

# The Daily Astorian.

Vol. XIV.

Astoria, Oregon, Tuesday, Morning, April 19, 1881.

No. 92.

## SALMON.

Observations by David S. Jordan and Chas. H. Gilbert.

American Naturalist, March 1878.

During the most of the present year, the writers have been engaged in the study of the fishes of the Pacific coast of the United States, in the interest of the United States fish commission and the United States census bureau. The following pages contain the principal facts ascertained concerning the salmon of the Pacific coast. It is condensed from our report to the United States census bureau, by the permission of Professor Goode, assistant in charge of fishery investigations.

There are five species of salmon (*Oncorhynchus*) in the waters of the north Pacific. We have at present no evidence of the existence of any more on either the American or Asiatic side.

These species may be called the quinnat or king salmon, the blue-back salmon or red-fish, the silver salmon, the dog salmon, and the hump-back salmon or *Oncorhynchus chonicha*, *nerka*, *kisutch*, *keta* and *gorbuscha*. All these species are now known to occur in the waters of Kamtschatka as well as in those of Alaska and Oregon.

As vernacular names of definite application, the following are on record:

a. Quinnat—*Chonicha*, king salmon, *quinna*, saw-kwey, Chinook salmon, Columbia river salmon, Sacramento salmon, tyee salmon, Monterey salmon, deep water salmon, spring salmon, ek-ul-ha ("ekewan") (fall run).

b. Blue-back—*krasnaya ryba*, Alaska red-fish, Idaho red-fish, sukkegh, Frazer's river salmon, rascal, ok-chooy-lia.

c. Silver salmon—*kisutch*, winter salmon, hoopid, skowitz, coho, bielaya, *ryba*, o-o-wun.

d. Dog salmon—*kayko*, *lekai*, *ktlawhy*, *quaioch*, fall salmon, o-le-a-rah. The males of all the species in the fall are usually known as dog salmon, or fall salmon.

e. Hump-back—*gorbuscha*, *had-do*, *hona*, *holia*, lost salmon, Puget-sound salmon, dog salmon (of Alaska).

Of these species, the blue-back predominates in Frazer's river, the silver salmon in Puget-sound, the quinnat in the Columbia and the Sacramento, and the silver salmon in most of the small streams along the coast. All the species have been seen by us in the Columbia and in Frazer's river; all but the blue-back in the Sacramento, and all but the blue-back in waters tributary to Puget-sound. Only the quinnat has been noticed south of San Francisco, and its range has been traced as far as Ventura river, which is the southernmost stream in California which is not muddy and alkaline at its mouth.

Of these species, the quinnat and blue-back salmon habitually "run" in the spring, the others in the fall. The usual order of running in the rivers is as follows: *nerka*, *chonicha*, *kisutch*, *gorbuscha*, *keta*.

The economic value of the spring running salmon is far greater than that of the other species, because they can be captured in numbers when at their best, while the others are usually taken only after deterioration.

The habits of the salmon in the ocean are not easily studied. Quinnat and silver salmon of every size are taken with the seine at almost any season in Puget-sound. The quinnat takes the hook freely in Monterey bay, both near the shore and at a distance of six or eight miles out. We have reason to believe that these two species do not necessarily seek great depths, but probably remain not far from the mouth of the rivers in which they were spawned.

The blue-back and the dog salmon probably seek deeper water, as the former is seldom or never taken with the seine in the ocean, and the latter is known to enter the straits of Fuca at the spawning season.

spawning season in November; the time of running and the proportionate amount of each of the subordinate runs, varying with each different river. In general, the runs are slack in the summer and increase with the first high water of autumn. By the last of August only straggling blue-backs can be found in the lower course of any stream, but both in the Columbia and the Sacramento quinnat runs in considerable numbers till October at least. In the Sacramento the run is greatest in the fall, and more run in the summer than in spring. In the Sacramento and the smaller rivers southward, there is a winter run, beginning in December.

The spring salmon ascend only those rivers which are fed by the melting snows from the mountains, and which have sufficient volume to send their waters well out to sea. Such rivers are the Sacramento, Rogue, Klamath, Columbia and Frazer's rivers.

Those salmon which run in the spring are chiefly adults (supposed to be at least three years old). Their milt and spawn are no more developed than at the same time in others of the same species which will not enter the rivers until fall. It would appear that the contact with cold fresh water, when in the ocean, in some way caused them to turn toward it and to "run," before there is any special influence to that end exerted by the development of the organs of generation.

High water on any of these rivers in the spring is always followed by an increased run of salmon. The canners think, and this is probably true, that salmon which would not have run till later, are brought up by the contact with the cold water. The cause of this effect of cold fresh water is not understood. We may call it an instinct of the salmon, which is another way of expressing our ignorance.

In general, it seems to be true that in those rivers and during those years when the spring run is greatest, the fall run is least to be depended upon. As the season advances, smaller and younger salmon of these two species (quinnat and blue-back) enter the rivers to spawn, and in the fall these young specimens are very numerous. We have thus far failed to notice any gradations in size or appearance of these young fish by which their ages could be ascertained. It is, however, probable that some of both sexes reproduce at the age of one year. In Frazer's river, in the fall, quinnat male grise of every size, from eight inches upwards, were running, the milt fully developed, but usually not showing the hooked jaws and dark colors of the older males. Females less than eighteen inches in length were rare. All large and small, then in the river, of either sex, had the ovaries or milt well developed.

Little blue-backs of every size down to six inches are also found in the upper Columbia in the fall, with their organs of generation fully developed. Nineteen-twentieths of these young fish are males, and some of them have the hooked jaws and red color of the old males.

The average weight of the quinnat in the Columbia, in the spring, is twenty-two pounds; in the Sacramento about sixteen. Individuals weighing from forty to sixty pounds are frequently found in both rivers, and some as high as eighty pounds are reported. It is questioned whether these large fishes are: (a.) Those which, of the same age, have grown more rapidly; (b.) Those which are older but have, for some reason, failed to spawn; or (c.) Those which have survived one or more spawning seasons. All of these origins may be possible in individual cases; we are, however, of the opinion that the majority of these large fish are those which have hitherto run in the fall and so many have survived the spawning season previous.

Those fish which enter the rivers in the spring, continue their ascent until death or the spawning season overtakes them. Probably none

of them ever return to the ocean, and a large portion fail to spawn. They are known to ascend the Sacramento as far as the base of Mount Shasta, or its extreme headwaters, about four hundred miles. In the Columbia they are known to ascend as far as the Bitter Root mountains, and as far as the Spokane falls, and their extreme limit is not known. This is a distance of six to eight hundred miles.

At these great distances, when the fish have reached the spawning grounds, besides the usual changes of the breeding season, their bodies are covered with bruises on which patches of white fungus develop. The fins become mutilated, their eyes are often injured or destroyed; parasitic worms gather in their gills, they become extremely emaciated, their flesh becomes white from the loss of the oil, and as soon as the spawning act is accomplished, and sometimes before, all of them die. The ascent of the Cascades and the Dalles probably causes the injury or death of a great many salmon.

When the salmon enter the river they refuse bait, and their stomachs are always found empty and contracted. In the rivers they do not feed, and when they reach the spawning grounds their stomachs, pyloric coeca and all, are said to be no larger than one's finger. They will sometimes take the fly, or a hook baited with the salmon roe, in the clear waters of the upper tributaries, but there is no other evidence known to us that they feed when there. Only the quinnat and blue-back (then called red-fish) have been found in the fall at any great distance from the sea.

The spawning season is probably about the same for all the species. It varies for all in different rivers and in different parts of the same river, and doubtless extends from July to December.

The manner of spawning is probably similar for all the species, but we have no data for any except the quinnat. In this species the fish pair off, the male, with tail and snout, excavates a broad shallow "nest" in the gravelly bed of the stream, in rapid water, at a depth of one to four feet; the female deposits her eggs in it and after the exclusion of the milt they cover them with stones and gravel. They then float down the stream tail foremost. A great majority of them die. In the headwaters of the large streams all die, unquestionably. In the small streams, and near the sea, an unknown percentage probably survive. The young hatch in about sixty days, and most of them return to the ocean during the high water of spring.

The salmon of all kinds in the spring are silvery, spotted or not according to the species, and with the mouth about equally symmetrical in both sexes.

As the spawning season approaches the female loses her silvery color, becomes more slimy, the scales on the back partly sink into the skin, and the flesh changes from salmon red and becomes variously paler, from the loss of the oil; the degree of paleness varying much with individuals and with inhabitants of different rivers.

In the lower Sacramento the flesh of the quinnat in either spring or fall is rarely pale. In the Columbia, a few with pale flesh are sometimes taken in spring, and a good many in the fall. In Frazer's river the fall run of the quinnat is nearly worthless for canning purposes, because so many are white meated. In the spring very few are white meated, but the number increases towards fall, when there is every variation, some having red streaks running through them, others being red toward the head and pale toward the tail, the red and pale ones cannot be distinguished externally, and the color is dependent neither on age nor sex. There is said to be no difference in the taste, but there is no market for canned salmon not of the conventional orange color.

As the season advances, the dif-

ferences between the males and the females become more and more marked, and keep pace with the development of the milt, as is shown by dissection.

The males have: (a.) The premaxillaries and the tip of the lower jaw more and more prolonged, both of them becoming finally strongly and often extravagantly hooked, so that either they shut by the side of each other like shears, or else the mouth cannot be closed. (b.) The front teeth become very long and canine-like, their growth proceeding very rapidly, until they are often half an inch long. (c.) The teeth on the vomer and tongue often disappear. (d.) The body grows more compressed and deeper at the shoulders, so that a very distinct hump is formed; this is more developed in *O. gorbuscha*, but is found in all. (e.) The scales disappear, especially on the back, by the growth of spongy skin. (f.) The color changes from silvery to various shades of black and red or blotchy, according to the species. The blue-back turns rosy red, the dog salmon a dull, blotchy red, and the quinnat generally blackish.

These distorted males are commonly considered worthless, rejected by the canners and salmon-salters, but preserved by the Indians. These changes are due solely to influences connected with the growth of the testes. They are not in any way due to the action of fresh water. They take place at about the same time in the adult males of all species, whether in the ocean or in the rivers. At the time of the spring runs, all are symmetrical. In the fall, all males of whatever species are more or less distorted. Among the dog salmon, which run only in the fall, the males are hooked and red-blotched when they first enter the straits of Fuca from the outside. The hump-back, taken in salt water about Seattle, shows the same peculiarities. The male is slab-sided, hook-billed and distorted, and is rejected by the canners. No hook-jawed females of any species have been seen.

It is not positively known that any hook-jawed male survives the reproductive act. If any do, their jaws must resume the normal form.

On first entering a stream the salmon swim about as if playing; they always head towards the current, and this "playing" may be simply due to facing the flood tide. Afterwards they enter the deepest parts of the stream and swim straight up, with few interruptions. Their rate of travel on the Sacramento is estimated by Stone at about two miles per day; on the Columbia at about three miles per day.

As already stated, the economic value of any species depends in great part on its being a "spring salmon." It is not generally possible to capture salmon of any species in large numbers until they have entered the rivers, and the spring salmon enter the rivers long before the growth of the organs of reproduction has reduced the richness of the flesh. The fall salmon cannot be taken in quantity until their flesh has deteriorated, hence the "dog salmon" is practically almost worthless, except to the Indians, and the hump-back salmon is little better.

The silver salmon, with the same breeding habits as the dog salmon, is more valuable, as it is found in Puget-sound for a considerable time before the fall rains cause the fall runs, and it may be taken in large numbers with seines before the season for entering the rivers. The quinnat salmon, from its great size and abundance is more valuable than all other fishes on our Pacific coast together. The blue-back, similar in flesh but much smaller and less abundant, is worth much more than the combined value of the three remaining species.

The fall salmon of all species, but especially the dog salmon, ascend streams but a short distance before spawning. They seem to be in great anxiety to find fresh water and many of them work their way up little brooks only a

few inches deep, where they soon perish miserably, floundering about on the stones. Every stream, of whatever kind, has more or less of these fall salmon.

It is the prevailing impression that the salmon have some special instinct which leads them to return to spawn in the same spawning grounds where they were originally hatched. We fail to find any evidence of this in the case of Pacific coast salmon, and we do not believe it to be true. It seems more probable that the young salmon, hatched in any other place, mostly remain in the ocean within a radius of twenty, thirty or forty miles of its mouth. These, in their movements about in the cold waters of their parent rivers, or perhaps at any other river at a considerable distance from the shore. In the case of the quinnat and the blue-back, their "instinct" leads them to ascend these fresh waters, and in a majority of cases these waters will be those in which the fishes in question were originally spawned. Water in the season the growth of the reproductive organs leads them to approach the shore and to search for fresh waters, and still the chances are that they may find the original stream. But undoubtedly many fall salmon ascend, or try to ascend, streams in which no salmon was ever hatched.

It is said of the Russian river and other California rivers, that their mouths in the time of low water in summer, generally become entirely closed by sand bars, and that the salmon in their eagerness to ascend them, frequently fling themselves entirely out of water on the beach. But this does not prove that the salmon are guided by a marvelous geographical instinct which leads them to their parent river. The waters of Russian river soak through these sand bars and the salmon "instinct," we think, leads them merely to search for fresh waters.

This matter is much in need of further investigation; at present, however, we find no reason to believe that the salmon enter Rogue river simply because they were spawned there, or that a salmon hatched in the Clackamas river is any the more likely on that account to return to the Clackamas than to go up the Cowlitz or the Des Clutes.

At the hatchery on Rogue river, the fish are stripped, marked and set free, and every year since the hatchery has been in operation some of the marked fish have been re-caught. The young fry are also marked, but none of them have been re-caught.

This year the run of silver salmon in Frazer's river was very light, while on Puget-sound the run was said by the Indians to be greater than ever known before. Both these cases may be due to the same cause, the dry summer, low water and consequent failure of the salmon to find the rivers. The run in the sound is much more irregular than in the large rivers. One year they will abound in one bay and its tributary stream and hardly be seen in another, while the next year the condition will be reversed. At Cape Flattery the run of silver salmon for the present year was very small, which fact was generally attributed by the Indians to the birth of twins at Neah bay.

the number caught was about half as great as now, the amount of netting used was perhaps one-eighth as much. With a comparatively small outfit the canners caught half the fish, now the nets much larger and more numerous, they catch them all, scarcely any escaping during the fishing season (April 1 to August 1). Whether an actual reduction in the number of fish running can be proven or not, there can be no question that the present rate of destruction of the salmon will deplete the river before many years. A considerable number of quinnat salmon run in August and September, and some stragglers even later; these are all which keep up the supply of fish in the river. The non-molestation of this fall run, therefore, does something to atone for the almost total destruction of the spring run.

This, however, is insufficient. A well ordered salmon hatchery is the only means by which the destruction of the salmon in the river can be prevented. This hatchery should be under the control of Oregon and Washington, and should be supported by a tax levied on the canned fish. It should be placed on a stream where the quinnat salmon actually come to spawn.

It has been questioned whether the present hatchery on the Clackamas river actually receives the quinnat salmon in any numbers. It is asserted, in fact, that the eggs of the silver salmon and dog salmon, with scattering quinnat, are hatched there. We have no exact information as to the truth of these reports, but the matter should be taken into serious consideration.

On the Sacramento river there is no doubt of the reduction of the number of salmon; this is doubtless mainly attributable to over fishing, but in part it may be due to the destruction of spawning beds by mining operations and other causes.

As to the superiority of the Columbia river salmon; there is no doubt that the quinnat salmon average larger and fatter in the Columbia than in the Sacramento and in Puget-sound. The difference in the canned fish is, however, probably hardly appreciable. The canned salmon from the Columbia, however, bring a better price in the market than those from elsewhere. The canners there have had a high regard for the reputation of the river, and have avoided canning fall fish or species other than the quinnat. In the Frazer's river the blue-back is largely canned, and its flesh being a little more watery and perhaps paler, is graded below the quinnat. On Puget-sound, various species are canned; in fact, everything with red flesh. The best canners on the Sacramento apparently take equal care with their product with those of the Columbia, but they depend largely on the somewhat inferior fall run: There are, however, sometimes salmon canned in San Francisco, which have been in the city markets, and for some reason remaining unsold, have been sent to the canners; such salmon are unfit for food, and canning them should be prohibited.

The fact that the hump-back salmon runs only on alternate years in Puget-sound (1875, 1877, 1879, etc.) is well attested and at present unexplained. Stray individuals only are taken in other years. This species has a distinct "run," in the United States, only in Puget-sound, although individuals (called "lost salmon") are occasionally taken in the Columbia and in the Sacramento.

A cough, cold or sore throat should be stopped. Neglect frequently results in an incurable lung disease or consumption. Brown's Bronchial Troches do not disorder the stomach like cough syrups and balsams, but act directly on the inflamed parts, allaying irritation, give relief in asthma, bronchitis, coughs, catarrh, and the throat troubles which singers and public speakers are subject to. For thirty years Brown's bronchial troches have been recommended by physicians, and always give perfect satisfaction. Having been tested by wide and constant use for nearly an entire generation, they have attained well-merited rank among the best staple remedies of the age. Sold at 25 cents a box everywhere.

## BUSINESS CARDS.

J. Q. A. BOWLEY.  
ATTORNEY AT LAW.  
Chenamus Street. - ASTORIA, OREGON.

C. W. FULTON.  
ATTORNEY AT LAW,  
ASTORIA  
Office over Page & Allen's store, Cass street

J. W. ROBB.  
ATTORNEY AT LAW,  
ASTORIA - OREGON  
Office over Warren & Eaton's Astoria Market, opposite the Occident Hotel.

E. C. HOLDEN.  
NOTARY PUBLIC,  
AUCTIONEER, COMMISSION AND INSURANCE AGENT.

A. VAN DUSEN.  
NOTARY PUBLIC.  
Chenamus Street, near Occident Hotel,  
ASTORIA, OREGON.  
Agent Wells, Fargo & Co.

F. P. HICKS.  
DENTIST,  
ASTORIA - OREGON.  
Rooms in Allen's building up stairs, corner of Cass and Squeamochie streets.

D. M. D. JENNINGS.  
PHYSICIAN AND SURGEON.  
Graduate University of Virginia, 1868  
Physician to Bay View hospital, Baltimore City, 1870-79.  
Office - In Page & Allen's building, up stairs, Astoria.

JAY TUTTLE, M. D.  
PHYSICIAN AND SURGEON,  
Office - Over the White House Store.  
RESIDENCE - Next door to Mrs. Munson's boarding house, Chenamus street, Astoria, Oregon.

J. C. ORCHARD.  
DENTIST,  
Dental Rooms,  
SHUSTER'S  
Photograph Building.

D. A. McINTOSH.  
MERCHANT TAILOR,  
Occident Hotel Building,  
ASTORIA - OREGON

C. H. BAIN & CO.,  
DEALER IN  
Doors, Windows, Blinds, Trussoms, Lumber, Etc.  
All kinds of Oak Lumber, Glass, Best Material, etc.  
Steam Mill near Weston hotel, Cor. Genevieve and Astor streets.

J. G. FAIRFOWL & SON,  
STEVEDORES AND RIGGERS  
Portland and Astoria, Oregon.  
Refer by permission to—Boyer, Meyers & Co., Allen & Lewis, Corbett & Macleay, Portland, Oregon.

WM. UHLENHART.  
Occident Hotel Hair Dressing Saloon  
ASTORIA - OREGON.

Hot, Cold, Shower,  
Steam and Sulphur  
BATHS.  
Special attention given to ladies' and children's hair cutting.  
Private Entrances for Ladies.

WILLIAM FRY,  
PRACTICAL  
BOOT AND SHOE  
MAKER.  
CHENAMUS STREET, opposite Adler's Book Store, - ASTORIA, OREGON.  
Perfectly fitted guaranteed. All work warranted. Give me a trial. All orders promptly filled.

W. L. McCABE, J. A. BROWN  
Astoria. Portland.

BROWN & McCABE,  
STEVEDORES AND RIGGERS.  
Astoria office - At E. C. Holden's Auction Store. Portland office - 24 B street. 18-17

Music Lessons.  
T. F. CULLEN and C. E. BARNES  
TEACHERS OF  
VIOLIN, PIANO, GUITAR, CORNET AND BANTO.  
Would like a few pupils on either of the above instruments.  
Terms - Eight lessons for five dollars. Enthusiasts left at Stevens & Sons book store will be promptly attended to.

To-Night. To-Night.  
GRAND BALL  
AT MUSIC HALL,  
THIS EVENING.

E. A. QUINN.  
dealer in  
FAMILY GROCERIES AND  
NAILS, MILL FEED AND HAY  
Cash paid for country produce. Small profits on cash sales. Astoria, Oregon, corner of Main and Squeamochie streets.

SPICES.  
The undersigned is prepared to furnish a large number of Spices and Spars at his place on short notice, at reasonable rates. Apply to  
C. G. CAPLES,  
Columbia City

I. W. CASE,  
IMPORTER AND WHOLESALE AND RETAIL DEALER IN  
GENERAL MERCHANDISE  
Corner Chenamus and Cass streets.  
ASTORIA - OREGON.

Wm. Houseman of Portland  
BEGS LEAVE TO NOTIFY HIS friends and customers that he has opened  
A FISHERMAN'S CLOTHING  
AND FURNISHING GOODS STORE  
Next to G. W. Hume's grocery store.  
F. HOUSEMAN, Agent