

Its movements being like those attributed to evil spirits, probably suggested the name by which it is known.

Dr. Bryant (Proc. Boston Soc. of N. H. v. 7, p. 132) gives the following account of *Puffinus obscurus*:—"The nest is always placed in a hole or under a projecting portion of the rock, seldom more than a foot from the surface, and never, as far as my experience goes, out of reach of the hand. On being caught they make no noise, and do not resist at all. Why these birds and the Stormy Petrels never enter or leave their holes in the daytime, is one of the mysteries of nature; both of them feeding and flying all day, yet never seen in the vicinity of their breeding places before dark."

NOTES ON A COLLECTION OF FISHES FROM CLACKAMAS RIVER, OREGON.

By DAVID S. JORDAN, M. D.

The United States National Museum has lately received from Mr. Livingston Stone a small collection of fishes obtained by him from the Clackamas River, a tributary of the Columbia in Oregon. The collection comprises only six species, but each species (excepting *Salmo tsuppitch*) is represented by several specimens, all in excellent condition; and it so happens that each one of these is a species of special scientific interest, and one concerning which our knowledge has for one reason or another been incomplete. Four of these species were first described by Richardson (Fauna Boreali-Americana, 1836), viz, *Oncorhynchus quinnat*, *Salmo tsuppitch*, *Salmo clarki*, and *Gila oregonensis*; another, *Acrochilus alutaceus*, was first made known by Professor Agassiz (Am. Journ. Sci. and Arts, 1855); and the last, *Salvelinus spectabilis*, by Dr. Girard in 1856.

I. ONCORHYNCHUS QUINNAT (Richardson) Günther.

*California Salmon. Columbia Salmon. Quinnat Salmon.*

- 1836—*Salmo quinnat* RICHARDSON, Fauna Bor.-Am. iii, p. 219, (described from notes by Dr. Gairdner).  
*Salmo quinnat* DEKAY, Fauna New York, Fishes, p. 242, 1842, (copied).  
*Salmo quinnat* STORER, Synopsis Fish. N. A. p. 196, 1846, (copied).  
*Salmo quinnat* HERBERT, Frank Forrester's Fish and Fishing, Supplement, p. 31, 1850.  
*Salmo quinnat* GIRARD, Proc. Ac. Nat. Sc. Phila. viii, p. 217, 1856.  
*Salmo quinnat* GIRARD, Pac. R. R. Rep. Fishes, p. 306, pl. 67, 1858.  
*Salmo quinnat* SUCKLEY, Nat. Hist. Wash. Terr. p. 321, 1860.  
*Oncorhynchus quinnat* GÜNTHER, Cat. Fishes Brit. Mus. vi, p. 158, 1866, (compiled).  
*Salmo quinnat* SUCKLEY, Monograph Genus Salmo, Rept. U. S. Fish. Comm. p. 105, 1874.  
*Salmo quinnat* NELSON, Bull. Ills. Mus. Nat. Hist. i, p. 43, 1876, (Illinois River).  
*Salmo quinnat* HALLOCK, Sportsman's Gazetteer, p. 359, 1877.  
*Oncorhynchus quinnat* JORDAN, Man. Vert. ed. 2d, p. 357, 1878.  
*Oncorhynchus quinnat* JORDAN, Catalogue Fresh-water Fishes N. A. p. 431, 1878.  
*Salmo quinnat*, U. S. Fish Comm. Repts., and of writers on Salmon and fish culture generally.

1856—*Fario argyreus* GIRARD, Proc. Ac. Nat. Sc. Phila. p. 218.

*Fario argyreus* GIRARD, Pac. R. R. Surv. Rep. Fishes, p. 312, pl. 70, 1858.

*Salmo argyreus* SUCKLEY, Nat. Hist. Wash. Terr. p. 326, 1860.

*Salmo argyreus* SUCKLEY, Monograph Salmo, p. 110, 1874.

1861—*Salmo warreni* SUCKLEY, Ann. Lyc. Nat. Hist. N. Y. vii, p. 308.

*Salmo warreni* SUCKLEY, Monograph Salmo, p. 147, 1874.

*Salmo warreni* JORDAN & COPELAND, Check List, p. 144, 1876.

This species, the most abundant and most valuable of the *Salmonide* of the Pacific coast, is represented in the present collection by numerous partly grown specimens, some black-spotted and some nearly plain silvery. The only question which now arises in the synonymy of this species is as to its distinctness from its congener *O. nerka* (Walbaum), (*O. lycaodon* Pallas). The slender, more fusiform, and less compressed form of the latter species, as well as its fewer branchiostegals and less forked tail, seem to indicate specific difference. The types of *Fario argyreus* Girard, I have examined. They are two in number, each about 8 inches long, and are evidently young *quinnats*. The original types of *Salmo warreni* are apparently lost. There is, however, a bottle of small silvery fishes, young individuals of *quinnat*, in the National Museum, labelled by Dr. Suckley "*Salmo warreni*?" There can be little doubt that the original types of *Salmo warreni* were similar specimens of a young *Oncorhynchus*, most likely the young of *O. quinnat*.

There can be no possible doubt of the entire generic distinctness of the genus *Oncorhynchus* from *Salmo*, although the characters assigned to *Oncorhynchus* by Dr. Suckley have no such value. The great development of the anal fin and the peculiar form and dentition of the vomer are of much more importance than the hooked jaws of the male, although neither character was noticed by Dr. Suckley. Indeed, this author includes most of the *Oncorhynchi*, under one name or another, in his subgenus *Salmo*. Thus the species termed by him *quinnat*, *confluentus* (= *keta*), *argyreus* (= *quinnat*), *paucidens* (= *nerka*), *truneatus* (= *nerka*), *richardi* (= *nerka*), *kennerlyi*, and *warreni* (= *quinnat*), are all hook-jawed species, with a long anal fin and an increased number of branchiostegals, yet they are all referred by Dr. Suckley to his subgenus *Salmo* proper.

An examination of the specimens of *Oncorhynchus* in the National Museum, including all of Dr. Suckley's types excepting *richardi* and *warreni*, has convinced Dr. Gill and myself that they all belong to five species, *O. gorbuscha*, *O. keta*, *O. nerka*, *O. quinnat*, and *O. kennerlyi*. These are divisible into two very strongly marked subgenera, or perhaps even distinct genera,—*Oncorhynchus*, including the first four species named, and *Hypsifurio*, Gill, including only *kennerlyi*. *O. kennerlyi* is very much smaller than the other species, and is much more compressed and of a different form. Its form seems to me, however, rather an exaggeration of that of *O. quinnat* than a distinct type, and the resemblance is almost as great between *quinnat* and *kennerlyi* as between *quinnat* and *gorbuscha*.

The species of *Oncorhynchus* at present admitted by Dr. Gill and myself may be briefly compared as follows:—

- a. Body more elongate, heavier forward and less compressed than in the next; jaws in the adult males very unequal; the lower jaw prolonged and hooked upwards; the upper jaw still more elongate and curled over the tip of the lower, the profile of the forehead being concave when viewed from the side; teeth of the premaxillaries and of the tip of the lower jaw greatly enlarged and hooked .....(Subgenus *Oncorhynchus*.)
- b. Scales very small, in more than 200 transverse rows; smaller on caudal peduncle than on flanks; form much distorted in the adult males, the fleshy hump at the shoulders being greatly developed, and the caudal peduncle slender and rather elongate; the jaws greatly prolonged and curved; size small. (Pacific coast and streams, Washington to Kamtschatka.) .....GORBUSCHA.\*
- bb. Scales medium, in about 170 (155 to 180) transverse rows; form distorted, but less so than in the preceding, the fleshy hump considerably developed in the males, and the jaws greatly elongated and hooked; branchiostegals about 16. (Pacific coast and streams, Oregon to Kamtschatka.) .....KETA.†
- bbb. Scales large for the genus, in about 133 transverse rows.
- c. Form elongate, not greatly compressed, the greatest depth in advance of the middle of the body; the males with the caudal peduncle rather slender, and with a well-marked fleshy hump, and with the jaws much elongated and distorted; caudal fin feebly forked; branchiostegals about 13. (Pacific coast and streams, California to Kamtschatka.) .....NERKA.‡
- cc. Body elongate, compressed, the greatest depth (in female and immature specimens at least) being just under the dorsal fin; depth of body one-fourth of length, or a little more; head moderate, rather bluntly pointed; less distorted in male specimens than in the preceding species; maxillary shortish, curved, reaching somewhat beyond eye; caudal fin more or less forked; branchiostegals 15 or 16. (Coast and streams, California to Alaska.) .....QUINNAT.
- aa. Body oblong, very strongly compressed, the dorsal region much elevated; a nearly even slope from the snout to the base of the dorsal fin; dorsal fin unusually far back, the first ray being behind the middle of the body; head long, deep, compressed, but still wide; mouth extremely large and very oblique; the jaws about equal in the females; in the males, the lower jaw protruding beyond the upper, which is curled up like the snout of a snarling dog, showing the enlarged canines, the premaxillaries never hooking over the lower jaw, as is the case with *Oncorhynchus* proper; dentition as in typical *Oncorhynchus*.  
(Subgenus *Hyppisfaris* Gill.)

\*ONCORHYNCHUS GORBUSCHA (Walb.) Gill & Jordan.—*Gorbuscha*, Pennant, Arctic Zoology.—*Salmo gorbuscha*, Walbaum, Artedi Gen. 1792.—*Salmo gibber*, Bloch, Schneider, Ichthyologia, 1801.—*Salmo proteus*, Pallas, Zool. Rosso-Asiatica, 1811.—*Salmo gibber*, Suckley, 1861.—*Oncorhynchus gorbuscha*, Jordan, Man. Vert. ed. 2d, 1878.

†ONCORHYNCHUS KETA (Walbaum) G. & J.—*Keta* vel *kayko*, Pennant, Arctic Zoology.—*Salmo keta* vel *kayko*, Walbaum, 1792.—*Salmo keta* vel *kayko*, Bloch, Schneider, 1801.—*Salmo lagocephalus*, Pallas, 1811.—*Salmo scouleri*, Richardson, 1836.—*Salmo confluentus*, 1861.—*Oncorhynchus keta*, Jordan, Man. Vert. ed. 2d, 1878.

‡ONCORHYNCHUS NERKA (Walb.) Gill & Jor.—*Nerka*, Pennant, Arctic Zoology.—*Salmo nerka*, Walbaum, 1792.—*Salmo lyaodon*, Pallas, 1811.—*Salmo japonensis*, Pallas, 1811.—? *Salmo paucidens*, Richardson, 1836.—*Salmo consuetus*, Richardson, Voyage of the Herald, 1854.—*Salmo dermatinus*, Richardson, l. c. 1854.—*Salmo canis*, Suckley, 1861.—*Salmo cooperi*, Suckley, 1861.—*Salmo scouleri*, Suckley, 1861, (not of Rich.).—*Salmo truncatus*, Suckley, 1861.—? *Salmo richardi*, Suckley, 1861.—*Oncorhynchus lyaodon*, Günther, 1867.—*Oncorhynchus nerka*, Jordan, 1878.

d. Depth of body about .29 of length, its width only about .10; length of head .29 of length; the interorbital space about .09; maxillary, .12; mandible, .19; scales moderate, thin, partly imbedded in the skin along the back, but not closely imbricated, in number about 20-135-20; branchiostegals about 15; dorsal fin rather high—higher than long; adipose fin long and narrow, somewhat spatulate; caudal fin well forked; general color red, somewhat spotted above; size small. (*Habitat*.—Pacific coast streams, Sacramento River to Fraser's River.) .....KENNERLYI.\*

The series of *Oncorhynchus* in the National Museum is by no means so complete as is desirable, except in the case of *O. quinnat* and *O. kennerlyi*. *O. keta*, *O. nerka*, and *O. gorbuscha* are represented only by skins, mostly dried and moth-eaten, and all in poor condition. A fuller series may show that more than five good species exist, or it may show that *O. quinnat* is really only a variety of *O. nerka*.

## 2. SALMO TSUPPITCH Richardson.

### *Tsuppitch Salmon. Black Trout of Lake Tahoe.*

1836—*Salmo tsuppitch* RICHARDSON, Fauna Bor.-Am. Fishes, p. 224.

*Salmo tsuppitch* DEKAY, New York Fauna, Fishes, p. —, 1842.

*Salmo tsuppitch* STORER, Synopsis, p. 197, 1846.

*Salmo tsuppitch* HERBERT, Frank Forrester's Fish and Fishing, Suppl. p. 39, 1850.

*Salmo tsuppitch* SUCKLEY, Nat. Hist. Wash. Terr. p. 327.

*Salmo<sup>1</sup> tsuppitch* GÜNTHER, Cat. Fishes Brit. Mus. vi, p. 118, 1867.

*Salmo tsuppitch* SUCKLEY, Monograph Salmo, p. 111, 1874.

*Salmo tsuppitch* JORDAN, Man. Vert. ed. 2d, p. 358, 1878.

A fine specimen of a trout from the Clackamas River enables me to make a probably correct determination of the hitherto unidentified *Salmo tsuppitch* of Richardson. The specimen seems to be identical with the so-called "Black Trout of Lake Tahoe" (not the "Silver Trout of Lake Tahoe", which is the species termed by Professor Gill and myself *S. henshawi*"), of which numerous specimens were collected in Lake Tahoe and in Kern River, California, by Mr. H. W. Henshaw. I feel less hesitation in identifying Richardson's *tsuppitch* with this species, from the fact that the fish does not seem ever to have been renamed by later writers. The following description was taken from the Clackamas River specimen.

General appearance of *Salmo henshawi*, but with smaller scales, smaller, shorter head, and smaller mouth, besides wanting the hyoid teeth.

Body elongated, somewhat compressed, the dorsal region moderately elevated. Head rather small, pointed and lengthened, its form quite distinctly conic, less convex than in *spilurus*, the top rather narrow and slightly keeled. Mouth moderate, not large, with rather weak teeth, the maxillary comparatively narrow and not extending much

\* *Oncorhynchus kennerlyi* (Suckley) Jor.—*Salmo kennerlyi*, Suckley, 1861.—*Hypisifario kennerlyi*, Gill, 1864.—*Oncorhynchus kennerlyi*, Jordan, 1878.

beyond the eye; opercle more prolonged backwards than in *spilurus*, making the head appear longer. Pectoral fins smaller than in *spilurus*.

Scales small, silvery, 28-180-29.

Caudal fin short, rather faintly forked, but more so than in *spilurus*. Adipose fin rather small. Fins all small, the dorsal of the usual "salar" pattern.

Fin-rays: Dorsal, 2, 11. Anal, 2, 10.

Color dark above; head, body, and upper fins with small, round, black spots, very numerous, and nearly as close together before as behind; a few spots on the belly in some specimens.

Measurements of specimen: Length, 12 inches; depth,  $.23\frac{1}{2}$  of length to base of caudal; head,  $.24\frac{1}{2}$ ; interorbital width, .07; maxillary, .10; mandible, .15; middle caudal rays, .11; outer caudal rays, .17.

This species may be known from *S. spilurus* by the more forked tail, the longer and slenderer head, and the greater spottiness anteriorly. From *S. irideus*, it may be known by the much slenderer form, larger mouth, longer head, and much larger scales; from *S. henshawi*, which it most resembles, by the shorter head and by the lack of hyoid teeth; and from *S. clarki*, which it also resembles, by the want of hyoid teeth, and other characters.

These black-spotted Salmon of the Rocky Mountain region and Pacific slope belong to a well-marked group, for which the name *Salar*, Valenciennes, may be retained as a subgenus of the genus *Salmo*. Although not by any means so different from the true *Salmo* (type *S. salar* L.) as are the genera *Oncorhynchus*, *Cristivomer* (type *S. namaycush* Walb.), and *Salvelinus* (type *S. salvelinus* L.), it is not impossible that future writers may consider *Salar* as a genus distinct from *Salmo*. The character of a single instead of a double row of teeth on the shaft of the vomer, supposed to distinguish *Fario*, Val., from *Salar*, has no generic value, and probably not even a specific value, at least as hitherto stated. In all the species properly referable to *Salar*, the teeth are arranged alternately, each one pointing to the right or left, in an opposite direction from its neighbor. These teeth are therefore in a sort of quineuncial row, which in many or most instances appears as two distinct rows, and almost always is divided into two anteriorly. Most of the "Salmon-trout" and "Trout" of Europe and Asia belong to this group, "*Salar*". Although most of the species referred to *Fario* belong to *Salar*, it is not certain whether the type of *Fario*, *F. argenteus* Val., from France, is a *Salar* or a true *Salmo*. The figure looks to me like a young Salmon (*S. salar*).

The American species of the subgenus *Salar* which are now considered valid by Dr. Gill and myself may be compared as follows:—

*Common characters*:—River Salmon, not anadromous, with the vomer comparatively flat and not boat-shaped, its form essentially as in *Salmo* proper, the vomerine teeth extending for some distance along the shaft of the bone in two alternating rows or in one zigzag row, the teeth divergent and directed somewhat forward, not deciduous: scales

moderate, comparatively thin and loose, appearing silvery, especially in fishes which have entered the sea: fins small, the last rays of the dorsal somewhat elongate, the first ray usually less than twice the height of the last ray; caudal fin slightly forked, or more usually truncate, with a slight emargination, double-rounded when spread open: upper parts, especially the back, and the dorsal and caudal fins, more or less thickly covered with small, rounded, black spots; in some specimens, especially those which have been in the sea, these spots are more or less confluent, obscured or even obsolete: species not of the largest size, the sexual peculiarities not strongly marked ..... (Subgenus SALAR.)

a. Hyoid bone entirely destitute of teeth.

b. Scales comparatively large, in 120 to 150 transverse series.

c. Body more or less short and deep, compressed, the depth .24 to .33 of length. Head short, bluntish, convex above, obtusely carinate, about .25 of length: mouth small, smaller than in any other of the group, the maxillary bone of moderate width, scarcely reaching beyond the eye, .10 to .11 of length, the mandible about .15: eye large, about .05 of length: caudal fin moderately but very distinctly forked, more so than in any of the other members of the group; first long ray of dorsal about twice the height of the last ray: dorsal, 2, 11; anal, 2, 11: scales about 28-135-28, varying considerably, but in all cases decidedly larger than in any other of our species of *Salar*. Rivers from California to British Columbia west of the Sierra Nevada ..... IRIDEUS.

bb. Scales comparatively small, in 165 to 205 transverse series.

d. Caudal fin somewhat forked: head rather small, about .25 of length, pointed and lengthened, conical, the upper outline rather narrow and not much convex, the carina slight: mouth moderate, the maxillary comparatively narrow and extending much beyond the eye: opercle considerably prolonged backward: scales small, 28-180-29: depth about .24 of length: body nearly equally spotted before and behind. Rivers west of Sierra Nevada ..... TSUPPITCH.

dd. Caudal fin double-rounded or truncate, not at all forked in the adult.

e. Head not notably broad and flat, heavy and proportionally short, its upper outline strongly convex, both longitudinally and transversely: mouth very large, the maxillary extending much past the eye in the adult, the opercle not especially prolonged backward: dorsal fin notably high behind, its last rays more than  $\frac{2}{3}$  the height of the first, some of the middle rays shortest: scales small: depth of body about .24 of length: spots on body most numerous posteriorly. Rocky Mountains to the Sierra Nevada south of the Columbia region ..... SPILURUS.

x. Scales medium, in 170 to 190 transverse rows: top of head gibbous, obtusely carinated. Headwaters of Rio Grande, Bear River, etc.

Subspecies *spilurus*.\*

xx. Scales small, in 190 to 205 rows: head more or less sharply carinated, much less gibbous. Generally distributed.

Subspecies *pleuriticus*.†

aa. Hyoid bone with an elongate band of small teeth between the bases of the first and second pairs of gill-arches (readily scraped off by careless observers, and possibly sometimes naturally deciduous).

\* *Salmo spilurus* Cope, 1872.—*Salmo stomias* var. *spilurus* Jordan, 1878.

† *Salmo pleuriticus* Cope, 1872.—*Salmo stomias* var. *pleuriticus* Jordan, 1878.

- f. "Head large, broad, flat, not keeled, 4.25 in total length, equal to depth of body: muzzle obtuse: eye nearly 5 times in head: scales (small, as in var. *pleuriticus*) 42 below first dorsal ray: dorsal fin equidistant: caudal fin not notched. Kansas River."—(Cope.).....*STOMIAS*.\*
- ff. Head comparatively large, and long acuminate, .25 of length, its outline as a whole pointed, but the muzzle itself bluntish, its upper surface not much convex in either direction, very slightly carinated: mouth medium, the maxillary moderate, .12 of length, not reaching much beyond eye: patch of hyoid teeth small, and comparatively weak: body elongate, not greatly compressed, the depth .25 of length: dorsal fin small, its last rays  $\frac{2}{3}$  the height of the first: caudal fin short, quite distinctly forked: scales small, in 160 to 184 transverse rows: colors rather dark, back and sides more or less profusely covered with small rounded spots. Streams of California west of the Sierra Nevadas; Lake Tahoe.....*HENSHAWI*.†
- fff. Head comparatively short and thick, .22 to .25 of length, its outline more convex, more or less distinctly carinated above: mouth rather small, but larger than in *irideus*, the maxillary not reaching far beyond the eye: patch of hyoid teeth well developed: body moderately elongate, compressed; depth .24 of length: dorsal fin rather low, its last rays  $\frac{2}{3}$  the height of the first: caudal fin scarcely forked, rather more so than in *spilurus*: scales moderate or rather small: colors variable, the back and sides usually profusely, but variably spotted, silvery in sea-run individuals. Rio Grande to Upper Missouri and west to the Pacific.....*CLARKI*.
- y. Scales moderate, in 155 to 165 rows; chiefly west of the Rocky Mountains.....Subspecies *clarki*.
- yy. Scales small, in 165 to 170 rows; chiefly east of the Rocky Mountains.....Subspecies *aurora*.

The American species of this subgenus *Salar* are very closely inter-related, and might almost be considered as varieties of a single polymorphous species. The occurrence of forms apparently intermediate prevents me from considering *aurora* and *pleuriticus* as distinct species, although they may usually be readily recognized.

Of the true subgenus *Salmo*, there seems to be but one species in America, the *Salmo salar*, our specimens being, so far as I can see, precisely identical with the European. The land-locked Salmon of Maine, *Salmo sebago*, Girard, does not differ by any constant character from *Salmo salar*, and its permanent residence in fresh water is the only character of which I know on which a subspecies *sebago* could be based. Land-locked Salmon from Bergen, Sweden, in the United States National Museum, and land-locked Salmon from Sysladobsis Lake, Maine, are to my eye precisely alike, and both are *Salmo salar*, Linnæus.

\* *Salmo stomias* Cope, 1872.—I have not seen this species, but Professor Cope writes me that if I had, I would certainly consider it specifically distinct from *S. pleuriticus*. Since the above was in type, I have examined a head of a large specimen of *Salmo stomias* from the Upper Missouri. It agrees fully with Professor Cope's description. As it is a species with well-developed hyoid teeth, it is related to *S. clarki*, and *S. henshawi*, differing in the peculiar form of the head and the smaller size of the scales.

† *Salmo henshawi* Gill & Jordan, Jordan, Man. Vert. ed. 2d, p. 353, 1878.—This fine species is named in honor of Mr. H. W. Henshaw, the well-known ornithologist, who first brought specimens from Lake Tahoe.

## 3. SALMO IRIDEUS Gibbons.

*Pacific Coast Brook Trout.*

- 1855—*Salmo iridea* GIBBONS, Proc. Cal. Ac. Nat. Sc. p. 36.  
*Salar iridea* GIRARD, Proc. Ac. Nat. Sc. Phila. p. 220, 1856.  
*Salar iridea* GIRARD, Pac. R. R. Expl. Fishes, p. 321, 1858, pl. 73, f. 5, and pl. 74.  
*Salar irideus* JORDAN, Catalogue Fishes N. A. p. 431, 1878.  
*Salmo irideus* GÜNTHER, Cat. Fishes Brit. Mus. vi, p. 119, 1867.  
*Salmo iridea* SUCKLEY, Monograph Genus Salmo, p. 129, 1874.  
*Salmo irideus* JORDAN & COPELAND, Check List, p. 144, 1876.  
*Salmo irideus* HALLOCK, Sportsman's Gazetteer, and of writers on fish and fish-culture generally.  
*Salmo irideus* JORDAN, Man. Vert. ed. 2d, p. 358, 1878.  
*Salmo rivularis* AYRES, Proc. Cal. Ac. Nat. Sc. p. 43.
- 1856—*Fario gairdneri* GIRARD, Proc. Ac. Nat. Sc. Phila. p. 219, (not *Salmo gairdneri* Rich., a species with the "caudal fin semilunate" and "no hyoid teeth"; hence neither the present fish nor *S. clarkii* Rich.).  
*Fario gairdneri* GIRARD, Pac. R. R. Expl. Fishes, p. 313, pl. 71, f. 1-4, 1858.
- 1858—*Fario newberryi* GIRARD, Proc. Ac. Nat. Sc. Phila. p. 224, 1858, (substitute for *gairdneri*).  
*Salmo newberryi* SUCKLEY, Monograph Genus Salmo, p. 159, 1874.  
*Salmo newberryi* JORDAN & COPELAND, Check List, p. 144, 1876.
- 1858—*Fario clarkii* GIRARD, Proc. Ac. Nat. Sc. Phila. p. 219; (not *Salmo clarkii* Rich.).  
*Fario clarkii* GIRARD, Pac. R. R. Expl. Fishes, p. 314, pl. 71, f. 5-8, 1858.
- 1860—*Salmo masoni* SUCKLEY, Nat. Hist. Washington Terr. p. 345, (substitute for *clarkii*).  
*Salmo masoni* SUCKLEY, Monograph Salmo, p. 134, 1874.  
*Salmo masoni* JORDAN & COPELAND, Check List, p. 144, 1876.
- 1860—? *Salmo gairdneri* SUCKLEY, Nat. Hist. Washington Terr. p. 331, (not of Richardson).  
? *Salmo gairdneri* SUCKLEY, Monograph Salmo, p. 114, 1874.
- 1867—*Salmo purpuratus* GÜNTHER, Cat. Fishes Brit. Mus. vi, p. 116, 1867, (in part; probably not of Pallas, whose specimens came from Siberia, = *Salmo mykiss* Walbaum, = *Salmo muikisi* Bloch, both names prior to Pallas, who gives "Mykiss" as the vernacular name of *purpuratus*).

*Habitat.*—California to British Columbia, in streams of or west of the Sierra Nevada and Cascade Ranges.

This abundant Trout is represented by several specimens. In justification of the above synonymy, I may say that I have examined specimens purporting to be the types of *irideus* Gibbons, *rivularis* Ayres, *newberryi* Girard, *masoni* Suckley, and *gairdneri* Suckley, and that I have no hesitation in considering all (excepting *gairdneri* Suckley) as representatives of a single species.

The type of *S. newberryi*, which Dr. Suckley was unable to find, is a well-preserved young fish, without hyoid teeth. It has a rather wider maxillary than is usual in *irideus* and rather smaller scales (33-146-33), and the vomerine teeth are in a single, somewhat zigzag row. Nevertheless, I believe it to be an *irideus*, with which it agrees in every other respect.

The types of *S. masoni*, the one a moth-eaten skin and the other a specimen in alcohol, are not different in any respect from the ordinary *irideus*. Notwithstanding Dr. Suckley's statement that the scales in his type are "double the size of *irideus*", his typical specimens have each about 130 scales in a longitudinal series, which is about the usual number in *irideus*.



The type of *S. gairdneri*, Suckley, is a large stuffed skin, badly stretched, and in very poor condition. I am not able certainly to identify it.

As Dr. Günther found about 130 rows of scales in his *S. purpuratus*, I have referred it to the present species rather than to *S. clarki*. As elsewhere stated, I consider it rather unsafe to identify *fresh-water* Salmon from America and Asia as belonging to the same species before the species of either region have been critically studied.

#### 4. SALMO CLARKI Richardson.

Subspecies CLARKI.

*Salmon Trout of the Columbia.*

- 1836—*Salmo clarkii* RICHARDSON, Fauna Boreali-Americana, iii, p. 224.  
*Salmo clarkii* STORER, Synopsis, p. 197, 1846.  
*Salmo clarkii* HERBERT, Frank Forrester, Fish and Fishing, Supplement, p. 40, 1850.  
*Salmo clarkii* SUCKLEY, Nat Hist. Washington Terr. p. 344, 1860.  
*Salmo clarkii* SUCKLEY, Monograph Genus Salmo, p. 112, 1874.  
*Salmo clarkii* JORDAN, Man. Vert. ed. 2d, p. 359, 1878.  
*Salar clarkii* JORDAN, Catalogue Fishes N. A. p. 430, 1878.
- 1856—*Fario stellatus* GIRARD, Proc. Ac. Nat. Sc. Phila. p. 219.  
*Fario stellatus* GIRARD, Rept. Pac. R. R. Expl. p. 316, pl. 69, f. 5-8, 1858.  
*Fario stellatus* SUCKLEY, Nat. Hist. Wash. Terr. p. 346, pl. 69, f. 5-8, 1860.  
*Salmo stellatus* GÜNTHER, Cat. Fishes Brit. Mus. vi, p. 117, 1867.  
*Salmo iridea* var. *stellatus* SUCKLEY, Monograph Genus Salmo, p. 130, 1874.
- 1856—*Fario tsuppitch* GIRARD, Proc. Ac. Nat. Sci. Phila. viii, p. 218, (not *Salmo tsuppitch* Rich.).  
*Fario tsuppitch* GIRARD, Rept. Pac. R. R. Surv. Fishes, p. 300, 1858.
- 1858—*Salmo gibbsii* SUCKLEY, Ann. N. Y. Lye. Nat. Hist. vii, p. 1, 1858, (substitute for *tsuppitch* Grd.).  
*Salmo gibbsii* SUCKLEY, Nat. His. Wash. Terr. p. 332, 1860.  
*Salmo gibbsii* GÜNTHER, Cat. Fishes Brit. Mus. vii, p. 119, 1867.  
*Salmo gibbsii* SUCKLEY, Monograph Genus Salmo, p. 141, 1874.  
*Salmo gibbsii* JORDAN & COPELAND, Check List, p. 144, 1876.
- 1861—*Salmo brevicauda* SUCKLEY, Ann. N. Y. Lye. Nat. Hist. vii, p. 308.  
*Salmo brevicauda* GÜNTHER, Cat. Fishes Brit. Mus. vi, p. 120, 1867.  
*Salmo brevicauda* SUCKLEY, Monograph Genus Salmo, p. 140, 1874.  
*Salmo brevicauda* JORDAN & COPELAND, Check List, p. 144, 1876.

Subspecies AURORA.

*Missouri River Trout. Utah Trout. Yellowstone Trout.*

- 1856—*Fario aurora* GIRARD, Proc. Ac. Nat. Sc. Phila. viii, p. 218.  
*Fario aurora* GIRARD, Pac. R. R. Surv. Fishes, p. 303, pl. 68, 1858.  
*Salmo aurora* SUCKLEY, Nat. Hist. Wash. Terr. p. 343, 1860.  
*Salmo aurora* GÜNTHER, Cat. Fishes Brit. Mus. vi, p. 119, 1867.  
*Salmo aurora* SUCKLEY, Monograph Genus Salmo, p. 110, 1874.  
*Salmo aurora* JORDAN & COPELAND, Check List, p. 144, 1876.  
*Salmo clarkii* var. *aurora* JORDAN, Man. Vert. ed. 2d, p. 359, 1878.
- 1856—*Salar lewisi* GIRARD, Proc. Ac. Nat. Sci. Phila. viii, p. 219, 1856.  
*Salar lewisi* GIRARD, Pac. R. R. Surv. Fishes, p. 29, pl. 71, 1858.  
*Salmo (Salar) lewisi* SUCKLEY, Nat. Hist. Wash. Terr. p. 348, 1860.  
*Salmo lewisi* GÜNTHER, Cat. Fishes Brit. Mus. vi, p. 122, 1867.  
*Salmo lewisi* SUCKLEY, Monograph Genus Salmo, p. 139, 1874.  
*Salmo lewisi* JORDAN & COPELAND, Check List, p. 144, 1876.

- 1856—*Salar virginalis* GIRARD, Proc. Ac. Nat. Sc. Phila. viii, p. 220, 1856.  
*Salar virginalis* GIRARD, Pac. R. R. Expl. Fishes, p. 320, 1858.  
*Salmo (Salar) virginalis* SUCKLEY, Nat. Hist. Wash. Terr. p. —, 1860.  
*Salmo virginalis* GÜNTHER, Cat. Fishes Brit. Mus. vi, p. 123, 1867.  
*Salmo virginalis* COPE, Hayden, Geol. Surv. Montana, 1871, p. 469, 1872.  
*Salmo virginalis* SUCKLEY, Monograph Genus Salmo, p. 135, 1874.  
*Salmo virginalis* COPE & YARROW, Zool. Lieut. Wheeler's Expl. W. 100th Mer.  
 p. —, 1876.  
*Salmo virginalis* JORDAN & COPELAND, Check List, p. 144, 1876.
- 1872—*Salmo carinatus* COPE, Hayden's Geol. Surv. Montana, 1871, p. 471, 1872.  
*Salmo carinatus* JORDAN & COPELAND, Check List, p. 144, 1876.
- 1874—*Salmo utah* SUCKLEY, Monograph Genus Salmo, p. 136, 1874.  
*Salmo utah* JORDAN & COPELAND, Check List, p. 144, 1876.

Examination of a very large series of the Salars with hyoid teeth has convinced the writer that all (excepting *S. stomias* and *S. henshawi*) belong to a single species, although two, and possibly three, or even four subspecies or varieties may be distinguished. For this species the name *Salmo clarki* is the name to be retained, as almost the only important character which Richardson was able to assign to this species is that of the patch of teeth on the hyoid bone. No other species of this group possessing this character is as yet known from the Columbia.

Specimens examined from Utah, from the Rio Grande, from the headwaters of the Missouri, Yellowstone, Platte, and Snake Rivers, as well as the types of *Fario aurora* from the Columbia, possess much smaller scales than typical *clarki* (*i. e.*, *stellatus* Grd.). These may be really specifically distinct, but intermediate specimens occur; and until this Rocky Mountain species can be better defined as distinct from the Columbia River species, it is best to consider it as var. *aurora* of the latter.

The typical specimens of *Fario stellatus* Girard are still preserved. I consider them as typical of *Salmo clarki*. This perfectly distinct species is almost the only one described by previous writers, which Dr. Suckley ventured to discard, he confounding it with *S. irideus*, yet of all our species of *Salar*, *irideus* and *clarki* (*stellatus*) are technically the most distinct.

The types of *S. brevicauda* Suckley are still preserved, but are almost decayed. One of them is certainly a *clarki*, probably sea-run; the other is past recognition.

The types of *Fario aurora* are still preserved in the same condition as when first described and figured. They are well kept as to the bodies, but the scales are all rubbed off, an accident apparently not noticed by Dr. Girard's artist, which accounts for the peculiar squamation shown in the published figure. These specimens are young, and very chubby; but as they have hyoid teeth and show no points of distinction from *S. lewisi* Grd., I identify them as belonging to the same species. The remarks of Dr. Suckley on the description of such specimens as new species are so pertinent that I will quote them here. They would perhaps have sounded better, however, if he himself had suppressed his own *Salmo warreni*, *Salmo gibbsii*, and other more or less purely complimentary species.

"The naming of *Salmonida*, and the description of new species, based on the characters of young, partially grown fish, cannot be too strongly reprobated. There is already too much confusion in the synonymy of the different 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."—(Suckley, Monograph Salmo, p. 113.)

The types of *Salar lewisi* are still preserved. The one figured by Girard seems to be a female specimen, in very flabby condition. It is quite deep-bodied and has a smaller head and mouth than is usual in this species. Other specimens from the same waters agree more or less completely in these respects with *S. virginalis*, so that it does not seem possible to consider the Missouri River Trout as even varietally distinct.

The types of *Salmo carinatus* I have not seen. They were from the Yellowstone, and so far as the description is concerned seem to belong to this species.

The types of *Salar virginalis* are likewise preserved. They represent the ordinary form of this species in the Rocky Mountain region, and hence are typical of what I call var. *aurora*.

The original type of *Salmo gibbsii*, a stretched skin in poor condition, is now lost. If the species is not identical with *Salmo clarki*, it is likely to remain uncertain.

*Salmo clarki* Richardson is identified by Dr. Günther with *Salmo purpuratus* Pallas (*Salmo mykiss* Walbaum) of Kamtschatka. Günther's *Salmo purpuratus*, however, appears to be *Salmo irideus*, and not the present species, and an identification of a fresh-water salmon from California with a Kamtschatkan salmon is very uncertain. In regard to the migratory salmon, however, the case is different.

##### 5. SALVELINUS SPECTABILIS (Girard) Gill & Jordan.

###### *Pacific Red-spotted Trout.*

1856—*Salmo spectabilis* GIRARD, Proc. Ac. Nat. Sc. Phila. p. 218, (not *Salar spectabilis* Valenciennes).

*Salmo spectabilis* GIRARD, Pac. R. R. Expl. Fishes, p. 307, 1858.

*Salmo spectabilis* SUCKLEY, Nat. Hist. Wash. Terr. p. 342, 1860.

*Salvelinus spectabilis* JORDAN, Man Vert. ed. 2d, p. 360, 1878.

*Salvelinus spectabilis* JORDAN, Cat. Fishes N. A. p. 430, 1878.

1861—*Salmo parki* SUCKLEY, Ann. Lyc. Nat. Hist. N. Y. vii, p. 309.

*Salmo parkii* GÜNTHER, Cat. Fishes Brit. Mus. vii, p. 121, 1867.

*Salmo parkei* SUCKLEY, Monograph Genus Salmo, p. 149, 1874.

*Salmo parkei* JORDAN & COPELAND, Check List, p. 144, 1876.

*Salmo parkii* HALLOCK, Sportsman's Gazetteer, p. 347.

1861—*Salmo campbelli* SUCKLEY, Ann. Lyc. Nat. Hist. vii, p. 313, (substitute for *spectabilis*).

*Salmo campbelli* GÜNTHER, Cat. Fishes Brit. Mus. vi, p. 148, 1867.

*Salmo campbelli* SUCKLEY, Monograph Genus Salmo, p. 118, 1874.

*Salmo campbelli* HALLOCK, Sportsman's Gazetteer, p. 349.

The Charrs, or *Salvelini*, form a strongly marked group, which has several times been distinguished as generically or subgenerically different from the true Salmon. The absence of teeth on the shaft of the vomer has been the character most usually relied on to distinguish the Charrs. A more important character is, however, seen in the form of the bone, which is boat-shaped, with the shaft short and depressed. The Charrs are further distinguishable by the very small size of the scales, and also by the coloration, they being always red-spotted, and with the lower fins peculiarly colored.

No one who examines the skull of the Charr can doubt its generic distinctness from *Salmo*. The question of the nomenclature of the genus is a matter perhaps of some uncertainty. The group has long been known as *Salvelini*, but that name was hardly given by Nilsson in the usual generic or subgeneric sense, but merely as a plural noun referring to an assemblage of species.

In 1836, Richardson used the name *Salvelinus* for the "subgenus" of Charrs. The use of the name in nomenclature therefore dates from Richardson.

In 1842, DeKay founded his genus *Baione* on the young of one of the species of Charr (*S. fontinalis*); *Baione* is therefore a synonym of *Salvelinus*, although given under a different supposition.

Somewhat later, the genus *Umbla* was proposed by Rapp for those *Salvelini* which have teeth on the hyoid bone. As *Salmo salvelinus* L., the presumable type of *Salvelinus*, has such teeth, *Umbla* probably is also a mere synonym of *Salvelinus*. That the character of hyoid teeth is not a generic one in this case is evident from the close relationship of such species as *S. oquassa* and *S. spectabilis*, with hyoid teeth, with *S. fontinalis* and *S. bairdi*, species destitute of such teeth. The teeth in *S. spectabilis* and *S. oquassa* are too few and small for their absence or presence to be a generic character. In the subgenus *Salar*, the case is precisely the same.

In 1867, Dr. Günther proposed a genus *Hucho* for the *Salvelini* without hyoid teeth. The genus cannot stand on that basis, but nevertheless it appears to be valid, its type, *Salmo hucho* L. (*Hucho germanorum* Günther), being a Pike-like fish, very unlike, both in form and habits, the genuine species of *Salvelinus*. The single known species of *Hucho* as thus restricted, inhabits the Danube.

The remaining subdivision of the old genus *Salmo*, for which the name *Cristivomer* has been proposed by Dr. Gill and myself, is peculiar to the lakes of the northern part of America.

The relations of *Cristivomer* are entirely with *Salvelinus*, a fact which has not hitherto been noticed. Its vomer differs, however, from that of *Salvelinus* in being provided with a raised crest flush with the head or chevron of the bone. This crest is posteriorly free from the vomer for some distance, and is armed with a series of stout teeth. There is also a strong band of hyoid teeth, the dentition generally being more complete than in most other Salmon.

The scales in *Cristivomer* are quite small, and the species are gray-spotted. There are probably but two species, *Cristivomer namaycush*\* (Walbaum) and *Cristivomer siscowet* (Agassiz).

The species of *Salvelinus* known within the limits of the United States are compared below. The species from British America, *Salvelinus stagnalis* (Fabricius) (= *S. nitidus* and *S. alipes* Rich.), *S. rossi* Rich., *S. hoodi* Rich., *S. lordi* Günther, *S. arcturus* Günther, and *S. tules* Cope, I have not seen. Most or all of them are probably valid. *Salvelinus bairdi*, of the Pacific coast, is very near *Salvelinus fontinalis*, and may be a variety of it; but never having seen it in life, I am not by any means prepared so to consider it.

*Common characters*:—River Salmon, not anadromous, with the vomer boat-shaped, somewhat carinate below; a few teeth on the posterior part of the chevron; none on the depressed shaft: scales very small, more or less imbedded in the skin, in 200-250 transverse series, those of the lateral line considerably enlarged. fins moderate, the last ray of the dorsal not lengthened, shorter than any of the other developed rays; caudal fin rather short, usually but little emarginate in the adult, forked in the young; sides of the body with round red spots; lower fins with a pale marginal band anteriorly, succeeded by a darker band; in sea-run specimens, these spots and other markings are often obliterated, and a more or less uniform silvery tint prevails: species not of the largest size, the sexual peculiarities not very strongly marked, the adult male usually with a fleshy projection at the tip of the lower jaw, which fits into a slight emargination of the upper jaw.

a. Hyoid bone provided with a median band of teeth.

b. Body elongate, slender, considerably compressed, the depth about .20 of the length of the body: caudal peduncle long and slender: head quite small, .21 of length of body; its upper surface flattish, .13½ of length, the interorbital space about .07: mouth quite small, the maxillary short and moderately broad, .08 of length, not extending to the posterior margin of the eye; mandible .12 of length; snout, .05: scales quite small, in about 230 transverse rows: caudal fin well forked; adipose fin rather small: coloration dark blue, the red spots confined to the sides of the body, round, smaller than the pupil: hyoid teeth numerous, small. Lakes of Maine .....OQUASSA.†

bb. Body stout, not greatly compressed, the back elevated, the depth .24 of the length: head large, stout, broad, and flattened above, about .25 of length, its upper surface .17 of length, the interorbital space .08: mouth large, the maxillary extending beyond the eye .11 of length; the mandible, .16; the snout, .07: hyoid bone with very few (3 or 4), rather strong teeth (sometimes deciduous): fins short, the caudal slightly forked; adipose fin unusually large, its length in adults nearly twice that of the eye: scales very small, in about 240 transverse rows: red spots on the sides quite large, about the size of the pupil; back covered with very distinct spots, similar to those on the sides, but rather smaller, the dorsal spots said to be cream-colored or greenish in life, rather than red. Streams west of the Sierra Nevada .....SPECTABILIS.

\* Namaycush Salmon, Pennant.—*Salmo namaycush* Walbaum, 1792, = *Salmo namaycush* Bloch, 1801, = *Salmo pallidus* Rafinesque, 1817, = *Salmo amethystus* Mitchill, 1818, = *Salmo confinis* DeKay, = *Salmo symmetrica* Prescott, 1851, = *Salmo adarondacus* Norris, 1864, = *Salmo toma* Hamlin, 1863.

† *Salvelinus oquassa* (Girard) Gill & Jordan.—*Salmo oquassa*, Girard, 1854.

## aa. Hyoid bone without teeth.

c. Body elongate, moderately compressed, not much elevated, the depth .23 of length: head large and long, notably so in the adult, nearly .30 of length, .22 to .25 in the young; top of head .14 to .18 of length; interorbital space broad, .07 to .08½ of length; snout rather conical and pointed, .09 of length, blunter in the young; mandible .22 of length in adult, .15 in young: eye small, nearly in a line with the axis of the body: scales very small, similar to those in the other species, in about 230 transverse rows: caudal fin little forked; adipose fin quite small, shorter than the eye; pectoral and ventral fins not elongate: red spots about the size of the pupil, confined to the sides of the body, the back being nearly plain. Rivers west of the Sierra Nevada.....BAIRDI.\*

cc. Body oblong or elongate, moderately compressed, not much elevated, the depth .20 to .30 of length: head large, but not very long, its length .21 to .24 of length, the top about .14, the rather broad interorbital space about .07: mouth large, the maxillary reaching more or less beyond the eye, about .10 of length; the mandible about .15: eye large, more or less above the line of the axis of the body: scales very small, in about 230 transverse rows: caudal fin slightly lunate in the adult, forked in the young; adipose fin small; pectoral and ventral fins not especially elongate: red spots on body chiefly confined to the sides, rather less than the size of the pupil; the back and vertical fins more or less barred or mottled; coloration often plain in sea-run individuals. Rivers from Little Tennessee in Georgia to Lake Superior and Hudson's Bay.

FONTALIS.†

The original type of *S. spectabilis* and of *S. campbelli*, the latter being merely a substitute name, is still preserved in the National Museum. Although badly decayed, its identity with the species here called *spectabilis* is evident. The types of *Salmo parkei* are now lost, but that the species is the same as *S. spectabilis* seems unquestionable. The name *spectabilis* should now be retained for this fish, as the *spectabilis* of Valenciennes, being a *Salar*, belongs to a different genus.

## 6. GILA OREGONENSIS (Richardson) Jordan.

- 1836—*Cyprinus* (*Leuciscus*) *oregonensis* RICHARDSON, Fauna Bor.-Americana, iii, p. 305.  
*Leuciscus oregonensis* DEKAY, New York Fauna, Fishes, p. 215, 1842.  
*Leuciscus oregonensis* CUV. & VAL., Hist. Nat. des Poissons, xvii, p. 326, 1844.  
*Leuciscus oregonensis* STORER, Synopsis Fishes N. A. p. 412, 1846.  
*Ptychocheilus oregonensis* GIRARD, Proc. Ac. Nat. Sc. Phila. p. 209, 1856.  
*Ptychocheilus oregonensis* GIRARD, Pac. R. R. Expl. Fishes, p. 298, pl. 64, figs. 5-9, 1858.  
*Leuciscus oregonensis* GÜNTHER, Cat. Fishes Brit. Mus. vii, p. 239, 1868.  
*Ptychocheilus oregonensis* JORDAN & COPELAND, Check List of Fishes, p. 151, 1876.  
*Gila oregonensis* JORDAN, Catalogue Fishes N. A. p. 424, 1878.  
1855—*Ptychocheilus gracilis* AGASSIZ, Am. Journ. Sci. Arts, xix, p. 229.

Specimens from the Clackamas River agree in all essential respects with the descriptions given by Agassiz, Girard, and Günther. The

\* *Salvelinus bairdi* (Suckley) Gill & Jordan.—*Salmo bairdii*, Suckley, 1861.

† *Salvelinus fontinalis* (Mitchill) Gill & Jordan.—*Salmo fontinalis*, Mitchill, 1814.—*Salmo allegheniensis*, Rafinesque, 1820.—*Salmo nigrescens*, Rafinesque, 1820.—? *Salmo hearnii*, Rich., 182.—*Salmo canadensis*, H. Smith, 1834.—*Salmo erythrogaster*, DeKay, 1842.—*Baione fontinalis*, DeKay, 1842.—*Salmo immaculatus*, H. R. Storer, 1850.—*Salmo hudsonicus*, Suckley, 1861. The names *immaculatus* and *canadensis* were given to the Canadian Salmon-Trout, which is a Brook-Trout run into the sea.

teeth are 2, 4-5, 2, not 2, 5-5, 2, and the folding of the lips, which suggested the name *Ptychochilus*, is not an evident feature to me.

This species, which is the type of the genus *Ptychochilus*, is a true species of the genus *Gila* as the characters of that genus are now understood. The general physiognomy is similar, the head is long, slender, and depressed, the mouth is very large and overlapped by the snout, the caudal peduncle is slender; the scales are similarly small and loosely imbricated, the dorsal fin is slightly behind the ventrals, the anal fin is not elongate; the lips are normal; the pharyngeal teeth are two-rowed, the inner row 5-4 or 5-5, and the intestinal canal is short. In all these respects, the type of *Ptychochilus* agrees with the type of *Gila*, and as no generic difference has been shown, *Ptychochilus* becomes a synonym of *Gila*. At present, the fishes called *Clinostomus* by Girard are referred to *Gila*. The two groups ought to be generically distinguishable. The typical species of each are very different in physiognomy, but at present, as has been shown by Professor Cope, we are unable to draw a line between them.

The other species referred to *Ptychochilus* are probably distinct from *oregonensis*, but should be compared with species of *Gila* and with each other. If *rapax* and *lucius* have really the teeth 2, 4-4, 2, it may be necessary to frame a separate genus for them, as they would hardly be referable to *Notropis* or to *Gila*.

## 7. ACROCHILUS ALUTACEUS Agassiz & Pickering.

### *Hard-Mouths.*

1855—*Acrocheilus alutaceus* AGASSIZ & PICKERING, Amer. Journ. Sci. Arts, xix, p. 96.

*Lavinia alutacea* GIRARD, Proc. Ac. Nat. Sc. Phila. 1856, p. 184.

*Acrochilus alutaceus* GÜNTHER, Cat. Fishes Brit. Mus. vii, p. 276, 1868.

*Acrochilus alutaceus* JORDAN & COPELAND, Check List Fishes, p. 146, 1876.

*Acrochilus alutaceus* JORDAN, Catalogue Fishes N. A. p. 418, 1878.

Several fine specimens of this very interesting species are in Mr. Stone's collection. As no detailed account has been given of the fish, and as none of the authors mentioned in the above synonymy, excepting Professor Agassiz, seem ever to have seen it, I give a description of one of the specimens. The relations of this genus are doubtless with *Chondrostoma*, but its teeth are fewer and differently formed.

General form and appearance of the species of *Gila*, but the head not depressed, and more blunt forward.

Body elongate, not much compressed, its sides more so than the caudal peduncle; the greatest depth, over the ventrals, 4 in length; caudal peduncle very long and very slender, unusually broad, nearly terete, its length contained  $4\frac{2}{3}$  times in the length of the body, its least depth  $2\frac{2}{3}$  in length.

Head moderate,  $4\frac{1}{4}$  in length of body, bluntish, the profile considerably rounded, the interorbital space strongly convex. Mouth horizontal,

subinferior, overlapped by the broad, blunt snout, its breadth considerable, but the maxillary not extending far back, not to opposite the front of the eye. Upper jaw protractile, covered with a fleshy lip, inside of which is a small, straight, cartilaginous plate, similar to that on the lower jaw, but much smaller and not evident externally. Lower lip covered with a firm cartilaginous plate, sharp externally, the upper surface being formed by its bevelled edge. The transverse width of this plate is between four and five times its (longitudinal) breadth. The plate extends in nearly a straight line from one angle of the mouth to the other; its transverse width is contained  $2\frac{3}{4}$  times in the length of the head. Eye rather large,  $5\frac{1}{2}$  in head,  $1\frac{3}{8}$  in snout, its position anterior and not high up,  $2\frac{1}{4}$  in interorbital space.

Fin-rays: Dorsal I, 10. Ventrals, 9. Anal I, 9. Dorsal long, rather low, its first ray just behind the first ray of ventrals, about over the middle of the latter fin, midway between the snout and the middle of the base of the caudal fin; caudal fin very long, the lobes about equal, longer than the head, widely forked, the accessory rays at its base very numerous and recurrent on the caudal peduncle; about eight of these may be distinguished on each side of the fin. Anal fin rather large; ventrals broad, not reaching vent. Pectorals moderate, not reaching two-thirds of the distance to the ventrals.

Scales quite small, somewhat imbedded in the skin, very loosely imbricated, or often scarcely imbricated at all, the exposed surfaces longer than high, profusely punctate; squamation quite irregular; the scales smaller on back and belly than on sides, most exposed on caudal peduncle. Scales 21-85-13. Lateral line broadly decurved.

Coloration very dark, belly paler, but nearly all parts of the body studded with minute dark points.

Teeth 5-4 (5 on the left side, 4 on the right), hooked, somewhat club-shaped, with a broad masticatory surface.

Peritoneum black; intestines much elongate, filled in this specimen with vegetable substance, apparently five leaves and branches of a *Sphagnum*-like moss.

Length of specimen examined, one foot.

## 8. MYLOCHILUS CAURINUS (Richardson) Girard.

- 1836—*Cyprinus* (*Lenciscus*) *caurinus* RICHARDSON, Fauna Boreali-Americana, iii, p. 304.  
*Leuciscus caurinus* DEKAY, Zoology N. Y. Fishes, p. 215, 1842.  
*Leuciscus caurinus* CUVIER & VALENCIENNES, Hist. Nat. des Poissons, xvii, p. 325, 1844.  
*Leuciscus caurinus* STORER, Synopsis Fishes N. Am. p. 159, 1846.  
*Mylocheilus caurinus* GIRARD, Proc. Acad. Nat. Sci. Phila. p. 169, 1856.  
*Mylocheilus caurinus* GIRARD, Pac. R. R. Expl. x, p. 213, pl. 46, f. 1-4, 1858.  
*Leucosomus caurinus* GÜNTHER, Cat. Fishes Brit. Mus. vii, p. 270, 1868.  
*Mylochilus caurinus* JORDAN & COPELAND, Bull. Buffalo Soc. Nat. Hist. p. 155, 1876, (name only).  
*Mylochilus caurinus* JORDAN, Catalogue Fishes, p. 427, 1878.



- 1855—*Mylocheilus lateralis*, AGASSIZ, Am. Journ. Sci. and Arts, p. 231.  
*Mylocheilus lateralis* GIRARD, Proc. Acad. Nat. Sci. Phila. p. 169, 1856.  
*Mylocheilus lateralis* GIRARD, Pac. R. R. Expl. p. 213, pl. 48, f. 5-8, 1858.  
*Mylocheilus lateralis* JORDAN & COPELAND, Bull. Buffalo Soc. Nat. Hist. p. 155, 1876.
- 1856—*Mylocheilus fraterculus* GIRARD, Proc. Acad. Nat. Sci. Phila. p. 169.  
*Mylocheilus fraterculus* GIRARD, Pac. R. R. Expl. x, p. 215, pl. 45, f. 1-4, 1858.  
*Mylocheilus fraterculus* COOPER, Nat. Wealth Cal. by Cronise, p. 496, 1868.  
*Mylochilus fraterculus* JORDAN & COPELAND, Bull. Buffalo Soc. Nat. Hist. p. 155, 1876, (name only).

*Habitat.*—Northern California to British Columbia.

My specimens agree perfectly with Dr. Günther's description of his *Leucosomus caurinus*, which was taken in part from Richardson's original types, except that the size of the eye in my fishes is proportionally larger. Agassiz's account of *Mylocheilus lateralis* answers in a general way, except that I find no trace of anything which can be called a horny sheath on the jaws. There is nothing in Girard's trivial description of *Mylochilus fraterculus* to indicate distinction. I therefore follow Dr. Günther in considering *M. lateralis* and *M. fraterculus* as mere synonyms of *M. caurinus*. The genus *Mylochilus* resembles in form, squamation, etc., the genus *Gila*. It has, however, a much smaller mouth than most of the species of that genus. Its relations are rather with *Pogonichthys* and *Platygobio*, from both of which it differs in the peculiar form of its teeth as well as in the number of teeth. I find in the specimen before me the teeth 2, 5-5, 2, the teeth of the smaller row quite small and close together, and the innermost of the larger row much enlarged and truncate, gradually diminishing in size to the uppermost, which is slender, compressed, and hooked. I find no trace of a third row in my specimens.

The genus *Mylopharodon* Ayres is perfectly distinct from *Mylochilus*, the upper jaw being non-protractile, the dorsal behind the ventrals, and no barbel at the angle of the maxillary. *Mylopharodon* thus far apparently contains but a single species, the types of *Gila conocephala* B. & G. and *Mylopharodon robustus* Ayres being, so far as I can see, conspecific.

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**A REVIEW OF THE AMERICAN SPECIES OF THE GENUS SCOPS,  
SAVIGNY.**

**By ROBERT RIDGWAY.**

Previous to the publication, some two years since, of Mr. R. B. Sharpe's admirable work on the *Strigidae*,\* I had paid considerable attention to the study of the American Scops-owls, but the lack of sufficient material prevented my reaching any very positive conclusion as to several forms of questioned validity. More recently, however, through the assistance of several friends, among whom I may name in particular Mr. Osbert

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\* Catalogue of the Striges, or Nocturnal Birds of Prey, in the Collection of the British Museum. By R. Bowdler Sharpe. London: Printed by order of the Trustees. 1875.