

off in one continuous act, any game, *feræ naturæ*, on the land of B, the dead game is the absolute property of B, *ratione soli*.

That the same doctrine is applicable to fish caught and taken from the waters of the owner cannot be questioned; and the cases referred to by the judges in the discussion of the cases above cited mention fish as of the same character as animals and birds.

Your committee, therefore, being of opinion that the navigable waters within each State belong to it, subject to the paramount right of navigation, for the benefit of its own people, it has the right to secure the exclusive right of fishing in them to its own citizens by virtue of their common property in said waters, and that the citizens of other States have no constitutional right, nor can Congress confer any, to participate in fishing in them.

Your committee recommend that the bill referred do lie on the table, and the prayer of the petitioners be denied. All of which is respectfully submitted.

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#### 43.—OBSERVATIONS ON SALMON IN GERMAN RIVERS.\*

By Prof. B. BENECKE.

We know but little about the salmon while ascending the different rivers, although this knowledge is of the greatest importance for the salmon fisheries and for the fixing of a rational season of protection. If we except the exceedingly valuable observations on the migration of the Rhine salmon by Miescher-Ruesch, no systematic investigation of this subject has anywhere been made. It is particularly astonishing that even in England, in spite of the great interest which the English take in the salmon fisheries, and in spite of the fact that there is a special inspector of salmon fisheries, and superintendents for every salmon stream, no one seems ever to have thought of subjecting this matter to scientific investigation.

Regular and exact observations have been made recently in the rivers Küddow and Rheda, which are small salmon streams of Germany, in which the circumstances are specially favorable.

The Küddow is a rapid and clear trout stream, which rises from the Vilm and Dolgen lakes near Neustettin, flows from north to south in many meanderings and with a strong current, and finally empties near Uszcz into the Netze, a well-known tributary of the Oder. In its middle course the Küddow has numerous spawning places of salmon; and since the reckless fishing which was formerly going on at its mouth, near Uszcz, and above, near Schneidemühl, has been checked, salmon ascend the Küddow regularly for the purpose of spawning. Our ob-

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\* "*Beobachtungen über den Aufstieg des Lachses in den Flüssen.*" From Circular No. 1, 1886, of the German Fishery Association, Berlin, March 4, 1886. Translated from the German by HERMAN JACOBSON.

server is the lessee of the fisheries, who resides in Borkendorf below the lowest spawning places, and who has carried on these fisheries for many years, so that he is well acquainted with the habits of the salmon in this river. It is certain that but few of the ascending salmon escape his observation. At our request the governor of the province has granted him the privilege to catch salmon and sea-trout even during the winter season of protection, on condition that he takes the sexual products from the mature fish and sends them to the hatchery at Schönthal. In this way the Schönthal hatchery during last winter received about 300,000 eggs, of which only about one-third lived.

The conditions for making observations are still more favorable in the river Rheda. This small and rapid coast river, in which trout are now very common, flows through two mouths—the Rheda proper and the Strömming—into an arm of the Baltic, the Bay of Putzig. Formerly salmon and sea-trout ascended both mouths of this river, but since the Rheda proper has been filled with sand, they almost exclusively use the Strömming. In this river a salmon trap, whose privileges date from time immemorial, has been constructed about  $1\frac{1}{2}$  miles above its mouth, and every fish which ascends the river must necessarily be caught in this trap. The fisheries in this river belong to a large landed proprietor whose fisherman lives in close proximity to the salmon trap.

At both stations of observation every fish which is caught is noted, and described on a form prepared by us, and this has been done since November, 1884. We give the date when it was caught, the kind (salmon or sea-trout), sex, length, greatest height in front of the dorsal fin, height of the root of the tail, weight, color, spots (if any), formation of hook, &c.

In course of time it has become evident that the measure of the circumference along the front edge of the dorsal fin is not needed; and it is therefore no longer taken, principally because it is very easy to make a mistake in taking this measure, and because the greatest height alone is sufficient. We have recently added in our form the length of the head, the teeth, and several columns with definite questions relative to the coloring and the spots. It has also been found desirable to take account of the condition of the water and the weather, and to state the probable cause of particularly rich or poor catches, such as high water, ice, &c.

It is of course not to be expected that the chances for observations will everywhere be as favorable as in these two rivers, and that in all cases there will be as reliable observers, but we hope next year to obtain similar reports from a number of rivers. Such observations made by carefully instructed observers are of course far more valuable for obtaining a knowledge of the habits of the salmon than the sending out of question sheets, whose questions are frequently unintelligible to those who receive them, and which therefore in many cases remain un-

answered. Even if these question sheets are returned, the answers are as a general rule of doubtful value.

The observations made last year on the Küddow and Rheda correspond, according to the statements of the fishermen, entirely with the facts observed by them for years, but they differ greatly in the two rivers.

. In the Küddow, about 40 to 50 miles from the sea, the first ascending salmon are usually noticed in August; but when the water is low, not until September or October; and only when the water is very high have they been seen as early as June. The fishermen are very well informed on the habits of the salmon during its ascent. In 1884 the period of observation was limited to November and December; last year the fisheries began in August and ended in the second half of November, the largest catches being made during the first half of November. The total number of fish caught during the 4 months was 99, with a total weight of 2,305 pounds; the average weight of the fish was therefore 23.2 pounds. Of this number of fish 36 were males, with a total weight of 1,012.5 pounds, the average weight of each fish, therefore, being 28.1 pounds. The maximum weight of the male fish was 44, and the minimum 16 pounds. Their length varied from 44 to 54 inches. The number of female fish was 63, with a total weight of 1,292.5 pounds. The average weight was 20.5, the maximum 33, and the minimum 11 pounds. Their length varied from 31½ to 47½ inches. No difference could be noticed in the period of migration of the two sexes. The fish are salmon and sea-trout.

The conditions are entirely different in the Rheda. At the salmon trap before-mentioned the ascent of salmon and sea-trout, which can here be distinguished with certainty is observed all the year round. During winter the trap has to be opened occasionally on account of ice or high water, in order to save it from destruction; but it is probable that even at such times fish ascend the river. Very low water occasionally renders the ascent of the fish difficult or impossible, owing to the great quantity of sand in the mouth of the Strömning. In this river also the governor of the province has permitted the catching of salmon during the winter season of protection, so as not to hinder our observations.

The number of migratory salmon caught during the four months was 245, with a total weight of 1,558.25 pounds, the average weight therefore being 6.3 pounds. Among this number there were 145 salmon with a total weight of 982.5 pounds, the average weight therefore being 6.8 pounds, the maximum 18, and the minimum 1 pound. The total weight of the 100 sea-trout was 575.75 pounds, the average weight 5.75 pounds, the maximum 13, and the minimum 1 pound. As to sex there were 144 males and 101 females. The largest number of fish ascended the river during the first half of July, both when taking all the fish together, and when taking the salmon separate from the sea-trout.

Neither in the Küddow nor in the Rheda could any law be shown governing the migrations of these two kinds of fish; while in the Rhine and in the rivers of Great Britain very easily distinguishable schools of fish of different ages ascend the rivers at different times; and the numerical proportion of the sexes varies greatly in the schools ascending at different times. Observations made during one year in two rivers are of course not sufficient to draw therefrom any general conclusions. The evident differences of the conditions of migration in the different rivers makes it, however, exceedingly desirable that accurate and systematic observations should be taken in as many places as possible, especially in rivers which contain many salmon, such as the Weser, where thus far nothing is done but to count the salmon that are caught, so that all we learn is at best how many fish were caught every day. According to the observations of Miescher-Ruesch, the largest number of salmon ascends the Rhine, both in the Netherlands and near Basel, in July; while in the Weser, according to a communication by Dr. Lindeman in the *Weser Zeitung*, the largest catches were made during the first half of May.

This is not the place to give a detailed review of the carefully ascertained measurements and weights of the fish, especially as the number of fish observed in the two rivers—344—is too small; but I will simply give a few results of my observations on the measurement and weight of the fish. Thus, taking the height of the body as the unit, the length of the salmon varied between 3.6 and 6.2, while that of the sea-trout varied between 3.5 and 5; and these variations occur with tolerable regularity in fish of every size, from 12 to 54 inches. The proportion between the length and the weight of the body, of course, varies just as much. The following are some of the results of my observations:

Weight.	Corresponding length.	Weight.	Corresponding length.
	<i>Inches.</i>		<i>Inches.</i>
Weighing 1 pound .....	12.6 to 15.4	Weighing 16 pounds .....	42.1 to 45.7
Weighing 2 pounds .....	12.6 to 18.5	Weighing 17 pounds .....	42.4 to 47.2
Weighing 3 pounds .....	13.5 to 22	Weighing 18 pounds .....	37.4 to 44.9
Weighing 4 pounds .....	13.4 to 21.7	Weighing 19 pounds .....	41.7 to 45.7
Weighing 5 pounds .....	18.9 to 24.8	Weighing 20 pounds .....	40.3 to 43.3
Weighing 6 pounds .....	15.7 to 25.6	Weighing 21 pounds .....	42.5 to 42.9
Weighing 7 pounds .....	19.7	Weighing 22 pounds .....	41.7 to 44.9
Weighing 8 pounds .....	24.8 to 28	Weighing 23 pounds .....	45.7 to 47.2
Weighing 9 pounds .....	28	Weighing 24 pounds .....	45.3 to 46.5
Weighing 10 pounds .....	28.7 to 29.9	Weighing 25 pounds .....	44.1 to 45.7
Weighing 11 pounds .....	31.5	Weighing 26 pounds .....	45.3 to 47.2
Weighing 12 pounds .....	28 to 42.1	Weighing 29 pounds .....	44.1 to 46.9
Weighing 14 pounds .....	33.1 to 37.8	Weighing 30 pounds .....	45.7 to 49.2
Weighing 15 pounds .....	42.1 to 44.5		

A salmon measuring 45.7 inches in length can therefore weigh, in the same water, 16 or even 30 pounds, which ought certainly to involve some difference in the shape of the body.