

XII.—ON THE SPECKLED TROUT OF UTAH LAKE.

Salmo Virginalis, Girard.

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The lake trout, or, as it is sometimes called, the brook and speckled trout, by the inhabitants of Utah, is one of the most characteristic and numerous fish of the Territory, affording a valuable, healthy, and cheap article of diet. This fish has existed for years in immense numbers, and for this reason it is rather singular that its occurrence was not noticed until the party under Lieutenant Wheeler, of the Engineers, visited Utah Lake in 1872. This fish is found in Utah and Paugwitch Lakes (the latter in Southern Utah) throughout the year, being most abundant during July and August, at which time these notes were hastily made.

In comparison with the other fishes of Utah, the lake trout is undoubtedly the most numerous and most easily captured; how long, however, this condition of affairs will last it is impossible to say, the supply having greatly diminished during the past few years, owing to reckless methods of fishing and increase in the number of fishermen; moreover a larger demand is now made for this fish, owing to increase in the number of settlers. The decrease in the yield may be roughly estimated at about one-third, but this percentage is slowly but surely increasing. The greatest size this fish attains, as far as could be learned on inquiry and from personal observation, is three feet; weight about fifteen and a half pounds. The average length, however, is about fourteen inches, and average weight one and a half pounds. The rate of growth is not known, although it is stated by the fishermen to be perhaps an inch per annum, but according to my own belief the rate is greater. The fish is supposed to attain its full size in about five years. In shape there is very little difference between the male and female; though near the breeding season the female is the larger and more brilliant in color. This increased brilliancy of color affects both sexes, but is noticeable in a more marked degree in the female. About breeding-time the eyes are brighter, scales more brilliant, and the superficial blood-vessels more fully engorged than ordinarily; the movements are more rapid, a celerity being displayed quite at variance with its usual somewhat sluggish habits. This fish winters in the deepest waters of the lakes, as most of the mountain streams to which it resorts in spring and summer are shallow and very cold. The male and female, large and small, run indiscriminately together, the presence of this fish in any

particular locality being indicated by the presence of flocks of birds hovering over the water. Except in the month of July, when unusually sluggish, the lake trout may be taken at any time with the hook and line, and, being high-spirited and particularly gamy, affords excellent sport for the angler. In summer it swims low in the water, in order, I think, to avoid the extreme heat of the sun. In winter it prefers the deepest water.

As far as could be ascertained the spawn has not been observed to run from this fish when captured, either by the line or net, for the reason, most likely, that the gravid female is seldom taken just prior to or during the time of spawning. It first enters the mouths of mountain streams and rivers to spawn about the middle of March, remaining until the middle of May, by which time the majority have fulfilled their reproductive functions. It is at such times that the fishermen, lying in wait at the mouths of the rivers, are able to capture such enormous quantities. In coming on to the breeding-grounds all sizes are found together, young and old, little and big. The favorite localities for feeding in summer are close to the mouths of rivers, the water of which from the mountains is ice-cold, from ten to twelve feet deep, and the current very swift. As already stated, the cold water is preferred in summer and warm in winter.

After spawning the trout invariably swim in schools, from one part of the lake to the other, in search of food, a solitary fish at such time being seldom seen; in traveling the trout is nearly always accompanied by its friendly companions the mullet, sucker, &c., which share with it the danger of attack by man and birds.

Notwithstanding the apparent affection existing between the different species of fish in Utah Lake, the trout does not hesitate to prey to a large extent upon the young of other kinds, suffering itself, in return, in the same way, but in a much less degree. The trout is very voracious, devouring other fish smaller than itself, particularly a species locally known as "silver-sides," of from two to six inches in length; on dissection, I have found the stomach of the trout crammed with these little fish. Grasshoppers, too, are a source of diet to the trout, with flies and other insects, while they do not disdain even snakes and frogs of tolerably large size. With regard to the methods of feeding I have not been able to perceive or otherwise learn of any peculiarities of the trout unless it be the great eagerness with which they seek their food, and the rapidity of devouring the same, especially with reference to bait on the hook. The quantity of food it consumes, judging from personal observations and accounts of experienced fishermen, must be enormous. During the spawning season no very observable changes take place in the trout except those mentioned above, and also, that the under part of the cheek of the female becomes very bright. As a rule, it may be stated that in general appearance the male is much brighter than the female at this season, and that the former is the smaller.

Before spawning the nest is made in the sand or gravel by a rotatory motion of the tail of the male. Into this cavity the eggs are exuded by the female, which is sedulously guarded by the male until the process is completed, when the latter deposits the milt which is to impregnate the eggs. No further care is taken by either after the deposition of the impregnating substance. Most of the spawning is done in the rivers, but the process takes place in the lakes also to some extent. Spawning is greatly interfered with by the nets used by the fishermen; knowing the time when the fish begin to run up the rivers, the nets are drawn near the mouths of the waters, and large numbers of fish taken. It is not known at what age this fish begins to breed, nor what period of time the process continues, although both these points might be definitely ascertained by careful observation of captives under favorable circumstances. The act of spawning exerts an injurious effect on the flesh of the fish, rendering it poor and insipid. In addition, many of the fish seeking the upper parts of the rivers, to fulfill their reproductive duties, do not survive the severe bruises and other injuries they meet with in the journey past the rocks and through the rapid currents of the mountain streams.

The water in the locality in which the trout spawns has never been noticed to be whitened by the milt, but it does present a translucent pinkish appearance after the event.

The temperature of water most favorable for hatching appears to be the coldest obtainable, the eggs, in many cases, being laid directly on the bottom of ice-cold mountain springs. The color of the spawn is whitish pink, each egg, just previous to spawning, being of the size of No. 4 shot. In July the eggs are not larger than No. 12, or dust-shot. The eggs, when spawned, always sink to the bottom, where they remain unless eaten or carried away by the swift current. As already stated, the nest is made from gravel and stones entirely, no other materials being used as far as has been observed. The eggs are hatched in March, April, and May, but the number of days required by the process is not known. The spawn and young fish suffer greatly from the attacks of other fish, aquatic reptiles, and even from the large fish of their own species, these seeming to have no affection for their young. It is rather a singular fact that the very young trout is seldom seen or taken either by the hook or net, and I am unable to account for the same unless it is that it resorts to unknown localities until a larger growth is obtained. Its food, so far as known, consists principally of small insects.

No steps have as yet been taken to increase the supply of this valuable fish by artificial means, the yield still being large enough to meet the wants of the settlers and miners; but in the course of a few years artificial propagation must be resorted to, for although certain laws have been passed regulating the size of the meshes of nets, no attention is paid to them by some greedy individuals, who think only of filling their own pockets at the expense of future generations.

It may be mentioned in this connection that a letter, prepared at the request of the Hon. G. Q. Cannon, and bearing on this subject, has been presented to the legislature of Utah. It suggests the enacting of certain laws with reference to the preservation of fish, &c., and that the same be rigidly enforced when passed.

No epidemic causing sickness or destruction of life among the trout of Utah and Pangwitch Lakes has ever been known, nor is this fish ever affected with parasites, as are many of the marine species. I must state, however, that I have been informed by a trustworthy friend that the same fish of the lakes in the Yellowstone region is uneatable in the summer, its flesh being riddled and filled with parasitic tape-worms of considerable size, many, according to Dr. Leidy, being *five inches* in length. Mr. Carrington, whose notes accompanied the specimens examined by Dr. Leidy, states that the smaller worms were contained in cysts adherent to the exterior of the intestines, while the larger ones up to six inches in length were found imbedded in the flesh. From five to fifty of the parasites were found in a single fish. When numerous they appeared to affect the health of their host, and the fishes most infested could generally be told by their duller color, meagreness and less activity. Dr. Leidy states that this worm belongs to the genus *Bothriocephalus*, or rather to that section of it now named *Dibothrium*. Two species have long been known as parasites of the salmon and other members of the same genus of fishes in Europe; but the tape-worm of the Yellowstone trout appears to be a different one, and may, from the shape of its head, be named with propriety *Dibothrium cordiceps*.

The trout of Utah Lake may be taken at nearly all seasons by both hook and net at all times, but in Pangwitch Lake by hook only, since fishing in any other way is prohibited by common consent. This, however, is no hardship, since large captures are easily made with the hook, I myself having taken from thirty to forty pounds weight in a single hour's fishing. The hooks used are simply large steel ones, with a snood, or snell, of piano-wire, which is strong and flexible. The best bait is minnow and grasshopper, although this trout will bite at almost anything. In Pangwitch Lake a fish's eye is considered a very tempting bait. The nets used in Utah Lake are made of Nos. 9, 12, and 18 cotton twine, are generally four hundred yards long, eight to ten feet deep, and are furnished with brails at either end; when employed they are reeled into the boats by means of a wooden windlass in the stern. The average daily catch of one person with hook and line would perhaps be twenty pounds, or about thirty-six hundred pounds the entire season; for a net of the dimensions above specified, one hundred and fifty pounds daily in summer and thirty or forty in winter.

This trout is highly prized by the settlers and miners of Utah, and quite a large proportion of those taken are consumed in the immediate neighborhood; the remainder is sent to the different mining camps, settlements, and the Salt Lake City market. As an article of food its

excellence is not surpassed by any fish, either fresh or salted. The delicacy and firmness of its flesh commend it to all who have a preference for fish-diet. Furthermore, it retains for a longer period than most fish its unequaled and unique flavor. All that are captured are readily disposed of, mostly in a fresh state, though a few are salted and smoked. In no case is it used for manure, nor is it ever exported. The retail price of the fish in its fresh state varies from twenty to thirty cents per pound; wholesale, from ten to fifteen cents; salted ones bring from ten to fifteen cents. These prices are about those formerly obtained, and are now current in the Salt Lake market.

The foregoing observations, as already stated, are the result of notes taken in Utah in July, 1872, by my assistant, Mr. Henshaw, and myself, though in some instances valuable aid and information were obtained from Mr. Peter Madsen, an intelligent Danish fisherman of Utah Lake, who kindly placed at our disposal data obtained during many years' experience acquired in this locality.

In conclusion, it may be stated that the Utah Lake trout is of vast economic importance to the settlers of the Great Salt Lake Valley, supplying as it does a comparatively cheap and most excellent article of sustenance, and one to the preservation of which special attention should be speedily given, since, if means are not shortly taken to prevent the destructive methods of fishing now employed, the species must become extinct after a few years. A number of fishermen, having no fear of the law, which is virtually a dead letter, are in the habit of visiting Utah Lake from Salt Lake City and other localities, and make use of nets of very small mesh for the express purpose of taking in the small fish, which readily sell for ten cents per pound in the Salt Lake market. As already mentioned, this reckless and destructive mode of fishing is in no wise tolerated by the people of Pangwitch, nor should it be by the residents of Provo City, near Utah Lake. Mr. Madsen, who lives on the lake, and who has been engaged in fishing for the past eighteen years, complains bitterly of these interlopers and law-breakers, as he finds his profits are gradually decreasing with the number of fish from year to year. He mentions that, in 1864, such was the abundance of this fish, that in one haul of the seine, discarding all other kinds, he secured between thirty-five and thirty-seven hundred-weight of trout, while at the present time five hundred pounds is considered an enormous haul.

In September and October the trout are somewhat scattering and do not approach the shore; consequently large hauls are seldom made at this period. Mr. Madsen states it as his opinion that the female in spawning ejects only a portion of her eggs, as he has found on dissecting the trout after the spawning season eggs of various sizes, some very small and others full grown. The manner of seine-fishing in the locality mentioned is quite similar to that pursued in the East, excepting that two boats are used instead of one, the seine being paid out from one of the boats, which generally takes position to the southward

of Provo River, while the other, with a line attached, makes a semicircle. As there is a perceptible current setting from the southern arm of the lake, increased by the southwest wind, the net is gradually drifted to near the mouth of the river; the boats then approach each other, the brails are seized, and the lead-line is held down by the feet of the fishermen, who jump into the shallow water into which the net is drawn, the fish being secured as the net is gradually hauled in. In winter fishing is carried on under the ice, holes being cut at certain distances and the net introduced by means of spars; it is then dragged to a favorable open space, and the fish collected. The hauls in winter, however, scarcely repay the labor bestowed; the net is sometimes seriously damaged, and the trout are shy and run into deep water; but the so-called suckers are very numerous, and meet with a ready sale.

The accompanying maps will afford a better idea of the lakes in question and their tributaries than any description I could possibly give. They are copied from the maps of Lieutenant Wheeler's report of the Territory, and are reliable. To this gentleman I am indebted for permission to publish these observations, which form part of his Report on the Ichthyology of the West.