (*Family Engraulidæ*). *Page 63.*

THE LADY-FISHES.

(*Family Albulidæ.*)

The Lady-fish (Albula vulpes).

The body is nearly as wide as it is deep and the head is wedge-shaped with a pointed snout that overhangs the small mouth. The top of the head between the eyes is flat, and the sides are nearly vertical. The maxillary does not reach back to opposite the eye. The eye is nearly covered with a thickened, transparent membrane. This is a very brilliant silvery fish, dark olive-brown on the back and with faint streaks following the rows of scales. It reaches a length of 3 feet and is common in tropical seas. On our coast it is not very uncommon in San Diego Bay and has been taken as far north as Monterey Bay. In most localities it is little valued for food, though this is not always an indication of the real food value of a fish.

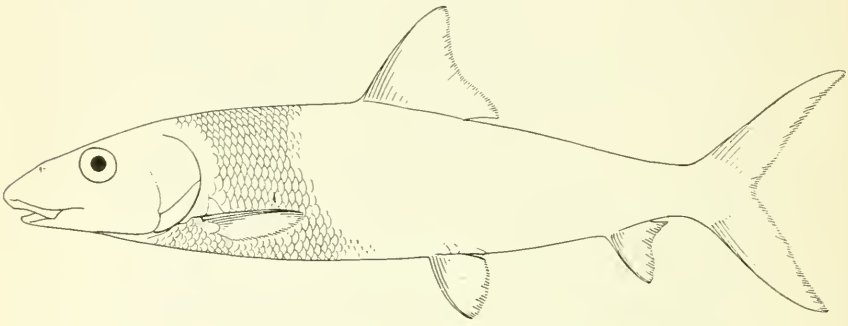

Fig. 35. The lady fish (*Albula vulpes*).

The young of this fish pass through a metamorphosis. They are for a time elongate, small-headed, band-shaped and composed of very loose, colorless, transparent tissue, so clear as to be scarcely seen when in the water. From this condition they become gradually shorter and more compact, shrinking from $3\frac{1}{2}$ inches in length to 2 inches. Then commences their real growth and soon they assume the adult form. In the Gulf of California where the lady-fish abounds, these band-shaped young are often thrown on the beaches in great masses by the waves.

THE HERRINGS.

(*Family Clupeida.*)

The Japanese Herring (Etrumeus microps.)

This herring may be known from others of its family by the ventral fins being entirely behind the dorsal, rather than partly or entirely under it, and by the short base of the anal fin which is less in length than the diameter of the eye. The head is a little longer than the

depth of the body. The eye is covered with a transparent, thickened membrane. The color is bright silver with each scale on the back having a large brown spot.

This fish is more nearly round in section (cigar-shaped) than are other members of its family on our coast, the width of the body being about two-thirds of the depth. Next in order in this respect is the

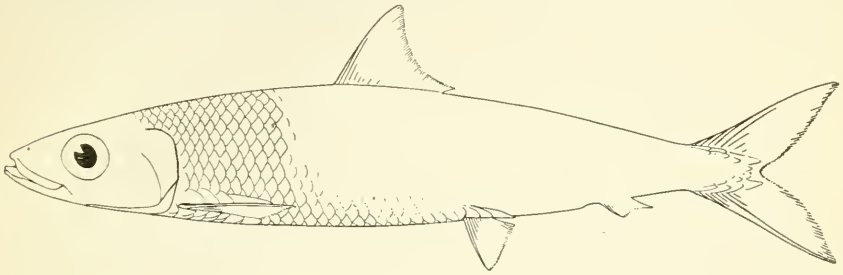

Fig. 36. The Japanese herring (*Etrumeus microps*).

sardine, which is considerably plumper than the herring, and deepest of all is the shad, which is very much deeper than wide.

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.

The Sardine (Sardinia cærulea).

The sardine may be known by the opercle having a few raised lines or ridges running obliquely downward, the head longer than the depth of the body, and the breast and belly not drawn to a sharp, saw-toothed edge. The ventral fins are under the base of the dorsal fin, and the base of the anal fin is twice or more times longer than the diameter of the eye. The maxillary reaches to below the middle of the eye. The

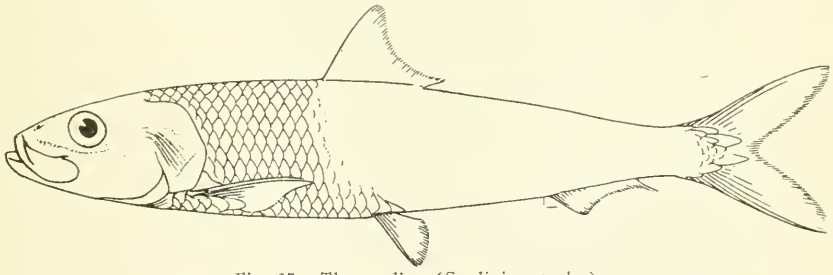

Fig. 37. The sardine (*Sardinia cærulea*).

color is bluish on the upper parts and bright silvery below with metallic reflections. A series of large dark spots is usually present along the side, but often they are absent, especially in large individuals.

The sardine occurs in great abundance along the entire west coast of the United States and southward on the coast of Lower California. It is taken the year around and is especially abundant from Septem-

ber to December. It spawns in the spring. It is an oily, delicately-flavored fish that resembles very closely the European sardine (*Sardinia pilchardus*). On the coast of South America is a sardine that is almost identical with it, but that differs sufficiently to regard it as a separate species. In Europe the small sized fishes only are canned, though the European species grows to be nearly as large as ours. On our coast fishes of all sizes are canned. As a pan fish it is particularly delicious.

The best canned sardines are carefully cleaned, soaked for a time in cold running sea water, surface dried in the sun or in a hot current of air, boiled in oil, packed in cans, again cooked in a retort, and then aged for several months, if preserved in oil, before they are marketed. A great difference exists, however, in our sardines, owing to quick, poor methods of canning. It may be added that the canned product is rapidly improving. The brands that were poor are being made better so that the difference between them will doubtless become less and less marked. Among our west coast sardines are some that are not surpassed by any in the world.

The Herring (Clupea pallasii).

The opercle has no raised ridges as in the sardine, and the head (in specimens over 5 or 6 inches in length) is about equal to the depth of the body. The ventral fins are under the base of the dorsal fin, and the breast and belly are not sharply saw-toothed. The color is silvery on the sides and lower parts and slate-blue above. The tip of the snout and lower jaw are dark.

The herring is widely distributed on both coasts of the Pacific and is found along our entire west coast southward to San Diego Bay, but it is not at all common on the southern California coast. The herring

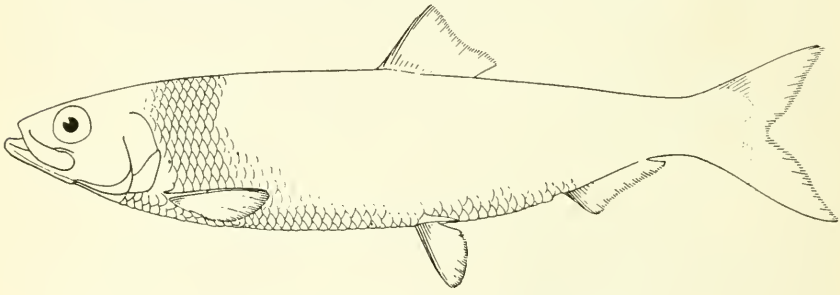

Fig. 38. The herring (*Clupea pallasii*).

fishery is scarcely developed, but considerable attention is now being paid to it and it may be expected to rapidly increase in importance. Some are smoked and cured in various ways, and many are salted for bait by the line fishermen. A part of the fishes that are cured and marketed as herring, however, are not this species, but are sardines. As a pan fish the herring is very good, but drier and not so richly flavored as the sardine, which makes it preferable to some people. It is only taken from December to April, when it enters the sheltered bays to spawn. Its whereabouts is not known for the balance of the year. The herring reaches a length of 18 inches.

The Shad (Alosa sapidissima).

The body is deep and is drawn to a sharp saw-toothed edge on the breast and belly. The opercle usually has raised ridges somewhat as in the sardine, but less even and regular in arrangement. The length of the head is much less than the depth of the body.

The shad does not naturally belong to our west coast fauna, it having been introduced from the Atlantic. It has become one of our abundant food fishes but it is not appreciated as it is on the Atlantic coast, even

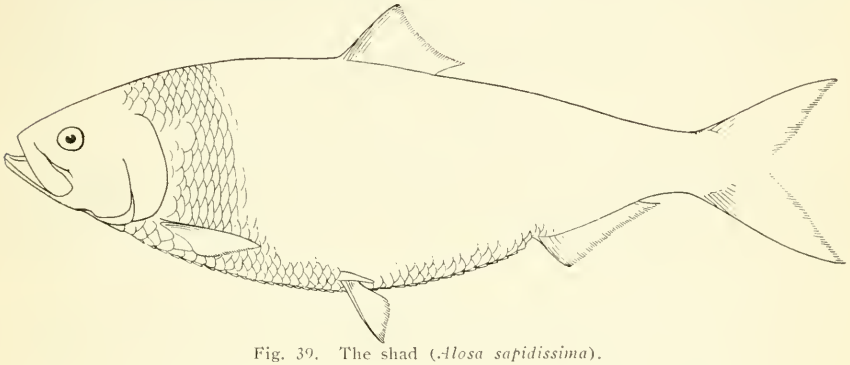

Fig. 39. The shad (*Alosa sapidissima*).

though the people there have a greater variety of good fishes to select from than we do. The shad baked or broiled is one of the most toothsome fishes that we have, and though it has a superabundance of small bones, its flavor more than pays for the trouble of removing them.

In the spring it ascends the streams to spawn and is then taken in abundance. In salt water it is not taken in any quantity, though occasional good-sized catches are made, especially in Monterey Bay. It is found in salt water as far southward as San Diego.

THE ANCHOVIES.

(Family Engraulidæ.)

The Northern Anchovy (Engraulis mordax).

The long head, slender body and short anal base separates this from the other two anchovies on our coast. The head is much longer than the depth of the body. The middle of the head is a considerable distance behind the eye. The anal fin base is much shorter than the head. In color it is bluish above and silvery on the sides and lower parts.

This is the largest and most valuable of our anchovies, growing to a length of 7 inches. It is found in great abundance along the entire west coast and is the only one found north of Santa Barbara. It is canned to some extent, but is inferior to the sardine, though inferior, perhaps, only because the proper methods of canning are not understood. As a pan fish it is exceedingly good when cooked until the bones are crisp, and it is difficult to imagine why it never appears in the fresh fish market. Its use in this form should be encouraged.

There is no reason why anchovies should not be pickled and packed, coiled in bottles as is done with its close relatives that we import from Europe. Nor is there any reason why it should not be made into a

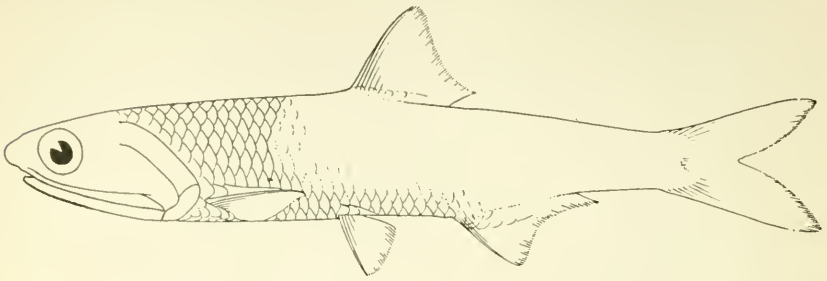

Fig. 40. The northern anchovy (*Engraulis mordax*).

superior paste and even find a European market, where anchovy paste is used in great quantities. It is a very good fish salted, though in this form it is used as yet only as bait. It is one of our undeveloped resources that may become of importance.

The Southern Anchovy (Anchovialla delicatissimus).

This anchovy has the length of the head about equal to the depth of the body. The middle of the head comes at the hind edge of the eye. The length of the base of the anal fin is equal to the length of the head,

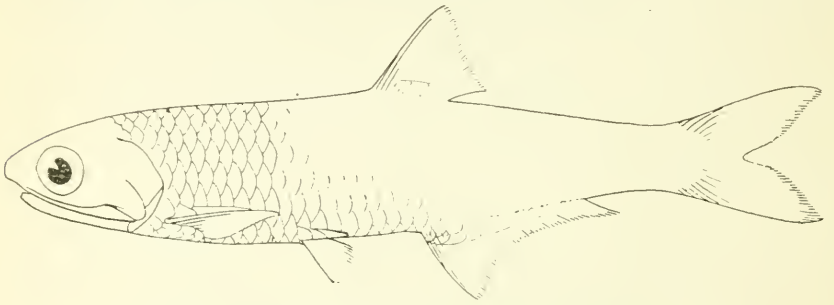

Fig. 41. The southern anchovy (*Anchovialla delicatissimus*).

or very slightly longer. The color is greenish and translucent; along the middle of the side is a silvery band.

This species is found very abundantly on the southern California coast. It does not much exceed 3 inches in length. Crisply fried in oil, this fish is all that its Latin name signifies—most delicate.

The Deep-Bodied Anchovy, or Sprat (Anchovialla compressus).

This anchovy may be known by its deep thin body and long anal base. The latter is very much longer than the length of the head, and considerably longer than in the preceding two species. It is pale translucent greenish in color with a silvery band along the side that shades downward on the lower parts.

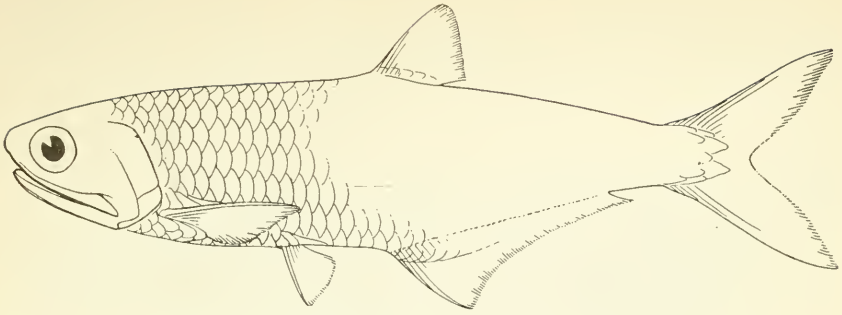

Fig. 42. The deep-bodied anchovy (*Anchovialla compressus*).

This anchovy grows to a length of five inches, and is found only on the southern California coast where it is abundant. Its flesh is thin and dry, and as a pan fish it can not be compared with the other two anchovies.

THE HERRING AND THE DEVELOPMENT OF THE HERRING INDUSTRY IN CALIFORNIA.

By N. B. SCOFIELD, in Charge, Department of Commercial Fisheries, California Fish and Game Commission.

The herring, of which there are several species, are found in the northern salt waters of both hemispheres. They are small silvery fishes, not usually exceeding twelve inches in length, but what they lack in size they make up in numbers, for they appear along the coast during their spawning seasons in vast schools and are caught by the fishermen principally at that time.

The herring catch in Europe in the year 1909 exceeded one and one-quarter billion pounds, valued at $21,500,000. The herring fisheries on the Atlantic coast of North America, while not as extensive as those of Europe, are, nevertheless, of great importance. In the state of Maine many millions of pounds of young herring are taken annually in traps or weirs and canned as sardines, but the principal herring fisheries are around Newfoundland, where the mature fish are caught and cured, either by salting or smoking.

The Pacific herring, *Clupea pallasii,* is found along the Pacific coast of North America from Alaska to Morro Bay in California, and south along the Siberian and Japanese coasts. Although a different species from that of the Atlantic, it is very closely related and is probably its equal in quality. So far the herring fisheries of the Pacific coast have not been greatly developed, for the reason that there is a prejudice against the Pacific herring, and the markets prefer the herring of the Atlantic, especially those coming from Scotland and Norway. This prejudice has, no doubt, been mostly due to lack of knowledge and a lack of care in preserving the fish on this coast. The first herring packed from British Columbia and Alaska did not come up to the standard of the European product and the trade immediately concluded

that the Pacific herring was inferior in quality. For years the fishery was neglected; the only part of the industry of importance was the rough salting of herring for the Oriental trade. More recently different companies have begun canning the herring and the fishery has begun to

Fig. 43. Herring gill netters at Belvedere Cove, San Francisco Bay, January, 1918. Photograph by N. B. Scofield.

grow. The United States Bureau of Fisheries during the past summer sent experts to Alaska to demonstrate the Scotch method of curing herring and it is believed by these experts, after the favorable reception of this experimental pack, that the Pacific herring can compete successfully with the herring of Europe.

Fig. 44. Drawing a herring seine on Richardson Bay, January, 1918. Photograph by N B. Scofield.

In California very little has been done with the herring for their size is comparatively small and with the present methods of capture the fish are taken after they have begun spawning and are not in prime condition for salting or smoking.

The principal fishing is done in San Francisco and Tomales bays (see figs 43 and 44). The species of herring under discussion is reported to run in Morro Bay, San Luis Obispo County, and as far as is known that is the southern limit of its range. Going north from Morro Bay, the next point at which they are found is in Monterey Bay, where they enter Elk Horn Slough for the purpose of spawning. The schools are small and the fish themselves are of small size.

In San Francisco Bay the first schools appear in January and soon begin spawning. The eggs are attached to the rocks and seaweeds below low tide mark where they are supposed to hatch in a couple of weeks (see fig 45). The spawning continues until April, when the fish

Fig. 45. (*a*) Herring spawn on seaweed, San Francisco Bay, March, 1918. (*b*) A close view of herring spawn. Photographs by N. B. Scofield.

leave and are not seen again until the spawning season of the following year. The fish composing these schools are rather small, few of them reaching a length of ten inches.

The herring enter Tomales Bay a month earlier and schools continue to spawn at various places in the lower bay until March. They are considered the best herring in California and many of the fish reach a length of ten or eleven inches and are fatter than those found in other parts of the state.

Herring also spawn in Drakes Bay, Bodega Bay, Shelter Cove and Humboldt Bay. A careful survey will probably show that these fish are found in many other localities in northern California. The herring of Shelter Cove and Humboldt Bay are reported as being only seven or eight inches in length, which is smaller even than those farther to the

south. Size and fatness count for much in smoked and salted herrings and it is not likely that California will be able to do much in these lines on account of the small size of the fish.

It is customary to grade herring into four classes according to size. The largest, or number one, brings the best price. The majority of fish from Tomales Bay will fall into grades two, three and four, while those of San Francisco Bay will fall into grades three and four.

During the present season an expert of the Bureau of Fisheries supervised the packing of fifty barrels of herring on Tomales Bay after the Scotch style and it is expected that a good pack of Scotch cured herring will be put up on that bay next year.

In 1917 herring were canned for the first time in this state and for the first time fishing operations were conducted on a scale large enough to

Fig. 46. Transporting herring from Tiburon to the cannery at Pittsburg, January, 1918. Photograph by N. B. Scofield.

test the capacity of the fishery. There were taken in Tomales and San Francisco bays more than six million pounds of fish and it is estimated that these two bays can produce double that amount without overtaxing the supply. The size of the California herring makes it better for canning than for curing and we can look for the greater development along the canning line.

The methods of fishing, as in most of the other sea fisheries of California, are inadequate and can be improved greatly. On Tomales Bay small gill nets and beach nets are used and good catches can not be made until the fish have come into the shallow water to spawn, at which time they are less fat than when the roe and milt is not so fully developed. The herring enter and remain in the deeper part of the bay at least a month before they come inshore to be caught by the nets now in use. The fishermen realize this and are prepared to use purse nets and larger boats next year.

On San Francisco Bay the fishing methods are slightly better, but the introduction of purse nets or good-sized Lompara nets, would enable the fishermen to catch the fish before they are actually spawning.

The herring canning operations are so far being carried on at Pittsburg, at the junction of the Sacramento and San Joaquin rivers. Here canneries originally fitted for canning salmon and shad are being utilized and the fish are shipped to this point by boat from Sausalito and Tiburon. The herring from Tomales Bay make the first stage of their

trip by rail. So far herring canning has been somewhat in the nature of an experiment. If it proves to be a permanent industry, canneries will be built nearer the fishing grounds.

When the fish arrive at the Pittsburg cannery, they are put through a revolving sealer. They are next cleaned by hand, the work being done by girls and women. After a thorough washing they are next carried on belts through a drying chamber through which a blast of warm air is driven. This is to remove the excess moisture and to dry the surface of the fish so that they will not disintegrate when cooked and appear unappetizing in the can. They are next packed in one pound oval cans, seasoned with oil and spice or tomato sauce, then passed through an exhaust box for a preliminary heating. The covers are next crimped on the cans by machinery. They are now ready for the final cooking, which

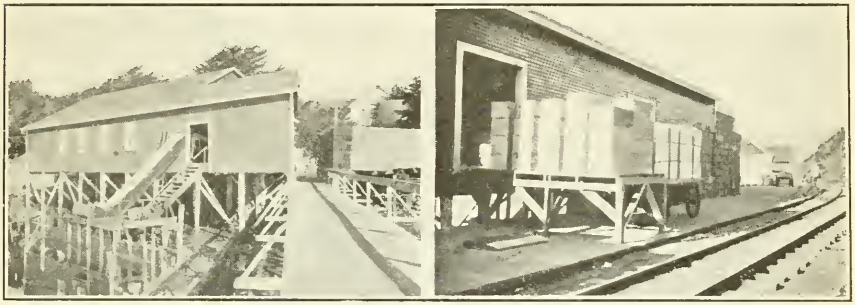

Fig. 47. (*a*) Booth herring saltery at Hamlet, Cal. (*b*) Herring boxed for fresh fish market. Photographs by N. B. Scofield.

is done in closed retorts where the cans are kept the required length of time under a pressure of a few pounds. After labeling, the cans are packed forty-eight in a box and are ready for the market.

Another favorite method of putting up the herring is to kipper them before canning. This is accomplished by taking the fish, after they have been cleaned, and hanging them in the smokehouse for about an hour. This dries them sufficiently and imparts to them the smoked flavor so agreeable to most of those who have eaten smoked fish. They are then packed in the cans and cooked as described above.

One of the most popular methods of curing herring is that of smoking. In this process the larger fish are placed entire in brine for 24 hours, then they are strung on slender three-foot sticks by running the stick through one gill opening and the mouth. These fish are then hung in the smokehouse, which is so built in sections or "bays" that the sticks on which the fish are strung may be placed in tiers. Beginning at the top, each "bay" is filled in succession. When the smokehouse is full the fish are smoked for about four weeks. They are packed in small wooden boxes and are then ready for the market. The larger California herrings are fairly good for smoking and when the fishing methods are improved so that the fish are caught while they are yet fat, a much better product can be turned out.

More herring should be used fresh in this state. The fish are of excellent flavor and, containing as they usually do the roe and milt, have a high food value. They can be had in large numbers during at least

five months of the year and the price is very low in comparison with other fish. With all this to recommend the fish, but very few are sold in the fresh fish markets. The public objects to the many fine bones which require time and effort to remove. While herring have been retailing for five cents per pound this winter, the public has spent much time and effort in complaining of the scarcity and high cost of fish.

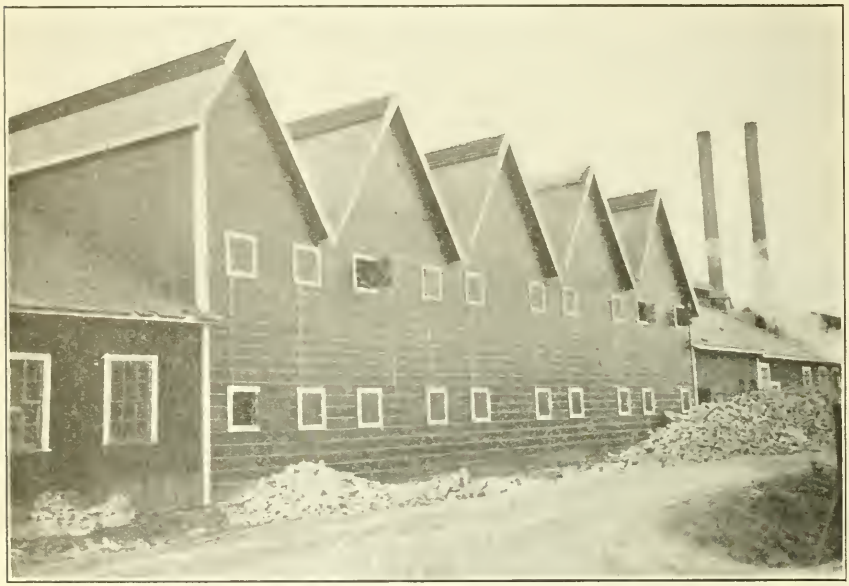

Fig. 48. Herring smoke houses at Pittsburg, Contra Costa County, California, March, 1918. Photograph by N. B. Scofield.

DUCKS VS. RICE.

By GEORGE NEALE, Assistant, Sacramento Division, Fish and Game Commission.

A number of complaints having been made to the Fish and Game Commission of the destruction of rice by wild ducks, Mr. F. M. Newbert, president of the Fish and Game Commission, instructed me to make a full investigation of the same, learn the extent of the alleged damage; also to seek some method of defense against the loss. After a series of experiments conducted by myself and Mr. T. R. Cooper, of Gingg & Cooper, large rice growers near Live Oak, Sutter County, I am in a position to state that destruction of growing rice crops by blackbirds and waterfowl, if properly controlled, can be prevented. The only method heretofore utilized to obtain relief has been to use what is known as "fixed ammunition," or the regular shotgun loads of smokeless powder, with bird shot.

I do not hesitate to say that this method of securing relief is ridiculous on the face of it; for, to obtain relief, it can be seen that it would be necessary to kill every blackbird, duck and mudhen in the country, which is an impossibility and unnecessary. And, again, for the reason that smokeless powder is made to kill and not to frighten.

The waterfowl are on their regular migration southward and, finding the water and feed conditions favorable, they remain in the vicinity of the rice fields until driven south by lack of water, feed, and by weather conditions. Probably two-thirds of all the ducks in California are centered in the rice-growing area. The rice grower has a remedy at hand, but it must be used by concerted action on the part of all the growers, or the grower who does not co-operate will be the only sufferer.

It is known that for some reason ducks, mudhens and blackbirds attack certain rice fields while other rice fields are perfectly immune. Gingg & Cooper were perhaps the greatest sufferers last season (1916), and seeing the impossibility of obtaining relief by the use of smokeless powder and shot, and also not wishing to bring down upon their heads the state and federal officials, under whose jurisdiction the protection of waterfowl now comes, sought assistance from the Fish and Game Commission.

After a number of experiments with rockets, bombs and other explosives, a certain form of bomb was selected to do the work. Mr. Cooper ordered four dozen of these bombs at $5.00 per dozen, for use as an experiment on his fields where the birds were most abundant. He fired several bombs after dark, also at daylight, and two or three while the birds were in the air. He did this for three days and nights, with the result that there was a great decrease in the number of birds at every shot. He met with such success that he ordered five dozen more as an emergency.

In an interview with Mr. Cooper on September 26 he authorized the statement that there were no ducks or mudhens to be seen in his rice fields; that he had not killed a bird. (Also supplemented this statement later by saying that he had been unable to kill a duck on his land after the open season because the ducks were afraid to come on his place. Also that he had not used any quantity of the emergency purchase of five dozen bombs).

Certainly these birds were somewhere in the vicinity. Now, if there is co-operation among the rice growers to use these bombs simultaneously on the rice fields, the birds will leave for new grounds and will be driven to the overflow tule lands, where they will remain, *unless forced by hunters to return to the rice fields, which will occur if the open season is made at an earlier date than now, as is proposed by some.*

Many rice growers claim that at certain stages of growing rice, under certain conditions, the ducks are injurious to growing rice. Others deny this statement and say that while the ducks do injure the rice they are very beneficial to them, as they eat quantities of water grass and other noxious weed seeds. Be that as it may, the greatest hue and cry is made by the man who has no rice and because he can not wait for the open season on these birds. A number of such men were arrested this season while shooting ducks in closed season and not one of them owned an acre of rice. The rice grower will not permit trespassing on his fields at growing time.

President Newbert states that the Fish and Game Commission wishes to co-operate with the farmers and agriculturists and will always render them assistance in behalf of their great interests, but co-operation must come from the really interested man and not from a certain element whose only interest is to eat ducks before the season opens.

To obtain the most effective results in the use of the bombs *it is most important that they be used according to the following directions*: As large a number of ducks, mudhens and blackbirds as possible should be allowed to gather in the particular field which is to be bombed. Fire a bomb from each side of the field, at a low elevation, so that it will cover as great an area as possible. Have them fired at a certain given time, all at once. As soon as the birds rise in the air, slightly elevate the bombs to explode higher in the air than the previous ones and, if possible, shoot them into the birds. The bomb will not kill them, but will so demoralize them that very few will return. This should be done at daybreak, at noon and after dark. If done as directed every duck will be driven away and will remain away. New arrivals that have not taken this degree will of course have to be bombed away, but ordinarily two or three days and nights will rid the fields of all birds. This is also effective if used to drive geese from grainfields.

The name and address of the manufacturers of the bombs used in this experiment, together with prices and full information, can be obtained from Racliff Sales Co., 146 Davis street, San Francisco, California, or Ernst Behr, secretary Pacific Rice Growers' Association, Willows, California.

A LOOKOUT'S VIEW OF TRINITY GAME REFUGE.

By Frank Hoffman.

During the fire seasons of 1915, 1916 and 1917 I have acted in the capacity of lookout at the Hayfork Bally Lookout Station, which is situated near the center of the Trinity Game Refuge. Because of its location, Hayfork Bally might justly be termed the pivotal point of that refuge. Its altitude of approximately 6,262 feet affords an excellent view of the major portion of the area, which the deer have already learned to look upon as a haven.

During the period of my service at that station I have made a study of the conditions, both in the refuge and in the adjoining territory, and have kept in close touch with the stockmen and others who have occasion to travel through it. The present article is based on notes of my own observations and on information derived from the above-mentioned sources.

Excellent judgment was displayed in the selection of this area as a protected breeding ground, for it would have been difficult to find a more ideal location for that purpose. There is an abundance of all types of feed available at the various altitudes during the different seasons of the year, and ordinarily deer do not suffer because of lack of food during the winter months. But during the occasional severe winters a considerable number of them die of starvation, and as they increase in numbers, it will be necessary to provide a certain quantity of feed and thus enable them to weather these periods of stress. The deer, despite the occasional raids of poachers, are rapidly increasing in number, and if unmolested, the overflow will provide a continuous source of supply for the neighboring hunting grounds. Practically every mature doe that I have seen this season is the proud mother of two

fawns, and Mr. Fisher, the government trapper, reports that the same holds true in that portion of the refuge lying north of the Trinity River.

Coyotes and other predatory animals are quite numerous, and the fawns fall an easy prey to these beasts. Mr. Fisher reports having seen the carcasses of five deer, and upon investigation he placed the responsibility for their death upon coyotes.

Mr. Fisher is an industrious individual, thoroughly understands his business, and is making good as a destructive agency among predatory animals in the refuge. He is laboring under adverse conditions, for the deer and range cattle insist upon disturbing his "sets," but even so, since he has been operating here there are many familiar voices missing that one time gave tone and volume to the melancholy chorus, as the coyotes held their nightly concerts far out upon the distant ridges.

This area is amply provided with natural salt licks, but they are all situated in the lower altitudes, and the deer that frequent the higher levels are compelled to travel a long distance to reach them. During my terms of service on Hayfork Bally, I have salted the deer in that section, and I find that they patronize the licks freely during the summer months. The young deer visit the lick practically every twenty-four hours, and the large bucks and does visit it on an average of four times each week. I am firmly convinced that the deer I have salted do not go below the 2,500-foot level during the entire summer. The bucks, during the warm weather, love to roam in the cool regions of the high altitudes, and as food is abundant, they will remain there until the rutting season, if provided with salt.

Owing to the fact that I am able from my point of vantage to hear nearly every shot fired in the southern and central portions of the refuge, poachers do not often venture in during the months I am on duty, and by salting the deer at that time, they are kept out of harm's way, for it is a deplorable fact that some of the deer that go to the river licks never return. Mr. G. O. Laws, the excellent and efficient local representative of the Fish and Game Commission, recognizes the necessity of attending to this phase of the salting question, and has, at his personal expense, left a standing order at the Big Bar store for all the salt I might require for this purpose. With some of this salt, I have constructed a new lick near the spring where the deer water, and it was found and used by them the second night after being placed. At this date, about two weeks after I received the salt, there are seven large bucks and several does with their little ones who make almost nightly visits to the lick within fifty yards of my quarters.

The average resident of this district did not take kindly to the refuge idea, their principal cause of complaint being that it deprived them of their best hunting ground, but the contiguous territory is so well stocked with game that it is only a matter of their going in an opposite direction to hunt. However, the majority of them, if they do not approve of the idea, have learned to tolerate it, and respect the will of the majority. We are troubled by the presence of a few chronic offenders and malcontents, but that is an ailment which is prevalent in all small communities. That the present generation has no right to exploit the earth's resources at the expense of those who come after, interests these people but little. They have not as yet reached that state of near-perfection when one, by properly schooling himself, is enabled to overcome that

little mite of selfishness, which, alas, exists in us all. They are unalterably opposed to any measure that curtails their self-granted privileges, and the restrictions placed upon them by the enactment of game laws, they view in the light of an infringement upon their inalienable rights.

However, if it is impossible to educate them, a serious check may be placed upon their future activities. The rigid and impartial enforcement of the game laws by the resident deputy, and the ever-increasing sentiment in favor of game protection serves this purpose admirably, and while it may not result in their complete reformation, it compels them to proceed with more than ordinary caution.

But it is logical to assume that the offspring of this line, will, if no attempt is made to curb them, follow the footsteps of their fathers. The sympathy and understanding of the child is fundamental to the attainment of the conservation measures of the future. In some of our isolated school districts no attempt is made of adequately teaching nature study. In conducting the campaign of education along conservation lines it behooves us not to ignore the little mountain school ma'am. She is, potentially, a most important factor in the dissemination of knowledge along the desired lines. It is not only necessary to acquaint her with the names and habits of the different forms of wild life, but she must be made to understand the full significance of the word "conservation" as applied to them. It would be an excellent step in the right direction if the Forest Service, acting in cooperation with the Fish and Game Commission, could have the district ranger or other persons familiar with the subject visit these schools at least once each month and arrange field trips so that children might be more acquainted with the out-of-doors. I am convinced that the results attained would prove very encouraging.

CONSERVATION OF FORESTS INCREASES GAME.

By GEORGE W. COURTRIGHT, Deputy Fish and Game Commissioner.

Personal observation in Modoc and Lassen counties dating back to 1890, at which time forest fires were permitted to spread and destroy the reproduction of the forests, has convinced us that the present method of forest conservation is the correct one and that game increases with forestation.

We have personal knowledge of a forest fire which swept over almost the entire area of 14 townships in the fall of 1892. This was not at all exciting to the settlers for the reason that forest fires could be sighted at all times in the mountains. Fires were often willfully set. Hunters finding a secreting place for deer, such as an area of brush where they were hard to find, would simply set a fire and burn this hiding place.

In the 90's all reproduction through the forests of Modoc and surrounding counties was very small and cattle and horses could be sighted at a distance of a mile in some parts of the forest; in fact, it was a very uncommon thing to find young trees in the forests at all. Deer were scarce in the forested areas where they had no hiding places except in the shade of a large pine tree.

We were through Modoc County daily between 1896 and 1904. While we had plenty of grass and water, as we have today, we had practically no brush or forest reproduction. We had also very few mule deer, which is considered the most popular game animal of the western states.

We have more than two hunters now where there was one in the 90's, and yet the entire forested area of the county has now a growth of pine, fir and cedar, young trees that range in height from 4 to 12 feet. The reason for this young growth is due solely to added fire protection and scientific conservation of the forests. At present hunters have no difficulty in finding the mule deer. However, the hunter must be a good marksman if he gets a deer, because of the splendid cover afforded by the forests. Between 1890 and 1904 one could walk or ride for ten miles over most parts of Modoc County without even seeing a deer trail. At the present date it is quite common to hear a rancher say: "There are fifteen or more deer feeding on my meadow; we see them nearly every day somewhere about the ranch." These deer go back to the edge of the forest and rest in the brush during the heat of the day and feed early and late. They are found in the shade of thickets of young pine trees, which make a fine resting place for them. Were these sheltering trees and bushes burned, the deer would leave that locality.

We have observed that if the area is thickly forested, even where young brush and grasses, which are the natural food of deer, are entirely lacking, there are sure to be mule deer. We have never known of deer standing out in the open, say in a grainfield, where they could see for a mile in every direction; the thick timber is their natural habitat. Consequently, we believe that forest conservation has proved a great factor in the protection of game.

Further protection for the deer of this region is found in the fact that the officers of the Modoc National Forest are all game wardens, and that they have convinced the public that they are here to enforce the laws. The Forest Service thus becomes of double utility in game protection.

SUPREME COURT DECISION ON PARCEL POST SHIPMENT OF GAME.

(Reported 170 Pac. Rep. 412)

In re FRANK PHOEDOVIUS, on *Habeas Corpus.*

Application for Writ of *Habeas Corpus.*
For Petitioner—Nathan Moran.
For Respondent—Carl Westerfeld.
W. H. Lamar, Solicitor for the Postoffice Department, Washington, D. C., *amicus curiæ.*

The petitioner was convicted of a violation of the provision of section 627*b* of the Penal Code, which declares that "any person who ships any of the wild birds or wild animals or fish by parcel post is guilty of a misdemeanor," and adjudged to pay a fine of $25.00, and in default of such payment to be imprisoned. Held in the custody of the sheriff of San Mateo County by virtue of this judgment, he seeks his discharge on *habeas corpus*, claiming that this provision of law is invalid.

Said section 627*b*, as amended July 27, 1917 (Stats. 1917, p. 651), contains various provisions as to the conduct of common carriers and individuals in the matter of the shipment and the receiving for shipment of wild birds, wild animals and fish, and the transportation thereof, violation of any of which provisions is declared to be a misdemeanor. These provisions, which prohibit the receipt by a common carrier

from, or the transportation for any one person of more than the legal limit of game allowed to be taken or killed by one person, or the shipping or offer for shipment by an individual of any such excess, and which also require every common carrier to keep all shipments of game in open view, labeled with the name and residence of the shipper and of the consignee, and the exact contents of the package, were designed, of course, to prevent shipment of wild game illegally taken and to enable the authorities to more easily discover violations of the game laws, all with a view to the proper preservation of the wild game of the state for the people of the state. The section, as so amended, contains the provision involved in this proceeding, one entirely new in this state, but obviously having the same purpose as the other provisions. It is urged on his behalf in this proceeding that the provision of the statute is void as being both an unlawful interference with a federal instrumentality, viz., the postal service of the United States, and an attempt to regulate interstate commerce. Petitioner also claims that it constitutes an unlawful interference with the property right of citizens to use the United States mail, and that it is in violation of section 11 of article I of our own constitution, which requires that all laws of a general nature shall have a uniform operation.

Of course, no one disputes the proposition that the postal service is a federal instrumentality under the exclusive jurisdiction of Congress, and that a state may in no way regulate or burden the operation thereof. It is this very fact which furnishes the basis for the discrimination against the use of that service by our citizens in the shipment of "wild game" (included in which is fish, *People* vs. *Truckee Lumber Co.*, 116 Cal. 397), and in favor of other methods of shipment. When game is deposited in the parcel post it is at once subject to the exclusive control of the postal authorities under the statutes of the United States and regulations of the Postoffice Department, and absolutely free from state inspection and control. For reasons which are obvious the federal government could not tolerate the slightest interference with its officers and employees in the handling and delivery of the mail. For the purpose of protecting the game of the state for the use of the people of the state, the legislature has enacted many laws relative to the taking of game, some prohibiting the taking of certain kinds at any time, others prohibiting the taking of certain kinds except during a certain time known as the "open season" for such game, others limiting the number of certain kinds that may be taken by one person during a stated time, and so on. As a method of guarding against illegal taking of game it has been provided that the Fish and Game Commissioners of the state shall see that the game laws are strictly enforced, and "shall inspect all buildings, other than dwellings, and all receptacles, other than the clothing actually worn by a person at the time of inspection, where game or fish may be stored or placed, and all boxes and packages containing fish or game that are held for transportation by any transportation company or common carrier; * * * to inspect regularly * * * all boxes and packages, containing fish or game that are held for transportation by any transportation company or common carrier." Also to "seize and take possession of all game or fish," which has been illegally taken, killed or had in possession, or has been shipped or offered for shipment contrary to any of the laws of the state. It is necessarily conceded that these provisions as to inspection and seizure by the state officers of game shipped or offered for shipment can not be enforced as to shipments by mail. Any attempt to so enforce them would indeed be an attempted unlawful invasion of the exclusive federal jurisdiction. If these provisions for inspection and seizure of game found to be illegally taken are valid enactments of state law, the fact that they can not be enforced as to game delivered to the postal service for transportation furnishes a sufficient basis for excluding the parcel post from the means by which game may be shipped, in so far as any objection of special legislation or want of uniformity in operation under our state constitution is concerned.

The argument of learned counsel for petitioner in support of the proposition that the provisions as to inspection, etc., are invalid as improperly interfering with property rights, and that the provision here involved which precludes petitioner from using the United States mail for the shipment of game is in effect a deprival of his property right to use the United States mail without due process of law, to our minds fails to give due effect to the well settled doctrine as to the nature and extent of one's property right in wild game. That doctrine was stated by this court through Mr. Justice Van Fleet in *Ex parte Maier*, 103 Cal. 476, 483, in language subsequently approvingly quoted by the Supreme Court of the United States in *Geer* vs. *Connecticut*, 161 U. S. 519, 529, as follows: "The wild game within a state belongs to the people in their collective, sovereign capacity; it is not the subject of private ownership, except in so far as the people may elect to make it so; and they may, if they see fit, absolutely prohibit the taking of it, or any traffic or commerce in it, if deemed necessary for its protection or preservation, or the public good." The offense there charged was that of selling deer meat in violation of a state statute which prohibited any such sale in California. The meat sold was cut by the defendant from the carcass of an entire deer theretofore brought by him from the state of Texas, in which state it had been lawfully killed. It was contended that the statute did not and could not prohibit the sale of meat lawfully taken in another state. It was

held that the statute both did and lawfully could prohibit such a sale, and that while the law was of course intended only for the protection of the game of *this* state, the intention was to accomplish that very end by prohibiting the sale wherever game was in fact obtained, and that such a law was reasonably adapted to that end. All state laws reasonably looking to this end have consistently been maintained by the courts, the theory being that the ownership of the sovereign authority being in trust for all the people of the state, it is the duty of the legislature to enact such laws as will best preserve the subject of the trust and leave the beneficial use in future to the people of the state. In *Geer* vs. *State of Connecticut*, 161 U. S. 519, the Supreme Court of the United States upheld a statute of Connecticut which forbade the transportation without the state of game lawfully killed or taken within the state, or the having of such game in one's possession with the intent to procure its transportation beyond the state. In *Ex parte Kenneke*, 136 Cal. 527, a statute prohibiting the buying or selling of quail was upheld by this court. The court, through Mr. Justice McFarland, said: "Wild game belongs to the whole people, and the legislature may dispose of it as may seem to it best, subject only to constitutional limitations against discrimination. Within those limitations the legislature, for the purpose of protecting game, may pass such laws as to it seem most wise; and the measures best adapted to that end are for the legislature to determine, and courts can not review its discretion." It was held that the law did not destroy a right of property, the court approvingly quoting from *American Express Co.* vs. *State*, 133 Ill. 649, as follows: "The fallacy of the position consists in the supposition that the person who may kill quail has an absolute property in the dead animals. * * * The legislature has the right to permit persons to kill or take game upon such terms and conditions as its wisdom might dictate, and that the person killing game might have such property interest in it, and such only, as the legislature might confer. * * * The person killing quail under this statute has but a qualified property in the birds after they are killed. * * * But the law which authorized him to kill the quail has withheld the right to sell or the right to ship for the purpose of sale, and when such person undertakes to ship for sale he is undertaking to assert a right not conferred by law. The act, therefore, does not destroy a right of property, because no such right exists." In *State* vs. *Rodman*, 58 Minn. 393, it was said that the legislature may adopt reasonable regulations not only as to the time and manner in which game may be taken and killed, "but also imposing limitations upon the right of property in such game after it has been reduced to possession." It was further said that such legislation deprives no person of his property, because the person reduces game to possession "subject to such conditions and limitations as the legislature has seen fit to provide." (See, also, *Silz* vs. *Hesterberg*, 211 U. S. 31.) Such has been the uniform course of decision. We are, of course, speaking of regulations which may reasonably be held by the legislature to look to the preservation of the game of the state for the beneficial use of the people of the state. The person taking or killing game, takes or kills subject to the limitations of any such reasonable regulation by the state, and his right of property therein is qualified thereby. We can see no good ground for a claim that regulations subjecting such game to inspection by state officers when offered for shipment or when in course of transportation under shipment for the purpose of enabling illegal takings to be illegally taken, are in any way an unreasonable exercise of the power of the legislature in this behalf. Whatever rights the shipper has in game shipped by him are subject to these regulations, as are necessarily the rights of the transportation company and the consignee. And the same thing is necessarily true of the law here involved prohibiting the shipping of game by parcel post. It is a reasonable complement of the regulations as to inspection, without which the inspection in course of transportation could be had only as to such game as is shipped by some other means than the United States mail. The person having game in his possession which he desires to ship, acquires and holds it subject to the condition that he will not ship it by parcel post, and no property right in such game is violated by a law which makes it a crime for him to do so. We are entirely at a loss to see how a person's property right to use the United States mail for all lawful purposes is violated by a law which prohibits his use thereof for the purpose of transmitting property which he has acquired and holds subject to the condition that he shall not so transmit it.

The case of *Ex parte Knapp*, 127 Cal. 101 (involving the question of the validity of a *county ordinance*) relied on by learned counsel for petitioner in this connection is sufficiently distinguished as to such a case as this by what was said by the court in *Ex parte Kenneke*, *supra*, as follows: "There is no question in the case at bar as to the reasonableness of an ordinance as in *Ex parte Knapp*, 127 Cal. 101, and other cases cited; the provision attacked here is a law of the state passed by the legislature."

The claim that the state law here involved is an unauthorized regulation of interstate commerce is, we think, fully answered by decisions of the United States Supreme Court, the final arbiter on this question. A similar claim was made in *Geer* vs. *State of Connecticut*, *supra*, and held to be without foundation. The court, through its present chief justice, after exhaustively discussing the question of property in wild

game, said: "The right to preserve game flows from the undoubted existence in the state of a police power to that end which may be none the less efficiently called into play, because by doing so interstate commerce may be remotely and indirectly affected. * * * The exercise by the state of such power therefore comes directly within the principle of *Plumley* vs. *Massachusetts*, 155 U. S. 401, 473. The power of the state to protect by adequate police regulations its people against the adulteration of articles of food (which was in that case maintained), although in doing so commerce might be remotely affected, necessarily carries with it the existence of a like power to preserve a food supply which belongs to all the people of the state, which can only become the subject of ownership in a qualified way, *and which can never be the subject of commerce except with the consent of the state and subject to conditions which it may deem best to impose for the public good.*" [The italics are ours.] In another portion of the opinion the court speaks of the "consequent power of the state to follow such property into whatever hands it might pass with the conditions and restrictions deemed necessary for the public interest." In the later case of *Silz* vs. *Hesterberg*, *supra*, a similar claim was made, and the court held that the law (one prohibiting the possession of wild game during the close season, whether killed within or without the state) was not directed against commerce or any of its regulations, but only indirectly and remotely affected the operations of commerce, and was of obligatory force upon citizens within the territorial jurisdiction of the state. The court said: "That a state may not pass laws directly regulating foreign or interstate commerce has frequently been held in the decisions of the court. But while this is true, it has also been held in repeated instances that laws passed by the states in the exercise of their police power, not in conflict with laws of Congress upon the same subject, and indirectly or remotely affecting interstate commerce, are nevertheless valid laws." It is sought to draw a distinction between these cases and the statute here involved, in that our laws permit the shipment beyond the borders of the state of game killed within the state, thus making game, it is said, "articles of interstate commerce." We do not consider the distinction material. The difficulty with the argument is that we have not made wild game an article of interstate commerce in the full and unrestricted sense. For so long as it remains within this state, at least, it remains burdened with the conditions imposed for the purpose of protecting the game of the state, to the effect that it may be shipped only in certain ways. As to this the language of Mr. Chief Justice White in *Geer* vs. *Connecticut*, *supra*, that such game "can never be the subject of commerce except with the consent of the state *and subject to conditions which it may deem best to impose for the public good*" is specially pertinent. Our own case of *Ex parte Maier*, *supra*, is also in point to the effect that there is in our law no unwarranted interference with interstate commerce.

The principles controlling the determination of the question just discussed are equally applicable to the claim that the state law here involved is an unlawful interference with the postal service of the United States. As said by respondent, there is no attempt here to regulate the postal establishment or in any way or degree to affect its operations. Looking to the proper protection of the game of the state for its people, the legislature has prohibited any person within the state from shipping it by parcel post. It must be assumed here that such provision is reasonably necessary to such proper protection. The sole purpose of the enactment is the protection of game for the people of the state. The most that can be said in this connection is that the law may indirectly and remotely affect the postal department by depriving it of this patronage and the consequent revenue which would be paid as postage. But this, we think, in view of the decisions we have referred to, can not be held to make the law invalid as unlawfully interfering with the postal service. In a well considered opinion, the court of common pleas of Northampton County, Pennsylvania, reached a similar conclusion as to a recent statute of that state which prohibited shipments of game by parcel post. (See *Com.* vs. *Reimel*, 44 Pa. Co. Court Rep. 557.)

We see no good ground upon which the statutory provision attacked may be held invalid.

The writ is discharged and the petitioner remanded to the custody of the sheriff of San Mateo County.

ANGELLOTTI, C. J.

We concur:

SHAW, J.
SLOSS, J.
MELVIN, J.
VICTOR E. SHAW, J. *pro tem.*
WILBUR, J.

CALIFORNIA FISH AND GAME

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

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

April 15, 1918.

EAT MORE FISH.

THE UNDERLYING PURPOSE OF A "HERRING" NUMBER.

It is doubtless interesting and useful to anyone to know a herring when he sees it; to know where and when it is to be found and what are its nearest relatives. It is also instructive to read of the herring fishery of the Pacific coast, of the methods of catching, canning and curing of the fish. It is more pertinent still to know by actual test that herring and sardines are splendid food and that they are among the cheaper kinds of fish.

The "Herring Number" will fulfill its purpose only, if it interests its readers in the herring as a tasty meat substitute in the present war emergency, and consequently finds a larger place in our bill of fare.

SUPREME COURT UPHOLDS STATE LAW PROHIBITING SHIPMENT OF GAME BY PARCEL POST.

A case in the Supreme Court to determine the validity of the law passed by the last legislature prohibiting the use of the mails in the shipment of game resulted in a decision upholding the law. This law has been declared by many to be unconstitutional, and after its passage a ruling of the postal authorities which received wide publicity, prevented the search of parcel post shipments of game with the result that market hunters quickly took advantage of this opportunity to make illegal shipments. Frank Phoedovius, having been duly convicted of a violation of the provision of section 627*b* of the Penal Code, which declares that "any person who ships any of the wild birds or wild animals or fish by parcel post is guilty of a misdemeanor," took an appeal to the Supreme Court. The decision concurred in by all of the judges sitting in bank is printed in full on page 75 and should be read by everyone.

This decision is the fourth important one relating to game in California. Of prime importance was the decision in *Ex parte Maier*, 103 Cal. 476, 483, that "wild game within a state belongs to the people in their sovereign capacity" and is not "the subject of private ownership." A decision upholding a statute prohibiting the buying or selling of quail was handed down in connection with *Ex parte Kenneke*, 136 Cal. 527. The handling of game by "transfer companies" was held invalid in the Superior Court by the Honorable Judge Frank J. Murasky. As a fitting climax to these cases comes this decision on the shipment of game by parcel post (*In re Frank Phoedovius*, on *Habeas Corpus*, Crim. No. 2108. In bank, January 17, 1918; Pacific Recorder, Vol. 170, p. 412).

MARKET HUNTERS MAKE CAPITAL OF THE PRESENT EMERGENCY.

On the plea that letting down the bars on fish and game will help furnish additional food supply, a dangerous attempt has been made to destroy the protection which has taken years to build. The conservationists in almost every state have had to fight these attempts to break down protective laws. Many persons even, from lack of appreciation of the consequences, have espoused the attacks on protective laws. As one editor points out, "To suspend the fish and game laws would be like deciding to kill all of the hogs and cattle at once, to avert starvation before feeling the pangs of hunger, and thus insuring shortage at a later period when hunger might be felt."

Typical of those who would make capital of the present emergency is a spokesman of the fish industry in Texas who exclaimed, "Damn posterity; lets get the fish." Unfortunately, this is the

attitude of some commercial interests. A great pretense of being interested in conserving the supply in order to insure their own interests is made, but under this veneer is avarice and selfishness.

This is what the commercial interests in Texas demanded:

1. Suspension of the closed seasons for the period of the war.
2. Removal of restrictions on weight, size, the use of seines and the dredging of oysters.
3. The drafting of new fish and game laws.
4. Removal of protection from fish-eating birds.

To the credit of Governor Hobby of Texas no change in the laws has been made, but so plausible was the plea made by the commercial fishermen that the removal of restrictions was narrowly averted.

Every conservation unit should be mobilized and held ready to withstand a similar attack in this state. Already slight skirmishes with the enemies of wild life have been recorded.

FISH LAWS MODIFIED BY FOOD ADMINISTRATION.

At an important meeting, charged with great interest to the consumers and producers of sea fish held Saturday in Federal Food Commissioner Merritt's offices in San Francisco, the first definite action towards speeding up California's fish production was taken.

It was found that the state laws in the main do not restrict the full development of the fisheries and it was further found that in only a few cases, do they prevent fish from being generally used as food. For example, in order to protect certain game fish, their sale has been prohibited. It was deemed wise during the period of the war to remove such restrictions. Under authority an act of Congress entitled "An act to provide further for the national security and defense by encouraging the production, conserving the supply and controlling the distribution of food products and fuel," approved August 10, 1917, President Wilson issued a proclamation empowering the Food Administration to annul any restrictive legislation whose conservation features seemed to the Food Administration less essential during the present crisis than the incidental curtailment of food supply in the present days of international need.

After a lengthy discussion the following changes in the state law were decided on:

1. California whiting, also known as corbina or surf fish, yellow-fin croaker and spot-fin croaker, the sale of which is now prohibited by the state law, may until further notice be sold.

2. The possession of paranzella or trawl or drag nets shall not be unlawful while in transit over the waters of Fish and Game District 19, as defined by the state laws, but such nets must not be used or dragged within said district under penalty of revocation of the federal license.

3. Bait nets may be used in Fish and Game District 20 (Santa Catalina Island) for the purpose of taking bait only.

4. Halibut below the four-pound minimum weight prescribed by the state law may hereafter be sold provided they are caught in conformity with the laws of this state as above modified.

The attention of all fishermen is particularly called to the regulation requiring every salt water fisherman to procure a license from the United States Food Administration, application for which can be had at the Food Administration's offices. The license of any fisherman violating any of the federal or state laws as above modified or any rule or regulation issued by the United States Food Administration will be revoked and such fishermen will not thereafter be permitted to engage in the vocation of fishing.

DISCRETIONARY POWERS INSURE BETTER CONSERVATION.

Many Eastern states are finding it advantageous to grant sufficient discretionary powers to the fish and game commission to allow a change in seasons and bag limits when unusual conditions arise. Immediate protection is sometimes necessary and a wait of one or two years for a session of the legislature is often dangerous. Here in California we persist in delegating to the legislature every change in the game laws. No matter what the emergency, no lawful change can be made in the fish and game laws except at the biennial meeting of the legislature. If

deer are practically exterminated by disease in Trinity County, hunters are allowed, under the law, to take the same toll as is taken in other counties. If quail in Inyo County are endangered because of severe winter weather no relief can be given until the following meeting of the legislature and then the necessary legislation may not pass.

The best conservation policy is found in immediate protection whenever conditions warrant it. The legislature should delegate to the Fish and Game Commission sufficient power to efficiently administer wild life resources. A check on any change may easily be provided for by requiring petitions with a set number of signatures or by insisting on the signature of the governor.

Watch the next number of CALIFORNIA FISH AND GAME for more information on the subject.

INCREASED SHEEPING ENDANGERS WILD LIFE.

Great pressure is being brought to bear to so change the regulations regarding grazing in the national forests as to allow sheeping in national parks and increased sheeping in national forests. This may sound favorable so far as increased meat supply is concerned, but anyone who has seen the deep traces left in sections where sheep have grazed will shudder to think what results are to be expected. Many are the wornout meadows, deeply gullied, which now testify to the past inroads of herds of sheep, and many the depleted game covers where the trampling of nests and the destruction of food has reduced upland game birds to the minimum. These are dangerous times and every conservationist must help form the army of defense needed to save wild life in this emergency when special opportunity to devastate wild life resources is given the enemy.

FEDERAL MIGRATORY BIRD LAW BEING ENFORCED.

In spite of the lack of funds and lack of legislation backing the Migratory Bird Law, a report from the Chief of the Bureau of Biological Survey shows that many arrests have been made and that the law is being enforced. The 16 inspectors and 186 federal wardens have reported during the last year 208 cases of violations of the regulations. Since the law became effective prosecutions have been made in 29 cases, resulting in impositions of penalties in all but five.

That the violations reported by no means approximate the number that have occurred is to be expected and is due to the impossibility in many cases under the law of securing evidence sufficient to convict. Possession of wild fowl during the closed season is not a violation under the federal act, and there must be evidence of actual shooting or capture on which to base prosecution. Furthermore, inspectors and wardens appointed under authority of the law have no power of arrest, and hence many violators escape.

Notwithstanding the difficulties attending enforcement, the present law is very generally observed, and communications received from fish and game commissioners and other persons contain incontrovertible evidence that since the law became effective a very marked increase in the number of waterfowl and shorebirds has been noted in most of the states; that wild fowl have become unusually tame in spring; and that many thousands of waterfowl are breeding in certain localities where they had not nested for many years. The consensus of opinion attributes these greatly improved conditions to the abolition of spring shooting and the general observance of the regulations.

STILL IN THE SAME CLASS.

The Sportsmen's Review of February 16, 1918, comments thus on the sale of game:

WAKE UP.

In all this fair land there are still two states, Louisiana and North Carolina, which permit the hunting of game for market.

In all this fair land there is no state which has enough game left to feed it to epicures who are too lazy to go out and get it themselves.

In all this fair land there is no real sportsman who would allow market hunting in his native state without a protest.

We suppose that our partial prohibition of the sale of game saved us from being included with Louisiana and North Carolina. So long as we continue the sale of ducks and geese we in reality belong in the same class. Wake up! California!

COUNT THE DUCKS.

The accompanying photograph was taken on the overflow from Butte Creek, just northwest of the Marysville Buttes, on February 2, 1918. The picture gives evidence that two days after the season closed there were still plenty of ducks left in this vicinity despite the toll taken by numerous gun clubs. At least 98 per cent of the ducks in the picture were mallards. A slight sprinkling of pintails, baldpates and green-winged teal was noted. Beyond the birds in flight was a mile of water, black with ducks. Although geese were not numerous at the same date the picture on page 84 shows that a few still remained on the loafing grounds in the vicinity. There is a notable concentration of ducks in this vicinity, probably occasioned by the abundant food supply furnished by grain and rice fields.

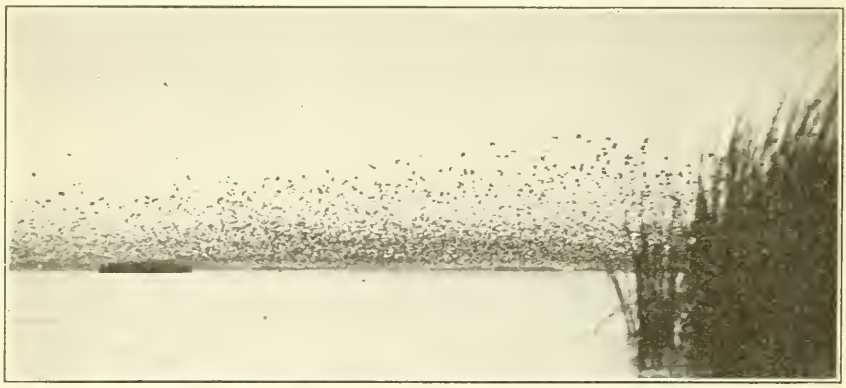

Fig. 49. Mallards and still more mallards. A photograph taken at the mouth of Butte Creek, near Pennington, Sutter County, California, two days after the 1917–18 season closed. Photograph by H. C. Bryant.

ANOTHER EDITOR WONDERS.

The tedious routine of an editor's life is often enlivened by his exchanges. The apparent lack of proof reading in one exchange that comes to our desk so invariably furnishes amusement that it is scanned as one would read a funny magazine. Here is the latest on the front page:

FEBRUARY.

February is the month for Owls. It is this month that the big North American owls of various species collect their nesting site, and frequently lay their eggs.

A day's wondering through the woods is likely to result in the addition of one or more sets of rare eggs to the collection of the wonderer.

Take the advice of the editor and wonder.

CONSERVATION SENTIMENT GROWS.

We do not have to go very far back in the history of our state to find the time when a game warden held a political job. The first warden in the state was a market hunter himself and, instead of prosecuting offenders, profited by added protection. He marketed 107 25-pound sacks of game during the first year of his appointment. Contrast this condition with the situation at the present time and you will discover that conservation sentiment has grown rapidly. Now wardens are appointed on merit and their sole duty is to enforce the fish and game laws. That they actually do enforce these laws is evidenced by the number of convictions obtained from month to month, reports of which are always to be found in CALIFORNIA FISH AND GAME.

NEW PATROL BOAT "MAKES GOOD."

"Albacore," latest acquisition of the Fish and Game Commission for commercial fisheries research and regulation work in southern California ocean waters, has taken up the business for which she was built, and is now patrolling the waters between the mainland and the channel islands, devoting a great deal of her time

to careful scientific investigation of the many marine problems which are of greater interest to the growing canning industry and the fish-consuming public today than ever before.

The new boat has acquitted herself thus far even better than Captain Nidever had dared to hope. Having superintended every detail of her construction and feeling confident of her seagoing qualities, Nidever stood out from under the lee of Catalina Island at the height of the heaviest storm of the winter and gave his command a full-speed drive right into as rough a seaway as ever she is likely to find in the regular course of duty. "Albacore" stood up to her work splendidly; kept above everything but spray, shipping no solid water at all.

In design, while following in general the approved practice of the most successful fishing-boat builders for southern conditions, the "Albacore" departs somewhat in behalf of greater speed without sacrifice of sea-keeping ability, attained largely through a refinement of lines. Much more in the way of human comfort has been built into her also, as the state men, wardens and investigators who must live and labor aboard for days at a time are to make of her a floating home and workshop combined. Especially when making experimental hauls of scientific gear to prospect the sea floor the boat is designed so as to use a sail and make use of favorable winds, thus saving distillate.

The commercial fisheries research department of the Fish and Game Commission has laid out a comprehensive program of investigation work for the year, fraught with prime importance to the fishing industry and through it, the entire public. Mr. William F. Thompson, ichthyologist, has been busy with studies of the albacore, halibut and sardine, striving to free the atmosphere of some of the theories prevalent by finding out the exact facts, some of which can be ascertained with convincing certainty. He has been working on the boat much of the time. The Japanese albacore experts from the Imperial Fisheries College of Japan have made numerous trips upon the new boat whose name commemorates the wonderful fish that in a few short years has succeeded from the status of once despised by all, to the exalted plane of premier commercial importance in the South, a standing testimonial to the pitiful truth that the American food-consuming public doesn't know a good thing when it sees it, but has to be convinced by barrels of printer's ink, and the adoption of a different name!

Quite a lively interest attaches to the work of the Japanese albacore fishermen, whose experiments with long-line and deep-trolling methods are being embodied in an exhaustive report.

In the South, the public long since has learned to take the little brown men mighty seriously as fishermen; and in going to Japan for the most advanced scientific thought in marine fisheries methods, the Fish and Game Commission sought to standardize the production of albacore by demonstrating methods to catch them in winter. This was an intelligent following-up of Mr. Thompson's summer work in demonstrating that the albacore merely descend to lower levels in the colder weather, rather than migrate as many previously had supposed. The value of a discovery that would stabilize the albacore supply is so well appreciated by the big southern fish packers that every detail of the work of the state toward this end is being watched with keenest interest by these men who have put southern California on the map as a source of seafood supply for the world.

Among other objects of the "Albacore's" work this summer is that of extending the known range of the rich and delicious sablefish to include the deeper off-shore banks of southern California. Rock cod fishermen get a sprinkling of fish they call "black" or "blue cod," and it has been noted that the rock cod seem to run larger on the deeper parts of a bank; so by systematically working the depths, the present small size of the sablefish may give place to a fish whose proportions are more nearly those of commercial requirements. The federal government made quite a publicity campaign in behalf of the sablefish some time ago; and the fish needs all the promotion it can get, as people in the South are not educated to it as yet, only a relatively few housewives understanding what a choice and always desirable boiling or broiling fish it is, the

larger ones being quite as choice for frying when filleted. Frying, despite all educated effort to the contrary, continues the popular method of cooking fish because easy. EDWIN L. HEDDERLY.

YOSEMITE HATCHERY PRACTICALLY ASSURED.

For many years different persons have suggested to the Fish and Game Commission that a state hatchery be placed in Yosemite Valley. On the earnest solicitation of those interested, a careful investigation of the situation was made by Commissioner Bosqui, W. H. Shebley, in charge of fishculture, and Field Agent E. W. Hunt. Convinced that proper facilities were offered and that such a hatchery would be of great educational value in demonstrating the work of the commission, plans were made for the immediate installation of a suitable hatchery plant. The site was even selected. Governor Stephens, who happened to be in the valley at the time of the investigation, approved the plan. Supervisor Lewis of the park has also been a strong advocate of a Yosemite hatchery.

After considerable delay arrangements are now being consummated with the Department of the Interior so that a fine hatchery building will probably soon be under way. At first it seemed that on account of the plans of the Bureau of Fisheries a hatchery built by the state commission would be impossible. A letter from Alexander Vogelsang, first assistant secretary of the Department of the Interior, clears the situation and makes proposals which should prove satisfactory. The state commission will be able to obtain a lease for a term of years and sufficient water rights to properly provide for a hatchery. This same letter also suggests the possibility of a new hatchery in the Sequoia National Park. An investigation is soon to be made to ascertain whether this is feasible.

GEESE DAMAGE CROPS NEAR TULARE LAKE.

The unusual conditions arising from the lack of rain caused serious damage to the crops in the vicinity of Tulare Lake during February. Great numbers of geese concentrated in this vicinity, fed in the grainfields and destroyed the grain as it appeared above the ground. After the close of the season the geese became very tame, and it was difficult to herd them from the fields. Ranchers appealed to the State Council of Defense and to the Fish and Game Commission with the result that an investigation was instituted and arrangements made so that crops could be protected.

Fig. 50. Geese on loafing grounds near Pennington, Sutter County, California, February 2, 1918. Photograph by H. C. Bryant.

During normal years these same birds feed on native plants and grasses and what little damage is done to grain is so distributed over a wide area that no one takes notice of it. This year the only green feed in the vicinity was to be found in the grainfields sprouted by irrigation.

Existing conditions made the problem a difficult one. Ranchers, urged to raise a maximum crop of wheat, believed protective game laws prevented their protecting crops. Of course the rights of the farmer were immediately championed by townspeople who thought they saw an oppor-

tunity to hunt geese out of season, but few took into consideration the conservation of the geese. Geese are very greatly diminished in numbers, and they are in need of careful protection in order that the necessary breeding stock be maintained. Promiscuous spring hunting would necessarily endanger breeding stock.

A misleading statement which appeared in newspapers to the effect that, owing to damage to grain crops by the geese near Tulare Lake, people would be allowed to kill geese, brought countless inquiries to the Fish and Game Commission offices and stirred up "a tempest in a teapot." The statement suggested that under the circumstances the Fish and Game Commission would "wink at the law" giving protection to geese. A treaty with Canada, the federal Migratory Bird Law, and a state law all provide for an open season of three and one-half months, from October 15 to January 31, inclusive. It would take both federal and state enactments to provide a longer open season. Under such circumstances, even under the pretext of an emergency, the Fish and Game Commission had no power to change the present law. Furthermore, the Commission, knowing the resulting difficulty of law enforcement, refused to "wink" at any law on the statute books. It was of interest to find that, although geese were causing real damage, the rancher neither wished to slaughter the geese nor to allow others to slaughter, but simply wanted to protect his crops. By far the greater complaint of damage came from townspeople who, under the pretext of helping to protect crops, desired a chance to hunt geese out of season.

Fortunately, a rain scattered the geese soon after agitation was at its height and ranchers had little difficulty in protecting crops. Herding the geese from the fields with rifles and frightening them with bombs were the two methods most widely used.

A NEW AQUARIUM FOR SAN FRANCISCO.

Mr. Sigmund Steinhart, a philanthropic citizen of San Francisco, provided in his will sufficient funds to build a fine aquarium. The building is now nearly completed and will cost $250,000. Both fresh and salt water fish will be displayed. Outdoor pools will be provided for seals, sea lions, porpoises and other aquatic mammals. The aquarium is situated in Golden Gate Park and is to be under the direct control of the California Academy of Sciences. The funds for the maintenance and the operation of the Steinhart Aquarium will be furnished by the city of San Francisco. A charter amendment submitted to the voters of San Francisco in November, 1916, directs the supervisors to include an item of not less than $20,000 in their annual budget to be used for the maintenance of a public aquarium. This aquarium should do much to educate the people of the state regarding fish life and fisheries.

MANY TONS OF SHARKS MARKETED.

Large catches of sharks were reported during the last two weeks of January, 1918. The greater number of these sharks were the well known dog fish but a few Henlis sharks were also taken. These fish averaged from four to six pounds. Such a large number were caught that many were thrown overboard and doubtless the total catch was well up to the 100,000 pound mark.

A NEW HATCHERY ON KLAMATH RIVER IS PLANNED.

A law recently passed by the legislature provides that when it is proved unfeasible to install a fish ladder over a dam, a power company will be required to install a fish hatchery instead. A similar law has been in operation in Alaska for several years. The first hatchery to be erected under this law will probably be placed on the Klamath River near Copco, where the California-Oregon Power Company has a 130-foot dam. Experts have proved that a fish ladder over this dam would be impracticable. The California-Oregon Power Company has therefore agreed to the erection of a hatchery on its property on Fall Creek. The United States Bureau of Fisheries which has operated a spawning station lower down the Klamath River has given up its work at this location and relinquished control to the California Fish and Game Commission.

The solution of the problem arising from the Copco dam has thus been solved and improved fishing conditions on the Upper Klamath River are to be expected.

FEW STURGEON LEFT.

During August, 1915, a giant sturgeon was caught in the Feather River, two miles east of Live Oak, by W. A. McAuslin. With the aid of J. J. Haken, Mr. McAuslin soon landed the fish. Small white fish baited to three bass hooks at the end of a common chalk line were used in its capture. The sturgeon swam into shallow water and after shooting it several times the men had no difficulty in landing it. This fish, a male (see fig. 51) was seven feet long and weighed one hundred and sixty pounds. Another fish, evidently its mate, was seen in the river at the same time.

This fish was caught before the sturgeon was given total protection. Once extremely abundant in our larger streams and considered poor food, the sturgeon, now that it is the nearest extinct of all of our food fishes, is considered a delicacy and every attempt is being made to increase its numbers.

Fig. 51. Giant sturgeon weighing 160 pounds, caught near Live Oak, California, in August, 1915. The sturgeon is so nearly extinct in waters of this state that it has been given total protection.

AN ALL-WOMAN JURY CONVICTS NIGHT SHOOTERS.

In January a jury of twelve women, the first jury so far as is known made up entirely of women to try a fish and game case in California, heard the evidence and brought in a verdict of guilty, at Willows, Glenn County. Four Colusa duck hunters were arraigned on the charge of night shooting. On January 4 they were tried by a jury of men who disagreed seven to five in favor of acquittal. The new trial was set for January 14, and twelve women were seated as jurors. The case being historical it may be of interest

to record the names of the women selected. They were as follows: Mesdames Lulu B. Burgi, Ellen Hunter, Eva O. Halterman, Hattie Luce, Jane E. Bielar, Bell C. Feige, Francis J. Davis, Katherine A. Keim, Annie C. Lohse, Laura Cummings, Sallie Wood, and Ida Cook. Each promised to support the law on the evidence presented, and the result was a verdict of guilty. Although the atttorney for the defense, charging fraud, petitioned for a new trial, the petition was denied and sentence of $100 each or one hundred days in the county jail was imposed.

An astonishing plea in behalf of the defense by Attorney Belieu was made. He argued that in view of the fact that the 287 ducks which were confiscated from the hunters and donated to charity were worth between $150 and $200, a lenient fine should be imposed on account of the value of the ducks contributed to the county. This argument was met by Attorney Duke of the Fish and Game Commission in the reply that game illegally killed is not the property of the defendants in any case and can not be used in partial payment of their fine any more than it would appear feasible to allow a convicted chicken thief to present his booty as part payment of his fine.

WHALE MEAT NUTRITIOUS.

Analyses of whale meat made at the University of California Experiment Station show that this meat is very nutritious. It contains 23.31 per cent protein, a larger percentage than is contained in average beef. Other constituents of whale meat are: water 71.22 per cent, ash 1.02 per cent, and undetermined substances .21 per cent. Whale meat is as easily digested as beef and, like other meats, is more readily digested than eggs.

There are tough cuts as well as tender cuts in whale meat. Its preparation should, therefore, vary accordingly. Whereas, tender whale steaks can be broiled, savory stews should be made of the tougher portions.

LION BOUNTIES IN 1917.

The complete returns on the number of mountain lions upon which bounties were paid in 1917 show that the decrease of several years ago has changed to a slight increase. During 1917 a bounty was paid on 188 lions as against 179 in 1916 and 162 in 1915. The number for 1917 is only about half of the total paid in 1908 when the bounty law first went into effect. If the number of bounties paid is any criterion of the abundance of lions, Humboldt County must be considered the state with the largest lion population, for the total bounties paid to residents of Humboldt County is 534. The nearest competitor for this honor is Siskiyou County with 240. Trinity is a close third with 234. The total number of bounties paid up to the end of 1917 was 2,713.

NEW GOOSE DISCOVERED IN CALIFORNIA.

In a state where ornithology is so widely studied as California it seems incredible that so large a bird as a goose should remain unknown to science until this late date, but such is the case. Two well-defined subspecies of the white-fronted goose (*Anser albifrons*), called by the hunters, speckled-bellied goose, occur in California during the winter months, where but a single race has been heretofore recognized, according to a paper written by H. S. Swarth and Harold C. Bryant (Univ. of Calif. Publ. Zool., Vol. 17, pp. 209–222, October 9, 1917).

The new "tule goose" or "timber goose" is distinguished from its relative, the common white-fronted goose by its greater size, its call notes, its browner tints, its yellow eye ring, and the possession of a greater number of tail feathers. To anyone handling the birds in the flesh the differences between the two are obvious beyond dispute.

The specimens of tule goose obtained for study were all taken near West Butte, Sutter County, California, and are all winter birds. No breeding birds were available for comparison, thereby making it impossible to indicate the summer ranges of the two forms. However, the following theoretical breeding ranges are suggested by the authors. The white-fronted goose is known to breed in western Alaska and it is probable that the breeding grounds of the tule goose are to be found further to the eastward in Arctic America.

While the tule goose seems to occur regularly in Sutter County during the winter, there is no data demonstrating its

presence at any other point in the state. However, a rumor persists among market hunters of the Los Banos region that a large form of white-fronted goose exists and has been killed there.

It is said that the tule goose is never seen in such large flocks as is customary with the white-fronted goose but is most frequently noted singly or in pairs, also that it is pre-eminently a denizen of open water or ponds and sloughs surrounded by tules and willows.

It was interesting to find that the original description of the American white-fronted goose by Hartlaub more nearly fits the tule goose and that consequently the name *Anser albifrons gambeli* must be made to apply to the tule goose, the common white-fronted goose assuming the name *Anser albifrons albifrons* in common with the white-fronted goose of Asia.

Waterfowl hunters will hereafter be justified in giving the large white-fronted goose with bill 53–62 millimeters in length the name of tule goose and the smaller white-fronted goose with bill 44–52 millimeters long the name of white-fronted goose.—Amy M. Bryant.

FAIR PLAY.

(A page of criticisms and answers.)

RAISING RICE FOR WILD GAME CONSUMPTION.

Editor *The Chronicle*—Sir: I bought a wild duck in a market in Sacramento a few days ago and when I dressed it I found at least a half ounce of rice in its craw, and many grains embedded tightly under each wing, showing beyond a doubt that it had beaten the rice stalks down in order to get at the grain. If this were called to the attention of Mr. Newbert, president of the State Fish and Game Commission, he would likely explain by saying that some mudhen had stuck the grains of rice under the duck's wings while in deadly combat with the duck.

W. D. Bludworth.

Sacramento, January 28, 1918.

—*S. F. Chronicle*, Jan. 31, 1918.

THEY DINE ON THE LEAVINGS.

Editor *The Chronicle*—Sir: My attention has been called to a little item which appeared in the Safety Valve column of your paper of January 31. It was headed "Raising Rice for Wild Game Consumption," and bore the modest signature of W. D. Bludworth of this city. Mr. Bludworth asserts he bought a wild duck in the market recently and he found at least a half ounce of rice in its craw and many grains of the cereal embedded tightly under each wing, showing beyond a doubt that the duck had beaten the rice stalks down in order to get at the grain. I would share Mr. Bludworth's apprehension and indignation were it not for the fact that my knowledge of ducks goes slightly beyond "craws." It may interest Mr. Bludworth to know that ducks do not have craws, they have gullets. Craws are peculiar to chickens and turkeys. The rice crop was fully matured and cut by November 1 (over three months ago) and was threshed, sacked and stored more than one month ago, so the duck mentioned by Mr. Bludworth apparently had "put one over" on Hoover and had hoarded that rice under its wings for three months after the crop was in. The rice found in Mr. Bludworth's duck can be accounted for by the fact that there is a large amount of rice lost in harvesting the crop. This lost rice serves as food for many varieties of birds and if left on the ground it would grow into a form of water grass that is particularly obnoxious to rice farmers. On the whole, if Mr. Bludworth's statement is to be accepted without question, I would say he had purchased not a duck but a pin-feathered freak of nature. Mr. Bludworth says it was a wild duck. It's enough to make any duck wild. The question is "When is a duck not a duck?" Answer: When it's a quack.

George Neale.

Sacramento, February 6, 1918.

—*S. F. Chronicle*, Feb. 10, 1918.

FACTS OF CURRENT INTEREST.

The new commercial fisheries patrol boat was successfully launched at San Pedro, December 27, and is now in commission.

The fishing season opened auspiciously April 1, a return to an earlier date after a try at a May 1 opening.

More than four thousand ducks and geese, illegally taken or shipped, were confiscated during the past open season and donated to charity.

All deep-sea fishing is now under government control. Each fisherman is under license and an attempt is being made to reduce the price of fish to the consumer.

Five aliens convicted of killing songbirds recently paid fines approximating $200.

Striped bass market fishermen persist in violating the law, as is evidenced by the confiscation of 5,644 pounds of this fish during November, December and January. All of this fish was donated to charity.

At the Mount Shasta Hatchery there are 13,000,000 young salmon awaiting distribution.

During January the first jury made up exclusively of women to try a game case brought in a verdict of guilty and the four Colusa hunters convicted of night shooting were sentenced to $100 fine or 100 days in the county jail.

The largest albacore ever taken on rod and reel was secured by Mr. Elijah Pringle of Tuxedo Park, New York, on February 14, 1918, while fishing near Catalina Island. The fish, which weighed 81 pounds, took twenty-nine minutes to land. Two other albacore recently caught weighed over fifty pounds. The record albacore previous to the Pringle fish weighed 67 pounds and was taken by Tad Grey on January 11, 1918.

Until this year it was believed that the albacore entirely disappeared from the waters of southern California during the winter season. Investigation has shown that a few large fish of this species remain each winter and the former theory is entirely upset by the large catches of several hundred fish weighing over forty pounds which have been taken this past winter.

Severe penalties were recently meted out to two trappers who had failed to secure licenses. One paid a fine of $15 and the other was sentenced to 40 days in the county jail, it being the latter's second offense.

HATCHERY NOTES.

W. H. SHEBLEY, Editor.

MOUNT SHASTA HATCHERY.

With the completion of the work of distributing the 1917 hatch of fish from the different hatcheries, work on preparing for the collection of trout eggs for the season 1918 was immediately commenced.

The buildings, hatching troughs and pond system have been given a general overhauling; work was completed before the winter storms set in.

excellent condition and will be ready for distribution during the middle or latter part of May.

Rainbow egg-collecting operations were commenced during the fore part of February at Mount Shasta Hatchery and at the Klamath River stations; to date approximately 500,000 have been taken. While the season is late, owing to very unusual weather conditions, we believe

Fig. 52. Seining spawning salmon at Bryan's Rest Egg Collecting Station on Eel River, Humboldt County, California. Photograph by S. Campbell.

Thirteen million salmon eggs were received at this station, and the resulting fry are now being reared for distribution in the upper reaches of the Sacramento and Klamath rivers. A portion of these fry will be distributed during the coming spring and the balance held over summer in the three large rearing ponds and planted during the fall of 1918.

The taking of Loch Leven and Eastern brook trout eggs from the adult fish carried in the ponds at Mount Shasta Hatchery was very successful this year; 1,850,000 Loch Leven fry and 1,350,000 Eastern brook fry were hatched from the eggs secured. These fry hatched out in

that the operations on the Klamath River will result in an average take of rainbow trout eggs.

MOUNT WHITNEY HATCHERY.

The 150,000 Eastern brook and Loch Leven eggs which were shipped to Mount Whitney Hatchery have hatched out and are doing nicely. It is proposed to ship a sufficient number of rainbow and steelhead trout eggs to the Mount Whitney Hatchery from other hatcheries and egg-collecting stations to supply 1,500,000 trout for distribution in southern California counties.

BEAR LAKE HATCHERY.

On March 4 a crew of men left for San Bernardino en route to the Bear Lake Hatchery. Every effort will be made to collect a large number of rainbow trout eggs at the North Creek spawning station. During the past summer and fall extensive repairs and improvements were made at the North Creek station and with the new thirty-trough hatchery at that point we will be able to handle a much larger number of eggs than in former seasons.

TAHOE HATCHERIES.

Arrangements have been made to open the Tallac Hatchery on March 18 or 19 and plans have been made to take the usual number of eggs from the black-spotted trout of Lake Tahoe.

WAWONA HATCHERY.

A lease has been obtained from the Wawona Hotel Company, and contract has been let for the construction of a small, modern hatchery. Unless this work is delayed by a heavy fall of snow, the hatchery will be ready for operation during the fore part of April, and 250,000 trout eggs will be shipped to that station, and the resulting fry distributed in the streams of Mariposa and Madera counties.

ALMANOR AND DOMINGO SPRINGS HATCHERIES.

Arrangements have been made to send a crew of men into Plumas County to open up the Almanor and Domingo Springs hatcheries on March 11. All repair and improvement work was completed at these stations last fall, after the completion of the fish distribution operations, and everything is therefore in readiness for this season's operations.

FORT SEWARD HATCHERY.

In addition to 300,000 quinnat salmon eggs taken at the Bryans Rest Station on Eel River, Humboldt County, approximately 90,000 quinnat salmon were shipped to the Fort Seward Hatchery from the Mount Shasta Hatchery. The fry resulting from these eggs are doing nicely and will soon be ready for distribution. As the fry reach the proper stage, they will be distributed in the Eel River and tributaries and other streams in Humboldt County.

Fig. 53. Quinnat salmon taken at Bryan's Rest Egg Collecting Station on Eel River, Humboldt County. Photograph by S. Campbell.

SNOW MOUNTAIN STATION.

The Snow Mountain station was opened during the fore part of January. Owing to extreme drought, the spawning steelhead have not ascended Eel River as far as Cape Horn dam, at which point our egg collecting station is located, in any considerable numbers, and therefore the collection of eggs has been very much delayed. However, should there be sufficient rainfall during the coming month, we will undoubtedly be able to obtain an ample supply of steelhead trout eggs at this station.

BROOKDALE AND SCOTT CREEK STATIONS.

The same climatic conditions have obtained in Santa Cruz County as at the Snow Mountain station, and the collection of steelhead trout eggs at the Scott Creek station has been very small. Only a little over 300,000 eggs have been collected to date. However, our assistants report that there are large numbers of spawning trout at the mouth of Scott

Creek, and that the first storms will in all probability bring them up to our station. We anticipate collecting the usual number of eggs at this hatchery.

SCREEN AND FISHWAY SURVEYS.

A number of new surveys for fish ladders have been made during the winter in Santa Cruz, Siskiyou and Mariposa counties. New notices to install screens have been served during the past six months on nearly every ditch owner in the state who has not heretofore installed suitable screens. Among the more important screens which have been installed during the past winter are those of the Northern California Power Company, in Shasta and Tehama counties. The commission has been endeavoring since 1912 to have the large canals of this company properly screened, but it was not until the last couple of months that our efforts were successful. The screens installed are, with one exception, of the Southern California Edison type and are of first class construction.

The Anderson-Cottonwood Irrigation Project is at the present time constructing a three-unit screen, each unit of which will be 12 feet 5 inches in diameter and 9 feet long. This installation is also of the Southern California Edison type. The construction of the screen will be completed before the water is turned into the canal.

The Stanford University Vina Ranch has let contracts for the construction and installation of the new type of Requa automatic cleaning screens for all of their ditches.

COMMERCIAL FISHERY NOTES.

N. B. SCOFIELD, Editor.

ADDITIONAL INFORMATION ON HERRING.

There is a great mass of literature on the herring fisheries and on the life history of the Atlantic herring but very little has been published on the Pacific herring. Those interested may find the spawning habits of the Pacific herring described in a paper by Dr. C. M. Frazer, published by the Biological Board of Canada (University of Toronto Press, 1916).

For information as to what the scope of a fisheries investigation should be, read "A Contribution to the Life History of the Pacific Herring: Its Bearing on the Condition and Future of the Fishery," by W. F. Thompson, in the Report of the Commissioner of Fisheries, British Columbia, for 1916.

A full description of the Scotch method of curing herring may be obtained from the United States Bureau of Fisheries, Washington, D. C.

SHAD SEASON APPROACHING.

The herring season has about come to a close and the shad, a near relative, will take its place. People will continue to talk of the high cost of fish, and of bones, and the shad taken in California will continue to travel across the continent to those who appreciate a good fish.

FRESH SARDINES NOT APPRECIATED.

The California sardine is a splendid fish to fry in the pan, and is abundant and cheap. During what has been termed the "fish famine" of the past winter, sardines could have been obtained almost without limit, but, except as a canned product, there was no sale for them.

CLAMOR FOR STURGEON.

Whereas the sardine catch in California is over one hundred million pounds annually, there is a clamor for the removal of fishing restrictions from the now nearly extinct sturgeon.

SALMON CATCH IN 1917.

The catch of salmon on the Sacramento and San Joaquin rivers, including San Francisco Bay, from January to December, 1917, inclusive, was 7,219,846 pounds.

The catch of salmon on Monterey Bay for the same year was 3,981,670 pounds.

PATROL BOAT "ALBACORE" BUSY.

The fish and Game Commission's new patrol boat "Albacore" is now in commission, and under Captain H. B. Nidever will take care of the fisheries and kelp patrol work, and lend assistance in the investigation work being carried on by the commission. The boat's headquarters will be at Long Beach and its territory will be the state waters from Ventura to San Diego.

ANCHOVIES WILL BE SALTED.

Santiago Briones, Inc., fish packers of New York, have established a plant at Monterey and are preparing to put up salt anchovies on a large scale. The fish will be packed in 5-, 14- and 28-pound cans.

THE ANCHOVY A FINE FOOD FISH.

The anchovy is one of our best food fishes and is delicious fried in olive oil or butter. It is found along our shores the year round in immense numbers and the markets could sell it very cheaply if the public would use it.

MACKEREL DELICIOUS BUT SELDOM EATEN.

The coast of California for a good part of the year swarms with mackerel. They are found close to shore, where any one may easily catch them. They are food fish of the highest quality, but the fishermen do not catch them, for they can not sell them.

TUNA INVESTIGATIONS.

The Fish and Game Commission in its investigation of the tuna, under the supervision of Mr. W. F. Thompson, has added several assistants in order that the work may be hurried along. A laboratory has been opened at Long Beach in close proximity to the tuna canneries in order to facilitate the gathering of data and the handling of cannery statistics. The scope of the work has been extended in order to include the sardine and herring.

The objects of this investigation work are to establish a basis on which the future of the fisheries may be judged and to determine if they show evidence of depletion, also to assist in the more rapid development of the fisheries. The work has been well organized along the lines of similar investigations in Europe and with the intention of continuing it indefinitely.

The commission is co-operating with tuna packers in carrying on experimental fishing on rather a large scale. Two well trained Japanese fisheries experts are employed and already we feel assured that new methods of tuna fishing can be profitably introduced and the fishing season considerably extended.

BETTER FISHING METHODS NEEDED.

The meatless days and the high price of meats have increased the consumption of fresh and canned fish throughout the state, but there has been no material increase in the consumption of salt or smoked fish. During the winter months the fishermen have not been able to supply the public with the species that are more commonly used fresh, such as California halibut, salmon, striped bass, sand dabs, sole and rock cod. The reason for the shortage of fresh fish this winter was due mostly to the inefficient fishing methods employed, which proved inadequate to supply the increased demand during what is termed the "off season" for fish. The shortage of fish in northern California was caused mostly by the poor catches of the trawl or paranzella nets, which failed when most needed.

Three years ago the editor of this department read a paper before the Pacific Fisheries Society in which he had the following to say about improved methods and the future of trawl fishing in California:

> "As to the future of trawl fishing in California, it is safe to say the otter trawl will in time be adopted, for it can be operated more economically and will do better work. It can be operated at night and the fish landed fresh for the morning market. The paranzella can not very well work at night. The otter trawl can work in much deeper water, thus greatly extending the fishing area. It can work near submerged rocks and close to rough bottom by virtue of the fact that the net follows directly behind the boat and by taking soundings the rocks or rough bottoms are detected before the net reaches them and the course can be altered or the net raised. By fishing adjacent to rough bottom this trawl will catch a greater variety of fish. It can work in the stormy weather of winter when the fish bring a good price. The boats would be larger and

more seaworthy and have better accommodations for the crew. They have room to clean and ice the fish at sea and on that account can make a longer trip. An otter trawl of a size sufficient to do the work of one of the San Francisco paranzella outfits could be operated at two-thirds the expense.

"California will never be the home of a great trawling industry, for the trawl fishing grounds are too limited. On account of the rapid deepening of the ocean floor to the west of the continent, the bottom suitable for trawling is a very narrow strip. This strip extends from Point Concepcion to our northern boundary, but only in two or three places will it exceed five miles in width and most of it is one to three miles wide. Otter trawls from San Francisco could fish this entire distance if the market would take the fish. The three San Francisco paranzella outfits and the four smaller outfits at Santa Cruz, with their comparatively primitive methods, can for the most of the year easily over-supply the market. By adopting the improved methods of handling fish, in use elsewhere, interior markets could be reached. But our people are not fish eaters and unless the public takes more kindly to a fish diet, our trawling grounds will be sufficient for many years to come, as in the past forty years they have been only scratched in two or three places."

THE GOVERNMENT CONTROL OF FISHERIES.

Some apprehension has been felt in regard to the announcement issued from Washington that the government was to take over the control of the fisheries and remove fishing restrictions. On February 10, the United States Food Administrator for California issued the following:

"San Francisco, Feb. 10, 1918.—Attention of salt water fishermen throughout California was called today to the following statement issued by the United States Food Administration at Washington warning fishermen regarding procuring of licenses to do business:

"Under a recent proclamation of the President, the second issued by him on control of the fish industry, salt water fishermen, generally, must be licensed by the Food Administration. By the first proclamation, effective November 1, 1917, it was made compulsory for all wholesale fish distributors, brokers and commission men to secure licenses; but those catching fish were not included unless they were also in one of the classes named. By the new proclamation of January 10, 1918, 'all salt water fishermen, whether fishing independently or on shares,' must secure licenses if 'engaged at any period of the year in the commercial distribution including catching or selling, of any or all varieties of salt water fish, including menhaden, and of shellfish and crustaceans.'

"These licenses must be secured on or before February 15, 1918, and are issued without charge or fee of any kind. The term 'salt water fishermen' includes all (except those employed for wages only, without a share in the proceeds) who are engaged in catching salt water fish or producing any other kind of sea food, including lobsters, crabs, shrimps, oysters, clams, etc. Also any person, firm, corporation or association engaged in production and employing any such fisherman or producer of sea food, whether for wages or on shares or both, must take out a license. These licenses can be secured from the Licensing Division of the Food Administration at Washington.

"This license system, as applied to the fisherman, is wholly for their benefit, not to affect their prices, not to limit their operations, but to extend them and to remove local restrictions that now prevent free and full development of sea-food production.

"The Food Administration does not intend to regulate the prices of fish and sea foods in the fishing districts; and distribution and prices, so far as fishermen and producers are concerned, will move along natural lines as before.

"By assuming this more direct control of salt water fishermen, the Food Administration will be able, where necessary, to supersede state laws and local restrictions by general regulations which will allow increased opportunity to fishermen and broaden their operations during the war. These local restrictions have discouraged fishermen, lessened their catches and limited the use of their most productive gear; nonresidents and aliens have been prevented from fishing in waters of certain states; closed seasons have been enforced on certain varieties of fish during their period of greatest abundance, and restrictions upon the use of purse seines have prevented utilization of this effective gear within the three mile limit. These and other restrictions on fishing have curtailed production and brought about a shortage in supplies of salt water fish when we need sea food more than ever before. These restrictions will be removed or modified under the new regulations, and this greater freedom for fishermen, with other measures for the benefit of the fish industry, should largely increase the supply of sea food by spring of 1918.

"At the same time, due regard will be paid by the Food Administration to any present restrictions that are vitally necessary to protect the fish supply of the future, and to prevent extinction or too great reduction in the number of any species valuable for food."

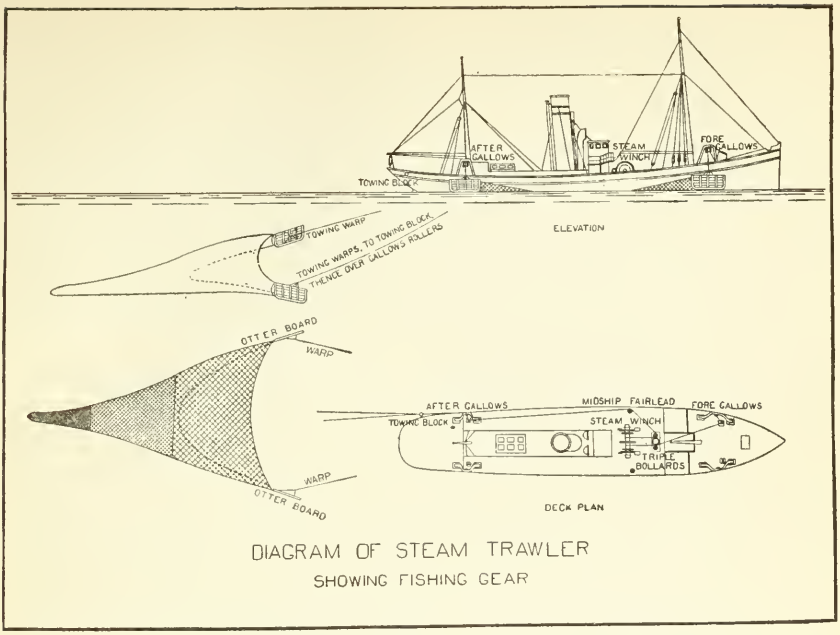

Fig. 54. Diagram showing steam trawler and otter trawl. Apparatus of this kind would improve our fisheries and assure the market fresh fish daily. (From United States Bureau of Fisheries, Document No. 816, p. 19.)

Later the California Food Administrator appointed a Fish Administrator for southern California, Mr. W. C. Crandall of the Scripps Institute, and on March 2, a conference was held at the Food Administrator's office at which were present representatives of the United States Bureau of Fisheries and the State Fish and Game Commission. After considerable discussion following a report by Mr. Crandall on conditions in southern California, it was determined that the state laws in the main do not prevent the full development of the fisheries. The restrictions on sea fishing which prevent the use of effective fishing gear, as condemned in the proclamation of the Federal Food Administrator, does not apply to California as it does to many other states. It is only in minor instances of a local character that restrictions need to be removed or modified. The Fish and Game Commission, or the governor of the state, do not have the power to set aside regulations passed by the legislature so that the opportunity to modify existing regulations or to issue new ones to meet rapidly changing conditions, is welcomed by the state.

The few changes in the state laws as indicated on page 80 were decided upon.

The State Food Administrator expressed himself as opposed to removing fishing restrictions from the species of fish that are being caught to the limit in this state at present, such as salmon, shad, striped bass and California halibut, while there are plenty of other good fish the people can use.

It was brought out at the conference that the salt water fishing boats and fishing gear are inadequate to meet the present emergency. This is especially true with regard to the trawl nets and rock cod or long-line boats. We need otter trawls of good size and larger long-line boats with power gurdies for working more lines and at greater depths. It was also brought out that we have many good species of fish which could be furnished the people in large quantities if they can only be induced to use them.

CONSERVATION IN OTHER STATES.

OCEAN FISH REFUGES.

The Bureau of Fisheries is placing subway stone and other refuse to a depth of eighteen inches, from Romer Shoals to Long Beach, New York. The ocean floor here is a hard, sandy bottom, and the rock piles will attract marine animal life upon which fishes feed. Captain J. Klein of Bergen Beach has experimented for many years with ocean rock piles, and in one area containing 300 square feet of such dumpings in 66 days of fishing two men, using hook and line, took seventeen tons of fish. This convinced Dr. H. F. Moore of the United States Bureau of Fisheries that such feeding grounds were worth making on a larger scale, and if the Romer Shoals-Long Beach newly made grounds produce results the idea will be applied elsewhere.—*The American Angler*, August, 1917.

FISH AND GAME ADMINISTRATION IN WASHINGTON.

The Fish Commission of Washington is made up of the state fish commissioner, the governor and the state treasurer.

In the state the county unit is most important in fish and game legislation. The fish commissioner and state game warden act in an advisory capacity to the various county fish and game commissions. The state receives 20 per cent of the fund from the sale of licenses, while the remaining 80 per cent is expended by the various counties.

WASHINGTON'S GAME REFUGES.

Instead of setting aside large areas as game refuges, the state of Washington creates refuges for wild fowl by preventing the killing of all waterfowl on the Columbia or Snake rivers or within a quarter of a mile of the shores thereof throughout several counties. This provides a safe breeding place and a sanctuary for many waterfowl.

NO INCREASE OF BOUNTIES IN PENNSYLVANIA.

The governor of Pennsylvania recently vetoed a bill providing for increased bounties on wildcats and weasels. His excuse for so doing is as follows:

1. Uneconomic conditions would be produced owing to the fact that idle and irresponsible persons are incited to waste time in the woods.

2. It would cause unnecessary drain on hunters' license funds. Noxious animals are, as a rule, overrated in their destructiveness. Nature's balancing of life, undisturbed by man, is, on the whole, wise and good.

In spite of forcible arguments advanced, many sportsmen in Pennsylvania are disappointed in the failure of the bounty bill to become a law.

$15,000 FINE PAID FOR TRAPPING WILD DUCKS.

A check for $15,000 from Henry C. Phipps, in settlement of a case against him for illegally trapping wild ducks upon his estate at Wantagh, Long Island, has been received by Conservation Commissioner George D. Pratt of New York. This is the second largest fine in a game case ever obtained by the commission, the largest having been for $20,000 for illegal sale of wild ducks in 1913.

The case began with a raid by Chief Protector Llewellyn Legge and a corps of game protectors upon Mr. Phipps' estate at Wantagh on February 20, when 442 live wild black ducks, 25 dead wild black ducks, 5 pintails and 1 wood duck were seized. A court of investigation was held the same day.—*Bull. Amer. Game Prot. Assn.*, May 1, 1917.

DOVE PROTECTION IN TEXAS.

At the last session of the Texas legislature a bill was passed extending for two months the open season during which doves may be killed. The main reason advanced why this change ought to be made was that sportsmen of north Texas were deprived of the sport of killing these useful birds and that the south Texas gunners got the best of the dove shooting. Because many farmers and others were opposed to changing the open season for doves to suit the convenience of some sportsmen, they were criticized and ridiculed, their motives impugned, their statements misquoted and misrepresented, and themselves contemptuously referred to as "silly sentimentalists," "extremists," "hayseeds," "bird cranks," etc., by many of those who proposed and advocated the amendment.

Many of the best sportsmen who are in favor of reasonable protection, with a view to preserving this valuable little game bird and preventing its extermination, are not in favor of commencing dove shooting in September, for the reason that doves are not through with their nesting season at that time of the year. In some parts of this state doves nest all through July and August; their eggs are frequently found in September, and occasionally as late as the middle of October.—H. P. Attwater.

PENALTIES FOR VIOLATION OF OREGON GAME LAWS.

The following interesting penalties are imposed upon the violators of game laws in Oregon:

"Any person killing any mountain sheep, mountain goat, antelope, elk, or moose, may be fined from $200 to $1,000 and imprisoned not less than sixty days nor more than six months."

"Besides fines, any one violating laws shall be subject to a civil liability ranging from $2 for each game bird to $300 for elk and mountain sheep; shall forfeit all guns, dogs, boats, traps, fishing apparatus and implements used in violation of laws, and shall forfeit his hunting license for the balance of the calendar year in which the offense was committed."

NEVADA PROHIBITS DEER HUNTING WITH AID OF DOGS.

Although both California and Oregon place certain restrictions upon hunting of deer with dogs, a provision of the Nevada law states:

"Sec. 46. It shall be unlawful for any person or persons, firm, company, corporation, or association, at any time of the year to hunt, chase, pursue, catch, or kill, any deer, antelope, caribou, elk, mountain sheep, or mountain goat, with or by the use or aid of any hound or hounds."

Another interesting provision of the Nevada law is that which protects the American eagle. The law states:

"Sec. 56. It shall be unlawful for any person or persons, firm, company, corporation or association to kill, destroy, wound, trap, injure, keep in captivity, or in any other manner to catch or capture, or to pursue with such intent the bird known as the American eagle, or to take, injure or destroy the nest or eggs of said before-mentioned bird."

VALUE OF WILD LIFE ENORMOUS.

Reduced to statistics the annual value of wild life assets of the state of Minnesota, after careful investigation and inquiry, are estimated as follows:

Food value of game and fish	$2,000,000
Furs, skins and pelts	1,300,000
Value of tourist trade	1,500,000
Value of commerce depending upon game and fish	3,000,000
Value to agriculture of insectivorous birds	2,500,000
Total	$10,300,000

Every effort has been made to make this estimate conservative, and doubtless some of the items should be much larger. —*Fins, Feathers and Fur*, December, 1916.

MINNESOTA COMMISSION REMODELS FISH AND GAME LAWS.

A commission created by the last Minnesota legislature is remodeling the fish and game laws of that state. The work of the commission will be to make a thorough study of the provisions of the laws governing fish and game and to revise and simplify them, striking out those laws which are ambiguous and conflicting.

A SUCCESSFUL SPARROW CAMPAIGN.

The Davenport Bird Club of Davenport, Iowa, has almost wiped out English sparrows in that city. Poisoned grain in the form of cracked corn and wheat screenings coated with strychnine-poisoned starch was used. After two months a careful count disclosed a reduction of 95% in the sparrows feeding in the streets. The club estimates that about 150,000 sparrows were destroyed during the winter. As far as is known only two or three native birds were poisoned.—*Current Items of Interest*, October 26, 1917.

NEW YORK HAS CONSERVATION SCHOOL.

The New York legislature has appropriated $15,000 for a game farm to be conducted as a part of the New York State College of Agriculture at Ithaca, New York. The administration of the farm is in the hands of the trustees of Cornell University, who will cooperate with the New York Conservation Commission. Instruction will be along educational and experimental lines.

BIRD PRESERVES IN RUSSIA.

Although birds receive little legal protection in Russia, there have been established a few sanctuaries. One of these has been established in Caucasia for the protection of the francolin and several for zibelines have been created in Siberia by the Russian Department of Agriculture, the largest of these comprising an area of 50 by 45 miles, or 2,250 square miles. The protection of birds in the parks of Kharkow is planned by a newly formed "Commission for the Protection of Birds" of that town.—*Current Items of Interest*, June 25, 1917.

GOULD LEAGUE OR BIRD LOVERS IN AUSTRALIA.

The Gould League of Bird Lovers, the bird-protection organization of Australia, continues to grow, having a membership of 60,000 (mostly school children) in Victoria alone. It is taking up the plan of supplying state school grounds, parks, and public gardens with nesting boxes, food-tables, and bathing pools for the birds.—*Current Items of Interest*, June 25, 1917.

ARKANSAS REFORMS.

In the recent game bill enacted by the Arkansas legislature, all seines and nets are eliminated from use by market fishermen except stationed hoop nets with limited wings, the meshes of which must not be less than three inches square. The seasons on migratory birds were made to conform with the federal regulations, so there is to be no more spring shooting in Arkansas. Only rabbits and squirrels may be sold. It is illegal to sell other game in the state or to ship it out to a market. Market hunting is dead in Arkansas. Bag limits in the state are twenty-five ducks and fifteen quail in a day, two deer, four turkeys and one bear in a season.—*Wild Life*, September, 1917.

LOUISIANA OPPOSES SUSPENSION OF GAME LAWS.

Conservationists have had to fight the move to suspend all laws protecting game birds "as a war measure." Commissioner Pratt of New York was the first one to set right misguided enthusiasts on the subject. Commissioner Alexander of Louisiana has also opposed any move to allow a greater amount of hunting. He shows that the proposed action would undo the work of years and would not lower the price of meat a single cent. The point is also made that Louisiana is host to almost 75 per cent of the migratory waterfowl during the winter season and hence there is thrust upon her an obligation of guardianship which can not be ignored.

LIFE HISTORY NOTES.

COYOTE KILLS QUAIL.

During the early part of October, 1917, Deputy T. K. Duncan and myself were going down Marsh Creek, in Contra Costa County. Near the oil pumping station, just at break of day, we flushed some quail from a creek bottom. These birds flew across the road as if greatly frightened. In a moment a large coyote appeared, but a few feet from us, carrying in his mouth a valley quail. Evidently the coyote is an enemy of quail, as well as an enemy of other game.—M. S. Clark.

HUNGARIAN PARTRIDGES SEEN IN INYO COUNTY IN 1913.

In July, 1913, I saw about a dozen Hungarian partridges on the Walter's ranch, near Independence, Inyo County, evidently part of the birds planted in the vicinity. The following spring two old ones were seen, but since that time the birds have absolutely disappeared.—J. J. Singlau.

"VARMINT" DOGS CLEAN OUT BOBCATS.

Last winter, with the use of "varmint" dogs "Tennessee Coon Hounds," we treed and shot out twenty wildcats, and all of these up to the time of spring lambing had deer meat in their stomachs, and as lambing came on some had lambs' meat and wool in their intestines. This winter we have caught five already and all full of venison but one, and this one had a till of rats and mice. It seems only just and fair to all concerned that a bounty, say

of $2.50, be placed on them. This would give trappers more inducement to rid the country of this pest. I keep the dogs for my own protection and at no small expense, but feel this the best insurance my stock can have. It is sure some sport to follow the dogs and at the end of from thirty minutes, sometimes only ten, up to two and a half hours, to find yourself looking up at a very nervous cat in a tree.—C. H. Cooley.

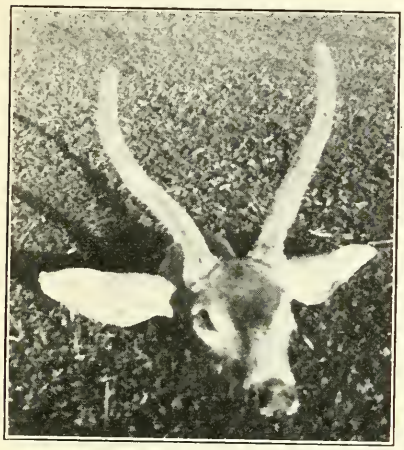

Fig. 55. Freak antlers of black-tailed deer killed near Mount Hamilton, September 10, 1918. According to law this deer was unlawful game in that it lacked branched antlers. Photograph by W. N. Dirks.

ADULT DEER WITH UNBRANCHED HORNS.

A freak deer was killed near Mount Hamilton, September 10, 1917. This deer was apparently an old stag and weighed close to 150 pounds. The antlers, however, were unbranched in spite of the fact that they were much longer than any normal pair (see fig. 55). The law definitely states that the killing of such deer is a violation. Deer of this sort are so rare that the hunter loses nothing, the supply of deer is augmented, and the law more easily enforced when such animals are not killed.—W. N. Dirks.

SWANS RARE THIS YEAR.

Proof of the oft-quoted statement that swans are driven south during severe weather is to be found in the lack of birds of this species during the past winter, which has been an unusually open one. Last season a mile or two of water northwest of the Marysville Buttes was covered with swans. This year in the same place not over twenty birds have been seen on this body of water. As swans nearly always loaf in the same situation, these birds could be expected in this locality had they come south into California. —Geo. Neale.

UNITED STATES FOREST SERVICE CO-OPERATION.

FOREST FIRE KILLS FISH.

Ranger Robert Finley, who is in charge of the trail crew, reports that in places at the head of Arroyo Seco in the Monterey National Forest where fires occurred last summer the rains have washed so much hardwood ashes into the creeks that the fish have been killed.—H. G. Merrill.

ANTELOPE IN MODOC COUNTY.

A small bunch of antelope range on the plateau country north of Alturas and although local opinion is much divided as to their number, I have heard of but one man who had seen over a dozen head. This man claimed to have counted seventeen.—Wm. S. Brown.

MOUNTAIN QUAIL SCARCE IN TRINITY COUNTY.

A general scarcity of mountain quail is reported in the Trinity National Forest, except at the lower elevations along the Trinity River. This condition is attributed mainly to the heavy snows of the past season, which prevented them from securing the usual amount of food. After the storm numbers of dead birds were found along the trails and roads in our region. The coyote is also responsible for a heavy annual loss, as it is a well-established fact that great destruction, especially to the young, is due to these animals.—E. V. Jotter.

REPORTS.

CALIFORNIA FISHERY PRODUCTS, OCTOBER, NOVEMBER AND DECEMBER, 1917.

Species of fish	Del Norte, Humboldt	Mendocino, Sonoma, Lake	Marin	Solano, Yolo	Sacramento, San Joaquin	Alameda, Contra Costa	San Francisco	Santa Cruz	Monterey	San Luis Obispo, Santa Barbara, Ventura	Los Angeles	Orange	San Diego	Imperial	Mexico	Total
Albacore										5,691	1,409,021	202	397,382			1,812,296
Anchovy							8,612		47,925		45					56,582
Barracuda										27,102	221,163		245,135		54,065	548,068
Bonito								249		1,580	373,385		383,643			758,857
Bocaccio							11,201	67,981	341,043							420,228
Bluefish							26,017	271	8,182							34,470
Chilipepper							40,109	136,957	108,405							285,471
Carp		317		1,801	12,311	9,406	2,392									26,227
Catfish		24,765		6,689	6,750	734										38,938
Coalfish							2,039	1,437	1,397		2,664					7,537
Cultus cod	81						161,203	14,933	210,900							387,117
Dogfish						225	168,972	318	242		4,163		6,379			180,299
Flounder	693		63	453			79,045	67,675			617					148,546
Halibut	654						4,451	1,197	526	45,786	173,976		331,560		223,160	811,320
Hake							51,822	18,000			3,863		695			74,383
Hardhead					13,526	2,957										16,483
Herring	2,300		161,330				80,349				425					244,404
Kingfish							4,641	4,800	6,798		104,851		9,704			130,794
Mackerel							305		353,926		798,382	746	123,124		8,775	1,287,069
Mullet														17,832		17,832
Pike				12	841	1,420	22									2,295
Pompano							28				3,718					3,746
Perch	956	130	11,438			8	28,597	225	2,634		12,858	148	124			57,118
Rock bass											149,064		23,521			172,585
Rockfish	3,182						467,212	155,121	374,257	17,059	399,237	2,750	197,713		1,695	1,618,196
Sole						58	2,195,009	417,747	2,810		10,896		5,360			2,631,910
Salmon	1,274,973	109	479	5,553	759	4,707	149		225		492					1,287,446
Smelt	2,315	50	10,070				8,183	8,832	9,143	31,974	83,241	169,368	36,545		778	360,499

Sea bass (white)			260				459			5,114	19,843		7,998		6 110	39,884
Sea bass (black)										284	39,675		28,426		5,230	73,615
Sand dab							379.080	239,973	22		4,505					623,380
Striped bass			192		70,910	94,312	16 492									181,906
Shad				2,658	24	6,544	1,538									10,764
Sardine			2,072				117,172	1,150	16,867,822		13,120,252		4,667,268			34,775,736
Skate							79,525		203							79,728
Sculpin							50		100		10,224					10,374
Sea trout											36					36
Tom cod							5,370									5,370
Trout (lake)								237								237
Trout (steelhead)	18,611															18,611
Turbot			40													40
Whitebait			2,014				2,237									4,281
Yellowtail								105.761	18,157	1,078	560,463		310,967		9,089	1,014 455
Miscellaneous			4,619		344		78,119		2,556	2,832	14,783		4,333			107,616
Totals	1,303,775	25,371	192,707	17,166	105,465	120,371	4,020,433	1,272,861	18,357,303	151,056	17,530.948	173,211	6,810,117	17,832	308,872	50,407,494
Crustaceans—																
Crab (dozen)	727						34,362	290	108							35,487
Spiny lobster										26,959	42,243	3.524	131.558		62,746	266,350
Shrimp							162.301									162,301
Turtle													170		520	690
Total																461,808
Mollusks—																
Squid									12,040							12,040
Cuttlefish							4,945	2,713	5,243		5					13,006
Clam (Pismo)										230,080						230,080
Clam (cockle)			5,501								5,747					11,248
Clam (softshell)		1,335	37 295				3,900									42,530
Clam (mixed)	11,990	270	317,631					1.374		57		1,400				32,752
Oyster (shell) No.							621,835									621,835
Abalones		1,183							148,014	21,058						170,255
Mussels	160						2,707			2.405	5,809	590				11,671
Total																1,145,417

VIOLATIONS OF FISH AND GAME LAWS.

November 1, 1917, to February 1, 1918.

Offense	Number of arrests	Fines imposed
Game.		
Hunting without license	54	$825 00
Failure to produce license on demand	1	----------
Deer, close season, killing or possession	4	100 00
Female deer and fawns, killing or possession	3	100 00
Deer meat, close season, possession	7	100 00
Deer horns and skins, failure to produce	1	50 00
Quail, close season, killing or possession	3	75 00
Ducks, possession or shipping excess bag limit	6	50 00
Geese, possession or shipping excess bag limit	2	----------
Brant, possession or shipping excess bag limit	2	----------
Doves, close season, killing or possession	1	50 00
Grouse, close season, killing or possession	1	25 00
Wild pigeon, close season, killing or possession	5	100 00
Tree squirrels, close season, killing or possession	2	50 00
Nongame birds, close season, killing or possession	22	281 00
Shore-birds, close season, killing or possession	4	100 00
Taking song-birds with net	5	200 00
Night hunting	37	575 00
Shooting from power boat while in motion	5	60 00
Shooting at pheasants	2	25 00
Selling wild game without a license	3	20 00
Offering Bird of Paradise for sale	1	15 00
Possession mountain sheep heads and hides	2	100 00
Using an animal blind	1	25 00
Trapping fur-bearing mammals without a license	2	20 00
Total game violations	176	$2,946 00
Fish.		
Angling without license	10	$190 00
Fishing for profit without license	14	60 00
Trout, close season, taking or possession	7	160 00
Trout, taking other than by hook and line	1	----------
Trout, excess bag limit	2	50 00
Salmon, Saturday and Sunday fishing, taking other than by hook and line	8	650 00
Spot-fin croaker, offering for sale, close season	1	10 00
Catfish, offering for sale, undersize	1	20 00
Halibut, offering for sale, underweight	2	30 00
Abalones, close season, taking or possession, undersize, drying	40	900 00
Crabs, female, undersize	5	30 00
Clams, undersize, excess bag limit	11	350 00
Lobsters, undersize	5	90 00
Illegal fishing apparatus	11	300 00
Dynamiting fish	2	----------
Dried shrimps, possession	1	----------
Total fish violations	121	$2,840 00
Grand total fish and game violations	297	$5,786 00

SEIZURES—FISH, GAME AND ILLEGALLY USED FISHING APPARATUS.

November 1, 1917, to February 1, 1918.

Game.

Ducks	2,242	
Geese	815	
Brant	222	
Quail	89	
Doves	2	
Pheasants	100	
Wild pigeon	3	
Rabbits	51	
Sparrows	779	
Nongame birds	27	
Song-birds	344	
Deer meat	216	pounds
Bird nets	2	

Fish.

Striped bass	5,644	pounds
Salmon	3,967	pounds
Trout	100½	pounds
Black bass	9	pounds
Catfish	27¾	pounds
Halibut	270	pounds
Spot-fin croaker	30	pounds
Crabs	187	
Clams	1,972	
Abalones	1,454	
Abalones (dried)	197	
Lobsters	30	
Lobsters	37	pounds
Dried shrimp shells	500	pounds
Miscellaneous fish	21	pounds
Nets, traps and fishing outfits	27	

Searches.

Illegal fish and game	27

STATEMENT OF EXPENDITURES FOR THE MONTHS OF OCTOBER, NOVEMBER AND DECEMBER, 1917.

	October	November	December
General Administration.			
General administration	$1,827 46	$1,580 12	$1,697 49
Research, publicity and education	205 23	215 26	193 34
Printing		1,172 91	82 23
Fish exhibits	42 93	23 50	
Game exhibits	7 75		
Game farm	263 01	310 40	242 30
Mountain lion bounties	290 00	300 00	320 00
Lithographing hunting licenses			
Lithographing angler's licenses			895 00
Hunting licenses, commission and refunds	2,273 70	954 25	1,752 40
Angler's licenses, commission and refunds	742 70	1,214 15	1,463 20
Market fishing licenses, commission and refunds	48 50	82 00	93 50
Paper Mill Creek Dam	236 37		
Totals	$5,940 65	$5,852 53	$6,739 46
Patrol.			
San Francisco district	$5,740 54	$5,626 31	$5,296 37
Sacramento district	4,015 22	3,719 19	3,694 09
Los Angeles district	2,518 90	2,528 99	2,902 33
Launch patrol	599 73	836 80	1,523 70
Prosecutions—fish and game	182 25	213 40	174 55
Crawfish inspection	296 78		
Winter game feeding			
Accident and death claims	250 89	200 64	200 64
Tota's	$13,604 22	$13,125 33	$13,791 68
Department of Fish Culture.			
Hatchery administration	$808 64	$813 94	$799 98
Mount Shasta Hatchery	1,315 54	1,302 73	1,774 38
Klamath Station		8 40	125 00
Mount Whitney Hatchery	1,302 58	766 24	670 65
Rae Lakes Station	34 00		
Cottonwood Lakes Station			
Tahoe Hatchery	208 05	45 49	5 00
Tallac Hatchery	5 00	5 00	5 00
Marlett Lake-Carson Hatchery			
Fort Seward Hatchery	820 63	632 34	565 38
Ukiah Hatchery			
Snow Mountain Station			6 75
Brookdale Hatchery	77 35	71 53	161 90
Scott Creek Station	31 00	30 00	31 00
Almanor Station	16 35	5 00	5 00
Domingo Springs Station	52 14	17 20	9 00
Bear Lake Hatchery	421 14	555 98	246 50
Wawona Hatchery			
Yuba City Station			
Fish distribution	1,316 70	372 03	78 89
Fish transplanting	281 41	408 71	
Screen, fishway and water pollution	347 75	587 80	507 62
Special field patrol	222 82	275 78	64 10
Totals	$7,261 10	$5,898 17	$5,056 15
Commercial Fisheries Research and Patrol.			
Fishery research and patrol	$1,123 82	$1,379 89	$1,116 42
Grand tota's	$27,929 79	$26,255 92	$26,703 71
Department Engineering Launch "Albacore"		1,483 04	

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CALIFORNIA FISH AND GAME

"CONSERVATION OF WILD LIFE THROUGH EDUCATION"

Volume 4 SACRAMENTO, JULY, 1918 Number 3

CONTENTS.

A REVIEW OF THE KELP INDUSTRY.

By W. C. CRANDALL.

In the year 1910, the Bureau of Soils of the United States Department of Agriculture, called the attention of the public to the giant kelps lining much of the west coast of America. New requirements for fertilizers and an extending market had caused the Bureau of Soils to look for other sources of supply, and from information at hand at that time, it seemed that the giant kelps might prove to be such a source. More intensive study of the plant and the extent of its distribution confirmed the idea, and consequently a great industry is being developed.

The giant kelps along the coast of California are of these general types. The one more widely distributed and greatest in quantity is the *Macrocystis pyrifera* or ribbon-kelp. Plants of this species varying

from 25 to 100 feet in depth below the water, are found in beds along the shore where rocky ledges or loose rocks abound and to which the plants attach themselves by means of holdfasts. These beds occur usually in exposed places where the wave action is pronounced.

The plant itself consists of a holdfast or root-like structure which attaches itself to rocks at the bottom; stipes or stems, unbranched, which grow up from this holdfast until they, sooner or later, reach and spread out upon the surface of the water; and lamina or leaves which occur at intervals along the stipes, the intervals varying from 2 to 3 feet near the holdfast to a slight space near the growing end. The terminal leaf of the growing stem splits, a new terminal leaf forms and splits, and as the process continues, lamina along the stipe are increased; while by the elongation of the distance between lamina the total length of the stipe is increased.

The plant reproduces itself by means of spores which are developed in spore bodies located, usually, on leaves near the holdfast, although they are occasionally found on leaves near the tip of the plant. In this regard, Dr. R. P. Brandt, Botanist of the Scripps Institution, will soon be ready to publish some interesting observations made by him in his recent studies of *Macrocystis pyrifera*.

The beds of *Macrocystis* with which the California kelp industry is concerned extend along the coast from San Diego to Point Concepcion and about the islands offshore. During the last year the beds from San Diego to San Juan Point and about San Clemente, San Nicholas and Santa Barbara Islands were used by the Hercules Company, Swift & Company, and numerous handpickers; the beds about Long Beach and Wilmington were used by the Diamond Match Company, the Pacific Products Company, and the Sea Products Company; while in the Summerland region, the United States Experimental Plant, the Lorned Manufacturing Company, and the California Chemical Company were operating. The total amount of kelp used during the year was nearly 400,000 tons wet, the amount of potash (K_2O) per ton averaging about 1.5 per cent. With this were considerable quantities of iodine, nitrogen, and other by-products such as acetones and ketones.

The kelp is cut by harvesters which are very similar to grain-reapers, the notable feature being that reciprocals cut the plants 2 or 4 feet below the surface and the cut kelp is then carried up over the draper and deposited on the barge. Its treatment then varies according to whether it is to go through the "wet" or the "dry" process. Sometimes it is ground fine; sometimes it is cut into short lengths; and sometimes it is left in long strands. At the factory the kelp may be dried in large rotary driers, ground and made into fertilizer; or dried, incinerated, and then made into fertilizer; or, again, mixed with certain chemicals, permitted to ferment, and then broken up into different products by the processes of evaporation, crystallization, and fractionalization.

The last legislature placed the control of the kelp beds in the hands of the State Fish and Game Commission, and the scientific study of the plant in the hands of the Scripps Institution for Biological Research of

the University of California. At the same time, a tax of $1\frac{1}{2}$ cents per wet ton was levied, and a license, costing a fee of $10.00, was demanded of every company harvesting kelp. As soon as the Fish and Game Commission assumed control, the beds were numbered consecutively from San Diego along the coast to Point Concepcion and thence about the islands, and, in order that after being harvested a bed should have sufficient time to recuperate, usually about ninety days being required, a system of opening and closing of beds was worked out. This measure not only protects the bed from depletion, but assures the

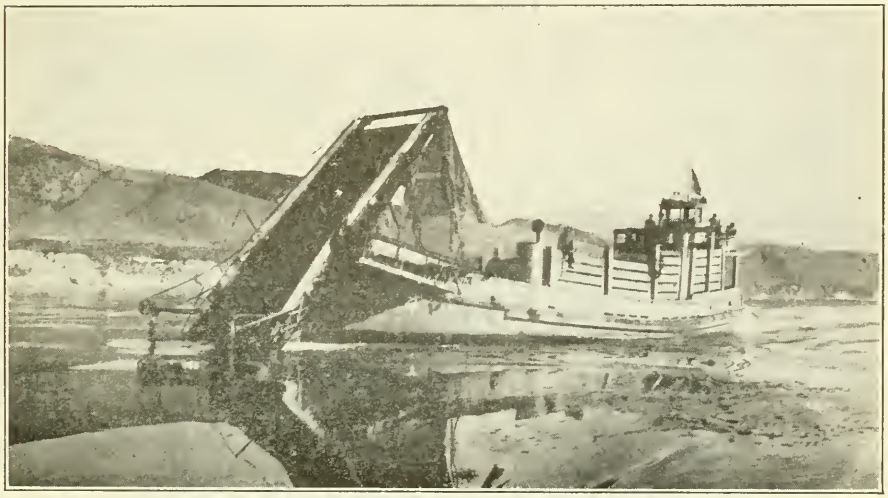

Fig. 56. Power kelp harvester at work off coast of southern California. Photographed by Edward E. Porteous.

maximum crop. The beds off Santa Barbara were closed for the use of the United States Kelp Experimental Plant. In opening the other beds, it was arranged so that the harvesting would not interfere with the beaches during the summer season, nor with unprotected beaches during the winter, it being the intention of those concerned to regulate the harvesting of kelp with as little inconvenience as possible to neighboring communities.

What effect the harvesting of kelp has on the fishing industry has been carefully studied by the U. S. Bureau of Fisheries, by the Scripps Institution and by many fishermen, and no injurious effect has been apparent as no fish eggs are found attached to the upper portion of the kelp plant and only this upper portion is cut. However, kelp-harvesters and fishing-gear in the same bed are not good companions, to say the least, and better co-ordination between the two industries represented is being planned.

THE GROWTH OF KELP.

By EDWARD PORTEOUS.

Studies of the life history and growth of kelp *Macrocystis pyrifera* are most fascinating, but this phase of the kelp problem has received very little attention from the industries dependent upon it. These, seemingly content with the fact that it does replace itself in time, have left the working out of its phases, environment, reproduction and growth to those scientifically inclined, who, in turn, look at it from an entirely different aspect from the manufacturer who is so dependent upon the plant as his source of revenue.

The harvesting of kelp over comparatively large areas has given some small insight into the life of the plant. This knowledge undoubtedly could be greatly increased if the state could appoint someone to take up this and many of the other problems connected with the comparatively new industry.

After the harvester has cut a bed clean, to the depth of four feet, the old kelp may be seen standing in an upright position with its growing ends cut off, looking not unlike a poplar tree. The kelp thus cut gradually lightens in color and appears to disintegrate and gradually disappear. This disintegration seems to start from the cut end and extend downward toward the holdfast, but usually before it has entirely disappeared from view it is hidden by the fresh shoots coming up from the rizomes.

Fig. 57. Growing ends of kelp (*Macrocystis pyrifera*). Photograph by Edward E. Porteous.

Variation in the character of a bed is often noticed. Bed No. 24 in 1916 showed unmistakable "lanes" of water or clear places, looking not unlike "roads" left by the harvesters; but examination showed no plants beneath the surface. These long lanes of clear water, which

were devoid of kelp, were about ten to twelve feet in width and were parallel to each other, and as a whole parallel to the trend of the coast. Two explanations of the phenomenon can be given: First, this condition might have been caused by the covering up of portions of the rocks to which the plant attaches its holdfast by the "sand waves" caused by the meeting of two currents, one from Santa Monica Bay, flowing southward, and the eddy current, near the shore, flowing northward. Second, geologically the land adjacent to this bed belongs to the Quaternary system, which all shows more or less deformation. The power of the sea which is derived chiefly from the winds, makes an effective eroding agent, and, since the land resists erosion, according to the coherence of the rock masses, the harder offering more resistance and the softer being moved by the onrush of the waves along the beach in the direction of the heaviest storms or prevailing winds, that which is fine enough is taken up by the water and deposited in quieter regions beyond the action of the waves. Owing to the deformation of the stratification of the land, and the upturned hard strata, following the configuration of the deposition, would present long, comparatively flat, parallel ridges upon which the plant might attach itself, while the "valleys" or softer portions between the harder strata, would be of such a nature that the plants, if attached, would break away, and thus leave voids in the continuation of the beds.

Another idiosyncracy of the same bed, which can be explained more easily by the first speculation given above, is seen in the fact that the following year these "waterlanes" had entirely disappeared and in their stead there had appeared a large oval-shaped clear patch, apparently devoid of kelp. This was a little farther northward and closer in shore, but it possessed the same general trend on its longer diameter as the "waterlanes." Undoubtedly the changes of the current had deposited a sort of "bar" of sand, which covered up the holdfasts, and the harvesters having cut their growing ends thus destroyed the plants in this area.

A noticeable fact in the growth of kelp is that the leaves are much longer and broader and the stipe or stem heavier and thicker in the kelp on the surface than is the case with the kelp that is always beneath the surface. Once on the surface the growth is greater, owing to the plant now being able by photosynthesis to build up plant material. The cells admitting the penetration of the various salts held in solution, more especially the potash, stimulate nuclear division, and cause the leaf to expand and likewise increase in weight. No doubt growth is aided by osmotic pressure also, as well as by the influence of the sun's rays.

Since all matter absorbed by the plants must pass through the cell wall, and since no solid material can be taken up as nutriment, the food, on entering the cell walls, must be either in a liquid or gaseous state. The cells not only allow the entrance of a fluid, but also some of the substances held in the solution. This free path of a solution, having crystalloids in suspension, is of vital importance in the upbuilding of the plant, and incidentally in the maintenance of a potash plant or factory, for without this tiny cell's power to absorb the potash from the ocean, America would be dependent upon the Strassfurt and various smaller deposits of crude salts, as before.

It follows that if a solution can enter into the cell, it would have first to pass through the protoplasm by way of the cell's wall; but living protoplasm, unlike its walls, gives permeability to all substances in solution in varying amounts, segregating certain crystalloidal bodies from others, according to conditions. This power of decision is not entirely limited to the outer protoplastic covering or membrane. The vacuole's wall has a similar distinction in its selective ability, and this selective power is so much greater than the osmotic pressures bearing on the cells that they often show great variation in chemical constituents and quantities to their surrounding medium. It seems remarkable that this medium containing three per cent of chloride of sodium, four one-hundredths of one per cent potash, and with the proportion of iodine so small that it requires more than 20,000,000 pounds of the sea water to furnish the kelp with one single pound of iodine, that we find that the cells of some of the plants select one and eight one-hundredths per cent potash, six-tenths of one per cent sodium, and three one-hundredths of one per cent iodine, in their fresh and natural state. These small

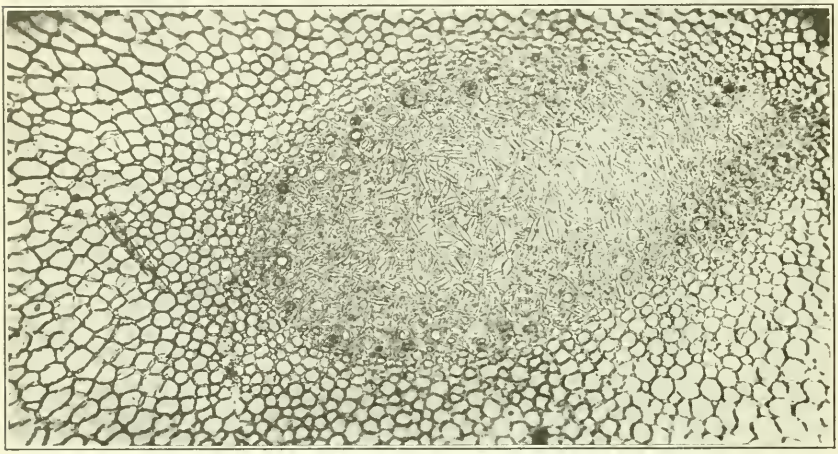

Fig. 58. Cross section of stem of kelp greatly enlarged, × 400. Photograph by Edward E. Porteous.

elementary substances are large when compared to the quantity of metals the sea holds in solution, and upon which the seaweed has some absorptive power. In the case of gold there is about one grain in every ton of sea water, yet kelp has been known to absorb twenty cents worth of this precious metal to the ton of green kelp. In the case of silver, there is about one grain to every six tons of sea water; but so far, except in the case of *Pocillopora alciconis*, analyses have not shown silver in the plants. Of the lesser metals, no doubt traces may be found. However, very little work has been expended in this direction.

The rate of growth and the growing period, or seasonal growth, are still mooted questions. While it is believed that kelp grows all the time, it appears that there are periods when the growth is more luxuriant. At least, this is borne out in the following observations. On bed No. 21, which undoubtedly has been cut over more than any single bed on the coast, and one which the writer has had under observation

for three years, we find there are two main growing periods about six months apart; the larger and better growth of the two being from July to September, the other one January to April, the winter period requiring a little longer, owing to cloudy weather. Dark days retard growth, while bright sunny days accelerate it, no doubt aided by the water being more or less obscured by the sand and silt from the rainy season and storms that agitate the shore line.

After the growing end is destroyed, or cut off, it takes about 170 to 180 days for the kelp to grow from the holdfast to the surface (the mean depth of bed No. 21 being seven fathoms). There is a constant growth of fresh shoots, about four to six feet under the cuttings, which can best be seen after a bed is cut over. If the cutters had cut lower than four feet under the surface of the water these shoots would have been destroyed and thus the appearance of the kelp on the surface would have been delayed. This same appearance of young kelp on a cut over bed can also be noticed on portions of bed No. 24, which owing to its greater variation in depth, is not as uniform in its fresh growth as the former bed.

A ten-foot length, floating on the surface at a falling tide was measured back under water to a depth of ten feet and cut in the endeavor to find the maximum number of leaves and their lengths on this twenty foot cutting. The results were as follows:

1st foot from growing end, 9 leaves, weighed 1 oz., longest leaf 12 inches and the diameter of the stipe just back of the splitting area was 3/32 inches
4th foot from growing end 5 leaves, weighed 3 oz., longest leaf 17 inches
5th foot from growing end 5 leaves, weighed 3 oz., longest leaf 19 inches
6th foot from growing end 5 leaves, weighed 3 oz., longest leaf 19 inches
7th foot from growing end 5 leaves, weighed 3+ oz., longest leaf 19 inches
8th foot from growing end 5 leaves, weighed 3¼ oz., longest leaf 19½ inches
9th foot from growing end 5 leaves, weighed 3½ oz., longest leaf 19½ inches
10th foot from growing end 5 leaves, weighed 3¾ oz., longest leaf 19½ inches
11th foot from growing end 4 leaves, weighed 3 oz., longest leaf 19½ inches
12th foot from growing end 5 leaves, weighed 3½ oz., longest leaf 20 inches
13th foot from growing end 4 leaves, weighed 2¾ oz., longest leaf 18 inches
14th foot from growing end 4 leaves, weighed 2¾ oz., longest leaf 18 inches
15th foot from growing end 4 leaves, weighed 2¾ oz., longest leaf 18½ inches
16th foot from growing end 3 leaves, weighed 2 oz., longest leaf 18½ inches
17th foot from growing end 4 leaves, weighed 2¼ oz., longest leaf 18½ inches
18th foot from growing end 3 leaves, weighed 2 oz., longest leaf 18½ inches
19th foot from growing end 3 leaves, weighed 2 oz., longest leaf 19 inches
20th foot from growing end 3 leaves, weighed 2 oz., longest leaf 20 inches

The diameter of the last foot of stipe was 9/32 of an inch. Plotting the above figures, we find that there is a wide discrepancy between the weight and the number of leaves up to the third foot. From here on, while the number of leaves per foot remains constant up to the tenth foot, the weight gradually increases up to the same division. From here on, the variation is very small; at the seventeenth foot the weight falls a little lower than the general average, the tenth foot marking the nodal point, from which on one hand, the growing end, the number of leaves and the weight per foot gradually approach from nothing, to about the fourth foot, where the number of leaves per foot remain constant up to the ten-foot or nodal point. From this point toward the holdfast, weights and numbers of leaves have about the same constant, rising and falling in unison.

The maximum number of leaves is at or near the third foot; while the greatest weight per foot is at the tenth. The size of the stipe follows

a close ratio to the width of the leaves; while, strange to say, the ratio between the length of the leaves and the weight, after the tenth or twelfth foot falls away. This, of course, can easily be explained by the fact that the number of leaves also decreases.

The weights and sizes of leaves of a section of kelp measuring forty-five feet were as follows:

1st 5-foot length	15 oz.,	largest leaf 20x4	inches,	stipe diameter	8/32, 40 leaves
4th 5-foot length	32 oz.,	largest leaf 24x4¾	inches,	stipe diameter	12/32, 28 leaves
5th 5-foot length	20 oz.,	largest leaf 25x4½	inches,	stipe diameter	10/32, 19 leaves
6th 5-foot length	13 oz.,	largest leaf 26x4	inches,	stipe diameter	9/32, 15 leaves
7th 5-foot length	8 oz.,	largest leaf 25x4	inches,	stipe diameter	8/32, 10 leaves
8th 5-foot length	5 oz.,	largest leaf 18x3	inches,	stipe diameter	8/32, 8 leaves
9th 5-foot length	3 oz.,	largest leaf 18x2¾	inches,	stipe diameter	8/32, 5 leaves

The third to fifth foot shows the most rapid changes in growth. Up to this point the plant as a whole develops in the same ratio. The most even tenor of the plant's life as far as growth is concerned is found between the fifth foot and that portion which just enters the water toward the holdfast; in other words it is in that floating portion on the surface of the water, and that portion of the plant just below the tidal influence, that the most rapid changes take place in the number of leaves and the weight per foot. The length of the leaf remains fairly constant until such a part is reached that, owing to the more or less transparent condition of the water, the natural growth of the leaf is affected.

The above measurements and weights are given simply as examples of growing kelp, and really are not sufficient in number nor collected from enough different areas or seasons of the year to arrive at a general conclusion.

ENEMIES OF KELP.

Now that we are utilizing kelp both as a source of revenue and as a raw material for manufacturing a commodity, we are jealous of the various forms of life that live upon the seaweed. Some are quite harmless in their habits; others more destructive, from our point of view.

A large trochid which feeds upon the kelp, although consuming such a small amount as to be negligible, yet clings to the plants in such great numbers at certain seasons of the year that it greatly affects the calcium content of the output. Some beds of kelp are more affected than others. Another calcareous tube worker, the *Spirorbis borealis,* easily mistaken for a small shell, is found sometimes so thick as to give the kelp leaves a bleached appearance, literally covering both sides of the fronds and extending over quite large areas, increasing the weight forty per cent. The *Trochiscus norrisi* mentioned above is very much heavier in proportion to the *Spirorbis,* but their number luckily is not as great, a square centimeter of the frond holding sixty to seventy *Spirorbis. Flustra membranacea,* a polyzoan, forming a gauze-like incrustation on the leaves and stipe and occupying irregular patches, sometimes nearly covering the whole frond, also increases the calcium percentage. These and many others, although in a lesser capacity, more or less affect the general chemical constituents of the plant.

So far only one gastropod, an acmæa, has been found to be really destructive to kelp. It really prefers an *Egregia* plant to a *Macrocystis,* but it is not above devouring the stipe to such dangerous proportions that it breaks off and is cast adrift at the first heavy swell or storm that passes.

THE MUSSELS OF THE PACIFIC COAST.*

By EDWARD P. RANKIN.

To most of those who have spent any time on the seashore, the mussels, clustered in balloon-shaped masses on the pilings of wharves or scattered in irregular groups on the rocks, are a familiar sight. It is the purpose of this paper to make these mussels more widely known, to introduce them to those people who have had no opportunity to make their acquaintance at first hand, and to make them, if possible, more interesting to those who have met them already.

We have, on the Pacific coast, two species of mussel: a small one, *Mytilus edulis,* and a large one, *M. californianus.* The latter-named

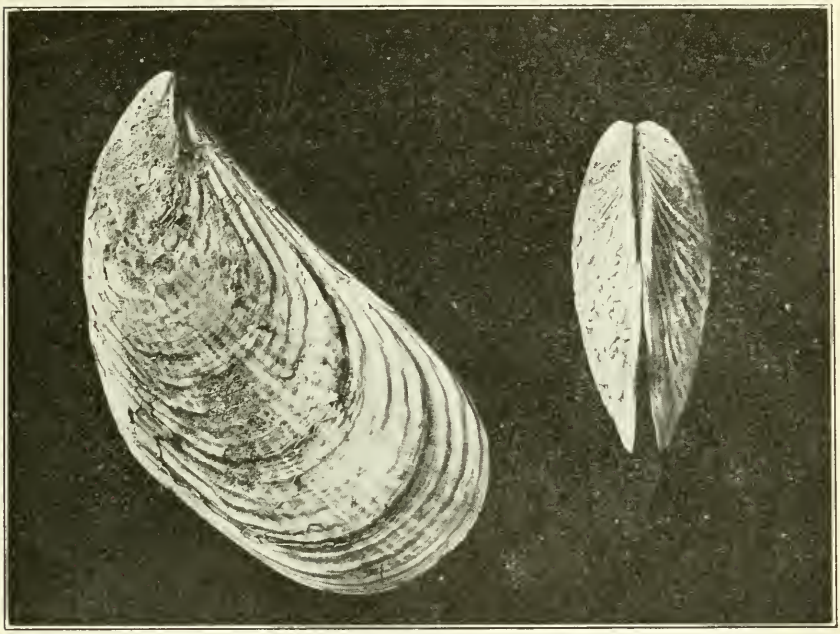

Fig. 59. Two common species of mussels found in California. Left, *Mytilus californianus,* a large form found along the entire coast; right, *Mytilus edulis,* a smaller variety restricted more largely to inlets and bays. Photograph by W. C. Mathews.

species, which can attain a length of ten inches, is known from Socorro Island (in the Revilla Gigedo group, about 250 miles south of Lower California) to Alaska; its shell has both radial and concentric markings, and varies in color from light brown to dark purple. This mussel likes the salt water of the open coast, where it clings to reefs and wharves. *M. edulis* rarely exceeds three inches in length and has a shell that is smoother (lacking the radial lines) and darker than that of *californianus.* It ranges from San Diego northward and prefers the more sheltered and brackish waters of inlets and bays such as San Diego Bay and San Francisco Bay.

*Printed by permission of the United States Bureau of Fisheries.

In structure the two species are very similar. Externally, there is the bivalve-shell, narrowed to the *umbo* or "beak" at the anterior end, and hinged at the "back" or dorsum by an elastic piece of cartilage-like substance that tends to pull the shell open (see fig. 60). Internally, the shell is lined with a membrane, called the *mantle*, for the protection of the animal within; the mantle bears the shell-forming glands that serve both to add to the size of the shell and to repair breaks (see fig. 61). During most of the year the mantle is a very thin-looking tissue indeed, but in the spawning-season it becomes greatly thickened and swollen by the eggs or the milt. On each side, between the mantle and the "body" of the animal are the gills, two layers of extremely delicate tissue; they can be distinguished from the mantle by reason of the very fine longitudinal lines which mark them.

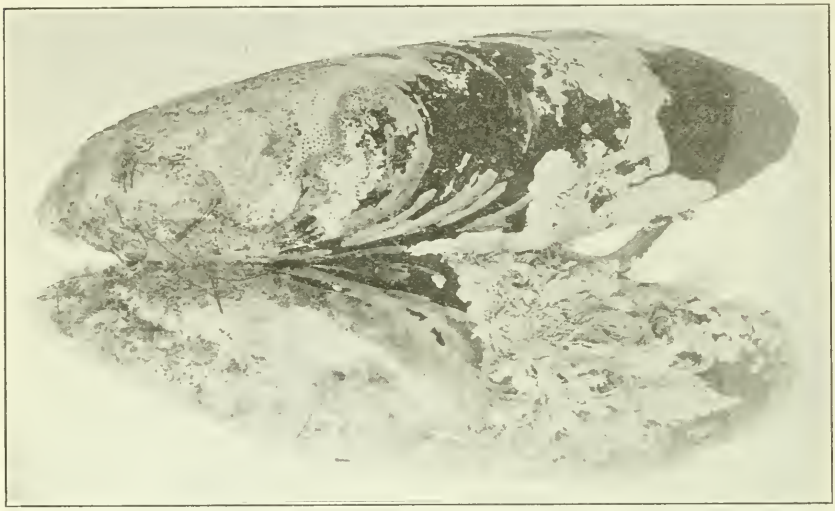

Fig. 60. Exterior of California mussel. Photograph by W. C. Mathews.

The "body" contains the digestive tract and bears the foot. In an opened mussel, one can see, at the anterior end, four leaf-like pieces of tissue growing out from around a slit-like opening; this opening is the mouth or labium, and the pieces of tissue surrounding it are the labial palps, which by their motion help to direct the food into the mouth. The remainder of the digestive tract is rather difficult to trace; its course will be merely outlined. From the mouth the food passes into the gullet, forward of the foot, and then into the stomach, which lies in a mass of dark-colored tissue, the so-called liver; the intestine passes back to the big posterior adductor muscle, around which it bends, then passes forward to the heart and back again to the muscle already referred to. Like other molluscs, the mussel has a closed circulatory system, with heart and blood vessels; it has also a very simple and primitive nervous system. The tongue-like foot is the organ of locomotion during the juvenile period; it contains the byssus gland, which will be referred to more fully farther on.

Finally, there are three sets of muscles which can be found more or less readily. First, there are the adductor muscles with which the animal closes his shell; one of these, the posterior adductor, is the large muscle which must be cut before the shell can be opened; the other, the anterior adductor, is a small muscle at the anterior end. Then there are the muscles which protrude and retract the foot; these are fastened "fore and aft," some of them lying parallel to the hinge; the outlines of the posterior retractors are shown in the photograph (fig. 61). Lastly, the fine pallial muscles serve to attach the mantle edge to the shell.

When the soft parts have been removed, one can see, on the inside of the shell, the "scar" where the posterior adductor muscle was attached, and the pallial line which marks the region of the edge of the mantle.

Fig. 61. Interior of California mussel showing body structure. Photograph by W. C. Mathews.

It is not yet known when the Pacific coast mussels spawn. Dealers believe that spawning takes place as early as April or May, but at San Diego, in 1917, the mussels certainly were not in spawning condition before the latter part of July. However that may be, the resulting young mollusks are able to swim about within a very few hours. They continue to be free swimming (or, to express it more explicitly, they are carried about by the tital currents) for about four or five days. At any rate, this is what Dr. Field (1909) reports for the Atlantic coast mussels, and it is likely that ours behave in much the same fashion.* The young then grow a shell, begin crawling over solid objects by means of the foot, and at last attach themselves to something solid. The attaching threads, constituting the *byssus*, or "beard," are produced by the byssus gland previously mentioned. These threads are

*Field, Irving A. 1909. Food value of sea mussels. Bull. U. S. Bureau of Fisheries, vol. 29, pp. 85-128.

probably of a glue-like consistency at first, but harden into the firm, stiff fibers which hold the mussel so securely to his perch.

From now on, the mussels are practically settled for life; doubtless they can shift about in a very limited area on the object to which they are fastened, but their days of "roving" are ended.

Owing to the precariousness of their existence, of the countless numbers of young that are produced each season comparatively few live to maturity and to "ripe old age." At the beginning, many probably fall prey to small fishes and to other carnivorous creatures; many doubtless succumb to the lack of food, while still others may fail to find suitable places for attachment. Those that succeed in becoming fixed are still exposed to attacks from carnivorous inhabitants of the sea. Their worst enemy on the Pacific coast is the starfish, which has been known to destroy immense mussel beds in a short time.

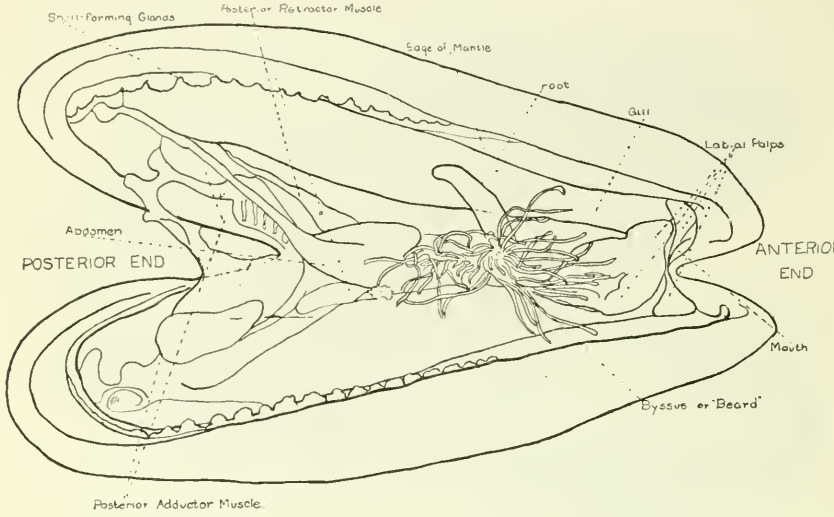

Fig. 62. Diagram showing the interior structure of a California mussel.

Members of the species *californianus* mature in about two seasons, and in that time attain a length of from two to four inches. At the Scripps Biological Station, near La Jolla, a concrete pier was put down in November, 1915; in July, 1917, two seasons later, most of the piles were thickly clustered with mussels, some of which were four inches long. It is not known what the life of the mussel is, but it probably is six or seven years at least, and possibly longer.

As is the case with other mollusks closely related to it, for instance, the clam and the oyster, the mussel swallows everything that comes his way. He simply opens his mouth, lets the sea water enter, and then proceeds to digest and to assimilate whatever there may be of value as food. The water teems with organisms that are microscopic in size; among them are the diatoms, which are one-celled plants, and many species of protozoans or one-celled animals. These constitute the bulk of the food of mollusks like the mussel. It has been demonstrated that diatoms constitute 98 per cent of the bulk of the food of the oyster, and the mussel likely uses about the same quantity of diatoms in its diet. To be sure,

undesirable substances, as well as desirable ones, find their way into the mussel's digestive tract, for the mussel has no power of selection and everything that is small enough is taken in with each swallow of water. For this reason, there is danger in eating mussels which have lived in polluted or stagnant waters, because disease germs and poisonous substances may be harbored in the animal's body. But there is no danger from this source when the mussels are taken from the clean sea water of the open shore.

Sporadic cases of poisoning have occurred on the Pacific coast and elsewhere. Though many have been attributed to ptomaine, their cause is not definitely known. The evidence goes to show that, in most of these cases, the mussels had been gathered from high up on the rocks, either during or immediately following a period of hot weather. Because of this, during the summer months one should not eat mussels unless they have been taken *from under the water*.

For a long while fresh mussels have been on the market in a few of the restaurants, though in limited quantities. It is only within the last few years that any attempt has been made to can them on the Pacific coast. Their preparation for the market involves no little labor and considerable handling. It was our privilege, a short time ago, to watch the process of getting mussels ready for the San Francisco market. These mussels were of the small species, *M. edulis*, taken in the bay.

Put into deep, wire-bottomed trays, they were washed thoroughly to remove the mud and silt adhering to the shells. Then they were transferred to narrow wooden vats, where they were "worked," much as mortar is worked, by two men with hoe-like rakes; this process serves to separate the mussels one from another and to remove many of the barnacles from the shells. From here the mussels were hauled to a shed in which was a long table, on which they were dumped; then, taking one mussel at a time, the men went through the whole pile, throwing out broken shells and dead mussels, and with flat iron bars knocking off the remaining barnacles. The fresh mussels, washed and cleaned, were then ready for market.

For canning purposes, the perliminary process is practically the same as that just outlined. Having been cleaned, the mussels are placed in trays in an oven or a retort, and heated till they open. The meats and the liquor are placed in cans which, after being sealed, are put into the retort again and subjected to steam heat for a certain sufficient length of time to cook the mussels and to sterilize the contents of the cans. They are then ready for the market.

Both fresh and canned mussels can be prepared for table use as readily and as quickly as can oysters. They are wholesome, nutritious and deliciously flavored; moreover, they are as cheap a food as can be had in these days of increasing expenses. Several packers in California are making preparations to begin the packing of this food, hitherto unutilized, and it is hoped that before another year has gone by the mussel will be a staple and "standard" article of diet.

THE MACKEREL AND MACKEREL-LIKE FISHES OF CALIFORNIA.*

By EDWIN CHAPIN STARKS, Stanford University.

The group composing the mackerel and mackerel-like fishes is commercially one of the world's most important groups of fishes containing as it does the true mackerel of the Atlantic coast and the albacore of the California coast. Only the herring group surpasses it in value. It contains some of the swiftest fishes that swim as well as some of the largest. Most members of the group are built for speed, the fins folding into grooves in the body, the mouth and gill covers fitting tightly and smoothly, and with no projections on the head or body to break the continuous curves. The contours are said by nautical engineers to be perfect for passage through the water with the least resistance. But among these fishes are many variations of form of body, some of which are not at all adapted to swift swimming.

Usually the head is sharp, the tail slender and with a widely forked caudal fin, the scales very small and thin, and the color silvery and metallic. Usually the dorsal and anal are elevated to a point in front with the outline just behind the point concave. Many of them have the pectoral fins scythe-shaped, and most of them have a keel on each side of the tail.

These fishes are closely related to the bass-like fishes. Though differing from them very much in the extremes they grade into them, on the other hand, so that they can be separated only arbitrarily.

Among the mackerel-like fishes are several pelagic fishes or fishes of the high seas, that are occasionally taken on our shores, but so rarely that there is little reason for including them in a report of this character.

GLOSSARY.

Air bladder: A thin walled sac lying in the upper part of the abdominal cavity.

Anal fin: The fin on the lower side of the body. Sometimes in two parts but never paired (two side by side).

Caudal fin: The tail fin.

Compressed: Said of the body when it is flattened from side to side.

Dorsal fin: The fin on the back, often divided into two fins, the first usually of stiff spines and hence called spinous dorsal.

Finlets: The little detached fins behind the dorsal and anal in the mackerels.

Keel: The sharp projecting ridge at the side of the tail.

Maxillary: The flattened bone bordering the mouth above.

Pectoral fin: The uppermost of the paired fins. Situated close to the gill opening.

Ventral fins: The paired fins on the lower part of the breast, close under the pectorals in these fishes.

*A report of the Committee on Zoological Investigations of the State Council of Defense.

Families of the Mackerel and Mackerel-Like Fishes.

Small finlets follow the dorsal and anal fins. A projecting keel on each side of tail (except in *Scomber*). Ventral fins present. *The Mackerels* (*Family Scombridæ*) page 119.

No finlets follow the dorsal and anal fins. A projecting keel or ridge on each side of tail. Ventral fins present. *The Yellow-Tail and Horse-Mackerel* (*Family Carangidæ*) page 124.

Upper jaw prolonged into a sword. A pair of long single rayed ventral fins present. *The Marlin-Spike Fishes* (*Family Istiophoridæ*) page 126.

Upper jaw prolonged into a sword. No ventral fins present. *The Swordfishes* (*Family Xiphiidæ*) page 127.

A single long dorsal and anal fin without sharp spines. Body deep and compressed. No ventral fins. *The California Pampano* (*Family Stromateidæ*) page 128.

THE MACKERELS.

(*Family Scombridæ.*)

In this family are the mackerel, bonito, skipjack, albacore, and Spanish mackerel. All but the mackerel (*Scomber*) have a keel-like projection on the side of the tail with sometimes a pair of small ones. *Scomber* lacks the keel in the middle of the side but has a pair of small ones on each side. Most of the mackerels have very small scales. In some of them these are enlarged and crowded together at the front of the body in a corslet. In all of them the dorsal and anal fins are followed by detached finlets. The caudal is widely forked and the tail exceedingly slender. The color is usually metallic steel-blue and bright silvery.

The Mackerel (Scomber japonicus).

The mackerel has a high, triangular first dorsal fin with 9 or 10 spines. It is separated by a considerable space from the second dorsal, which is much lower. The anal is similar to the second dorsal and is a trifle behind it. Both dorsal and anal fins are followed by 5 or 6 finlets.

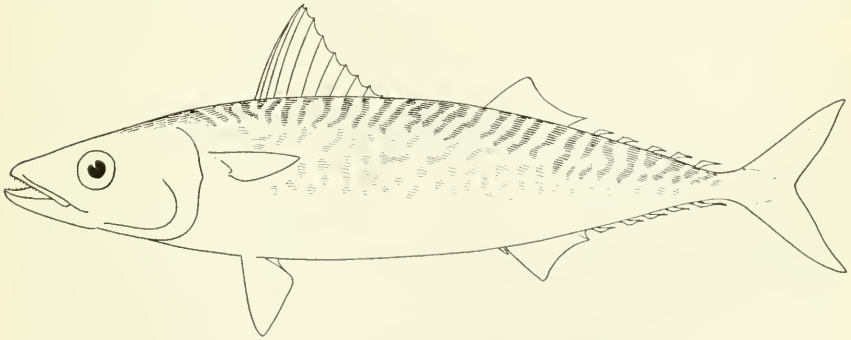

Fig. 63. The mackerel (*Scomber japonicus*).

The pectoral fin is rather short, or about as long as the distance from the eye to the gill opening. On each side of the tail are a pair of keel-like projections. The color most readily distinguishes the mackerel from its relatives. It is blue above and silvery below, with many crooked, blackish bars extending downward from the back to the middle

of the side. The lower part of the side is usually more or less mottled with dusky blotches.

In California, though we call this fish the mackerel, without differentiating it from the true mackerel of the Atlantic, we must remember that it is a very different fish. It differs particularly in having an air bladder which is entirely lacking in the true mackerel. Its dark bars are not so clearly cut, and it has a larger eye. The true mackerel has no dusky mottled spots on the lower part of the side, and there are several other differences.

This mackerel is widely distributed over the Atlantic and Pacific oceans, being found north to England, Maine and San Francisco. It is common in the Mediterranean and in southern California. It may be that more than one species is found in this wide range, but no one has as yet found any characters that are constant enough to separate it. It is known as the chub, or thimble eyed, or tinker mackerel on the East coast. It is somewhat inferior to the true mackerel, but nevertheless it is a good and important food fish, particularly good broiled or baked, and attention is now being directed towards canning it, or salting it in wooden kits as the Eastern mackerel is. Recent Atlantic coast quotations (early May) list this fish under the name of tinker mackerel at from 28 cents to 35 cents a pound in the wholesale market. It retails in California at 10 cents a pound.

(The Spanish Mackerel (Scomberomorus sierra).

The Spanish mackerel may be known by the long slender body, the teeth flattened and dagger-shaped, the spinous dorsal long and with little space between it and the second dorsal, and particularly by the spots on the side of the body. The maxillary reaches to below the hind

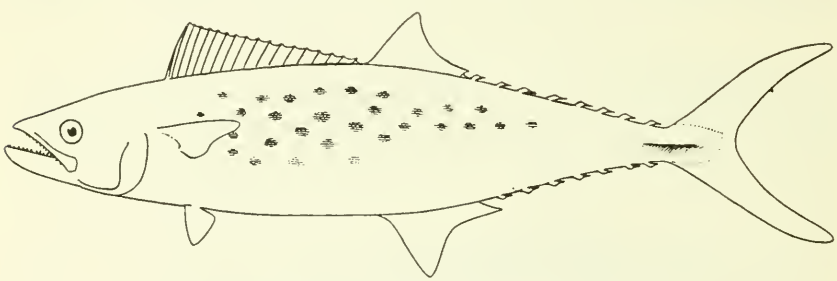

Fig. 64. The Spanish mackerel (*Scomberomorus sierra*).

border of the eye. The length of the head is equal to, or exceeds but little, the greatest depth of the body. It has 9 finlets behind the dorsal and the anal. The color is silvery on the side and lower parts and dark blue on the back. On the side are five or six rows of elliptical spots of bluish or dull orange color.

This fish is common on the Pacific coast of Mexico and has been reported in some abundance off San Diego. It is hoped that when it is next seen within our waters its occurrence may be reported to the Fish and Game Commission in San Francisco and if possible a specimen saved.

On the Atlantic coast is a Spanish mackerel that is very close to ours, if not identical with it, that is valued among the very best of food fishes. The name Spanish mackerel has been applied to various mackerel-like fishes, but this and the next are the only ones on our coast that should be so called. In England our common mackerel is called Spanish mackerel, and in California the oceanic bonito is also sometimes given that name.

The Monterey Spanish Mackerel (Scomberomorus concolor).

This fish resembles the last (*S. sierra*) in general characters, but it may be most easily distinguished from it by the sides having only two series of spots (female) or none at all (male).

It appeared in Monterey Bay nearly 40 years ago and for a few years was taken in some abundance, appearing each year in September and staying only a couple of months. It commanded a high price in the market. Since that time it has never been reported, nor is it known from any other locality. If ever taken specimens should be preserved in formalin (1 part formalin, 15 parts water) and sent to the Fish and Game Commission.

The Skipjack (Sarda chilensis).

This species is rather slender, though less so than the Spanish mackerel. It may be known by the narrow dark stripes on the back that do not follow the outline of the back but run obliquely back and slightly up from the side. The lower ones run from the region of the

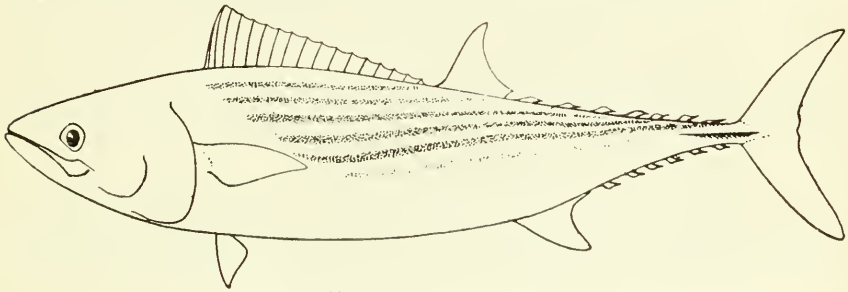

Fig. 65. The skipjack (*Sarda chilensis*).

pectoral to the upper part of the tail and the last dorsal finlets. The front of the anal is behind the second dorsal. The pectoral is short and its length is about equal to the distance from the eye to the gill opening. The length of the head is greater than the depth of the body. It has seven or eight finlets behind the dorsal, and six or seven behind the anal.

The skipjack is found in abundance in summer on the California coast and is known as far northward as Puget Sound. It is common along the South American coast and in Japan. It reaches a length of three feet and its flesh is dark red, oily, and rather coarse.

The Tuna, or Tunny (Thunnus thynnus).

The tuna, or leaping tuna of the anglers, may usually be known by its great size, but size can not be altogether relied upon to distinguish it. It is a deep, thick, heavy-bodied fish, with a pectoral fin shorter

than the length of the head and without conspicuous stripes on the body. The color is deep blue on the back but with greenish reflections,

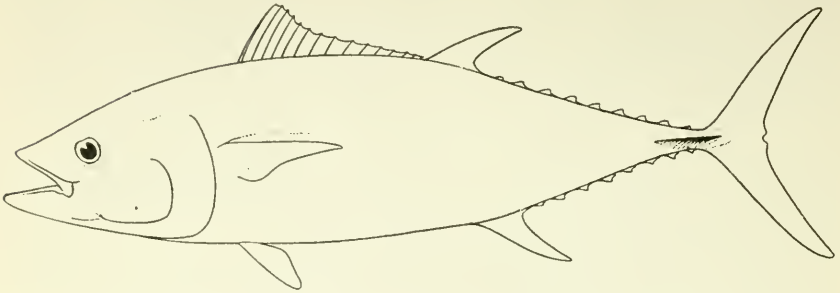

Fig. 66. The tuna (*Thunnus thynnus*).

and the lower parts are silvery. When freshly caught it is very brilliant with a play of metallic colors. It is sometimes canned with the albacore under the same label, and is said to be equally good. Or perhaps it is better to say that it is canned under its own label, for the albacore is, unfortunately, canned under the label of tuna.

This fish is found in all warm seas, occurring as far north on our coast as San Francisco. It is known as the tunny on the Atlantic coast. The name we apply to it, tuna, is the name that is current in the Mediterranean. In the Atlantic it is reported to reach a weight of 1,500 pounds, and individuals weighing a thousand pounds are not very rare. None is recorded on the California coast nearly that large. The largest taken with hook and line weighed only 251 pounds. The tuna is probably the hardest fighting marine fish that is classed as a game fish. Devoted to its capture under certain regulations as to light tackle is the Tuna Club of Santa Catalina Island.

The Yellow-Finned Albacore (Thunnus macropterus).

This species, like the albacore and tuna, is a heavy-bodied fish. It may be known by its pectoral, which is shorter than in the albacore and longer than in the tuna. The pectoral reaches nearly or quite to

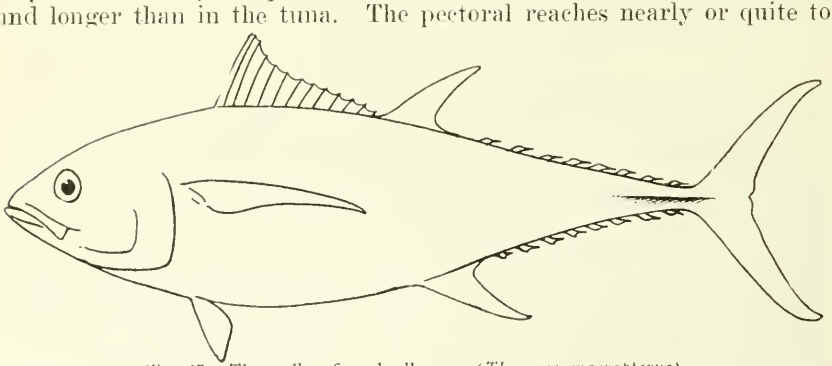

Fig. 67. The yellow-finned albacore (*Thunnus macropterus*).

the front of the anal fin, but not past it as in the albacore. The fin is longer than the length of the head. There are no conspicuous stripes on the body. The soft dorsal and anal fins are higher than those of the albacore, and the finlets are lemon-yellow.

This fish is common in Japan, somewhat less so than in the Hawaiian Islands, and at times is reported to be not rare about the Santa Barbara Islands. It is not common enough to be of commercial importance, though a game fish of note.

The Albacore (Thunnus alalunga).

The albacore may be known at once from all of the other mackerels by the great length of the pectoral fins, which reach considerably past the front of the anal, and are about two-fifths of the entire length of the fish. It is dark steel blue on the back shading to silvery below.

It is found in all warm seas and at certain seasons is common on the California coast, in Japan, and in the Mediterranean. On our Atlantic coast it is rare. On the California coast it occurs as far northward as San Francisco, though it has not been taken in abundance north of the Santa Barbara Channel. It is a fish of the high seas, and is not found

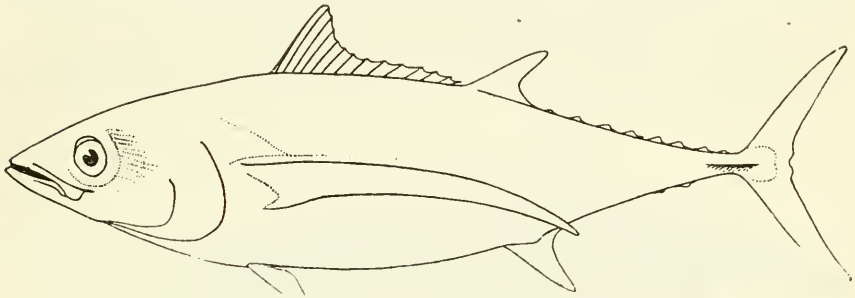

Fig. 68. The albacore (*Thunnus alalunga*).

in sheltered bays and rarely near shore. Its food is anchovies, sardines, squid, and small free-swimming fishes generally. It is most abundant from May to December, though it is taken in small numbers in other months. Nothing is known of its spawning habits or spawning grounds as yet on our Western coast. Individuals have been taken up to 70 or 80 pounds in weight, though the average is about 20 pounds. Very small ones are rarely seen on the California coast, though it has been taken as small as two or three pounds in weight. Once an entire school of small ones was reported.

As a food fish it has been little appreciated in America until within a very few years, when, canned under the name of tuna, it quickly became the most important fish in our state. This position it held until last year, when the sardine took the place of first importance. In Japan it is eaten raw.

Though the albacore is taken in abundance the demand is greater than the catch. Perhaps when some method of netting it is invented the catch may be greater. Now it is taken only by hook and line. In the commercial fisheries it is attracted to the boats by a process known as chumming.* It is trolled for by power boats, and when a "strike" is made quantities of live anchovies, sardines or other fishes are thrown overboard with the hope of attracting the school of albacore to the boat. If the school appears fishing begins with strong, short poles, short lines

*The term chumming is used on the Atlantic coast when ground bait or pieces of salt fish are used to attract a school of fish about the boat. Here it seems to be restricted to the use of live bait.

and barbless hooks baited with small fish. There is little sport in this sort of fishing and much hard work, for the albacore, if biting at all bite at once, and are lifted straight out of the water by main strength, shaken from the hook onto the deck and the hook at once baited again. Thus each fisherman may land a fish every minute or so. It is related that three men once averaged a ton each in a half hour. But the albacore is very erratic in taking the hook, or in appearing at all, or when biting well may suddenly stop, so that the catch is uncertain.

In an old book on English fisheries (W. Yarrell) I note that on the coast of France this fish is caught abundantly at a depth of 80 fathoms; that it rises to the surface to pursue flying fishes, but that fishermen take few except at great depths. This is interesting in light of the fact that ours are practically all taken at the surface. Experimental fishing may show that ours may also be taken at a depth, perhaps at times when they can not be taken otherwise.

The Oceanic Bonito (Euthynnus pelamis).

This species may be recognized by four or five dark stripes on the lower part of the side that are parallel with the lower outline of the

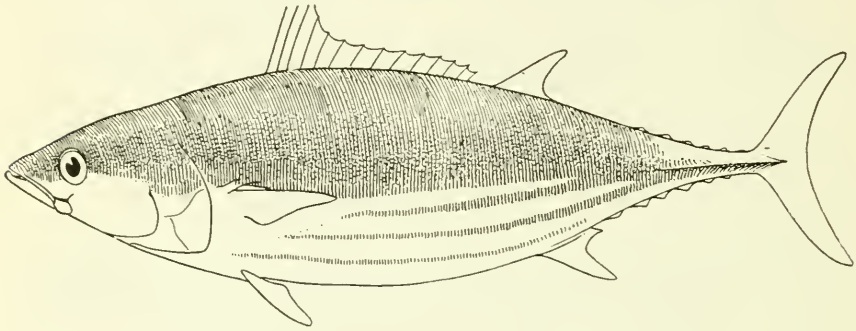

Fig. 69. The oceanic bonito (*Euthynnus pelamis*).

body. The back is bluish and the belly silvery, while the stripes are brownish or coppery color. The general shape of the body is similar to that of the albacore and tuna.

This fish is sometimes called skipjack by anglers, but *Sarda chilensis* has a better right to that name. Probably this confusion has arisen because both of these fishes have stripes, but the stripes on the skipjack are on the back and are not parallel with the outline of the body, while on this fish they are on the lower part of the body and are parallel with the outline.

The oceanic bonito is found in the warmer parts of the Atlantic and Pacific oceans. It is reported to be frequently taken about the Santa Barbara Islands.

THE YELLOWTAIL AND HORSE MACKEREL.

(Family Carangida.)

This is a large family especially well represented in tropical waters. Two only are found commonly within our limits. Among them are the pampanos (not the California pampano, which is a butter-fish) the cravelles, the pilot fishes, the horse mackerels, the yellowtails, and many

others. The tail is slender and the caudal fin forked. In both of our species there is a keel (though slight in the yellowtail) on the side of the tail, and no dorsal or anal finlets are present.

The Yellowtail (Seriola dorsalis).*

This fish is covered with small scales, some of them being on the cheek just behind and below the eye. The pectoral fin is rather short, about half as long as the head, and does not reach past the ventral fins. It has a slight ridge-like keel on the side of the tail, but this is much less developed than in the bonito or albacore. The first or spinous dorsal is considerably lower than the second. The front of the anal fin is a considerable distance behind the front of the dorsal and behind the middle of the body. The color is bright steel blue above and dull silvery on the side and lower parts. A yellowish irregular band extends along the side. The caudal fin is a dull yellow.

This fish is found from the southern California coast southward along the coast of Mexico. The largest one recorded weighed 60½ pounds, and

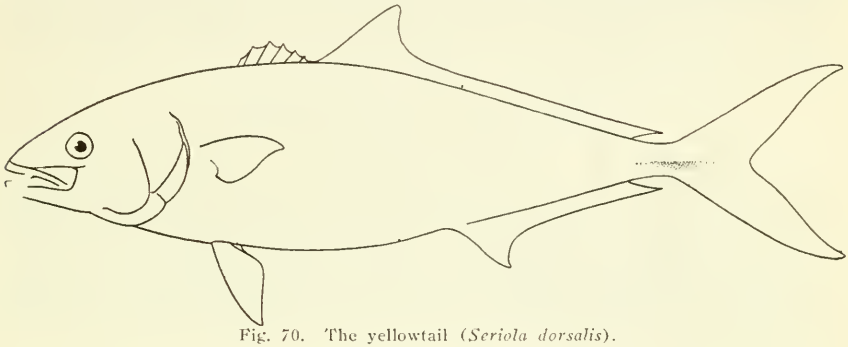

Fig. 70. The yellowtail (*Seriola dorsalis*).

this was taken with light tackle (Tuna Club record). The yellowtail is an excellent food fish and abundant enough to be of considerable importance. It is now being canned to some extent. As a game fish it has long been famous and it holds an important place in the affections of the angler.

The Horse Mackerel (Trachurus symmetricus).

The horse mackerel may be known by its having a row of vertical bony plates along the side. Above the pectoral fin this row is rather high on the side, but under the front of the second dorsal it bends down and runs straight along the middle of the side to the tail where it forms a sharp bony keel. Southward along the Mexican coast are other species with this row of bony plates, but this is the only one found within our limits.† The lower jaw projects slightly past the upper one, and the maxillary extends to under the front of the pupil. The first

*Related to the yellowtail is the pilot fish (*Naucrates ductor*). It is not given a place here because it has been taken only once or twice on our coast. It has a much lower spinous dorsal, wider keel on the tail, and smaller mouth than the yellowtail has. About five broad dark bars extend from the back to the lower part of the body.

†In 1858 another species (*Caranx caballus*) having these bony plates was taken at San Diego, but as it has not since been seen so far north it is not included here. It is common in the tropics and may be found again, so any fish besides the horse mackerel with bony plates forming a keel on the tail should be preserved.

dorsal is high and triangular, and has about eight spines. The front of the second dorsal and anal are high and pointed. The anal is preceded by two strong spines and is behind the front of the second dorsal.

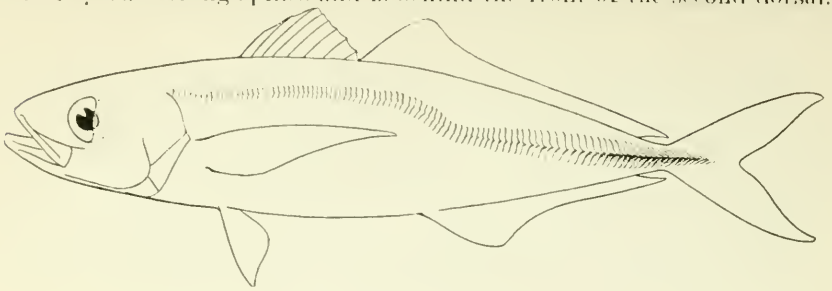

Fig. 71. The horse mackerel (*Trachurus symmetricus*).

The pectoral fin reaches to or a little past the anal spines. The back is greenish shading downward to silvery on the lower parts.

The horse mackerel is found abundantly from San Francisco southward. As a food fish it is inferior to the mackerel, being rather coarse fleshed. Little has been done in preserving it.

THE MARLIN-SPIKE FISHES.

(*Family Istiophoridæ.*)

In this family are the sailfishes (*Istiophorus*), and spearfishes of the Atlantic, and the marlin-spike fishes of the Pacific. The spearfishes and marlin-spike fishes belong to the same genus (*Tetrapterus*) though of different species. The fishes of this family differ from the true swordfishes in having small granular teeth in the mouth, in having ventral fins, and in having two keel-like projections on each side of the tail.

The Marlin-Spike Fish (Tetrapterus mitsukurii).

This species may be known by its upper jaw being prolonged into a "sword" together with its having long ventral fins composed of one ray each. The first dorsal fin is high in front where it rises to a point,

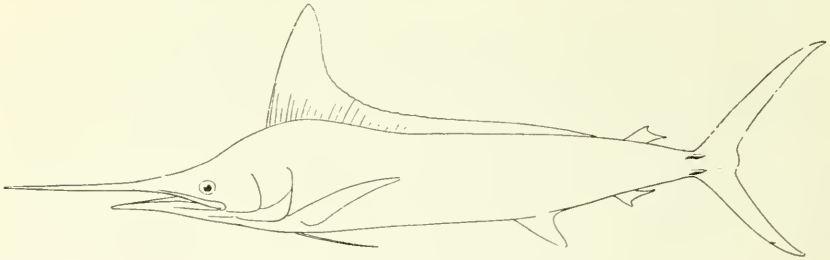

Fig. 72. The marlin-spike fish (*Tetrapterus mitsukurii*).

and is as high or a little higher than the depth of the body. The dorsal quickly becomes lower and runs for nearly the whole length of the back as a low fin, gradually growing lower and disappearing. The second dorsal is small and short; the front of it elevated to a point. The pectoral fin is about as long as the dorsal is high. The anal fin is divided

into two parts, both parts with the front elevated as in the dorsals. The first anal is about three times as high as the second, which is a little in front of the second dorsal. The sword is not sharp edged but rounded, and the point of the lower jaw reaches nearly half of the distance from the eye to the tip of the sword. The body is crossed by narrow light stripes extending down from the back.

The marlin-spike fish reaches a length of 12 feet or more. The largest one recorded by the Tuna Club taken under their specifications of light tackle weighed 340 pounds. It is now known only from Japan and the California coast, though this range will doubtless be extended when other localities are known.

Much controversy is carried on among anglers as to whether this fish may or may not be called a swordfish. It would appear that the catching of anything that bears the name of swordfish carries with it more glory than the catching of a marlin-spike fish, though I believe it is conceded that the latter is the greater fighter. If that be true why not let it stand on its own merits? The name marlin-spike sword fish being too long and somewhat ambiguous in that the sword is twice referred to, the angler has left off a very descriptive part of it and calls it the marlin swordfish, though marlin without the spike obviously means nothing at all in this connection. As this fish belongs to the same genus as the Atlantic spearfish it would be consistent to call it the Pacific spearfish. However there are, unfortunately, no rules or laws governing the use of common names so there is no reason why this fish should not be called a swordfish if it is sufficiently distinguished from the fish that has the best right to the name.

On account of anatomical differences the swordfish is placed in one family and the marlin-spike fishes, the spearfishes, and the sailfishes in another, thus indicating that the last three are more closely related to each other than they are to the swordfishes. The angler apparently objects to placing this fish in a family separate from the swordfish chiefly because it seems to rob him of his right to call it a swordfish. But considering groups higher than families they are all grouped together in a superfamily—marlin-spike, sail, and swordfishes—and spoken of as "the swordfishes." That is a zoological license for considering the marlin-spike fish a swordfish.

On the southern California coast there is a little fish that has the lower jaw prolonged into a sword. It does not exceed a length of seven or eight inches, and is often called the little swordfish. And that is an equivocal license for calling the marlin-spike fish a swordfish, for the little swordfish is not at all related to the big one.

THE SWORDFISHES.

(Family Xiphiidæ.)

In this family is the swordfish, cosmopolitan in its distribution. Only one species is now recognized. But these large fishes have not been very carefully studied owing to the lack of carefully made and accurate descriptions, and to the impossibility of preserving fishes of such size. It is not improbable that future study will reveal more than one species. Teeth are present only in the young. The ventral fins

are entirely wanting, and even the internal bones (pelvic girdle) for their support. On each side of the tail is a wide projecting keel.

The Swordfish (Xiphias gladius).

Called broadbill swordfish by anglers. The upper jaw is prolonged into a much longer sword than in the marlin-spike fish. The lower jaw does not reach over a quarter or a fifth of the distance from the eye to the tip of the sword. The sword is flattened and sharp edged. The first dorsal fin is high, curved and short, being much higher than it is long. The second is very small and is back on the tail; its height is less than the diameter of the eye. The anal is also divided into two parts. The first anal resembles the first dorsal in shape, but is much

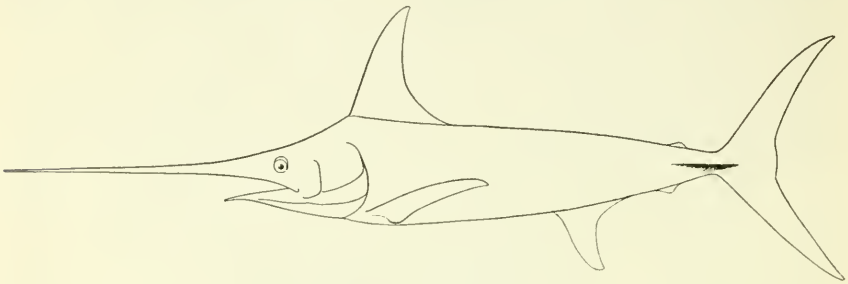

Fig. 73. The swordfish (*Xiphias gladius*).

smaller and situated behind the middle of the body. The second anal is a little in front of the second dorsal. The pectoral fins are about as long as the height of the first dorsal. The body is metallic purplish in color above and dusky below. It has no cross bars of color.

In the young the dorsal and anal are each continuous as a single long fin, but as the fish grows older the central part of the fin disappears leaving only the two ends.

The swordfish is the object of extensive fisheries on the Atlantic coast, where from 3,000 to 6,000 are taken every year. On our coast it is regarded more as a game fish than as a commercial fish, though the few that are caught find a good market. It reaches a weight of over 600 pounds. In the Tuna Club handbook for 1917 the largest recorded taken with light tackle weighed 362 pounds, but I believe that record has since been very much beaten.

The swordfish is the swashbuckler of the sea, attacking with ready sword everything that floats. It must not be confused with the sawfish, which belongs to the group of sharks and skates.

THE BUTTER FISHES.

(*Family Stromateidæ.*)

Belonging to this family are the butter fishes, or harvest fishes of our Atlantic coast, and the so-called pampano of California. They are only distantly related to the mackerel group, but more nearly related than to any other group that will be treated of in these papers, and so are here included. The family is represented in California by one species. It has no separate first, or spinous, dorsal, and no ventral fins. The body is deep and thin (compressed).

The California Pampano (Palometa simillimus).

The body is compressed and deep; about half as deep as it is long without the caudal. It is covered with fine scales. The profile of the head is rounded and with a blunt curved snout. The single dorsal and anal are similar, long, highest in front, low behind, and extending

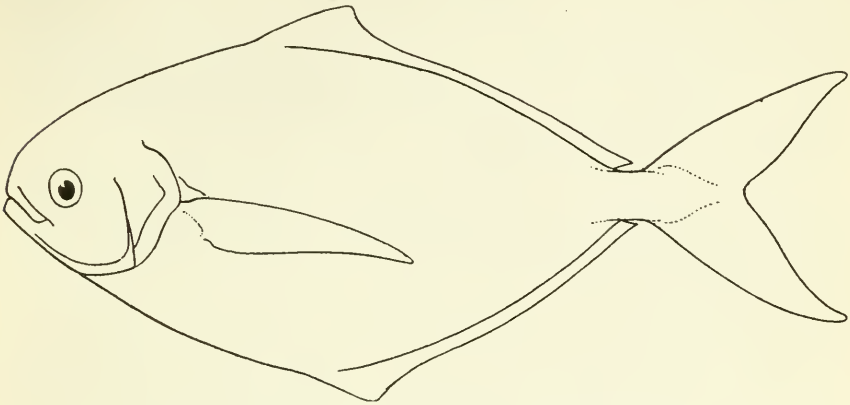

Fig. 74. The California Pampano (*Palometa simillimus*).

nearly to the caudal fin. The front of the anal is behind that of the dorsal. The pectoral is long. When turned forward it reaches past the snout, and in its natural position far beyond the front of the anal, or nearly half way from its base to the caudal fin. It is bluish above and silvery below.

This is a highly prized food fish, reaching a length of 10 inches, and found from Puget Sound to San Diego. About central California it is abundant in summer. Its flesh is rich and delicate. It is not related to the famous pampano of Florida, there being nothing between them in common more than the shape of the body, but it is one of the butter fishes of the East coast.

DISCRETIONARY POWERS AND GAME CONSERVATION.

By HAROLD C. BRYANT.

California for many years has administered fish and game affairs in an unscientific way. The power to make or change fish and game laws is vested only in the state legislature. The laws are enacted for at least two years and no change can be made in them during that time, irrespective of the fact that new conditions may arise and serious injuries result. Frequently it is impossible to secure the attention of lawmakers to matters that are of the greatest importance and it is impossible to put legislation into effect that is really necessary. In general, however, it may be said that our laws are as satisfactory as they can be under the present system.

WHY DISCRETIONARY POWERS ARE NEEDED.

A few years ago during the eruption of Mount Lassen, a mud flow destroyed all of the fish in Hat Creek. This creek was one of the best

streams in California and literally teamed with trout. In order to bring this stream back, it should have been heavily stocked and all fishing prohibited for at least two years. If this had been done, fishing in Hat Creek would have been as good or even better than before. The commission was powerless to close this stream.

In Inyo County a few years ago during a severe winter a great many of the mountain quail in that county were killed. It was not possible for the commission to suspend the open season for mountain quail in the fall of the year although that should have been done. The birds have not yet approached their former numbers and will not until additional protection can be given.

In 1912 in Trinity and adjoining counties a very severe epidemic occurred among the deer. Thousands of the animals were found dead. The animals remaining were not in the best physical condition and were perhaps not fit for human consumption. Certainly they were needed for breeding stock to bring back the deer to their former numbers, but it was not possible to give them protection in time.

Every few years an epidemic has occurred among wild ducks in the lower San Joaquin Valley. Thousands of ducks have died. The disease is prevalent at the time the season opens. Hundreds of sick birds are killed by market hunters and shipped to the San Francisco and Los Angeles markets. Some way should be devised whereby the killing of these sick birds can be prevented.

The coast streams are sometimes in best shape for steelhead fishing at the first of April; other years the streams should not be fished until during the month of May. It is not possible to have a fixed law that will be satisfactory.

Almost every state is from time to time confronted with problems that develop during a period of drought. If several dry winters follow in close succession, the food supply of game birds such as quail is greatly diminished and the numbers of these birds are reduced to the minimum on account of the scarcity of food and unfavorable breeding seasons. The number of birds killed during such years by hunters should be cut down in order to conserve the breeding stock. It is impossible to do so under a system that is wholly controlled by the legislature. Forest fires often cause similar conditions which demand immediate action.

During the strenuous times through which we are now passing with the world at war, we are impressed with the necessity for making immediate changes in our laws so as to provide for the greatest production of fisheries products. The laws regulating the taking of fish can not be modified until the legislature meets. If the Fish and Game Commission had discretionary powers, the use of nets in prohibited waters and the use of other kinds of nets that should be probihited under normal conditions could be allowed and the fish markets of the state provided with a greater abundance of fish. After the war, the laws could be restored; perhaps made a little more severe in order to bring back the fish to their original numbers.

OTHER STATE COMMISSIONS HAVE DISCRETIONARY POWERS.

It has been found necessary in order to properly safeguard the horticultural and agricultural interests of the state against injurious insects to give discretionary powers to the State Horticultural Commission. It has also been deemed necessary to give such powers to the

State Board of Health. Discretionary powers have been given to these boards by the state legislature, so that it would not be without precedent were the Fish and Game Commission given similar powers.

GAME COMMISSIONS IN OTHER STATES HAVE DISCRETIONARY POWERS.

California would not be taking an untried step if the Fish and Game Commission was allowed to use its discretion in times of necessity.

In Maine, newly-stocked streams are closed to fishing at the direction of the Fish and Game Commission.

The New York Conservation Commission has power to change the deer season according to the conditions that may arise in the different localities.

In Washington, the commission has the power to close any lake or stream for fishing, should in their opinion the fish in these streams or lakes require additional protection.

In Oregon, the commission has power to close or suspend the open season for the taking of game or fish at will.

In Nevada, the Board of County Commissioners can change the open season on many different species of game.

In Michigan the state game, fish and forest fire commissioner of the Public Domain Commission, has the power to suspend, abridge or otherwise regulate the open season on any kind of game or fur-bearing animals or game birds found in a wild state in any designated area, where it becomes necessary to assist in the increase or better protection of any particular kind or species of such game.

Similar authority is delegated to game commissions in other states.

Congress has placed in the hands of the Department of Agriculture discretionary powers in order that the Federal Migratory Bird Law may be properly enforced.

According to the Minister of Game and Fisheries of Canada, no provision in the game act of that country has proven so useful as has the section under which the Lieutenant Governor in Council may make legislation preventing the hunting of game that may appear to require more protection than is given by the act.

SOME SOLUTION NECESSARY.

The conditions above outlined, which are of more or less regular occurrence, demand attention. It is evident that present laws applied to these conditions do not allow a solution of the problems presented. Some provision must be made to better care for such situations. Other states have given discretionary powers to the Fish and Game Commission or to the Governor and we could improve conditions in the same way. Without such powers the Fish and Game Commission can not do efficient work.

HISTORY OF LAW GIVING DISCRETIONARY POWERS.

As early as 1895, the importance of allowing the Fish and Game Commission the right to make certain regulations during the interim between the meetings of the legislature was recognized. But the suggestion was opposed by those who felt that autocratic powers were being given the commission. Increasing difficulty in properly conserving wild life under the present system of laws led the Fish and Game Commission

to bring the question before the 1917 legislature. Those opposing the measure claimed that it would be unconstitutional. The need for greater leeway in giving local protection to fish and game becomes more apparent from year to year and further attempts are sure to follow until an act which will improve present conditions is obtained.

A MODEL LAW.

What sort of a law would meet the needs in California? Before answering this question let us look at some of the laws found workable in other states.

Pennsylvania's law reads as follows:

"* * * That from and after the passage of this act, the Governor of Pennsylvania shall have authority, through proclamation, to close for a period not exceeding one season at one time, any county or counties or any section of any county, of this commonwealth, to either hunting or fishing, or to close any stream or part of streams to fishing, because of excessive drought and consequent danger from forest fires, low water, and the presence of contagious or infectious diseases, when such action may be necessary to conserve either the health or welfare of our people or our natural resources."

This act provides a penalty of not less than twenty-five dollars or more than one hundred dollars. (Proclamation issued under Pennsylvania Act, P. L. 1915, 530, Sec. 1.)

Full power to suspend laws is given the State Game Warden of Arizona:

Sec. 14 (*a*). The State Game Warden shall have power to suspend the open season on any kind of game in any designated area where, in his judgment it becomes necessary for the protection of any particular kind or species of game threatened with extermination.

The New York law is more complicated:

"1. Petition for protection. Ten or more citizens of the state may file with the commission a petition in writing requesting it to give to any species of fish other than migratory food fish of the sea, including fish or game birds or quadrupeds, protection or additional protection to that afforded by the provisions of this article. Such petition shall state the grounds upon which such protection is considered necessary, and shall be signed by the petitioners who shall attach their addresses.

"2. Notice of hearings. If the commission shall after hearing petitioner entertain the petition, it shall hold a public hearing in the locality or county to be affected upon the allegations of such petition at such time and place within the locality or county affected as the commission may determine within twenty days from the filing thereof. At least ten days prior to such hearing notice thereof, stating the time and place at which such hearing shall be held, shall be advertised in a newspaper to be selected by the commission and published in the counties or county to be affected by such additional or other protection or if less than a whole county, in or near the locality which shall be affected. Such notice shall contain a brief statement of the grounds upon which such application is made, and a copy thereof shall be mailed to such petitioner at the address given in such petition at least ten days before such hearing.

"3. Powers to grant protection. If upon such hearing the commission shall determine that such species of fish or game, by reason of disease, danger of extermination or from any other cause or reason, requires such additional or other protection, in any locality or throughout the state, the commission shall have power by order to prohibit or regulate, during the open season thereof, the taking of such species of fish or game. Such prohibition or regulation may be made general throughout the state or confined to a particular part or district thereof and the order shall fix the day when the same shall take effect and the commission shall sign and enter the order in its minute book."

A public hearing and proper publicity is demanded in the Maine law:

"The commissioners of inland fisheries and game shall have general supervision of the enforcement of the inland fish and game laws. Whenever they shall deem it for the best interests of the state after due notice and public hearing in the locality to be affected, they may regulate the times and places in which and the circumstances under which game and inland fish may be taken for a series of years not exceeding four, but they can not authorize the taking of game or inland fish at a time in which its capture is prohibited by the laws of the state. They may, from time to time, modify or repeal such needful rules and regulations, not contrary

to the laws of the state, as they may deem necessary and proper for the protection and preservation of the game and inland fish of the state. They shall file, in the offices of the clerks of the towns in the territory to be affected a copy of the rules and regulations adopted by them and publish the same three weeks successively in a newspaper printed in the county, and post on the banks of waters to be affected, as nearly as may be like notices; and whenever any such rules or regulations apply to any organized township, a like copy shall be filed with the clerk of courts for that county, and published three weeks successively in a newspaper printed in the county; they shall, immediately upon the adoption of any rules and regulations contemplated by this section, file an attested copy of the same in the office of the Secretary of State. (Provides penalty, maximum one hundred dollars.) (P. L. 1915, Sec. 15.)

It will be seen from the following that the proposed California law attempts to make use of the best provisions found in the laws of other states. It does not deprive the legislature of its right to legislate on game but simply provides that temporary changes may be made in emergencies. The following provision can be best inserted in the law by the addition of a paragraph to Section 642 of the Political Code relating to the duties and powers of the Fish and Game Commission.

Whenever, after due notice and hearing, it shall appear to the board of fish and game commissioners that any species of mammal, bird or fish of the State of California is threatened with extermination by reason of disease, excessive hunting or fishing, or any other cause, or that it is necessary to assist in the increase or better protection of any particular species of mammal, bird or fish, or that it is desired to introduce into this state any new species of mammal, bird or fish, the board of fish and game commissioners shall have power to regulate by suspending, shortening or lengthening the open season and by modifying restrictions on the mode of taking or the amount taken of such species of mammal, bird or fish, in any designated area, or waters, or stream, or part thereof, of this state, for a period not exceeding two years at one time, or until such time as new legislation thereon enacted by the state legislature shall become effective. During the suspension of any open season by the board of fish and game commissioners, all provisions of law relating to the closed season for such mammals, birds or fish shall be in force, and every person who violates any such provision shall be subject to the penalties prescribed therefor. Any order issued under authority hereof shall become effective on approval of the Governor of California and shall contain a description of the area, waters, stream, or parts thereof, affected, the time when it becomes operative and the period during which it shall be effective, and a copy thereof shall be published in at least one newspaper of general circulation in each county within the district or any part of the district in which the regulation or order shall apply, at least once a week for two successive weeks, and a certified copy of such order shall be filed in the office of the county clerk of each of said counties.

CONCLUSION.

1. It is apparent that under the present system the hands of the Fish and Game Commission are tied and that this body is powerless to give fish and game added protection in time of emergency.

2. The present situation can be improved by the passage of legislation giving the Fish and Game Commission discretionary powers.

3. With power to suit protection to each locality when unusual conditions arise, greatly improved results may be expected.

4. The feasibility of a law giving discretionary powers is evidenced by the successful operation of similar laws in other states.

5. Three important things can be accomplished by giving the Fish and Game Commission discretionary powers:

a. Legislation can be suited to the requirements of localities rather than whole districts.

b. Increased protection can be immediately afforded fish and game whenever unusual circumstances warrant it.

c. Increasing complication of the districting law can be remedied.

6. A law allowing discretionary powers in the administration of fish and game is the game law most needed at the present time.

CALIFORNIA'S "BIT."

By JOHN N. COBB.

While the commercial fishermen of all the states in the Union have been doing their "bit" in trying to replace the much needed meat and other food products sent to our allies on and near the fighting line, those of California have especially covered themselves with glory in this regard as the following comparison of fishery products produced in 1917 with certain other years plainly shows.

The United States census of 1908 showed a production by the commercial fishermen of California of 47,477,000 pounds, valued at $1,970,000. A later investigation of the United States Bureau of Fisheries showed that in 1915 our commercial fisheries produced 92,513,457 pounds, valued at $2,488,098, while reports made by the commercial fishermen to the California Fish and Game Commission for the twelve months ending September 30, 1917, and other sources, show that 1,000,020,428 pounds, valued at $7,697,598, were produced. This latter comprised 178,450,472 pounds of edible fish, valued at $5,353,514; 23,757,782 pounds of other edible fishery products (such as mollusks, crustaceans, etc.), valued at $2,138,190, and 797,812,174 pound of non-edible products (mostly kelp), valued at $205,894.

Arranged in tabular form the three years in question show as follows:

Year	Pounds	Value
1908	47,477,000	$1,970,000 00
1915	92,513,457	2,488,098 00
1917	1,000,020,428	7,697,598 00

The data given above represents the products as landed by the fishermen, and the value is that realized by them. A large number of canneries and other plants receive a considerable part of the products so landed and prepare them in various ways for shipment and sale throughout the world, the value of the products increasing many fold in these operations. The enormous amount of kelp gathered in California waters and utilized at the immense plants established in the southern part of the state since the outbreak of the war, is valued at only about $200,000, although when the potash and other chemicals are extracted their value runs into millions of dollars.

As a result of the efforts of our fishermen, California now occupies first place, so far as quantity produced is concerned, amongst the various states of the Union. Virginia, with 494,959,362 pounds, being a very poor second, and is surpassed in value of its fisheries by Alaska, Massachusetts, and Maine alone, in the order named, with values of $8,413,713, $7,992,756 and $7,742,647, respectively.

The total fishery production of the United States amounts to about 3,950,000,000 pounds, valued at approximately $84,500,000, and of this enormous production, the greatest by any nation, California produces about one-fourth of the quantity and about one-eleventh of the value.

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

July 15, 1918.

"To the profiteering proposal of the Pseudo-Patriots, the Patriots for revenue only, that protection of wild life in war time be relaxed, the united hosts of conservation reply:

'YOU SHALL NOT PASS.'

"Let this be the slogan of every farmer, of all who dwell in the open, and of all who love nature and who wish to see our natural resources preserved for the perpetual use of our people and not destroyed for all time to gratify the greed of a moment."—Theodore Roosevelt.

KELP.

We have long realized the value of our fishery resources, but we have just begun to find out that there are other products of the sea which can be utilized. That the vegetable life, as well as the animal life, can be made a source of profit is shown by the kelp industry. Formerly used only for the making of souvenirs, the common kelp of the southern California coast is now the basis for the manufacture of potash, a material important in the manufacture of fertilizers and just now a necessary component of war ammunition. In recognition of a new and important industry, and in order to acquaint our readers with interesting facts related to the industry, we are issuing this "Kelp Number."

WHO'S TO BLAME?

To hear some persons talk one would think that the Fish and Game Commissioners were among those most to be detested. Some persons apparently even have a personal grievance against the men themselves. The truth of the matter is that such persons talk disparagingly of the Fish and Game Commission simply because the commission enforces the fish and game laws. It will be seen also that the professional agitators are almost always those who are commercially interested in fish and game.

Some statements made lead one to conclude that the Fish and Game Commission makes the game laws and that it alone must be held responsible for any disturbing provisions. Of course, this is not true. The legislature is entirely responsible for fish and game laws. One function of the Commission is to enforce these laws, and consequently it must stand along with other bodies which enforce the laws and be the subject of continual criticism. No matter how faithful a Fish and Game Commission may perform its duties it must still be the recipient of vituperations without number.

It is remarkable how many people believe that a law can be repealed or amended by attacking the Fish and Game Commission. Exactly the opposite attitude will bring the best results, because there is no better way to secure the repeal of a bad law than to rigidly enforce it. The state constitution provides for the initiative and recall, and relief is always possible by utilizing the lawful means at hand.

TALK VS. ACTION.

Statements to the effect that the game laws are not being enforced are far too common. Letters are constantly written to newspapers and statements made in public regarding known violations of the game laws. If the persons making these statements would be half as active in reporting violations to the proper authorities as they are in giving publicity to violations, conditions would be greatly improved. For some unknown reason people take delight in pointing out violations, but when asked to swear out a warrant for the arrest of a violator they immediately say, "Let George do it." A game warden can not always be on the spot when a game law is violated, but he can reach the spot and make a conviction if the proper information is furnished

him. When unselfish persons take an active interest in the enforcement of game laws we will hear fewer statements regarding alleged violations, and game will receive proper protection.

SHAD BECOME SCARCE.

As predicted by the Fish and Game Commission, the shad catch has been far below normal, owing to excessive fishing of the past few years. Five years ago shad fishermen were able to catch 5000 pounds a day. They obtained but fifty cents for a 200-pound box. Three years ago fishermen obtained one-half cent for buck shad and two cents for roe. This past year the average catch made by a fisherman is about 400 pounds. He now obtains three cents a pound for buck and five cents for roe shad.

FISH ESCAPE FROM BOULDIN ISLAND.

The completion of a levee around Bouldin Island, on the Lower San Joaquin River, impounded great numbers of bass and shad, as the island has been under water for some time. Fearing that large numbers of valuable food fish would be destroyed because unable to reach the river, the Fish and Game Commission decided to allow fishermen to take the fish in nets. The island was opened to fishermen at 9 o'clock on May 21, and many fishermen from Pittsburg were on hand. After all of the work of laying the nets, one of the largest catches noted was composed of two shad and two carp. The fishermen were quickly convinced that all of the fish had escaped and left immediately for other fishing grounds. Thus ended the controversy as to the large numbers of food fish which would be destroyed when the levee was completed. It may be necessary at a later time to rescue some of the smaller fish which have been impounded, but it has been clearly demonstrated that the food fish have already escaped into the river.

A DANGEROUS STATEMENT.

The following is an extract from an editorial which appeared in a leading newspaper of San Francisco:

"This much is certain that there is a lot of nonsense talked on the subject of game preservation. In whose interest is it protected? Not in that of the great mass with little opportunity for indulging in the luxury of killing things and in no way benefited by game as a table decoration. Nor is it in the interests of those engaged as farmers or fruit growers. That birds included in the protected list are destructive of crops can not be denied, and as our established rural industries are of infinitely greater importance than the pastime of sportsmen or the sentimentalities of the nature-worshipers our game laws should be amended so as to permit the destruction of all destructive creatures."

We trust that our readers are not convinced of the truth of these statements. Let us analyze some of them. Many persons are impressed by statements calling attention to the fact that the poor man has little chance to secure wild game. The fact is that the poor man has a far better chance of obtaining and utilizing game for food than in obtaining his share of use in public roads, public parks and public buildings, all of which belong to the people and for which each citizen is annually taxed. The utilization of these latter assets are far more dependent on wealth than is game.

What if we applied the rule suggested in the last statement that all destructive creatures be destroyed? We would soon discover that we were "cutting off our noses to spite our faces," for if everything has its rightful place in the balance of nature then the more creatures that are destroyed the greater is the balance upset. Controlling wild creatures is a different thing from destroying them utterly. Then, too, it must be remembered that some of our bird and animal pests do not rightly belong in our fauna. The house rat, house mouse and English sparrow are deserving of extermination. Native animals and birds may need to be controlled so that our interests may be cared for, but they are deserving of perpetuation, not of extinction.

Every conservationist must help point out the fallacy of such arguments. Anyone who reads the game laws knows that the farmer is definitely given the chance to protect his crops.

WAR PROFITEERS.

New evidence of operations of selfish interests which profit in the present emergency at the expense of wild-life conservation comes in daily. One of special importance that has come to our notice is a petition sent Food Administrator Hoover by two United States senators, and signed by many Montana men, urging the killing of all elk in Yellowstone Park.

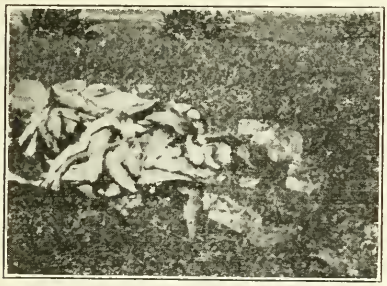

Fig. 75. Trout, 159 in number, weighing 28 pounds, confiscated by Deputy Gyger from two violators, on the south fork of San Jacinto Creek, April 14, 1918. The fish were taken with flies out of season.

IS THIS JUSTICE?

Achille Paladini and W. S. Stewart, agent of the Glacier Fish Company of Pittsburg, were arrested recently on the charge of shipping 5600 pounds of striped bass out of the state. The men were convicted and fined $50 each by Justice of the Peace Jackson of Concord, Contra Costa County. We wonder what effect so small a fine will have on such a chronic offender as Paladini. Mr. Paladini cleared at least $600 on the striped bass transaction. What difference would it make to him if he had to pay $50 from his profits in paying a fine?

STATE PLUMAGE LAW EFFECTIVE.

The new law prohibiting the sale of aigrettes, plumes and like feathers has effectively stopped the commercialization of the plumage of birds in California. The first case made under this law resulted in a fine of $15 for the sale of a bird of paradise. The defendant was A. Larson, Jr., wholesale millinery dealer of Los Angeles. The excuse that he had secured the feathers before the law took effect had no weight with the judge.

UNITED STATES FOOD ADMINISTRATION MEMORANDUM ON THE USE OF GAME AS FOOD.

The problem of providing for the country a maximum supply of game as food has been carefully considered by the Food Commission. It has reached the conclusion that this maximum supply can best be obtained by constantly increasing the breeding reserve of game under present and even more progressive laws directed toward that end.

Up to a short time ago no fact is more clear than that the game of the country has been decreasing, some species even approaching the point of extinction. That the energies of the whole country have been directed toward increasing the stock of game is demonstrated by the fact that many state legislatures have decreased the amount of the game to be killed by individuals and shortened the seasons in which game could be killed. Notwithstanding these efforts, the decrease in game became so serious that a universal demand throughout the country persuaded Congress to pass a law placing the jurisdiction of migratory game birds under federal supervision. Canada passed through the same experience, as is proved by a treaty negotiated with the United States practically incorporating the terms of the migratory bird law passed by Congress. The result of better state laws and the migratory bird law has been a positive increase of waterfowl and a wide extension southward of the breeding of waterfowl. It is perfectly clear that this increased breeding reserve gives more individual citizens the opportunity to kill for food more game, which opportunities must necessarily increase each year proportionately to the increase of the breeding reserve.

Any effort to weaken the present laws or in any way relax them in one locality would immediately lead to a demand for such relaxation of laws in all other localities, insuring a rapid breakdown of the whole legal structure of present game protection erected after efforts extending over numerous years. Once the perfected laws were relaxed to the point where game could be killed more freely, notwithstanding the fact that numerous gunners have gone to war, the game would be quickly destroyed by largely increased

numbers of local gunners using modern methods of transportation, such as automobiles, motorboats, trolley roads and improved firearms. The present game supply of the country should be considered in exatly the same way as that of domestic stock and fowls, the breeding reserve of which should be increased to insure increased supplies for food. This is even more necessary for much of the wild game, since once it is destroyed to a certain point it will decrease under natural conditions to extinction and can never, as in the case of domestic stock, be restored.

To advocate the relaxation of state game laws would secure neither uniformity in action or results since state legislatures can not be brought to exactly the same views, and most of the states will not have regular sessions for another year. Since an attempted relaxation of laws would tend toward a rapid destruction of game, no emergency has as yet arisen sufficiently acute to warrant the Food Administration advocating the destruction or impairment of game which forms a valuable national asset.

It may be added that no extensions of the hunting season or bag limit beyond those now specified in the state game laws could be legally made without action by the state legislatures, most of which will not meet until a year from the coming winter. Furthermore, an action which could be taken in this country which would contravene the Migratory Bird Treaty between the United States and Great Britain as concerns the conservation of wildfowl would be deeply resented by Canada, which through considerable effort has secured the acceptance of all the provinces of the treaty and of the enabling act and regulations whereby it is to be enforced.

U. S. Food Administration.

HOW TO HELP.

There are many persons sufficiently interested in wild life to seek some way of helping in the conservation movement. Believing that one of the most fundamental methods of bringing about conservation in the future is to begin with school children, we are led to make the suggestion that such people demand that wild-life conservation be taught in the schools of their respective towns or cities. A talk with the principal or with the teachers will oftentimes accomplish the right end. The ability to properly teach nature study and wild-life conservation should be demanded of every prospective teacher.

LIMITS THE RULE.

The opening day of the 1918 trout season demonstrated that fish are even plentiful in the coastal streams near San Francisco. One of the fish and game deputies, working near Pescadero, San Mateo County, checked over forty-two limits of trout, and many other fishermen had very near the limit. The fish were not very large, but of sufficient size to make them the best kind of food.

THE POLLUTION OF PUBLIC WATERS.

The pollution of the public waters of the state has become a serious menace to fish life, and the Fish and Game Commission has for a number of years been using the powers given it by the legislature to stop this wanton destruction of fish.

Large quantities of fish in San Francisco and San Pablo bays are often so charged with petroleum that they are unfit for food. The principal offenders are the refining companies on the shores of San Francisco and San Pablo bays. The companies have been warned from time to time regarding this evil and have promised to stop the pollution, but, with few exceptions, have failed utterly to keep their agreements. They have been arrested numerous times and with but one exception have escaped punishment upon the promise to the court that the evil would be remedied. The defense frequently advanced by the several offending companies has been that the industry is more important to the people than the fish. Both are economically important, but the importance of one is no excuse for the destruction of the other, for it has been shown conclusively that the evil complained of can be remedied without impairing the operation of the plant. This has been demonstrated in almost every instance, for, as soon as an arrest

is made, the pollution is stopped temporarily, and then is continued again with greater aggravation. Consequently, if it can be stopped temporarily, it can be stopped permanently.

Another defense frequently advanced is that the expense of disposing of the waste oil, other than in the public waters of this state, is too great. Certainly it can not be contended that the money expended by any oil company to prevent this pollution would represent, in the smallest degree, the value of the fish destroyed.

There are only a few of nature's gifts which have not been appropriated and exploited by corporate greed and which the public are privileged to enjoy. These are air, fish and game, and, regardless of expense, they should be perpetuated.

One of the best illustrations of the willful and malicious pollutions to which the attention of this commission has been called is that of two oil companies operating on Edna Creek in San Luis Obispo County. This stream is one of the largest and best trout streams in the county. For some time the companies on its banks have run their waste oil into the creek, polluting it for many miles, so charging fish with oil as to make them unfit for food, and making the water unfit to drink, either for man or beast. The companies have been warned numerous times to cease polluting the water of Edna Creek, which warning they have failed to heed, and as a result they were arrested recently and convicted and fined. Within twenty-four hours after they were convicted, the pollution ceased, and the sump holes, from which pipes and ditches lead into the creek, were filled in or disconnected.

This same condition prevails along the shores of San Francisco and San Pablo bays.

The pollution of the public waters can and must be stopped. The people demand it and it is absolutely necessary for the preservation of the fish life in waters of the state. The Fish and Game Commission will do all in its power to enforce the laws upon the statute books governing this subject, and it is the duty of the courts to see that the mandates of the law are carried out.

This, however, can not be done without the earnest assistance and co-operation of the several district attorneys throughout the state, who have in some instances failed to give the assistance which the importance of the subject demands.—Robert D. Duke.

HOW SAN FRANCISCO BACKS THE GAME LAWS.

There has been great improvement in the co-operation of the judges of this state in enforcing the fish and game laws. There are only a few places where it is still difficult to obtain convictions. One such place is San Francisco. Records compiled by the Fish and Game Commission show that during the last three years but twenty fines, and these for small amounts, have been imposed by the police courts of San Francisco on violators of the fish and game laws. During the same length of time, only five violators were sent to jail, while thirteen cases were dismissed and fifty-three convicted persons were let go with suspended sentences. The record also shows that a large percentage of those who were fined or jailed were Chinese. All but ten of the eighty-nine violators appearing in court were foreign born.

The record compiled is worthy of consideration. This commission does not expect the fishermen to be branded as felons or anything of that sort. It seeks from the courts in convictions, punishment which will deter the market fishermen from despoiling the fish supply. The law is not drastic. It aims to protect in a perfectly sane way the fish and game food supply of the state. When the commission presents evidence that warrants conviction, it stands to reason that if the convicted person is let off with a suspended sentence which means no punishment at all, the very purposes of the commission's work are hampered seriously.

If for profit market fishermen or game hunters are wilfully violating laws which they know exist, the Fish and Game Commission should be sustained in its endeavor to enforce these laws.

SAN DIEGO COUNTY NOW HAS TROUT FISHING.

The lack of year-round streams has driven San Diego County anglers to other localities in the past, but now all is changed. Cuyamaca Lake, bone dry in 1913, is now the scene of some of the best fishing in the state.

The results of the present trout season at Cuyamaca Lake clearly demonstrate the value of the hatchery work of the Fish and Game Commission. In 1915, 2500 trout sent from the State Hatchery were planted in the lake. This was purely an experiment and the anticipated results were doubtful. Thousands of trout from the State Hatchery and some furnished from the exhibit of the United States Bureau of Fisheries at the Exposition have been added in the last two years. Now the fish crop is ready to be harvested. On the opening of the trout season in May, two limits were taken. One bag contained a six and one-half pound rainbow trout which was twenty-two inches long and seven inches wide and took twenty-five minutes to land. All other trout taken here have been steelhead, weighing from one and one-half to six pounds, and good catches have been made all during the season. The larger fish had roe nearly developed and the males contained milt. Since no schools of small fish have been found near the shore it is believed that the trout are spawning in the lake.

Cuyamaca Lake has been fed solely by rains and snows which drain into the basin. Due to dry winters, the lake became dry in 1913. Since that time a dam has been built and it is very unlikely that it will dry up again.

Due to effort on the part of anglers and intelligent and effective work of the State Hatcheries every county in the state may now boast of trout fishing. Ideal water and food conditions have produced splendid large fish within a short time, and Cuyamaca Lake will henceforth be a favorite camping place for San Diego anglers. These unlooked-for results have shown the efficacy of the state's method of augmenting the fish supply by propagating trout in hatcheries.

Fig. 76. Trout caught on opening day of season in Cuyamaca Lake, San Diego County. From left to right: Mr. Webb Toms with 3-pounder, Mr. Jack E. Thornton with 3 and 4 pounders, and Mrs. J. E. Thornton with 6½-pound rainbow, the largest catch of the day.

SQUIRREL CAMPAIGNS AND QUAIL.

Several complaints that quail had been poisoned in the squirrel campaigns being instituted in many counties have reached the Division of Rodent Control of the

State Commission of Horticulture. Mourning doves sometimes are victims of poison put out for squirrels, but there is little direct evidence that quail are poisoned. The government formula is being used almost exclusively, and the United States Public Health Service showed by a series of experiments that quail can take five or six times as much poisoned barley as a ground squirrel and show no effects. (See "The Effect of Strychnine Sulphate on California Valley Quail," Calif. Fish and Game, Vol. 2, pp. 11-13.) The experiments demonstrated that valley quail may be fed relatively large amounts of strychnine sulphate without toxic symptoms and that poisoned barley as used in ground squirrel eradication does not cause the death of California valley quail under natural feeding conditions.

RESEARCH PROBLEMS OF THE CALIFORNIA FISH AND GAME COMMISSION.

Although depending largely on the results of scientific investigations carried on by universities and professional investigators, the California Fish and Game Commission is actively engaged in solving some of the problems connected with the administration of fish and game resources. The greater the basis of fact the more sure is proper legislation. Facts suitable as a basis for legislation are obtained by careful research work. Some of the early experiments in tagging salmon and trout furnished dependable evidence as to the importance of these fish and furnished a splendid basis for legislation. Experiments carried out by the state hatcheries have greatly improved methods.

A summary of the investigations now under way will demonstrate the fact that the commission is attacking problems in a systematic and scientific way.

Department of Commercial Fisheries.

In order to solve problems connected with the fisheries, a trained investigator, Mr. Will F. Thompson, a graduate of Stanford University and formerly an official investigator for the British Columbia Fishery Department, has been employed. Mr. Thompson is devoting his full time to the solution of the problems connected with albacore and albacore fisheries. He has already been able to report that there is a correlation between temperature and the catches made. Much evidence as to spawning of this fish and the age as demonstrated by microscopical examination of the scales has been compiled. This investigator will next turn his attention to the herring and the herring industry. A full laboratory equipment has been furnished for this work.

Examination of many specimens of fish of different kinds to demonstrate the time of spawning has also been carried on by the department. Plans have also been made for some tagging experiments, so that the life history of the salmon may be better known.

Department of Fish Culture.

Although no definite investigations are now under way, the outcome of several fish transplanting experiments are being awaited with interest. Golden trout have been transplanted and it will be possible to demonstrate whether these brightly colored fish will change in coloration when changed to other localities. Other similar experiments dealing with steelhead trout have been instituted.

BUREAU OF EDUCATION, PUBLICITY AND RESEARCH.

A part of the time of the director of this bureau has been directed to the study of the food habits of birds. An investigation of the food habits of the roadrunner has been completed. The roadrunner has been accused by sportsmen of destroying nests and young of the valley quail. Eighty-three stomachs of roadrunners were examined, the contents tabulated, and a full report published. The last year has been devoted to the food habits of ducks in California. Hundreds of duck's stomachs have been examined and it will be possible to show which are the best food plants for attracting waterfowl.

In addition, studies have been made as to the relation of certain birds and animals to agriculture, and evidence on the breeding of ducks and other waterfowl has been collected. Information on the game birds and mammals of the state is being systematically collected and filed so that it will be available for further work.

WILD LIFE FILMS.

The wild-life films used in the educational work of the commission continue to be popular. There is sufficient demand to keep them busy most of the time. Many high schools are availing themselves of the opportunity to use these pictures. Organizations desiring to use these films this coming fall should secure dates immediately from H. C. Bryant, Museum of Vertebrate Zoology, Berkeley, Cal.

SHOOTING THE MOVIES.

The casual visitor to a shooting gallery displaying the sign, "Shooting the Movies," would be led to think that the old-time shooting gallery, with its moving array of ducks and deer, had been displaced by a regular moving picture, which gives a man a chance to shoot a real picture of the wild game which he shoots in the open. It is true that moving pictures of wild game now form the marks for the customers of a shooting gallery, but few persons realize the complicated electrical system needed to make this sort of shooting possible. A man shooting at objects in a moving picture would soon discover that almost before he pulled the trigger some other object would be in view. In order to make it possible to actually see where the animal has been hit, a complicated electrical system is necessary. The system is under Swiss patent and the controlling mechanism is a microphone. The report of the gun is recorded by the microphone, which in turn operates electrical devices which instantly stop the projecting machine, allowing the one shooting to see exactly where the animal is hit, and then automatically start the projecting machine again. The same system automatically changes the paper background of the picture, covering up the bullet hole and so prepares the target for the next shot.

At the beginning of the war the British Government became interested in developing some device for giving rifle practice to prospective soldiers. Fifty thousand pounds was set aside, and finally the electrical devices necessary to make "shooting the movies" possible were developed. Apparatus of this kind is now installed on the larger battleships, in aero stations and in training stations. Moving pictures of submarines and periscopes form the targets for those on board ship, whereas, soldiers going over the top often form the target at training camps.

The present apparatus has been perfected after eighteen months of work and is proving very satisfactory. Lubfin & Butler have opened a shooting gallery of this type on Market Street in San Francisco and the same firm expects to introduce this new sport in all of the larger cities of the West. Needless to say, this new sport develops the ability to shoot quickly and accurately.

NOT APPRECIATED HERE, SHAD ARE SHIPPED EAST.

The shad is one of our best food fishes, but only easterners appreciate the fact. We can buy a shad for twenty-five cents, which the easterner gladly pays one dollar or more to obtain.

No man may say why one fish finds a market, and another, and perhaps a better one, does not, but apparently in the case of the shad the reason it is not appreciated is that it is cheap. One hears the statement on all sides nowadays that fish food is so expensive people can not afford to eat it: and still they buy the expensive fishes when the cheaper ones are often (nay, usually) superior to them (the salmon always excepted). When our shad was not yet abundant it sold for from twenty to twenty-five cents a pound, and the demand was great. At this time money had about twice the purchasing power it has now. But before this the price was still higher, for it sold for a dollar and a dollar and a half a pound, and in some instances single fish brought ten and fifteen dollars! As the fish became more and more abundant the price dropped to ten, to five, and even to two cents a pound. At this price it became very unfashionable to eat shad.

You may argue that this does not bear out the assertion that if the shad was more expensive it would be better appreciated, for, you may say, it only shows that people have become tired of it. But on the Atlantic coast, where the shad came from, people have not tired of it. Quite the contrary. And now the point that proves the statement: From 80 to

90 per cent of our shad was shipped east last year, about 67 carloads in all, much of it going to the Atlantic seaboard, where the local supply was not great enough to supply the demand. There it sold at a price that commanded consideration and that placed it in a class of undoubted respectability. So this fish that we do not valne appears, after a journey of over 2,000 miles, on the table of the epicure. Planked shad has been a tradition on the Atlantic coast since the time of George Washington, and anyone who may have been elected by the gods to eat planked shad at Marshall Hall, near Mount Vernon, will remember the occasion with reverence. It is commercially the most valuable food fish on the Atlantic coast.

We complain that the shad is bony. That is freely admitted. It is very bony, but it is just as bony when it arrives on the east coast, and people there are only too glad to remove the bones for the sake of the savory reward. It is not inconceivable that part of the flavor results from the trouble of removing the bones. That which comes without effort is usually not worth while. However, a little experience will teach one to remove the bones with very little trouble.

The shad passes most of its life in salt water, bnt annually migrates to fresh water for the purpose of spawning. It is during its migration up the rivers that it is caught, though a few are taken in the ocean. Little is known of its life in the ocean, and little is known of its food, for it eats scarcely at all while in the rivers. Furthermore, our shad does not naturally belong to the Pacific coast fauna. Several times between the years 1871 and 1880 young shad were shipped from the Atlantic coast and planted in the San Joaquin and Sacramento rivers. Now it is one of our abundant fishes.

The shad is doubly a cheap fish at present, for it is oily enough to require very little additional fat in cooking. But it will not remain a cheap fish when it is appreciated, for the supply will not stand a great demand here any more than it has on the Atlantic coast.

The shad season is now on. Let us keep for our own consumption this excellent fish. Sending our shad east is admitting that we lack epicurean education.

Try it baked: Season fish well with salt and pepper and sprinkle lightly with corn flour. Lay it on a flat baking dish and spread over it about a teaspoonful of oil or meat drippings. Bake in a brisk oven from 20 minutes to a half-hour, basting occasionally with a little milk and water, or with just water. Serve with lemon or tartar sauce. In a gas oven the fish may be placed under the flame and turned over.

COMMITTEE ON ZOOLOGICAL INVESTIGATIONS, CALIFORNIA STATE COUNCIL OF DEFENSE.

CHEAP FISH ARE OFTEN THE BEST.

With the exception of the salmon there is scarcely a fish that is expensive because it is good. The salmon is worth all that is asked for it at its highest price. It is not a cheap fish, nor should it be, for there is a market for every salmon that is caught, even if it never appeared in the fresh fish market.

Though people think of the sardine more as a canned fish, it is, if used fresh and fried, or broiled, or baked, one of our most delicious fishes. (Do not let the market-man sell you herring for sardines. The sardine usually has dark spots on the side, but not always. But it always has fine raised lines or ridges on the gill cover that extend downward and spread out fan-like.) In San Francisco the sardine may be had for five cents per pound, and it should be had that cheaply everywhere in the state where the demand is great enough to enable the dealer to order a 100-pound box at one time, for the fishermen receive less than a cent a pound for it (from $10 to $18 per ton).

The striped bass retails in San Francisco at five times the price asked for the sardine. Now, it is a dangerous thing to assert that one of two good fishes is the better, for tastes differ more perhaps in fish food than in other food. Some like a rich, fine-fleshed fish, while some prefer a drier, coarser fish; some like one flavor, some another. It is a case of Jack Sprat over again. The writer (and he is not alone in this opinion) would prefer the sardine even if the above prices were

reversed. But the supply of the striped bass is very much less than that of the sardine. Last year's catch of sardines exceeded a hundred millions of pounds on our California coast. Everyone knows the striped bass. It is a game fish that sportsmen pay good sums of money to go fishing for, and when people hear that the market-man has striped bass they think it must be a particularly good fish, for they have heard so much about it. When they learn the price they feel sure that it is the best. On account of this demand the fishermen received from ten to fifteen times as much for the striped bass as they do for the sardine.

Not only do we pay much more for such expensive fishes, but because we demand them we increase the price of the cheap fishes on account of more expensive waste. Figure it this way. A wholesale dealer pays $15 for 100 pounds of striped bass. He pays $1 for 100 pounds of sardines. He may lose sometimes on an off day as much as 25 per cent of his fish. Of course, this excessive waste is very unusual, but it will illustrate what we wish to say. Thus he loses $3.75 on his striped bass and 25 cents on his sardines, and as he has to average his loses to some extent the cheap fish have to bear more than their share of the burden and are no longer cheap fish.

To put it briefly, if we ate only the plentiful sorts of fishes the price could be made much less, for if the dealer did not have to handle the expensive sorts his loss would be less.

There are other cheap fishes besides the sardine that are good: the rex-sole, the shad, the sablefish, the mackerel and others. We have picked out the sardine to compare with the striped bass only because of its abundance. It should always remain a cheap fish.

COMMITTEE ON ZOOLOGICAL INVESTIGATIONS, CALIFORNIA STATE COUNCIL OF DEFENSE.

FEW ELK IN 1859.

The following interesting item relative to the killing of an elk in the vicinity of Stockton is doubtless of far greater interest to us at the present than it was to the readers of the "Stockton Argus" in 1859. It can be seen that even at this date the elk had become practically exterminated in the San Joaquin Valley. We are indebted to Mr. William Cohen for the item:

"An elk weighing some 425 pounds was brought to Stockton on 25th October from Middle River, where it was killed on Saturday last by Robert Dykman, the hunter, to whose superior skill with the rifle we are indebted for the larger portion of game of this description that finds its way into our market. Mr. Dykman was three days upon the trail, in which time he followed his game from near the mouth of the Mokelumne, across the San Joaquin and Middle River, a distance of about thirty-five miles. The horns were some six feet in length, with antlers, the longest of which were eighteen inches. The head and horns weighed 75 pounds, which were retained here, and the remainder shipped to San Francisco, where the scarcity of cervine provision commands for it a higher price than could be obtained in our own market.—*Stockton Argus*, October 25, 1859.

SALT FOR DEER.

Some salt bricks were furnished forest officers in Trinity County by the Commission in 1915. The deer made good use of this salt after they had become accustomed to the bricks. The forest officers who made this experiment, as well as others familiar with wild life, believe that much greater utilization of the salt would have resulted if ordinary loose salt had been provided. Salt in this form could be placed on logs by squaring off one side and boring two-inch auger holes five-sixths of an inch deep and filling these with salt. The salt logs might be cut where cattle do not ordinarily travel and additional safety would be furnished by the small holes from which salt cannot be licked so easily by a cow.

There is a real necessity for salting deer. It is, of course, well known and recognized that cattle absolutely must have salt to grow in weight and to remain healthful. As deer have always used licks, it is assumed that this method of salting is satisfactory.

One of the advantages of salting deer is that they do not have to leave the high feeding grounds to travel a long distance to some lick that is usually near a stream at some low elevation, with little feed in

the near vicinity. Other deer linger near the licks and usually are in poor condition because of the lack of feed.

In getting the small amount of salt in the licks, deer get a large quantity of earth which, if not injurious, is certainly not healthful. Licks are not in as good condition as they were before so many stock were grazed, for cattle trample all around and through the licks, mixing the salty deposits with the clay or other dirt. It appears certain that the deer, with their smaller feet and some instinct for continued use of the licks, make regular trails and keep the saline part of the licks more free from foreign matter. So far as hunting at licks is concerned, no more of this would be done at the artificial licks than at the natural licks. Salting deer is necessary, and the commission should furnish and distribute 2,000 pounds of salt annually in Trinity County.—E. V. JOTTER.

FAIR PLAY.

(A page of criticisms and answers.)

WANTS SALE OF TROUT.

San Francisco, June 1, 1918.

Mr. Carl Westerfeld,
Executive Secretary,
State Fish and Game Commission,
San Francisco, Cal.

My dear Mr. Westerfeld: I am in receipt of a communication from one Jack Lloyd of Pine Knot, Los Angeles County, who writes that there are thousands and thousands of big trout in Big Bear Lake which he says could be sold at reasonable rates in Los Angeles. Lloyd writes that there is no limit to the fish in the lake at the present time, and inasmuch as he has written me asking to know how this supply could be made available for the fresh market commercially, I am writing to you without comment, although I would be glad to have your opinion on the matter.

Yours very truly,
(Signed) F. N. BIGELOW,
Secretary.

SALE OF TROUT PROHIBITED.

San Francisco, June 4, 1918.

F. M. Bigelow, Esq.,
Sec. State Market Commission,
No. 606 Underwood Building,
San Francisco, Cal.

My dear Mr. Bigelow: Your letter dated June 1, advising me that you had received a communication from Jack Lloyd of Pine Knot stating that there are thousands and thousands of big trout in Big Bear Lake which could be sold at reasonable rates in Los Angeles, is now before me.

Jack Lloyd is a market fisherman. On October 19, 1917, he was convicted for having over the limit of trout in his possession and paid the fine of $25 imposed by the judge.

Big Bear Lake is an artificial lake in San Bernardino County, about eight miles long and a mile and a half wide. It was stocked with fish by the commission and is one of the favorite fishing grounds in southern California. From 50,000 to 100,000 tourists go there every year for recreation and sport, being attracted largely by the fishing. At the request of these people a bill was introduced at the last session of the legislature prohibiting the sale of trout. It had the unanimous support of the representatives from southern California, and after a most thorough discussion passed both houses of the legislature and was signed by the Governor.

At the time the bill was before the legislature I had the pleasure of hearing all the arguments, pro and con, and thoroughly agreed with those in favor of the bill, particularly in its relation to Bear Lake, which is a small lake and would in a short time be depleted of its fish if market fishing were permitted to continue, thus depriving many, many thousands of people of the only real good trout fishing to be had in southern California.

It seems that every market fisherman, commission merchant and profiteer has attempted to set aside the restrictions passed for the conservation of our fish and game. The best answer to those men

is Col. Roosevelt's message, which reads as follows:

"To the profiteering proposal of the pseudo-patriots, the patriots for revenue only, that protection of wild life in war time be relaxed, the united hosts of conservation reply:

"You Shall Not Pass.

"Let this be the slogan of every farmer, of all who dwell in the open, and of all who love nature and who wish to see our natural resources preserved for the perpetual use of our people and not destroyed for all time to gratify the greed of a moment."

Yours very truly,

(Signed) CARL WESTERFELD,
Executive Officer.

FACTS OF CURRENT INTEREST.

The enabling act of the Federal Migratory Bird Law was finally passed on June 6, 1918; the greatest piece of game protective legislation in the world is thus brought to completion.

✣ ✣ ✣

Two Austrian fishermen have been arrested in southern California under the Wood Act of August, 1917, for dumping overboard twenty tons of barracuda. Such wanton destruction of valuable food is now a criminal act.

✣ ✣ ✣

The site for the new Yosemite Hatchery has been selected and ground will be broken soon.

✣ ✣ ✣

On May 7, 1918, the Western California Fish Company of Pittsburg, California, secured a salmon weighing 67 pounds.

✣ ✣ ✣

The counties of Marin and Yolo each pay a bounty of $20 on coyotes and Solano and Sutter each pay $10.

✣ ✣ ✣

Paladini, the fish dealer so often accused of monopolizing the wholesale fish industry of San Francisco, has been arrested for shipping striped bass out of the state.

✣ ✣ ✣

The attempt to breed ducks for the market recently made by A. Schilling, has been abandoned. The large game farm near Newark, Alameda County, was the largest of its kind in the state.

✣ ✣ ✣

Striped bass have been plentiful this spring and have sold as low as seventeen cents per pound. The abundance is doubtless due to the added protection this fish has received the past three years.

✣ ✣ ✣

Large numbers of fish have died in the Kern River near Bakersfield, probably because of low water. Fortunately these fish were not valuable as food.

✣ ✣ ✣

The lowly jackrabbit has become so important a food item that the price has been increased in the markets.

✣ ✣ ✣

The shad catch this spring has been below normal due to overfishing the past few years.

HATCHERY NOTES.

W. H. SHEBLEY, Editor.

FRY DISTRIBUTION BEGINS.

On June 2, Fish Distribution Car No. 02 will leave Sisson on the first trip of the season. A consignment of 100,000 quinnat salmon fry will be shipped from Mt. Shasta Hatchery on this trip, consigned to H. E. Westbrook of Smith River. Delivery of the fish will be made at Grant's Pass, Oregon. From that point the shipment will be transported overland in auto trucks and planted in Smith River, Del Norte County, near Crescent City. Immediately upon the return of the car from Grant's Pass, the shipment of trout fry from Mt. Shasta Hatchery will be commenced. Car No. 02 has just returned from the Southern Pacific car shops at Sacramento, where it has been fitted up with a new type of gas engine and air compressor. This distribution car, which is a converted Southern Pacific baggage car, operated under lease to this commission for the season of 1918, is exceptionally well equipped for the season's distribution work, many important improvements having been made in the special aerating apparatus.

Distribution Car No. 01 is at the present time in the Southern Pacific shops at Sacramento, where it is being reconstructed. An entire new steel underframe was recently received from the East, and with extensive repairs to the trucks, roof and body of the car, repainting, etc., the car will be as good as new when completed. The engines and aerating apparatus, too, are to be given a thorough overhauling before the car is again put on the road. This work is all being rushed to completion, and it is expected that the car will be ready for operations by the middle or latter part of June. The first work undertaken by Car No. 01 this season will be to assist in the distribution of trout fry from Mt. Shasta Hatchery. Later on in the season it will in all probability be sent south to take up the distribution of fish in the waters of southern California from the Mt. Whitney Hatchery.

TAKE OF EGGS BELOW NORMAL.

Owing to the extreme drought this season the take of both rainbow and steelhead trout eggs was considerably short of our expectations. Every effort was made to obtain a greater number of trout eggs than ever before, but despite out utmost endeavors only between sixteen and seventeen millions of eggs of all species were obtained. On some of the streams where our egg-collecting stations are located the flow of water became so low during the latter part of April that all egg-collecting operations were discontinued before the first of May, whereas, in normal years, operations are carried on until very near the first of June. This condition was especially noticeable at the Snow Mountain Station on the Eel River, Mendocino County, where steelhead trout eggs are taken. The water in the river fell so rapidly and became so low during the closing days of April that it was only by exercising the greatest care and working night and day that the hundreds of thousands of steelhead eggs being "eyed," in preparation for shipment to other stations, were saved. Other stations affected by the extreme drought were: Scott Creek Station in Santa Cruz County, the Klamath stations at Bogus Creek and Camp Creek in Siskiyou County, Almanor and Domingo Springs stations in Plumas County, and Tallac Station, El Dorado County. Had it not been for the preparations made for obtaining a record take of eggs this season, fishcultural operations for the year 1918 would undoubtedly have been a failure. As a result, however, of our extensive operations we will be enabled to distribute in the waters of the state in the neighborhood of sixteen million trout fry, and this number, under the circumstances, will be made to fill all requirements.

BROOKDALE HATCHERY.

The distribution of trout fry from Brookdale Hatchery has been commenced, and by the middle of June the streams of Santa Cruz County will have

been well stocked with fish. Following the Santa Cruz County distribution work, the streams of Santa Clara County will be taken care of by the Brookdale Hatchery. Owing to the fact that there is grave danger of the water supply giving out if operations are continued much beyond the fore part of July, it is essential that the distribution work from Brookdale Hatchery be rushed to completion at an early date.

UKIAH AND FORT SEWARD HATCHERIES.

Ukiah and Fort Seward hatcheries will commence distributing fish in the streams of the north coast counties during the fore part of June. At these stations also it will be necessary that the distribution work be completed before the water supply becomes too low.

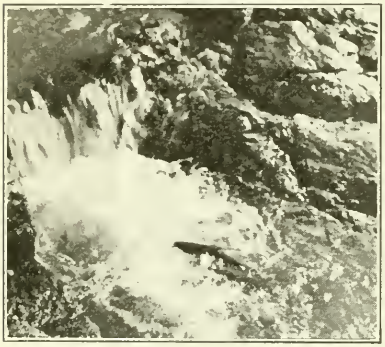

Fig. 77. Trout ascending fish ladder of Snow Mountain Dam, in Mendocino County. The Snow Mountain egg-collecting station is situated near by. Photograph by S. Campbell, April, 1918.

ALMANOR HATCHERY.

Almanor Hatchery distribution operations will be commenced in the near future, and by the fore part of July the planting of fish from Domingo Springs Station will be under way.

FEATHER RIVER HATCHERY.

A new hatchery has been constructed on Gray Eagle Creek near the town of Blairsden, Plumas County, on the line of the Western Pacific Railroad. From this station trout fry will be shipped to supply the applicants of Plumas, Modoc and that portion of Lassen County, along the line of the Nevada, California and Oregon Railway. This station, which will be known as the Feather River Hatchery, is at present only a temporary structure. If conditions prove to be favorable for fishcultural operations, a permanent hatchery will be constructed next season.

BEAR LAKE HATCHERY.

Bear Lake Station is fulfilling all expectations. Even under adverse weather conditions obtaining, this season's results have been most satisfactory. With the improved facilities at North Creek Station we were enabled to obtain in excess of three million rainbow trout eggs. A considerable number of eggs, after being "eyed," were shipped to Mt. Whitney and Mt. Shasta hatcheries, where they will be hatched, reared and distributed in the waters of the state. In excess of one million of the eggs will be hatched and reared at North Creek Station and at the main hatchery near Green Spot Springs, for liberation in the streams of San Bernardino County and Big Bear Lake.

MOUNT WHITNEY HATCHERY.

The results of the extensive improvement work recently commenced at the Mt. Whitney Hatchery are beginning to show. The large pond is nearly finished, and the work on the grounds is progressing nicely. The fish hatched from Eastern brook and Loch Leven eggs shipped to this station during the early spring months are thriving well and are about ready for distribution. The steelhead trout fry hatched from eggs shipped from the Snow Mountain Station are also doing well.

WAWONA HATCHERY.

All repairs to the building, flumes, tank, etc., at Wawona Hatchery have been completed. On May 12, consignments of rainbow and steelhead trout eggs were received at Wawona from Mt. Shasta and Brookdale hatcheries. The resulting fry will be distributed in the streams in and around Wawona, as in former seasons.

TAHOE HATCHERIES.

Egg-collecting operations at Mt. Tallac Hatchery have been nearly up to normal

this season, and the usual number of black-spotted trout fry will be distributed in the streams tributary to Lake Tahoe from the Mt. Tallac and Tahoe City hatcheries. Consignments of black-spotted eggs for distribution in other sections of the state will also be shipped from Mt. Tallac Hatchery to Mt. Shasta and Mt. Whitney hatcheries.

LADDERS AND SCREENS.

Reports have been received to the effect that a fish ladder has been installed over the Huseman Dam, the property of the Lucerne Water Company, near Granada, Siskiyou County. This is one of the dams for which plans and specifications for a fish ladder were furnished during the early spring months. It has also been reported that an open cut, to enable fish to pass the dam, has been constructed in the Spaulding Dam in Little Shasta River, Siskiyou County. This dam is the property of the Spaulding Mill.

Reports from Shasta, Tehama, Modoc and San Bernardino counties indicate that screens are being installed in a great many irrigating power ditches and canals, in accordance with our instructions. Screen surveys were recently made in Lake County, and we have been assured that the screens will be installed as soon as materials can be obtained for their construction. Among the more important automatic cleaning screens recently installed are those of: Bert Hampton, near Mineral, Tehama County; R. W. Haynes, Burney, Shasta County; R. L. Johnston, Montgomery Creek, Shasta County; P. Bertagna, Montgomery Creek, Shasta County; Pacific Improvement Company, Castle Crags, Shasta County; W. L. Williams, Chromite, Shasta County; and Mrs. R. McKay, Red Bluff, Tehama County. The work on the large screens for the Stanford University Vina Ranch in Tehama County is being rushed, and within a very short time these screens should be ready for installation. The largest rotary screen ever constructed in the state was completed about a month ago. It was installed by the Anderson-Cottonwood Irrigation District at the intake of their canal, near Anderson, Shasta County. The screen is in three sections, each 9 feet wide by 12 feet 5 inches in diameter, and is of the southern California Edison type. A recent inspection was made of this screen, and it was found to be working perfectly.

COMMERCIAL FISHERY NOTES.

N. B. SCOFIELD, Editor.

KELP AND POTASH MANUFACTURE.

During the year 1917 the following kelp companies operated in California:

Diamond Match Company
Hercules Powder Company
Lorned Manufacturing Company
Pacific Products Company
Occidental Chemical Company
San Diego Kelp Ash Company
Sea Products Company
Swift & Company Kelp Works

Besides these companies several outfits known as "handpickers" operated along the southern California coast. Their method of operation is to go out in boats and cut the kelp by hand and pull it in over the side of the boat or load it into small barges. The kelp is then taken ashore where it is scattered on the grass to dry. When it is sufficiently dried it is burned in an open kiln. The resulting ash is sacked and sold to the larger companies who refine it to extract the potash and other salts and by-products, or else it is shipped direct to refineries in the eastern United States. It takes twenty tons of wet kelp to make one ton of ash and the ash contains between eight and ten per cent of pure potash.

A few of the larger companies and the United States experimental plant at Summerland have chemists and chemical engineers employed who are endeavoring to devise more economical means of extracting the potash salts as well as developing by-products; the object being to make it profitable to continue the operation of the plants when the price of potash shrinks to near what it was before the war. So far the best results in the way of developing by-products are being obtained in the fermentation process

such as is employed by the Hercules Company at San Diego. One of the most likely leads on which they are working is the development from the celulose of the kelp of a base for the non-inflammable shellac which is used for aeroplanes and non-inflammable motion picture films.

The company feels confident that it will be able to continue the San Diego plant after potash has shrunk to its pre-war price. The companies believe that more economical methods of refining of the potash salts will be developed as they gain in experience and cite as an example the wonderful progress that has been made in the process of sugar refining.

At the beginning of the kelp industry there was much prejudice against the cutting of the kelp beds, for it was believed by many that the beds were the spawning places of many varieties of fish and that if the beds were cut the kelp would be destroyed and thus not only would the fish be destroyed for the want of a spawning place but the beaches would be deprived of the protection the beds afford against the high waves. It has been found that the kelp is not destroyed by cutting and

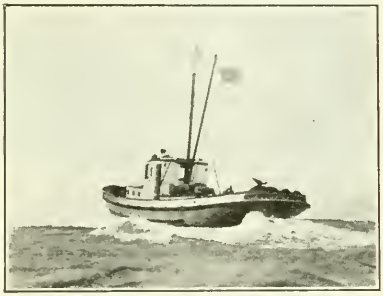

Fig. 78. New patrol boat "Albacore" under way. Photograph by H. B. Nidever.

that it regrows within ninety days. Even after the most severe cutting, which takes off the tops of the kelp spread out on the surface of the water, enough tops remain intact to still offer a good refuge for fish and to protect the beaches against the action of waves. It has been found through the investigations of the United States Bureau of Fisheries and the Scripps Institution that cutting the kelp does not destroy the fishes spawn. In fact, no spawn of any fish has been found on the kelp which is harvested.

Some complaint has also been made of the odor of the kelp at the factories during the process of incineration. The odor, which is not unlike that of roasting coffee, has been mostly overcome by passing the gases again through the fire and thence through condensing rooms and sprays of water.

FISHERY STATISTICS.

In order that the statistics of the fisheries, which the Fish and Game Commission has been gathering during the past three years, may be more complete and accurate, a new system is being employed. The present law requires that packers and dealers receiving fish from fishermen make monthly reports to the Fish and Game Commission of the amount of each variety of fish received. They are also required to issue receipts to each fisherman from whom fish are received and to keep a carbon copy of the receipt which must be kept at least six months for the inspection of the commission.

It is extremely valuable from a conservation standpoint that accurate records of individual boat catches be kept. It has proved to be of importance also to the Food Administration that individual boat records in certain fisheries be kept. The Fish and Game Commission therefore has undertaken to furnish the Food Administration with this needed information. Each packer and dealer now is furnished receipt books in triplicate to be used when receiving fish. One carbon copy will be for the use of the Fish and Game Commission. From these receipts will be compiled the monthly records of the quantity of each variety of fish taken in the state. The Food Administration will be furnished with data as to prices paid, to whom fishermen under contract are delivering fish, and the average yearly catch of boats in any fishery. By using these books the packers and dealers will be relieved of the trouble of making out the monthly fish report which has been required and also the weekly report of receipts from individual boats now required by the Food Administration in certain of the fisheries. Not only will the dealer and packer be benefited and the Food Administration receive the information it requires, but the Fish and Game Commission will be getting a system of statistics more complete and accurate than

that of Scotland which leads all other countries in statistical fisheries conservation work. The record of individual boat catches such as will be gathered each year will be priceless in determining the trend of the fisheries and will be conclusive evidence whether any fishery is or is not being depleted.

INCREASE WORKING FORCE.

To gather the fisheries statistics necessary for the conservation of the fisheries and to compile the data desired by the Food Administration, the Fish and Game Commission has employed two extra men, one to be located at San Francisco and the other at San Pedro Harbor. To facilitate this work and to keep in better touch with the already extensive and rapidly growing fisheries of Southern California, the Fish and Game Commission has established an office on Fishermen's Wharf, San Pedro, where the statistical files for that part of the state will be kept and tabulated. The office will also be a headquarters where information may be obtained by fishermen or anyone else interested in the fishing or kelp industries. A laboratory is also being fitted up in connection with the office to be used by the commission's fisheries investigators.

CONSERVATION IN OTHER STATES.

BEAVER WANTED IN MICHIGAN.

Even the State of Michigan, which was once noted for its colonies of beavers, realizes the fact that she must re-colonize these animals. Conservationists are urging the stocking of tributary creeks flowing through sand plains, on the plea that these animals would cause no hardship on agriculturalists. The beaver is pointed out as the only fur-bearing animal that does not prey on other forms of wild life.

MINNESOTA HELPS IN GOVERNMENT'S "EAT MORE FISH" CAMPAIGN.

As a part of the campaign of the United States Bureau of Fisheries, designed to get people to eat more fish, the State of Minnesota is conducting demonstrations of the cooking of the coarser fishes, such as the carp, bowfin (dogfish) and buffalofish. Two different parties are now touring the state. Work of this kind has proved of great value in Illinois and other states.

MARYLAND TO HATCH STRIPED BASS.

Maryland is constructing and equipping two fish hatcheries. One of them for the tidewater work is to be a floating hatchery.

This hatchery will be equipped to propagate white perch, yellow perch, shad and herring and it is also proposed to try out the propagation of rockfish or striped bass.

NEW YORK ENFORCES FISH AND GAME LAWS.

The New Yo k Conservation Commission, headed by George D. Pratt, is enforcing the fish and game laws. Of the 243 cases reported for August, 1917, 202 were settled in civil actions, and $4,443.72 was recovered in fines. Even frogs are protected in New York, and the one violation of the law reported was settled in court and a fine of $21.00 was collected. Violations of the law protecting fur-bearing mammals netted $39.00, and the six cases brought into court having to do with the protection of song birds resulted in fines amounting to $185.40.

WASHINGTON GAME FARM.

The Washington Fish and Game Commission is trying out the experiment of placing the game farm at the state penitentiary, and utilizing convict labor. The experiment will be watched with interest.

AUTO HUNTING STOPPED IN NEW JERSEY.

A law making it illegal to kill or pursue birds or animals by the aid or use of an automobile is now in effect in New Jersey. The penalty for violation of the act is $50 for each offense.

Provisions of the anti-automobile hunting law are very specific. They make it unlawful for any person or persons while in an automobile to hunt for, pursue, shoot, shoot at, kill, capture, injure or destroy any bird or animal in this state.

or to use any light or lights carried on or attached to any automobile for any purpose whatsoever in hunting.—Sportsmen's Review Mar. 23, '18.

PENNSYLVANIA WILL PROTECT RUFFED GROUSE.

A petition by which counties can be closed against the shooting of ruffed grouse, is being sent by the Pennsylvania Game Commission to sportsmen and hunting clubs throughout Pennsylvania.

Ruffed grouse, or pheasants, are becoming alarmingly scarce in various sections of the nation and sportsmen in Pennsylvania are insisting that the season for grouse must be closed for a period if this, the greatest of American game birds, is to be preserved from extinction. Unfortunately these birds can not be purchased in either the United States or Canada. Therefore drastic steps must be taken if the grouse are to be saved.

Already about a dozen counties have closed the season for one or two years and the petition is circulated in the hope that all the counties will act simultaneously to protect the bird for two years.

LIFE HISTORY NOTES.

LIONESS TRACKED TO LAIR.

On April 24, 1918, I made a trip up the mountain side northeast of Wawona looking for lion signs and found the tracks of a female mountain lion (*Felis concolor*). The tracks were about two days old. My dogs cold trailed her until it began to rain heavily, which destroyed the scent, so I was compelled to give her up for that day. I was convinced that the lioness had young in some of the bluffs in that vicinity so started early the next morning to hunt the bluffs and about seven o'clock the dogs picked up the trail of the lioness which was then about twelve hours old. After trailing about three hours, during which time the lioness had made several unsuccessful attempts to kill a deer, the trail finally led to the carcass of a doe which was partly devoured as it had been killed several days earlier (see fig. 80). From here the lioness went up the mountain, circling round a bluff of rocks. On the upper side, atop of the bluff, the trail apparently ended for the lioness had jumped down over a ledge and

Fig. 79. Site of the lair of mountain lion near Wawona, California.
Photograph by Jay C. Bruce.

worked down the bluff to her lair (see fig 79). After circling for about ten minutes without locating the trail the dogs winded the lair and soon located it. The mother lion was in the lair with the three kittens.

After some difficulty I succeeded in shooting the mother lion in her lair and then captured the three kittens which were about ten days old, I should judge.

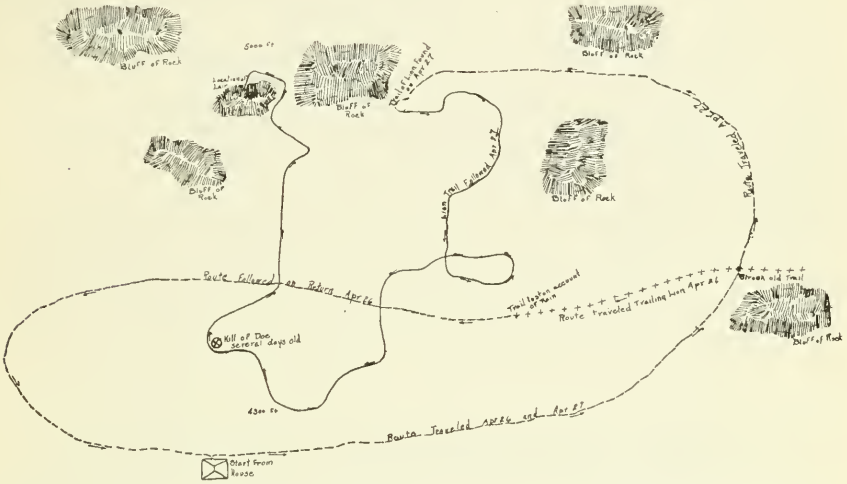

Fig. 80. Diagram showing location mountain lion lair and route followed by hunter and lion.

The lair was about six feet long and two feet wide. The nest was bedded with pine needles, probably carried in the den by wood rats for their nests at some time. There was also a small opening, perhaps eight inches in diameter, through which the sun would shine on the kittens in the nest.—Jay C. Bruce.

Fig. 81. Mountain lion kitten captured by J. C. Bruce near Wawona, California, on April 27, 1918. Photograph by Jay C. Bruce.

QUAIL SUFFERED FROM LACK OF FOOD.

During the severe snow storm in January, 1916, great numbers of quail died in Modoc County, either from lack of food or lack of shelter. Ranger Snelling placed large quantities of wheat near all the warm springs in Pitt River Canyon where the snow had fallen to a depth of thirty-six feet. The quail, after devouring the food set for them, would seek shelter under roots and brush and even in the holes of small animals, where they very often died during the night. The snow would become so packed that the birds were unable to come out of their resting places and would be smothered. Consequently, it was seen that not only food, but also shelter must be provided for the quail during heavy storms. The numbers of birds dwindled from three hundred and fifty first seen at the feeding places, to nineteen, the number finally captured with traps. The captured birds were fed and kept in a warm place for about a month when they were given their liberty. These quail returned again and again to the old feeding places.—G. W. Courtright.

AN EMPEROR GOOSE TAKEN IN GLENN COUNTY.

On Sunday, December 2, 1917, I saw in a string of ducks killed by a Los Banos hunter a fulvous tree-duck. I believe

this is a rather late date for this bird to be found in that section.

I was recently advised by Dr. B. A. Mardis of San Francisco, California, that he killed an emperor goose near Norman, Glenn County, California, during the fall of 1916. This bird is now on display in the store rooms of the Ellery Arms Company.—J. S. HUNTER.

VALLEY QUAIL LAYS TWENTY-NINE EGGS.

Those who are endeavoring to rear valley quail in captivity will be interested in the following results obtained in the past breeding season. A valley quail which I have kept in captivity for several years deposited her first egg on March 2 and the last one on May 16, making a total of twenty-nine eggs. She showed no inclination to incubate them so it has been necessary to hatch them under bantam hens. A still larger number of eggs for breeding purposes could doubtless have been obtained had the eggs been removed as they were laid.—GEORGE NEALE.

THE BARN OWL AS A GOPHER CATCHER.

Direct evidence of the value of the barn owl is to be found in an experiment performed on the ranch of Mr. Burris, near Hanford, Kings County, California. A young barn owl was taken from the nest and placed where the parent birds could feed it. On the dates indicated the fresh food in view around the young bird was as follows:

May 14th, 6 gophers and 1 jack rabbit.
May 15th, 5 gophers.
May 16th, 1 gopher and 1 jack rabbit.
May 17th, 2 gophers.
May 18th, 4 gophers.
May 19th, 2 gophers.

Thus, a total of 20 gophers and 2 jack rabbits were killed in six days time by one pair of barn owls. In addition the parents fed themselves and another young owl left in the nest.—E. W. SMALLEY.

UNITED STATES FOREST SERVICE CO-OPERATION.

PEOPLE FAVOR ANGELES GAME REFUGES.

People are in favor of the two refuges of approximately 600,000 acres within the Angeles Forest, known as 4-A and 4-B. Deer are becoming more and more plentiful. We have approximately 400,000 people go into the forest each year for recreational purposes, and if there are 1,000 deer hunters, it stands to reason that the opposition of 399,000 should outweigh that of 1,000. If anyone is benefited by reason of an open season, it would be the resort owners, and yet with the possible exception of one owner, a man who has been in court several times for alleged game violations, I have yet to find a resort owner who is not in favor of the continuance of the game refuges.—B. W. CHARLETON.

ELK INCREASING IN SHASTA NATIONAL FOREST.

The elk in the Squaw Creek District are increasing. Seven cow elks with calves were seen this year (1917). Some of the original herd died off but they seem to be increasing now and are apparently acclimated. All elk seen were in good condition and apparently doing well.—WM. GRACEY.

GAME SCARCE IN EL DORADO NATIONAL FOREST.

Game is becoming so scarce in the El Dorado National Forest that the consensus of opinion of forest officers is that closed seasons should be enforced as follows:

Deer ..... 3 years.
Grouse ..... 3 years.
Gray Squirrels ..... 3 years.
Quail ..... 3 years.

—E. L. SCOTT.

GROUSE IN THE PLUMAS NATIONAL FOREST.

Grouse are noted in most parts of the Plumas National Forest, but the number is small. Sage-hen are only seen in Frenchman Creek, and a few in Sierra Valley. It is my opinion that the season on both these game birds should be closed for a number of years, and this same opinion has been voiced by a num-

ber of residents of this locality.—A. G. Barrett.

DESTRUCTION OF GAME BY PREDATORY ANIMALS.

Mountain lions are getting very numerous in District 2-21, the southern edge of which borders on the Yosemite National Park, which forms an ideal breeding ground for them, since no hunting or trapping is allowed, and dogs are prohibited as well. Ranger Elliott states that he had noted several instances where deer have been killed by these animals. Gordon McGrue, a trapper who winters in the high country, reports finding the carcasses of five deer which were killed by one lion. He has attempted to trap or poison the lion, but so far has been unsuccessful. Ranger Fowler also reports that he found four carcasses of deer killed by lions. The cases mentioned, which were reported by only three men, would show that lions are about the most serious problem to contend with when the whole forest is considered. We know that four were killed in District 3 and four in District 2 within the last year, although it is quite probable that several more were caught during this time.—Ernestt Bach.

BEARS NUMEROUS IN SHASTA NATIONAL FOREST.

About thirty-five bears were killed in the country between the McCloud River and Kosh Creek in the Shasta National Forest during 1916. Thirty coyotes and ten lions are also reported as being killed in this section during December of the same year.—W. M. Gracey.

THE FISHER IN THE TRINITY NATIONAL FOREST.

Fisher usually inhabit the higher, heavily timbered slopes and are seldom found at lower elevations except during the winter months when the country is covered with snow. It is thought that their food consists chiefly of field mice, gophers, tree squirrels and other small bird and animal life. On New River a settler is attempting to raise fisher in captivity, but so far has had only indifferent success. It is estimated that twenty to twenty-five fisher are taken each year on the Trinity National Forest, although the species is becoming more rare.—F. V. Jotter.

WILD LIFE IN RELATION TO AGRICULTURE.

MOUNTAIN RATS INJURE YOUNG TREES.

Forest Examiner Munns of the United States Forest Service has made an interesting study of the damage done by pack rats to young pine growth on the Angeles Forest. In one locality where the rats were numerous it was discovered that 43 per cent of the young trees have been severely injured or killed by these animals. The rats seem to work chiefly during the late summer and fall and usually more in a dry season than in a wet one. Mr. Munns concludes from this that the rats, which often have no access to water, tear off the tender bark in search of moisture. —*Weekly Bulletin of Forest Service*, Dec. 23, 1916.

IT PAYS TO DESTROY GROUND SQUIRRELS.

A word in regard to the economy of the ground squirrel eradication is at the present peculiarly appropriate, at a time when such stress is being laid on the conservation of the country's agricultural resources. During the past year it was estimated that squirrels on Union Island, in San Joaquin County, caused a damage to crops amounting to $65,000. An expenditure of $10,000 would practically completely free this land of squirrels and $1,000 a year thereafter would insure continued freedom. Surely it is more important to eradicate such a damaging pest from land now under cultivation than to cultivate even very large tracts of now uncultivated lands.—*Cal. State Bd. of Health Month. Bull. 12*, p. 321.

CALIFORNIA FISHERY PRODUCTS—JANUARY, FEBRUARY, MARCH, 1918.

Species of fish	Del Norte, Humboldt.	Mendocino, Sonoma, Lake.	Marin.	Tehama, Glenn, Colusa, Sutter.	Solano, Yolo.	Sacramento, San Joaquin.	Alameda, Contra Costa.	San Francisco.	Santa Cruz.	Monterey.	San Luis Obispo, Santa Barbara, Ventura.	Los Angeles.	Orange.	San Diego.	Imperial.	Totals.	Mexico.
Albacore												63,278				63,278	1,527
Anchovy										91,285						91,285	
Barracuda								4,912	15,284			71,411		451,492		543,099	136,840
Bonito												7,710		13,286		20,996	4,004
Bocaccio								15,363	72,701	371,601						459,665	
Bluefish								5,663	320	7,256						13,239	
Chilipepper								49,557	56,587	5,506						111,650	
Carp		14,834	8,250	2,298	8,087	11,918	35,153	3,403				52,529				136,472	
Catfish		73,168		2,383	1,966	15,573	11,393	912								105,395	
Coalfish								70,657		7,935	150	2,149	161			81,052	
Cultus cod	82							134,417	8,543	132,736						275,778	
Dogfish								167,131		5,075		9,611		1,495		183,312	
Flounder	10,129		99		981		51	193,291		69		4,930		1,120		210,670	
Halibut	60							20,380	653	880	56,530	436,149	2,304	550,727		1,067,683	186,970
Hake								12,422	3,575	8		1,533		2,359		19,897	1,113
Hardhead				7,195		7,205										14,400	
Herring	4,078		3,005,320					4,591,998	5,900							7,607,296	
Kingfish			10					5,400	19,769	14,837		278,006		9,714		327,736	
Mackerel										165,221		538,187	1,001	62,708		767,117	13,343
Mullet															64,467	64,467	
Pike			1,285	433	204	717	4,573	172								7,384	
Pompano								228		246		7,232				7,706	
Perch	8,975	258	38,897				15	5,315	2,356	3,844		2,505	15			62,180	
Rock bass												55,386		6,736		62,122	
Rockfish	2,852							372,865	185,417	335,618	68,638	837,208	15,324	562,414		2,380,336	855
Sole			36					1,291,294	283,335	94,674	9,955	43,230	138	2,463		1,725,125	
Salmon		1,273	2,253	6,750	75,334	29,191	80,384	6,618	337	320,630						522,770	
Smelt	744		3,766					33,786	3,141	3,766	2,675	34,439	2,753	21,743		106,813	
Sea bass (white)										136	40	18,534		5,370		24,080	
Sea bass (black)												7,732		11,445		19,177	1,310
Sand dab								427,646	36,992	1,717		6,203				472,558	
Striped bass			19,955	746	132,228	47,512	256,788	11,846	31							469,104	
Shad			1,639		14,537	1,338	30,767	595								48,876	

Splittail				3,652		2,877	1,115									7,644		
Sucker						4,525										4,525		
Sardine		240	451							9,294,110		30,474,902		1,657,219		41,426,922		
Skate								101,159		729		3,564	28			105,480		
Sculpin								165				7,679				7,844		
Tom cod								4,592				510				5,102		
Trout (lake)								265	1,151					47		1,463		
Trout (steelhead)			431													431		
Turbot			250				10				525	40				825		
Whitebait			4,569													4,569		
Yellowtail									43,524	22,491		48,874		116,356		231,245	40,404	
Miscellaneous			102	3,251		1,315		7,982	230	1,907		6,769		5,812		27,368	160	
Totals	26,920	89,773	3,087,313	26,708	233,337	122,171	420,249	7,540,034	739,846	10,882,277	138,513	33,020,300	21,724	3,482,506	64,467	59,896,138	386,526	
Crustaceans—																		
Crab (dozen)	1,802							36,940	454	95						39,291		
Spiny lobster											14,673	20,826	1,529	55,113		88,249	188,265	
Shrimp								58,012								58,012		
Mollusks—																		
Squid										16,083		29,677		13,912		59,672		
Cuttlefish								6,182	3,846	4,252		53				14,333		
Clam (Pismo)											175,604					175,604		
Clam (cockle)			2,954								60	8,852				11,866		
Clam (softshell)		3,158	29,170				25,736									58,064		
Clam (mixed)	9,295	540	33,044					200	252			7,662				50,993		
Oyster (shell) No.			14,220					746,650								760,870		
Abalones										71,988	12,452					84,440		
Mussels	560		169					1,758	4,270	100	6,431	12,183		480		25,951		
Snails												661				661		
Reptiles—																		
Terrapin		511														511		
Sea turtle														835		835	10,042	

VIOLATIONS OF FISH AND GAME LAWS.

February 1 to June 1, 1918.

Offense	Number of arrests	Fines imposed
Game.		
Hunting without license	12	$195 00
Trapping without license	2	15 00
Spike buck, killing	1	
Deer meat, close season, possession	7	100 00
Trailing deer, close season	3	50 00
Illegal deer hides, possession	2	
Ducks, close season, killing or possession	4	75 00
Quail, close season, killing or possession, sale	4	105 00
Geese, close season, killing or possession	6	125 00
Cottontail rabbits, close season, killing or possession	4	75 00
Wild pigeon, close season, killing or possession	1	25 00
Wild pheasant, killing	1	50 00
Tree squirrels, close season, killing or possession	3	
Nongame birds, killing or possession	4	45 00
Total game violations	54	$860 00
Fish.		
Angling without license	27	$477 50
Fishing for profit without license	7	85 00
Making false statement on application for license	2	50 00
Trout, close season, taking or possession	18	375 00
Trout, excess bag limit	8	200 00
Trout, taking other than by hook and line	13	300 00
Trout, shipping by parcel post	1	
Striped bass, undersize, taking or possession	3	50 00
Black bass, close season, taking or possession	1	
Catfish, undersize, offering for sale	3	60 00
Sturgeon, possession, offering for sale	1	
Young of fish in possession	3	20 00
Salt water eels, undersize, taking or possession	3	100 00
Abalones, close season, undersize, taking or possession	17	390 00
Crabs, female, undersize, shipping from Humboldt Bay	8	120 00
Clams, undersize, excess bag limit	8	170 00
Illegal fishing apparatus	13	645 00
Dynamiting fish	2	400 00
Total fish violations	138	$3,442 50
Grand total fish and game violations	192	$4,302 50

SEIZURES—FISH, GAME AND ILLEGALLY USED FISHING APPARATUS.

February 1 to June 1, 1918.

Game.

Ducks	137	
Geese	8	
Quail	1	
Cottontail rabbits	5	
Tree squirrels	6	
Deer meat	178	pounds
Deer hides	24	
Deer feet	52	
Spike buck head	1	
Tree squirrel skins	41	

Fish.

Trout	439	pounds
Striped bass	513	pounds
Black bass	6	pounds
Salmon	69	pounds
Sturgeon	123	pounds
Catfish	12½	pounds
Salt water eels	62	
Abalones	315	
Crabs	330	
Crabs (cooked)	30	
Clams	1,537	
Lobsters	25	
Cockle clams	606½	pounds
Nets, traps and fishing outfits	5	

Searches.

Illegal fish and game	80

STATEMENT OF EXPENDITURES—YEAR 1918.

Item of expense	January	February	March	April
General administration	$1,950 09	$1,887 21	$1,782 56	$1,930 33
Research, publicity and education (game)	233 61	287 50	258 95	320 25
Printing	760 23	395 42	37 52	662 00
Fish exhibits	62 03			
Game exhibits				
Game farm	173 80	305 25	251 70	214 54
Mountain lion bounties	660 00	280 00	860 00	640 00
Lithographing hunting licenses				
Lithographing angling licenses				
Hunting license commissions	1,816 60	953 40	1,150 20	776 30
Angling license commissions	1,093 30	228 60	644 20	339 90
Market fishing license commissions	16 50	8 00	155 00	151 50
Paper Mill Creek Dam				
Totals	$6,766 16	$4,345 38	$5,140 13	$5,034 82
San Francisco district	$5,290 61	$5,320 48	$5,381 34	$5,624 48
Sacramento district	3,565 89	3,454 18	3,456 16	3,703 06
Los Angeles district	2,431 66	2,257 14	2,393 67	2,619 80
Launch patrol	642 27	1,109 52	1,086 10	1,217 53
Prosecutions (fish and game)	374 75	43 95	146 70	197 45
Crawfish inspection				
Winter game feeding				
Accident and death claims	250 80	539 29	212 50	124 04
Totals	$12,555 98	$12,724 56	$12,676 47	$13,486 36
Hatchery administration	$796 33	$816 90	$884 08	$933 97
Mount Shasta Hatchery	2,117 19	1,940 11	1,286 75	1,283 13
Klamath Station	227 25	423 30	316 10	514 75
Mount Whitney Hatchery	622 97	693 97	1,151 49	2,350 20
Rae Lakes Station				
Cottonwood Lakes Station				
Tahoe Hatchery	2,005 00	12 10	13 90	5 00
Tallac Hatchery	5 00	5 00	265 46	371 22
Fort Seward Hatchery	291 55	237 54	233 78	404 51
Ukiah Hatchery	23 63	20 78		100 42
Snow Mountain Station	398 79	383 96	355 16	297 62
Brookdale Hatchery	174 73	288 20	141 70	224 91
Scott Creek Station	31 00	28 00	78 10	101 00
Almanor Station	5 00	7 30	50 75	255 70
Domingo Springs Station	13 50		205 00	116 08
Bear Lake Hatchery	1 11	24 38	343 74	445 71
Wawona Hatchery				
Fish distribution	26 15	9 25	229 29	316 45
Fish transplantation	41 10			18 00
Screen, fishway and water pollution	599 70	625 93	714 72	664 09
Special field investigations				
Totals	$7,380 00	$5,516 72	$6,270 02	$8,402 76
Feather River Hatchery				$376 06
Fishery research and patrol	$1,335 29	$1,282 83	$1,333 92	1,517 64
Grand totals	$28,037 43	$23,869 49	$25,420 54	$28,817 64
Department of Engineering, launch "Albacore"	2,872 30			

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CALIFORNIA FISH AND GAME

"CONSERVATION OF WILD LIFE THROUGH EDUCATION"

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CONTENTS.

THE FLAT-FISHES OF CALIFORNIA.*

By EDWIN C. STARKS, Stanford University.

Though most of the flat-fishes on the California coast are known as soles, they are in truth all flounders but one—a very small one that is seldom taken and never used for food. The name sole seems to insure a better market than the name flounder, with the result that more and more of the flat-fishes that were once correctly called flounders are now called soles, and the name flounder is seldom used. The name flounder is used herein except in a few places where the name sole has been used so long it is firmly fixed.

The flat-fishes form a well marked group strikingly separated from all other fishes by one side of the head and body being white or almost colorless, while the other side is dark, and with the eyes both on the dark side. They lie on the sea bottom flat on the colorless side with the eyes and color on the uppermost side.

*A report of the Committee on Zoological Investigations of the California State Council of Defense.

When the flat-fish is born, however, and for some time afterwards, it is symmetrical and has an eye on each side of the head, while it swims back upwards as does any other fish. As it grows it leans more and more to one side, and the eye on the side toward which it leans gradually creeps over to the other side of the head. Though the eye only seems to creep to the other side, the whole skull in truth twists, and the part that is between the eyes is the part that is normally on top of the head in other fishes.

A peculiarity of the flounders of the western coast of North America is that several of them have an accessory branch of the lateral line that runs back from the head following under the base of the dorsal fin. There is a species in Japan with this characteristic, but otherwise it is found on flounders from no other part of the world.

The flat-fishes are widely distributed, and are found in nearly all seas. Some of them ascend rivers to where the water is scarcely or not at all salt. Some species, or groups of related species, have the eyes and color always on the right side, while other species have them on the left. A very few species have about an equal number of individuals colored on either side. On our coast are several with this uncertain distribution of color to either the right or left side.

A zoological key has been prepared for the easy identification of the flounders. For those who are unable to use the key there remains the method of hunting through the descriptions and pictures until one is found to fit the specimen at hand. It is urged, however, that the reader become accustomed to the use of the key. Keys are used in nearly all serious zoological books, and will be used in these papers where, as in the flounders, it is difficult to avoid their use. The key is arranged to consider alternative characters; one character being under a single figure (6) as contrasted with an alternative character under a double one (6-6). In long keys a second alternative is often used (6-6-6). If, in consulting the key, the characters under the first figure do not fit the specimen go to those under the double figure. If they do fit read on down, using only the characters that fit (and when they do not fit skipping to where they do) and going as far as possible when the name will be found. For instance: suppose we have a flounder with the ventral fins one on each side of the abdomen; without an arch at the front of the lateral line; the body covered with ordinary scales; the maxillary not reaching to below the hind border of the lower eye; and the pectoral fin longer than the head. We compare our specimen with 1 at the beginning of the key. The ventral fins are not as described, so we skip everything between and consult 1-1, which fits. Taking the next number below, 3, "lateral line with a high arch." It has not. We go to 3-3, which fits. The character under the next number, 8, does not fit, but under 8-8 it does. The next character below, 9, does not fit, for the maxillary does not reach to directly below the hind border of the lower eye, which character is as under 9-9. The next character, 10, fits, for the pectoral is longer than the head, and as we can go no farther it follows that our specimen is the rex sole.

The species in the body of this paper are arranged with reference to their possible relationship, but in the key their arrangement depends only upon convenience.

GLOSSARY.

Anal fin: The fin along the lower edge of the body.

Caudal fin: The tail fin.

Depth of body: The greatest distance from the base of the dorsal to the base of the anal fin.

Dorsal fin: the fin along the back.

Head: The head is measured from the tip of the snout to the edge of the gill cover.

Lateral line: A line of pore-bearing scales along the middle of the body. When the lateral line is said to have an arch in front, it means a high, abrupt arch, not simply the front of the lateral line curved up.

**Maxillary*: The flattened bone just above the mouth.

Pectoral fins (or pectorals): The fins just behind the gill openings; one on each side of the body.

Snout: That part of the head in front of the eyes.

Ventral fins (or ventrals): the pair of fins on the lower edge of the abdomen.

Families of Flat-Fishes.

The bone of the gill cover that bounds the cheek behind (preoperculum) has the margin distinct, and not covered and bound down by skin and scales. The eyes are rather large, and the mouth moderate or large, and armed with teeth. The Flounders (family *Pleuronectidæ*), page 165.

The bone of the gill cover that bounds the cheek behind has the margin bound down and covered by skin and scales. The mouth is small and much twisted, and the teeth are rudimentary or absent. The only California member of this family differs from the flounders in having the body tapering to a point behind, and the dorsal, anal, and caudal fins continuous around it. The Soles (family *Solcidæ*), page 179.

KEY TO THE FLOUNDERS OF CALIFORNIA.

1. Ventral fins not symmetrical; that of eyed side on ridge of abdomen.
   2. Ridge between eyes concave; highest above lower eye where it rises to a ridge. Lower eye much longer than snout. Soft Flounder (*Citharichthys sordidus*). Page 178.
   2–2. Ridge between eyes narrow and not concave; not highest above lower eye. Lower eye about equal to length of snout. Speckled Flounder (*Citharichthys stigmæus*). Page 178.

1–1. Ventral fins symmetrical. One on each side of ridge of abdomen.
   3. Lateral line with a high arch in front. (Not simply curved upwards.)
      4. Pectoral on eyed side as long or longer than the head; reaching about to middle of body. Long-finned Flounder (*Xystreurys liolepis*). Page 169.
      4–4. Pectoral on eyed side not much over half as long as head.
         5. Maxillary reaching to directly below hind border of lower eye, or past it.
            6. Eyes very large and separated by a high ridge of bone. Teeth very fine. Big-mouthed Flounder (*Hippoglossina stomata*). Page 168.
            6–6. Eyes small and separated by a flat area. Teeth sharp. Chicken Halibut (*Paralichthys californicus*).

*In the descriptions when the maxillary is said to reach to below a certain point it means vertically below. For instance: "maxillary reaching to below middle of eye" means that the fish must be held horizontally and the maxillary must reach to an imaginary line drawn vertically downward from the middle of the eye.

5–5. Maxillary not reaching past middle of lower eye.

7. Depth of body about a third of the length without caudal fin. Scales fine and smooth. Halibut (*Hippoglossus hippoglossus*). Page 166.

7–7. Depth of body about a half of the length without caudal fin. Scales rather large and rough. Double-lined Flounder (*Lepidopsetta bilineata*). Page 175.

3–3. Lateral line without a high, abrupt arch in front, but usually with a small curve.

8. Body covered with rough, scattered plates. The dorsal and anal with alternate black and orange marks. Starry Flounder (*Platichthys stellatus.*) Page 175.

8–8. Body covered with ordinary scales.

9. Maxillary reaching to vertically behind the lower eye. Arrow-toothed Halibut (*Atheresthes stomias*). Page 165.

9–9. Maxillary not reaching to vertically below the hind border of lower eye.

10. Pectoral fin on eyed side much longer than head. Rex Sole (*Glyptocephalus zachirus*). Page 177.

10–10. Pectoral fin not as long as head.

11. Maxillary reaching to vertically below the middle of the lower eye.

12. First dorsal rays at least twice as long as the eye, and for most of their length not connected to each other by membrane. Spotted Flounder (*Pseudichthys melanostictus*). Page 168.

12–12. First dorsal rays not as long as eye.

13. Scales small; over 30 rows of them between lateral line and back at widest place. Jordan's Flounder (*Eopsetta jordani*). Page 167.

13–13. Scales larger; not 20 rows of them between lateral line and back at widest place. Slender Flounder (*Lyopsetta exilis*). Page 166.

11–11. Maxillary not reaching to vertically below middle of lower eye.

14. Eyes not separated by high bony and spiny ridge. Dorsal beginning on ridge of body, or only slightly on the blind side.

15. Depth of body about half of the entire length (including the caudal fin). The scales semi-imbedded and scarcely touching each other. Diamond Flounder (*Hysopsetta guttulata*). Page 173.

15–15. Depth of body less than half the entire length. Scales normal.

16. Teeth on both sides of lower jaw. Scales large and rough to the touch when finger is passed towards head. Scaly-finned Flounder (*Isopsetta isolepsis*). Page 174.

16–16. Small blunt teeth on blind side of lower jaw only. Scales small and smooth.

17. Ventral fins longer than long diameter of eye. The lower eye its own length from tip of snout. California Sole (*Parophrys vetulus*). Page 174.

17–17. Ventral fins not over a half as long as the long diameter of the eye. The lower eye one-half its length from tip of snout. Slippery Sole (*Microstomus pacificus*). Page 177.

14–14. Eyes separated by a high bony ridge on which are from 1 to 3 short spines. The dorsal fin commencing on blind side of body where it curves downward with from 5 to 9 rays on the blind side.

18. Front of dorsal at level with corner of mouth on blind side of head; at least 9 of its rays on blind side. Curl-finned Flounder (*Pleuronichthys decurrens*). Page 170.

18–18. Front of dorsal above level of corner of mouth; not more than 5 or 6 of its rays on blind side of head.

19. Ridge between eyes high and very sharp edged; ending behind in a sharp spine that stands at least one diameter of the pupil above the surrounding level of the head. Two spines on the front of the ridge, the first one extending forward to vertically above the point of the snout. Sharp-ridged Flounder (*Pleuronichthys verticalis*). Page 171.

19–19. Ridge between eyes not so high and sharp as described above; the front spine, if developed, behind tip of snout.

20. The bony spines at front of ridge that separate eyes scarcely developed. Mottled Flounder (*Pleuronichthys coenosus*). Page 171.

20–20. Two short, blunt spines developed at front of ridge that separate eyes. A dark spot usually present on the lateral line at the middle of the body, and one at each edge of the body near the base of the anal and dorsal fins towards the tail. Ritter's Flounder (*Pleuronichthys ritteri*). Page 172.

FAMILY PLEURONECTIDÆ.

The Arrow-Toothed Halibut (Atheresthes stomias).

This is a rather slender flounder with large scales and a big mouth armed with long sharp teeth, which are shaped like a spearhead at the point. The lateral line is without an arch in front. The space between the eyes is flat and covered with scales. The upper eye is near the edge of the head so that it shows slightly when the fish is viewed from the blind side. The maxillary is about half as long as the head, and reaches to below the hind border of the eye, or a little past.

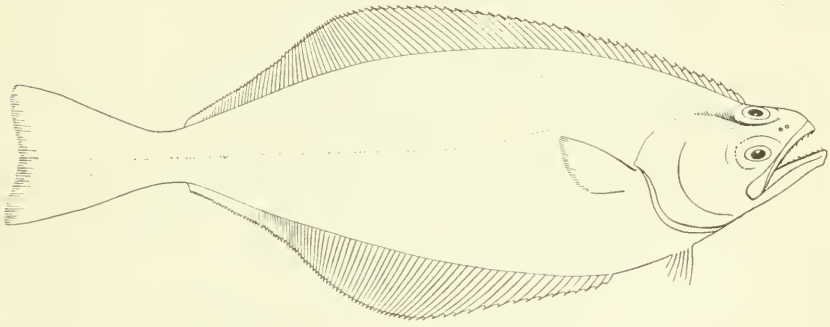

Fig. 82. The Arrow-Toothed Halibut (*Atheresthes stomias*).

This flounder reaches a length of a couple of feet, and is found in deep water off San Francisco and northward to Bering Sea. It is caught in some abundance off San Francisco in the paranzella nets and is a food fish of considerable importance, though not of the best.

The Halibut (Hippoglossus hippoglossus).

The halibut is a slender form with a rather thick body and a moderately large mouth. The maxillary reaches to below the middle of the lower eye. The lateral line has a high arch in front and the scales are small. The eyes are separated by a flat area.

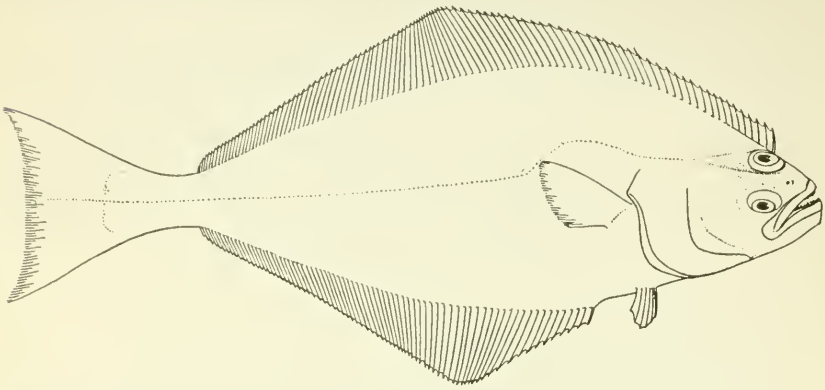

Fig. 83. The Halibut (*Hippoglossus hippoglossus*).

Both in America and Europe the halibut is the largest and most important commercially of all the flounder tribe. It reaches a weight of 500 pounds and occasionally even more. It is found on both sides of the north Atlantic and north Pacific. On our coast it is found southward to Monterey Bay. Its food appears to be anything that it may catch, including many kinds of fishes, crabs and clams.

The Slender Flounder (Lyopsetta exilis).

Body moderately slender, covered with rather rough, large scales. The lateral line is without an arch in front. The eyes are large and

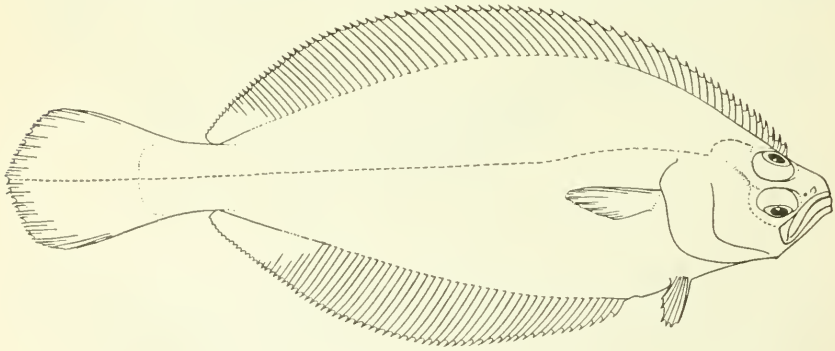

Fig. 84. The Slender Flounder (*Lyopsetta exilis*).

separated by a rather high area that is covered with fine scales. The mouth is large and curved, and the maxillary reaches to below the middle of the lower eye.

This is a small, unimportant, but abundant flounder, scarcely exceeding a foot in length. It is found from San Diego along the entire California coast and northward. The paranzella net fishermen catch it in abundance off San Francisco.

Jordans Flounder (Eopsetta jordani).

This flounder usually goes by the name of English sole, a name that is doubly unfortunate, for it is not a sole at all, and certainly in no way resembles the English sole. It is a moderately broad flounder with a rather large curved mouth armed with fine sharp teeth. The eyes are large, and are separated by a narrow low ridge covered with very fine scales. The maxillary reaches to below the middle of the lower eye. The length of the pectoral fin is about half that of the

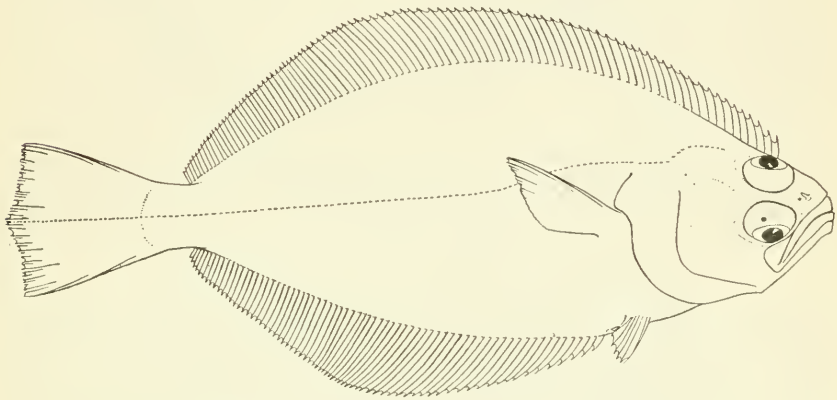

Fig. 85. Jordan's Flounder (*Eopsetta jordani*).

head. The scales are fine and rough to the touch when the finger is moved towards the head. The lateral line is without an arch at its front.

This is one of the commonest flounders on the coast of California. It is found from Monterey Bay northward to Puget Sound, and has been rarely taken as far south as San Diego. It reaches a length of 20 inches, and is one of the best food fishes among the flounders. Great numbers are dried by the Chinese.

The Spotted Flounder (Psettichthys melanostictus).

A rather slender flounder covered with fine scales that feel rough to the touch as the finger is moved toward the head. Fine scales cover the head and bases of the fins. The eyes are small and are separated by a rather wide, scaled area. The mouth is large and armed with long, sharp, uneven teeth. The dorsal fin begins opposite the front edge of the upper eye, and the first rays are long and slender, and connected with each other by membrane only at their base. The longest of the first rays is in length about equal to the distance from the tip of the snout to the hind margin of the upper eye. This character separates

this from any other flounder in our region. The lateral line is without an arch in front. This flounder is grayish-brown finely speckled with darker color.

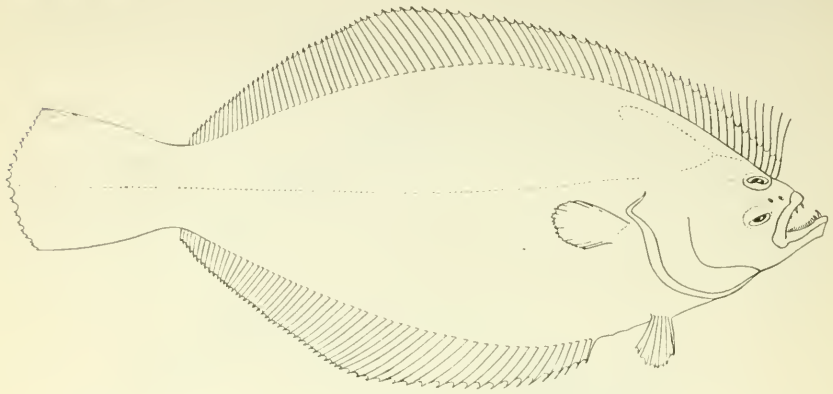

Fig. 86. The Spotted Flounder (*Psettichthys melanosticus*).

The spotted flounder is one of the common flounders, and like many others goes by the name of sole. It lives near shore and reaches a length of 20 inches. It is known from Monterey Bay northward to Alaska.

The Big-Mouth Flounder (Hippoglossina stomata).

A rather slender flounder with a large mouth, very small teeth, and the eyes separated by a high, sharp, bony ridge that curves upwards behind them. The front of the lateral line has an abrupt arch. The first of the two nostrils has a flap of skin just in front of which is a bony protuberance on the side of the snout. The maxillary reaches to below the hind border of the lower eye. The eyes are large and the

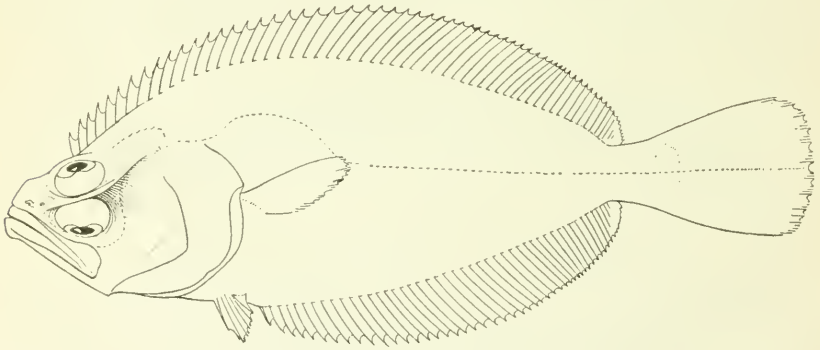

Fig. 87. The Big-Mouth Flounder (*Hippoglossina stomata*).

upper one does not nearly fill its bony socket. The dorsal begins a distance from the tip of the snout equal to the length of the pectoral of the blind side.

This is not a flounder of commercial importance, as it is rather rare. It is found off southern California and southward to the Gulf of California.

The Long-Finned Flounder (Xystreurys liolepis).

This is a wide flounder with an abrupt arch at the front of the lateral line, and a long pectoral fin that is as long, or longer, than the head and reaches about to the middle of the body. The mouth is moderate in size, and the maxillary reaches to below the middle of the

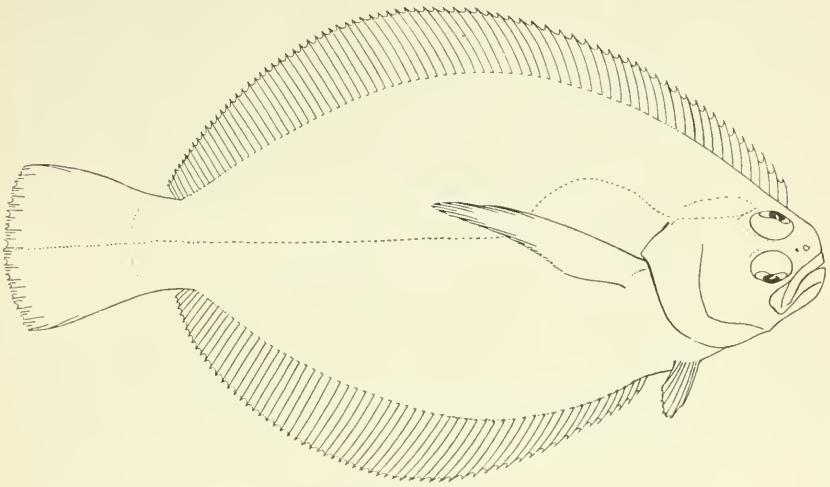

Fig. 88. The Long-Finned Flounder (*Xystreurys liolepis*).

lower eye. This flounder has the longest pectoral of any that has an arch at the front of the lateral line, though the length of the pectoral is said to vary considerably.

The long-finned flounder reaches a length of 15 inches, and is rather common on the southern California coast. It has been taken as far south as the Gulf of California.

The Chicken Halibut or Bastard Halibut (Paralichthys californicus).

Though this flounder is commonly known as the chicken halibut that name is more commonly used for the young of the true halibut. It is a rather slender, thick flounder, resembling somewhat the true halibut in

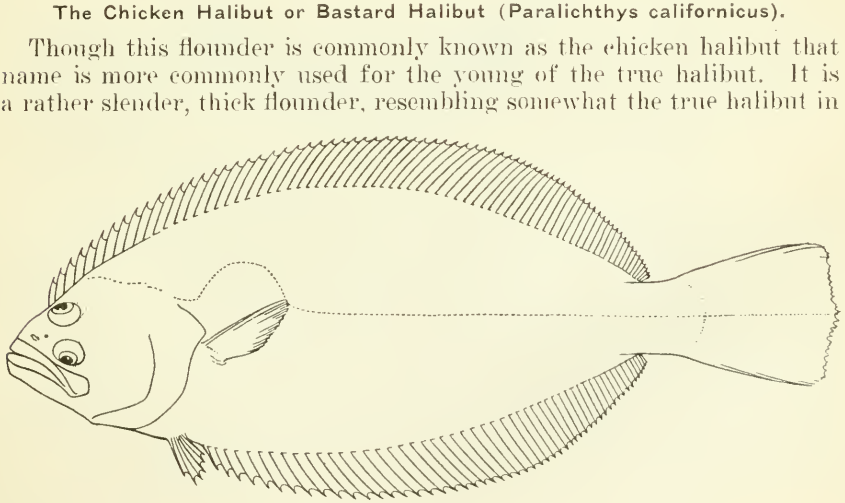

Fig. 89. The Chicken or Bastard Halibut (*Paralichthys californicus*).

shape. The front of the lateral line is arched. The eyes are small and separated by a rather wide flat area. The mouth is large and armed with large, sharp, uneven teeth. The maxillary reaches a little past the lower eye, and is about as long as the pectoral fin. The dorsal fin begins opposite the front of the eye.

This is an important food fish, being found in abundance from San Francisco southward to the Gulf of California. The young are very common in shallow water in southern bays. It reaches a length of three feet and a weight of 60 pounds. It takes its common name from its resemblance to the true halibut, and in southern California usually goes by the name of halibut. It is a rather coarse, flavorless fish, overrated and not to be compared with the true halibut. It has found great favor with the market men on account of its good keeping qualities, and, because it has been much advertised, it is in great demand.

The Curl-Finned Flounder (Pleuronichthys decurrens).

This flounder may be known by the dorsal fin curling down on the blind side of the head until it is opposite the lower corner of the mouth. At least 9 of the dorsal rays are on the blind side. Three other flounders in our region have the dorsal developed on the blind side, but in them it does not extend below the level of the tip of the snout, and only about 5 rays extend down. The sharp ridge between

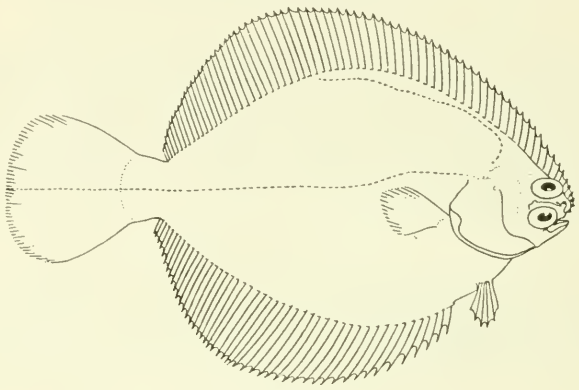

Fig. 90. The Curl-Finned Flounder (*Pleuronichthys decurrens*).

the eyes has a blunt bony protuberance opposite the hind edge of the lower eye, and another smaller one opposite the front of the upper eye. Behind the border of the upper eye there are two similar ones. The eyes are large and protruding. The scales are small, scarcely touching each other, and somewhat imbedded. There is a branch of the lateral line along the dorsal base.

This species is not uncommon in deep water, and is known from the Santa Barbara Islands northward. Many are taken in the paranzella nets. It is not recognized in the markets under a separate name but is sold with many others under the class name of flat-fish or sole.

The Sharp-Ridged Flounder (Pleuronichthys verticalis).

Five or six rays of the dorsal are on the blind side of the body, and the eyes are separated by a very high, sharp bony ridge that has two short sharp spines at its front, the first directly above the tip of the upper jaw and the other at the front of the eye. On the hind end of the ridge is a sharp spine, pointing backward, that stands above the surrounding level of the head a distance equal to the diameter of the pupil. There are no teeth on the eyed side of the jaws. The ventral fin of the eyed side is somewhat behind that of the blind side. The lateral line has an upper branch running back from the head along the base of the dorsal fin. The color is dark olive brown with round grayish spots. The dorsal and anal are mottled.

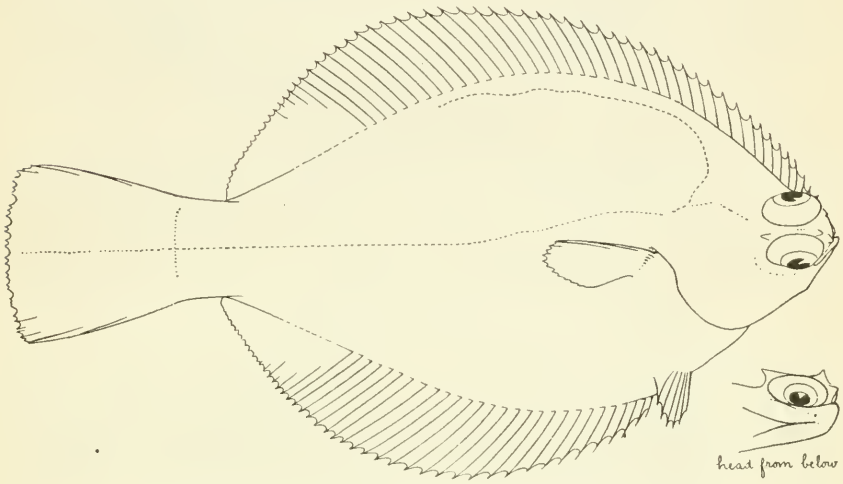

Fig. 91. The Sharp-Ridged Flounder (*Pleuronichthys verticalis*).

This species is known along the California coast southward to the Gulf of California. It is found in rather deep water. Like most of the flounders that are not caught in great abundance this is not differentiated by name by the fish men. It may be known from others that have the dorsal developed on the blind side by the character of the ridge between the eyes and the spines on it as described above.

The Mottled Flounder (Pleuronichthys coenosus).

Five or six rays of the dorsal fin are on the blind side of the body, and the high, sharp bony ridge that separates the eyes has no bony protuberance developed opposite the front of the eyes, but has one opposite the hind edge of the eyes that points backward and downward. There is a branch lateral line along the base of the dorsal on the front part of the body. The scales are smooth and scarcely touch each other, or at least do not overlap. The color is dark brown, usually mottled.

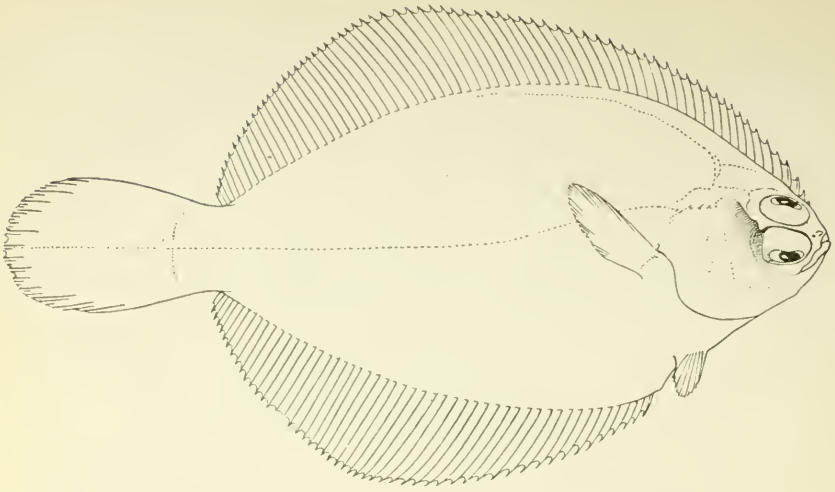

Fig. 92. The Mottled Flounder (*Pleuronichthys cocnosus*).

This flounder is rather common in water of moderate depth. It is found along the entire California coast, and grows to be about 14 inches in length.

Ritter's Flounder (Pleuronichthys ritteri).

About five rays of the dorsal are on the blind side of the head, the lower end of the fin being on a level with the tip of the snout. The scales overlap at least on the middle of the body, and there is a branch lateral line along the base of the dorsal fin in front. There is a small dark spot on the lateral line at about the middle of the body.

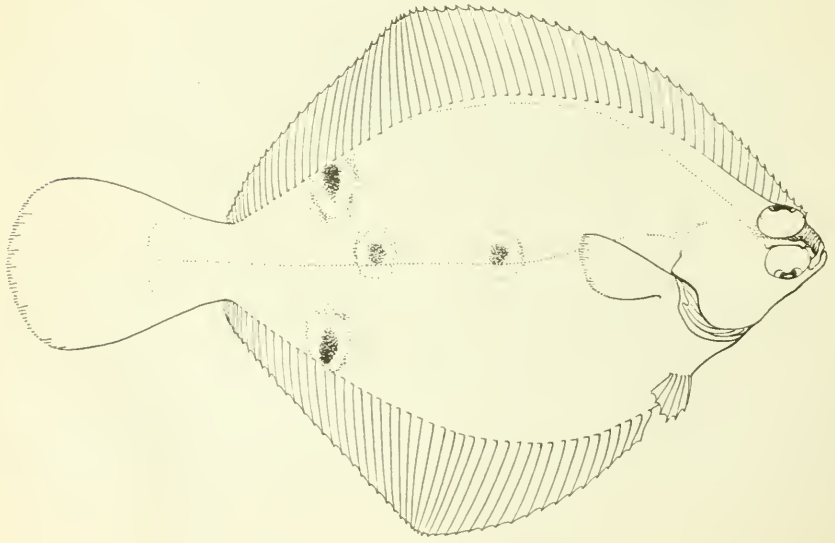

Fig. 93. Ritter's Flounder (*Pleuronichthys ritteri*).

and at each side of the body near the base of the anal and the dorsal fin towards the tail there is a similar one usually smaller. Just in front of between the last two spots there is often a fourth spot. From the sharp-ridged flounder (*P. verticalis*) and the mottled flounder (*P. coenosus*) that also have 5 rays of the dorsal on the blind side of the head this species may be known by the character of the ridge separating the eyes and the bony protuberances on it. The ridge is not so high and sharp as in *P. verticalis,* and the front bony protuberance does not overhang the tip of the snout. It has 2 bony protuberances developed at the front of the ridge, which are scarcely or not at all developed in *P. cocnosus.*

This flounder is known from San Pedro southward to the coast of Lower California, where it replaces *P. cocnosus* on the southern coast. It is rather abundant in San Diego Bay. It is a very good food fish and reaches a length of about a foot.

The Diamond Flounder (Hysopsetta guttulata).

The body is very broad and covered with smooth, semiembedded scales that scarcely touch each other. The lateral line is not arched in front, and there is a branch lateral line extending along the base of

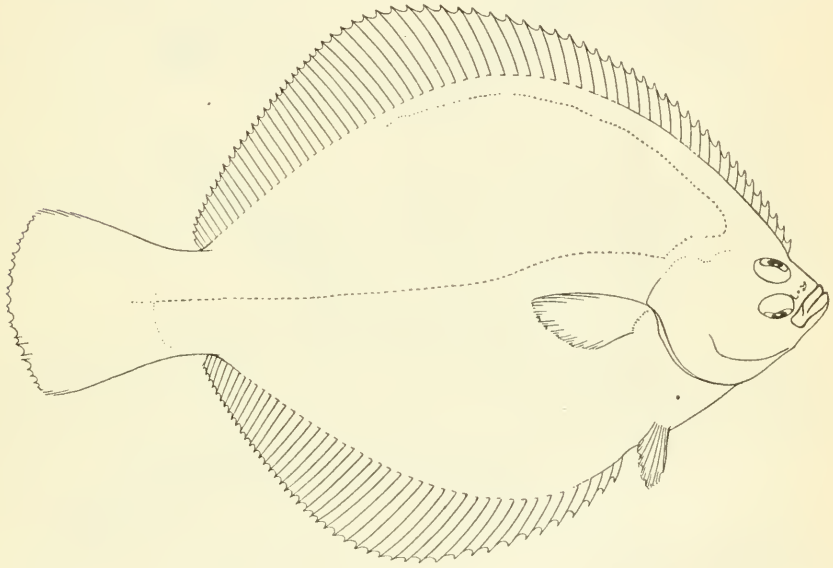

Fig. 94. The Diamond Flounder (*Hypsopsetta guttulata*).

the dorsal fin in front. The mouth is small and the maxillary does not reach to below the middle of the lower eye. The outline of the head is concave just in front of the eye. On the head the scales are scarcely developed. Small teeth are on the blind side only of the jaws. The caudal fin is large and rounded.

This is a very abundant flounder south of Cape Mendocino on the California coast and is found southward along the Lower California coast. It is a very good food fish.

Common "Sole" or California "Sole" (Parophrys vetulus).

This flounder is moderate in width, with a concave outline of the head just above the eyes. The mouth is small, and the maxillary reaches only a little past the front of the lower eye. The eyes are large and the upper one is on the upper outline of the body, so that it may be seen slightly as the head is viewed from the blind side. There is no abrupt arch at the front of the lateral line, and a branch of the lateral line runs back from the head along the base of the front of the dorsal. The scales are fine and do not feel rough as the finger is passed towards the head. The space between the eyes is narrow, but not high and sharp.

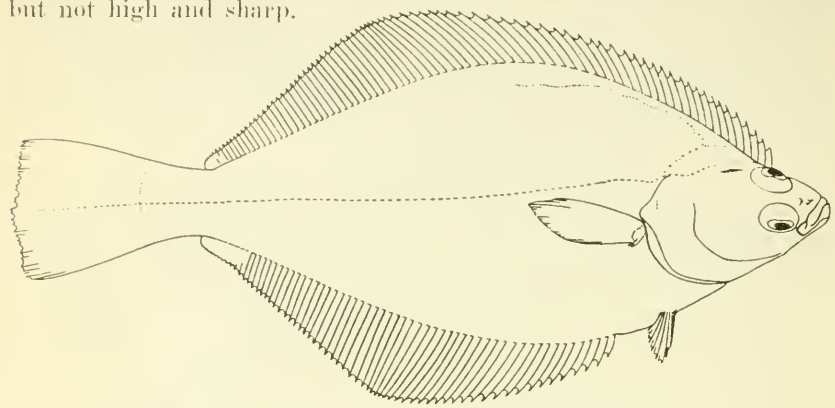

Fig. 95. The Common or California "Sole" (*Parophrys vetulus*).

This flounder in common with many others is known as a sole, and is very abundant in water of moderate depth. It is found along the entire California coast and northward to Alaska. It is small in size, but its abundance makes it of some importance.

The Scaly-Finned Flounder (Isopsetta isolepis).

This is a moderately wide flounder covered with rough scales which extend out on the fin rays and over the head. The front of the lateral line has a slight arch, but not a high one as in the flounders that are

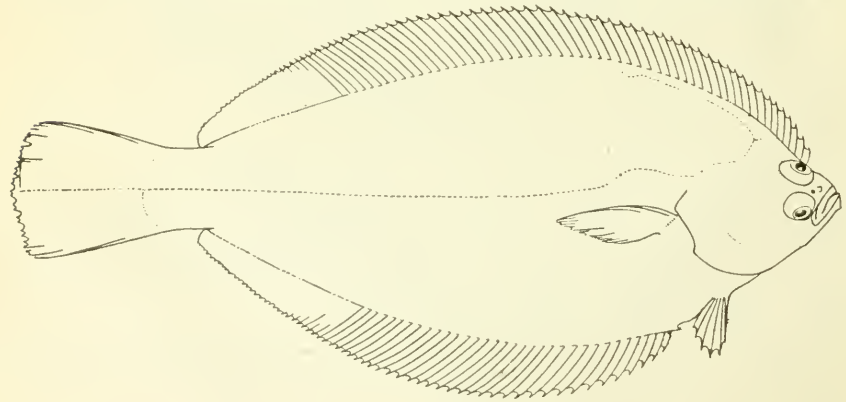

Fig. 96. The Scaly-Finned Flounder (*Isopsetta isolepis*).

here classed as having an arch at the front of the lateral line. The mouth is small and the maxillary does not reach to below the middle of the lower eye. The small eyes are separated by a moderately wide scaly space. A branch lateral line runs along the front of the base of the dorsal backwards from the head.

On the California coast this is a rather common flounder. It reaches a length of 15 inches, and is found in rather deep water from southern California northward to Puget Sound.

The Double-Lined Flounder (Lepidopsetta bilineata).

This is a very wide flounder, covered with scales of moderate size that are very rough in northern specimens, but in southern ones are sometimes almost entirely smooth. It has an abrupt arch at the front of the lateral line, and an accessory branch of the line follows the

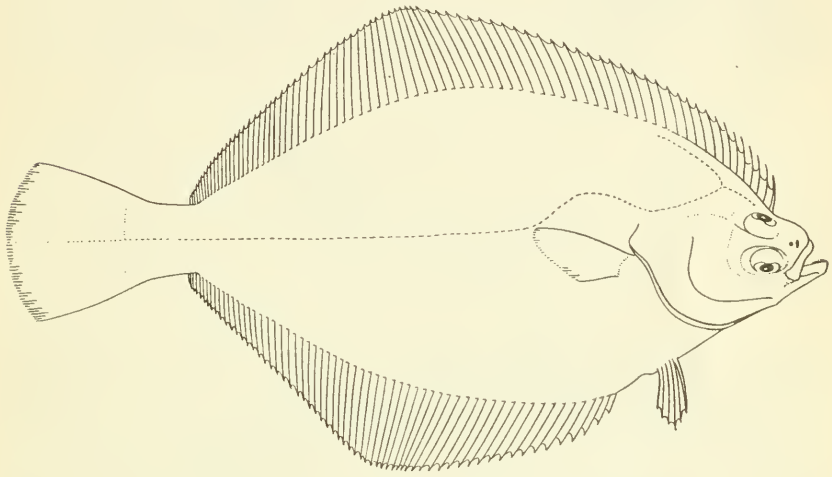

Fig. 97. The Double-Lined Flounder (*Lepidopsetta bilineata*).

base of the front of the dorsal fin. The mouth is small and the maxillary scarcely reaches to below the middle of the lower eye. The dorsal fin begins above the front of the upper eye. The eyes are moderate in size, and separated by a flat scaly area.

This is a common flounder found from southern California northward to Bering Strait, though south of Monterey Bay it is probably rare. It reaches a weight of 5 or 6 pounds.

The Starry Flounder (Platichthys stellatus).

This is a moderately wide flounder that may be known by the small rough plates scattered over the body, and by the alternate black and orange-brown spots or stripes on the dorsal, anal and caudal fins. The bony plates are larger and rougher at the base of the dorsal and anal fins where they are disposed in a single row. A rough ridge runs back from between the eyes, ending above the gill cover in a couple of rough bony protuberances. The lateral line is without an arch in front,

though it is rather strongly curved in this region. The mouth is small and the maxillary scarcely reaches to below the middle of the lower eye. The color is dark brown or nearly black, with spots or stripes on the dorsal, anal and caudal fins, formed by a few black rays, then a few orange or brownish ones, and thus alternating so that the stripes run lengthwise of the rays.

The starry flounder is one of our commonest flounders. It is widely distributed, being found from southern California to the Arctic Ocean,

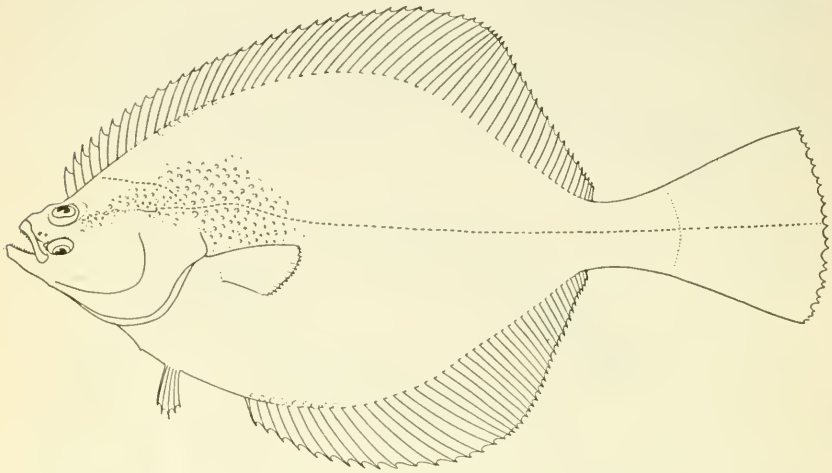

Fig. 98. The Starry Flounder (*Platichthys stellatus*).

and southward on the Asiatic side to the Amur River. It reaches a weight of 15 or 20 pounds. It lives in shallow water and sometimes ascends the larger rivers. Commercially it is one of the important flounders on account of its size and abundance, but as a table fish it is one of the poorest, being rather coarse and tasteless, and not to be compared with some of the flounders. It is almost the only flat-fish still known as a flounder, and is sometimes called "the flounder," but even it helps to form "fillet of sole."

The Slippery or Chinese "Sole" (Microstomus pacificus).

This is a slender flounder, covered with very fine scales. The mouth is very small, the maxillary reaching only a little past the front of the eye. The eyes are large and separated by a flat, scaly area. The teeth are developed on the blind side only of the jaw. They are broad and close set so that they form a continuous cutting edge. The gill opening does not extend above the pectoral fin. The lower eye is much longer than the snout.

The slippery sole is so called on account of the excessive mucous that covers it. On this account it is sometimes thrown back into the water by the paranzella-net men when other flounders are plentiful, for the mucous makes it difficult to hold in cleaning it. It is, however, one of the best flavored of the flounders. It does not reach a large size, being commonly taken from a foot to 18 inches in length. It is

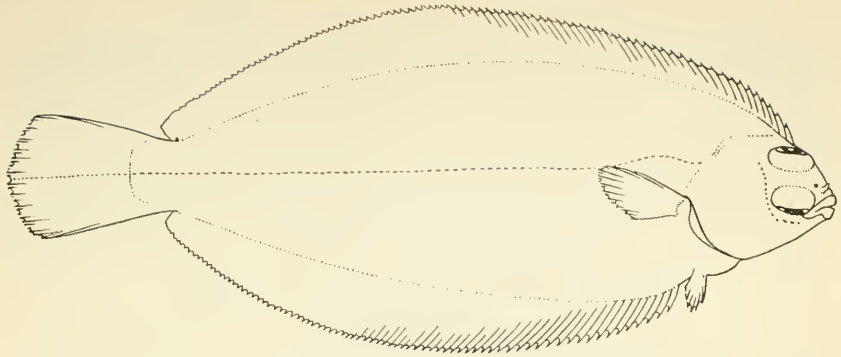

Fig. 99. The Slippery or Chinese "Sole" (*Macrostomus pacificus*).

abundant in water from 15 to 20 fathoms in depth, and is found from Puget Sound southward to southern California. South of Monterey Bay it has not been reported in abundance.

The Rex "Sole" (Glyptocephalus zachirus).

The rex "sole" is a slender flounder covered with smooth, fine scales. It may be known by its slender pectoral which is much longer than the head, and the lateral line without an abrupt arch in front. The mouth is very small, with the maxillary reaching past the front of the lower eye. The eyes are very large and separated by a flat narrow space that bears fine scales. The lower eye is slightly in advance. The dorsal begins above the middle of the eye. The ventrals are small, or about equal to the long diameter of the eye in length.

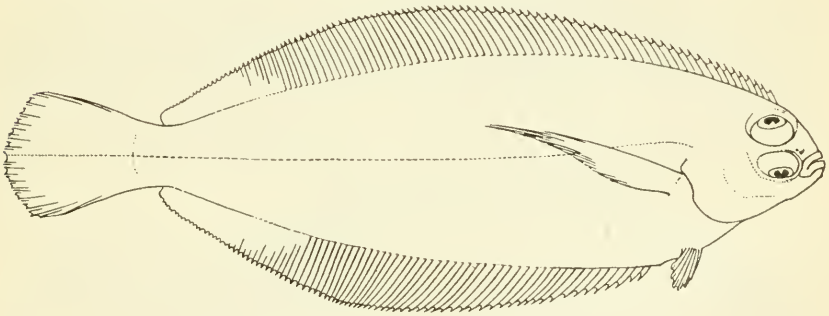

Fig. 100. The Rex "Sole" (*Glyptocephalus zachirus*).

This flounder is common in deep water from San Francisco northward to Bering Sea, and it has been taken as far south as southern California. It is sometimes caught in great abundance by the paranzella nets. It scarcely exceeds a foot in length. As a food fish it has been little appreciated, for it has been uncertain in its appearance in the markets. A fish that can not be counted upon to appear every day in the fish stalls, at least in its season, does not easily become a popular fish, for the caterers can not put it on a menu, and the menu is the chief source of advertising that a fish gets. It is now growing in favor, however, and bids fair to become an epicurean dish.

The Soft Flounder (Citharichthys sordidus).

This flounder is rather slender and is covered with large thin scales. The eyes are large, and separated by a rather wide, slightly concave space, that is highest and rises to a ridge at its lower edge just above the lower eye. The lower eye is longer than the space from it to the tip of the snout. The lateral line is without an arch in front. The mouth is moderate in size, curved, and armed with fine, sharp teeth. The maxillary reaches to below the middle of the lower eye. The dorsal begins slightly on the blind side and a little in front of the upper eye. The ventral fin of the colored side is on the ridge of the belly, and the pectoral fin is about two-thirds of the length of the head.

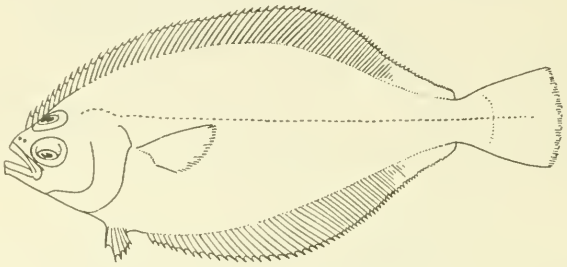

Fig. 101. The Soft Flounder (*Citharichthys sordidus*).

The soft flounder is found in considerable abundance from British Columbia to Lower California in water of moderate depth. It rarely exceeds two pounds in weight. Its flesh is rather soft and as a table fish it has not been reported upon.

Speckled Flounder (Citharichthys stigmaeus).

This and the soft flounder may be known by the ventral fin of the eyed side being on the ridge of the abdomen. It may be known from the soft flounder by the character of the space between the eyes, which in this species is narrow, not concave, and not rising to a ridge just above the lower eye, and by the lower eye being about equal in length

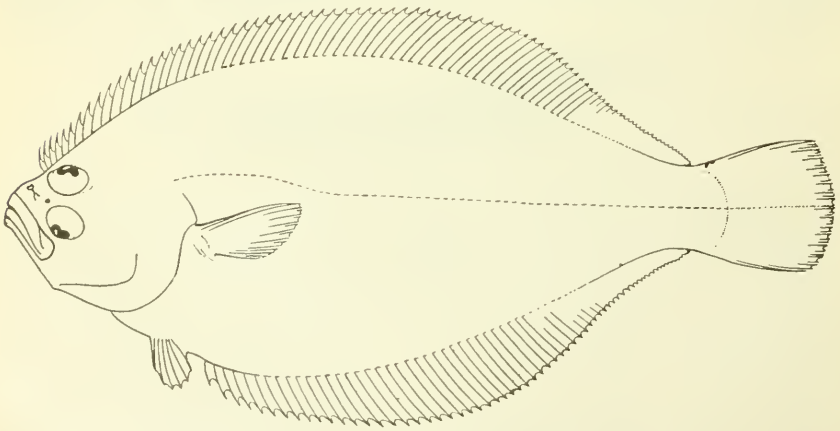

Fig. 102. The Speckled Flounder (*Citharichthys stigmaeus*).

to the space between it and the tip of the snout. The dorsal fin is rather high in front and begins somewhat on the blind side opposite the front of the eye. The lateral line is not arched in front. The maxillary reaches to below the middle of the eye.

The speckled flounder is a small rare flounder, known from San Diego to Oregon, and is found in rather deep water. Specimens have been taken that were full of spawn when at a length of only 5 inches. It is commercially of no importance whatever.

FAMILY SOLEIDÆ.

The Tongue Sole (Symphurus atricaudus).

This is the only true sole we have on our coast. It may be known at once from all of the other flat fishes by the shape of the body, which is blunt at the head end and tapers to a point behind as in the accompanying figure.

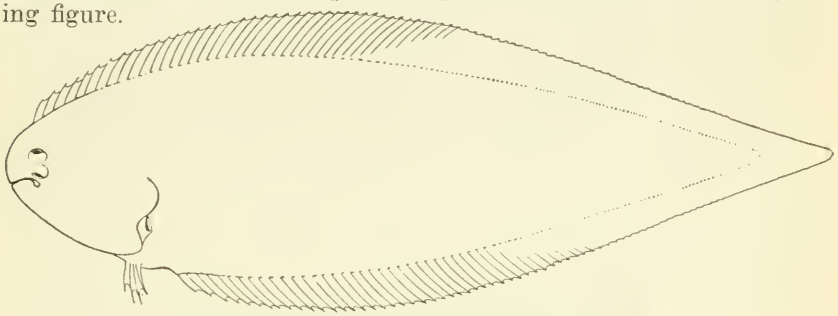

Fig. 103. The Tongue Sole (*Symphurus atricauda*).

This sole is found from southern California southward along the lower California coast. In San Diego Bay it is rather common. On one or two occasions specimens have been taken as far northward as San Francisco. It does not exceed 6 inches in length.

ON COMMON NAMES OF FISHES.

By E. C. STARKS.

The paper on mackerel and mackerel-like fishes that appeared in the July number of CALIFORNIA FISH AND GAME has called forth considerable discussion as to the use of the names skip-jack and bonito.

It is difficult to say what is the correct use of the common name of a fish, such names not being governed by any rules, as are scientific names. A fish that is known by a certan name in one locality may bear an entirely different one in another locality; or the same name may in two localities refer to entirely different fishes; or names may be exactly reversed so that "a" becomes "b" and "b" becomes "a."

The mackerel of our coast is known on the Atlantic coast as chub, thimbleeye, and tinker, according to locality. In England it is known as the Spanish mackerel—a name I have heard applied to it in southern California. In America the name Spanish mackerel is more usually applied to a fish of the genus *Scomberomorus*. Now, no one can say which of these fishes has a better right to the name Spanish mackerel.

In America we shall continue to apply that name to members of the genus *Scomberomorus* wherever they may be found. But has it as good a right to the name as the fish called Spanish mackerel in England (our mackerel) which probably was first so called? Great numbers of examples could be quoted illustrating this confusion in the use of common names.

The name oceanic bonito has always been applied to the fish I have designated, until within recent years. In Australia, England and many Atlantic ports it has always been known as bonito. Cuvier so called it in 1831 in France, where it is still so called. In southern California, when these fishes became of commercial importance, the old names seem to have become confused. This came about when the interest was transferred from the anglers, who had a greater interest in the fishes for themselves, to the fishermen and dealers. Oceanic bonito as applied to *Euthynnus* is the best name because it is used by the greatest number of people and over the greatest part of the world; for it is a widely distributed fish. The fish called skipjack is not found in the Atlantic, though it has close relatives there. These relatives go by the name of bonito, and our representative might well be called California bonito, were it not that that name is so easily confused with oceanic bonito. This fish used to be called skipjack on our coast (a name applied to various silvery, jumping fishes in different parts of the world) and though in recent years the names skipjack and bonito seem to have been interchanged in southern California it has been restored as the best available name.

We are given to understand that the Bureau of Chemistry proposes to can *Euthynnus* under the name of striped tuna. If so, this name is to be deplored, for it is not a tuna. Not only does it belong to a different genus, but certain features of its anatomy are so strikingly different from that of the tuna that it may be placed in a different subfamily. Canning the albacore under the name of tuna has led to so much confusion that no one knows whether the albacore or the tuna is referred to when the name tuna is used.

In the papers on the fishes of California, being published, it is the intention to use the common names that are the most universally used, unless there are reasons against such use. For instance, there are very good reasons against the use of the name English sole, for the fish we call by that name is not a sole and it in no way resembles the English sole. Very often, as among the flat-fishes, there are no common names. In these cases either the meaning of the scientific name is used as a common name or some name referring to some character of the fish is used—as, spotted flounder.

Common names of fishes have been transferred from one locality to another. When our ancestors came from Europe and saw certain fishes on our Atlantic coast that a had a more or less close resemblance to the fishes they were familiar with, they named them accordingly. In the same manner the common names of our Pacific fishes came from their resemblance or imagined resemblance to Atlantic fishes, and the names have been good or poor depending upon the acuteness of observation of the men who named them. Thus the names in different sections of the same coast vary according to a fancied resemblance of the fishes that bear these names to other fishes, as seen by different people.

THE SPAWNING OF THE LITTLE-SMELT, LEURESTHES TENUIS (AYRES).

By P. S. BARNHART, Scripps Institution for Biological Research.

We have known for a number of years that the little-smelt, *Leuresthes tenuis* (Ayres), appears in immense schools on all sandy beaches near San Diego at a certain time each year when it may be picked up from the sand in quantities. Hubbs (1916) prints a letter written to him by J. B. Joplin of Santa Ana, describing the breeding habits of this fish. Mr Joplin wrote:

> "Three months during the year, usually March, April and May, on the second, third and fourth nights after the full moon, at full tide, great schools of them come out in the breakers, at the mouth and for half a mile on each side of where a small fresh water stream flows into the ocean, for the purpose of depositing their eggs or spawn in the sand. The water recedes and when the fish are not disturbed they wiggle tails down in the sand, as far out as the force of the water will carry them, both males and females—sometimes as many as eight or ten together—where the crust of the sand is broken. Sometimes only one female is found with just her head visible."
>
> "Why they come out at night, which is usually from ten to one o'clock, and the run usually lasts three hours or longer, is a question."
>
> "I have been observing them for thirty years and the time of their coming is so regular that during that time I have rarely missed them."

Although these facts have been known for a number of years and many people go to the beaches to gather the fish that have appeared to be cast up by the waves, so far as I know no further observations have been made of the incident and its significance. My attention was called to it a year ago when some of the fish were given to me and an examination of them showed that they were in spawning condition. It was then too late for investigation, as the last run was over, and I had to wait until this year to make these observations, which coincide in the main with the remarks in the above letter.

The nightly run begins within a few minutes of the time when the tide is at its highest point and lasts for several hours. The fish shoot in with an incoming wave, sometimes forcing themselves up the slope of the beach by wiggling and flipping until a favorable place is found, rest quietly a moment while depositing milt or eggs, begin wiggling again in the sand and finally flip back or shoot back with the next high wave that reaches them. They must have a good sense of direction for out of the immense quantity which come ashore at these times not one remains on the beach. Sometimes they half bury themselves in the sand horizontally, and I have found many of them with their bodies buried vertically right up to the pectoral fins. The greatest numbers were found in the riffles or run-offs where they crowded in and made quite a commotion. Samples of the sand taken in such places were full of

eggs. So far as I was able to observe there was no pairing of males and females.

Collections taken at different points along the beach showed that the males were in the majority by more than two to one over the females. This is directly opposite to the general condition supposed to exist among fishes. The method of spawning here described nevertheless must entail an enormous wastage of fertilizable eggs, as sometimes there are only a few seconds between the wash of the waves when the sperms and eggs are mixed in the sand by the movements of the fish and then carried off the beach by a receding wave.

The eggs are 1.8 to 2 mm. in diameter, contain a large number of reddish yellow oil drops and are demersal. In all other species of Atherinidæ so far observed the eggs are provided with delicate filaments for attachment to each other and to eel-grass and seaweeds. In this species, however, the eggs have no filaments and are entirely free from each other. The capsule is smooth and hard so that particles of sand do not adhere to it, and the egg is so heavy that it stays on or very near the bottom until hatched.

This inshore migration of *Leuresthes tenuis* has, so far as I know, only been noted on the sandy beaches between Point Loma and Newport, and are independent of the presence of freshwater streams. It would be interesting to know just how far north and south of these points it extends.

RARE FISH APPEAR OFF SOUTHERN CALIFORNIA.

By WILL F. THOMPSON.

This year has been a very unusual one in many respects in southern Californian fisheries. The albacore run has been a failure during August and very disappointing during July. The total for July of last year (1917) was probably greater than that for the whole season thus far when albacore alone is considered. The lack of albacore has to a very small extent been alleviated by the appearance in unusual numbers of other species, some formerly rare or unknown in our waters. Notable among these are the skipjack (*Euthynnus pelamis*)* and the yellowtail (*Seriola dorsalis*). Some of the canneries are taking great quantities of mackerel (*Scomber japonicus*), but the market for them appears to be sufficiently doubtful to hinder the free use of them by all firms. Among the mackerel are frequently found considerable numbers of the horse-mackerel (*Trachurus symmetricus*), which is not a true mackerel, although it is canned with them. The blue-fin, or leaping tuna (*Thunnus thynnus*) has also been taken in considerable numbers, chiefly by the purse seiners, and more especially in the earlier part of the summer. The albacore fishermen seem to obtain isolated individuals of the tuna, but not great numbers of them. Those caught by the purse seiners are fairly small, one large catch, for instance, averaging under ten pounds apiece. This contrasts greatly with the extreme weights reached of 200 or 250 pounds. It will be remembered that last year was the first year in which the purse seiners caught great numbers of

*The common name here used is the one most often given the fish in southern California. This fish is sometimes called the oceanic bonito.—*Editor.*

this species, one fisherman losing a part of his net due to the weight of the fish he had impounded. Altogether, the year has been thus far an unusual one indeed, contrasting greatly to the usual one in which the albacore has formed the predominating species caught at all times during its season. If it were not for the sardines, the canneries would undoubtedly have a very short year.

The impression one has of an unusual year is greatly heightened when some of the rarer forms which have been brought in are considered.

The dolphin, one of the most beautiful fish ever taken in these waters, has formed a considerable addition to the catches of the sportsmen at Catalina, and has come in to the canneries in numbers at times, despite the fact that there is no market for them there. It has been recorded from various points on the southern Californian coast by scientists in previous years. Two were caught and presented to the writer last year. It is the *Coryphana hippurus* Linnæus of all warm seas.

The yellow-fin tuna has also been unusually abundant this year, as many as fifteen specimens having been brought in by a single fishing boat at a time. It has been much confused with the albacore and the real tuna by the fishermen and the cannerymen. The pectoral fin on the side is median in length, between that of the blue-fin tuna and that of the albacore, and the body has a strong lemon tinge everywhere, especially on the fins. It has faint reticulations below the lateral line similar to those of the young blue-fin tuna, forming indefinite stripes transverse to the body axis. In this respect it differs from the albacore, which has indefinite longitudinal arrangements of this pattern. It is commonly held to be a member of the albacore genus, rather than that of the tuna, although all three are undoubtedly so close together as to be rather members of the same genus.

Another rare fish, previously unknown in our waters, and in fact not known from Mexican waters, is the frigate mackerel (*Auxis thazard*). This has been taken in small numbers very recently, and so far as known for but a short period of time from various localities around Catalina and San Pedro. It has been described from Japan, the East Indies and the Mediterranean. It is very small and much resembles the skipjack (*Euthynnus pelamis*) save in the fact that the dorsal fins are widely separated and the colors are different, the stripes being absent and a mackerel coloration being present above the lateral line. Its appearance caused considerable excitement among the older hands at the canneries and in the markets.

HUNTING WITH BOW AND ARROW.

By SAXTON POPE.

You think it absurd when anyone tells you that he hunts with a bow and arrow.

Of course, all kids shoot with a bow and arrow, but then they never hit anything. One fellow in a sporting journal, recently said: "I never saw an archer that could scare game, much less kill any."

We think hunting with bow and arrow is not only possible, but demonstrate that it is possible by going out and getting the game.

For the past three years W. J. Compton, Arthur Young and the writer have been hunting with the long bow. We make our own weapons of Oregon yew. They are the height of a man and pull fifty to eighty pounds. The string is made of Irish linen; one strand of Bubours No. 12 for every pound of pull. This is well waxed and twisted.

The arrows used for hunting are made of birch dowels five-sixteenths or three-eighths of an inch in diameter and twenty-eight inches long.

Some arrows for shooting small game are blunt-pointed. They are

Fig. 104. Quail shot with bow and arrow by Messrs. Young and Compton at twenty yards. A bird apiece for a shot apiece. Buck killed with long bow. Photographs by Saxton Pope.

made by inserting a round headed screw in the shaft and binding the end with fine wire.

Arrows for killing large game have a steel head, shaped in the classic triangle, an inch and a half long and one inch broad. These are kept very sharp by filing them. We carry about three dozen on a hunting trip and shoot some many times.

We have hunted all sorts of game, bagging scores of quail, rabbits and squirrels. Foxes, coons, skunks and other predatory varmints have been taken into camp. These have been shot at distances ranging from ten to fifty yards.

In one afternoon Arthur Young killed seventeen ground squirrels with the bow. The last five of these animals he killed with five successive arrows.

In the line of big game, at present we have gone no further than the festive buck, but in the past three years we have killed a half dozen deer. Two years ago in Monterey County, Compton shot a running buck at 75 yards, and drove an arrow through his shoulder,

up to the feather. This deer dropped after plunging down the canyon a couple of hundred yards.

Last season Mr. Young got a three pointer at 60 yards by a shot in the flank. The deer jumped a ravine and sought shelter in a bunch of bay trees. Young landed a second arrow through the chest and put him out of commission.

On the same trip, the writer shot a forked horn at 65 yards, driving an arrow clean through him and flying twenty yards beyond. The deer ran some thirty more yards, staggered and was killed by a shot

Fig. 105. Forked-horn buck shot with long bow by Saxton Pope at sixty-five yards in Monterey County, September, 1918. The first arrow penetrated the deer completely, the second is seen sticking through the chest.

through the heart, as you see in the picture (Fig. 105). He dropped without a struggle.

An arrow in the chest, or abdominal cavity, kills as quickly as a bullet, and seems to make more hemorrhage. If it strikes muscle or bone, it makes a clean cut wound and does little damage.

Altogether, we feel that it is a clean, fair sport. It requires more careful hunting and gives the game an even chance. After all, this is the essence of sport, that there should be a contest of skill, strength and cunning between the quarry and the hunter. It is not the size of the bag that counts, it is the fairness of the contest.

Archery is difficult to master, but it is a noble and romantic art.

CALIFORNIA FISH AND GAME

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

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

October 25, 1918.

Back of protective laws must be a healthy public sentiment, prompting every person to take the minimum rather than the maximum, and only under conditions which will permit of using all for food.—Illinois Sportsman, June 6, 1918.

ALL READERS TAKE NOTICE.

Owing to many changes of addresses it is necessary to revise our mailing list. Enclosed with this number of CALIFORNIA FISH AND GAME is a post card which everyone interested in receiving the quarterly should fill out and return promptly. Unless this card, properly filled out, is received before the next number is ready for mailing, your name will be removed from the mailing list. Those who are not interested enough to sign and send in the card are the ones we wish to eliminate from the list.

WOULD SLAUGHTER DUCKS.

During August and September the newspapers published numerous articles dealing with the destruction of rice caused by ducks. The noticeable feature of the greater part of the articles was the suggestion that the season should be opened and the ducks put on the market. Attention was focused on the sale of ducks, not on the protection of crops. Before the rice growers attempted any protective measures the Fish and Game Commission began experimenting with bombs and fireworks. As a result a simple and effective method of driving ducks from rice fields has been worked out. And this method is much less expensive.

If Congress stopped long enough during war time to pass a needed conservation measure it can not be expected that a handful of rice growers bent on slaughtering game for profit will be able to modify a law designed to benefit all the people. Practically all of the ducks coming to California during the winter season are birds which have been raised to the north of us. By international agreement we are allowed only a fair share of these ducks and fairness to the others involved demands that ducks be not slaughtered for profit.

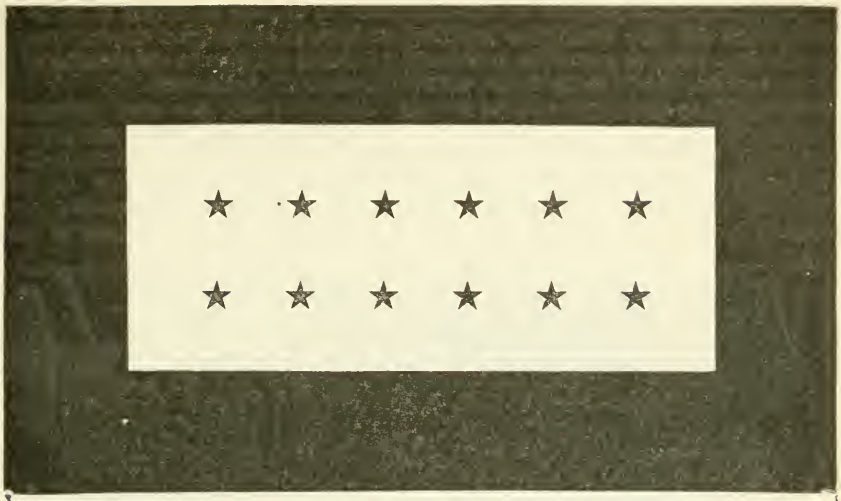
Fortunately, most rice growers realize that a means of protecting crops which will involve a small expenditure and a few men is much to be preferred over turning a bunch of market hunters into the rice fields.

BOY SCOUTS TAUGHT CONSERVATION.

This past summer most of the boy scouts in California have had an opportunity to become acquainted with the great out-of-doors in the many summer camps which have been established. Some of these camps have been in the nature of training camps of scouting, whereas others have been established as an aid to agriculturalists, the boys picking fruit or doing other agricultural work. In the training camps, each morning has been devoted to classes in scouting. The Fish and Game Commission has made it possible for many of the different camps to receive instruction in nature study and game conservation. A competent instructor has taken the boys on field excursions and taught them to recognize the different kinds of birds and animals at sight and by sound, and has given them talks on game conservation around the camp fire. Many of the boys accepted the opportunity offered and passed tests entitling them to the merit badge in conservation.

Great interest was shown at each camp where this work was instituted and many were the recruits for the army of defense formed to protect wild life. Nothing can be more fundamental in bringing about proper conservation than work of this kind.

OUR SERVICE FLAG.



E. NEILSEN
E. W. BOLT
H. L. NEHF
H. R. DUNBAR
V. GOODMAN
CLAUDE CHRISTIANSON
CLARENCE CHRISTIANSON
M. S. HEMEY
E. CLESSENS
C. HILLARD
R. ELKINS
C. O. WARD

IMPORTANT PROVISIONS OF THE MIGRATORY BIRD TREATY ACT.

Sec. 1. Title: The Migratory Bird Treaty Act.

Sec. 2. Taking, killing, transportation or sale of migratory birds or their nests or eggs is prohibited.

Sec. 3. The Secretary of Agriculture has power to authorize from time to time the killing or capturing of certain species or extend the season, etc. These authorizations become effective only when approved by the President.

Sec. 4. Shipment of protected birds, eggs and nests from one state, province or territory into another, or exportation and importation is prohibited.

Sec. 5. Violators may be arrested without warrant by an authorized agent of the Department of Agriculture and brought to trial. Birds, eggs and nests seized from such persons are confiscated and disposed of by the court.

Sec. 6. A convicted person shall be guilty of misdemeanor and shall be fined not more than $500 or imprisoned not more than six months, or both.

Sec. 7. States may make additional laws for protection as they see fit.

Sec. 8. For scientific purposes migratory birds may be killed or captured; they may also be shipped if packages are clearly marked.

Sec. 9. Unexpended balances of money appropriations are reappropriated to be expended for expenses of carrying into effect the provisions of the act and for payment of rent, salaries, etc. Employees are not exempted from the military draft.

Sec. 10. If any clause of the act is held invalid by a court, that shall not affect any of the other clauses.

Sec. 11. All acts or parts of acts inconsistent with the act are repealed.

Sec. 12. The breeding of migratory game birds on farms and preserves for purpose of increasing the food supply is permitted under proper regulations.

Sec. 13. The act becomes effective immediately upon its passage and approval.

WHAT IS EXPECTED FROM THE NEW FEDERAL LAW.

The treaty made effective by enabling legislation for the first time provides everywhere absolute protection to migratory nongame birds, both those which are valuable to agriculture and the others which add charm to the outdoors. Secondly, it terminates forever the selfish and spendthrift attitude of certain sections of the country which, while adequately protecting their localized game, sary permission for scientific study will be granted. Any species of birds which increase to such an extent as to be destructive to agricultural interests may be reduced in numbers by a regulation of the Secretary of Agriculture.

Already under the most unfavorable conditions splendid results are apparent in this country from the passage of the original migratory bird law in 1913. Under the beneficent influence of this regulation practically all species of birds

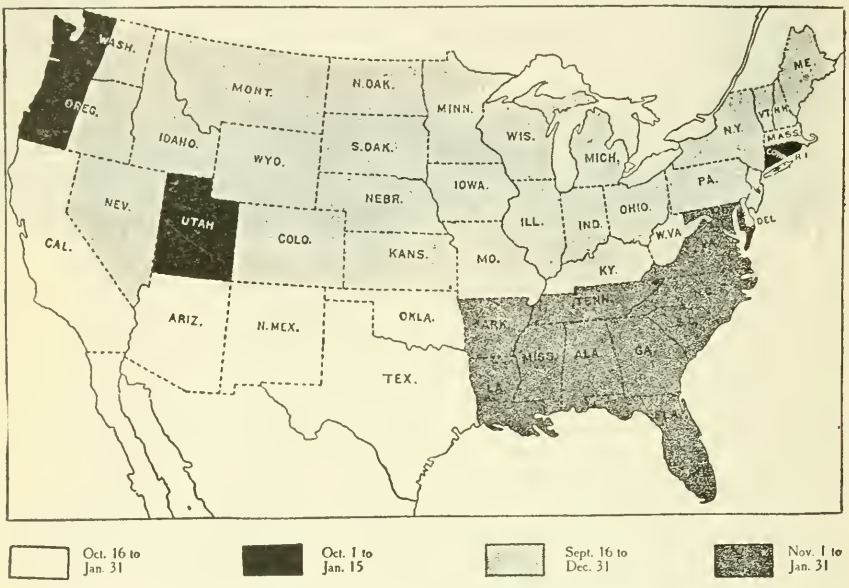


Fig. 106. Seasons under the new Migratory Bird Treaty Act Regulations, effective July 31, 1918.

exercised no forbearance whatever where the migratory game was concerned. Such sections acted on the theory that it would only be a short time before the migratory game was exterminated and that it was better to let their citizens take as much of it as they could while the supply lasted, without reference to breeding seasons or the rights of others or any economic or co-operative conditions whatever.

In addition to this, under the new law the police powers of the agents of the Department of Justice are defined and made effective. The sale of migratory game will be prohibited and suitable bag limits established. Encouragement will be given to the propagation of wild game under suitable regulations and the necessary permission for scientific study will be granted. Any species of birds which increase to such an extent as to be destructive to agricultural interests may be reduced in numbers by a regulation of the Secretary of Agriculture.

Already under the most unfavorable conditions splendid results are apparent in this country from the passage of the original migratory bird law in 1913. Under the beneficent influence of this regulation practically all species of birds have increased. Waterfowl in particular have responded to the added protection to an amazing degree. Everyone is so familiar with this fact that it is needless to amplify its discussion.

As regards the game birds, it is the policy of those having to do with the regulations to equalize opportunity for all sections of the country in so far as natural conditions permit. The flexibility of the new law is another strong feature in its favor, as when any particular kind of game bird increases or decreases the open season and bag limits can be increased or decreased to suit the situation. Closed seasons can be established where game is in need of absolute protection.—JOHN B. BURNHAM.

THE DANGERS OF THE BOUNTY SYSTEM.

Since the burden of expense of bounties for the destruction of noxious animals falls on the community at large, the question arises as to how far this method of extermination has been successful, and whether the results warrant its continuance. The value of bounties is not admitted by all, and complaints of the failure of the laws and lack of real protection are often made by those who should be most benefited by them. The most serious objections, however, are the great expense which is often out of proportion to the benefits obtained, and the chance for fraudulent misrepresentation which it affords.

As regards the expense of this method, the coyote act of our state, which went into effect March 31, 1891, and was suspended September 30, 1892, after $187,485 had been expended and little had been accomplished, is an example of the fate which much of our recent bounty legislation has suffered. It is, therefore, safe to say that the $3,000,000 which have been expended for bounties in the United States during the last 25 years did not give results that corresponded in any way to the outlay. As regards the chance for fraud, the unequal bounties maintained on the same animals in adjoining counties or states often lead hunters to fraudulently transport the scalps to districts where a higher bounty is paid. Thus, thousands of coyote scalps were imported into California, where under the above mentioned act a bounty of $5 was paid, from Nevada where only 50 cents was paid for the scalp of this animal.

Fig. 107. Boy Scouts encamped in Yosemite receiving instruction on fish and fishing. Photograph by H. R. Wilson, June, 1918.

But there are other disadvantages inherent in the bounty system. For instance, it is often impossible to maintain bounties over the entire range of the animal that is to be exterminated. This is particularly true when the animal's range reaches into neighboring counties or states which pay no bounty and, therefore, favor their multiplication. Again, the animals to be exterminated may often be more useful than harmful. We have only recently come to realize this fact

in the case of owls, crows and other birds on which bounties were paid in several states.

Where predatory animals are a sufficiently adverse factor and not too numerous to deplete the treasury, the bounty system may be of more value. The state bounty on the mountain lion and the county bounties on coyotes during outbreaks of rabies are cases in point. This much can also be said for the bounty system: No matter what the actual result in property saved may be, it lets everyone know that something is being done, which adds greatly to the temper of the population.

The list below shows the total amounts of bounties paid in California during 1917. The estimates which had to be made in several cases are, if anything, very conservative, and it is therefore problematical whether the expense was in proportion to the damage prevented which these animals (mostly coyotes, wildcats and mountain lions) would have caused. The bounties paid by each county are also given.

BOUNTIES PAID IN 1917.

County.	
Amador	$843 90
Butte	744 60
Calaveras	568 00
Colusa	1,447 50
Humboldt	4,224 00
Kern	90 00
Lassen	†2,000 00
Madera	1,489 50
Mendocino	4,300 00
Merced	2,404 00
Modoc	2,650 75
Mono	4,224 00
Nevada	395 00
San Joaquin	1,060 00
Santa Barbara	2,404 00
Shasta	2,240 00
Sierra	422 50
Siskiyou	*2,520 00
Solano	330 00
Sonoma	390 00
San Luis Obispo	2,687 65
Sutter	130 00
Tehama	6,030 00
Trinity	1,155 00
Tulare	*4,335 17
Tuolumne	613 00
Ventura	†1,000 00
Yolo	855 00
Yuba	1,015 00
	$53,567 97

*Fiscal year, July 1, 1917-June 30, 1918.
†Yearly average.

Fig. 108. California Grey Squirrel (*Sciurus griseus*), a splendid game animal, the season on which opens September 1. Reproduced from a copyrighted photograph by J. F. Boysen.

BOUNTIES OFFERED ON PREDATORY ANIMALS, 1918.

County and species	Bounty
Alameda	None
Alpine	None
Amador—	
Bluejay	$0.05
Magpies	.05
Coyote	2.00
Coon	.25
Fox	.25
Skunk	.25
Butte—	
Coyote	3.00
Calaveras—	
Coyote	2.00
Colusa—	
Coyote	10.00
Coyote pups	2.50
Lion	5.00
Fox	2.50
Buzzard	1.00
Contra Costa	None
Del Norte	None
El Dorado	None
Fresno	None
Glenn—	
Coyote	5.00
Humboldt—	
Coyote	8.00
Imperial	None
Inyo	None
Kern—	
Mountain lion	5.00
Kings—	
Coyote	2.00
Lake	None
Lassen	None
Los Angeles	None
Madera—	
Jackrabbit	.02½
Coyote	1.50
Rabbit	.02½
Bluejay	.02½
Marin—	
Coyote	20.00
Wildcat	2.50
Mariposa—	
Coyote	1.50
Wildcat	1.00
Mendocino—	
Coyote	6.00
Merced—	
Coyote	2.00
Modoc—	
Coyote	2.50
Wildcat	1.00
Rabbit	.05
Mono—	
Coyote	1.00
Monterey	None
Napa—	
Coyote	2.00
Wildcat	2.50
Nevada—	
Coyote	$2.50
Orange	None
Placer	None
Plumas	None
Riverside	None
San Benito	None
San Bernardino	None
San Diego	None
San Joaquin—	
Coyote	2.50
San Luis Obispo	None
San Mateo	None
Santa Barbara—	
California lion	20.00
Coyote	2.00
Santa Clara	None
Santa Cruz	None
Sacramento	None
Shasta—	
Coyote	5.00
Sierra—	
California lion	5.00
Wildcat, lynx	2.50
Coyote	2.50
Siskiyou—	
Coyote	$2.50
Wildcat, lynx	2.50
Lion, panther	30.00
Solano—	
Coyote	10.00
Sonoma—	
Coyote	5.00
Stanislaus—	
Coyote	2.00
Sutter—	
Coyote	10.00
Sheep growers also pay	10.00
Tehama—	
Coyote	5.00
Coyote pup	2.50
Wildcat	1.00
Trinity—	
Coyote	3.00
Tulare—	
Coyote	2.00
Tuolumne—	
Lion	3.00
Coyote	2.00
Wildcat, lynx	1.00
Ventura	None
Yolo—	
Coyote	20.00
Wildcat	2.50
Yuba—	
Coyote	5.00

BIRD STUDY FOR BOY SCOUTS.

In order to stimulate interest and promote the knowledge of bird life, the organization of Boy Scouts of America has been awarding a merit badge in bird study to those scouts who successfully pass a prescribed test. This test provides that the scout must, among other things, prepare a list of fifty species of wild birds, a list giving the greatest number seen in one week, and a list of twenty species valuable to agriculture. All of these must have been observed personally. He must, besides, prepare a list, from personal reading, of ten birds of prey and of ten species useful in protecting trees, and further must have been actively engaged in the protection of bird life.

This is apparently a rather difficult test for boys fourteen or sixteen years of age, for it not only requires close personal observation of bird life but some reading and practical work in conservation as well. The practical conservation work may include such things as the prevention of the slaughter of birds, the promotion of closed seasons for vanishing species, or the promotion of the establishment of bird preserves and sanctuaries.

Notwithstanding these requirements, the test was recently passed by two Oakland scouts, and will undoubtedly be passed by others in the near future.

Work of this kind among the growing generation, the focusing of attention upon the necessity for conservation at an early age, is perhaps the most effective means of producing a public opinion favorable to the protection of our birds.

MANY FISH RESCUED.

A seining crew under the direction of W. J. Green of the Sacramento Division has just completed the work of seining many young fish from Paradise Cut, San Joaquin County. The ponds consisted of land-locked holes in an area of 3¾ miles. The water in the deeper ponds will remain permanent until a new flood of water comes, so it was not necessary to remove the fish from these ponds, as they will go out with the next freshet. The most important of those species saved were:

Shad, 2″ to 4″ in length	2,500
Striped bass, 2″ to 6″ in length	450
Black bass, ½″ to 5″ in length	300
Catfish, 3″ to 6″ in length	12,000
Several species of blue-gill, sunfish and crappie	65,000

GEORGE NEALE.

WILD PIGEONS STILL PROTECTED.

In the treaty with Canada wild pigeons, the wood duck, and the little brown and sandhill cranes, are to receive total protection for ten years. As a consequence there will be no open season on band-tailed pigeons or the other birds mentioned, despite the fact that the period of protection afforded by state law has expired.

The fact that one must read the treaty, the enabling act and the regulations to be conversant with the new federal law regarding migratory birds has led to considerable confusion.

DEER ANSWER TO BREAKFAST CALL.

Wild deer answer breakfast and dinner calls in the giant redwoods. Under the towering trees, 300 feet high and as thick as 35 feet, stands the cabin of a man who calls the bucks and does from their mountain haunts to feed. A. M. Weaver, deputy warden of the state redwood park, has succeeded after seven months' patient effort in gaining the confidence of the limpid-eyed children of the forest. The following is vouched for by Deputy J. L. Bundock of the Fish and Game Commission:

Early in the morning, or at 6 o'clock in the evening, campers and visitors hear a loud call: "Come baa-aa-by, come baa-aa-by," from the heart of the forest. Soon after this the fleet deer are seen bounding through the redwoods. They come within a few yards of the deputy warden and patiently wait until he finishes his call for others he expects, and finally throws to them cut pieces of apple. Should a stranger walk within their sight the deer wheel and bound away, returning only when Mr. Weaver calls, and after the moving person has either stopped or walked out of sight. Then they cautiously move up to Mr. Weaver and partake of his titbit offerings. Lettuce and vegetable parings form the next portion of the meal, and finally Mr. Weaver will walk toward a large

fallen redwood giant, where stands a shallow trough. The deer trot almost at his heels. Mr. Weaver spreads barley in the trough and the deer walk up to it and feed like mules.

An old doe will paw away the younger deer and feed on the thickest of the barley. They use their feet in fighting and quite often the old does seem viciously hoggish.

Last November the warden discovered the deer were following him to eat apple parings he might drop, and months of patience in accustoming them to his voice and motions have been rewarded with their answering his calls for breakfast or dinner.

The greatest number at one time that yet have answered the call is 14. Never has the call sounded with less than one coming.

During the spring the bucks dropped off, being in velvet, and Mr. Weaver does not expect them to return until their horns are hard. Does dropped off but returned within three days after finding their young. Mr. Weaver says they hide their young and come to feed, and hopes that soon the doe will bring the young in to feed with them.

Several times the deer have been driven out of the Big Basin by hounds, and several that had come to feed were lost this way, according to the warden. Deer are protected within the state park and loose dogs or firearms are prohibited.

Of those who visited the park this year, including many sportsmen, there were none who had heard of wild deer being called in to feed, and Mr. Weaver is probably the first man earning the distinction as a feeder of wild deer who can call them to their meals.

AMERICAN FISHERIES SOCIETY POINTS OUT CONSERVATION MEASURES.

At the last meeting of the American Fisheries Society, which has as members all those actively interested in fisheries conservation in this country, a Committee on Resolutions was appointed. This committee has drafted the following resolution which appeared in the March, 1918, number of the Transactions of the Society:

Report of Committee on Principles of Legislation Relative to Proper Utilization of Fisheries Resources.

WHEREAS, Under the stress of present conditions the nation has been brought to look carefully into the character and the amount of its various food supplies; and

WHEREAS, In the past it has, through lack of attention, failed to appreciate in any real sense the significance of its food fishes and the opportunities afforded by its numerous and varied water bodies to produce a large and important element for the food supply of the nation; and

WHEREAS, We, members of the American Fisheries Society, in session at the Forty-seventh Annual Meeting held at St. Paul, Minnesota, by virtue of our contact with the fishing industry and knowledge of its problems and opportunities, being thus aware of the dangers in the situation and cognizant of the various lines in which the nation can be benefited at the present time, desire to record in formal manner those fundamental principles which appear to be essential to wise legislation and to effective work for the proper utilization of the fishing resources of the nation, and do accordingly express these views; and

WHEREAS, Under the stress of war conditions expert advice and trained supervision is even more necessary than in ordinary times; and

WHEREAS, Hasty or inexperienced action may easily result in the depletion of natural resources which can not be restored within a long period of years; and

WHEREAS, In the staff of the United States Bureau of Fisheries, and in the trained experts of the state bureaus, commissions and hatcheries, the country is possessed of a body of highly trained men devoted to the needs of the nation as a whole and qualified to speak on special problems of fisheries in the war with the knowledge and experience that will guard against the evident danger of hasty action; and

WHEREAS, Proposals have been made to suspend or revoke laws for the regulation of fisheries which have grown out of long experience and careful study of conditions regarding the habits, growth and multiplication of fish on the one hand, and the practical conditions of the fishing industries on the other hand; and

WHEREAS, The shad, striped bass, and other anadromous species have decreased in some rivers almost to the point of extinction, because of fishing devices operated in the salt and brackish waters through which they must pass to reach their natural spawning grounds in fresh water; and

WHEREAS, Artificial propagation of these species is impossible and natural reproduction is prevented unless a reasonable supply of such fishes is allowed to reach their natural spawning grounds in fresh waters; therefore be it

Resolved, That the expression "letting down the bars," as applied to the fishery resources of the country, is unfortunate; national welfare demands the greatest development of the said fisheries, including fish culture and the artificial propagation of food fishes to the highest possible point of efficiency;

Resolved, That commercialization of the so-called game fishes is not conducive to their proper conservation, but would tend to destroy a limited but valuable food product—the annual catch under present restrictive laws, aided by artificial propagation, being barely sufficient to maintain a reasonable annual supply;

Resolved, That the taking of nongame fishes, under proper supervision, be encouraged in every legitimate manner consistent with the preservation of a sufficient breeding stock to insure a future normal crop (in states where required, necessary legislation to this end should be enacted); that many waters in which the so-called game fishes predominate contain also rough fish such as carp, suckers, bowfin, gars, etc., and in such waters the removal of these nongame fishes will be beneficial to angling, and a limited amount of commercial fishing, under proper regulation, should be encouraged;

Resolved, That the anadromous fishes should be permitted to ascend the rivers from the ocean in sufficient numbers to maintain a constant and normal supply, and that to this extent the commercial fishing should be subject to proper regulation; and be it

Resolved, That a solution of this problem relating to the alarming decrease of these species rests in the federal control of all anadromous fishes; and be it further

Resolved, That a copy of these resolutions be forwarded to the Bureau of Fisheries, the United States Food Administration, and the fisheries authorities of the various states.

(Signed) JOHN W. TITCOMB,
Chairman.

GAME CONDITIONS IN ALPINE COUNTY.

Hunting and fishing in Alpine County was exceptionally good this year. Not for fifteen years has there been such an abundance of game in that district as there was this season. I obtained my limit of deer during the first two days—all mule-tail deer and every one a big fellow. This abundance of game is undoubtedly due to the spike-buck law, which is one of the best laws ever put into effect. Mountain quail and grouse seem to be double the number that they have been in previous years, and this is perhaps due to the lack of hunters on account of the war.

At Highland Lakes, the largest one being the headwater of the Mokelumne River and the smaller one the headwater of the Stanislaus River, the fishing is unequalled. Cutthroat, Loch Leven and Dolly Varden trout from 1½ to 5 pounds are numerous.

Fig. 109. A good day's kill, 3 wildcats and 1 mountain lion, made by Jay C. Bruce, February 14, 1918, at Wawona, California. This kill represented $53 in cash in addition to the sport.

The outlet to the large lake is the spawning grounds for the cutthroats, but this summer it dried up, leaving the spawn in little pools. Several other fellows and myself caught about fifteen horse buckets full and distributed them in the lake and farther on down the stream, to save them from dying.

ASA M. CLARK.

FINE FOR KILLING PIGEONS.

The fact that a great many pigeons of the racing homer type, which have been trained by the Signal Corps of the Army for purposes of communication, are destroyed by hunters and children, has led to the passage of an act by Congress prohibiting the killing or capture of these birds and providing a fine of $100 and imprisonment. Carrier pigeons are an effective means of communication in the Army, and any pigeon in the air may therefore be "in the service." Consequently it is necessary that they be allowed to proceed on their way unmolested, for interference with them may prevent the delivery of an important message, or at least interrupt their training. The Fish and Game Commission has recently, through its deputies, given publicity to the above facts, and it is expected that the co-operation of hunters thus induced will insure greater safety to the birds.

FISH LAWS AGAIN MODIFIED.

The United States Food Administration has made the following modifications in the state fish laws, and these are now in effect:

Black bass, crappie, Sacramento perch and sunfish may be taken with hook and line in the state of California during the month of April. Otherwise the daily limit and prohibition of sale shall remain as in the present state law.

Market fish may be taken in Tulare Lake with nets under the supervision of the Fish and Game Commission.

Three-mesh or trammel nets or nets with strings or suspenders, provided the nets are not of less than five and one-half inch mesh, may be used in that part of Fish and Game District No. 12 B, lying northeasterly above Vallejo Light.

Shrimp trawls may be used for the purpose of taking shrimps only in the waters designated in the state laws as Fish and Game District No. 12, but any person or firm desiring to use a shrimp trawl must first notify the Fish and Game Commission of his intention so to do. Unmarketable shrimps taken while fishing for the fresh shrimp market may be dried and sold for food within the state of California. In the catching of shrimps, the line dividing what are designated as Fish and Game District No. 12 and No. 13 shall be considered as extending from Point Avisadero to the end of the Alameda Mole.

Gill nets may be used for catching smelt and herring in Elkhorn Slough, Monterey County.

California whiting, also known as corbina or surf fish, yellow-fin croaker, and spot-fin croaker, the sale of which is now prohibited by the state law, may, until further notice, be sold.

Paranzella nets, trawls or drag-nets shall not be used or dragged within the three-mile limit of District No. 19, under penalty of having the federal license revoked. It will be lawful to carry paranzella nets, trawls or drag-nets across the waters of the three-mile limit within District No. 19.

Bait nets may be used in Fish and Game District No. 20 (Santa Catalina Island) for the purpose of taking bait only.

Salt-water perch south of Point Concepcion, when caught incident to catching other fish, may be shipped and sold.

Beach seining is unlawful, except for seining for smelt in District No. 19 during the open season for smelt; *i. e.*, the first day of September to the thirty-first day of January.

Halibut below the four-pound minimum weight prescribed by the state law, may hereafter be sold, provided they are caught in conformity with the laws of this state as modified above.

Barracuda between eighteen inches in length and three pounds in weight, caught incident to catching other fish, may be sold.

FISH PROTECTIVE ASSOCIATION FORMED.

At the annual meeting of The Salt Water Fish Protective Association of Southern California, held in the city hall, Avalon, California, in June, 1918, the following officers were duly elected by unanimous vote: President, J. H. Stamford; First Vice President, James L. Trout; Second Vice President, B. Wynns; Secretary, Ernest Windle; Treasurer, F. W. Elder, with the following members to make up the Executive Committee: C. B. Parker, P. V. Reyes, H. D. MacRae. A motion was duly made and carried to make the membership dues of the association for the coming year as follows: Associate members $1, Active $2, Life $10, Benefactor $100. The association adopted for its 1918 motto, "For the improvement of conditions affecting spawning fish."

GAME SANCTUARIES IN PENNSYLVANIA.

The game preserves in Pennsylvania are each one about nine miles in circumference and inclose about 3,200 acres each. A tract of this size is large enough to provide safety for the game and not too large to permit animals to breed and live and die in them without benefiting anyone. They are surrounded by an open space from ten to fifteen feet in width, from which the underbrush has been cut. This is known as a fire-line, but comes and goes at pleasure. No dog is permitted on these lands at any time.

Each preserve is under the supervision of a keeper, who lives in a house erected for his use. He has a stable, a horse, and suitable fire apparatus. During the open season he travels around the sanctuary at least once each day. During the closed season he goes around as necessity may require.

It is the duty of this keeper to protect and feed game in the preserve, to kill vermin, and to see to it that any animal

Fig. 110. Bear Lake Hatchery, San Bernardino Mountains. This hatchery furnishes fish for restocking the most famous of the fishing grounds in southern California. Photograph by Barry, April, 1918.

because forest fires can easily be extinguished by going along this line. On the inner side of the fire-line is stretched, about waist high, a strand of wire as thick as a telegraph wire, to mark the boundaries of this fixed area, and to give notice that it is more than an ordinary tract of land.

Along the wire at intervals of a hundred yards or so are posted notices, printed on cloth, calling attention to the fact that the wire encloses a state game preserve, upon which no hunting by any person is permitted at any time, and asking those who read to keep out and help to keep others out. Game is not enclosed, mortally wounded by hunters during the open season is captured and delivered to the men who first wounded the animal. The hunter, following his wounded quarry, finding it has gone under the wire, immediately reports that fact to the keeper, who, if he finds the game mortally hurt, kills it and delivers it to the hunter to whom it belongs.

AEROPLANE OBSERVATIONS OF MIGRATING BIRDS.

Despite the strenuous and engrossing character of their occupation, a few aviators have found opportunity to note the height of flight of various migrating birds.

Thus, from French soldiers of the air, it is learned that swallows have been observed to maintain an average altitude of 700 yards and wild ducks one of 1,800 yards, while green plover have been seen at a height of 2,150 yards. Incidentally it may be mentioned that the ducks were moving at a speed of 65½ miles an hour when flying upward and 69 miles an hour when flying horizontally. From another aviator it is learned that when he was flying at 9,500 feet he saw swallows high above him. And another, whose observations were made at a height of 6,000 feet during a heavy bombardment, "with anti-aircraft shells bursting in all directions," states that he observed 200 golden plover, perhaps driven higher than usual by the fact that the vicinity was "an unpleasant belt to cross."—Current Items of Interest, Feb. 21, 1918.

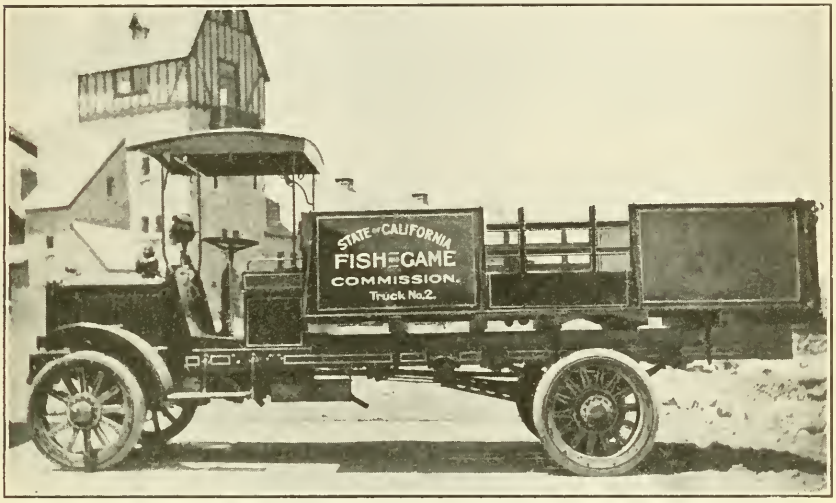


Fig 111. Truck No. 2 at Mt. Whitney Hatchery. By means of two trucks such as this the output of the Mt. Whitney Hatchery is hauled to the railroad station. Photograph by A. E. Culver, 1918.

THREE ESSENTIALS IN BIG GAME CONSERVATION.

In a program for rehabilitating the game resources of the National Forests, where there is abundant room for an enormous number of game animals without seriously interfering with the present livestock industry, three things are essential:

(1) A series of national game preserves located in favorable situations and distributed in National Forests throughout the West in order to provide breeding sanctuaries where game may increase and supply the surrounding areas.

(2) Co-operation between the Forest Service and the states wherein National Forests are located, whereby the Forest Service shall designate the parts of the forests where hunting may be done and the number of animals that may be killed in any particular forest or section of forest each season, the states meanwhile to have full control over issuing hunting licenses and to receive all fees therefrom. The states would thus benefit by the services of the trained force of forest rangers and guardians acting as federal game wardens to guard the game resources from spoliation just as they now protect the trees and the grazing in the interest of the country at large.

(3) A co-operative arrangement between the Forest Service and the National Park Service whereby the game service in the National Parks and the National Monuments shall be co-ordinated with that of the Forest Service to the same end, that the game supply may be increased and perpetuated.—E. W. Nelson, in *Recreation*, November, 1917.

DISTRIBUTION OF GAME BIRDS IN GERMANY.

According to present food regulations in Germany, a small number of the game birds killed by hunters go to the owners of the preserves on which they are taken, and the rest of the bag is divided into two equal parts, one for the local supply, the other for the cities. In Bavaria, four out of every five of all pheasants and partridges killed after the first five, must be delivered to the commune. Maximum prices are fixed for partridges and wild ducks. No report has come to hand of any relaxation of the laws protecting nongame birds so as to permit their utilization as food.—Current Items of Interest, June 29, 1918.

FACTS OF CURRENT INTEREST.

The Gates and the Harvester ranches near Corcoran, Kings County, which reported heavy damage by geese in February now report the heaviest grain crop ever harvested in the vicinity.

Large catches of salmon were made on the Sacramento River during the middle of September.

Catalina anglers had taken 600 tuna and 19 marlin-spike fish up to August 27, 1918. The deep sea angling of Santa Catalina Island attracts sportsmen from all over the world.

The tuna catch in southern California has been much below normal. The last of August the fish disappeared entirely and canneries had to turn their attention to yellowtail and other fish.

By September 5, sixty-one sportsmen of Sacramento had returned with deer. About ten of this number had secured the limit.

Some aliens are enthusiastic anglers. A Japanese in Sacramento recently sold twelve books of anglers' licenses to his countrymen.

Experiments have proved conclusively that ducks can be successfully frightened from rice fields by bombs.

The new federal regulations providing for the opening of the dove season on September 1 disturbed many dove hunters in District 1, where the season opened August 1, but many young birds will be spared as a result.

The drying up of many overflowed areas and many irrigation canals has necessitated the rescue of many fish in the Sacramento and San Joaquin valleys.

COMMERCIAL FISHERY NOTES.

N. B. Scofield, Editor.

INSHORE TRAWL FISHING NOT TO BE ALLOWED.

Recently fishermen operating the smaller seine trawls in Scotland asked the Fisheries Board for the privilege of fishing within the restricted districts within the three-mile limit. As far as we can learn this privilege has not been granted. The seine trawls of Scotland are a relic of the days when all of the fishing was done in shallow water close to shore, before the adoption of the beam trawl and later of the otter trawl.

Extensive investigations by the Scotland Fisheries Board into the effects of trawl net fishing resulted in prohibiting the use of these nets in shallow water within the three-mile limit, for the reason that the young fish congregate in the shallow water near the shore and their destruction and consequent waste by the operation of these nets was too great. Despite the fact that many of the varieties of fish in the North Sea have been depleted and the larger trawlers now go as far as Iceland for their fish, and despite the fact that Scotland and England have been engaged actively in the Great War for four years and meats have become scarce, and the price paid fishermen for trawl-caught fish has reached the government's maximum control price of 18 cents per pound, the trawls are still prohibited from fishing in the water near shore. England and Scotland in conserving their fisheries plan to regulate the fishing so that they will get the greatest perpetual output and they will not consent to the excessive destruction of fish before they have reached maturity. The destruction of young fish is bad enough in the deeper water and the trawls will not be allowed in the shallow water except as a last resort.

In California our trawl fishing is done in the most part by the primitive seine trawl, or paranzella, as it is called in northern California, and the drag-net, as it is known in southern California. For six years now these nets have been barred from the inshore districts within the three-mile limit along portions of the coast for the reason that here, as in the North Sea, they destroy too many immature fish close inshore.

Let us compare the conditions here with those in England and Scotland. Outside the three-mile limit in the neighborhood of San Francisco trawler fish are more numerous on each acre of bottom than they are in the waters surrounding England and Scotland. We have been at war little over a year and there is not a shortage of meat in California. We have an abundance of good varieties of fish, which, for lack of a market, are not caught. We utilize less than 10 per cent of the fish that are caught, the rest being canned or cured for export. No shortage in fish is indicated by prices, for the retail price of trawler fish here is only about half the price received by the fishermen in England. If we knew the retail price of these fish in England the price of our fish would appear ridiculously small. As stated above, England and Scotland have not deemed it necessary to set aside their conservation measures. We are different in America. We exploit our natural resources as though they were without limit, using destructive methods and taking little thought of the future.

Trawler fish during most of the year in California are caught in excess of the demand and large quantities are disposed of at reduction plants. Occasionally there are times when our primitive trawlers fail to make good catches for the reason that they actually fish only three hours out of twenty-four. On account of their lack of room aboard to clean and ice the fish or to house the crew they venture only a little way from port and have to return each evening. They also are unable to fish in deeper water than sixty fathoms. In spite of their poor equipment and their three hours of actual fishing a day, they manage to catch more fish during most of the year than the people will eat. Without proper facilities for caring for the fish they catch, or for holding their big catches over to dispose of during the time of poor catches, they occasionally fail to supply the market. Then the cry immediately goes up

that the restrictive laws are to blame and that they should be allowed to work inshore in the shallow water, even using the worn-out argument that they destroy fewer small fish in the shallow than in the deep water, never seeming to realize that their poor methods and poor equipment are to blame.

TINKER MACKEREL.

Excerpt from the New York Fishing Gazette of August 17, 1918:

> "Probably the highest price ever paid for tinker mackerel at Portland, Me., was that given boat fishermen recently by the Rundlett Company, they paying 27 cents a pound right out of the boats. For the past two weeks mackerel have been unusually scarce all along the New England coast, few being found by the seiners, while the traps on the Maine coast have of late collected only small amounts."

This item should be of interest to Californians, for we have large numbers of tinker mackerel in our coast waters from Monterey to San Diego. Ours is in every way as good as the Atlantic fish, but is neglected at 10 cents per pound retail and the price to the fishermen seldom exceeds three cents. Not long ago there was what was styled a "fish famine" in southern California at a time when great schools of these excellent fish were all along the coast feeding close to the shore where anyone could catch them. When fishermen were asked why they did not catch them they replied that there was no market for them.

SCOTLAND'S FISHERY PRODUCTS.

The Annual Report of the Fishery Board of Scotland, recently published, states that the total quantity of fish, including shellfish, landed in Scotland in 1917 was 344,934,016 pounds, valued at $18,029,355. This is a decrease of 10 per cent compared with 1916, but an increase in value of 16 per cent; 4,609 fishing vessels were employed, manned by crews numbering 14,800.

ENGLISH FISHERMEN GET HIGH PRICES.

Steam trawlers in the northeastern fishing district of England landed at Grimsby and Hull, for the quarter ending June 30, 1918, a little less than 65,000,000 pounds of wet fish, which was worth to the fishermen 18 cents per pound. This is an increase over the corresponding quarter in 1917 both in quantity and price paid. The fish sold at the maximum government control prices. Other trawlers several times realized over $14,600 per trip and in one instance one trawler sold its catch for a single trip for $53,044.

CANADA EXPORTS NINETY-FIVE PER CENT OF CATCH.

According to a statement issued by the Canadian Government, the Canadians do not eat enough fish. Out of 200,000,000 pounds of cod caught each year, the people of Canada eat less than 5 per cent, the rest being cured for export. The government is making great efforts to induce the people to use more fish, as they are short of meats.

SOCKEYE SALMON RUN BEING RE-ESTABLISHED IN THE COLUMBIA RIVER.

Years ago there was a good run of sockeye salmon in the Columbia River, but due to excessive fishing on the lower river and to the use of traps and spears for capturing the fish after they had reached their spawning grounds in the upper tributaries, the run was all but wiped out. In fact, the run was so depleted that a sufficient number could at no place be taken to warrant establishing a hatchery.

Eight years ago the U. S. Bureau of Fisheries conceived the idea of bringing sockeye eggs from their Yes Bay station in Alaska to be hatched and liberated in the Columbia. The eggs were sent to the Oregon Fish and Game Commission and hatched at the State Hatchery at Bonneville. Unfortunately, the young fish were not held a sufficiently long time after hatching and it is doubtful if any result was obtained during the first few years of the operations.

In the meantime, it was shown by the researches of Dr. C. H. Gilbert of Stanford University, that the young sockeyes naturally spend from one to three of the first years of their life in the lakes and that of the small proportion that pass to sea shortly after hatching, few or none live to return again to the stream. Four years

ago, acting on this knowledge, several hundred thousand out of nearly two million young fish hatched, were retained and fed in one of the ponds at Bonneville Hatchery until the spring of 1916, at which time they were a little over one year of age. Under the direction of Dr. C. H. Gilbert fifty thousand of these sockeyes were marked by removing the adipose and both ventral fins. The marked fish as well as the rest which had been held in the pond were liberated in the spring of 1916.

The majority of the Yes Bay sockeyes mature in their fifth year, but a slightly smaller number mature and return to their parent stream in their fourth year. As these marked salmon were four years old this year a lookout was kept for their return with the result that numerous marked fish have been found from Astoria to The Dalles. As high as ten specimens were received at one cannery in a day. As is usual in such cases, all of the salmon receiving stations did not look carefully for the marked fish or keep a proper record of those which were observed, but from the number of marked fish observed by certain canneries it is estimated that fully 2,000 marked fish were taken on the river, which is 4 per cent of the number marked. This is a conservative estimate of the number of marked fish which were captured and does not take into account the marked fish which returned, but were not captured.

It is also pointed out that more marked fish can be expected to return next year for a majority of the Yes Bay sockeyes mature at five years and a large proportion of the native Columbia sockeyes mature at five years.

An interesting and very important fact in connection with this experiment is that these Yes Bay salmon averaged 6½ pounds weight while the Columbia sockeyes, or "Bluebacks" as they are called, average about 3½ pounds, thus indicating that by properly selecting the breeding stock much larger fish can be produced in the same length of time, greatly increasing the output of the river without correspondingly increasing the expense of the hatchery operations.

But, of far greater importance is the large per cent of returned marked fish, good evidence which so far has been lacking, that intelligent artificial propagation of sockeye salmon pays. If in nature one sockeye egg out of each thousand would hatch and the resulting fish reach maturity, and return to the parent stream to spawn, the run would hold its own even if one-half the returning fish were captured by fishermen.

Bearing this in mind, the gain of getting back 4 per cent, or 40 out of each 1,000 of the fish, becomes more apparent.

LIFE HISTORY NOTES.

RING-NECKED PHEASANTS IN SANTA CLARA COUNTY.

Ring-necked pheasants (*Phasianus torquatus*) have been doing well in the Santa Clara Valley, especially so on the freshwater marshes or lowlands. However, the fact that alfalfa fields, and the fields in which volunteer hay is raised, form favorite nesting places constitutes a serious menace to the birds, for large numbers of eggs and young are destroyed by mowing machines. The birds are laying and nesting just about the time hay is being mowed. The hen sits very close and does not leave or fly from the nest until the mowing machine is right on top of her, very often too late to save the eggs or young chicks, and quite frequently too late to save herself from being killed.

Last season in the Ogier field, containing about 100 acres, while the first crop of alfalfa hay was being cut, over 100 eggs, about 25 young pheasants and three pheasant hens were destroyed and killed. In the Billings field on the Coffin Road, near the Mountain View Road, four nests containing about 60 eggs and one hatch of about 14 young birds were saved. During this season (1918), on this place, not one egg or bird was lost; but last season not a single one was saved, although Mr. Johnson, who drove the mower both seasons, kept watch as best he could and made every effort not to run into or over a nest. In the Cooney,

McAbbee and Gripenstraw fields on Downer avenue, near the Almaden road, about one-half the eggs were saved, and most of these were taken to the State Game Farm. On the H. W. McComas ranch, between Agnew and Sunnyvale, there is a pear orchard of about twelve acres upon which the grass and weeds were allowed to grow quite high, and when being plowed under last April fifteen pheasant nests were turned over. Only nine eggs were saved out of all these nests.

When the hay is cut over or even around nests the pheasant hen seldom returns. Occasionally she does come back to her nest and finishes her hatch.

Pheasants in the wild state commence nesting a little earlier than those in captivity; sometimes even hatching in the winter. Last February on the Nicholson ranch, near Alviso, I saw four little pheasants a little over one-fourth grown, and on the Fisher ranch, near Coyote, a brood of about a dozen just able to fly. Of course, these must have been exceptionally early hatches.—I. L. Koppel.

VALLEY QUAIL SUCCESSFULLY REARED.

In the hope that the following facts regarding the breeding of valley quail may be of service to other breeders, we here detail our experiences. Three years ago there came into our possession a pair of valley quail. The female was a very young bird and was raised by hand. These birds were kept in an aviary along with many other small finches. The first year the female deposited 22 eggs, but would not incubate them; later the same year she laid 15 more and these she also deserted. The second year the first clutch contained about 18 eggs, but these were deserted. The second set was carefully incubated by the male bird, the female showing no inclination to sit on the eggs. Not a single egg hatched, however. This year, 1918, 18 eggs were deposited and the female began incubating the first part of May. Twenty-three days later she came off the nest with 16 young. One of the chicks was found dead the first morning, and several others died soon after, probably owing to the fact that the male would not hover the young at night and the female could not cover so many growing birds. Nine were brought to maturity. Of this number eight are males. Another time we believe that greater success can be attained. The young quail were fed on dry weevils, and later on weed seeds, obtained as screenings from threshing machines.—H. C. Bryant.

A DEER TRAGEDY.

The accompanying picture (Fig. 112) illustrates one of the tragedies of the woods. Notice the foot of the deer which is wedged in the fork of the oak tree. After following the trail of a coyote, I found the carcass of this deer, upon which it had been feeding. The vegetable matter on the ground having been covered by two feet of snow, the deer had put his front feet up on the trunk of the tree to reach some mistletoe on which he intended to feed. One foot slipped and caught between the forks of the tree. As the animal struggled to free himself the foot became more tightly wedged and the deer must finally have become frantic, for his leg was twisted up to the shoulder and he was lying on his back, dead. The picture was taken this year (1918), two years after the accident.—Jay C. Bruce.

YELLOW PERCH NEAR SACRAMENTO.

The occurrence of yellow perch near Sacramento makes the history of its introduction of interest. In November, 1908, I received from the United States Bureau of Fisheries, through the Fish and Game Commission, a large number of blue-gills, sunfish and crappie; also about forty fingerling yellow or ring perch (*Perca flavescens*). These were placed in suitable localities near Sacramento. However, this was not the first introduction of these fishes into California waters, for in 1891, 3,000 yellow perch were planted in the Feather River. In 1904 I was informed that owing to the low stage of water in Nigger Jack Slough, near Marysville, large numbers of yellow perch were dying. I proceeded there immediately and saw a number of this species of fish dead in the shallow waters. There were quite a number of patients from the Yuba County Hospital catching some with hook and line in the deeper waters of the slough, some of them of good size. I immediately reported the

matter to Mr. Charles A. Vogelsang, who was chief deputy of the Commission at that time, and he sent the late deputy Manuel Cross to assist in the removal of these stranded fish to permanent waters. The presence of these fish was doubtless the result of the Feather River planting. Conditions must have been highly favorable for them as there was a larger number of them in this body of water than I have seen in any other body of water in the valley. We removed several thousand small and adult fish to the Feather River.

Yellow perch occasionally can be found in small numbers in nearly all the interior dredger cuts and canals in the Sacramento and San Joaquin valleys, notably so in the railroad cut that runs parallel with the Sacramento Southern Railroad from Sacramento to Walnut Grove. Also in Washington Lake, Yolo County, where I planted those last received from the Bureau of Fisheries. A few of them are occasionally taken in fyke nets in the Sacramento River, but in no considerable numbers.

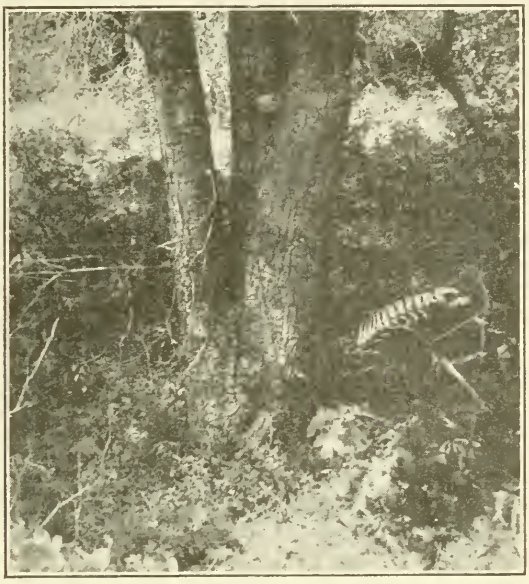


Fig. 112. Skeleton of deer which met untimely death by getting foot caught in crotch of tree. Photograph by J. C. Bruce.

Although these fish have a very wide distribution in the valley, they are in no wise numerous. It is my belief that our voracious fishes prefer them to most any other species for food because I have occasionally found the young in the stomachs of black and striped bass. There are two processed specimens in the Sacramento office of the Fish and Game Commission, about twelve ounces each in weight, taken from the dredger cut parallel with the Oakland, Antioch and Eastern Railroad, near Sacramento.

GEORGE NEALE.

REPORTS.

CALIFORNIA FISHERY PRODUCTS—APRIL, MAY, JUNE, 1918.

Species of fish	Del Norte, Humboldt	Mendocino, Sonoma, Lake	Marin	Solano, Yolo	Sacramento, San Joaquin	Tehama, Glenn, Colusa, Sutter	Alameda, Contra Costa	San Francisco	Santa Cruz	Monterey	San Luis Obispo, Santa Barbara Ventura	Los Angeles	Orange	San Diego	Totals	Mexico
Albacore												302,368	230	44,240	346,838	
Anchovy			7,500					206,038		161,800		9,160		8,966	393,464	
Barracuda								460		3,952	3,325	1,048,430	9,343	468,816	1,534,326	29,300
Bonito												21,539	383	2,305	24,207	
Bocaccio			125					30,375	23,058	133,250					186,808	
Bluefish								71,606	238	20,747					92,681	
Chilipepper								158,708	32,950	1,860					193,518	
Carp				7,268	14,912	1,005	27,131	27,620				27,330			105,266	
Catfish		11,338		7,328	34,193	2,105	23,657								78,621	
Coalfish			19					245,492	3,593	49		2,048	569		251,770	
Croakers												22,799		7,798	30,597	
Cultus cod	1,055	12,170	2,308					46,522	64,110	23,056					152,221	
Dogfish								16,395		94		1,657		4,817	22,963	
Flounder	2,776		391	541			2,968	91,532	10,170	24,006		427	240	21	133,672	
Halibut	10,536	7,803	46					14,789	2,196	10,071	51,852	469,374	7,469	609,852	1,183,979	151,443
Hake			8					51,315	9,288	16		6,177		1,578	68,382	
Hardheads					591	114									705	
Herring	100		374					173							647	
Kingfish								15,089	30,315	80,562		90,069	150	6,961	223,146	
Mackerel										147,472		613,898	3,668	55,658	820,696	4,695
Mullet												3,347			3,347	
Pike				26	1,167	297	1,012								2,502	
Pampano								719	2,351	1,375	44	1,616			6,105	
Perch	1,511		11,268					4,420	2,585	200		3,103	359	320	23,766	
Rock bass											701	124,658	2,819	108,237	236,415	
Rockfish	33,571	6,046	224					154,753	185,526	372,549	28,404	393,715	1,914	336,724	1,513,426	165
Sole	146		42					1,049,879	783,147	85,303	21,689	8,961	3	145	1,952,306	
Salmon	1,948	101,421	32,496	249,790	66,850	35,071	435,321	413,332	131,953	2,191,114		1,065			3,660,361	
Smelt	1,973		1,944				196	66,977	2,348	46,891	12,200	28,399	170	4,045	165,143	
Sea bass (white)								463		306	1,194	204,785	659	50,957	258,364	7,880
Sea bass (black)											2,796	15,148	2,721	42,892	63,557	1,350
Sand dabs								413,086	209,782	33,133		7,476			663,477	
Surf fish	7,431														7,431	
Striped bass			802	92,739	42,633	4,320	241,671	69,314	16						451,495	

Shad, roe				194,549	35,035		672,094								901,708	
Shad, buck				159,921	13,475		230,098								403,494	
Shad				199,008	101,223	2,069	633,482	57,820							993,602	
Sturgeon							31								31	
Stingaree			151,500												151,500	
Sardine	167							102,416	1,825	4,973,350		38,633,255		7,928,388	51,669,461	
Skate								45,173	1,700	139	425	1,871			49,308	
Split tail					262	74									336	
Sculpin												7,608		50	7,658	
Suckers					273	190	17								480	
Sea trout												15		58	73	
Sheepshead												357		785	1,142	
Tom cod								583				12,352	99	345	13,034	
Trout (farm)								1,106	750						1,856	
Trout (steelhead)	485														485	
Turbot			73												73	
Whitebait		100	3,865					85,508			18,326				107,800	
Yellowtail									49,122	33,942		317,609		339,159	742,827	1,275
Miscellaneous					2,253			30,173		15,098		11,131		6,143	64,798	130
Totals	61,699	138,878	212,986	911,170	312,897	45,245	2,267,678	3,471,926	1,550,023	8,366,335	140,947	42,421,747	30,767	10,029,260	69,961,553	195,838
Crustaceans—																
Crab (doz.)	1,265							15,571	246	427					17,509	
Spiny lobster											600			18,557	19,157	288,420
Shrimp								264,485							264,485	
Ecrevisse																
Mollusks—																
Squid			85					1,850	850	261,195		13,561		514	278,055	
Cuttlefish			10					3,696	477	7,111		37			11,331	
Clam (Pismo)											209,609				209,609	
Clam (cockle)			8,746								100	6,160			14,006	
Clam (softshell)		6,086	27,855				32,946								66,887	
Clam (mixed)	2,790	1,327	32,466				10,780	109			56	5,974			53,482	
Oyster (shell) No.			161,075					887,650							1,048,725	
Abalones	1,935	270								123,320	19,189				147,714	
Mussels	200		504				1,896	1,921		500	479	3,860	600	100	9,060	
Reptiles—																
Sea turtle														17,298	17,298	
Snails (sea)												335			335	

VIOLATIONS OF FISH AND GAME LAWS.

June 1, 1918, to September 1, 1918.

Offense	Number of arrests	Fines Imposed
Game.		
Hunting without license	16	$395 32
Failure to produce license on demand	1	10 00
Making false statement on application for license	1	25 00
Deer—close season—killing or possession	21	465 00
Female deer—spike bucks, fawns—killing or possession	23	1,218 32
Failure to retain portion of deer head bearing horns	1	----------
Illegal deer hides—possession	1	80 00
Cottontail and brush rabbits—close season—killing or possession	10	135 00
Quail—close season—killing or possession	9	258 32
Doves—close season—killing or possession	14	285 00
Ducks—close season—killing or possession	2	50 00
Sagehen—close season—killing or possession	3	65 00
Wild pigeon—close season—killing or possession	3	25 00
Wild pheasant—killing	1	25 00
Nongame birds—killing or possession	1	----------
Netting song birds	2	100 00
Trespassing—Mount Tamalpais Game Refuge	1	----------
Total game violations	110	$3,136 96
Fish.		
Angling without license	17	$240 00
Making false statement on application for license	2	50 00
Refusing to exhibit game fish on demand	1	30 00
Fishing for profit without license	1	10 00
Fishing with nets in restricted district	2	200 00
Trout—close season—taking, possession, offering for sale—excess bag limit	2	45 00
Trout—shipping by parcel post	1	----------
Striped bass—close season—netting—shipping from state—excess bag limit	9	235 00
Shad—close season—netting	4	60 00
Abalones—undersize—taking or possession	7	150 00
Crabs—undersize—taking or possession	1	20 00
Clams—undersize—excess bag limit—taking, possession, shipping	10	235 00
Pollution	1	----------
Dynamiting fish	1	200 00
Total fish violations	59	$1,475 00
Grand total fish and game violations	169	$4,611 96

SEIZURES—FISH, GAME, AND ILLEGALLY USED FISHING APPARATUS.

June 1, 1918, to September 1, 1918.

Game.		
Cottontail and brush rabbits	7	
Quail	5	
Doves	9	
Ducks	3	
Wild pigeon	4	
Sagehens	14	
Deer meat	377	pounds
Coon hides	21	
Fish.		
Salmon	40	pounds
Shad	286	pounds
Trout	4½	pounds
Striped bass	23½	pounds
Abalones	46	
Clams	721	
Illegal nets, traps and fishing outfits	5	
Searches.		
Illegal fish and game	21	

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CALIFORNIA FISH AND GAME

"CONSERVATION OF WILD LIFE THROUGH EDUCATION"

Volume 4 Sacramento, January, 1918 Number 1

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* * * *

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FISH AND GAME DISTRICTS

FOR LAWS IN FULL SEE PENAL CODE

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Volume 4 Sacramento, April, 1918 Number 2

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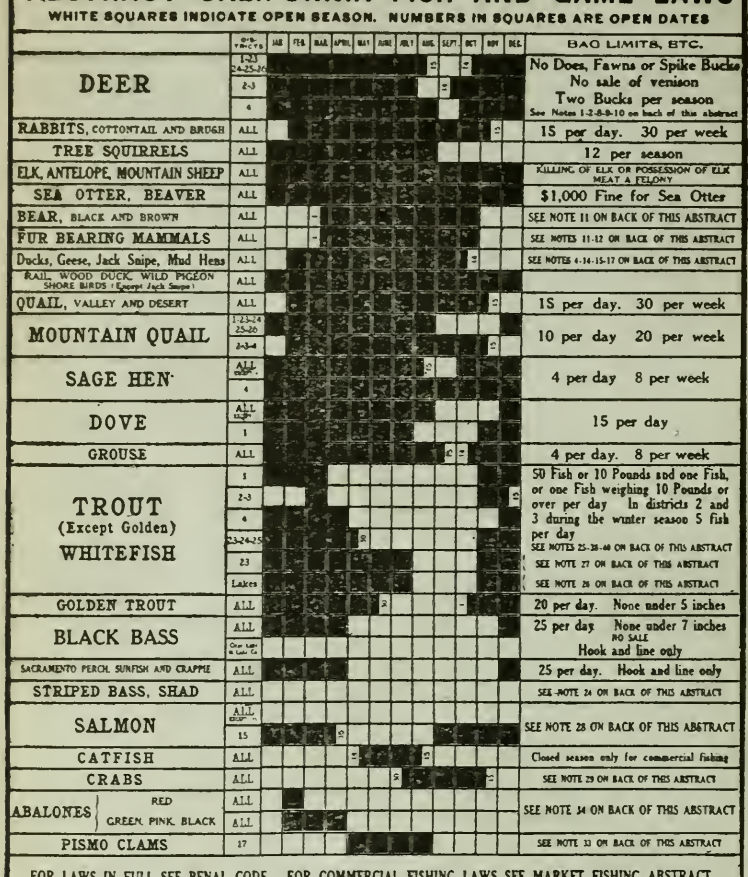

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WHITE SQUARES INDICATE OPEN SEASON. NUMBERS IN SQUARES ARE OPEN DATES

	Districts	JAN.	FEB.	MAR.	APRIL	MAY	JUNE	JULY	AUG.	SEPT.	OCT.	NOV.	DEC.	BAG LIMITS, ETC.
DEER	1-23 24-25-26								15		15			No Does, Fawns or Spike Bucks No sale of venison Two Bucks per season See Notes 1-2-8-9-10 on back of this abstract
	2-3									15				
	4													
RABBITS, COTTONTAIL AND BRUSH	ALL												15	15 per day. 30 per week
TREE SQUIRRELS	ALL													12 per season
ELK, ANTELOPE, MOUNTAIN SHEEP	ALL													KILLING OF ELK OR POSSESSION OF ELK MEAT A FELONY
SEA OTTER, BEAVER	ALL													$1,000 Fine for Sea Otter
BEAR, BLACK AND BROWN	ALL			-										SEE NOTE 11 ON BACK OF THIS ABSTRACT
FUR BEARING MAMMALS	ALL			-										SEE NOTES 11-12 ON BACK OF THIS ABSTRACT
Ducks, Geese, Jack Snipe, Mud Hens	ALL										14			SEE NOTES 4-14-15-17 ON BACK OF THIS ABSTRACT
RAIL, WOOD DUCK, WILD PIGEON SHORE BIRDS (Except Jack Snipe)	ALL													
QUAIL, VALLEY AND DESERT	ALL												15	15 per day. 30 per week
MOUNTAIN QUAIL	1-23-24 25-26													10 per day 20 per week
	2-3-4												15	
SAGE HEN	ALL (EXCEPT 4)								15					4 per day 8 per week
	4													
DOVE	ALL (EXCEPT 1)													15 per day
	1													
GROUSE	ALL									15	15			4 per day. 8 per week
TROUT (Except Golden) WHITEFISH	1													50 Fish or 10 Pounds and one Fish, or one Fish weighing 10 Pounds or over per day. In districts 2 and 3 during the winter season 5 fish per day SEE NOTES 25-31-40 ON BACK OF THIS ABSTRACT SEE NOTE 27 ON BACK OF THIS ABSTRACT SEE NOTE 28 ON BACK OF THIS ABSTRACT
	2-3												15	
	4													
	23-24-25					20								
	23													
	Lakes													
GOLDEN TROUT	ALL						20				-			20 per day. None under 5 inches
BLACK BASS	ALL													25 per day. None under 7 inches NO SALE Hook and line only
	Clear Lake & Lake Co.													
SACRAMENTO PERCH, SUNFISH AND CRAPPIE	ALL													25 per day. Hook and line only
STRIPED BASS, SHAD	ALL													SEE NOTE 24 ON BACK OF THIS ABSTRACT
SALMON	ALL (EXCEPT 15)													SEE NOTE 28 ON BACK OF THIS ABSTRACT
	15				15									
CATFISH	ALL						14			15				Closed season only for commercial fishing
CRABS	ALL							20					15	SEE NOTE 29 ON BACK OF THIS ABSTRACT
ABALONES — RED	ALL													SEE NOTE 34 ON BACK OF THIS ABSTRACT
ABALONES — GREEN, PINK, BLACK	ALL													
PISMO CLAMS	17													SEE NOTE 33 ON BACK OF THIS ABSTRACT

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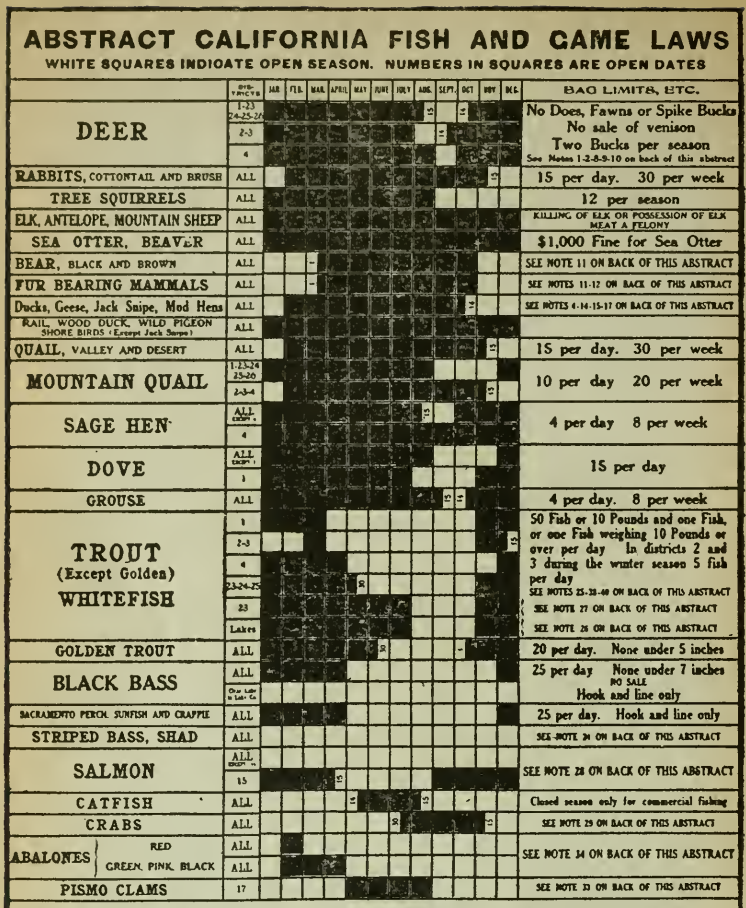

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