

### III.—ON THE NORTH AMERICAN SPECIES OF SALMON AND TROUT.

BY GEORGE SUCKLEY, SURGEON, UNITED STATES ARMY.

(Written in 1861.)

---

NOTE.—The late Dr. Suckley made a special study for some years of the North American *Salmonidæ*, his attention having been specially called to them by the number of species met with in his journeys across the northern part of the United States to the Pacific coast while serving as naturalist to the Pacific Railroad Survey, under Governor Stevens, and while stationed as surgeon at Western military posts.

A report was prepared by him on this subject in 1859, forming part of the twelfth volume of the series of Pacific Railroad Reports, and was reproduced in a separate volume entitled "The Natural History of Washington Territory," by Dr. J. G. Cooper and himself.

After the return of the Northwestern Boundary Survey, in 1861, he was intrusted by the Commissioner, Mr. Archibald Campbell, with the preparation of a report on the *Salmonidæ* of Washington Territory, which he completed, although it was never published, and which Mr. Campbell, by permission of the State Department, kindly turned over to the Smithsonian Institution to dispose of as it might think proper.

At the request of the Smithsonian Institution, Dr. Suckley then enlarged this report by the addition of other species of North American *Salmonidæ*, thus making a second and much improved edition of his first memoir, embracing, as it did, the large amount of material belonging to the Institution, among the most important of which was that collected in the Hudson Bay territory by Mr. Kennicott and other correspondents.

This memoir was delivered to the Institution in July, 1861; and, although in the thirteen years which have elapsed, much change has taken place, in our knowledge of the subject, still, on account of the completeness of the paper, and the absence of anything more full on the subject, I here introduce it, by permission of the Secretary of the Smithsonian Institution, in its original form.

Whatever be its defects or redundancies, it will serve as an excellent basis for further investigation; and although it is probable that the actual number of species is less than that given by Dr. Suckley, who doubtless considered certain variations of age, sex, and season as species, it will be easier to reduce them to the proper number after the publication of this report.

S. F. BAIRD.

Although a great many divisions have been established for the species of the old Linnæan genus *Salmo*, for the purposes of the present report it will be sufficient to consider them all as one, only recognizing a separate section of *Oncorhynchus*, for the sea-salmon with permanently hooked bill. For convenience, however, we may arrange them as follows:

I. Anadromous salmon. Species running up into fresh water to spawn; the young remaining there for a greater or less time, then returning to the sea, in which they continue to abide, except during the period of reproduction. (Salmon.)

a. Intermaxillaries of the fresh-run adult male fish or those just from the sea, long, decurved, projecting and hooking downward considerably beyond the top or knob of the lower jaw; well armed with strong teeth; the extremity of the lower jaw terminating in a broadly dilated knob, similarly armed with strong, hooked teeth. (The subgenus *Oncorhynchus*, Suckley.)

1. *Salmo scouleri*, RICHARDSON.—Hook-nosed salmon; fall salmon, (Pacific coast.)
2. *Salmo proteus*, PALLAS.—Hump-backed salmon. (Alaska coast.)
3. *Salmo cooperi*, SUCKLEY.—Cooper's salmon. (Columbia River.)
4. *Salmo dermatinus*, RICHARDSON.—(Bering Sea.)
5. *Salmo consuetus*, RICHARDSON.—(Yukon River.)
6. *Salmo canis*, SUCKLEY.—Dog salmon; spotted salmon. (Puget Sound.)

b. Jaws of adult males when fresh-run, symmetrical, and either subequal or the point of the lower jaw received in a notch between the premaxillaries.

† Without red spots; not feeding in fresh water, except from caprice.

7. *Salmo salar*, LINNÆUS.—The common salmon. (North Atlantic.)
8. *Salmo quinnat*, RICHARDSON.—The California salmon. (west coast of the United States.)
9. *Salmo confluentus*, SUCKLEY.—Towatl salmon. (north-west coast.)
10. *Salmo aurora*, GIRARD.—Red-char; Salmon. (Columbia River.)
11. *Salmo argyreus*, GIRARD.—(West coast.)
12. *Salmo paucidens*, RICHARDSON.—Weak-toothed salmon. (Fraser River.)
13. *Salmo tsuppitch*, RICHARDSON.—White salmon. (Columbia River.)
14. *Salmo clarkii*, RICHARDSON.—Clark's salmon. (Columbia River.)

15. *Salmo immaculatus*, STORER.—The unspotted salmon. (Labrador.)  
 16. *Salmo gairdneri*, RICHARDSON.—Gairdner's salmon. (Columbia River.)  
 17. *Salmo truncatus*, SUCKLEY.—The short-tailed salmon. (Columbia River.)  
 18. *Salmo richardi*, SUCKLEY.—Richard's salmon. (Fraser River.)

† Spotted with red; feeding freely in fresh water.

19. *Salmo campbelli*, SUCKLEY.—Campbell's salmon. (Columbia River.)  
 20. *Salmo hudsonicus*, SUCKLEY.—Hudson's Bay trout.  
 21. *Salmo rossii*, RICHARDSON.—Ross' salmon. (Arctic Ocean; Boothia Felix.)  
 22. *Salmo hearnei*, RICHARDSON.—Coppermine salmon. (Coppermine River.)  
 23. *Salmo alipes*, RICHARDSON.—Long-finned Char. (Lakes of Boothia Felix.)  
 24. *Salmo nitidus*, RICHARDSON.—The angmalook. (Lakes of Boothia Felix.)

II. Species not anadromous, nor running up from the sea, but living entirely in fresh water or only occasionally passing down to the sea. (Trout.)

c. Spotted with red or black; found in flowing fresh water; feeding, spawning, and spending the greater part of the year in the same; retiring to deep, still water in the winter; access to salt water usually relished, but not indispensable.

† Red-spotted.

25. *Salmo fontinalis*, MITCHILL.—The American brook-trout. (Eastern States.)

†† Black-spotted.

26. *Salmo iridea*, GIBBONS.—Pacific brook-trout. (California streams.)  
 27. *Salmo masoni*, SUCKLEY.—Mason's trout. (Columbia River.)  
 28. *Salmo virginalis*, GIRARD.—Utah trout. (Southern Rocky Mountains, Utah; New Mexico.)  
 29. *Salmo lewisi*, GIRARD.—Missouri trout. (Rocky Mountain slopes north of South Pass.)  
 30. *Salmo brevicauda*, SUCKLEY.—Short-tailed trout. (Puget Sound waters.)

d. Trout found in deep rivers or lakes, ascending shallow streams to spawn.

## † Black-spotted.

31. *Salmo gibbsii*, SUCKLEY.—Columbia salmon trout. (Columbia River.)  
 32. *Salmo sebago*, GIRARD.—Sebago trout. (Sebago Lake, Maine.)  
 33. *Salmo kennerlyi*, SUCKLEY.—Kennerly's trout. (Chiloweyuck Lake; Fraser's River.)  
 34. *Salmo warreni*, SUCKLEY.—Warren's trout. (Fraser's River.)

## ‡ Red-spotted.

35. *Salmo bairdii*, SUCKLEY.—Baird's trout. (Clark's Fork of the Columbia.)  
 36. *Salmo parkii*, SUCKLEY.—Parker's River trout. (Kootenay River, Rocky Mountains.)  
 37. *Salmo oquassa*, GIRARD.—Blue-back trout; Oquassa. (Rangeley Lake, Maine.)  
 e. Lake trout, passing their lives in deep, fresh water lakes, approaching the shores annually to spawn in shallow water; never entering running brooks or repairing to the sea.  
 38. *Salmo namaycush*, PENNANT.—Mackinaw trout. (Great Lakes.)  
 39. *Salmo confluvis*, DEKAY.—Lake trout. (Lakes of New York.)  
 40. *Salmo siscowet*, AGASSIZ.—Siscowet. (Lake Superior.)  
 41. *Salmo symmetrica*, PRESCOTT.—Winnipiseogee trout.  
 42. *Salmo hoodii*, RICHARDSON.—Hood's salmon. (Lakes of Atlantic slope, north of Canada.)  
 43. *Salmo newberryi*, GIRARD.—Newberry's salmon. (Klamath River.)

## 1. SALMO SCOULERI, Richardson.

## SKOWITZ; HOOKED-NOSED SALMON; FALL SALMON.

- SYN.—*Salmo scouleri*, RICH. Faun. Bor. Amer. iii, 1836, pp. 158 and 223, Pl. 93; DEKAY, N. Y., Fauna iii, 1842; GIRARD, Gen. Rep. Fishes, p. 305; HERBERER, Fish and Fishing, &c., Suppl., p. 37, 1850; SUCKLEY, Nat. Hist. Washington Territory, p. 335.  
*Salar scouleri*, VALENC. in CUV. and VAL. Hist. Nat. Poiss. xxi, pp. 242, 345, 1848; STORER, Synops, p. 194, 1846; GRD. in Proc. Acad. Nat. Sc., Philad. viii, p. 217, 1856.  
 ? *Salmo consuetus*, RICH. Zool. Voy. Herald, Plate xxxiii, 1854.  
 ? *Salmo lycodon*, PALLAS, Zoogr. Ros. Asiat.  
*Oncorhynchus scouleri*, SUCKLEY, "Notices of a Species Salmon," &c., N. Y. June, 1861.

SP. CH.—*Male*.—Profile much arched, the convexity rising from nape to dorsal fin. The body at that point is thick, tapering from thence to

the caudal. Intermaxillary prolongation strongly decurved, and armed with large hooked teeth. Under jaw armed with a dilated and slightly incurved knob, similarly provided with strong teeth. The teeth on the sides of both jaws are strong, and very irregular in size or disposition, and extend almost to the angle of the commissure. Teeth on the vomer, present or absent, varying in this respect in different specimens. Caudal fin moderately lunated, the degree varying according to age.

*Colors.*—In recent specimens fresh from the sea we find a silvery luster; not, however, as strongly marked as in the *S. gairdneri*, *S. quinnat*, and other species. The ground-color of the back is lead-color or a silvery blue, and that of the belly white or yellowish white. The back and sides, dorsal fin, and tail are unspotted.

*Female.*—The fresh run females differ in having symmetrical jaws, destitute of elongated intermaxillary, or of the incurved knob on the lower jaw.

*DIAGNOSIS.*—The male may be known from all but the other hook-billed species by having the long decurved intermaxillaries and cartilaginous snout extending considerably beyond the point of the lower jaw; by its large irregular teeth on the maxillaries: From the *S. proteus* and *S. dermatinus*, by having less of a dorsal hump; by the marked lapping of the scales, and by having an unspotted caudal fin. The teeth along the maxillaries are also not awl-shaped and uniform as in *S. proteus*, being more frequently alternately large and small. They are also less numerous. The female may be recognized from those of most of the other species.

*HABITAT.*—Pacific coast; anadromous; enters fresh-water rivers in autumn.

Spec. 1129 Smiths. Coll. has a less number of rows of scales both above and below the lateral line, than has No. 1130. This may be owing to sex, or perhaps species. In many respects the fish agree very well. No. 1130, however, has the tongue and vomer toothless. May not this be the result of age? If not, and the fish prove to be distinct, which shall be considered new? or which *S. lycodon*, Pallas, *S. consuetus*, Rich., or *S. scouleri*, Rich?

It would be very easy to take up one of these specimens and impose a name upon it, and, ergo, an additional incubus upon the study of the family. But I refrain. A few years will probably bring us plenty of specimens from the waters of the North Pacific, on both sides. Then, and not till then, can the synonymy of the hooked-snout, big-toothed, and round-backed species be properly determined. This is an exceedingly abundant species on the northwest coast, and affords the principal salmon harvest to the Indians, who dry vast numbers for winter use. It usually commences to run up the streams which empty into Puget Sound about the first week in September, and continues to arrive until near Christmas. During the months of January, February, and March, they are found abundantly in small shallow brooks and streams tributary to the larger

rivers. At this late period they are much emaciated, owing to their exhaustion from breeding and from months of abstinence, they being said not to eat after entering fresh water; and their flesh, when cooked, is rank and ill-flavored. During the month of April they suddenly disappear, probably returning by the spring floods to salt water, although the Indians say that but few return to the sea. The flesh of this fish, when fresh from salt water, the individual being fat and in good condition, is of a very pale yellowish "salmon" color. This color soon changes to a pinkish-yellow, and, when the fish is worn out, to yellowish-white.

The males of this species have the hooked snout while still in salt water and in good condition. In this difference of the jaws in the sexes they agree with the *S. hamatus* of Lapland, which, according to the author of the "Lachesis Lapponica," has the hooking of the lower jaw confined to the male sex. (See quotation in Rich. F. B. A.)

The female *skowitz* when fresh run has symmetrical jaws. The snout becomes slightly decurved when they are much emaciated, and is simply owing to the absorption of the fatty cushions along the intermaxillaries, and therefore more apparent than real.

The *skowitz* runs in immense shoals up the rivers emptying into Puget Sound. Fisheries have been established in certain localities, and as many as 3,000 fish taken in one haul of the seine.

Since writing the report for the Pacific Railroad survey, so frequently alluded to in this monograph, I have been further convinced that Dr. Gairdner, whose notes are quoted by Sir John Richardson, confounded the *Salmo proteus* and the present species, and recorded notes, part of which apply to one and part to the other. The flesh of this fish, although inferior to *S. quinnat*, *S. gairdneri*, and *S. truncatus*, is far better than of the other autumnal kinds. Being of a convenient size, they are rather preferred for packing in salt.

After entering the Columbia the *skowitz* ascends the current of the main river and its tributaries to points fully seven hundred miles by water from the sea.

The Indians say that many individuals return to the sea. According to the natives at Fraser River, the present fish after entering salt water changes color in a very uniform manner, the males turning red, the females black. It, as well as *S. canis*, enters Chiloweyuck Lake.

On the 4th of October, 1859, George Gibbs, esq., obtained from the Okanagon River, Washington Territory, a female of this species, (No. 2007 Smith. Collect.,) which he says is the kind known to the Indians of that region as the *ka-shoo*, (*ke-as-soo*, or *ka-ka-soo*, McDonald.) (See chap. on Salmonidæ, Cooper & Suckley, Nat. Hist. Washington Territory.) According to Mr. Gibbs, the length of his specimen was 27 inches; head, 5.75; lateral line, 18; distance from snout to ventrals, 13.50; to dorsal, 10.60; to adipose, 18.75; to anal, 17.75; meat, red; eggs, orange; size of beaver, short. It had just arrived in the river.

The species was not yet quite ready to spawn, and does not do so till after the *ta-ah-nia*, (*S. cooperi*.) A specimen in Dr. Kennerly's collection appears to be that of a female of this species, taken from the salt water when in prime condition. It was obtained at New Duugeness, Straits of Fuca, in August, 1857, and was called by the Indians of that locality the *kutsh-kuss*, the name they are known to apply to the *S. scouleri*. There is nothing remarkable about the specimen except its bright silvery appearance, which, however, the species always has while yet in the salt water. It has also 14 to 15 branchiostegals, one more than is usual. In a paper entitled "Notices of certain New Species of North American Salmonidæ," published by the writer in June, 1861, I proposed a distinct sub-genus for the group of salmon embracing this species, the *S. scouleri*, *S. proteus*, and *S. cooperi*, in which the adult males have the premaxillaries considerably elongated, and the tip decurved, extending considerably beyond the extremity of the lower jaws where there exists a knob at the extremities more or less broad, and heavily armed with strong curved teeth, as are the premaxillaries above.

The type of this sub-genus (which I designate as *Oncorhynchus*) is the *Salmo scouleri* of Richardson. If my separation of this group from the other salmon is considered as based on sufficiently good anatomical differences, the species above mentioned will hereafter be known as *Oncorhynchus scouleri*, *Oncorhynchus cooperi*, *Oncorhynchus proteus*, *Oncorhynchus dermatinus*, *Oncorhynchus consuetus*, and *Oncorhynchus canis*.

In the latter species the projection of the intermaxillaries beyond the lower jaw is not so strongly marked, but the broad knob and the heavy armature of strong teeth on both that and the premaxillaries exist.

## 2. SALMO PROTEUS, Pallas. .

### HUMP-BACKED SALMON.

Specimen in Smithsonian collection Fishes, No. 1132.

SYN.—*Salmo proteus*, PALLAS, Zoog. Ros. Asiat. iii, p. 376; VALENC. in CUV. and VALENC. Hist. Nat. Poissons, xxi, p. 360, 1848; SUCKLEY, Nat. Hist. Wash. Territory, p. 339, 1859; *Ibid.*, P. R. R. Repts., vol. xii.

*Salmo gibber*, SUCKLEY, Ann. N. Y. Lyceum Nat. Hist., Dec., 1858.

*Salmo dermatinus*, RICH., Voy. of Herald, 1854.

*Oncorhynchus proteus*, SUCKLEY, Notices of Certain New Species of Salmon. N. Y., June, 1861.

*Gorbuscha* of Kamtschatka; *Hunnun* of the Lummies; *Huddoh* of the Nisquallies.

SP. CH.—*Male*.—Dorsal profile much more arched than in *S. scouleri*, Rich. After entering fresh water, an adipose hump becomes strikingly apparent, its greatest prominence being nearly opposite a point midway on a line drawn from the eye to the anterior margin of the base of the dorsal fin; intermaxillary projection curved strongly downward, as in *S. scouleri*; jaws long, as in latter, the latter terminated by a dilated knob, (as in several other species of the genus,) which is armed with four

or five strong, sharp teeth on each side; labials and limbs of the lower jaw closely set with very fine, sharp teeth, finer and more numerous than those of the *S. scouleri*; vomerine and palatine teeth much larger than those of the labials; those of the vomer disposed in a single row on its anterior portion; tail rather strongly lunated, and profusely dotted with large, elongated, oval, dark spots; the other fins usually unspotted, adipose rather elongated; scales much smaller than those of the *S. scouleri* and very thin. They are imbedded in the skin and do not lap over, and in many parts of the body do not even touch each other; those of the back are much smaller than those below the lateral line. Skin very thick.

HAB.—The Northern Pacific coasts of Asiatic Russia and America; Puget Sound. Said not to enter the Columbia or to be seen south of the Straits of Fuca.

DIAGNOSIS.—The present species may be distinguished from the *S. scouleri* by its smaller size, the prominent hump in the males, its smaller scales, spotted tail, and the fine regular teeth along the sides of the jaws. The teeth of the *S. scouleri* are scattered irregularly, and are generally large, but by no means uniform in size along the sides of the maxillaries. The female is shaped much like a shad. The spots on the caudal of specimen 1132 are larger in proportion than those found on the tail of any salmon of which examples from the northwest coast are contained in the Smithsonian collection. But two hump-backed salmon have thus far been received from the northwest coast, both obtained by Dr. Kennerly, and both described in Vol. X, Pacific Railroad Reports. The condition of the skins before us does not well admit of a satisfactory demonstration whether the smaller scales along the abdomen and near the tail do not overlap each other; but the fact that they do not even touch each other on the back and sides is apparent. It is very probable that the salmon described by Richardson, (and included in the present monograph,) *S. dermatinus*, is identical with the *Proteus*. (See *S. DERMATINUS*.)

One of Dr. Kennerly's specimens has a smooth, toothless tongue; the other, a female, has a single tooth thereon. The colors of this species, like those of all anadromous salmon, become greatly changed after entrance into fresh water. Those of the male sent by Dr. Kennerly had "the head greenish-yellow, clouded with black; opercula, dull pinkish; upper parts, dirty grayish and yellow; ventrals and pectorals, grass-green; dorsal, ultramarine and green; tail, blotched with black."

There are two specimens of the true hump-backed salmon of the north-western coast in the Smithsonian collection. The writer described them as new, under the name of *Salmo gibber*, in the annals of the New York Lyceum, December, 1858; but upon further examination, and a careful comparison with Pallas's description of *Salmo proteus*, he became convinced that it refers to the same fish. Upon comparing the same specimens with Richardson's account of *S. dermatinus*, a similar identity of



resemblance is manifest. The Smithsonian specimens 1132, 1133, (male and female,) are described as *S. proteus*. The male agrees remarkably with Richardson's figure. The tongue is smooth; tail of the same shape; fin membranes very thick; skin ditto; scales very small and imbedded in the skin; except on the abdomen, perhaps; they do not lap or even touch each other. No. 1132 has been drawn and figured for the present work. The hump seems greater than in the *S. dermatinus*.

The female has a single tooth on the tongue. May not the toothless tongue be a mark of old age?

For the present it is thought best to retain the species under Richardson's name, and wait for more specimens of salmon, not only from Arctic America and the vicinity of Vancouver's Island, but also from Kamtschatka, before deciding the question of names and synonyms.

The average weight of the fish is about 5 or 6 pounds. Its flesh is pale, and for a white man, it is poor eating. The Indians say that this salmon is usually quite fat, and that as food they like it very much. They state that it enters Puget Sound and the rivers on alternate years, it being very rare for even a single individual to be caught in the intermediate season. The run of the *huddoh* in its regular years is large, coming in vast numbers, comparing favorably in this respect with the *satsup*, *skowitz*, or *h-hwahai*. According to the natives of our coast, the *hunch-back* never returns to the sea after spawning, but dies in fresh water. In this respect they again agree with the Kamtschatka fish.

In our opinion this is undoubtedly the *gorbuscha* of Kamtschatka, mentioned by Pallas and referred to by Sir John Richardson.

The *hump-back* enters the rivers about Puget Sound in August of alternate years. It is thought that it does not visit the Columbia River. The hump of the male is said to be caused by a thick layer of adipose matter.

For additional facts and extended quotations the reader is referred to the Pacific Railroad Reports, vol. xii, p. 339.

### 3. SALMO COOPERI, Suckley.

#### COOPER'S SALMON; THE TA-AH-NIA.

SYN.—*Salmo cooperi*, SUCKLEY, Notices N. S. N. Am. Salm. N. Y., June, 1861.

*Oncorhynchus cooperi*, SUCKLEY, op. cit.

The *Ta-ah-nia* of the Okina Kanes.

SP. CH.—*Male*.—Head enters nearly four and one-quarter times in the total length. Back much arched, having a tendency to hump. Scales rather coarse and large. Skin thick and strong. Tail deeply lunate; profusely sprinkled with oval spots of black. Snout (premaxillaries) somewhat elongated. Dental development much like that of *S. proteus*, Pal., but the fish differs in lacking the exaggerated hump, and in the lapping of the scales on the body. The adults rarely exceed 22 inches.

*Female*.—Of similar size; mouth symmetrical; back less arched; teeth

developed much as in the female *S. scouleri*. In both sexes there are usually thirteen branchiostegal rays on a side.

DIAGNOSIS.—From *S. proteus*, Pal., by the comparatively small hump, by its smaller size, and by its proportionately larger scales. From the *S. scouleri* it may be known by its smaller size, spotted tail, and small uniform teeth along the bodies of the maxillaries.

HAB.—Anadromous, ascending the Columbia in autumn. Found exceedingly abundant in Okina-kane River, where it is known to the whites as the "little red salmon," and to the natives as the *ta-ah-nia*.

This species, which we have named after Doctor James G. Cooper, who has spent much time investigating the natural history and physical geography of Washington Territory, was obtained by George Gibbs, esq., at the Okina-kane.

*S. cooperi*. Two specimens (typical) were obtained by Mr. Gibbs.

Okina-kane River, September 30, 1860. This fish is now drawing to its spawning season. It frequents this river and the lakes above in immense numbers, its peculiar color actually reddening the bed of the river.

"MEASUREMENTS.—*Male*. Length, 21.75 inches; head, 5; to dorsal fin, 10; to ventral, 10.50; to anal, 14; to adipose, 16. Upper line of head very concave; iris, yellow; body, brick-red; near the tail, scarlet; caudal brown, profusely speckled with black. *Female*. Length, 22 inches; head, 4.50; to dorsal, 10; to ventral, 11; to anal, 14.75; to adipose, 16.75.

"*Colors*.—Head, light greenish; back, brick-red, inclining to purple; belly, dirty, yellowish gray; caudal, speckled; upper line of the head convex—the reverse of that of the male; eggs red and of the size of swan-shot; caudal but slightly lunated.

"The fish measured above appear to be about the average size of adults."

#### 4. SALMO DERMATINUS, Richardson.

SYS.—*Salmo dermatinus*, RICH. Zool. of the Voyage of the Herald, p. 169. Pl. xxxiii. London, 1854.

? *Salmo proteus*, RICH.

? *Salmo gibber*, SUCKLEY, Annals N. Y. Lyceum.

*Oncorhynchus dermatinus*, SUCKLEY, "Notices of Certain New Species of the Salmonidæ," &c. N. Y., June, 1861.

SP. CH.—(Condensed from Richardson's description.) Tongue, toothless; seven or eight teeth on each premaxillary, unequal; one or two at the tip larger than the others, recurved. Maxillary armed with 18 to 21 acute subulate teeth, the first being stoutest, third and fifth next in size. Dilated knob on end of lower jaw, armed with strong teeth. This meeting the incurved snout (in males only ?) prevents the closing of the mouth. Scales do not overlap each other, but are imbedded in a thick

muciferous epidermis, and do not even touch each other. Branchiostegals 14 to 15. Tail strongly cut out.

HAB.—Ascends the rivers emptying into Behring's Sea. A single specimen of this salmon, about 32.4 inches in total length, was obtained by Sir John Richardson from the Yukon River in Arctic America. It is there known to the fur hunters as the *red fish*. Sir John says it is very distinct from any of the European anadromous salmon. It is called by the Kutchin tribe *tleukh-ko*. They take it by weirs constructed between island and island, and by spearing. The flesh and roe are dried for winter use, and the tough skins are made into clothing. (Vide Richardson, op. cit.)

### 5. SALMO CONSUETUS, Richardson.

SYN.—*Salmo consuetus*, RICH., Voyage of the Herald, London, 1854, p. 167, Plate xxxiii.

? *Salmo collaris*, PALLAS, Zoogr. Ross. As.

? *Salmo lycodon*, PALLAS, op. cit.

? *Salmo scouleri*, RICH. Faun. Boreal. Am., pp. 158 and 223, pl. 93.

*Oncorhynchus consuetus*, SUCKLEY, "Notices of N. S. Salm.," N. Y., June, 1861.

SP. CH.—Drawn from Richardson's description and probably applicable to an exhausted or emaciated male. General form that of *S. salar* when out of season, but smaller. Head disproportionately large; jaws distorted. Length of head (when measured from tip of snout to distal margin of operculum) contained four and two-third times in the total length of the fish. Cartilaginous snout decurved and extending considerably beyond the mandibles. Five or six rather large teeth on each premaxillary. Scales smaller than those of *S. salar*, but resemble them in delicacy of luster, and the ease with which they can be detached. Tongue armed with two parallel rows of teeth, six on each side. Dorsal outline strongly arched. Tail lunated.

HAB. 7.—Yukon River, Arctic America; ascends as high as the falls of the Poreupine.

Sir John Richardson drew his description from a male about 23.5 inches in total length. In this the scales in size compared to those of *S. salar* were smaller, as 12 or 13 to 10 on patches of skin of equal size; 140 scales on lateral line. Fin membranes quite thick. Rays Br. 12-13; D. 11-0; A. 15; C.  $1\frac{1}{8}$ ; P. 14 or 15; V. 9-9, or 10-10.

### 6. SALMO CANIS, Suckley.

DOG SALMON; SPOTTED SALMON; LE KAI.

SYN.—*Salmo canis*, SUCKLEY, Annals N. Y. Lyceum, Dec., 1858; *IBID.* Pacific R. R. Reports, vol. xii, part Fishes, p. 341. [The sp. ch. given in vol. xii., P. R. R. Reports and in the original description were written from memory. Luck-

ily since then Dr. Kennerly has sent home a fine skin and one or more heads;] *IBID.* Nat. Hist. Wash. Terr., chap. on Salmonidæ.

*Oncorhynchus canis*, SUCKLEY, Notices of Certain New Species N. A. Salmonidæ. N. Y., June 15, 1861.

**SP. CH.**—Head large; contained about  $4\frac{1}{2}$  times in the total length; its dorsal outline nearly straight; a dilated knob on the extremity of lower jaw, upon which there are usually at least three large curved teeth, the anterior being the largest. Large curved teeth on the premaxillary; arms of the jaws studded with small teeth of nearly uniform size and appearance. Tongue, with a diverging row of four teeth on each side. Nostrils large and pyriform. Free margin of opercula rounded much as in *S. salar*; average number of branchiostegals, 13. Skin thick, fleshy; fin membranes ditto. Scales quite adherent and over-lapping each other about one-third. General form of body, compressed laterally, causing it to be a rather deep fish for its size and weight; dorsal outline only moderately arched; caudal insertion rather deep, caudal furcate.

**Colors.**—Skin unspotted (*i. e.*, without speckles) but blotched on the sides (especially after being a few days in fresh water) with large patches of dingy-green and purplish-red. Fins and tail unspotted.

**DIAGNOSIS.**—The *Salmo canis* is known from the *S. scouleri* by the greater equality of its jaws; by its shorter intermaxillaries; by the short, small, pointed, nearly uniform awl-like teeth on the bodies of the inferior maxillaries. From the humped species it can readily be recognized. Like the *S. scouleri* it has an unspotted tail.

**HAB.**—Northwestern coast of America; enters the streams along Puget Sound in great numbers in autumn.

The mouth of the female, as is usual with this group or subgenus of salmon, is much more symmetrical than that of the male.

The dried skin of a female salmon was obtained by Mr. George Gibbs at New Dungeness, Straits of Fuca, August 12, 1857. It is now catalogued in the Smithsonian Museum as No. 1123. At first we took the specimen to be a female *S. scouleri*, but more careful examination showed our error. It more nearly approaches the *S. canis* and is probably the female.

Mr. Gibbs says it was known to the Klallams as the *ket-hlehts*. In the alcoholic specimen before me, the adipose fin is much elongated; its anterior (or upper) margin much curved. The jaws are about equal in length, but owing to the long teeth anteriorly they could not be made to close tightly—the nearest approach to perfect closure being when the under jaw was diverted to the right or left of its true line, like a pair of tongs, in which the extremities pass each other owing to a defect in the joint.

There are also two teeth felt near the middle of the vomer, one before the other. The jaws nearly equal in length, the lower being barely received in the upper.

The following quotation from our former report contains all the information recorded concerning the habits of the fish:

"The *spotted* or *le kai* salmon enters the rivers of Puget Sound in great numbers every autumn, generally appearing between September 15 and October 10. They come in vast numbers, and arrive so simultaneously as to seem to be in shoals, though, probably, that is occasioned, not by a gregarious habit, but by the same instinct causing all the individuals to leave the sea at about the same period for the purpose of procreation. They are not a finely flavored fish, even when "fresh run," many individuals being at that time in bad condition—a condition unusual among salmon just quitting salt water. After a short residence in fresh water, all become poor and unsavory, and some even intolerably rank. Upon first arrival the sickly fish are readily distinguished by the natives by their colors, the best fish being of a leaden-olive or dingy-green on the back, and a yellowish-white along the belly. The poor ones are of various shades and tints of dingy-green and yellow, more or less maculated on the sides with purplish and black blotches. They enter by preference the smaller streams. Owing to the large jaws and long ferocious-looking teeth of the species, they have obtained from the whites the name of dog-salmon. Vast numbers are taken by the Indians with spears, gaff-hooks, weirs, &c., and dried for winter use. Upon their arrival in September and October their roes are nearly mature. It is interesting to witness their persevering efforts to run up shallows, and in overcoming insurmountable obstacles, even running out of water upon the shores in their blind eagerness to surmount impossibilities and reach the head-waters of the stream to deposit their spawn. In endeavoring to ascend high falls, and in passing through rocky, violent passages, their snouts and bodies become much bruised and injured, giving rise to sores and ulcerations. The fins become much worn, also. The impoverished fish have hooked snouts and pale whitish flesh. At no time is it seen with the bright salmon-red flesh common to other kinds; but on the first arrival, when in good order, they are found with flesh which, when cooked, has a pinkish-buff color, and is not, in my estimation, bad. Like several other species of salmon, they are very regular in the periodical arrivals at the mouths of the rivers. In 1856 they arrived in the vicinity of Fort Steilacoom on the 3d of October, and by the 7th were in such vast numbers that a small boy with a pole armed with a gaff-hook could readily take one or two hundred pounds weight in an hour."

The Indians say that, although this species enters the rivers later than the *S. scouleri*, it returns earlier, staying a shorter time away from the sea. They say, also, that most of the individuals return to the sea after spawning, many more comparatively than do of the *S. scouleri*. They say that all individuals of the *S. proteus* die. The dog-salmon is preferred by the Indians for drying, as it has but little fat. It is found sparingly in the Straits of Fuca and the entrance of Puget Sound as early as August 10.

## 7. SALMO SALAR, Linnæus.

## COMMON SALMON OF EUROPE.

We are by no means satisfied that this European species exists on the American coast, although Dr. Storer, De Kay and others have so written. Herbert, quoting Mr. Perley, says that the *Salmo trutta*, Flem., of Europe, is also found, and it has been stated that the *S. hamatus*, Cuv., occurs. Most probably these species are, if ever found, only met with as accidental individuals; and those fish taken after cursory examination to be identical with the European are really of distinct species, analogous to or the counterparts of their relatives on the other side.

The description of *Salmo salar*, contained in Storer's synopsis, is so meager that it is useless for purposes of identification. Those of other authors are exceedingly contradictory. Jenyns, in his "Manual of British Vertebrate Animals," gives the following character as pertaining to the species: "Form, oval; moderately elongated, with the head and back in nearly the same line; the greatest depth a little before the dorsal; contained about five times and a half in the entire length, increasing, however, with age; thickness, half the depth, head small, about one-sixth of the entire length; snout rather sharp; jaws in young fish nearly equal, but in old males the lower one longest and curving upward in a hook. A row of sharp teeth along both sides of each jaw as well as on the palatines; but those on the vomer confined to its anterior extremity, and in some specimens rather obsolete.

"The only specimen in the Smithsonian collection, obtained from the American coast, which closely approaches the *S. salar* of Europe, is the head of a salmon supposed to have been brought from Maine, having been purchased in the Washington market. In certain respects the fish undoubtedly approaches the European species, if we may be allowed to judge by the head alone. Compared to the specimen sent from the Swedish Academy, and labelled *S. salar*, (of the correctness of which name we have, however, strong doubts,) we find the head comparatively much wider between the eyes, and posteriorly, in the Maine specimen. The taper of the snout and lower jaw is more rapid; their extremities sharper; teeth more irregular in size, and the angle of the mouth but little behind a line drawn vertically from midway between the eye and nostril; whereas in the European specimen the angle, when the jaw is moderately drawn down, is found just beneath the pupil. The shape of the pre-opercula also differ; that of the Maine fish having its posterior border nearly vertical, and not, as in the European specimen, arching almost parallel with the semicircular curve of the operculum.

"In addition, the vomer of the American fish has no teeth upon its shaft, and but two on its anterior extremity, in this respect agreeing with Jenyns's description of *S. salar*, but differing from the Swedish specimens, which have two rows of teeth upon the shaft of that bone."

The Swedish specimen (102, adult) shows scattered dark spots along the sides, and numerous small, round dark spots on the opercles and pre-opercula. Tail unspotted.

## 8. SALMO QUINNAT, Richardson.

### QUINNAT.

SYN.—*Salmo quinnat*, RICH. F. B. A. iii, 1836, p. 219; DE KAY, N. Y. Fauna, iv, 1842, p. 242; STORER, Synopsis, 1846, p. 196; HERBERT, Supplement to Frank Forrester's Fish and Fishing, &c., 1850, p. 31; GRD. in Proc. A. N. Sc. Phil., viii, 1856, p. 217; *IBID.* Pacific R. R. Reports, vol. vi; *IBID.* Gen. Rep. Fishes, p. 306; SUCKLEY, P. R. R. Rept., vol. xii, Part 2, p. 321; *IBID.* N. H. Wash. Tert. &c., p. 321.

*Common Salmon*, Lewis and Clarke.

Figures.—A young fish, called by this name, and probably belonging to the species, has been figured under Dr. Girard's supervision, and appears in the volume on the fishes collected by the United States Pacific Railroad surveying parties, Plate lxvii.

SP. CH.—*Adult*.—Head pointed and large, forming about a fourth of the length from the snout to the end of the scales on the caudal. Dorsal outline regularly arched. Caudal deeply cut out, (in the dried specimen forked,) snout cartilaginous, as in *S. salar*. Chin pointed, a triangular bare projection extending beyond the teeth.

“General tint of the back bluish gray, changing after a few hours' removal from the water, into mountain green; sides ash-gray, with silvery luster; belly white; back above the lateral line studded with irregular rhomboidal or star-like black spots, some of them ocellated. Dorsal fin and gill-cover slightly reddish; tips of the anal and pectorals blackish gray; the dorsal and caudal thickly studded with round and rhomboidal spots; back of the head sparingly marked with the same. Whole body below the lateral line, with the under fins, destitute of spots.” (Gairdner in Rich., F. B. A. Fishes, 220.) Scales large. Branchiostegal rays varying from 16 to 20.

*Young?*—“Body fusiform in profile; compressed; head forming about the fifth of the total length; maxillary bone curved, extending beyond the orbit; anterior margin of the dorsal equi-distant between the extremity of the snout and the insertion of the caudal; dorsal region olivaceous, studded with irregular black spots; dorsal and caudal fins similarly spotted. Region beneath the lateral line unicolor, silvery along the middle of the flanks, and yellowish on the belly; inferior fins unicolor; head above blackish-gray; sides bluish-gray.”—Girard.

Based on a specimen, No. 939, Smithsonian collection.

HAB.—Pacific coast of North America, from San Francisco northward; entering the larger rivers in great numbers annually.

This being the most important salmon, both in excellence and numbers, found in the western waters, I have taken the liberty of reproducing a portion of the remarks on the species which were embodied in the report

on this family furnished by the writer for the twelfth volume Pacific Railroad Reports :

In shape, and in many other particulars, this fish agrees with the description given in Pallas, Zoog. Ross. Asiat. of the *S. orientalis*, and, as quoted by Brevoort in notes on some figures of Japanese fish, like it, reaches a weight of sixty pounds; ascending the larger rivers only in the months of April, May, and June; in having fleshy lips, and in gastronomic excellence. It also has a large pointed head, with very similar jaws. It differs from Mr. Brevoort's figure in having the tail much more deeply cut out—almost forked—and in having spots on the back and head. It also but seldom attains the large size given above, the average being usually about twenty-five pounds. Valenciennes says that the *S. orientalis* has numerous crescent-shaped spots above the lateral line. This remark is based on a drawing, taken by Mertens, of a female. (See Brevoort's work above quoted, p. 23.) The *S. quinnat*, according to Gairdner, has the spots differently shaped.

In a memorandum furnished me by George Gibbs, esq., he says that in a visit to Chinook, near the mouth of the Columbia, he saw "the true spring salmon of the Columbia. Speckled on back, fins, and tail, with half-moon spots. Tail in large specimens not always spotted. Tail forked." The *S. quinnat* is designated by Lewis and Clarke as the "common salmon" of the Columbia. It was first scientifically described by Sir John Richardson from specimens and notes obtained from Dr. Gairdner, who was then (about the year 1835) living at the trading-post of the honorable Hudson Bay Company, situated on the right bank of the Columbia, nearly opposite the mouth of the Willamette River, about one hundred miles from the ocean, then and still known as Fort Vancouver. While stationed as surgeon at that important point, Dr. Gairdner, in a most praiseworthy manner, busied himself actively in studying the natural history of the region; and in connection with the labors of Tolleme, Townsend, Nuttall, and Douglass in the field, and of Richardson, Hooker, Audubon, and Bachman in the study, presented to the public almost all that was known to naturalists of that remote portion of the world up to the period when the late scientific explorations were undertaken under the auspices of our Government.

This salmon is, perhaps, the finest of all that enter the rivers and inlets of our Pacific possessions. The adults are readily recognized by the settlers from their great size and their large deeply-forked tails. When fresh from the sea they are in superb condition for the table, equal, in our estimation, to the best English or Scotch salmon.

The color of the flesh is of the richest "salmon-red." The general external appearance of the fish presents very bright silvery reflections. They first arrive in the Columbia River during the month of April—the periodical advents usually varying but a few days.

Lewis and Clarke speak of their first arrival at the Skilloot village, below the site of Fort Vancouver, on the 18th of April, 1806, and at the Dalles (two hundred miles above the mouth of the Columbia) in the year



1807, on the 19th of April. Major G. I. Rains, United States Army, noticed them at the latter place in 1854, on the 28th of April, and I myself saw the first of the season in 1855, April 11. George Gibbs, esq., in mss. notes informs me that in 1853 the same species were "in season" at the mouth of the Columbia on the 20th of April.

The *quinnat*, in an economical point of view, is by far the most valuable salmon of any species found in Oregon. The extreme richness and delicacy of its flesh cause it to be much preferred for salting, and were it not for the hitherto high prices of labor, barrels, and salt, it would have, ere this, been found a staple article of export from the Columbia. In numbers they seem to be inexhaustible, and are readily taken in nets and otherwise. During the "season" they are so abundantly taken at the rapids near Dalles that, notwithstanding the high rates at which most articles of domestic consumption are sold, I have frequently purchased noble specimens of this fish, weighing twenty pounds or more, each, for the small price of a quarter of a dollar. The Indians on the Columbia take immense numbers, eating what they need while fresh, and drying thousands for winter consumption or for trade. The principal method of capture employed at the Dalles is by "scooping" at random in the rapid water as it passes a projecting rock along the banks of the stream. The salmon, keeping close to the shore, in order to avoid the force of the current, take advantage of "shore eddies" in their ascent. The Indian selects a proper location, generally by a projecting rock, upon which he builds a platform, and with a "scoop-net" about four feet in diameter, attached to a long pole, rapidly sweeps the water below. The net passing down with the current, and immersed four or five feet below the surface, is alternately dipped and drawn up, again to be plunged in the boiling waters above. During the height of the season it is not uncommon for a single man thus to take twenty or thirty fish in an hour. The time chosen is usually during the long twilight of the evening or early morning. Whether this is because the fish do not "run" during the bright hours of the day, or because they, seeing better, avoid the net, I am in doubt.

For subsequent consumption the salmon are split open and the entrails and back-bone taken out; they are then hung up in the lodges to dry in the smoke. When perfectly dry they are packed in bundles and kept in baskets or mats, and in some places, as along the river from Walla-Walla to Fort Colville, large stores are placed on platforms raised on poles some twelve or fifteen feet from the ground. This is to protect them from the ravages of the wolves. To guard against rain and the plundering propensities of crows, magpies, and ravens, they are covered with mats or strips of bark, and occasionally with rough-hewn boards. No salt is used by the savages in preparing the fish; nevertheless, the food thus preserved keeps in good order for several years.

Four undoubted specimens of the *S. quinnat*\* are in the Smithsonian

\* A much fuller collection in the present day.

collection, two of which were sent by Mr. James Wayne, of Astoria, Oregon. A fifth specimen, obtained by the writer from Puget Sound, is the skin of a young fish, labeled by Dr. Girard *S. argyreus*. Although immature, it resembles more the present species than any other I have been able to compare it with. In an appendix to the private edition of the report above quoted (published under the title of Natural History of Washington Territory) the following additional information concerning this species was included:

"The *Salmo quinnat*, Rich., (see page 321,) we have ascertained by careful examination to be the principal species brought to the San Francisco markets. It was found abundant there during the months of January and February, and could easily be recognized by its large head and pointed jaws, and by the number of its branchial rays, which are usually over fifteen in number. The tail is large, and well cut out, and the lower fins unspotted. We heard of two specimens which had been brought to the market that weighed sixty-four and a half pounds each. These were the largest that we have known of in that locality, but fish of seventy pounds, it is said, have been caught farther north. This must be about the maximum weight to which it ever attains.

"The *quinnat* salmon is obtained for the San Francisco market by fishermen in the Sacramento River, who take them with gill-nets, much in the same way as shad are caught in the Hudson.

"The fishmongers to whom the question was put, whether any peculiarities in external appearance serve to distinguish the sexes, answered that they knew of none. The same species of salmon was found, about the 1st of December, abundant in the bay at Port Townsend, and at Port Gamble, Puget Sound. The Indians took them in moderate quantities, by trolling in the manner described on page 329. These salmon were not running up the rivers, not yet impelled by instinct so to do, as their ova thus early in the season were but very slightly developed.

"In the San Francisco market we also noticed a small salmon, more spotted, with smaller head and more rounded jaws than the *quinnat*—in fact, much more nearly resembling the *S. gairdneri* or the *S. truttaceus*. This kind is called by the dealers salmon-trout. It does not appear to attain a very large size, rarely exceeding 28 inches, and is for its real or supposed excellence sold for a much greater price than the *Quinnat*."

Mr. George Gibbs states that the Skagit Indians believe that the *youmutsh* salmon die after spawning. The largest he saw weighed forty pounds, and were about three feet in length. They become worn out by July or August. The Simiahmoo Indians, speaking another dialect, say that the *kwitshia* (*S. quinnat*?) alone bite at the hook. We have seen many of the *S. quinnat* taken with hook and line at Port Townsend.

Mr. Gibbs in his notes describes the manner the Lummi Indians take salmon in salt water by a net about 15 feet square, dipped several feet under water at the front end, but kept stretched between two canoes,

the hind part of the net being lifted a little above the surface. The canoes are propelled gently along, and when salmon are felt the net is raised like a dip-net, and thus the fish are captured. They occasionally in this way will capture fifty salmon at one "lift."

### 9. SALMO CONFLUENTUS, Suckley.

#### TOWALT SALMON.

Typical specimen in Smithsonian collection Fishes, No. 1135.

SYN.—*Salmo confluentus*, SUCKLEY, Ann. N. Y. Lyc., December, 1858; *IBID*, P. R. R. Rep., vol. xii., pt. 2, 1839.

*Towalt* of the Nisquallies.

SP. CII.—*Male*.—Form, stout; dorsal outline rising to a point just anterior to dorsal fin, then rapidly tapering to tail; dorsal, adipose, and caudal fins profusely spotted; caudal broad and moderately lunated; adipose opposite anal, and much elongated; spots along the back and sides, generally linear, or V-shaped; others irregular, (but few round,) covering from two to five scales; the most common cover three scales, and are about half an inch in length; fins on under parts unspotted, as also all parts beneath the lateral line. A triangular bare projection of the chin, anterior to the front teeth, as in the *S. quinnat*, but smaller; scales scarcely as large as those of *S. truncatus*. Teeth of irregular size, and not so closely disposed on the arms of the jaws and labials as in *S. gairdneri*; middle of dorsal fin nearly opposite a point at the middle of the total length. Differs from *S. quinnat* in having the tail but moderately lunated at the extremity, that of the latter being so deeply cut out as to be almost forked; in the number, shape, and size of its spots, and in its smaller head.

*Young?* (Characters drawn from a young *tsah-kwai*, sent by Dr. Kennerly from Chiloweyuk Lake, No. 203 in the doctor's collection.) Head contained  $5\frac{1}{2}$  times in the total length. Tail handsomely forked. Dorsal, adipose, and caudal spotted with oval black spots. Head spotted with round spots of the same, each about  $1\frac{1}{2}$  lines in diameter. Br. 16: P. 17: D. 15: V. 11: A. 16: C. 20: rows of scales just in front of dorsal, 31 above lateral line; 42 below; 145 upon it.

HAB.—Northwest coast of America, entering the rivers for spawning purposes during the spring, and continuing throughout the summer.

A very large salmon, known to the Indians of Puget Sound as the *towalt* or *to-oh-odlt*, is caught in Black River, a fork of the Dwamish. It is said that this species is distinct from the *satsup*, (which we take to be the *quinnat*,) but it is identical with the *tsah-kwai* of Fraser River.

Mr. George Gibbs, while on Fraser River, speaks of the salmon known to the natives there as the *tsah-kwai*. He says: "A few enter Fraser river as early as March, but they are so few that they are not caught at the fisheries before April. Mr. Gibbs mentions obtaining in the Haro Straits, on the 12th of March, 1859, one of these salmon. "Belly, silvery-white; back, dark olive-green on the ridge; sides, lighter and with

light bronze reflections to within an inch of the lateral line, with black linear spots on the same; tail and dorsal fin, speckled; head small and pointed; ventral fins commence nearly as far back as the dorsal ends; scales very small and bright. At this date they are still scarce."

A *tsah-kwai* obtained by Dr. Kennerly at L. Chiloweyuk, September 8, 1858, had, according to the doctor's notes, a length of 3 feet, 10 inches (nearly 4 feet,) and an abdominal circumference of 1 foot, 10 inches. Black spots on the tail as large as a buck-shot; those of the dorsal fin oblong. General color, silvery-grey with metallic lustre. Lateral line very distinct. Sides above the lateral line with irregular black spots. Snout projects a little when the mouth is closed. Head 8 inches long.

This species was in good condition and abundant at Chiloweyuk at date. He also adds: "This species is the largest found in these waters. Its meat is quite white and not so much esteemed as the *suk-keh*, which has red meat." In speaking of a young specimen he says: "The spots are quite distinct, perhaps of larger size in proportion than those of the adult."

#### 10. SALMO AURORA, Girard.

SYN.—*Fario aurora*, GRD. Proc. Acad. Nat. Sc., Philad., viii, 1856, p. 218; *IBID.* P. R. R. Rep., vol. x, 1858, p. 308.

*Salmo aurora*, GRD. Suckley, P. R. R. Rep., vol. xii., part 2, p. 343; *IBID.* Nat. Hist. Washington Territory, p. 343, pl. 6 8.

?? *Red-char*, Lewis and Clark.

SP. CH.—Body fusiform, compressed; head forming the fourth of the total length, caudal fin excluded; upper jaw longest. Maxillary gently undulating, its posterior extremity extending to a vertical line passing considerably behind the entire orbit. Anterior margin of dorsal fin equidistant between the tip of the snout and the base of the caudal. Ground color, greyish-silvery above; sides and belly, yellowish-orange; dorsal fin spotted.—Girard.

The two specimens from Astoria still remain in the Smithsonian collection. No others have been received since their arrival in 1854. Dr. Girard's description (based upon the characters of what appear to be young of immature fish) gives very uncertain data for the identification of adults of the species. The typical specimens are numbered 583 on the museum register.

Collectors near the mouth of the Columbia would do well to preserve for study and comparison several small (healthy) red salmon, if they can be obtained.

#### 11. SALMO ARGYREUS, Girard.

SYN.—*Salmo argyreus*, GRD. Pacific R. R. Rep., vol. x, 1858, p. 312, pl. 52; Suckley, P. R. R. Rep., p. 326, and Nat. Hist. Wash. Terr., p. 326.

*Fario argyreus*, GRD., Proc. A. N. Sc., Phil., viii, 1856, 218; *IBID.* Pacific R. R. Rep., vol. vi, part iv, p. 32.

As the description of this species given by Dr. Girard seems based on the characters of two young, partially grown fish, the specific characters

thus deduced are probably much unlike those of the adult in good condition.

SP. CII.—“Body very much depressed, rather deep upon its middle region, and quite tapering posteriorly. Head moderate, constituting the fifth of the entire length. Jaws equal. Maxillary slightly curved; its free extremity extending to a vertical line drawn posteriorly to the orbit. Anterior margin of dorsal fin nearer the extremity of the snout than the insertion of the caudal fin. Bluish-grey above; silvery along the middle of the flanks; yellowish beneath.”—Girard.

Three specimens are in the Smithsonian collection, labeled by Dr. Girard, as belonging to this species. From two of these, also, he based his description, and had the drawing of Plate lxx, Gen. Rep. Fishes, P. R. R. Rept., made. They are alcoholic specimens, and are numbered on the museum register 579, 580.

The least examination shows that both were very young fish—so young as to render it impossible to decide with certainty to what species they really belong. In many characters they resemble the *S. quinnat*, and particularly so in having fully fifteen branchiostegal rays.

## 12. SALMO PAUCIDENS, Richardson.

### WEAK-TOOTHED SALMON.

SYN.—*Salmo paucidens*, RICH. F. B. A. iii, p. 222;—HERBERT, Sup. to Fish and Fishing, &c. 1850, p. 36;—SUCKLEY, Nat. Hist. Wash Terr. and P. R. R. Reports, vol. xii, p. 325, 1859-'60.

Dr. Girard's species, the *S. aurora*, has the back well arched. This may be owing to youth. Were it not for this circumstance the exceedingly small, weak teeth of the specimens labeled by the doctor as *S. aurora*, (and from which he based his description of the species) would induce us to consider the latter name only as a synonym. The young of all the species of salmon known to the writer have forked tails, and it is, therefore not until the fish have reached adult age that this character can be relied on as specific.

The salmon in Dr. Kennerly's collection from Frazer River, labelled the *suk-kégh*, and described by us in “Notices of Several New Species of Salmonidæ, &c., New York, June, 1861,” as the *Salmo richardi*, comes nearer to this species than any that we have received from the Pacific coast, even including the *S. aurora*. More specimens from the Columbia will settle the question.

For discussion of certain points in connection with *S. paucidens*, we refer to the works last quoted in the synonymy above.

## 13. SALMO TSUPPITCH, Richardson.

### WHITE SALMON.

SYN.—*Salmo tsuppitch*, RICH. F. B. A. Fishes, 1836, p. 224;—DE KAY, N. Y. Fauna, iv, 1842;—STORER, Synop. 1846, p. 197;—HERBERT, Supplem. to Fish

and Fishing, 1850, p. 39;—SUCKLEY, Nat. Hist. of Wash. Territory, 1859. (not *Fario tsuppitch*;—GRD. PR. A. N. Sc. Phil., viii, 1856, p. 218;—*IBID.*, Gen. Rep. Fishes P. R. R. Rep., 1858, vol. x, p. 300.)

? *White-Salmon*, Settlers on the Columbia.

? *Silvery-white Salmon-trout*, Lewis and Clarke.

Figures.—The plate (LXIX, figs. 1-4) in the P. R. R. Reports, represents the *Salmo gibbsii*, and not this species.—(See remarks on *S. gibbsii*.)

SP. CH.—Convexity of dorsal outline rising gradually to origin of first dorsal, declining from thence to the tail. *Caudal forked*. Head small, *exactly conical*, terminating in a *pointed snout*. Commissure of mouth very slightly oblique. Back of body and head-studded with oval and circular spots; *sides and fins, including the caudal, destitute of spots*. Teeth minute and sharp; a single row on each palate bone, a few on the anterior end of the vomer, and a double row on the tongue. [The foregoing description is deduced from Dr. Gairdner's notes in Rich. F. B. A., p. 224.] The portions italicized in the above summary of specific characters are those differing strongly from a correct description of the fish taken by Dr. Girard for this species, and described by me as the *S. gibbsii*.

The description, &c., above quoted is copied bodily from the Report on the Salmonide, by the present writer, contained in part 2, twelfth volume Pacific Railroad Reports, and duplicated in the work entitled Natural History of Washington Territory. Since then no additional information has been obtained concerning the fish, although careful inquiries have been made.

#### 14. SALMO CLARKII. Richardson.

##### CLARK'S SALMON.

SYN.—*Salmo clarkii*, RICH. F. B. A. iii, 1836, p. 224;—STORER, Synop. 1846, p. 197;—HERBERT, Fish and Fishing of the U. S. Suppl., 1850, p. 40;—SUCKLEY, P. R. R. Report, vol. xii, p. 344, 1859;—*IBID.*, Nat. Hist. Wash. Territory, 1860. (not *Salmo clarkii*, GRD.)

SP. CH.—(Drawn from Richardson's description and Dr. Gairdner's notes.) Dorsal profile nearly straight. Ventrals opposite to the middle of first dorsal. Fissure of mouth oblique. Extremity of caudal nearly even. Both jaws armed with strong hooked teeth, a single row on each palate bone, and a double row on the anterior half of the vomer and on the tongue. The teeth are long, slender, and acute. Lingual teeth longest and most curved. An oblong plate on the isthmus which unites the lower ends of the branchial arches rough, with very minute teeth. Sixty-six vertebræ in the spinal column.

From the colors given by Dr. Gairdner we infer that they were noted from partially exhausted individuals of some species of anadromous salmon. He says: "Back generally brownish purple—red, passing on the sides into ash-grey, and into reddish white on the belly. Large patches of dark purplish-red on the back, dorsal and base of the caudal

ash-gray; end of caudal pansy-purple. Back, dorsal, and caudal studded with small semi-lunar spots. A large patch of arterial-red on the operculum and margin of pre-operculum. Pectorals, ventrals, and anal, grayish-white, tinged with rose red."

*Rays.*—"Br. 11; P. 12: V. 8: A. 13: D. 11-0." The original specimens were obtained by Dr. Gairdner at the Catlapootl River, a small tributary to the Columbia. None have been obtained during the recent explorations, although it is by no means improbable that some one of the species lately described from healthy-run individuals may really be identical with this fish. For further remarks and suggestions concerning *S. clarkii*, see "Nat. Hist. Washington Territory," or Pacific R. R. Reports, vol. 12.

### 15. SALMO IMMACULATUS, Storer.

#### THE UNSPOTTED SALMON.

*Syn.*—*Salmo immaculatus*, H. R. STORER. Bost. Journ. Nat. Hist., vi, pp. 264-269.

*Sp. CII.*—(Drawn from Storer's original description.) Length of head about one-sixth that of the body; its depth two-thirds of its length. Jaws with numerous sharp incurved teeth. Eyes laterally elongated, their diameter one-third the distance between them. Opercles rounded posteriorly; below, naked and marked with concentric striae. Pre-opercle larger than in *S. fontinalis*.

Scales larger than those of *S. fontinalis*. Lateral line commences back of superior angle of the operculum, and assuming the curve of the body is lost at the commencement of the caudal rays. The first dorsal commences just anterior to median line, and is nearly quadrangular.

*Fins.*—Adipose at a distance back of the first dorsal little less than one-half the length of the fish. Pectorals just beneath posterior angle of the operculum; their length three-fifths that of the head. Ventrals just beneath posterior portion of first dorsal. The plates, at their base, very large; anal about the length of the head behind the ventrals, terminating directly beneath the adipose fin. Caudal deeply forked, its length equal to greater depth of body.

*Colors.*—Silvery on sides and abdomen; darker on back. No spots.

*DIAGNOSIS.*—The diagnosis between this species, if it should really prove distinct, would be by the following: Its silvery color; absence of spots; great length of head compared to the body, the strongly forked tail and its great length. "D. 9: P. 13: V. 9: A. 11: C. 30."

The specimen described by Dr. Storer appeared to be unique. Its length was thirteen and a half inches, and from that circumstance, and from the deeply-forked tail, I am strongly inclined to consider it as that of a young fish, probably belonging to some species already known—perhaps *S. trutta*. The naming of salmonidæ, and the description of new species, based upon the characters of young, partially developed fish, cannot be too strongly reprobated. There is already too much confusion in the synonymy of the various kinds; and if the practice of

describing and naming new species from the characters of unidentified, immature individuals is not stopped, the study of the relations of the species will become so complicated that useful classification will be next to impossible, and the principal object and usefulness of scientific arrangement, such as simplifies the study of natural history in other branches, will be greatly impaired. Examples of description based on young fish are *Salmo neoberrii*, Grd., and *Salmo (Fario) argyreus* Grd. Errors of this kind might easily be avoided by a little care in labeling by the collector in the field. These remarks are meant generally, and not to reflect upon individuals.

Dr. Storer adds to his description the following statement: "But a single specimen of this beautiful fish was taken, and that by a gill-net stretched across the mouth of a brook flowing into Red Bay, Labrador."

## 16. SALMO GAIRDNERI, Richardson.

### GAIRDNER'S SALMON.

SYN.—*Salmo gairdneri*, RICH., Fauna B. A., Fishes, 1836, p. 221;—DE KAY, N. Y. Fauna, iv, 1842, p. 243;—STORER, Synop., 1846, p. 196;—HERBERT, Suppl. to Fish and Fishing of the United States, 1850, p. 34;—(not *Fario gairdneri*, GRD., Pr. A. N. Sc., Phil., viii, 1856, p. 219;—IBID. Pacific R. R. Reports, vol. vii; et Gen. Rep. Fishes, p. 313, Plate lxxi, fig. 1-4);—SUCKLEY, P. R. R. Rep., vol. 12, p. 331;—IBID. Nat. Hist. Wash. Terr., p. 331. *Quannich* or *Kwunnich* Chinook, (not jargon.)

SP. CHAR.—[Based on data given by Richardson, and on the examination of two dried skins in the Smithsonian collection.] Profile of dorsal outline nearly straight; tail terminating in a slightly semilunar outline. Ventrals correspond to commencement of dorsal, and adipose to end of anal. Jaws fully armed with strong hooked teeth, except a small space in center of upper jaw. Vomer armed with a double row for two-thirds of its anterior portion. Back of head and body, bluish gray; sides, ash gray; belly, white; caudal, spotted with oval dark spots; snout, rounded; head, short and comparatively broad; under fins, light-colored.

HABITAT.—Pacific Ocean, northwest coast of America. Enters and ascends the Columbia in the spring.

DIAGNOSIS.—From *S. quinnat* by its round muzzle and chin, and when adult by lacking the forked tail. From *S. truncatus* by its broad head at the base; its round "snub" snout. [For further marks of difference see those species.] It resembles the *S. truncatus* in its short head, small teeth, truncate tail, and large scales. In the specimen examined the operculum differs considerably in shape from that of the male *S. quinnat*.

Gairdner's salmon enters the Columbia in the spring in company with the *S. quinnat*. It is a fine silvery fish, and equal in flavor and delicacy to the latter, but much smaller in size; the average, according to Dr. Gairdner, being about six or seven pounds.

Two skins are in the Smithsonian collection, sent from Astoria by Mr. James Wayne.



## 17. SALMO TRUNCATUS, Suckley.

SHORT-TAILED SALMON; SQUARE-TAILED SALMON.

SYN.—*Salmo truncatus*, SUCKLEY. Ann. N. Y. Lyc., Dec., 1858.—IBID. Pacific R. R. Reports, vol. xii, p. 327, 1859.

*Klit-shim* of the Klallams.

Typical specimen, No. 1134, Smithsonian collection.

SP. CH.—[Based upon the skins in the Smithsonian collection.] Body, fusiform; dorsal outline but slightly arched; anterior margin of dorsal fin much anterior to a point equidistant between the nose and the insertion of the tail; head very small; jaws fully provided with small teeth; tail small, its free margin, when extended, being almost straight, having a very faint tendency to lunate; scales large. Colors of the fresh run fish: Back of head, back, dorsal and caudal fins bright blue, spotted on the head with roundish, on the fins with oval spots of black; the blue of the back is silvery, that of the head and fins darker; lower parts silvery white, this color extending about an inch above the lateral line, and merging itself irregularly into the color of the back; no spots below the lateral line, which is faint and of a bluish dusky color; lower fins pale and unspotted, their tips somewhat darkish. Abdominal cavity comparatively small; fish weighty for its size; usually two rows of teeth along the body of the vomer.

The male has a slightly larger head than the female; the teeth are also stronger; and between the front teeth opposite the intermaxillary a notch exists for the reception of the more pointed chin. It probably never becomes "hooked-billed."

DIAGNOSIS.—From *S. quinnat* can be distinguished by its more rounded snout and chin; by lacking the triangular bare space in front of the maxillary symphysis anterior to the teeth; by its short head; even, spotted tail; and by its large scales, which are double the size of those of the *quinnat*. From *S. gairdneri*, Rich. Snout and angle of jaws sharper; head much narrower at the base and more tapering; scales slightly larger.

The species are however nearly allied. [For remarks in detail concerning the differences and affinities between this and other salmon, see Pacific Railroad Reports, vol. xii, part 2, page 328.]

HAB.—Anadromous; Puget Sound; † Columbia River.

Since the preparation of the twelfth volume of the Pacific Railroad Reports, Dr. Kennerly obtained and forwarded some additional material, (skins 2097, 1119.) No. 2097 was obtained during the winter of 1859 at Fraser River; the other in the Straits of Fuca, in August. We have, therefore, been able more satisfactorily to determine the distinctions between this species and the *S. gairdneri*. Mr. Gibbs now seems to think this fish is not identical with the *skwowl* of the Nisquallys.

The measurement of the head of the typical specimen mentioned in the last works quoted in the synonymy was taken from the snout over the

vertex along the median line, and not from snout to farthest point on edge of operculum. It was this measurement of the head which was one-thirteenth of the fish's total length.

The following is extracted from the report on the Salmonidæ in the Pacific Railroad Report, vol. xii:

While residing at Puget Sound I collected the following information from the Indians respecting the salmon known to the Nisquallies as the *skowol*, which I consider identical with the *klutchin* of the Klallams, a specimen of which has served as the typical example of the present species. This fine salmon is second to none in beauty, size, or excellence. It arrives in the bays and estuaries of Puget Sound about the middle of autumn, and toward the 1st of December commences to run up the larger rivers emptying into the sound. Their ascent of these streams continues through December and January. This arrival of the species in fresh water is not as simultaneous, neither do they arrive in such great numbers at any one time or in schools, as is the case with the *skowitz*, and several other species, but the "run" being somewhat more "drawn out" affords a steady, moderate supply to the Indians during its continuance. In the fall and winter large numbers are taken by the Indians from the salt water by trolling with hook and line in the bays and coves of Puget Sound. The bait used is generally a small kind of herring, a little larger than the common sardine of commerce. After entering the rivers it is taken by the Indians in nets, traps, baskets, and also by spearing. Its flesh when cooked is of a beautiful salmon-red, and, as a table delicacy, when fat, as it generally is when "fresh run," ranks equally with that of the *S. salar*, the *satsup*, or the *quinnat*. The Cowlitz River, (a branch of the Columbia,) situated not more than sixty miles from the head of Puget Sound, has salmon of various species entering it at regular periods annually. Indians of intelligence have told me that the species under consideration is the only kind common to both these waters. How far we can place reliance on their statements is difficult to determine.

The distinguishing characters which strike the eye at a glance are its short and small head, the small weak teeth in the jaws, and the shape of its tail, which is truncated, not forked. Mr. George Gibbs says that the *S. truncatus* (*klitshin* or *klut-chin*) has the most solid meat of all the salmon, and has a very small abdominal cavity. It keeps its depth to the insertion of the tail, and weighs more in proportion than any other. Body covered with small black, roundish spots; back, dark olive; sides, gray; belly, white—gray behind; nose straight. A specimen obtained by him, 29 inches in length, had a girth in front of dorsal fin of 17 inches; girth at insertion of caudal, 7 inches. Length of head, 5 inches; nose to dorsal fin, 13.75 inches; breadth of tail, (at extremities of lobes,) 6 inches. Scales small; weight, 9.75 pounds; male. Whether this be the *skowol* or not, the fact that *skowol* enters the rivers in mid-winter and is gone or exhausted when the *S. quinnat* arrives, is of value, and will afford a clue to the collector.

## 18. SALMO RICHARDI, Suckley.

SUK-KEGH SALMON; RICHARD'S SALMON.

SYN.—*Salmo richardii*, SUCKLEY, Notices New Species N. Am. Salmon. N. Y., June, 1861.

? *S. paucidens*, RICH., F. B. A.

SP. CH.—[Based on a skin in alcohol, No. 2005, Smithsonian Cat.; Fishes.] Dorsal outline moderately convex, its point of greatest height being at the insertion of anterior ray of dorsal—the arch from the snout to the caudal insertion being very uniform.

*Female*.—Head conical; jaws apparently equal—the thick, fleshy tip on the point of the lower jaw of the fresh-run fish aiding much to give this appearance. Maxillary extends back to a point immediately below the posterior of margin of orbit. Teeth extremely small, and but few. Tail deeply lunated—almost forked. Tail and other fins unspotted. Does not often attain a greater weight than fifteen pounds—the average being scarcely more than eight. Br. rays, usually 14.

HAB.—Northwest Pacific coast. Enters Fraser and Skagit Rivers. The species is named in honor of Mr. J. H. Richard, the clever artist who has so handsomely and correctly drawn the ichthyological illustrations of the Pacific Railroad Reports.

DIAGNOSIS.—The forked or deeply lunated tail will serve to distinguish the species from those not possessing that character. From the *quinnat* it differs in lacking the strong teeth and pointed, triangular, smooth, projecting chin which extends in front of the teeth of the latter.

The unspotted tail and fins assist in the diagnosis. Concerning its identity with *S. paucidens*, see text beyond. The “lip” in front of the teeth on the lower jaw is not triangular; but is rather thick, extending some distance in front of the teeth, and in this respect approaching to the *S. quinnat*.

This salmon runs up Fraser River in great numbers, where it is the principal summer salmon. In the Skagit it occasionally is found, and is there considered a great rarity by the natives, who call it *ohch-itl*. This fish in many respects agrees with Richardson's description of the *S. paucidens*. But as that is so meager and may apply to the young of so many different kinds, I have been guided by the known difference of time in their arrival from the sea. Dr. Gairdner says that the weak-toothed salmon enters the Columbia in company with the *S. quinnat*, (in April and May,) whereas the *suk-kegh* does not run up Fraser River until later.

“The procuring of specimens from the Columbia of the salmon known to the Indians of the lower river as the *kwe-achts*, would settle this question.

“The *suk-kegh* is the best summer salmon of Fraser River, being in prime condition in the rivers during August and the early part of September. When they enter Lake Chiloweyuck they almost immediately die, owing,

as the Indians believe, to something peculiar in the water.—(Kennerly, in MSS.) Dr. Kennerly in a note made on the 13th of September, 1859, says that he had that day “observed many dead salmon floating on the lake.”

Mr. Gibbs found the species in full run August 1, 1857, in the salt water on the west side of Lummi Island.

II. Spotted with red, feeding freely in fresh water.

### 19. SALMO CAMPBELLI, Suckley.

#### PACIFIC RED-SPOTTED SALMON-TROUT; CHEWAGH.

SYN.—*Salmo spectabilis*, GRD. Proc. A. Nat. Sc. Ph. viii, 1856, p. 218;—IBID. Pacific R. R. Rep., vol. xii, p. 307;—SUCKLEY, Rept. on the Salmonidae, P. R. R. Reports, vol. xii, and Nat. Hist. Wash. Terri., p. 342.  
*Salmo campbelli*, SUCKLEY. Notices of certain New Species of N. A. Salmon, June, 1861.

SP. CH.—A slender fish for the genus. Head, measured from snout to distal edge of operculum, contained about four and three-quarter times in the total length; measured from snout to nape, it is contained seven and a half times. When the pectorals are smoothed backward against the belly the point of greatest girth is along a line drawn vertically near their ends; from whence to the snout there is a regular curve, but posteriorly the line of the back is quite straight, the body being somewhat compressed latterly and tapering. Scales much smaller than in individuals of *S. iridea*, Gibbons, of the same size. They are very delicate and easily detached. Caudal, forked. Back and sides, low down, are covered with spots (about two lines in diameter in a fish one foot long;) those near the lateral line being of a beautiful rose-color, those above and below, cream-colored or white. Tail forked. A small clump of teeth on anterior extremity of the vomer as in the charrs, or *Salvelini* of Nilsson.

DIAGNOSIS.—Known from all the Pacific trouts by the red spots on the sides, and whitish ones on the back.

In 1856 Dr. Girard described a trout sent by me from the Dalles on the Columbia River. The specimen was very much broken, and the description vague. I have, however, succeeded in identifying other specimens sent by Dr. Kennerly from Puget Sound, by comparing these with the remains of the original typical specimen.

In two of these fish in the Smithsonian collection there are two teeth on the head of the vomer, and on each side, and two on the shaft. One specimen had 42 scales above the lateral line to middle of the back; 40 below the lateral line, and 156 upon it.

*Keys*.—Br.? D. 12: P. 17: V. 10: A. 16: C. 20.

Dr. Girard first described this trout, giving it the name of *S. spectabilis*, but which I have been obliged to change, as there had already been described by Valenciennes, in his Hist. Nat. des Poissons, a species un-

der the name of *Salar spectabilis*. I cannot recognize the genera *Salar* or *Fario*, for reasons which have been given already in detail.

The *salmon-trout* of Puget Sound is a beautiful fish, varying in length from 10 to 24 inches. Its sides are profusely speckled with circular vermilion spots of about the same average circumference as a small pea. On the back of the fish there are several rows of the same sized spots, of a cream color. This trout is said to afford much sport; it certainly takes bait greedily, and would probably readily rise to the fly. They are found in the fresh waters from April till near Christmas, but are caught most abundantly during the months of October and November. The Puyallup, Dwamish, and Lummi Rivers, during three months, afford good fishing near their mouths. As a table-fish, this species, in my opinion, considerably surpasses the common brook-trout, which is saying a great deal.

A species of red-spotted anadromous trout is found in the rivers of Kamtschatka. According to Pallas it is known to the Russians as the *malma* or *golet*. In many respects it resembles the present species.

## 20. SALMO HUDSONICUS, Suckley.

### HUDSON'S BAY TROUT.

SYN.—*Salmo hudsonicus*, SUCKLEY, notices of Certain New Species of N. A. Salmonidae: N. Y., June, 1861.

SP. CH.—Head contained five times in the total length of the fish. Dorsal outline strongly arched, its point of greatest height being at the first ray of dorsal. Head small and conical. Mouth quite small. Teeth small; a few on the head of the vomer; none on its shaft. Two rows of teeth on the tongue. Tail broad, and usually barred. In some specimens the bars appear to have faded out. Upper parts dark (bluish?), sides brighter, belly white. The whole fish quite silvery. Scales small, but larger than in *S. fontinalis*. They are firmly adherent, and quite conspicuous. Flanks of adults above and below the median line covered with light spots about the size of peas—those in alcohol appearing as if they had been of a cream or orange color during life.

Integument over first ray of pectorals of a light orange or reddish color; that over the next ray dark. Female nearly similar.

DIAGNOSIS.—Would not be easily confounded with any Atlantic species except *S. fontinalis*, but has a smaller head, larger spots, and larger, more adherent, and thicker scales.

HAB.—Hudson's Bay and vicinity, (C. Drexler,) Labrador, (Elliot Coues,) Newfoundland, (T. Gill.)

Ray formula (of typical specimens,) Jar 3594, (Smith. Coll.) procured at Hudson's Bay by Mr. C. Drexler.

Original No. 433.—Br. 12: P. 11: D. 10–11?: V. 8: A. 10.

Original No. 168.—Br. 11–10: P. 11. D. 9–10?: V. 8: A. 9.

Several young trout brought from the North by Messrs. Gill and Coues were at first supposed to be individuals of the *S. fontinalis*, which

had become somewhat altered in appearance by long residence in salt water. But upon the examination of Mr. Drexler's specimens from Hudson's Bay, it became apparent that a distinct, but nearly allied species exists thus far northward, replacing the above, and of which the specimens obtained by the first-mentioned gentlemen were the young. While in the salt water they bite freely at any common bait.

## 21. SALMO ROSSII, Richardson.

### ROSS' ARCTIC SALMON.

SYN.—*Salmo rossii*, RICH. Nat. Hist., App. Ross's Voy., p. lvi;—IBID. F. B. A., vol. 3, p. 163; Pl. 80, Pl. 85, f. 2;—DEKAY, Zool. N. Y. Fishes, p. 242.  
*Salmo penshinensis*, GILL, Cat. Fishes E. Coast N. A., p. 52.

SP. CII. [Condensed from Sir John Richardson's description.] Form more slender, dorsal outline less arched than in *S. salar*. Head also rather larger, being one-fifth of the length to end of scales on the caudal. Snout very obtuse; under jaw remarkably long, its tip having a small, incurved knob. [? No notch between the intermaxillaries for the reception of this knob.] Conspicuous pores on the sides of the face bones posteriorly. Eye equidistant between snout and nape. Intermaxillaries toothed along their whole margins. About thirty teeth on the tongue.

*Ray formula*.—Br. 12-13; D. 13-0; P. 14; V. 10: A. 11.

Scales very small—particularly on the back; nowhere tiled, each scale being surrounded by a distinct space of smooth skin.

*Colors*.—Back, top of head, dorsal and caudal fins have a hue intermediate between oil-green and hair-brown. Sides, pearl-gray, with a blush of lilac and silvery luster. Near the lateral line scattered dots or spots of carmine. Belly varying from faded-orange to tile-red, and arterial-red.

HAB.—Arctic Ocean, near the mouths of the rivers of Boothia Felix.

There does not seem to be sufficient reason for doing away with the name first applied to this species by Sir Jno. Richardson. Besides, the comparison of one or two dried skins, of nearly similar species ought to be insufficient to condemn a name once established.

This salmon presents peculiarities of great importance, which no red-spotted trout which we have seen—or in fact, any other, in a collection of 30 species of American *Salmonidae*. Prominent among these may be mentioned the great number of teeth upon the tongue. The diagnosis between this species and others consists in the red-spots, obtuse snout, long under jaw, conspicuous pores on the face bones, the great number of teeth on the tongue, and the distinct space of smooth skin around each scale. All prominent and unmistakable characters.

## 22. SALMO HEARNII, Richardson.

## COPPERMINE RIVER SALMON.

SYN.—*Salmo hearonii*, RICH. Franklin's First Journ., p. 706;—IBID., Faun. B. A. iii, p. 167;—DEKAY, Rept., p. 242;—GILL, Cat. Fishes E. Coast, p. 52.

SP. CH.—[Condensed from Richardson's description.] Form somewhat similar to that of *S. salar*, the head rather larger in proportion. Eyes small, situated opposite middle of labials. Intermaxillaries form a comparatively small portion of the margin of the mouth, and project somewhat. The lower jaw terminates in a small knob, (fleshy?) which is received into a depression between the intermaxillaries. Teeth subulate. A solitary tooth on each side of intermaxillary notch. A few teeth on head of vomer, and a few stronger ones on the tongue.

Ray formula.—Br. 10: A. 10.

Caudal large and truncate with a slight rounding of the angles. Dorsal opposite ventrals. Between thirty and thirty-six cylindrical coeca. Scales firmly imbedded in a mucous skin, and very small.

Colors.—Back, olive green; sides, pale; belly, bluish; several longitudinal rows of flesh-red spots on the back and sides—larger on the latter.

HAB.—Coppermine River, in Arctic America. Anadromous.

## 23. SALMO ALIPES, Richardson.

## LONG-FINNED CHAR.

SYN.—*Salmo alipes*, RICH. Nat. Hist., App. Ross's Voy., p. lvii;—IBID. Fauna. B.A. iii, p. 169; Pl. 81; Pl. 86, fig. 1;—DEKAY, Report, p. 242;—GILL, Cat. Fishes E. Coast N. A., p. 52.

*Salmo stagnalis*, FAB., Faun. Grönl., p. 175, (Rich.)

SP. CH.—[Condensed from Richardson's description.] Form slender; dorsal outline comparatively straight. Head forms a little more than one-fifth of the total length; its upper surface convex, transversely and in profile; its cranial ridges prominent. Snout very obtusely rounded, receiving the knobbed extremity of the lower jaw in a toothless space. A projecting cluster of teeth on the knob of the vomer, the shaft of which is smooth and toothless. Teeth on the tongue disposed in two rows—six on each side—which are fully as large as those on the maxillaries. Pectoral, dorsal, and ventral fins very long—twice the length of the pectorals, reaching from the opercular opening to the middle of the ventrals. The ventrals, when turned back, almost touch the anus. Caudal forked. Scales small, thin, and adherent.

Ray formula.—Br. 11–12: P. 15: D. 13–0: V. 9: A. 10 or 11.

Lateral line formed of 126 scales, above which, at a point just anterior to the ventrals, there are 41 rows, and below 29, to the middle line of the body.

HAB.—Small lakes in Boothia Felix. Probably visits the sea.

The colors of this char, as given by Richardson, are obscure, as they were based on the appearance of a dried skin. There appear to have been yellow or orange spots along the sides. Lower parts white or yellow. We have been able to obtain no specimens for examination.

#### 24. SALMO NITIDUS, Richardson.

##### THE ANGMALOOK.

SYN.—*Salmo nitidus*, RICH. Nat. Hist., App. Ross's Voy., p. lvii;—IBRD. F. B. A., iii, p. 171, Pl. 82, fig. 1; Pl. 86, fig. 2;—DEKAY, Report, p. 242;—STOREY, Synopsis;—GILL, Catalogue Fishes E. Coast, p. 52.

Variety of *S. alipes*, (RICH.)

The *Iviksarok* of the Greenlanders.

SP. CH.—[Condensed from Sir John Richardson's description.] Knob at point of lower jaw, received in notch between intermaxillaries. Back nearly straight. Teeth much as in *S. alipes*, as are also many other anatomical characters, for which see sp. ch. of *S. alipes* and "diagnosis" below. Lower jaw, when depressed, slightly longer than from snout to nape. Scales tiled, small, roundish.

*Colors*, (according to Captain Ross:) Body above the lateral line, deep green, softening towards the belly, which is of a beautiful yellowish-red tint posterior to the pectoral pin. Under parts white, slightly clouded by yellowish-red. On the sides several rows of red spots, principally distributed between the lateral line and the yellowish red of the belly, varying in size, the largest being as big as a pea. Dorsal fin like the back. Under fins dusky-red, the anal paler, and the first rays of the pectorals, ventrals, and anals white.

*Ray formula*.—Br. 11-12; D. 14-0; P. 17; V. 10; A. 12.

*HAB.*—Small lakes in Boothia Felix. (Richardson.)

*DIAGNOSIS.*—In many characters this fish agrees with the *S. parkei*, (*nobis*,) found in the head-waters of the Columbia, west of the Rocky Mountains. The latter has more branchiostegals, and also light-green spots on the back, not noticed in the description of *S. nitidus*. From *S. alipes*, Richardson gives the following distinctive characters: Body thicker than that of *S. alipes*; belly more prominent, fins shorter, anus farther back; head less arched above and in profile; mesial ridge and lateral porous curves less prominent; no radiating lines above the orbit, which is proportionately nearer the snout; upper jaw shorter.

This fish, the *S. alipes*, *S. bairdii*, and *S. parkei*, agree in possessing characters almost sufficient to include them in a distinct subgenus. They all belong to the chars, (subgenus *Salvelinus* of Nilsson,) but in addition have an elongated, fleshy projection standing up from the point of the lower jaw, which is received into a toothless notch between the premaxillaries. They, in addition, have a mark common also to the *S. fontinalis*, Mitchill; this is in having the first rays of the pectorals, ventrals and anals yellow, red, or white. None of the black-spotted trouts, or salmon, have these rays in color specially distinguished from those of the rest of the fin.



When we speak of color of the ray, we mean of the integument or membrane covering it.

## 25. SALMO FONTINALIS, Mitchill.

COMMON TROUT; BROOK TROUT OF THE ATLANTIC COAST OF NORTH AMERICA.

SYN.—*Salmo fontinalis*, MITCHILL, Trans. Lit. & Phil. Soc. of N. Y., 1, p. 435;—RICH. F. B. A. iii, p. 176;—KIRTLAND, Report, Zool. Ohio, pp. 169-194;—THOMPSON, Hist. Vermont;—DEKAY, N. H. State of N. Y., Fishes, p. 235;—AYRES, Bost. Journ. N. H. iv, p. 273;—KIRTLAND, Bost. Journ. N. H. iv, p. 305;—VALENCIENNES, H. N. des Poissons, xxi, p. 266, 1848;—STORER, Synopsis;—BIGELOW, Bost. Journ., vi, p. 49;—FORSYTH, Bost. Journ., v, p. 412;—HERBERT, (Frank Forrester,) "Fish and Fishing;" also, "Supplement to the same;"—GILL, Cat. Fishes E. Coast N. A.

*Salmo nigrescens*, RAF. Ichth. Ohien, p. 45.

*Salmo erythrogaster*, DEKAY, Report, p. 236.—(Red-bellied variety.)

*Baione fontinalis*, DEKAY, Rep. Fishes, p. 244, 1842. (A species founded on the young.)

*Salmo canadensis*, HAM. SMITH, "Grif. Cuv., vol. 10, p. 474, Pl. 41."—DE KAY, Rep.; p. 243.—Storer, Synop., p. 197.

*Salmo fario*, SMITH, Fishes of Massachusetts, p. 141.

SP. CH.—[Mostly condensed from DeKay.] Body oblong, compressed; back, broad and rounded; head, sloping nearly symmetrically above and below; nostrils double; labials, intermaxillaries and lower maxillaries armed with minute teeth; tongue with two rows of from four to six teeth; vomer, with six to eight teeth in a single row. Br. 12, 12.

Colors.—Above with irregular dark markings on a horn-colored ground, which, in freshly caught specimens, give bluish and greenish metallic reflections; sides lighter, merging into silvery-white on the abdomen, but showing much red in the spawning season; upper part of the head dark greenish-brown, with obscure mottlings; vermilion dots and large yellow spots in the vicinity of the lateral line. The pectorals have the first ray yellow or the second black, the remainder orange; ventrals and anal with first ray white as on the tips of second and third. Caudal reddish, with obscure parallel dark bands, more distinct toward the tips of the lobes. Caudal somewhat emarginate; quite forked in the young, which have also dark transverse bars on the sides.

HAB.—Fresh-water lakes and streams from Canada to Tennessee on the Atlantic slope. Occasionally repairs to salt or brackish water if within reach.

Among some fifty specimens of this species of trout in the Smithsonian collection are individuals from Eastern Tennessee; Preston County, Virginia, (Professor Andrews;) from the Potomac River; from various rivers and streams in Pennsylvania, New York, and the New England States, Lake Superior, and Canada.

Notwithstanding the great range of the species there is but little sign

of local variety, except what may be caused in color by change of position from still to rapid or fresh to brackish or salt water, to which the species is very fond of repairing when accessible. The more southern specimens are paler, while those from Lake Superior and Canada are darker than is usual in the Middle States. This must be owing to some natural law affecting the Salmonidæ. The New Mexico specimens of *S. virginialis* in the Smithsonian collection show the same bleaching when obtained from southern localities. The *S. erythrogaster*, DeKay, is nothing but this fish tinged with red during the breeding season. This is the favorite game-fish of the Middle States, where its capture during the proper season is one of the most keenly-relished sports of our scientific anglers. Its weight rarely exceeds four pounds, and it is rare indeed to find one in Southern New York weighing more than three. The mountain streams, which are the sources of the Delaware, are favorite resorts of anglers, where large numbers are taken without difficulty, but unfortunately they are usually of small size. On Long Island much larger fish are taken. There are there—especially on the south side—many fine private ponds, where trout are carefully preserved and their management reduced to a specialty. Many of these ponds are owned or leased by fishing clubs. Stringent rules exist against the destruction of fish below a certain size, or the killing of more than a limited number daily. Probably the finest and best preserved trout-pond on the island, Massapequa, belongs to William Floyd Jones, esq. The writer can testify to the excellence of the fishing there, the large size of the fish, and the genuine hospitality of the proprietor. John D. Jones, esq., at his country-seat on the north side of the island, has several artificial ponds in which, at the time of writing, (June, 1861,) he is experimenting in the artificial raising and maintenance of this beautiful fish.

The following interesting remarks on the habits of *Salmo fontinalis* are extracted from a letter addressed to Dr. Storer, by I. B. Forsyth, M. D., published in the Boston Journal of Natural History, vol. v; p. 412.

“The few observations I have to communicate upon the habits and peculiarities of the salmon-trout, were made during a residence of ten years in Sandwich, Cape Cod, where the facilities for that purpose are very abundant.

“It may be well to premise, that the distance, at this point of the cape, from one bay to the other, varies from five to ten miles, and the land is gradually elevated from each shore, till it reaches the center, and consequently the streams, for the most part arising from springs, are short, terminating in creeks upon the marshes. Many of these are of sufficient magnitude for mill-sites, and are therefore crossed by permanent obstructions; and hence it frequently happens, in the short space of a quarter of a mile, you find specimens of both, as they are familiarly

called, the fresh and salt water trout. The following varieties in color and appearance have been observed :

"1st. Those having the upper part and sides of a pale brown, gradually becoming less so, till it terminates in white on the under part, having a silvery appearance when first taken from the water, and covered with small, distinct scales; the circular yellow and red spots very indistinct; generally found in the marshy creeks, or in open streams, where the sun has free access. They are well fed upon minnows and shrimps, having a plump appearance, and are the variety mostly sought after by those who desire the trout in its highest perfection, for the table. They are taken mostly between the mouths of January and July. They vary in size from one-fourth of a pound to four pounds; but I have never seen one to exceed two and a half.

"2d. Those having the upper part and sides of a dark brown, having a dark-green appearance, terminating in white or orange underneath, and covered more or less with round yellow spots, with a bright red center, color varying according to the location; and generally not so plump and well fed as those above mentioned:

"3d. Those having the upper part and sides of either a light or dark brown, with spots more distinctly marked on the dark than the light; underneath, the color uniformly ferruginous or orange.

"Each of these varieties is found both in the streams communicating with the salt marshes, and in those which are entirely cut off from them, by permanent obstructions. The first-named variety, however, is nowhere found in so great perfection as in close approximation to the salt creeks. The difference between the salt and fresh water trout, in this vicinity, seems to be only in name, so far as I have been able to determine, with ample opportunities in taking them, and with specimens before me.

"The peculiarity of these varieties seems to depend entirely upon the location and the nature of the soil at the bottom of the stream they inhabit. The first variety is found in clear water, with light gravelly bottom, and where the banks are not shaded by shrubbery, but where they are almost constantly exposed to the rays of the sun. The second variety inhabits streams which are for the most part shaded by trees, or which take their rise in, or pass through, peat-bogs. Thus in one stream, the trout caught at the head of it were always of a very dark brown, almost black, highly marked with yellow and red spots, while those taken near the mouth of the stream were of a light color. One of these streams arises from a deep basin of dark water 30 feet in diameter and 10 feet deep, surrounded by a peat-bog, where fish taken, so far as I know, have been uniformly of a dark brown. In other streams having a bottom of iron ore they are uniformly marked with orange underneath, the color of the upper part and sides appearing to depend upon the amount of exposure to the sun's rays. These observations are made independent of any of the changes of color or markings which take place during the spawning season.

"About the 1st of January these fish are found congregated together at high-water mark, and seem to have come down the stream for the purpose of locating themselves in the marshes, where they can obtain food. So uniform are they in this that, for a number of years it was my custom to visit one particular stream during this month, and I was always sure to find them assembled in waiting for me within a few rods of the same spot, in number I cannot say how many, but I would take of them varying from sixty to seventy-five.

"During the months of February, March, and April they become separated and are distributed the whole length of the creeks, and about the 1st of May begin again, in small numbers, to ascend the stream. This they continue to do as the season advances, and this means of sustenance increases (which is principally insects and flies) till about the middle of October, when they are found in great numbers, as near up as they can conveniently get to the origin of the stream. This is their spawning season, and having deposited their spawn, they begin to wend their way down the stream, for the most part in a body, till they reach again the marshes.

"These fish were formerly taken in considerable numbers with a kind of net used in the herring fishery; but this mode of taking them is, I believe, prohibited by legislation. They are now taken, for the most part, with line and hook, baited with minnow, shrimp, or earth-worm; or, at some seasons of the year, with the artificial fly, more especially in the fresh ponds. Two other methods of taking them have been resorted to in the small streams, both of which deserve a passing notice. The first is by titillation, so-called; and the second, hooking them up by the caudal extremity, decidedly the meanest way of taking them.

"The method of taking them by titillation is this: About the spawning season they are found, for the most part, in the small and narrow head streams, and seem more sluggish than at any other season of the year, and less inclined to take the bait. Having arrived at the edge of the stream the hand is carefully and gently passed along under the banks until it comes in contact with the fish, generally near the tail.

"The titillation then commences, and the hand is made to approach toward the head till sufficiently forward to prevent slipping through the fingers, when by a sudden grasp it is landed upon the shore, the fish remaining perfectly quiet during the process. This mode of taking them I have practiced in one stream three years in succession, and taken many fine trout. The unscientific mode of hooking them up by the caudal extremity is also practiced at the spawning season, when they are averse to taking the bait, and where the stream is deeper and wider. The manner is as follows: A large-sized hook, made very sharp, is fastened to the end of a long straight stick or piece of whale-bone. The fish is then sought and generally found beneath the root of an old tree, or under the shadow of a log, with the head and part of the body out of sight; the hook is then carefully introduced near the

extremity of the fish, and by a sudden jerk is inserted so as effectually to secure him."

We also copy an extract from the Journal of the Bost. Soc. Nat. Hist., vol. vi, p. 49, a paper entitled "Observations on some of the habits of *Salmo fontinalis*. By Samuel L. Bigelow, M. D."

"The following observations on the habits and peculiarities of a species of *Salmo* were made in a comparatively short space of time, without reference to science, but merely as a source of pleasure to myself, and to gratify a natural curiosity. The pond in which these trout are found is situated at the base of the northeast ridge of the Monadnock Mountain. It covers an area, I should think, of seventy-five or one hundred acres, and is so deep about the center that soundings have not been found, though a line has been sunk 200 feet. It is supplied entirely by springs at the bottom, which is composed of red and white sand and rocks, so far as the depth of the water will permit of an examination. The water is always very cold, and so clear that the bottom may be seen in a bright day to the depth of 25 or 30 feet; and although there are neither inlets nor outlets, its height is nearly the same at all seasons. Its depth increases from the shore, where it is only a few inches, in some parts gradually, and in others rather abruptly.

"The form of the pond is quite irregular and has been fancied by some to correspond very exactly to the base of the mountain, which is close beside it. From this circumstance, together with its great central depth, has arisen a legend of its having been once filled by this mass, now a mountain, which was heaved out by some convulsion of nature. The southwest shore is more stony and less exposed than almost any other, and here it is that the trout form their beds and come to spawn. Another natural advantage which this point possesses over others is, that here the change from shallow to deep water is quite abrupt, affording the trout a better chance for escape in case of fright or danger.

"Their beds, as they are called, are merely small cavities formed by the accidental position of three or four stones sunk to their upper surfaces in sand. Their capacity is generally from a pint to a quart, and their forms are various; sometimes flat and shallow. They are most numerous within 10 feet of the shore, and in not more than 10 or 12 inches of water. The trout having selected these little cavities, clean them out with care, removing the finer particles of dirt by fanning with their tails and the larger with their mouths; this done, they have a bed which they visit for a successive series of years, which will be longer or shorter, as they are more or less disturbed. An old fisherman pointed out to me abandoned beds on which he had in former years taken great numbers. They were on the south side of the pond, whence the fish had gradually followed the shore till the year before last, when they came up on the extreme southwest shore, where I found them. They remain in the deep water about the center of the pond during the entire year, except the spawning season, which commences about the 1st of October.

So precise are they in their time of appearing that this fisherman has for the last six or eight successive years taken fifty or seventy-five pounds on the first day of October, when even the day before he could neither see a trout or get a bite. They failed, however, to be thus regular last season. The first four days of October were quite warm and rainy, and with almost constant fishing we caught only ten or fifteen pounds during that time, and those in water of 20 or 25 feet in depth. This proximity to the shore, however, showed them to be approaching their beds, and a few cold nights brought them up.

"The unusual mildness of the season causing too great a difference in the temperature between the deep water they inhabit and the shallows on the border, may be the cause of their late appearance. But it was no easy matter to make a convert of the old fisherman to this doctrine; he held firmly to his old notion that 'they had a wonderful sight of almanac learning;' they had only 'missed their reckoning.' Having reached their beds they lose almost entirely their natural cautiousness and shyness, and seem wholly absorbed in the object of their visit, endeavoring in turn to reach a bed which they remain upon till their ova are deposited. If frightened by a sudden or violent motion of one standing on the shore, over them as it were, they reluctantly retire a little distance, but almost immediately return. The males follow the females closely at this time. They are, I should think, about in the proportion of one male to four or five females. I was in the habit of disturbing them daily, from sunrise till dark, and prevented them to a great extent from remaining quiet long enough to spawn; so they were compelled to come up in the night in order to go through with their labor undisturbed. In the females, which I took the day before they began to spawn at night, I found the membranes enclosing the mass of ova ruptured, and a continuous line of single ova extending from the mass through the passage and stopping directly within the external organs, which were very red and much swollen. The spawning season lasts, I think, for two or three weeks, after which they retire again to the deep water, where they can be taken only in the winter through the ice. Generally, in spawning time, there is no difficulty in taking them with a baited hook; but last season, perhaps owing to their being late, and pressed to the performance of their functions, they passed all kinds of bait and hook untouched. In the winter the only bait used is the minnow; but in October, it is various, as the grasshopper, angle-worm, and artificial fly. These are most used; but I found that when they passed all these they would often take readily to their own spawn, dried a little in the sun. Another means of taking them at this time is by a slip-noose of strong wire attached to the end of a short pole. This is passed over the tail or head, it matters little which, they are so careless at this time, and carried to the center of the body, when a strong and sudden pull will bring them to the shore. Another mode of catching them is by means of a large hook attached to a short pole and line. This is carried under the fish, and secured in the body by a sudden jerk which lands the fish on shore.

"Four hooks are sometimes used, bound together by the shanks in such a manner that the points are presented at right angles to each other. If these are dropped among a number there is a chance of securing more than one; and if a single fish is the object, his chance of escape is made less. These are both easy methods. At this time they do not seize the bait with the suddenness of the common brook-trout; they take it calmly and retire deliberately like the perch. They vary in size from one quarter of a pound to five pounds; but those taken are seldom less than one quarter or more than three pounds. The larger ones are taken almost exclusively in the deep water, through the ice. The males are of a very brilliant and shining dark-brown olive color on the back. The sides are brilliant and silvery and are traversed by a longitudinal line and covered with very bright red and yellow spots. The belly is perfectly white. There are some spots on the fins, but I cannot say on which, nor if all are spotted, nor do I know the precise number of spots. The females are less brilliant than the males; the back is lighter and more dingy; the sides are less silvery, and the spots are fewer and less bright. Several females that I took were of a yellow-brown color and darker on the back than on the sides, with a yellowish-white belly. They were mottled and looked as if water-soaked. These trout, as a whole, were much more silvery and brilliant, and had more and brighter spots than most brook-trout. Their flesh is red, but not so dark as that of the salmon. There is but one other kind of fish found in this pond, viz, the perch. They live in an entirely distinct part from that occupied by the trout, and I think they are never seen or taken together. The perch are only about the northeast shore, which is quite rocky. The trout have been taken in this pond, as far as I could learn, from time immemorial, and formerly in so great numbers, to use the language of the old fisherman, as to 'have been fed by bushels to the hogs.' This is by no means the case at the present day."

## 26. SALMO IRIDEA, Gibbons.

### PACIFIC BROOK TROUT.

SYN.—*Salmo iridea*, GIBBONS, Proc. Cal. Acad. Sc. i, 1855, p. 36;—GRD. vol. x, P. R. R. Reports. Pl. lxxiii, fig. 5; Vol. xii, part 2, Pl. lxxiv.

*Salmo rivularis*, AYRES, Proc. Cal. Acad. Sc. i, 1855, p. 43.

*Salar iridea*, GIRARD, Fr. Acad. Nat. Sc. Phil. viii, p. 220, 1856;—IBID. Pacific R. R. Reports, x, p. 321.

*Fario stellatus*, GRD. Proc. A. N. Sc., Phil., viii, 1856, p. 219;—IBID. P. R. R. Report, x, p. 316;—SUCKLEY, (by oversight retaining the word "Fario,") P. R. R. Rep. xii, p. 346; also, Nat. Hist. Wash. Ter., 346, pl. lxix, figs. 5-8.

SP. CH. Head large, its greatest length measured to edge of operculum, being contained about four and a-half times in the total length; usually a double row of teeth along the shaft of the vomer; dorsal outline but slightly arched; tail strongly forked; lateral line about in the same plane as the centre of the eye.

*Colors.*—Back, brownish olivaceous, with bright silvery reflections; lower parts silvery white; fins orange or red. Head and opercula profusely spotted with round black spots, numerous to the tip of the snout, all along the top of the head, above the eyes; the gill-covers scarcely as numerous or regularly spotted as the other parts. Back and sides freely spotted with black spots of irregular shape, some being star-shaped, others X-shaped; more numerous and irregular near the tail. Dorsal, adipose, and caudal profusely spotted with oval. Scales firmly adherent.

*DIAGNOSIS.*—From *S. lewisi* by its large head, more slender form, much larger scales, more numerous spots, and more forked tail. From *S. virginalis* by its strongly forked tail and spotted head; anal destitute of spots. From *S. masoni* by its small scales. (For further diagnosis see those species.)

*HAB.*—Streams along the west coast of California northward. The foregoing summary of specific characters was based on a specimen labelled by Dr. Ayres, of San Francisco, as belonging to his species *S. rivularis*; on a large specimen from Chico Creek, California; on two obtained at the Dalles of the Columbia; and on one obtained from the Deschutes River, Oregon. These have been selected as type specimens out of a vast number from the same and intermediate localities. All the true brook-trout found west of the Mississippi are distinguished by their black spots, the red spotted being either lacustrine or anadromous, and therefore hardly coming under the name "brook-trout," although often ascending streamlets to spawn.

Two varieties of the *S. iridea* seem to prevail, as follows:

*First variety.*—In general shape and form resembling the type of *S. iridea*. Colors pale, the fish having a washed appearance. Spots on a caudal and dorsal faint. Half a dozen specimens were sent from San Mateo, California, by Mr. R. D. Cutts. The type of this variety is entered in Mus. Catalogue Fishes, 597, labelled "variety *lavatus*."

*Second variety—stellatus.*—The star-spotted trout. This was described by Dr. Girard as a distinct species, under the name of *Fario stellatus*. Most of the specimens I have examined have a double row of teeth on the vomer. It is principally distinguished from the type form of *S. iridea* by the greater profusion, size, and irregularity of its black spots. The young frequently show large spots, of a more regular roundish shape. It may be one of the effects of age in the species *iridea* that the black spots fade out. The same seems to occur in individuals of the species described by us as *S. brevicauda*.

As a comparison of the relative size of the heads of the black-spotted trout seems to furnish valuable data for classification, the following table has been introduced. Two sets of measurements are given, the one showing the number of times the length of the head, when measured from snout to the scales at the nape, is contained in the total length of the fish; the other when the head is measured from the snout to the



farthest point on the free margin of the operculum, and the number of times it is contained in the total length.

Table showing the comparative size of the heads of the different species of Black-spotted trout.

Catalogue, No.	Name of species.	Locality.	Head contained in total length of fish.		Collected by—
			Measurement taken from tip of snout to nape.	Measurement from tip of snout to the farthest point on free margin of operculum.	
592.....	<i>Salmo lewisi</i> *.....	Falls of the Mo. R.	8.25	5.25	Dr. Suckley.
592.....	Do. ....	Do. ....	8.25	5.25	Do.
3326.....	Do. ....	Do. ....	8.25	5.20	Dr. Cooper.
3337.....	Do. ....	Do. ....	8.75	5.20	Do.
30-31.....	<i>S. virginialis</i> , .....	Fort Mass., N. M.	7.10	4.50	Dr. Peters.
31-31.....	Do. ....	Do. ....	7.35	4.75	Do.
30-31.....	Do. ....	Do. ....	7.35	4.50	Do.
30-31.....	Do. ....	Do. ....	7.20	5.00	Do.
595.....	Do. young.	Utah Creek, N. M.	6.75	4.50	Lt. Beckwith.
595.....	Do. ....	Do. ....	6.90	4.65	Do.
595.....	Do. ....	Do. ....	6.95	4.65	Do.
597.....	<i>Salmo tridea</i> , .....	San Mateo Cr., Cal.	6.75	4.40	R. D. Cutts.
597.....	Do. ....	Do. ....	6.75	4.50	Do.
595.....	Do. ....	San Francisco.	6.50	4.60	Dr. Nowberry.
27.....	Do. ( <i>rivularis</i> ) .....	San Francisco.	6.20	4.40	Dr. Ayres.
594.....	Do. ( <i>iridea</i> ) .....	Chico creek, Cal.	6.25	4.25	Dr. Nowberry.
596.....	Do. ....	Humboldt Bay.	6.30	4.60	Do.
1123.....	Do. ....	Dalles, Oregon.	7.30	5.25	Dr. Suckley, skin, P. mark.
584.....	† Do. ....	Ft. Steilacoom.	7.25	5.00	Dr. Suckley.
590.....	Do. ....	F. Dalles.	6.90	5.00	Do.
586.....	<i>Do. brevicauda</i> , .....	Nisqually Creek.	7.50	5.00	Do.
586.....	Do. ....	Cape Flattery.	6.30	4.75	Lt. Trowbridge
586.....	Do. ....	Do. ....	6.50	4.50	Do.
H.....	Do. ....	Puget Sound.	6.75	4.50	Do.
	Do. ....	Do. ....	7.20	4.75	Do.

\*Typical specimens.

This fine trout upon the Pacific slope replaces the *Salmo fontinalis* or the delicious red-spotted brook-trout of the Atlantic States, so much prized by both sportsmen and epicures. The fishing is very fine in nearly all the rapid streams of the Coast and Cascade Mountains of Oregon.

At Fort Dalles, O. T., trout-fishing is good in April, May, June, and July. Many of the rapid snow-water streams descending from Mount Hood abound in delicious fish of this tribe. But all pleasures have their drawbacks, and in this region, after the sunflower blossoms in spring, Piscator must look sharply when fishing, for other kinds of bites than trout-bites, namely, those of rattlesnakes. The great number of these infernal reptiles about Fort Dallas actually interferes much with the enjoyment of angling. These streams have another disadvantage; they are so thickly lined by cotton-woods, willows, and squaw-bushes, that it is very difficult to find positions where the fly can be successfully cast. Where this can be done, the trout rise boldly, and take it greedily, and the fish themselves are active, plump, and delicious, affording good sport. Owing, as above stated, to the dense brush along the banks of these waters, fly-fishing is generally impracticable. The angler is therefore obliged to resort to "bait"-fishing, which, indeed, has its pleasures, too, as, "old Izaak" has testified.

There are few angle-worms in Oregon or Washington, perhaps *none*. The writer has never been able to find them there, yet they will probably be hereafter introduced by civilization. (Introduction of certain worms, bugs, &c., the concomitants of civilization, into new countries by civilized emigrants, is by no means uncommon. Examples of this are given by Darwin in his remarks on New Zealand; *vide Voyages of a Naturalist.*)

Common raw meat is a very good bait for these trout—the tougher the better; we generally used the meat of a crow, killed for the purpose. This flesh combines redness and a rank smell with its proverbial toughness—all-important desiderata for “killing” bait. Grubs and the larvæ of wasps are also good bait, but troublesome. When the fish are capricious we have frequently found good sport by trolling with one of the belly-fins of a fresh-killed fish.

On Puget Sound, in the vicinity of Fort Steilacoom, the writer had the best sport. A much longer residence taught him the “ropes” better; and besides, the rattlesnake was absent. Nearly every stream and brook abounds in trout; all, except the salmon-trout, not yet described, of the black-spotted species. Here we noticed many peculiarities distinguishing this fish in habits from its Atlantic congener. Although fond of running water, it seeks the more deep and less turbulent portions of the stream, and it even does not eschew perfectly still water. When a youngster, we learned and practiced trout-fishing in those beautiful tributaries of the Delaware, the Beaverkill, and Willa-weemock, in Sullivan and Delaware Counties, New York. There the trout delight in fierce water, and if found below a violent rapid, or a waterfall, they may be caught almost always just outside the strength of the current, but not by any means are they fond of the *still* water, a little farther below the rapids, unless, indeed, the weather be very cold; or if in summer, during the shades of evening, when they repair to the more placid water, that they may the more readily perceive insects and other floating food. But in Washington Territory the brook-trout seems more fond of moderate currents, or of places that are perfectly still, where the waters are well shaded and deep; and it is rare indeed for the angler to have good sport at the immediate foot of a rapid or fall. One of the best spots for trout-fishing in the neighborhood of Fort Steilacoom is a small portion of the stream running through “Melville’s claim,” near the “Government garden.” This place is where the water of the stream is very sluggish, and almost choked up by lily-pads and grass. There are here but few trees, and the brook only averages 15 feet in width by about 4 in depth. The space in which throwing the line is practicable is but of limited extent, certainly not exceeding 75 yards in length. Here one day in August, 1856, we took twenty-five trout, the weight of the fish running from four ounces to a pound. Bait and flies were both used. Nearer the fort—even within sound of its drums—there is a small isolated lake, without outlet, and fed by a small spring. This lake be-

comes almost dry in summer. It is full of trout; how they ever got into it is a mystery. Here, seated on a half-submerged log, we have caught many a fine bunch of "speckled bellies." Flies do the best there, especially late in the afternoon, and until it becomes so dark in the evening that the angler cannot see his fly break the water. After this time, unless he has artificial *white* moths, the fly must be put aside, and then the anal fin, or a piece of the belly of a fresh-killed fish, gently trolled near the surface, will frequently hook "big ones."

Steilacoom Creek, below "Chambers's Mill," is an excellent place for trout in January, February, and March. Here the waters rise and fall with the tide, and are fresh, brackish, or salt, all within the space of half a mile. The writer has there caught several male trout, weighing, two hours after killed, over two pounds each. The two largest were killed in February, 1854, with a large, unnatural, gaudy salmon-fly. Fish of large size are rarely taken in this place later than March; after that they are replaced by vast quantities of small ones, rarely exceeding 7 inches in length, which, although excellent for the table, certainly afford no sport.

Although there are other good spots, such as the Turnwater Falls, near Olympia, Clark's Creek, near the Puyallup, and many more that could be mentioned, the writer will confine himself now to the consideration of but one more good fishing-ground, and then bid the geographical portion of the article good-bye. This last place is McAllister's Creek, situated about eleven miles from Fort Steilacoom, and nine from Olympia. It affords the best trout-fishing we know of in the Territory. Perhaps there are no more fish here than in many other similar water-courses in the neighborhood, but it has the advantage of having good banks, only moderately shaded, from which casts can readily be made. The best portion of the fishing-ground extends from the old mill-site to a point about three-quarters of a mile below. This is all subject to tide influence, but the water is fresh for the greater part of the tract, and even at the lower end is but slightly brackish at high water. The best time for fishing in this creek commences about an hour and a half before high water, and lasts three-fourths through the flood-tide. In one day's fishing in October, 1856, the writer caught, at this place, thirty-eight fine trout the aggregate weight of which, six hours after death, was fifteen pounds. The bait used on that day was principally salmon-roe, one-third dried, but we have frequently taken many fish, in the same place, with artificial flies, grasshoppers, meat, and most of the other ordinary allurements. To such of our readers as may probably condemn the unsportsman-like practice of fishing with salmon-roe, meat, or grasshoppers—to those who have no patience with any other mode of trout-fishing, except by the scientific whippings of an artificial fly—we must apologize by saying that our only fly-rod was irretrievably broken, our flies were gone, and it was nearly a thousand miles to the nearest fishing-tackle store.

In the streams near Fort Steilacoom there are probably many in-

dividual brook-trout which will weigh as high as three or four pounds; but owing to the want of tackle, &c., already alluded to, the writer was never fortunate enough to secure any fish that exceeded a trifle above two pounds.

One peculiarity about the northwest trout is, that the fish remain in good condition for the table until near Christmas, at which time they begin to spawn. On the contrary, the trout of the Middle and New England States spawn during the months of September, October, and November, and may scarcely be said to be in good condition between the 1st of September and the 1st of February, being, during the interval, lean, flabby, and insipid.

The black-spotted brook-trout of the northwest is by no means dependant upon occasional access to salt water, although he seems to avail himself of its invigorating effects when practicable.

In a lake near Bellingham Bay, and also in Chiloweyuck Lake, trout of this species or its relative, the *brevicauda*, are said to attain a weight of ten or twelve pounds; and in the latter lake according to Lieut. D. B. McKibben, of the United States Army, the common weight of the fish caught will scarcely fall below three or four pounds.

## 27. SALMO MASONI, Suckley.

### MASON'S TROUT.

SYN.—*Fario clarkii*, GRD. [*non Salmo clarkii*, RICH.] *Fide* Proc. Acad. Nat. Sc. Phil., viii., p. 219, 1856; also P. R. R. Rep., Gen. Rep., Fishes, vol. x, p. 314, Pl. lxxi, figs. 5-8.

*Salmo masoni*, SUCKLEY, Pacific Railroad Reports, vol. xii, p. 345;—*IBID.* Nat. Hist. Wash. Terr., p. 345.

SP. CH.—Head forms nearly a fifth of total length. Dorsal outline well arched; back dark olivaceous; sides silvery; belly white; the whole sprinkled with small irregular spots of black, which, however, are more faint than in *S. iridea*, as if the coloring matter was placed deeper below the surface; scales large; tail forked; upper fins and tail spotted.

DIAGNOSIS.—It may be known from *S. iridea* by the absence of red patches, also by its fainter spots, more convex dorsal outline, and larger scales, nearly double in size to those of the *iridea*. From *S. brevicauda* the diagnosis is more difficult; but in the latter the scales are very loose, and the tail more encroached upon by them.

HAB.—Small streams entering into the Columbia. This fish may prove to be simply a variety of *S. iridea*, which, beyond a doubt, exists in the waters of Oregon and Washington Territories.

Dr. Cooper caught in the Katapootl River the specimen (No. 582) from which Dr. Girard drew his description of *S. clarkii*, and upon which the description of the present species is based. The *S. clarkii* of Richardson is a very different fish, probably an anadromous salmon. The habits of this fish are almost precisely similar to those of *S. iridea*.

On the 13th of August, 1859, Mr. Gibbs obtained a trout on the Ska-

git River which we have referred to *S. masoni*. The total length of this fish was 12.75 inches, and the distance from snout to dorsal fin 5.75.

"*Colors*.—Back and sides above lateral line sprinkled with small spots of irregular shape, black on the back, on the sides *blue*, with a black edge behind. Behind the anal spotted below the line. Sides, as far back as anal fin, with a broad streak of lake-red. Dorsal and caudal spotted with black. Back, dark brown, approaching to black, with blue reflections. Belly, yellowish-red. Head partly spotted above, on the snout and on the preopercula.

"Head, short and blunt. Tail, slightly lunated. Another specimen had small specks along the belly, and the colors were lighter, with more red.

"Much larger specimens were taken, but the meat in every instance was *white*. Mr. Gibbs obtained a fish, apparently similar, from the waters of the Sunilkamun, flowing into another basin; but this had red flesh, and lacked the broad streak along the sides. [This latter is probably an effect of age or sexual excitement.] The lateral line was red."—Gibbs' Mss.

Two species of trout were taken in the mill creek, east of the Columbia, at Fort Colville, through the ice. One, with red flesh, is known as the *humāna*, and is the larger—(*S. gibbsii*?) the other is the *peestl*, and is the common black-speckled brook-trout. "Again," Mr. Gibbs remarks, "the Indians say that the *Peestl* has the dashes of carmine under the jaws which the *Humāna* lacks. They also say that it is the male fish which has a reddish tinge on the belly." \* \* \* On the 2d of April "found the Indians at the crossing of the Little Spokane taking the *Humāna* in small numbers. A female had the roe entirely developed."

## 28. SALMO VIRGINALIS, Girard.

### UTAH TROUT; SOUTHERN ROCKY MOUNTAIN TROUT.

SYN.—*Salmo (Salar) virginalis*, GRD., Pro. Acad. Nat. Sc., Phil., viii, 1856, p. 220;—*IBID.*, P. R. R. Report, vol. x., p. 320;—SUCKLEY, Appendix Rep. Fishes, Nat. Hist. Wash. Ter.

SP. CH.—[Drawn from a large number of specimens in the Smithsonian collection.] Body rather slender; dorsal outline but slightly curved; tail broad and but little cut out; black spots on sides of body and on back; posteriorly somewhat stellate and numerous; anteriorly scattered, distinct, and round; top of head unspotted; anal fin spotted with black; extremity of maxillary extends to a vertical line drawn from the posterior rim of the orbit; anterior margin of dorsal nearer the extremity of the snout than it is to the insertion of the caudal.

*Colors*.—[Taken from living specimens by the writer.] Ground color of the back pale brown, tinged with red, sprinkled on back and sides with small black spots, most numerous and irregular posteriorly; anterior half of the body, with those spots scattered sparsely, and quite round

in shape; under parts white and but little spotted. [See description in detail beyond.] Anal-fin spotted, pied chin, patches on the cerato-hyals.

Fig. Plate lxxiii, Pacific Railroad Reports, vol. x. (Part embracing Lieutenant Beckwith's Report.)

HAB.—Southern Rocky Mountains, Utah, New Mexico.

DIAGNOSIS: From *Salmo lewisi*. See text relating to the latter species. From *S. iridea* it may be distinguished by its usually smaller head, the absence of dark spots on the top of the head, the profusion of which in that situation in *S. iridea* being a notable feature of the species; the sparsely scattered, large, round, black spots on the anterior portion of the body; their distinctness and regular shape distinguishes them from the more numerous spots of the latter species. The tail of this species in the adult is nearly even at its fore margin; that of an adult *S. iridea* is well forked.

A trout sent from Santa Fé, N. M., preserved in the Smithsonian collection, shows slight variations from those received from Northern New Mexico, Utah, and Nebraska. It agrees with the *S. virginalis* in many characters; in fact, in all essential points, such as the dorsal profile, size of head compared to body, &c., &c., and in general plan of coloration. It is, however, a brighter or more silvery-looking fish; its dark spots smaller and less numerous.

Dr. Girard first described this species from a young trout sent from Utah Creek, a tributary of the Rio del Norte, by Lieutenant Beckwith.

A variety of the *Salmo virginalis* occurs in Lake Utah, a large sheet of fresh water about fifty miles south of Salt Lake City. The fish are less spotted than those caught in the mountain streams near by, and attain a much larger size. They ascend the Timpanagos River for spawning purposes; at the proper time, according to the accounts of the Mormons, leaving the lake simultaneously in great numbers. They are said to be occasionally seen a yard in length. A friend—Lieutenant Williams, of the United States Army, caught one of this kind in the Timpanagos, about seven miles from the lake, which weighed seven pounds. I myself have caught smaller fish in the same stream, which varied considerably from those caught on the eastern side of Bear Mountains.

In the Smithsonian collection two fish, obtained by Captain Simpson, United States Army, seem to be of that variety. They are simply labeled as from Utah, and appear to have been salted and dried before being thrown into alcohol.

For this variety or kind we will, for the present, apply the provisional name of *Salmo utah*.

CHARACTERS.—Highest point of convexity of dorsal profile rather anterior to the same on *S. virginalis*; scales appear somewhat larger, (but this may be more apparent than real, owing to the insufficient material for comparison;) appearances of fish more silvery, spots much smaller in size and more irregular in shape; in other respects resembling *S. virginalis*.

In 1859 the writer crossed the continent via Salt Lake. In the course of this journey many notes were made concerning objects of interest in nature, most of which, however, are, from force of circumstances, necessarily excluded from these pages.

None of the *Salmonidæ* were found along our route on the eastern slope of the Rocky Mountains; but in most of the streams of Utah, more especially Black's Fork, near Fort Bridger, Weber River, and the Timpanagos, (flowing into Lake Utah through Provo Cañon,) the *Salmo virginalis*, a very handsome trout, was plentiful. In its habits and general appearance it much resembles the brook-trout of the Middle States, (*S. fontinalis*.) It is abundant in Black's For , from which, on the 25th of August, we caught half a dozen, and on the following day about forty, with the artificial fly, to which they rose exactly in the manner of their more eastern relatives, and greedily seized, like unsophisticated fish, as they were, scarcely learning caution or timidity until pricked once or twice by the alluring and deceitful bait. Probably but few artificial flies, if any, have ever before been cast on those waters. One specimen, about 10 inches in length, caught with a red-hackle, was selected for examination and description. In general outline it was, perhaps, slightly more stout than the brook-trout of New York, (*S. fontinalis*.) The curve from the nose to the anterior insertion of the dorsal fin was very regular. The anterior point of insertion of said fin was but slightly in front of a point at the middle of a line drawn from the tip of the nose to the insertion of the tail.

*Colors.*—Ground color of back, pale brown, tinged with red; spotted above the lateral line with small spots of black, which were but sparingly distributed anterior to the dorsal fin; a few spots of the same colors were also found on the opercula and on the top of the head. In shape, the spots anterior to the dorsal fin were nearly round and quite small; those in the vicinity of the same fin, but farther back, were stellate, but slightly larger, and those posterior to a vertical line drawn from the anus were much larger, more numerous, and quite irregular in form, somewhat resembling those of *S. stellatus*. Anterior to the anus there were scarcely any spots below the lateral line except near the head, where there were about half a dozen; posteriorly, however, they were equally numerous both below and above.

The general style of the spots, their size and distribution in individuals of this species, are well displayed in the figure given in Volume x, Plate lxxiii, Figs. 1-4. Indeed, in the markings, spots, &c., of this species, I noticed great uniformity in all the specimens observed. The color of the dorsal, adipose, and caudal fins was the same as that of the back, but thickly studded with oval and roundish spots of black. The prevailing reddish-brown color of the back extended to the nose, but was of a slightly different shade on the head. From the median line of the back it extended down the sides, filling up two-thirds of the space of the lateral line. The silvery-white of the belly was separated from the

prevailing color of the back by a faint golden band, of irregular width; [in some specimens this extends from the iris to the base of the tail.] The lateral line was distinct. Irides, golden bronze, with several roundish spots of black upon them of the size of a pin's head. The under fins were of a pale red, their external rays of a deeper color. Patches of bright vermilion, about one-eighth of an inch in width, were found extending back from the chin to a point opposite the middle of the opercula. The chin was white, like the belly. [The vermilion bands above spoken of exist normally in all the specimens seen of this species, and are present also in other species, for example, the *S. stellatus* of Oregon.] The tail was but slightly emarginate. Angle of mouth about opposite (below) the posterior border of the pupil.

The general hues of the Fort Bridger trout, when freshly taken, were silvery, glistening with bright reflections; the scales are somewhat larger than those of *S. fontinalis*; the point of greatest girth being reached by the tips of pectoral fins when stroked back. Upon inquiry at Fort Bridger, we learned that 17 or 18 inches might be considered the maximum size in those waters, and out of forty or fifty fish it is rare to find one over a foot in length.

The species in the Timpanagos River appeared, upon careful examination, to be identical with that of Black's Fork, but much larger. They retreat to the quiet and deep waters of Lake Utah, from whence they ascend the Timpanagos at certain seasons of the year. A friend there caught, in August, 1851, one trout which weighed some five or six pounds, (approximately,) and was 26 inches in length. They are said to grow occasionally to 30 inches in length, and are an active, fine fish, affording much sport to the fly-fisher, and a delicacy to the epicure.

About the 1st of September last, we caught three trout from the same stream. Two of these were of good size, weighing from  $1\frac{3}{4}$  to  $2\frac{1}{4}$  pounds, respectively. They rose freely to large, dark hackles, but refused gaudy or light-colored flies. Owing to poor flies, which had been in our possession for several years, the whipping of the hooks having shrunk so that they were easily pulled off, we caught but these three out of many fish that jumped at them. The stream was excellently adapted for casting the fly, and abounding in fish of fine size and quality, was fit to take position in an angler's paradise.

The trout of Weber River seemed to vary from those of Black's Fork, in having the lower fins much more tinged with yellow. The stomachs of all, when examined, were found to contain insects, such as wasps, beetles, ants, &c.

We are inclined to believe that the geographical range of the species extends to the west as far as Gravelly Ford, on the Humboldt. Specimens were examined which were caught at Deep Creek, one hundred and fifty miles west of Great Salt Lake. Approaching so nearly to the trout of all other places in general appearance, and trout-like habits so peculiar and unmistakable, we cannot refrain from again expressing entire want of faith in the so-called genus *Salar*.



## 29. SALMO LEWISI, Girard.

## LEWIS'S TROUT; MISSOURI TROUT.

SYN.—*Salmo lewisi*, GRD., Pro. Acad. N. Sc., Phil., viii, 1856, p. 210;—IBID., P. R. R. Rep. Fishes, vol. x, p. 29;—SUCKLEY, P. R. R. Rep., vol. xii, p. 348, Pl. lxxi. [By mistake written ("*Salmo salar lewisi*.")] The "*salar*" would have been stricken out had the author read the proof-sheets;] IBID., Nat. Hist. Wash. Terr. 348, pl.

*Salar lewisi*.—GIRARD, in both the works already quoted.

SP. CH.—Body somewhat thick; back well arched; head comparatively small, being contained a little more than five times in the total length of the fish. Ground color of the upper region olivaceous; of the lower, yellowish-white. The back, peduncle of tail, with the dorsal, adipose, and caudal fins, are profusely sprinkled with stellate and irregular black spots. The belly and lower fins are usually unspotted. Tail somewhat notched.

Young.—Resemble the young of *S. virginialis*.

DIAGNOSIS.—*Salmo lewisi*, Grd., is known from *S. virginialis*, Grd., by its smaller head; the greater dorsal arch; its more deeply-notched tail; that of *S. virginialis* in the adult being nearly even; by having the top of the head profusely spotted with black, and by having a different arrangement or plan of spot markings. The black spots are smaller, more numerous, more irregular in shape in this species than in *S. virginialis*, there being scarcely a well-rounded spot posterior to the middle of dorsal fin. The spots on the tail are more numerous, but not so large. The hues of this species are darker, and it is a stouter fish; its scales, also, are larger. For comparative measurements of the head and body see table.

The young of this species and the *S. virginialis* are very similar, and it is only by a comparison of adults that strong diagnostic marks present themselves. From *Salmo iridea*, Gibbons, this fish may be known by having larger scales; a much smaller head; dorsal outline more arched; head less spotted; fewer spots on body anterior to a line drawn from origin of dorsal to same of ventrals. These spots also are more symmetrically round. Those near the tail are very irregular and resemble in shape those of the *S. iridea*. The tail of this fish, although more cut out than that of *S. virginialis*, is much less forked than that of *S. iridea*. Adults of the latter, of one foot or more in length, show strongly-marked forked tails. A good example of this is shown in specimen 59, sent from Chico Creek, California. From other species of black-spotted trout the diagnosis can be made up by reference to their descriptions.

HAB.—Both slopes of the Rocky Mountains, north of the South Pass; head-waters of the Missouri, (Dr. Suckley, Dr. Cooper.) Southern tributaries of the Yellowstone; Black Hills, Nebraska, (Dr. Hayden.) Clarke's Fork of the Columbia, (Dr. Cooper, Mr. Gibbs, Dr. Kennerly.) Kootenay River, (Dr. Kennerly.) Specimens have been received from all

the above sources, and are now in the Smithsonian collection. Dr. Cooper obtained, in the autumn of 1860, a specimen of trout from the Bitter-Root River, Washington Territory, (west slope of the Rocky Mountains,) differing in no important character from two specimens of *S. lewisii* obtained by him at the Falls of the Missouri, in Nebraska. This gives the species a wide range—probably extending as far westward as the Great Falls on the Clarke, Spokane, and other rivers of the western slope. Another trout, got by Dr. Cooper from the Spokane River, above the falls, partakes partly of the characters of this species, and partly of those of the *S. iridea*, var. *stellatus*. It may be a hybrid between the two. It has no characters sufficiently distinct from either species to warrant the recognition of its title to a new name. Toward the Lewis trout the writer feels more than an ordinary interest, having probably the honor of catching the first of the species ever taken with the artificial fly. This was at a point a mile or so below the Great Falls of the Missouri, in September, 1853, after a horseback ride of thirty miles on purpose to procure specimens. Their existence had been indicated by Lewis and Clarke, who spoke of having caught black-speckled trout at the falls. I found them a lively, fine fish, jumping readily at the fly, and taking bait freely. Three-quarters of a pound appeared to be the average weight, but, doubtless, individuals of much larger size are found. Two of my specimens, taken in 1853, were sent to the Smithsonian, and were rendered typical of the species, as from them Dr. Girard based his original description. They still exist in the collection, numbered 520 in the museum catalogue of fishes.

### 30. SALMO BREVICAUDA, Suckley.

#### SHORT-TAILED TROUT.

SYN.—*Salmo brevicauda*, SUCKLEY, Notices of Certain New Species of North American Salmonidae. New York, June, 1861.

SP. CH.—Body long and slender; its dorsal outline from a point opposite the posterior margin of the operculum being nearly straight. Scales large, quite thin, and glistening with metallic lustre; very loosely adherent. They encroach upon the tail for nearly a third of its length, thus giving it a short appearance. The peduncle of the tail is wide for the depth of the body, and the caudal itself is somewhat short and narrow. Head long, but not deep. Dorsal and caudal fins freely spotted with oval black spots. Body marked with small stellate and irregular dark spots, their number and size varying greatly in different individuals. There are usually two rows of teeth on the vomer. The head is contained nearly five times in the total length, which rarely exceeds eighteen or twenty inches. The tail appears shorter than it really is by reason of the great distance upon it that the scales extend.

DIAGNOSIS.—Upon a comparison of adults this species may be readily distinguished from *S. iridea* by its long, slender head and body, its appa-

rently short, narrow tail, and its thin silvery scales, so easily detached.

HAB.—Obtained from the waters of Puget Sound and the streams in that vicinity by Drs. Kennerly, Cooper, and Suckley.

This trout abounds in the fresh-water streams emptying into Puget Sound, and are not unfrequently caught in tide-water. It is known to the Nisquallies and Puyallups as the *kwousptl* or *skwouss-puttll*.

Mr. Gibbs obtained at Skagit River Rapids July 29, 1858, a small salmon or trout which the Indians said did not go to salt-water, called by them *tsee-tseh*; white beneath; back, grayish-olive. Its length does not exceed 10 inches.

### 31. SALMO GIBBSII, Suckley.

#### COLUMBIA SALMON TROUT; GIBBS' SALMON.

SYN.—*Fario tauppitch*, GRD., in Proc. Acad. N. Sc., Phil., viii, p. 218, 1856;—GRD., Rep. on Fishes, U. S. P. R. R. Surveys, p. 318, 1858. [*Non salmo tauppitch*, RICHARDSON.]

*S. gibbsii*, SUCKLEY, Annals N. Y. Lyceum, 1858;—IBID., Nat. Hist. Wash. Ter., p. 332;—IBID., P. R. R. Repts., xii, 332.

*Black-spotted Salmon-trout*, Lewis and Clarke;—*Shooshines* of the Walla-Walla.

Figures.—The typical specimen of the present species is figured as *F. tauppitch*, in P. R. R. Rept. Fishes, vol. xii, Pl. lxix.

SP. CH.—Body elongated, compressed, fusiform in profile; dorsal outline but slightly arched; snout rounded, the jaws sub-equal; maxillary greatly curved, dilated posteriorly, and extending in a vertical line passing slightly behind the orbit; anterior margin of dorsal nearer the extremity of the snout than to the insertion of caudal fin; colors of the head and back, in the fresh specimen, rich, dark olive-green, profusely dotted with roundish black spots, the scales in certain lights showing bright silvery reflections; sides below the lateral line are usually unicolor, of a yellowish-white; inferior fins unspotted; tail and upper fins yellowish olive, profusely spotted with round and oval spots of black, each spot being from one to two lines in diameter, and completely isolated from the others, not confluent, as in some other species; caudal fin moderately lunated, not forked; head, small; teeth, small and very numerous, especially on the labials; length of the full grown adult rarely exceeds two feet.

HAB.—The Columbia River and its larger affluents. The species is not anadromous, but remains in fresh water throughout the year—so say the Indians.

In the typical specimen of this species (Smithson. Cat., 940) the length of the head, taking the extreme distance from the tip of the snout to the farther margin of the operculum, enters six times in the total length of the fish. Its length from snout to nape is contained nine times in the same. In its affinities this salmon appears in structure nearly related

to the anadromous, *S. truncatus*, and *S. gairdneri*, but its head, compared to the total length, is comparatively larger. It has, also, a persistently varied plan of coloration—its spot-markings being more numerous. The body, also, more compressed laterally.

No additional specimens of this fish have been obtained since the original description appeared. We may, therefore, be pardoned for reproducing a few remarks then made—more especially, perhaps, because it is desired to embody herein all the useful information concerning this group of fishes that will tend to assist the field naturalist, who necessarily can carry about with him but a limited library. "The typical specimen upon which the foregoing description is based is a single skin contained in the Smithsonian collection, Catalogue, No. 940, that of a female, obtained by the present describer at Fort Dallas, Oregon, April 5, 1855." The species is known to the Walla-Walla Indians as the *shooshines*; and to the Wascos by the name of *te-kwan-eek*.

Mr. Girard, taking the specimen for the *S. tsuppitch* of Richardson, figured and described it as belonging to that species. Upon his attention being called to several marked discrepancies between the account given by Sir John Richardson of the *S. tsuppitch* and certain characteristics of the specimen from Fort Dallas, he at once coincided with me in considering the two species distinct. According to Richardson, the *S. tsuppitch* has the dorsal, anal, and caudal fins destitute of spots and the tail forked. The present fish on the contrary, has the tail but moderately lunated at its extremity; and the dorsal fins and tail are profusely spotted with black. These prominent differences, besides many others less striking, have been deemed sufficient to settle the question of non-identity of the two species; and as no recorded description seems to refer to the present salmon, it is now presented as a new species, under the name *Salmo gibbsii*, in honor of my valued friend George Gibbs, esq., geologist to the Northwestern Boundary Commission, and for many years a resident of Washington Territory. To Mr. Gibbs, more than any other individual, am I indebted for rare specimens in all branches of natural history, and especially for information, aid, advice, and encouragement while endeavoring to elucidate the history of the Salmonidæ of the northwest coast.

This salmon is obtained, during the winter and early spring months, at Fort Dallas, Oregon. It is also found, during the summer, in the Yakima, John Day's, and other rivers emptying into the Columbia. In the fall of 1855 I obtained a fine specimen of a fish resembling this species from Boisé River, one of the tributaries of Lewis's Fork. Its flesh is good for the table, and the size renders it convenient for culinary purposes, as it rarely exceeds five or six pounds.

Most individuals have a broad reddish or blush along the sides, commencing at the middle of the opercula, and extending to near the base of the tail. This band is apparently subcutaneous, and may exist only in individuals not in prime condition.

Nathan Olney, esq., long a resident at the Dalles, Oregon, writes that this species does not go down to the sea, but that the Indians take it all the year round, except during the coldest weather in winter, and then, perhaps, because they do not fish for it. He adds that he has eaten them as late as December and as early as February, and thinks that if they do go to the sea, they "run" all the year.

### 32. SALMO SEBAGO, Girard.

#### THE SEBAGO TROUT.

SYN.—*Salmo sebago*, GRD. Proc. Acad. Sc. Phil., 1853, p. 380.

*Salmo gloveri*, GRD. Proc. Acad. Sc. Phil., vol. vii, p. 85, May, 1854. [Description of *S. gloveri* based on the young of *S. sebago*.]

*Salmo gloveri*, HARRIS, Proc. Phil. Acad. Sc., 1858, p. 136.

SP. CH.—[Based on three specimens in the Smithsonian collection.]

*Male*.—Head contained nearly four and a half times in the total length of the fish. Pectorals quite long, reaching to a line perpendicular to a point about half an inch anterior to first ray of the dorsal. Gape line of mouth much arched. Point of lower jaw armed with a conical flesh knob, projecting upward. Sides of the body, principally above the lateral line, covered profusely with large black spots, of roundish and irregular shapes, and occupying from three to five scales. The largest black spots on the fish are those on the operculum and pre-operculum. Lower fins and tail unspotted, and of a bright color, bordered with dark, (as seen in alcoholic specimens.) Free margin of tail handsomely crescentic. Scales very large and adherent. A row of teeth on the tongue, and another on the vomer.

*Female*.—(Specimen about 17 inches long.) Spotted much as on the male. Caudal more furcate. No fleshy projection from the chin.

*Young*, (*S. gloveri*, Grd).—According to Dr. Girard, have a few small, reddish orange dots in the middle of the black spots. These seem to be wanting in the adult. The color in the female is uniform silvery-gray, darker on the back and head. Subquadrangular or subcircular black spots are observed upon the sides of the head, behind the eyes, along the back and half of the flanks, also on the dorsal and caudal fins, to near the edge. In the male the same colors exist, but spread all over with a reddish tint, more intense on the flanks and beneath than on the head, back, and dorsal, and caudal fins where the red is sometimes but faintly indicated.

HAB.—Lakes in the "southern part of the State of Maine," Union River, Maine, Saint Croix River, Passamaquoddy Bay.

DIAGNOSIS.—From the young of *S. namaycush* and *S. siskowet*, by the presence of its black spots; also by the crescentic-shaped extremity of the tail—that of both of the other species being strongly furcate. This species, however, when not full grown, has a forked tail; that of the female is more so than that of the male. The young *S. sebago* may

be distinguished from the young of any other salmon and trout on the Atlantic slope, by its strongly-marked black spots and coarse scales. The adult male in the collection was 19 inches long. The young of this fish was described as a distinct species, by Mr. Girard, in 1854, and named the *Salmo gloveri*. Upon comparing the types of both, their manifest identity is so apparent, that I have not the least hesitation in making *S. gloveri* a mere synonym of *Salmo sebago*, Grd. Three specimens of the species are in the Smithsonian collection—male, female, and young.

Mr. Edward Harris, in a letter to the Phil. Acad. Sc., (accompanying specimens of what he called the *S. gloveri*,) read June 23, 1858, gives the following information concerning the species, of which he had taken specimens at the outlet of Grand Lake, on the western branch of Saint Croix River:

“These fish are taken also in moderate quantities lower down the stream. But on the waters below Lewey’s Island, which are of a darker color and constantly filled with saw-dust from the mills, the fish lose their silvery brightness, and have the appearance of having been immersed in a yellowish dye; these fish, too, are always in a poor condition. \* \* \* \*

“It has heretofore been considered by those who are acquainted with this fish, that they were entirely confined to the waters of the Saint Croix, including its two branches and their lakes, in fact confined almost entirely to the lakes and their outlets; and it is only on this trip that I have heard of specimens having been taken as a variety in three small lakes which empty into the lower Saint Croix and into Passamaquoddy Bay. The fish described by Mr. Girard, as found in Union River, would have but a short distance farther to travel in the salt-water before entering that river. It is, therefore, pretty certain that they are, as far as yet known, confined to the waters of the Saint Croix, and streams of easy access therefrom by sea. They appear not to be known in New Brunswick, except in one of the small lakes alluded to, which empties its waters on that side of the river. Mr. Perley is said to be unacquainted with the fish, except from report. \* \* \* \*

“These fish, as taken, may be said to run from one to five pounds in weight, as it is very rare to take fish of a size intermediate between the small fish with the red spots, and those of the size of these specimens.”  
\* \* \* \*

“As a game-fish, affording fine sport to the fly-fisher, I doubt whether it has its equal on this continent, with the exception of the true salmon. Its strength and agility are surprising; when hooked it will frequently make a succession of leaps, two or three feet clear of the water. It is most readily taken with the fly in more rapid waters above the dam, at the foot of Grand Lake, which has been made for the purpose of running logs. They are readily taken while the gates are up, but as soon as they are closed and the waters become still, they decline the fly, but

will still take the bait. At this time it is necessary to fish below the dam, where there is still a very rapid current, from leakage and overflow. The brook-trout, *S. fontinalis*, is taken in the same waters, and, in the stiller waters above, a large lake-trout, there called the *togue*, which differs from the *Salmo confinis* of the northern lakes, by having a more deeply forked tail like the *S. siskowet* of Lake Superior."

Mr. Harris there makes some interesting remarks on the peculiar deformed appearance which the jaws of certain salmon present during the spawning season.

### 33. SALMO KENNERLYI, Suckley.

#### KENNERLY'S TROUT; CHILOWEYUCK RED SALMON-TROUT.

SYN.—*Salmo kennerlyi*, SUCKLEY, Notices of Certain New Species of Salmonidæ. New York, June, 1861.

Sp. CH.—*Male*: The head, measured from snout to nape, is contained about seven and a half times in the total length; when measured from the same point to extreme edge of operculum it is contained but four and three-quarter times. The point of greatest depth of body corresponds to a line drawn from the back downward, about midway between the tips of the adducted pectorals and the anterior insertion of the ventrals. The tips of the dorsal and ventrals when flattened backward reach the same imaginary vertical line. Adipose dorsal commences at a point nearly opposite the origin of the last ray of the anal—the tips of both fins extending backward equally far; tail strongly forked, its free margin somewhat waved. Snout somewhat turned up, the lower jaw projecting slightly beyond the upper. A single row of teeth along the anterior half of vomer. Teeth on the premaxillaries rather strong. Size of adult rarely exceeds 10 or 11 inches; body compressed laterally, its greatest depth contained four and a quarter times in total length. Dorsal outline strongly arched, from the nape, the ridge being somewhat sharp. Curve of belly from origin of ventral fin to that of the last ray of the anal very sharp; from thence to the caudal the upper and lower borders of the peduncle of the tail are almost straight and parallel. General color red, dingy along the back, paler on the sides, and fading to pure white on the belly. Small, irregular, black spots above the lateral line. Pectorals bluish, their tips slightly grayish. Dorsal and ventrals red. Tail slightly spotted.

*Female*: Jaws more equal. Snout curled up. Length about the same as that of male, but the depth of the body is not so great, neither is the sharp, hump-like ridge on the back so apparent.

*Colors*.—General color red, but slightly darker than the male. In other respects the sexes appear to agree.

DIAGNOSIS.—The *Salmo kennerlyi* can be readily recognized by its narrow, deep body, red colors; the back spotted with black, and the sharply forked tail.

HAB.—Chiloweyuck Lake, near the Fraser River, (Dr. Kennerly.) Nahoi-al-pit-kun R., (Mr. Gibbs.) This interesting species was first obtained at Chiloweyuck Lake, near the forty-ninth parallel, and but a short distance from Fraser River. It has seemed proper to name a fish so well marked and so distinct from any other known American species in honor of Dr. C. B. R. Kennerly, (its discoverer,) naturalist to the Northwest Boundary Commission, whose lamented death, while returning home after three years uninterruptedly spent in exploring the wilderness, has already been alluded to in the early part of this report. The full-sized figure in the plate was taken from a male specimen in good preservation, now in the Smithsonian collection. This has 25 rows of scales above the lateral line (counted just anterior to dorsal fin), 24 below the line to middle of belly; 155 on the lateral line and its fin formula as follows: P. 17: D. 10: V. 11: A. 17: C. 21. In different individuals the branchiostegals vary from 12 to 15 on a side. One female had 12 on one side and 15 on the other. Mr. Gibbs's specimen from the west of the Cascade Mountains seems to differ only in size from those obtained at Chiloweyuck Lake. It is now in the Smithsonian collection, No. 2006 Museum Catalogue, fishes.

Dr. Kennerly, in his notes and journal, gives the following items of interest concerning it:

"August 16, 1859. *Chiloweyuck depot*: When we returned from our morning expedition, Lieutenant McKibben had been up to old Camp Chiloweyuck, and in the small stream near had seen vast numbers of a small species of red salmon, and had caught many. They doubtless ascend to get out of the way of the *chewagh*, who feed upon them. A *chewagh* weighing 9½ pounds, caught by the party to-day, had two of these small salmon whole in his stomach."

[NOTE.—Dr. K. must be mistaken about the cause of the appearance of this fish in such situations annually, as the *S. oquassa* and various other species have the same habit when about to spawn.—S.]

August 17, 1859. *Lake Chiloweyuck*.—To-day Captain Woodruff and myself took several men with us, and went after the small salmon mentioned by Lieutenant McKibben, yesterday. In a short time after reaching the small brook spoken of, we had rare sport, killing one hundred and eighty fish. Considering these sufficient for our present wants, we ceased and returned home. A Skopaalitch Indian calls the kind *tsi-mia*, and says they are common in Swheltscha and Pekosie Lakes, and that they never descend into smaller streams, and never go to the salt water. They are said to last but a short time, and disappear entirely after the arrival of the *howhuts*. At another date he adds: "I believe this fish is peculiar to the Chiloweyuck Lake, where it makes its appearance, about the 10th of August, at the mouths of all the small streams emptying into the lake. They are then found in immense numbers; so numerous are they that they may be caught with the hand. They are followed by the *chewagh*, or large salmon-trout, who feed upon them. They try to escape



their enemies by crowding the most shallow brooks, where they are easily taken with a hand-net. The Indians here call them *tsi-mia*. About the 1st of September they disappear quite suddenly." Again he writes, September 1: "Have been fishing as usual, and with good success; caught a salmon-trout, or *chevagh*, (*S. campbelli*,) with hook and line, which weighed eight pounds. The little red salmon have nearly disappeared, and those left are turning white, undergoing the same change which takes place later in the season with the *korwhuts*." Kennerly, (in mss.)

### 34. SALMO WARRENI, Suckley.

#### WARREN'S TROUT.

SYN.—*Salmo warreni*, SUCKLEY. Notices of Certain New Species of N. A. Salmonidae, New York, June, 1861.

Typical specimens 2070, 2073, in Smithsonian collection of fishes.

SP. CII.—[The largest specimens examined by the describer were not over 10 inches in length. They may have been immature individuals of a larger anadromous species, but were labeled "trout" by Dr. Kennerly.] Dorsal outline strongly arched; its convexity rising suddenly from the nape, and attaining its height at a point near a line drawn perpendicular to the lateral line and touching the tips of the pectorals when flattened backward along the sides. Head rather broad; muzzle somewhat conical; jaws equal and rounded. The eyes beneath plane of lateral line. Opercula and pre-opercula spotted with minute spots of black. Numerous stellate and irregular black spots, many of which are quite faint, as if obscured by the thickness of the overlying scales; belly white; back bluish or greenish; dorsal fins and tail spotted; scales small, (but much larger than in *S. fontinalis*,) compact and very adherent; when glistening in certain reflections, giving an enameled appearance to the fish. Tail forked.

DIAGNOSIS.—See text beyond.

HAB.—Waters of Fraser River, British Columbia, near Chiloweyuck depot. Dr. Kennerly.

Dr. Kennerly sent home six specimens of this salmon from Chiloweyuck depot. They are handsome and silvery, appearing as if fresh run from the sea.

The description was drawn from Dr. Kennerly's specimens already spoken of. The largest of these was about 9 or 10 inches long; the smallest not quite 6. In none were the dark bars of youth visible; so I have not been disposed to consider them the young of a larger species of anadromous salmon, although their silvery appearance would incline to that conclusion. They seemed to be more compressed laterally, and to have greater comparative depth than individuals of the species known as *S. iridea*, Gibbons; or of the *S. masoni*, Suckley. The thick glistening scales—obscuring to a certain extent the numerous black stellated spots beneath—serve as another point of difference between this fish and *S. iridea*, (*S. stellatus*, Grd.,) in which the scales seem thick,

and the black markings very apparent. This salmon is named in honor of W. J. Warren, esq., the Secretary of the Northwestern Boundary Commission, as a slight acknowledgment of the great and oft-repeated kindness with which he has facilitated the operations of the naturalists of the expedition.

Except the word "trout," on the invoice, Dr. K. has left nothing recorded upon the habits of this fish.

### 35. SALMO BAIRDII, Suckley.

#### BAIRD'S RIVER TROUT; RED-SPOTTED ROCKY MOUNTAIN TROUT.

SYN.—*Salmo bairdii*, SUCKLEY, Notices of New Species N. A. Salmonidæ, N. Y., June, 1861.

SP. CH.—Drawn from two skins of adults in the Smithsonian collection, one sent by Dr. Kennerly, the other supposed to have been sent by Lieutenant Mullan, U. S. A. Head contained about five times in total length; snout having a deep notch between the extremities of the premaxillaries, receiving a conical fleshy protuberance that projects upward from the chin. Teeth strong, hooked, and very uniform in size; two rows on the tongue; from two to four on the front of the vomer; none on its shaft. [In one of the specimens examined, a single accidental small tooth was found on the shaft of this bone; on the other, none.] Sides of the body beautifully spotted with rose-colored spots, of the size of small peas, of which there are numerous rows. Nostrils double. Tail broad, and but moderately lunated. Scales small. Anterior rays of the pectorals, ventrals, and anal, broad, and the skin upon them colored yellowish-red as in *S. fontinalis*. Attains the weight of ten or twelve pounds.

DIAGNOSIS.—This trout being a red-spotted fish, is not likely to be confounded with any species west of the Rocky Mountain divide, except the *S. campbelli* and *S. parkei*. From the former it may readily be distinguished by the great number, separation, and regular roundness of the red spots, and by lacking the cream-colored spots on the back, and also below the line of red spots which the *chewagh* (*S. campbelli*) has. The tit-like flesh protuberance at the chin and corresponding notch above are also wanting in the latter species. From *S. parkei*, it may be known by lacking the pale-green spots on the back, and by its smaller head.

HAB.—Clarke's Fork of the Columbia, and its tributaries. This beautiful species, a specimen of which Dr. Kennerly obtained in September, 1860, at Camp Kishenehn. It was caught in a mountain torrent, coming down from the main divide of the Rocky Mountains, and emptying into the Flathead River. At the same place several others were killed, apparently working up to spawn. Upon examination the fish soon proved to be undescribed. Its size and beauty induced the writer to name it after Spencer F. Baird, of the Smithsonian Institution.

It has many characters in common with the *S. fontinalis*, Mitchill, or common brook and pond trout of New York State. The color of the skin upon the broad anterior rays of the under fins, the red spots, small scales and general style, are very similar. But the different shape of the mouth, the notch between the intermaxillaries, the great size, the larger number of red spots, are sufficiently diagnostic.

The two specimens of this fine trout which we possess vary somewhat in their branchiostegals and fin-rays, as follows:

(Typical.) Br. 14: P. 13: D. 13: V. 10: A. 11: C.—Dr. Kennerly's specimen, No. 2010. Br. 13: P. 14: D. 11: V. 10: A. 10.—One supposed to be from Lieutenant Mullen, No. 2011.

### 36. SALMO PARKEI, Suckley.

#### PARKE'S RIVER TROUT.

SYN.—*Salmo parkei*, SUCKLEY, Notices of Certain New Species Salmonidæ, New York, June 15, 1861.

*Green speckled-back trout. Aitskst, of the Kootenays.*

SP. CH.—Head contained about four and a half times in the total length; its top flat; muzzle, pointed. Tail forked; unspotted. Back dark-green, spotted with spots of lighter green; sides spotted with red. Scales adherent and about the size of those of *S. bairdii*. A disposition toward the formation of a fleshy "tit" projecting upward at the point of lower jaws, with a corresponding notch between the premaxillaries. Superior maxillary reaches to a point considerably behind the eye. Branchiostegals 13–14. The anterior rays of the lower fins are covered with a differently-colored skin from that of the rest of the fin, as in *S. fontinalis* and *S. bairdii*. Two teeth on the outer extremity of the vomer, behind which from one to three on the shaft.

DIAGNOSIS.—From *S. campbelli* it differs in lacking the cream-colored or whitish spots along the back, by its large head and turned-up knob at the point of the jaw. From *S. bairdii* it may be recognized by its larger head, which is contained but four and a half times in the total length; that of *S. bairdii* being contained five times; also by its more deeply-notched tail, and by the presence of the pale greenish spots on the back.

HAB.—Kootenay River, Rocky Mountains.

"A specimen of a young male *aitskst* was taken April 6, 1860. Back lighter than olive-green; reflections silvery; beneath, white. Sides with light flesh-colored spots, nearly round; those on the back are of a very pale green. Length, 21 inches; head, 5; to end of lateral line, 18.50; to dorsal, 9.25; to ventral, 10.25; to anal, 14.50; to adipose, 15. Tail moderately lunated, having a spread of six inches. The body elongated and slender; head very long; mouth large, with thick "lips;" all the fins dark-colored. It is said to be found in the lakes of the Upper Columbia, Kootenay, and Clarke's Fork."—Gibbs.

## 37. SALMO OQUASSA, Girard.

## BLUE-BACK LAKE-TROUT; THE OQUASSA TROUT.

SYN.—*Salmo oquassa*, GRD. Proc. Bost. Soc. Nat. Hist., vol. iv, p. 262. (Read before the society October 20, 1852.)

SP. CH.—[Condensed from Dr. Girard's description, and the examination of eight specimens.] Length (of full grown adult?) from 8 to 10 inches. Body subfusiform, slender, graceful. Head proportionally small, conical. Mouth smaller than in *S. fontinalis*, from which it also differs in the structure of the opercular apparatus. Fins placed in the same relative positions as the latter, but larger, excepting the adipose, which is considerably smaller. Margin of the caudal somewhat forked and undulated. Scales much like those of the brook-trout, but larger. Lateral line similar in both species.

Colors.—A bluish tint extends all along the back from the head to the tail, so that when seen from above the fish appears entirely blue. Sides and abdomen silvery-white in the female, and of a deep reddish-orange in the male, spotted in both sexes with the same hue as the abdomen. Dorsal and caudal fins brownish-blue, bordered with pale orange in the male; the pectorals, ventrals, and anal of a fiery-orange, blackish-blue at their bases, and margined with white.

HAB.—Moosemeguntic Lake, Kenebago River, Lake Oquassa, Maine.

According to Dr. Girard this is a lake species, of great delicacy and beauty. It is found on Lake Moosemeguntic, making its appearance from the depths about October 10, and, coming near the shore, ascends the Kenebago River in shoals. Half a mile from its mouth the Kenebago receives the outlet of Lake Oquassa. The trout there leaves the Kenebago and enters Oquassa Lake, where its voyage comes to a close. After the middle of November it returns to Moosemeguntic, and is not again seen till the following year. It is known to the residents of that region as the *blue-back*.

Dr. Girard adds the following remark: "The flesh of the fish is highly flavored and more delicate than the brook-trouts in Europe and America. It resembles that of *S. umbla*, of the Swiss Lakes, both in the peculiarity of its habits and its delicacy. *Salmo umbla* is a lake-trout, an inhabitant of the deep, making its appearance near shores January and February to spawn, and never ascending the brooks or rivers, tributaries of the lakes.

DIAGNOSIS.—From *S. gloveri*, by lacking black spots; by its smaller scales. - From *S. fontinalis*, or the common brook-trout, it can be distinguished by the uniform color of the back; its unspotted fins, (tail included;) slightly larger scales; small, conical head; slender body; small size of the light spots along the flanks, and by the colors, as given.

## 38. SALMO NAMAYCUSH, Pennant.

## MACKINAW TROUT; GREAT LAKE TROUT.

SYN.—*The Namaycush salmon*, PENNANT, Aret. Zool. Suppl., ii. p. 139, 1792.

*Salmo amethystus*, MITCHELL, Journ. Acad. Sc. Phil., vol. i, p. 410; DE-KAY, Nat. Hist. State of N. Y., Fishes, p. 240, Pl. lxxvi;—STORER, Synop. 1846, p. 193.

*Salmo namaycush*, RICH, F. B. A., vol. 3, p. 179, Pl. 79 and 85;—KIRTLAND, Report on the Zool. of Ohio, p. 195.—Boston Journ. N. Hist., 1842, iv, p. 25, Pl. 3, fig. 2;—AGASSIZ, L. Superior, p. 331, Bost. 1850.

*Salar namaycush*, VALENCIENNES, CUV. & VAL., H. N. Poissons, xxi, p. 348, 1848.

SP. CH.—[Drawn up from DeKay's description and the examination of specimens in the Smithsonian Institution collection.] Body robust; dorsal outline moderately arched. Lateral line nearly straight. Scales small, oval, adherent. Head one-fourth of total length. Nostrils double; contiguous muzzle somewhat pointed. Mouth large. Jaws strong? in the male, (when worn out;) the upper are longest, the lower having a conical point at their tip; jaws and tongue with a single row of teeth on each side; vomer with but a single row. Teeth strong, sharp, translucent; in the breeding season showing a beautiful amethystine color at their bases. Dorsal fin nearly in centre of fish; its height slightly longer than base.

RAYS.—Br. 12: D. 12-14: P. 15: V. 9-10: A. 11-13. Pectorals low down, pointed. Caudal strongly forked. Length from 2 to 5 feet.

COLORS.—Dark or dusky brownish-gray above; chin and under parts light-ash or cream-color. Back and sides specked with numerous irregularly-shaped spots of lighter gray, brown, or soiled white. Lower fins slightly yellowish.

DIAGNOSIS.—From *S. siskowet*, by its pointed snout and chin; by its more deeply-forked tail; by the difference in the style or pattern of its markings; its larger size and larger head, which in this species is contained four times in the total length, while that of the *siskowet* nearly five. In the specimens examined by the writer, the teeth of the *namaycush* appear to rake backward more. From all other lake-trout it may be distinguished by its great size.

HAB.—Lake Huron, Lake Michigan, Lake Superior, and, according to Richardson, all the great lakes which lie between the United States and the Arctic Sea; but never found in tidal waters.

Only two specimens\* of this fish are contained in the Smithsonian collection—both young, the largest about 20 inches long. These possessed a few teeth in a cluster at the anterior extremity of the vomer, and then a few scattered in a single row along its shaft, for half its length. But a single row of labial teeth. Sir John Richardson mentions a double

\* Full collections at date of publication.

row of vomerine teeth, but may have been deceived by their alternate slanting toward opposite sides. Single rows of vomerine teeth will thus often mislead, by appearing as if double. In our humble opinion the character is of but little importance. We have dissected trout which were apparently identical in every other respect, taken from the same jar, and labeled from the same locality, some of which had single, some double, and others incomplete double rows.

According to Herbert, ("Frank Forrester,") from observations of his own in the region where they are found, out of hundreds of specimens which he saw, none weighed less than 17 or 18 pounds, and many as high as 45. Sir John Richardson quotes Dr. Mitchill as his authority, that one had been caught weighing as high as 120 pounds. It is rare, however, to find them weighing over 50. Herbert (*vide* Supplement Fish and Fishing) says, "The average of this fish is fully up to 20 pounds," and adds, "The flesh of this fish, as an article of food, is exceedingly bad; it is coarse, flabby, and at once rauh and vapid, when fresh, if such a combination can be imagined." Again, he says, "When salted and smoked, or preserved in salt-pickle, it is somewhat better, though not at all equal to its sister fish the Siskowitz." He believes that neither fish can be taken with the fly or the spinning-minnow in trolling; and that, if ever taken in either of these modes, or with spoon or squid, it is contrary to their usual habit, and may be considered a freak of the fish, and one of so rare occurrence as to render it a very unprofitable attempt for the angler to endeavor to take them by any of these modes. This opinion was given after repeated inquiries "among Indians, hunters, and scientific anglers on the lake."

At Lake Superior they are taken in vast numbers through the ice. Strong lines some 50 feet in length are used, each having attached three or four baited hooks, so that it is not uncommon to capture two or more trout at a time. Suckers and other small fish form their ordinary food. They are said to be a very voracious fish, but not an active fish, unless hooked.

Herbert says: "A coarse, heavy, stiff rod; a long and powerful oiled hempen or flaxen line, on a winch, with a heavy sinker, a cod-hook baited with any kind of flesh, fish or fowl, is the most successful, if not the most orthodox or scientific mode of capturing him. His great size and immense strength alone give him value as a fish of game; but when hooked, he pulls strongly and fights hard, though he is a boring, deep fighter, and, I think, *never* leaps out of the water like the true salmon or the brook-trout."

In a discussion at a meeting of the Boston Society of Natural History, Professor Agassiz remarked that the color to which the *S. namaycush* owes its name of *S. amethystus* does not show itself distinctly while the fish is swimming, or when first caught, but only after being taken from the water, when the mucus on the surface begins to dry. The general color of this species varies with the ground on which it is caught. Those

found on a muddy bottom are generally grayish, while those from a gravelly bottom are of a reddish color, with much brighter fins. The sexes differ in shape, the male having a more pointed head than the female, although the jaws are of equal length. The ventral fins are placed very far back—a valuable specific mark in the *Salmonidæ*, a family in which it is very difficult on characteristic differences.

In answer to a question from Dr. Storer, Professor Agassiz replied that he did not notice the amethystine color in the mouth of this species.

### 39. SALMO CONFINIS, DeKay.

#### LAKE-TROUT.

SYN.—*Salmo confinis*, DEKAY. Nat. Hist. N. Y., p. 238, 1842.

SP. CH.—Colors blackish, with numerous gray spots. Body robust; comparatively short in proportion to its depth. Caudal fin, with sinuous margin. Length 2 to 4 feet. The body thicker and shorter than the common salmon. Head flattened. Snout produced, and, in old individuals, with a tubercular enlargement on the extremity of under jaw, which is the shortest, and received into a cavity in the upper. A row of teeth on the central furrow of the tongue. Attains a weight of 30 pounds.

HAB.—Lakes in Northern New York. Silver Lake, Pennsylvania. The foregoing description is condensed from Dr. DeKay's. He adds the colors of a freshly caught fish: "All the upper part of head and body, bluish-black. Sides of head and body, base of first dorsal, caudal, and anal fins with numerous rounded, crowded, irregular, gray spots." \* \* \* Chin, brownish bronze. Irides, salmon-colored. Dr. DeKay's notes, as hinted at by Herbert, probably refer to two different species of fish—the present species, and perhaps *S. symmetrica*, Prescott. This will account for the discrepancy between his observations and the recorded evidence of others, as to size, &c. No specimens of *S. confinis* are in the Smithsonian collection.

Herbert's account of this lake-trout may possibly be applicable to the *S. symmetrica*, but, being quite interesting, is here introduced:

"Concerning no fish have I seen occasion so greatly to alter my expressed opinions, founded chiefly on the opinions of others, and, where original, formed from examination of fish taken in the waters of the Eastern States, and in Lakes George and Champlain, in none of which is it either a game-fish, or, in my opinion, a good fish.

"I still doubt greatly whether there be not two distinct species of lake-trout; one quite peculiar to the small lakes of New York. Certainly I never saw or tasted any lake-trout similar in appearance, or equal in taste and flavor, to those which I ate at Geneva, and which were subsequently sent down to me in ice, by my friend, Mr. Mandeville, of that city. The description of these fish exactly tallies with the account of the red-fleshed lake-trout of Hamilton County, where I have never fished,

being deterred therefrom by dread of that curse of the summer angler, the black-fly, which is to me especially venomous.

"A letter, which I insert below, from a capital angler, who has caught this fish in the far-famed Louis Lake, agrees exactly with the characteristics of the Seneca Lake trout, but not with his habits; as I have the best authority for stating that in Seneca Lake they are never taken either by the fly or by trolling; although in Crooked Lake, immediately adjoining it, they are constantly caught by trolling for them with shiners strung upon the hook, and drawn head foremost, with a hook, leaded to sink 20 or 30 feet.

"In Seneca Lake they are taken on set-lines, varying in depth from 25 to 400 feet; concerning which method, more under the head of lake-fishing.

"The following is an accurate description of one of the fish sent to me from Seneca Lake. It differs, as will be seen, in many respects, in structure, shape, and color, from the account quoted at page 117 from Dr. DeKay's Fauna of New York, almost widely enough, in my opinion, to justify its erection into a separate species.

"*Dental system.*—A double row of strong, hooked teeth, on the labials and palatines of the upper jaw. The vomer perfectly smooth and toothless. In the lower jaw, a single row of strong hooked teeth on the labials, and a double row of smaller size on the tongue.

"Branchiostegous rays, 11 on the right side, 13 on the left. Pectoral fin rays, 16; ventral, 10; anal, 12; dorsal, 13; caudal, 27.

"In all these respects it differs from De Kay's *Salmo confinis*. Whole length, 19½ inches. Head, 4 inches to the lower margin of the interoperculum. Eye, 1½ inches from tip of snout. Origin of the ventral fin, 9¼ inches; of the anal, 13; of first dorsal, 8½; of second dorsal, 14 from the tip of the snout. Depth of the fish at the origin of the first dorsal, 3⅔ inches; breadth of back, 2 inches. Curvature of the belly greater than that of the dorsal outline.

"Color of the head, dark bluish-black. Irides, silvery; gill-covers, silvery, with nacreous reflections. Back and sides, above the lateral line, beautiful, glossy, cerulean-blue, mottled with bright silvery spots of the size of large duck-shots; below the lateral line the silvery spots are larger and the ground lighter blue; belly, pure silver.

"Pectoral fins, pale yellowish-green; ventrals and anal greenish, very faintly tinged with red. First dorsal, greenish-transparent, veined with black; second dorsal, silvery-gray, slightly mottled; caudal, greenish-gray, mottled with black.

"A very beautifully-formed fish, more tapering than the *Namaycush* or *Siskowitz*, with the small head, and much both of the form and luster of the true sea-salmon. Flesh rich, orange-buff, very firm, highly-flavored, and delicate. This fish, and another, rather larger, but otherwise exactly agreeing with this, were eaten at my table by a party of six gentlemen, as good judges of good eating as any with whom I am ac-



quainted, and were unanimously pronounced better than brook-trout—better than true salmon—the finest fish in the world.

“The average weight is eight or ten pounds.” This is an extract from the New York Fauna of Dr. DeKay. Now I venture to assert that Dr. DeKay never wet a line in the waters of Hamilton County, and that “the propensity to exaggeration in everything in relation to aquatic animals,” induced his informant to make the above statement. I boldly assert that the average weight of lake-trout is not four pounds.

“An eight or ten pound fish is considered an unusually heavy fish. I will give you my experience. In May, 1848, I spent eleven days in Hamilton County, in company with a friend, and that friend an old Hamilton County troller. We faithfully fished in Lake Pleasant, Round Lake, and the far-famed Louis Lake. We killed about two hundred pounds weight of fish. I killed one of sixteen pounds, one of nine pounds and a quarter, and two of five pounds each. My friend did not kill a single fish heavier than three pounds and three-quarters; neither did I, save those just mentioned; and I would, and do say, that our fish did not average three pounds, the great majority being two-pounders. At the same time two friends fished Piseco Lake and Rackett Lake; the heaviest fish killed by them was eleven pounds; and I do not believe that they took another of greater weight than four pounds; at all events we beat them all to smash in weight and number. So much for the average weight. The wholesale assertion on your 118th page that they never rise to the fly should be qualified. It is not correct that they ‘never rise to the fly.’ They frequently do. The nine-pound-and-a-quarter lake-trout above referred to was killed by me with an artificial fly. The facts are these: On the 28th of May, 1848, I was fishing on Louis Lake. I was using a trolling-rod and a small trout-rod, casting with one and trolling with the other. Upon my trolling-leader I had two flies, and when my oarsman was in the act of pulling round a projecting elbow of wood, I reeled up to avoid contact with a fallen tree, and, just as my first fly trailed on the surface of the water, the fish broke or rather dashed at it. I struck him instantly, and away he went with so much velocity that I had hard work to keep my line from overrunning, not having a click-reel. I fortunately thumbed the reel, and passed my trout-rod to the oarsman, and then had fair play; and I assure you I never had hold of a fish of the same size that showed more game, power, or endurance. He never sulked for an instant; and the only difference which I could discover in his modes of action from a salmon was that, after being struck, he did not show himself or leap. Had I hooked this fish with my light rod I would not have killed him under an hour; and, indeed, as it was, he was not ‘half gone’ when Cowles, my guide, put the gaff into him. This fish rose in about 8 feet water, and took me twenty-five minutes to kill him. I never worked harder in my life to secure a fish, for you may imagine that I was anxious to secure a lake-trout hooked as I have described.

“On the same page you quote from Dr. DeKay that this trout has the ‘coarseness of the halibut without its flavor,’ and subsequently assert as your own opinion ‘that this is the most worthless of all the non-migratory species.’ I think that you are mistaken; my reasons, presently. On page 274 to 276, you also use the following expressions. ‘These great, bad, and unsporting fish,’ &c., ‘with a bullet at the end of two hundred yards of line, run rapidly through the water.’ ‘He is very indifferent eating.’ I disagree with you. ‘Every man to his taste.’ ‘What’s one man’s meat is another man’s poison.’ I prefer a lake-trout to the best brook-trout—don’t laugh! If it be ‘very indifferent eating,’ then I am easily pleased, and every person with whom I have spoken on the subject are no judges of fish-flesh.”

#### 40. SALMO SISCOWET, Agassiz.

##### THE SISCOWET, OR SISKAWITZ.

SYN.—*Salmo siscowet*, AGASSIZ, Lake Superior, p. 333, Bost., 1850. Pl. i, fig. 3.

*Salmo siskawitz*, HERBERT, Fish and Fishing, Suppl., p. 17.

SP. CH.—(Condensed from Agassiz’s description.) Form stout, broad, thick. At the anterior ray of dorsal the height is equal to one-fifth the total length of the body. Middle part of the body rather cylindrical. Peduncle of tail dilated and subquadrangular. Head large, forming nearly one-fourth of the total length, excluding lobes of the caudal. Snout obtuse and rounded; several teeth on the anterior part of the vomer, then a row on the middle of its shaft. Two rows of very curved teeth on the tongue. Fins strong; dorsal higher than it is long. Scales small; larger on the lower region of body, behind the ventrals. According to Agassiz, the young are barred with dark, vertical patches, as is the case with the young of nearly all salmon and trout.

Br. 13: D. 12: A. 12–14: C. 6, 1, 9, 8, 1, 5: V. 9: P. 14.

Colors.—These vary according to their feeding-ground, and are brighter during the breeding season.

DIAGNOSIS.—From *S. namaycush* it can be recognized by its different opercular apparatus. (See Agassiz’s description in his “Lake Superior,” &c.) Also by the dorsal fin, which is higher than it is long, occupying the middle of the back. Caudal much less furcate. Muzzle more round. Ventral fins not placed so far posteriorly.

HAB.—Lake Superior, especially along the north shore.

Professor Agassiz says that the siscowet is a rich, highly-flavored fish, but too fat. This renders its preservation in alcohol very difficult. He obtained his specimens from Michipicoten, the same place from whence Mr. George Barnston sent the only specimens that are contained in the Smithsonian collection—four in number. The heads of these fish are smaller than those described by Professor Agassiz, but in other respects they agree with his description.

Mr. Barnston, in a letter, speaks of the existence there of another kind

of lake-trout, differing from this species, which he calls the "bear-trout." He says that the distinctness of the species is recognized by the Indians, and that they spawn at a different season. He mentions having sent a specimen. After careful examination I can detect no differences of value between the different individuals sent by him.

Herbert, in his "Supplement," affirms that, as a sporting fish, the "*siskawitz*" is of no value; but, in the following quotation which I have made, acknowledges its high gastronomic excellence:

"This fish, like the former species, came frequently under my eye during my late northern tour; and I rejoice in the possession of a barrel of him in his pickled state, which I procured at the Sault Ste. Marie, on the strength of which I can recommend him to all lovers of good eating as the very best salt-fish that exists in the world. He is so fat and rich that when eaten fresh he is insufferably rank and oily; but when salted and broiled, after being steeped for forty-eight hours in cold water, he is not surpassed or equaled by any fish with which I am acquainted. Since my return he has been tasted by very many gentlemen of my acquaintance, and by no one of them has he been pronounced anything less than superlative. His habits closely resemble those of the *namaycush*, and, like him, I cannot learn that he ever takes the fly or is ever taken by trolling. I do not, however, believe that either of these methods are often resorted to for his capture, although there are many scientific fly-fishers about the Sault and the brook-trout of those waters are principally taken with large and gaudy lake-flies. The average weight of the *siskawitz* does not exceed four or five pounds, though he is taken up to seventeen. His excellence is so perfectly understood and acknowledged in the lake-country that he fetches double the price per barrel of his coarser big brother, the *namaycush*; and he is so greedily sought for there that it is difficult to procure him, even at Detroit, and almost impossible at Buffalo."

#### 41. SALMO SYMMETRICA, Prescott.

##### WINNIPISEOGEE TROUT.

SYN.—*Salmo symmetrica*, PRESCOTT, Silliman's Jour., 2d series, xi, p. 340, May 1851. Read before Asso. of Am. Geologists and Naturalists, Boston, Sept. 1847.

SP. CH.—(Condensed from Dr. Prescott's description and from the examination of specimens.) Form, slender, symmetrical; a single row of teeth on the vomer and palatines. Head contained about four and a half times in the total length; position of dorsal fin considerably anterior to the middle point of total length; tip of anal fin extends some distance behind tip of adipose dorsal. Scales small. Lateral line waving for the first inch or inch and a half, commencing a little below the superior posterior angle of the operculum and gently descending for a short distance, and then ascending as much, when it proceeds in a straight line to the middle of the tail. Head slightly flattened between

the eyes. Jaws nearly equal and pointed; the extremity of the lower received into a cavity above. Jaws, tongue, palatine, and pharyngeals armed with a single row of small, pointed, recurved teeth. Teeth of lower jaw larger and less numerous than of upper. Pupils, black; irides golden. Tail deeply forked. (Prescott.) Integument covering the under surface of the arms of the lower maxillaries is pierced with several small pores or holes.

DIAGNOSIS.—The only species which this fish is likely to be confounded with are *S. confinis*, DeKay, and the young of *S. namaycush*, Penn. It will be recognized by its very slender form, by lacking teeth on the central furrow of the tongue, and those of other parts of the mouth being disposed in single rows; by the more anterior position of the dorsal fin. Scales very small, but much larger than in *S. fontinalis*.

HAB.—Winnipiseogee Lake. ? Lake George.

Dr. Prescott gives the following description of a specimen 20 inches long; weight 30 ounces:

“Distance from the extremity of the jaws to the eye,  $1\frac{1}{2}$  inches; to the dorsal fin, 9 inches; to second dorsal,  $14\frac{1}{2}$ ; to ventrals,  $9\frac{1}{2}$  inches.” \* \* \* “Length of base of dorsal fin equal to one-tenth of the length of the fish; height of the same, (longest rays,)  $2\frac{1}{2}$  inches.” \* \* \* “Caudal fin deeply forked; the distance between extremities of bifurcation being  $4\frac{1}{2}$  inches, or equal to length of the head.”

Colors.—In a foot-note Dr. Prescott says: “It is worthy of remark that the color of this fish, in common with many others, is very much influenced by the nature of the bottom upon which it feeds, being uniformly much darker when frequenting muddy than gravelly bottoms, or rapid streams. The color varies with age, and in many instances there is a marked difference between the color of the male and the female.”

The colors of the specimen whose measurements are above given were as follows: “Light to dark brown on the back and upper part of the head; sides dark-gray above lateral line, lighter below, in some approaching to light salmon; lower jaw, chin, and abdomen white, mottled with fuliginous; pectorals and ventrals gray, their anterior part being shaded faintly with pink. Dorsal and caudal fins dark-gray. The whole fish, including the dorsal and caudal fins, thickly sprinkled with small circular spots of a drab color on the sides, olive on the back, approaching to light salmon below. These spots become elongated and variously curved on the top of the head, and of an olive color, giving to the part a marbled appearance.” He adds: “This trout during winter is taken in great abundance by the hook, through holes cut in the ice, but not in such numbers as formerly. They are not unfrequently taken weighing 12 to 15 pounds. The largest reported to have been taken weighed 25 pounds. By most persons it is highly esteemed, and it is generally considered an excellent fish for the table.”

Two specimens from Lake Winnipiseogee are in the Smithsonian collection. From a careful examination we are led to believe that the species

is distinct from any described previous to Dr. Prescott's paper. There is also in the Smithsonian collection a jar, numbered 3588, on the fish catalogue, a lot of trout from what is supposed to be Lake George, New York, but the locality is somewhat uncertain, owing to the obliteration of the writing on the first label. They, however, resemble the *S. symmetrica* so closely that I have had no hesitation in labeling them as such. The light markings, common to the fish when fresh caught, apparently fade out in alcohol.

NOTE.—Since writing the foregoing, a reference to *S. hoodii* has caused regret that no indisputable specimens of that fish could be obtained for comparison.

## 42. SALMO HOODII, Richardson.

### HOOD'S SALMON; THE MASAMACUSH.

SYN.—*Salmo hoodii*, RICH. F. B. A. iii, p. 173; Pl. 82, fig. 2; Pl. 83, fig. 2; Pl. 87, fig. 1; DEKAY'S Report, p. 242; STORER'S Synop.

? *Salmo carpio*, FAB., (RICH.) A Greenland species.

SP. CH.—[Condensed from Sir John Richardson's original description.] Head a little more than one-sixth of total length. Lower jaw, when the mouth is closed, projects beyond the upper by the depth of the chin; its length applied to upper surface of head, passes about a quarter of an inch beyond the nape, in a fish about 18 or 20 inches long. A single row of teeth on each side of the tongue, a few scattered teeth also about its middle. Operculum half as wide as high. Caudal (in the adult) even at the end. Average weight of a full-grown adult, 8 pounds.

Colors.—[Taken from a female 21 inches long; season, August.] Back and sides intermediate between olive-green and clove-brown, studded with yellowish gray spots, as big as a pea, a few of which are on the gill covers. Belly and under-jaw white, the latter thinly dotted with bluish-gray. Dorsal and upper lobe of caudal marked with smaller spots.

HAB.—Fresh-water lakes on the Atlantic slope of America, from Canada northward.

## 43. SALMO NEWBERRYI, Girard.

SYN.—*Fario gairdneri*, GRD. Proc. Phil. Acad. Sc., viii, 1856, p. 219; GRD. Pacific R. R. Repts., x, p. 313 [not *Salmo gairdneri*, RICH.]

*Salmo newberryi*, GRD. Proc. A. N. Phil., p. 225, 1858, (referring to Plate lxxi, figs. 1-4. P. R. R. Reports, vol. x.

SP. CH.—[Copied from Dr. Girard's report, P. R. R. Repts., vol. x, p. 313.] "Body subfusiform in profile, very compressed head, comprised four times in the length, the caudal fin excluded. Upper jaw longest; maxillary curved, extending to a vertical line intersecting the posterior rim of the orbit. Anterior margin of dorsal equidistant between the extremity of the snout and the base of the caudal. Caudal fin furcate.

Back, silvery-gray; sides silvery, and belly yellowish-white. Body obsoletely spotted with black; similar black spots on the dorsal and caudal fins."

The figure given by Dr. Girard was taken from a single specimen contained in the Smithsonian museum, and said to be of the size of life. The specimen has disappeared from the collection, so that we are unable to judge whether it is the young of an anadromous salmon, or, what I suspect, simply a variety of the *Salmo iridea*, Gibbons. It was procured by Dr. Newberry from the Klamath River.