

2. NYCTIARDEA VIOLACEA (Linn.).

“‘Crabier montagne.’ Caught in a dark ravine in the mountains near Roseau and brought to me alive. I kept it for more than a week, feeding it on cray-fish and land-crabs, which it devoured with avidity. It died suddenly.”

3. CHARADRIUS VIRGINICUS, Borkh.

“Golden plover. Shot on sea-beach.”

4. ANOUS STOLIDUS (Linn.).

“‘Twa-oo.’ Brought to me alive when very young and I kept it alive for nearly a year, when it was choked by a careless child. It became very tame. It used to fly on to the roof of my house and bathe in a duck-pond in the garden. I gave it fish cut into small pieces.”

5. STRIX FLAMMEA var NIGRESCENS, Lawr.

“Owl. It is, I think, different in plumage and certainly smaller than one I had some years ago. This bird was caught in the town of Roseau and brought to me. I kept it alive for several weeks, when it died suddenly. It woke up usually just before dark and then partook of its meal of five or six small lizards or a mouse. On introducing a live lizard into its cage it darted down upon it with great quickness; it seemed to be more of a spring and a drop than anything else; it then held the animal in its claw for a minute or so and regarded it intently, then with its sharp beak it divided the spinal column just behind the head. This occurred once and again, and it would thus appear that the owl is endowed with the instinct of the easiest and surest way of killing its prey. The lizard when dead was seized by the head, and by a series of jerks or turnings up of the head the owl actually threw it down its throat. If the lizard was rather large the owl would rest for a while with the tail of the reptile hanging out of its mouth.”

I think this specimen is a male; the larger one spoken of was probably a female.

6. TRINGA MINUTILLA, Vieill.

“‘Bécass.’ Caught near to the mouth of Roseau River.”

NEW YORK, *June 15, 1880.*

THE EULACHON OR CANDLE-FISH OF THE NORTHWEST COAST.

By JAMES G. SWAN.

This paper I have prepared from my own notes made during a cruise on the United States revenue-steamer Oliver Wolcott to Alaska, during the summer of 1873, as special commissioner to procure articles of Indian manufacture for the National Museum, to be exhibited at the Centennial celebration at Philadelphia, and from information derived from Mr. Robert Tomlinson, clerk to Kincolet Mission, Nass River, British Columbia; from Mr. Charles F. Morrison, chief trader Hudson's Bay

Company, at Fort Simpson, British Columbia; and from reports of Rev. Mr. Duncan, of Metlakatla Mission, British Columbia, made to the Church Missionary Society, at London, and to Messrs. Langley & Co., Victoria, to whom I am indebted for the copy of Professor Redwood's report, which I give entire. The description of the Eulachon by Sir John Richardson is, I believe, the earliest, and but little can be added to it. As I have no copy of his works at hand I cannot give his description, which I regret.

JAMES G. SWAN.

NEAH BAY, *Clallam County, Wash., January 31, 1880.*

This fish, known to scientists as the *Thaleichthys pacificus*, and also as *Osmerus pacificus*, resembles the common smelt in size and general outward appearance, and is found on Puget Sound occasionally with the sand-smelt *Hypomesus olidus*.

The Eulachon, however, differs from all other varieties of the smelt family by having its entire body permeated with a peculiar fat, which, on being extracted, is of the consistence and color of soft lard, and is used largely by the natives as an article of food.

By a rectifying and deodorizing process, Messrs. Langley & Co., chemists, of Victoria, British Columbia, have succeeded in preparing an oil which appears to possess the remedial qualities of cod-liver oil in a remarkable degree, and is more agreeable to both palate and stomach. The quantity of this fatty substance is so considerable that when the fish is dried it can be set on fire like a torch and will consume its whole length like a candle, from which fact its common name of "Candle-fish" is derived. This adipose matter when first extracted, even when fresh caught, has a strong, disagreeable odor and a peculiar taste which is very unpalatable to most white persons. The fresh fish, however, has no unpleasant smell about it. It has somewhat of the same cucumber odor as the smelt, or rather an odor which resembles that of the bruised leaves of the wild syringa, *Philadelphus* L., which is a somewhat common shrub on the shores of Puget Sound and other portions of the northwest coast. When fried, like the smelt it is a most delicious pan-fish, or even when simply boiled, as the natives usually cook it, or toasted on a stick before the fire, it is most excellent and nutritious food.

The Eulachon are found in limited numbers at certain seasons in the Columbia River, Shoal-water Bay, Gray's Harbor, and at the mouth of the various small streams of the coast, and also in the waters of Puget Sound, where they are taken in seines and nets with smelt and other varieties of small fish, but they are thin and poor, and not to be compared to the same varieties further north. Even those taken in Fraser's River, near the boundary line between Washington Territory and British Columbia, are superior to those taken further south, and are sold in the Victoria market, where their excellence is highly prized. The few secured on Puget Sound are sold by the fishermen as smelts. The best

kinds are caught further north, and great quantities are salted by the Hudson's Bay Company, at their trading post at Fort Simpson, British Columbia, and either sold in the Victoria market or shipped direct to London in tierces, barrels, and kits.

As an article of food and for the grease or fat contained in them, the Eulachon are highly prized by the Indians of Northern British Columbia and Southern Alaska, where they abound; particularly at the Nass River, British Columbia, where they are annually taken in enormous quantities, and where they seem to attain their very finest condition.

The Nass River flows into Portland Inlet near the fifty-fifth parallel of north latitude, near the southern boundary of Alaska, and 30 miles north-northeast of Fort Simpson, British Columbia. At its mouth it widens out into a bay called Nass Bay or Strait, in which are various shoals favorable for the Eulachon spawning grounds.

There are other rivers and streams in British Columbia and Alaska at the mouths of which Eulachon are taken, but as the Nass River fishery exceeds them all, and is, in fact, the principal place where the business is carried on by both whites and Indians, a description of that fishery will suffice.

The principal run of the fish reaches Nass River in the latter part of March, generally from the 16th to the 22d, varying in exceptional years from the 28th to April 4. When the season approaches the Indians assemble in great numbers; not only the Nishka, or natives of the Nass country, but from hundreds of miles distant, some in canoes and some overland. In former years quarrels and fights among the different tribes were common, but of late years the influences of the missions at Metlakatla, Kincoeth, and Fort Simpson have produced a favorable change, not only in inducing them to be more peaceful, but to lay aside their old heathen superstitions, one of which was that all the fish eaten for the first four or five days after they commence to arrive must be either fried or toasted; no one was allowed to boil any, as they believed that if any were boiled the fish would immediately leave the river; they were also strictly forbidden to drink water after a meal of fish, lest there should be rain which would hinder the drying. These ceremonies are now abandoned in a great measure, and but seldom practiced at the present time.

The Eulachon only travel up the Nass River as far as the flood tides reach, which is from 15 to 20 miles from its mouth. For about 7 miles from Nass Strait the river is unsuited for fishing operations. From thence to the Nass Village, at the head of tide-water, is a succession of sand-bars, and these form the spawning beds of the fish. Every available spot along the banks of the river is occupied by the Indians during the fishing season, who erect temporary wigwams for themselves.

As the fishing season approaches the arrival of the fish is anxiously watched by the natives, as it is a season of the year in which they are generally out of food.

The fish usually swim in deep water till they reach the mouth of the river, and during their passage up the strait are followed by innumerable enemies. Porpoises, seals, dog-fish, ground-sharks, and halibut harass them in the strait, and if they rise to the surface they are attacked by clouds of gulls, ducks, and other sea-fowl.

The bishop of British Columbia, who visited the Nass River in 1863, writes concerning the fisheries:

“Such a scene of life—man life, bird life, fish life—I had never before conceived. Over the fish was an immense cloud of innumerable gulls; so many and so thick were they as they hovered about looking for the fish that the sight resembled a heavy fall of snow. The fish are caught in vast quantities. I saw hundreds of tons collected together, and the nets hauled in bushels at a time.”

When the fish reach the mouth of the river they generally rise to the surface of the water, and are caught by the natives with a pole about 18 feet long, slightly flattened into an oar-shape at the lower end. Into one edge of this flattened blade are stuck a row of wooden pins or pieces of wire sharpened. This implement is thrust down and with both hands drawn rapidly through the water, and the fish are impaled on the pins and are shaken off into the canoe in the same manner as the Indians about Puget Sound take herrings. The number of Eulachon caught in this way form a good estimate of the probable run of the fish for the season, whether they will be plentiful or not.

As soon as the fish make their appearance at the sand-bars fishing operations begin in earnest. In former years a sort of large landing net, called by the natives *Bānak*, was used, but of late these have been discarded for purse-nets. About an hour after the tide has begun to ebb two strong poles are driven into the sand at the bottom of the river about 12 feet apart; to these the net is attached, the mouth being kept open by inserting two small sticks across it. It is then depressed in the water until the under rim rests on the sand; the fish are drawn into the aperture by the force of the current.

The nets are generally six or eight fathoms long. A long crooked stick is used for raising the narrow end of the net. If it contains fish it is hauled into the canoe and, by loosening a string, its contents are easily shaken out. Sometimes the net for its whole length becomes blocked with fish. The greatest care and skill are then necessary to prevent its being carried away by the current.

Another difficulty, and the cause of much damage to the nets, is the loose ice. The fish first come about the time the ice begins to break up. Of course, there are exceptions to this rule. Some years the ice remains solid until after the fish are caught, in which case holes have to be cut in the ice to put down the nets; other years, again, the ice has all disappeared before the fish arrive.

When the tide begins to flow, the nets are all taken in and all the fish caught are thrown in heaps on the ground close to the wigwams. With

a good run of fish, each net ought to catch about two tons each tide. When a sufficient supply of fish has been obtained they are not boiled down at once, but are left on the ground in heaps from six to ten days, according to the state of the weather. This is done to facilitate the boiling, as the grease separates more rapidly from the fish after a partial decomposition than when fresh. The perfume which permeates the atmosphere at this time is certainly not to be found among the extracts and essences of Lubin or Rimmel. As has been said of the odor of the skunk, "it may be healthy, but is very offensive, and a little of it goes a great way." As an Irishman once remarked to me of a similar stench, "the smell of it would kill flies," which is saying a great deal for its energetic power.

After the fish have remained exposed on the ground five or six days a portion of them are strung up for drying by having their heads interwoven with thin strips of bark; they are then washed and hung on racks to dry; they are not covered up, but are thus exposed to the atmosphere in all weathers for three or four weeks and get perfectly dried and firm, and form a chief article of food for the Indians, who either toast them over the fire or boil them. They also use them as torches. It is only necessary to set them on fire and they will continue to burn until consumed.

In extracting the grease from the fish the Indians place them in large wooden boxes and boil them by means of red-hot stones. As the grease rises to the surface it is skimmed off, and when all has risen the residue of the fish bodies is taken out and pressed to get all the still adherent portion. A ton of fish makes from 24 to 30 gallons. This is then put in wooden boxes and any convenient receptacle, and forms a lucrative article of trade among the natives, and is known in Sitka and other white settlements as *small-fish grease*.

Within a few years, and since the Indians have seen the "rockers" of the miners, they have introduced wooden boxes, with sheet-iron bottoms. These answer very well, and save time, labor, and trouble. About the same time a white man attempted the plan of extracting the grease by heating the fish in a basin floating in boiling water and then subjecting it to pressure, but the attempt proved a failure. Another plan attempted was to cold-press the fish, and for the purpose a powerful screw-press was erected, but that also proved a failure. My own impression is that the grease could be successfully extracted by steam, as is now done at the oil works at Skidgate, Queen Charlotte's Islands, in extracting oil from dog-fish livers. Still, there may be some chemical reason why the grease yields to incipient decomposition, which may suggest some preparation which can produce a similar result.

The ordinary price for the grease at Nass is twenty-five cents per gallon, but in seasons of scarcity the price advances from one dollar to one dollar and twenty-five cents per gallon, although the latter figure is seldom attained.

The Hudson's Bay Company salt a great quantity of these fish for export. They are simply put into casks or butts when first caught, and lightly salted. After remaining two or three days a brine is formed. They are washed in this brine, resalted, and packed in tight barrels, casks, or kits. For smoking, they are allowed to remain in brine a day or two, then strung on slender sticks, which are passed through the eyes, and hung in the smoke. When freshly smoked they have a bright golden appearance, much like red herrings, and are most delicious eating, but they are so excessively fat that they will not keep unless they are smoked quite dry. This is a tedious process, and turns the skin a dull dusty color.

There is a second run of Eulachon in Nass River towards the end of June, but the quality is inferior, and but little grease is made from them.

The Eulachon come suddenly in countless myriads into Nass River, and after spawning depart as suddenly. They evidently pass the remainder of the year in the deep water south of the Aleutian Islands, and make their appearance almost simultaneously in Cook's Inlet and Cross Sound, Alaska, where they are very abundant, and in Nass River. They make their appearance in Fraser's River a few weeks later, but are not as fat or as plentiful as they are farther north.

As a remedial agent, Eulachon oil is considered by some of the best authorities who have tested it as equal to cod-liver oil. Others who have tested its effects only among Indians are in doubt of its efficacy. But it should be borne in mind that the Indians of the coast, who live exclusively on a fish diet, and on the algæ and other products of the ocean, rich in iodine, bromine, and phosphates, are not so easily affected by cod-liver or Eulachon oil as white people who reside in the interior, and partake of the usual regimen of civilized life. Hence, some persons who have administered Eulachon oil to coast Indians have been surprised at the want of success, and have hastily condemned it as worthless. A diet of new milk, fresh from the cow, would undoubtedly prove as efficacious for the coast tribes as cod-liver or Eulachon oil is for white people.

The following is a copy of a report made by Theophilus Redwood, esq., F. R. S., professor of chemistry and pharmacy to the Pharmaceutical Society of London, to Messrs. Langley & Co., Victoria, British Columbia, who kindly furnished it to me for this paper. Professor Redwood writes:

“Eulachon oil, although differing in its source from cod-liver oil, is said to resemble it in its properties, and to have been substituted for it as a remedial agent. In examining the oil, therefore, it was considered important to determine in what points it resembles and where it differs from, cod-liver oil. In taste and smell I cannot indicate any marked difference. Its tendency to congeal is much greater than that of cod-liver oil. At 50° Fahr. the Eulachon oil has the consistency of soft butter, and it does not become fluid until heated above 70° Fahr. The

portion separated by filtration at 60° remains bright at all temperatures above that point, and has a very slight yellowish tint, resembling that of the best pale cod-liver oil. When a few drops of sulphuric acid are added to a small quantity of the oil, placed in a porcelain capsule, it assumes a deep brown tint, without in the first instance affording the violet color which is produced under similar circumstances by cod-liver oil. If, however, the mixture thus formed be allowed to remain exposed to the air for several hours the violet color becomes developed. If an ounce or two of the Eulachon oil be boiled with about twice its volume of distilled water, and the water after being carefully separated and filtered be evaporated to dryness, a small quantity of a brown extractive matter will be left, which closely resembles the extract obtained under similar circumstances from cod-liver oil.

“The Eulachon oil readily saponifies with caustic alkali, and the soap, after being decomposed with acetate of lead, yields oleate of lead to ether, but the oleic acid resulting from the decomposition of this is not brown like that obtained from cod-liver oil.

“Eulachon oil, therefore, although in some respects resembling cod-liver oil, differs from it in some of its chemical and physical characters. The resemblance to cod-liver oil is, however, greater than that of any other oil I am acquainted with that is not extracted from a fish liver.

“THEOPH. REDWOOD.”

It would have been interesting if Professor Redwood had given the exact analysis of Eulachon oil, as that of the cod liver has been fully given in various medical works. The student of medicine could have thus been able to have compared the two together, and have found what constitutes their medicinal value.

Professor Redwood says that the oleic acid resulting from the decomposition is not brown like that of the cod-liver oil. The brown color is owing to the presence of a peculiar substance obtained by an analysis of cod-liver oil by De Jough, and named by him *gaduin*, but it has not been ascertained that *gaduin* is in any way connected with the virtues of the oil.

It has been thought that the action of the liver carbonizes the oil in a manner and thus renders it more susceptible of being taken up and assimilated by the systems of persons to whom it is administered. It is not improbable that the biliary principles associated with the oil are concerned in its peculiar influences. Winckler has inferred from his researches that cod-liver oil is an organic whole, differing from all other fixed oils. Eulachon oil, although a body oil, instead of a product of the liver, seems to possess properties essentially different from all other fish-oils, and future analysis may show that the curative principle of cod-liver oil does not lay in any of the causes mentioned, but in some hitherto undeveloped principle, which is identical with that of the Eulachon. I find no mention of the Eulachon in the voyages of Portlock,

Dixon, Meaus, Marchard, or Vancouver, except that Means mentions them casually as *sardines*, and says the Indians are as fond of them and make quite as much account of them as they do of salmon. They are found in countless myriads in the waters of Alaska Territory, but hitherto no other use has been made of them in that Territory except as an article of food for the Indians.

If some of the canneries of Alaska would try the experiment and put them up in oil similar to sardines, I predict that a lucrative trade would result. No regular statistics of the Eulachon fishery have ever been kept either in British Columbia or Alaska, and the foregoing meager account of a very important food-fish is all that I have been able to procure.

DESCRIPTION OF TWO NEW SPECIES OF FISHES, ASCELICHTHYS RHODORUS AND SCYTALINA CERDALE, FROM NEAH BAY, WASHINGTON TERRITORY.

By DAVID S. JORDAN and CHARLES H. GILBERT.

Ascelichthys, genus nova.

Family of *Cottidae*. Body rather robust, covered with naked skin. Head comparatively broad and depressed, covered with naked skin. Preoperele with a simple, strongly hooked spine. Villiform teeth on jaws, vomer, and palatines. No slit behind fourth gill. Gill membranes broadly united, free from the isthmus. No ventral fins. Spinous dorsal of low flexible spines. Other fins normally developed. This genus has the general appearance of *Oligocottus*, but is distinguished at once from all the known genera of the family by the absence of the ventral fins; hence the generic name from *ασκελής*, without leg, and *ἰχθὺς*, fish.

Ascelichthys rhodorus, sp. nov.

Body rather plump, broad, and low anteriorly, nearly cylindrical mesially, becoming compressed behind. Head comparatively broad and low, ovate, regularly narrowed forward, and rounded anteriorly. Eyes rather large, placed high, separated by a slightly concave interorbital space, narrower than the eye. Mouth rather large, nearly horizontal, the maxillary extending to opposite the posterior border of the eye. Lower jaw slightly shorter than upper. Lips rather full, the upper jaw protractile. Teeth small, in villiform bands on jaws, vomer, and palatines. The palatine bands long and narrow. Pseudobranchæ large. Gill-rakers almost obsolete. No slit behind the fourth gill. Branchiostegals six. Gill-membranes broadly united, free from the isthmus. A low, fringed dermal flap above the posterior part of each eye. No other cirri anywhere, and no trace anywhere, on body or head, of dermal prickles or scales. No nasal spines. Nostrils both with short tubes, the anterior the longer.

Suborbital stay very slender, barely reaching the preoperele. Preoperele with a rather short simple spine, strongly hooked upwards and in-