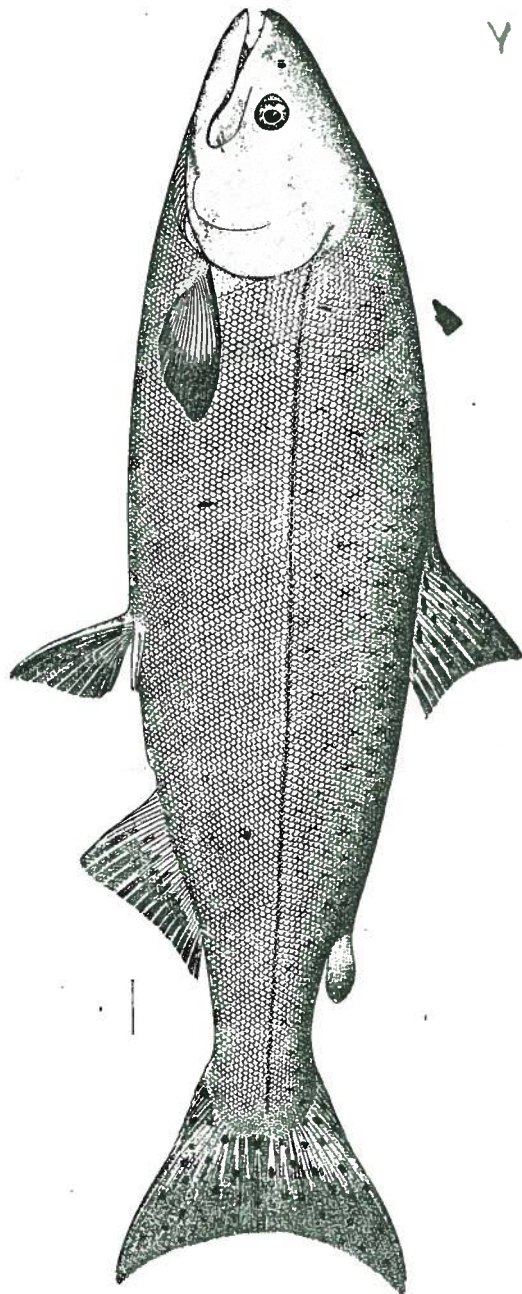


12 cup

Bull. U. S. F. C. 1894. Notes on Atlantic Salmon. (To face page 100.)

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PLATE 4.
Y 3338THE PACIFIC SALMON (*Oncorhynchus tshawytscha*)

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1895II.—RESULTS OF EXPLORATIONS IN WESTERN CANADA AND THE NORTH-
WESTERN UNITED STATES.BY CARL H. EIGENMANN,
Professor of Zoology, Indiana University.

INTRODUCTION.

During August and part of September, 1892, I made a series of collections of fishes between Winnipeg and Vancouver in Canada, and between Umatilla, Oregon, and Poplar, Montana, in the United States. Collections were made at 25 different places distributed as follows: 5 stations in the basin of the Red River of the North, 1 in the basin of Lake Manitoba, 6 in the Saskatchewan basin, 7 in the Columbia basin, 4 in the Fraser basin, and 2 in the Missouri basin. I thus collected material for a comparison of the fish faunas of the streams flowing into Hudson Bay and into the Gulf of Mexico on the Atlantic slope, and into Puget Sound and into the Columbia on the Pacific slope. The conclusions based on my observations are, of course, merely tentative, for many other species will probably be found in the streams examined.

Nineteen stops were made in Canada along a line which runs nearly west from Winnipeg, i. e., along the Canadian Pacific railway. On the Atlantic slope I collected from an elevation of 700 feet at Winnipeg to an elevation of 4,500 feet at Banff, in the Rocky Mountains Park, and on the Pacific slope from an elevation of 4,050 feet at Field to 300 feet at Umatilla on the Columbia system, and from 1,900 feet at Griffin Lake to tide water at Mission in the Fraser system.

The streams on the Atlantic side in Canada belong to one river system, since the Red River and the Saskatchewan are united in Lake Winnipeg and there is a direct communication between the Qu'Appelle River and the Saskatchewan.* I was informed that a similar relation exists between the headwaters of the Saskatchewan and the Milk River, thus connecting the Winnipeg system with the Mississippi system. The connection is said to lie in a marshy meadow to the west of the Cypress Hills; and should this be a fact, the Mississippi, Saskatchewan, and Columbia† would form one gigantic water system similar to that formed by the Orinoco, Amazon, and La Plata, with the difference that the Pacific slope is included in the North American system. The great similarity of the fauna of the Saskatchewan to that of the Missouri lends

* H. Youle Hind, Canadian Red River and Assiniboine and Saskatchewan Expedition (London, 1860), p. 355: "We soon found a pond from which we observed water flowing to the Saskatchewan and the Assiniboine. The pond is fed by a number of springs and small streams, a foot or two broad, issuing from the sand hills at right angles to the valley."

† For a full and interesting account of the connection between the headwaters of Snake River and the Yellowstone, see Evermann, Report of the Commissioner of Fish and Fisheries respecting the establishment of fish-cultural stations in the Rocky Mountain region and Gulf States, p. 22, 1892.

color to the claimed connection between these two systems. The connection between the Missouri and the Columbia has scarcely affected the distribution of fishes.

The region from Winnipeg to Calgary is very much like any section in the United States from the Mississippi to the Rockies. The slope for the most part is imperceptible and the country is level or slightly rolling. A large part is prairie, the rest is covered with low shrubs. The rivers have usually worn a narrow valley below the general surface, and their banks are nearly always quite abrupt and very muddy. From Calgary the ascent is rapid and the streams become mountain torrents.

On the Pacific slope the streams are all swift, and from Field to the Columbia the descent is very rapid. The Columbia is navigable from Golden up, but below Golden there are many rapids. This river makes a long horseshoe bend towards the north, and when the railway strikes it again at Revelstoke the river is 1,000 feet lower and again navigable.

I received much valuable information and many courtesies from Mr. McQueen, inspector of fisheries for Manitoba; from Mr. W. Hill, of Winnipeg; Mr. Amedée E. Forget, of the Canadian Indian department; Capt. Harper, of the Canadian mounted police, and Mr. G. A. Stewart, superintendent of the Rocky Mountains Park of Canada.

Finally, I must acknowledge my indebtedness to Dr. Albert Günther, of the British Museum, at whose suggestion and expense the explorations were undertaken.

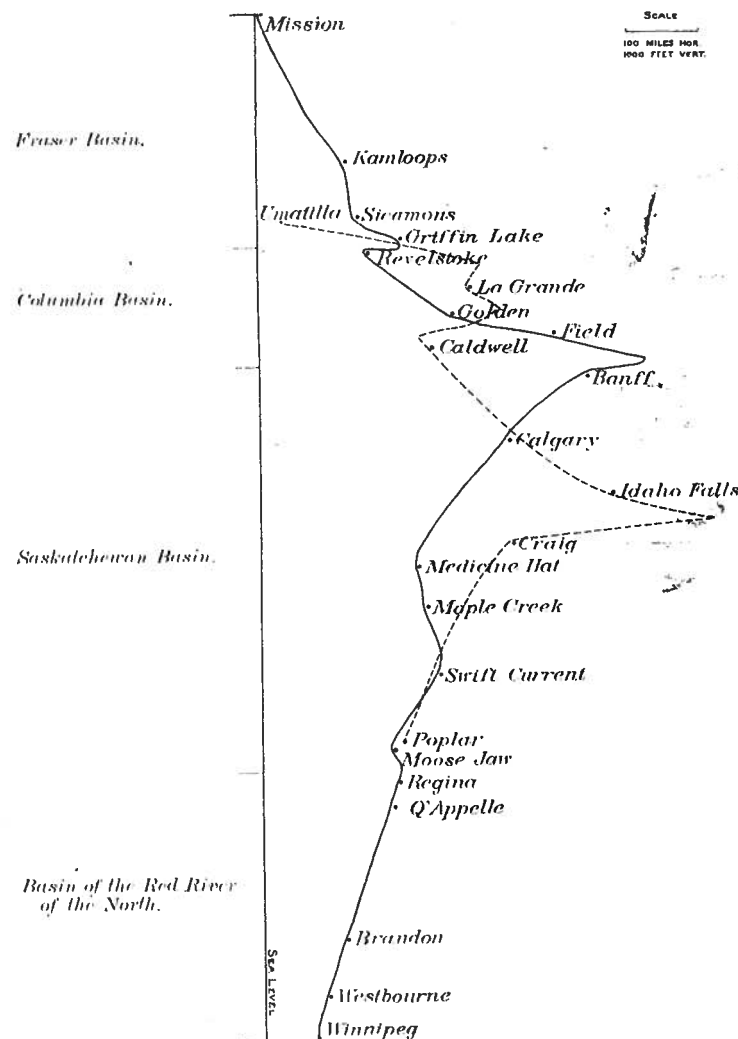
STATIONS WHERE COLLECTIONS WERE MADE.

In the following list I give the names of the places visited by me in their regular succession, the name of the river examined, the system to which it belongs, and, as far as I have been able to determine, the elevation of each locality. All the elevations of Canadian points have been taken from the levels of the Canadian Pacific Railroad. Plate 5 illustrates the relation of these stations to each other.

Station.	Elevation.	Stream.	River system.
<i>Canada, Atlantic slope:</i>			
Winnipeg	790	Red River of the North	
Westbourne	780	White Mud	Manitoba Lake.
Brandon	1,150	Assiniboine	Red River.
Qu'Appelle	*1,700	Qu'Appelle	Do.
Regina	1,575	Lacawanna Creek	Do.
Moose Jaw	1,720	Moose Jaw	Do.
Chaplin		Old Wives Lake	Do.
Swift Current	2,400	Swift Current	Saskatchewan.
Maple Creek	(?) 3,850	Maple Creek	Do.
Medicine Hat	2,150	Saskatchewan	Do.
Calgary	3,388	Bow and Elbow	Do.
Banff	4,500	Bow and Vermilion	Do.
<i>Canada, Pacific slope:</i>			
Field	4,050	Kicking Horse	Columbia.
Golden	2,550	Kicking Horse and Columbia	Do.
Revelstoke	1,475	Columbia	Do.
Griffin Lake	1,800	Griffin Lake	Fraser.
Steamons	1,300	Shuswap Lake	Do.
Kamloops	1,158	Thompson River	Do.
Mission	1	Fraser	Do.
<i>United States:</i>			
Umatilla	300	Umatilla Creek and Columbia	
La Grande	2,780	Grand Ronde	Columbia.
Caldwell	2,372	Idaho	Do.
Idaho Falls	4,712	Snake River	Do.
Craig	13,438	Missouri	Missouri.
Poplar	11,000	Poplar River	Do.

* About.

† Elevations furnished by Great Northern Railroad through its general manager, Mr. D. L. Mohler.



RELATIVE LONGITUDINAL AND ALTITUDINAL POSITIONS OF THE POINTS WHERE COLLECTIONS WERE MADE

The continuous line represents the Canadian points. The river basins to which these points belong are indicated beneath the sea-level line. The broken line connects the United States points. All those west of the highest point belong to the Columbia Basin; all those to the right belong to the Missouri Basin.

UNITED STATES.

The region about Umatilla is a rolling prairie. The banks of the Columbia River are sandy and gravelly. The Umatilla River is small and empties into the Columbia. About its mouth is an estuary with a soft mud bottom and with from 2 to 3 feet depth of water. The mud and some waterweeds usually filled the net so that it was difficult to pick out the fish, especially as it was necessary to collect after dark. The most important discovery of the season was made at this point. *Columbia transmontana* shows in a striking way the modification of the fins of the Pacific slope fishes. In this case it has found expression in the strong spines at the origin of the anal and the dorsal fins.

The Grand Ronde River is a tributary of the Snake. At La Grande it is a small stream with a few deep holes. It is dammed near the town for milling purposes, is full of angular pieces of lava, and seining is almost impossible. Below the dam large numbers of *Ammocetes* were found dead.

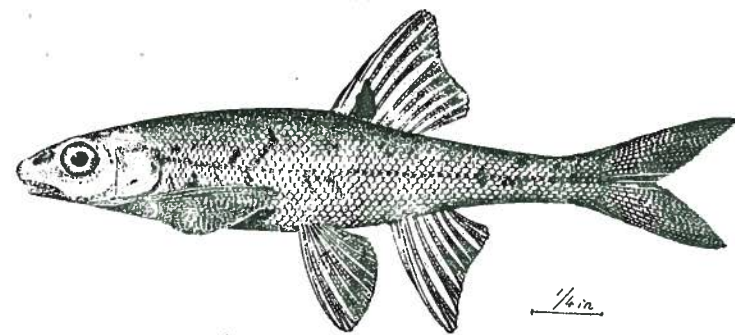
About Caldwell the country is a level plateau, treeless except along the river banks. The Boise River, which is a swift stream about 100 feet or less in width, is dammed at various places to divert the water into irrigating ditches. There are level stretches in the river, alternating with swift riffles.

At Idaho Falls the Snake River has worn a narrow gorge through the lava, and is a fierce torrent in which seining was out of the question. Fortunately a small stream has been diverted for a mill, and in this I obtained probably a complete series of the fishes of this region. The country is still a level valley with mountain ranges at a distance on either side.

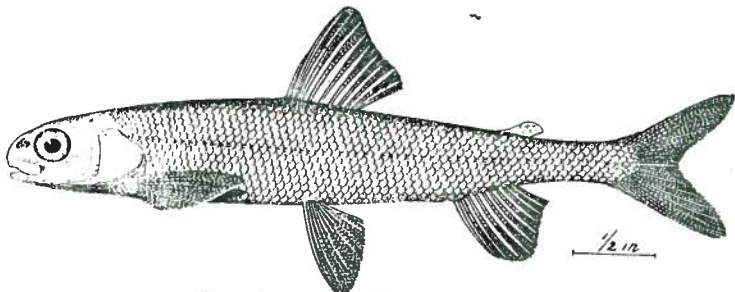
Soon after leaving Idaho Falls the continental divide is crossed. The first station at which I made collections was **Craig, Mont.**, on the Missouri. This river is here about 150 feet wide, a clear, cold, rapid stream with gravel bottom and full of *Coregonus williamsoni* and *Platyphio gracilis*. Fishing was confined chiefly to the slough formed at the mouth of a small creek entering from the eastern side.

At Poplar the Missouri is a swift, muddy stream, probably 200 yards or more wide. Poplar River is also muddy and partakes of the nature of the prairie streams near Winnipeg; that is, its banks are composed of soft mud. It seemed nowhere over 5 feet deep, and in many places it was only a foot deep.

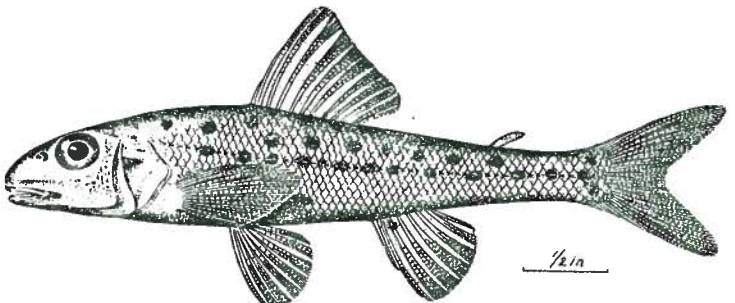
NOTES ON THE FISHES COLLECTED.



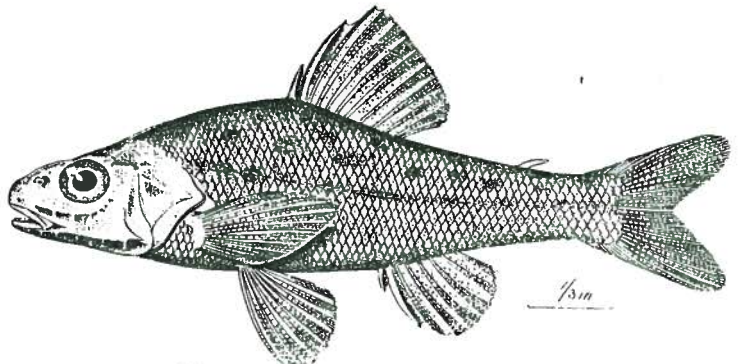
AGOSIA FALCATA Eigenmann & Eigenmann.



COREGONUS COULTERI Eigenmann & Eigenmann.



PERCOPSIS GUTTATUS Agassiz.



COLUMBIA TRANSMONTANA Eigenmann & Eigenmann.

1. *Ammocetes tridentatus* (Gairdner). This species ascends the rivers to spawn. At La Grande the Grand Ronde, a small stream 5 or 6 yards wide, is dammed for milling purposes. Just below the dam a large number of this species were noticed in all stages of decay. Some had evidently died the preceding night. The ovaries of those taken at this place were large, but the eggs were quite small. Whether the "eels" had spawned and died, or whether the specimens were left stranded, I am unable to state. All the specimens were about 600 mm. long. At Caldwell I secured a large number of the young of this species. The largest of these measured 60 mm. In their habits the young very much resemble *Embranchostoma*. They burrow in the sand near the margin of the stream. If they are disturbed they will come out of the sand a few centimeters from the place of disturbance. The small ones were procured by throwing the sand on the banks, whereupon they would squirm out and could be secured.
2. *Acipenser sturio* Linnaeus. This species is common at Winnipeg and in the lakes to the north. I procured a single specimen 96 mm. long. It has the upper part of the snout black, a black spot on the sides above the posterior third of pectorals, and another below the dorsal; a narrower dusky band connects these and extends to the tip of the tail.
3. *Noturus flavus* Rafinesque. A number of specimens of this species (150 to 250 mm. long) were obtained with hook and line at night in the Missouri River at Craig, Mont. This seems to be the most western record for any members of the *Siluridae*. They were reported to me at Medicine Hat, but I did not procure any specimens at that place. Prof. Evermann reports none in his explorations in Montana and Wyoming. It has hitherto been supposed that the members of this family do not ascend to the mountains. None have been found indigenous to the Pacific slope. In the larger specimens the two maxillary barbels reach the base of the pectorals. There is uniformly a white spot on the back just at the base of and behind the last dorsal ray.
4. *Ictalurus punctatus* Rafinesque. Winnipeg. Exceedingly abundant in the Red River, where it is caught in great numbers, especially at night. It frequently reaches a length of about 750 mm. It was reported to me at Brandon, but it can not be abundant at that place, since none were said to have been caught there since 1883. A catfish was also called to my attention at Medicine Hat, but from the description it must be a *Noturus*.
5. *Ictiobus cyprinella* (Cuvier & Valenciennes). Winnipeg. Two specimens, the largest 750 mm. long.
6. *Cariacus velifer* (Rafinesque). Winnipeg, Brandon, Medicine Hat, Poplar. I can detect no differences between the specimens from Winnipeg and some taken in the Ohio River at Cincinnati.
7. *Pantosteus jordani* Evermann.
(*Pantosteus columbianus* Eigenmann & Eigenmann, Am. Nat., Feb., 1893.)
Three specimens, 92 to 100 mm. long, Boise River, Caldwell, Oreg. Very closely related to *P. generosus*, the eye slightly larger, the caudal much longer. Head, 4½-5; depth, 4½-5; D, 11, 11½-12½ (in two); A, 1, 8½ (7½ in *generosus*). Scales, 16 to 19-80 to 100-15. Eye, 1½-2 in snout, 1½-1¾ in interorbital, 3½ to little more than 4 in head (2½; 3½; 4½ in *generosus* of same size). All the fins more pointed than in *generosus*, the caudal lobes considerably longer than the head (shorter than head in *generosus*), 3½-4½ in the length (5-5½). Light brown with indistinct clouds of darker.
8. *Catostomus catostomus* (Forster). Winnipeg, Swift Current, Medicine Hat, Calgary, Banff, Golden, and Revelstoke. Ascends streams to spawn. Is said to be very abundant at Winnipeg during the winter. Only a single specimen, the first of the season, was taken during my stay. As will be seen from the above localities, the species extends across the Rockies. A specimen of *catostomus* 230 mm. long, from Golden, on the Columbia River, differs in only a few minor details from a specimen of *Catostomus catostomus* of about the same size, the origin of which is not known. A series of larger specimens will probably show perfect intergradation. In the Golden specimen the eye is more anterior than in the other; and this feature changes all the proportions of the head. The size of the eye is the same in both; 6½ in the length of the head, 2 in the postorbital portion in the Golden specimen (2½-3 in the other), about 2½ in the snout (3½); middle of head behind anterior margin of pupil (at anterior

margin of eye); depth of head greater than length of snout plus eye (depth of head less than snout plus eye); scales of breast obscure, imbedded forward (scales of breast regularly imbricated, not imbedded); margins of lower fins all well rounded, all of them shorter than in typical *Catostomus* (margins of lower fins all more angular, some of the rays being longer than others). Distance of end of superciliary nares canal from transverse nuchal canal twice as great as in the typical form. Such differences would be considered of no value for purposes of classification in specimens from the same river system, and indeed I am not able to find any tangible differences between specimens 190 mm. long from the Columbia at Revelstoke and the flow at Calgary or the Swift Current. The larger specimen has the back and sides quite dark, centers of the scales toward the belly white; belly entirely white. A reddish band along the lateral line. The young from all localities are mottled gray.

9. *Catostomus griseus* (Girard). Swift Current, Medicine Hat, Craig. One specimen, 116 mm. long, was taken at Swift Current. Caudal as long as head, $4\frac{1}{2}$ in the length. D. 11, 10 $\frac{1}{2}$. Sides to ventral surface dark-grayish, variously mottled. Lower surfaces, white. A number of specimens were taken at Medicine Hat, the largest 90 mm. long. These smaller specimens can readily be distinguished from *C. calostomus* of the same size by their much larger mouth, which very much resembles that of *Pantosteus*. The jaws are provided with horny or cartilaginous sheaths, making the resemblance to *Pantosteus* still greater.
10. *Catostomus macrocheilus* Girard. Sicamous, Kamloops, Umatilla, La Grande, Caldwell, and Idaho Falls. I saw a species of this genus in Griffin Lake, but was unable to secure it. In all probability it was *C. macrocheilus*, since this species was obtained a few miles further west, at the mouth of the outlet of this lake. The largest specimen was obtained at La Grande, and measured 380 mm. It is quite dark to below the lateral line, where, from a line from just above the upper lip to the lower part of the caudal, the color abruptly changes to white. The pectorals, ventrals, and part of the anal are dusky, and a dusky bar extends upward from the base of the pectoral. The local variation in dorsal rays is well marked. Aside from the two undivided rays at the beginning of the fin the rays are as follows:

Locality.	Dorsal rays.					
	11 $\frac{1}{2}$	12 $\frac{1}{2}$	13 $\frac{1}{2}$	14 $\frac{1}{2}$	15 $\frac{1}{2}$	16 $\frac{1}{2}$
Sicamous.....		1	1	3		
Kamloops.....			2	3		
Umatilla.....			4	34	6	1
La Grande.....		2	2	1		
Caldwell.....			3	3		
Idaho Falls.....	1	3				

These last specimens approach *Catostomus ardens*.

11. *Catostomus commersoni* (Lacépède). Winnipeg, Westbourne, Qu'Appelle, Regina, Moose Jaw, Swift Current, Maple Creek, Medicine Hat, Calgary, Poplar. Very abundant everywhere. Scales, 55-69.
12. *Moxostoma aureolum* (Le Sueur). Winnipeg, Westbourne, Brandon, Poplar. Lower fins, and especially the caudal, red. D. 14 $\frac{1}{2}$ to 18 $\frac{1}{2}$. Specimens 210 mm., from Winnipeg, have the head 5 in the length.
13. *Moxostoma anisurum* Rafinesque. Winnipeg, Brandon. This species is much less abundant at Winnipeg than the preceding. The specimens measure from 90 to 285 mm. Head, $3\frac{1}{2}$ to 4. D. 16 $\frac{1}{2}$ or 17 $\frac{1}{2}$, counting all the rays. A. 8 $\frac{1}{2}$. Upper caudal lobe little longer than lower in the largest specimen. The largest specimen differs little from one obtained at Toledo, Ohio. Scales, 6-39 to 43-5. Color lighter than in the preceding species, no red on the fins.
14. *Hybognathus placita* Girard. Abundant at Poplar, but not seen elsewhere.
15. *Acrocheilus alutaceus* Agassiz & Pickering. Umatilla, Caldwell.
16. *Pimephales promelas* Rafinesque. Winnipeg, Westbourne, Brandon, Qu'Appelle, Regina, Swift Current, Maple Creek, Medicine Hat. Very abundant everywhere, especially so at Regina and Swift Current; least so at Qu'Appelle.

17. *Notropis jordani* Eigenmann & Eigenmann.

Notropis albeolus E. & E., An. Nat., Feb., 1893; not *N. albeolus* Jordan = *N. megalops*.

A single specimen, 73 mm. long, obtained at Medicine Hat. This species is most closely related to *N. maculatus* and *N. heterodon*. In color it differs strikingly from the latter, agreeing in this respect with *maculatus*, except that it lacks a caudal spot and is less profusely spotted. The lateral line is much less complete than in *heterolepis*, and better developed than in *maculatus*. Head, 4; depth, $4\frac{1}{2}$; D. 9 $\frac{1}{2}$; A. 8 $\frac{1}{2}$; scales, 4-35-4; 15 scales before the dorsal; teeth, 1-1, 1, 2. Two of the teeth feebly hooked, the two others with narrow imperfect grinding surfaces. The teeth on the right side are evidently abnormal, being arranged in three rows. Elongate compressed, more slender than *heterolepis*. Head much as in *heterolepis*, less convex above. Jaws equal; mouth oblique, the premaxillary on the level or lower margin of the pupil. Maxillary extending to anterior margin of orbit. Snout pointed, not decurved. Eye $3\frac{1}{2}$ in head, $1\frac{1}{2}$ in interorbital. Fins all small; origin of the dorsal over ventral, equidistant from base of middle caudal rays and nares, highest ray extending a little past end of the last ray when the fin is depressed, equal to head less snout; anal similar to dorsal, its highest ray equal to snout and eye; ventral equal to highest anal ray; pectorals longer, equal to head less opercle. Scales closely imbricated, the exposed edges little higher than long. Lateral line decurved, the tubes developed on less than 10 scales (some of those of the middle of the body are removed). General color silvery, no distinct markings. Ventral surface entirely white, a plumbeous lateral band overlaid with silvery. A dark vertebral line from occiput to caudal. Sides with a few dark specks, dorsal surface more densely speckled, the margins of the scales darker.

18. *Notropis heterolepis* Eigenmann & Eigenmann. A specimen, 35 mm. long, taken at Qu'Appelle. This species is evidently closely related to *N. heterodon*, *N. anogenus*, etc. It differs from them strikingly in having tubes developed in but one or two scales of the lateral line, while all the scales along the lateral line on one side and all but one or two on the other are deeply notched on their posterior margins. Head, 4; depth, $4\frac{1}{2}$; D. 9 $\frac{1}{2}$; scales, 5-35-4; 15 scales in front of dorsal. Teeth feebly 4-4; grinding surface well developed on three teeth. Head subcylindrical, little compressed, the snout rounded, little obtuse; the lower jaw included. Mouth little oblique, the premaxillary below the level of the lower margin of pupil. Maxillary almost reaching eye. Eye large, 1 in snout, $3\frac{1}{2}$ in head, $1\frac{1}{2}$ in interorbital. Dorsal inserted equidistant from base of upper caudal rays and anterior margin of eye, behind the last ray of the ventrals. Tips of the first rays much projecting beyond tips of last when depressed, the longest ray about equal to head less snout. Anal similar to dorsal, the longest ray about $1\frac{1}{2}$ in head; ventrals reaching vent, equal to highest anal ray; pectorals equal to length of head less opercle. Scales loosely imbricated, almost imbedded in front of the dorsal. Scales along the median line (lateral line) with a deep notch near the middle of the posterior margins, the line nearly straight. A few black specks along base of anal; a dark line along lower margin of tail from anal to caudal. A dark band from tip of snout along the sides to the caudal; on the tail the band coincides in position with the scales of the lateral line. On the body it is placed a little higher. A conspicuous black curved line at the base of each scale of the lateral line. All the scales above the lateral band dotted with black. A narrow vertebral line from occiput to dorsal, a broad dusky band on the back between the dorsal and caudal, between which and the lateral band is a lighter band. Scales of the back with dark margins. Series of minute black dots along each ray of the dorsal, anal, and outer portion of pectoral; the dorsal and caudal quite dusky.

19. *Notropis (Minnilus) reticulatus* Eigenmann & Eigenmann. Brandon, Qu'Appelle. This species is closely related to *N. spectranculus*, *frederici*, *ulidus*, and *topeka*, and may prove identical with one or the other. It approaches nearest *N. frederici* and *topeka*. From the former it differs chiefly in the larger scales in front of the dorsal, and from the latter in the naked breast. Head, 4; depth, 4-4 $\frac{1}{2}$; D. 9 $\frac{1}{2}$ or 10 $\frac{1}{2}$ (1 or 11, 8 $\frac{1}{2}$); A. 9 $\frac{1}{2}$ (11, 7 $\frac{1}{2}$); scales, 4 or 5-31-3 or 4; 12-14 scales in front of the dorsal; teeth, 4-4, hooked, with evident grinding surface. Head pointed, broad above and slightly convex. Snout decurved, pointed, the lower jaw included. Mouth oblique, the premaxillary on a level with the lower margin of the pupil or somewhat lower.

* A larger series of specimens collected by Mr. A. J. Woolman in the headwaters of the Red River make it probable that this species is *N. delicatulus*.

Maxillary reaching front of orbit. Eye large, considerably longer than snout, 3 in head, greater than interorbital. Origin of dorsal over ventrals, equidistant from tip of snout and from base of upper caudal rays; longest ray scarcely extending beyond tip of last when depressed. Anal low, the longest ray not extending past tip of last ray when the fin is depressed, equal to snout and eye. Ventrals reaching vent, slightly longer than the highest anal ray. Pectorals little longer than head less opercle. Scales closely imbricated, the exposed edges considerably deeper than long in the largest specimens. Lateral line decurved, complete. Breast naked (scaled in *N. topaka*). A dark streak from anal to caudal, lower parts otherwise plain. A dark vertebral line, a plumbeous band along the sides, a faint spot at the base of the caudal about as large as the pupil. A series of spots along each side of the lateral line. Upper parts of sides and the back profusely spotted, the edges of the scales black, giving the whole part a reticulated appearance. The specimens from Qu'Appelle are darker than those from Brandon.

20. *Notropis deliciosus* (Girard). Three specimens of this species were taken at Winnipeg.
21. *Notropis megalops* (Rafinesque). A number of specimens of this species were obtained at Brandon. None were seen elsewhere.
22. *Notropis scopiferus* Eigenmann & Eigenmann. This species is evidently closely related to *N. lucidus*, from which it differs in the scaling and in having a conspicuous jet-black spot about as large as the pupil at the base of the caudal fin. Numerous specimens were obtained at Winnipeg, Brandon, Fort Qu'Appelle, and Medicine Hat. The species is most abundant at Fort Qu'Appelle, where the largest specimens (112 mm.) were obtained. Head, 4-4½ (longest in young); depth, 4½; D. 9½; A. 10½ (the first two rays minute, unsegmented, and unbranched); scales, 6-36 to 42-4; 14 to 18 scales in front of the dorsal; teeth, 2, 4-4, 2; grinding surface very narrow, on two teeth. Compressed fusiform, the dorsal and ventral outlines about equally arched; highest point of back at first dorsal ray. Head heavy, compressed, flat above; snout blunt, much decurved. Mouth small, little oblique; the premaxillary below the level of the lower margin of the pupil; maxillary extending to anterior margin of eye. Eye large, longer than snout, 3 in head, little less than interorbital width. Origin of dorsal about equidistant from tip of snout and base of caudal; the highest ray extending much beyond tip of last when the fin is depressed, equal to the length of the head; caudal deeply forked, the lobes equal, longer than head. Anal similar to dorsal, but much lower, the highest ray about equal to the head less the snout; ventrals below the dorsal, reaching vent; pectorals about equal to the highest anal ray. Scales closely imbricated, but not notably deeper than long. Lateral line complete, and each scale with a well-developed tube. The line evenly and gently decurved to above origin of anal. All specimens, from the smallest (about 25 mm. long) to the largest, have a conspicuous black spot at the base of the middle caudal rays, a silvery lateral band, its dorsal margin distinct, its lower margin not distinct. Color otherwise variable; those from muddy water (Red River at Winnipeg) are bright silvery with very little dusky, the chromatophores being not less numerous, but contracted. The other extreme is found in the clear water of the Qu'Appelle. In these specimens there is a conspicuous vertebral band, and all the scales above the lateral line are most profusely dotted with black, the dots being largest at the margins of the scales. Top of head and upper parts of its sides similarly dotted. Dorsal, caudal, and upper parts of pectorals dusky. Specimens from Little Traverse Bay, Lake Michigan, seem to represent a variety of the species above described; the snout is more slender, the eye perceptibly smaller, and the caudal peduncle more slender. The difference is more marked in young examples, the form being much more slender than in *scopiferus* and the caudal spot notably smaller.
23. *Notropis jejunus* (Forbes). This species was found to be abundant at Winnipeg, Brandon, and Medicine Hat. The teeth are quite variable, being in different specimens 4-4; 1, 4-4, 2; and 2, 4-4, 2; otherwise there is little or no variation. It is not unlikely that some of the species described as having teeth 4-1, or 1, 4-4, 2 are identical with this species.
24. *Notropis atherinoides* (Rafinesque). Winnipeg, Medicine Hat, Poplar. The specimens from Winnipeg are slightly deeper than those from other localities, and all of the northern specimens have slightly larger eyes and correspondingly shorter snouts.

25. *Rhinichthys dulcis* (Girard). Swift Current, very abundant; Medicine Hat, few; Calgary, few; origin of dorsal equidistant from nostril and base of middle caudal rays. Banff, common in Bow River. One specimen has very much larger fins than the others, the pectoral quite reaching the anal. Also in hot sulphur springs, Banff, very abundant. Poplar, one specimen. Craig, abundant.
26. *Agosia nubilus* (Girard). Idaho Falls, abundant.
27. *Agosia falcata* Eigenmann & Eigenmann. Abundant in the Boise River at Caldwell, Idaho; two specimens from Umatilla. In the following description the statements and figures given in parentheses refer to *A. nubilus*. Head, 3½-4½ (4½-4½); depth, 4½-5½ (3½-4½); D. 11½ (8½-11½); A. 9½ (7½-9½). Scales, 53-60 (59-67). Teeth, 1, 1-1, 1 or 2. Elongate, slender, head longer than snout. Eye much larger than in *nubilus*, about 1½ in snout, 3½-4½ in head in larger specimens. The head being longer the proportional numbers do not differ from those of *nubilus*. Scales much larger than in *nubilus*, about 10 above the lateral line (11 in *nubilus*). Dorsal usually inserted directly over the origin of the ventrals, the fin large, its anterior rays prolonged. Origin of dorsal equidistant from base of middle caudal rays and from nares. Caudal deeply forked, the lobes acute, 3½ to 3½ in the length. Anal very obliquely truncate, the anterior rays very high, 4½-1½ (5-5½) in the length. Ventrals always more posterior in position than in *nubilus*, about equidistant from base of middle caudal rays and from nares, their tips extending to or just middle of base of anal, 4½ (5-5½) in the length (reaching to vent, very rarely to origin of anal). Pectorals not reaching ventrals. A dark band forward from eye; dark, lateral band scarcely evident; silvery below; sides and back with numerous, irregular, well defined blotches. Anal and sometimes ventrals with a dusky spot near base in front. Dorsal and caudal faintly mottled; crimson spots on mandible, axil of ventrals, and along base of anal. (Plate 6.)
28. *Agosia falcata shuswap* Eigenmann & Eigenmann. This variety seems well established by four specimens from Shuswap Lake at Sicamous. It is not at all improbable, however, that intergradations will be found. The specimens differ constantly in the more posterior position of the dorsal and ventrals; otherwise there is no difference of any note. Head, 3½-4½; depth, 4-4½; D. 10½-11½; A. 9½. Scales, 10-55-8. Teeth, 1, 4-4, 2 in two specimens; 2, 4-4, 1 in another; and 2, 4-4, 0 in the fourth. Head pointed, the snout scarcely projecting beyond the mouth. Eye large, equidistant from tip of snout and from upper angle of gill-opening, the orbit about equal to the snout, 3½-3½ in the head. Dorsal inserted directly over origin of ventrals, equidistant from base of middle caudal rays and from posterior half of eye. Its first two developed rays elongate, the margin of the fin strongly concave. Highest dorsal ray equal to distance from tip of snout to upper angle of opercle. Caudal long, deeply forked, the lobes finely pointed, the middle rays half as long as the lobes, at least as long as the head. Structure of anal similar to that of dorsal. Ventrals inserted equidistant between base of middle caudal rays and posterior half of eye, pointed, extending to middle of base of anal, equal to head less opercle. Pectorals less pointed than the other fins, as long as head or a little shorter. Light brown with numerous well-defined blotches, a dark band from tip of snout to base of caudal. All the fins with dark points along the rays collected in places, giving the fins a faintly mottled appearance.
29. *Hybopsis storerianus* (Kirtland). A number of small specimens from Winnipeg are probably to be referred to this species.
30. *Conesus dissimilis* (Girard). Very abundant at Swift Current, Medicine Hat, Calgary, Poplar. The specimens from Medicine Hat and from Poplar are quite light in color. Those from Calgary and from Swift Current are darker, the lateral band being well defined. Scales along the lateral line 58-62.
31. *Platygobio gracilis* (Richardson). Craig, Poplar, Brandon, Medicine Hat. This species is extremely abundant in the Missouri River at Craig, and in its tributary, Poplar Creek. A number were obtained with hook and line in the main stream at Craig, where the current is too swift for seining. In the slough at the same place none were seen. One was obtained at Brandon, and I was told that it is abundant at that place. Their projecting snout and frosted silvery color make them a striking species. The largest obtained measures 20 mm. There is a dusky vertebral band and a brown lateral one.
32. *Mylocheilus caurinus* (Richardson). Mission, Kamloops, Sicamous, Revelstoke, Golden, and Umatilla.
33. *Ptychocheilus oregonensis* (Richardson). Kamloops, Sicamous, Umatilla, La Grande, and Caldwell. Teeth usually 2, 1-1, 2. Dorsal with nine well-developed rays (1, 9½).

Leuciscus and Richardsonius. The genus *Richardsonius* was proposed by Girard in 1856. It was said to bear some resemblance to *Squalius*, from which it could "be distinguished by the smooth edge of the dorsal ridge and the long anal, together with the peculiar position of the latter in reference to the dorsal. The dorsal is also much deeper than long, which is not the case in *Squalius*." Species discovered since Girard's description was written have shown that no such differences between *Squalius* (*Leuciscus*) and *Richardsonius* exist. Dr. Günther classed the only two species of the genus *Richardsonius* with his *Abramis*, characterized by the elongate anal and compressed ventral ridge behind the ventrals. Jordan and Gilbert also separated the genus *Richardsonius* from *Leuciscus*, etc., on the basis of the compressed ventral ridge and elongate anal. I have examined a very large series of specimens and find that the ventral ridge is very variable, especially with age, and is of no worth whatever to separate *Richardsonius* even subgenerically from *Leuciscus*. In one specimen, which might have served Girard's artist when he drew *R. balteatus*, there is the merest vestige of a ventral ridge. The ridge seems best developed in specimens about medium size (75 mm.). The characters selected to separate the species of the old genus *Richardsonius* from each other seem no more fortunate. Neither the teeth nor the scales are of any value whatever in this respect. The anal fin is by no means an absolute guide, as will be seen later. In fact, I have been unable to detect a single character which will always separate the two forms, each of which is variable in the extreme. All those species of *Leuciscus* with increased number of anal rays, *montanus*, *hydrophlox*, *gilli*, *balteatus*, and *lateralis* may be classed under the subgeneric name *Richardsonius*. I find in examining 41 specimens of *Leuciscus montanus*, collected by Jordan at Provo, that in some the ventral ridge is much more developed than in typical specimens of *Richardsonius*. The anal rays are: 28 with 12½; 12 with 13½; 1 with 14½.

34. *Leuciscus atrarius* (Girard). This species is abundant in the Snake River at Idaho Falls. It readily takes the hook. The lateral line is not developed until late in life; in specimens 2 inches long the pores are formed on but few scales.

35. *Leuciscus hydrophlox* (Cope). Abundant in the Snake River at Idaho Falls. The anal rays in a number of specimens examined vary from 12½ to 14½. Two specimens have 12½ rays, fourteen have 13½, and four have 14½. The dorsal rays vary from 10½ to 11½, and the scales of the lateral line from 51 to 58. There is present a slight median keel behind the ventrals. These specimens agree very closely with specimens of *L. montanus* collected by Jordan at Provo, Utah, except that a larger percentage have 13 and 14 anal rays, and a smaller percentage have 12 rays.

36. *Leuciscus balteatus* (Richardson).

Cyprinus (*Abramis*) *balteatus* Richardson, Fauna Bor. Amer., III, 301, 1836; Storer, Synopsis Fish. N. A., 160, 1846.

Richardsonius balteatus Girard, Proc. Acad. Nat. Sci. Phila., VIII, 1856, 202; id., U. S. P. R. R. Exp. & Surveys, x, 278, pl. LX, figs. 1-4, 1859 (Fort Dalles, Oreg., Fort Vancouver, Oreg. ?); Bean, Proc. U. S. Nat. Mus. 1882, 93 (Garrison Creek, Wash.); Jordan & Gilbert, Syn. Fish. N. A., 251, 1882 (Columbia River and northward); Jordan, Cat. Fish. N. A., 83, 1885.

Abramis (*Ritica*) *balteatus* Günther, Cat. Fish. Brit. Mus., VII, 309, 1868.

Of this species I obtained two unquestionable specimens at Kamloops. There is a distinct median ridge behind the ventrals, and the anal has 20½ and 22½ (11, 18½-20½) rays. Teeth, 2, 5-4, 2. At Mission this species is abundant, the largest individuals measuring 140 mm. In the larger specimens the postventral keel is very variable and frequently not at all distinguishable; it is best developed in medium-sized specimens (80 mm.). The teeth are usually 2, 5-4, 2, when normally developed. Of these, the anterior tooth on the left is thicker and shorter than the others, dagger-shaped, and remote from them. I have made detailed counts and measurements of over 20 specimens, and have counted the rays of all the rest. The anal rays are as follows: 16½ in two specimens; 17½ in seven; 18½ in thirteen; 19½ in twenty-five; 20½ in eighteen; 21½ in eight; 22½ in two; 23½ in two; 24½ in two. The usual number, then, is 19½ or 20½. The dorsal varies from 11½-13½. I have found no coordination of variations whatever. Each character varies independently. The scales vary from 11 to 13-53 to 63-5 to 7. According to the Mission specimens the normal number of anal rays is 19½ or 20½, and the variation is three or four rays in both directions.

The following table gives the measurements and some other variations found among the specimens of *Leuciscus balteatus* from Mission:

No.	Length (in mm.)	Dorsal.	Anal.	Scales.	Teeth.*	Depth.	Position of dorsal.	Sex.	Remarks.
1	140	12½	18½	12-59-6	2-5-4-2	3½	(1)	♀	Keel scarcely evident.
2	120	12½	19½	11-53-5	2-5-4-1	3½	(5)	♂	Median keel scarcely evident.
3	110	13½	19½	12-00-6	2-5-4-2	3½	(1)	♂	Median keel moderate.
4	105	12½	20½	12-58-6	2-5-4-2	3½	(1)	♀	Median keel well developed.
5	109	12½	19½	11-57-8	2-4-4-2	3½	(1)	♂	Keel typical.
6	102	12½	19½	12-00-5	2-5-4-2	3½	(5)	♂	Keel moderate.
7	91	11½	20½	12-57-5	2-4-3-1	3½	(1)	♂	Keel evident.
8	92	11½	19½	12-58-0	2-5-4-1	3½	(1)	♂	Keel distinct.
9	88	12½	19½	12-01-6	2-5-4-2	3½	(1)	♂	Keel well developed.
10	92	12½	21½	12-01-6	2-5-4-1	3½	(5)	♀	Keel typical.
11	102	12½	20½	11-02-6	2-5-4-2	3½	(5)	♂	Keel well developed.
12	87	12½	20½	13-59-6	1-5-4-2	3½	(1)	♂	Keel moderate.
13	86	12½	20½	11-59-7	2-5-4-1	3½	(1)	♂	Keel well developed.
14	83	12½	20½	12-01-7	2-5-4-1	3½	(1)	♂	Keel no more than in <i>montanus</i> .
15	80	11½	19½	12-01-5	2-5-4-1	3½	(1)	♂	Keel distinct.
16	95	12½	18½	13-59-7	2-5-4-2	3½	(1)	♂	Keel evident.
17	90	12½	17½	13-58-7	2-5-4-2	3½	(1)	♂	Keel moderate.
18	89	11½	17½	11-00-7	2-5-4-2	3½	(1)	♂	Keel typical.
19	77	12½	17½	57	2-5-4-2	3½	(1)	♂	Keel well developed.
20	87	12½	10½	19-01-7	2-5-3-2	3½	(5)	♂	Do.
21	81	12½	22½	12-58-7	2-5-4-2	3½	(1)	♀	Keel moderate.
22	89	19½	21½	61	2-5-7	3½	(1)	♀	Do.
23	74	11½	19½	.....	2-5-4-2	3½	.....	♂	Do.
24	60	13½	24½	.....	2-5-4-2	3½	.....	♂	Keel evident.
25	68	12½	24½	.....	.....	.....	.....	.....	.....
26	64	12½	23½	.....	.....	.....	.....	.....	.....

* I have frequently observed that the largest individuals among the minnows usually have abnormal numbers of teeth.

† Equidistant from base of middle caudal rays and a point above middle of pupil.

‡ Anterior tooth of main row on left side is larger, dagger-shaped, and remote from the others, and points inward.

§ Equidistant from base of middle caudal rays and upper angle of preopercle.

|| Equidistant from base of middle caudal rays and posterior margin of eye.

Besides the above there are four with 17½ anal rays; eleven with 18½; twenty with 19½; eleven with 20½; five with 21½; one with 22½; one with 23½. The largest number of specimens with increased anal rays were small individuals, about 70 mm. long.

37. *Leuciscus balteatus lateralis* (Girard). The specimens of this subspecies from the different localities will be considered separately.

1. *Sicamous*. A number of the specimens contain large parasitic worms. Eight specimens examined show the following measurements:

No.	Length	Dorsal.	Anal.	Scales.	Teeth.	Position of dorsal.	Depth.
1	82	12½	10½	11-00-6	2-4-3-1	(*)	4—
2	82	12½	16½	11-02-6	2-5-4-2	Keel indistinct (*)	.....
3	80	12½	14½	11-02-7	2-5-4-2	(1)	3½
4	87	12½	17½	12-00-5	2-5-4-2	.....	4
5	86	12½	10½	10-02-5	2-6-5-3	(?)	4½
6	80	12½	18½	11-00-6	2-5-4-1	(*)	4½
7	85	12½	16½	11-59-5	2-5-4-2	(1)	4
8	77	12½	17½	11-01	2-5-4-1	(*)	4½

* Equidistant from base of middle caudal rays and upper angle of preopercle.

† Equidistant from base of middle caudal rays and a point above middle of pupil.

‡ Equidistant from base of middle caudal rays and occiput.

The total number of specimens collected at Sicamous was 58. They have the following number of anal rays: 1 has 14½; 3 have 15½; 13 have 16½; 28 have 17½; 8 have 18½; 5 have 19½. These specimens are a little more robust than those from Mission and are certainly more elongate, the depth in a number of them being 3½-4½ in the length. They are more coarsely and profusely punctate. There is a conspicuous black lateral band, above which there is in some specimens a narrow light line, above which there is another darker shade. The ventral keel is moderately developed. In all the normal pharyngeals examined the teeth in the main row were 5-4. In one case the teeth are 2, 5-3, 3 which may be a case of reversion. This is unquestionably the species figured by Girard as *R. lateralis*. The average size of the specimens is smaller than that of *balteatus*.

2. Specimens from *Griffin Lake*, also undoubtedly *lateralis*, are similar to those from *Sicamous* in color and proportions, being probably slightly more compressed and deeper. Many specimens of this genus are bright scarlet on the sides. There were taken in *Griffin Lake* 14 specimens with anal rays as follows: 3 with 14 $\frac{1}{2}$; 7 with 16 $\frac{1}{2}$; 3 with 18 $\frac{1}{2}$; 1 with 17 $\frac{1}{2}$; 75 mm. or less in length. The teeth in the main row are in all but one doubtful case, 5-4.

3. Two specimens from *Kamloops* have the keel moderately developed, the teeth 2, 5-4, 2 and 2, 5-3, 2; the anal rays, 17 $\frac{1}{2}$ and 18 $\frac{1}{2}$.

1. One specimen from *Revelstoke* has teeth 2, 5-4, 1; anal, 15 $\frac{1}{2}$; depth 4 in length.

5. *Golden*. The position of the dorsal fin does not vary materially in any of the specimens enumerated above, nor in *baltatus*. In all the specimens examined this fin was equidistant from base of middle caudal and from a point from above the middle of the eye to nearly the occiput. At *Golden* I obtained a number of specimens in which there is very great variation in this point. The dorsal is equidistant from base of middle caudal rays and from posterior margin of the eye in one extreme and from behind the occiput in the other. The specimens living in a milky river instead of a clear lake, as those at *Sicamous*, are much lighter and more uniform in color. The average number of anal rays is less than in the *Sicamous* specimens, as may be seen from the following table:

Measurement of specimens from the Columbia River at *Golden*, British Columbia.

No.	Length.	Dorsal.	Anal.	Scales.	Teeth.	Depth.	Head.	Position of dorsal.	Sex.	Remarks.
1	115	12 $\frac{1}{2}$	15 $\frac{1}{2}$	12-63-6	2, 3-4, 1	3 $\frac{1}{2}$	4 $\frac{1}{2}$	(1)	♂	Keel nil.
2	104	11 $\frac{1}{2}$	18 $\frac{1}{2}$	10-51-7	2, 5-4, 1	4	4 $\frac{1}{2}$	(1)	♂	Keel evident.
3	103	11 $\frac{1}{2}$	18 $\frac{1}{2}$	10-55-5	2, 5-4, 2	4	4 $\frac{1}{2}$	(1)	♂	Do.
4	103	11 $\frac{1}{2}$	17 $\frac{1}{2}$	12-59-7	2, 4-5, 3	4 $\frac{1}{2}$	4 $\frac{1}{2}$	(1)	♂	Do.
5	95	12 $\frac{1}{2}$	15 $\frac{1}{2}$	50	1, 5-4, 1	4	4 $\frac{1}{2}$	(2)	♂	Keel well marked.
6	92	11 $\frac{1}{2}$	15 $\frac{1}{2}$	.....	.....	4 $\frac{1}{2}$	4 $\frac{1}{2}$	(3)	♂	Keel well developed.
7	91	10 $\frac{1}{2}$	17 $\frac{1}{2}$	57	2, 4-3, 2	4 $\frac{1}{2}$	4 $\frac{1}{2}$	(2)	♂	Keel nil.
8	85	11 $\frac{1}{2}$	14 $\frac{1}{2}$	.....	.....	4	4 $\frac{1}{2}$	(2)	♂	Keel well developed.
9	85	12 $\frac{1}{2}$	10 $\frac{1}{2}$	.....	.....	4 $\frac{1}{2}$	4 $\frac{1}{2}$	(3)	♂	Keel scarcely evident.
10	82	11 $\frac{1}{2}$	10 $\frac{1}{2}$	.....	.....	4 $\frac{1}{2}$	4 $\frac{1}{2}$	(2)	♂	Keel evident.
11	82	11 $\frac{1}{2}$	10 $\frac{1}{2}$	.....	.....	4 $\frac{1}{2}$	4 $\frac{1}{2}$	(2)	♂	Do.
12	77	11 $\frac{1}{2}$	15 $\frac{1}{2}$	.....	.....	4 $\frac{1}{2}$	4 $\frac{1}{2}$	(2)	♂	Keel evident.
13	73	12 $\frac{1}{2}$	15 $\frac{1}{2}$	.....	.....	4	4 $\frac{1}{2}$	(2)	♂	Keel well developed.
14	72	10 $\frac{1}{2}$	15 $\frac{1}{2}$	.....	.....	4 $\frac{1}{2}$	4 $\frac{1}{2}$	(2)	♂	Keel moderate.
15	68	11 $\frac{1}{2}$	9 $\frac{1}{2}$	.....	.....	4	4 $\frac{1}{2}$	(1)	♂	Keel well developed.
16	67	12 $\frac{1}{2}$	17 $\frac{1}{2}$	.....	.....	3 $\frac{1}{2}$	4 $\frac{1}{2}$	(2)	♂	Do.
17	65	12 $\frac{1}{2}$	15 $\frac{1}{2}$	.....	.....	4	4 $\frac{1}{2}$	(3)	♂	Keel strong.
18	62	11 $\frac{1}{2}$	17 $\frac{1}{2}$	.....	.....	4 $\frac{1}{2}$	4 $\frac{1}{2}$	(2)	♂	Do.

* Equidistant from base of middle caudal rays and occiput (beginning of scaled region).

† Dorsal nearer base of middle caudal rays than occiput.

‡ Equidistant from base of middle caudal rays and upper angle of preopercle.

§ Equidistant from base of middle caudal rays and posterior margin of eye.

The dorsal in this lot has one or two spines.

Twenty-three specimens taken at *La Grande*, in the *Grand Ronde River*, vary from 32 to 108 mm. in length. Two have anal rays 14 $\frac{1}{2}$; six have 15 $\frac{1}{2}$; eleven, 16 $\frac{1}{2}$; four, 17 $\frac{1}{2}$. Depth, 3 $\frac{1}{2}$ -4; teeth in one specimen examined, 2, 5-4, 2; general color dark, markings well defined.

Thirty-three specimens from *Boise River* at *Caldwell* show the greatest variation in anal rays without any great specialization in one number. They are as follows: one with 14 $\frac{1}{2}$; two with 15 $\frac{1}{2}$; six with 16 $\frac{1}{2}$; seven with 17 $\frac{1}{2}$; eight with 18 $\frac{1}{2}$; seven with 19 $\frac{1}{2}$; two with 20 $\frac{1}{2}$; and one with 21 $\frac{1}{2}$. These specimens are rather flat and deep (depth 3 $\frac{1}{2}$ to 3 $\frac{3}{4}$), approaching *L. baltatus* in this respect as well as in the number of anal rays. They are rather pale in color with the markings not distinct. Some of these specimens may belong more properly to *baltatus*, but I am not able to detect any differences save those mentioned. The ventral keel in most of these specimens is no more evident than in specimens of *L. montanus*.

Of nine specimens from *Umatilla, Oreg.*, two have the anal rays 17 $\frac{1}{2}$, four have 18 $\frac{1}{2}$, and three, 20 $\frac{1}{2}$.

38. *Hiodon alosoides* (Rafinesque). *Gold eye*. Poplar, abundant; D. 11 $\frac{1}{2}$ or 12 $\frac{1}{2}$, counting all rays; lateral line about 60; depth, 3 $\frac{1}{2}$ to 3 $\frac{3}{4}$. This species is very abundant in the *Red River* at *Winnipeg*; the largest specimen seen measured 370 mm.; head, 4 $\frac{1}{2}$ -5 in largest specimens (4 $\frac{1}{2}$ -4 $\frac{3}{4}$ in smaller, 230 mm.); depth about 3; D. 11 $\frac{1}{2}$; A. 31-37; lateral line, 61. This species is here dried for the market; also taken at *Brandon* and reported to me at *Medicine Hat*.

39. *Hiodon tergisus* Le Sueur. *Winnipeg, Brandon*.

40. *Coregonus williamsont* Girard. This species is extremely abundant in the *Missouri River* at *Craig*. It was also taken at *Idaho Falls* in the *Snake River*, at *La Grande* in the *Grand Ronde*; at *Golden*, *Revelstoke*, and *Umatilla* in the *Columbia River*; at *Caldwell* in the *Boise River*; at *Calgary* and *Banff* in the *Bow River*, where it is called *grayling*, and at *Sicamous* in *Shuswap Lake*. There are minute differences between the specimens taken at different places, but I am unable to distinguish specific characters to separate them.

41. *Coregonus coulteri* Eigenmann & Eigenmann. Many specimens, the largest measuring 195 mm., from the *Kicking Horse*, at *Field*, *British Columbia*; one specimen from *Golden*. Head, 4 $\frac{1}{2}$ -5; depth, 4 $\frac{1}{2}$ -5 $\frac{1}{2}$; D. 10 $\frac{1}{2}$ -11 $\frac{1}{2}$; A. 12-13; scales 7, 60-63, 7 (to ventrals). Form rather heavy, little elevated, the snout broad, very blunt and decurved; greatest depth of head equals its length less the opercle. Mouth low, the snout but little projecting, maxillary reaching eye in largest specimen, further in the smaller ones. Eye equals snout, 4 in head. Supplemental bone a crescent. Gill rakers much as in *williamsont*. Dorsals and anal shorter and higher than in *williamsont*. Scales large, dull silvery; the spots of the young not so conspicuous as in those of *williamsont*. Length of largest specimen to origin of dorsal, 68 mm. (Plate 6.)

42. *Oncorhynchus tshawytscha* Walbaum. *Golden*, 11 specimens, the largest 120 mm. *Revelstoke*, a large number of specimens, the largest 120 mm. *La Grande*, 1 specimen. *Mission*, the largest 95 mm. *Kamloops*, 1 specimen.

43. *Salmo mykiss* Walbaum. *Calgary, Banff, Griffin Lake, Sicamous, Kamloops, Idaho Falls, and Craig*. The specimens from *Calgary* and *Banff* resemble very closely specimens in the collections of the *Indiana University* from the *Rio Grande* at *Del Norte, Colorado*. In one of the *Rio Grande* specimens I count 181 rows of scales; Dr. Jordan counted 155 to 160 in those he examined. In one of the *Calgary* specimens I find 156 rows. In the shape of the head and in color the specimens from *Calgary* and *Banff* are almost exact reproductions of the *Rio Grande* specimens. I therefore see no reason why the two should go under different names. The question of the number of species of trout does not appear settled as yet, nor is it probable that it will be until all the trout are caught. Specimens from *Kamloops* differ from those from *Calgary* in having slightly larger spots. Those from *Griffin Lake* have still larger and more numerous spots.

44. *Thymallus signifer ontariensis* Valenciennes. A single specimen, 212 mm. long; D. 21 $\frac{1}{2}$; A. 12; scales, 91. *Craig, Montana*. This specimen differs from the specimens obtained by *Jordan* in the *Madison River* and at *Horseshoe Springs*, in the larger scales, being in this respect identical with the typical *signifer*, and in having the black spots extend quite to below the soft dorsal fin. The color of the dorsal is as described by *Jordan*.

45. *Salvelinus namaycush* (Walbaum). *Calgary, Banff, Devils Lake, Golden, and Revelstoke*. A species of *Salvelinus*, probably to be referred to this species, reaches a large size, a meter and more in *Devils Lake*, in the *Canadian Rocky Mountains Park*. A photograph of one of these larger individuals shows it to be everywhere profusely spotted on head, sides, and back. The spots are slightly larger on lower parts of sides. Those of the head do not differ from those of the body. The dorsal, caudal, and to some extent the anal, ventrals, and pectorals, are also profusely spotted. The largest specimen obtained measures about 435 mm. The spots are much less numerous than in the photograph and those of the head show a tendency to unite, leaving a dark reticulation as a background. Dorsal, soft dorsal, and caudal well spotted; anal and inner surfaces of ventrals and pectorals also spotted. The anal margined in front and above with white. In this larger specimen the teeth of shaft of vomer are well developed.

In the *Bow*, into which *Devils Lake* has an outlet, and in the *Elbow* there are numerous small trout which are considered distinct from those in the lake. The largest of those obtained at *Banff* measured 300 mm. in length, the rest from *Calgary* are all smaller. In this largest specimen and in all the smaller ones no teeth are developed on the shaft of the vomer. In a specimen about 300 mm. long, from *Lake Michigan*, the shaft of the vomer has well-developed teeth. This would lend color to the popular belief that those of the river are different from those of the lake. The river specimens have smaller and much fewer spots, the dorsals and caudal and inner surface of pectorals are dusky without indications of spots; there are few or no spots on the head. A specimen 165 mm. long has these characters still more empha-

sized. There seems to be nothing about these specimens that may not be taken as characters of the young. Other specimens from the Columbia at Golden and at Revelstoke show no differences from those from Calgary and Banff. A large head in the University's collections from 20 miles east of New Westminster, B. C., has teeth on the shaft of the vomer and is *S. namaycush* (Walbaum).

46. *Percopsis guttatus* Agassiz. Winnipeg, Brandon, Regina, Swift Current, Medicine Hat. This species is abundant in almost all streams from Winnipeg to Medicine Hat. They are more numerous and larger in the cool, clear streams. The genera of *Percopsida* may be distinguished as follows: (Plate 6.)

a. Dorsal, with two feeble, slender, unbranched rays; anal, with a single similar ray; scales most strongly ctenoid on caudal peduncle; posterior margin of preopercle entire or with feeble crenulations; form slender *PERCOPSIS*.

aa. Dorsal and anal each with two very strong spines; scales most strongly ctenoid on anterior part of body; posterior margin of preopercle with a few short but strong spines; form heavy, deep *COLUMBIA*.

47. *Columbia transmontana* Eigenmann & Eigenmann. Umatilla. (Plate 6.)

Columbia transmontana Eigenmann & Eigenmann, Science, 1892, 239 (Umatilla, Oregon).

Head, 3½-3¾ (3 in the young); depth, 3½-3¾ (4 in the young); D. 11, 9½; A. 11, 6½; scales, 7 to 9-44 to 46-7. Body comparatively deep, dorsal profile more arched than the ventral, making an angle at the origin of the dorsal fin; sides compressed, caudal peduncle most so. Head short and chubby, eye equal to snout, about 3½ in the head. First dorsal spine about equal to the pupil, second spine one-half length of head, recurved and very deeply grooved behind. Anal spines somewhat lower than the dorsal spines; ventrals reaching past vent. Nape, with the exception of occipital spine, scaled. Translucent in life. Color, generally smutty. Side with three rows of more or less oblong blackish spots, the middle and superior rows most noticeable. Back with a series of similar spots, one being more conspicuous at beginning and end of first dorsal. Dorsal mottled, caudal barred. Head smutty, a blue black spot on middle of opercle; a narrow, silvery, lateral band. Young translucent, with well-defined dark spots.

48. *Lucius lucius* Linnaeus. Winnipeg, Brandon, Westbourne, Moose Jaw, Swift Current, Medicine Hat. This species is common throughout the North and is one of the most prominent game fishes. Usually called pike, the name pickerel being applied to the two species of *Stizostedion*.

49. *Pygosteus pungitius* Linnaeus. This species was obtained in the clear waters of the Qu'Appelle River. It was not noticed elsewhere.

50. *Eucalia inconstans* Kirtland. Qu'Appelle, Regina, Swift Current, Maple Creek, Calgary, Poplar. This species is very abundant at Regina just below the dam.

51. *Etheostoma guntheri* Eigenmann & Eigenmann.

Etheostoma guntheri Eigenmann & Eigenmann, Am. Nat. 962, 1892. Winnipeg; Cedar Rapids, Iowa.

Types: Three specimens 50, 50, and 60 mm. long, Winnipeg, Manitoba.

Three specimens from near Cedar Rapids, Iowa, collected by Seth E. Meek.

Premaxillaries not protractile; gill-membranes scarcely connected; ventral line with the median scales enlarged; lateral line complete; palate with well-developed teeth; dorsal spines, 10; preopercle entire; nape and breast, except the median line, naked; cheeks and opercles each with about three series of large ctenoid scales. This species is very closely related to *E. aspre*, from which it differs in the uniform size of the scales on the cheeks and on the opercles, etc. Head, 3½; depth, 6½; D. x-13 or 14; A. 11, 9½-11½; scales, 5-52 to 64-6. Form of *E. aspre*; mouth moderate, the maxillary not extending beyond anterior margin of eye, about 3 in head; eye, 3½ in head; cheeks with about 26 large, strongly ctenoid scales; opercle with similar scales; gill-membranes much more connected than in *E. aspre*, the connection not extending back beyond middle of cheeks. Outer series of teeth considerably enlarged in each jaw. Dorsal spines slender and high, slightly more than snout and eye in length; soft dorsal shorter and lower than the spinous. First anal spine but little longer than second; pectoral equals head less opercular spine; ventrals but little shorter than pectorals. Breast naked, a few scales along its median line, mid-ventral line naked, the scales when present probably little if any larger than those of the sides; nape naked, as in *E. aspre*.

Translucent in life; a dark stripe down and another down and forward from eyes. A black spot on humeral region. Sides with about eight dark spots, which are narrow, on anterior part of body, further apart and larger on tail; only the last three extending above the

lateral line; ventral surface plain; back tessellated, but much less regularly and distinctly than in *E. aspre*. Spinous dorsal with a black spot between the first two or three spines and another between the bases of the last three. The remainder of the fin, as well as the soft dorsal, regularly dotted; caudal faintly barred, a black spot at its base, the remaining fins plain.

A fourth specimen from Winnipeg may belong to the same species, but it is probably an immature specimen of *E. aspre*. It is but 19 mm. long. It has D. ix-11; A. 11, 7; scales about 46. Premaxillary not protractile; gill-membranes united to below middle of cheeks; nape, cheeks, and opercles naked; breast and ventral line naked. A black stripe forward from eye, not below it; a series of ten black spots along the sides; a series of six larger ones on the back; a black band through middle of spinous dorsal; about three oblique bands on soft dorsal and on the caudal. A black spot on base of caudal. No distinguishable lateral line.

The three specimens from Iowa differ in no essentials from the Winnipeg specimens. In the smallest (40 mm.) the blotches of the sides are larger and fewer in number, and there are rather broad dorsal blotches, intermediate in position to the lateral ones.

52. *Etheostoma aspre* (Cope & Jordan). Four small specimens of this species were taken at Winnipeg and a number at Brandon, the largest of which is 70 mm. long. These do not differ in any essentials from specimens collected by Prof. S. E. Meek in Iowa.

53. *Etheostoma nigrum* Rafinesque. Specimens of this species taken at Westbourne, a tributary of Lake Winnipeg, in the Assiniboine at Brandon, and in the Qu'Appelle do not differ from specimens collected in Indiana and Iowa. I was informed by a half-breed that this species was very abundant in some small streams north of Qu'Appelle. The same information was given me by others at Brandon.

54. *Etheostoma iowae* Jordan & Meek. Abundant at Swift Current. This is a very beautifully colored darter in life. The male has the base of the spinous dorsal dark blue, above which is a rusty band and then a narrower dark margin. A bright light-green spot above pectoral. Sides with about nine dark-green spots, the interspaces silvery with rusty and with green spots. Fins of the female nearly plain, the rusty spots of the sides wanting. In the alcoholic specimens the patterns of color are seen to be very varying. In smaller specimens there are about nine quite regular bands; in larger specimens the sides become much mottled by the addition of dark spots in the interspaces. Frequently there are eight or nine quadrate spots on the back. In one specimen there is a dark band along the sides from the head to the tail. The caudal is always more or less conspicuously barred, the soft dorsal less so, and the lower fins including the pectorals are plain. The lateral line is usually developed on more scales than in *E. quappelle*.

55. *Etheostoma quappelle* Eigenmann & Eigenmann.

Etheostoma quappelle Eigenmann & Eigenmann, Am. Nat. 963, 1892. Qu'Appelle.

Fort Qu'Appelle. A single specimen, 43 mm. This is the northernmost point at which darters have as yet been taken. Premaxillaries not protractile; gill-membranes scarcely connected; ventral line with the median scales not enlarged; lateral line straight, developed on 19 scales; palate without teeth; dorsal spines, 9; anal fin considerably smaller than soft dorsal; humeral region without black process; cheeks with a few small scales just below and behind eyes; opercle with a few scales on its upper angle. This species is closely related to *E. iowae* and *E. jessie*, differing in the radial formula, scales, etc. In shape it approaches very nearly *E. iowae*, being much slenderer than *jessie*. Head, 4; depth, 5½; D. ix-9; A. 11, 6½. Scales, 3-53-7; lateral line developed on 19 scales. Form similar to *E. iowae*, its dorsal profile notably less arched, its head lower and less compressed, more truly conic. Snout rather blunt, the maxillary extending to anterior margin of pupil, about 3 in head. Eye moderate, 3½ in head. Teeth in very narrow bands, the outer series enlarged. Cheeks with about 10 small cycloid scales bordering the lower posterior portion of orbit; opercles with a few scales. Dorsal spines rather short and stiff, the highest equal to snout and orbit. Second dorsal shorter than first, base of anal much shorter than base of second dorsal, not equal to snout and eye. Pectoral and ventrals about equal in length, about equal to head less opercle. Nape and breast naked; mid-ventral line with small scales. General color dusky, the markings much less conspicuous than in *iowae*. A dark shade downward from eye, another forward; a black spot behind eye; a dusky region on opercle and on shoulders. Sides with about 8 dark blue bars, alternating with rusty bars, the margins of these ill defined. No blotches on back. Basal half of spinous dorsal black, the remainder hyaline. Soft dorsal and caudal barred, anal and ventrals hyaline, pectorals dusky.

OBSERVATIONS ON THE DISTRIBUTION OF THE SPECIES OBTAINED AND THE RELATION OF THE DIFFERENT RIVER FAUNÆ EXAMINED TO EACH OTHER.

Six of the sixty-five species obtained are found on both the east and west slope of the continent, *Pantosteus jordani*, *Coregonus williamsoni*, *Salmo mykiss*, *Catostomus catostomus*, *Salvelinus namaycush*, *Lota maculosa*. (*Rhinichthys dulcis* is recorded from the Pacific Slope. I obtained none.)

Forty-two species were found in the Winnipeg system. They are:

<i>Acipenser sturio</i> .	<i>Notropis megalops</i> .	<i>Lucius lucius</i> .
<i>Ictalurus punctatus</i> .	<i>Notropis scopiforus</i> .	<i>Pygosteus pungitius</i> .
<i>Ictiobus cyprinella</i> .	<i>Notropis jejunus</i> .	<i>Eucalia inconstans</i> .
<i>Carpionides velifer</i> .	<i>Notropis atherinoides</i> .	<i>Etheostoma glintheri</i> .
<i>Catostomus catostomus</i> .	<i>Rhinichthys dulcis</i> .	<i>Etheostoma aspro</i> .
<i>Catostomus griseus</i> .	<i>Hybopsis storerianus</i> .	<i>Etheostoma nigrum</i> .
<i>Catostomus commersoni</i> .	<i>Conesus dissimilis</i> .	<i>Etheostoma towni</i> .
<i>Moxostoma aureolum</i> .	<i>Platygobio gracilis</i> .	<i>Etheostoma quappelle</i> .
<i>Moxostoma anisurum</i> .	<i>Hiodon alosoides</i> .	<i>Perca flavescens</i> .
<i>Pimephales promelas</i> .	<i>Hiodon tergisus</i> .	<i>Stizostedion canadense griseum</i> .
<i>Notropis jordani</i> .	<i>Coregonus williamsoni</i> .	<i>Stizostedion vitreum</i> .
<i>Notropis heterolepis</i> .	<i>Salmo mykiss</i> .	<i>Aplodinotus grunniens</i> .
<i>Notropis reticulatus</i> .	<i>Salvelinus namaycush</i> .	<i>Cottus onychus</i> .
<i>Notropis deliciosus</i> .	<i>Percopsis guttatus</i> .	<i>Lota lota maculosa</i> .

Eight of these species were found in the Saskatchewan and not in the Red River.

They are:

<i>Catostomus griseus</i> .	<i>Conesus dissimilis</i> .	<i>Etheostoma towni</i> .
<i>Notropis jordani</i> .	<i>Coregonus williamsoni</i> .	<i>Cottus onychus</i> .
<i>Rhinichthys dulcis</i> .	<i>Salmo mykiss</i> .	

Sixteen species were taken in the Red River of the North and not in the Saskatchewan. Many of these will probably be found in the Saskatchewan when its lower waters are examined:

<i>Acipenser sturio</i> .	<i>Notropis deliciosus</i> .	<i>Etheostoma aspro</i> .
<i>Ictiobus cyprinella</i> .	<i>Notropis megalops</i> .	<i>Etheostoma nigrum</i> .
<i>Moxostoma aureolum</i> .	<i>Hybopsis storerianus</i> .	<i>Etheostoma quappelle</i> .
<i>Moxostoma anisurum</i> .	<i>Pygosteus pungitius</i> .	<i>Perca flavescens</i> .
<i>Notropis heterolepis</i> .	<i>Etheostoma glintheri</i> .	<i>Aplodinotus grunniens</i> .
<i>Notropis reticulatus</i> .		

The seventeen species taken in the Missouri are as follows:

<i>Notrus flavus</i> *	<i>Notropis atherinoides</i> .	<i>Thymallus signifer ontariensis</i> *
<i>Carpionides velifer</i> .	<i>Rhinichthys dulcis</i> .	<i>Eucalia inconstans</i> .
<i>Catostomus griseus</i> .	<i>Conesus dissimilis</i> .	<i>Stizostedion canadense griseum</i> .
<i>Catostomus commersoni</i> .	<i>Platygobio gracilis</i> .	<i>Cottus bairdi punctulatus</i> *
<i>Moxostoma aureolum</i> .	<i>Hiodon alosoides</i> .	<i>Lota lota maculosa</i> .
<i>Hybognathus placita</i> *	<i>Coregonus williamsoni</i> .	

Of these, but two species (*Rhinichthys dulcis* and *Platygobio gracilis*) are found both at Poplar and at Craig. Thirteen of the species taken in the Missouri are found in the Saskatchewan basin.

The species of the Saskatchewan, with the exception of the new species, have all been taken in the Mississippi basin. The Saskatchewan basin, therefore, can not be separated from the Mississippi basin by any positive characters.

* Not found in the Winnipeg system.

The families of the Mississippi basin not yet found in the Saskatchewan basin are:

1. Lepistosteidae.	5. Amblyopsidae.	9. Atherinidae.
2. Amiidae.	6. Cyprinodontidae.	10. Aphredoderidae.
3. Clupeidae.	7. Umbridae.	11. Serranidae.
4. Dorosomatidae.	8. Anguillidae.	

Twenty-two specimens were taken in the Columbia.

<i>Ammocetes tridentatus</i> .	<i>Ptychocheilus oregonensis</i> .	<i>Salvelinus namaycush</i> .
<i>Catostomus catostomus</i> .	<i>Leuciscus atrarius</i> .	<i>Oncorhynchus tshawytscha</i> .
<i>Catostomus macrocheilus</i> .	<i>Leuciscus hydrophlox</i> .	<i>Columbia transmontana</i> .
<i>Pantosteus jordani</i> .	<i>Leuciscus balteatus lateralis</i> .	<i>Cottus asper</i> .
<i>Acrocheilus alutaceus</i> .	<i>Coregonus williamsoni</i> .	<i>Cottus rhizophagus</i> .
<i>Agosia nubila</i> .	<i>Coregonus coulteri</i> .	<i>Cottus philonotus</i> .
<i>Agosia falcata</i> .	<i>Salmo mykiss</i> .	<i>Lota lota maculosa</i> .
<i>Mylocheilus caurinus</i> .		

The ten species taken in the Fraser system are:

<i>Catostomus macrocheilus</i> .	<i>Leuciscus balteatus</i> .	<i>Salmo mykiss</i> .
<i>Agosia falcata shuswap</i> .	<i>Leuciscus balteatus lateralis</i> .	<i>Oncorhynchus tshawytscha</i> .
<i>Mylocheilus caurinus</i> .	<i>Coregonus williamsoni</i> .	<i>Cottus asper</i> .
<i>Ptychocheilus oregonensis</i> .		

But one variety, *Agosia falcata shuswap*, was found in the Fraser that was not also found in the Columbia. (*Leuciscus balteatus* has been taken by others in the Columbia system.)

Several species of *Oncorhynchus* and *Acipenser* are known from the Columbia and from the Fraser which are not included in these numbers.

STRUCTURAL PECULIARITIES OF THE FRESH-WATER FISHES OF THE PACIFIC SLOPE.

Almost every family of fishes having representatives in the fresh waters of both the Atlantic and the Pacific slopes has one or more of its Pacific slope representatives modified in one or the other of two directions: There is either a larger number of rays or spines in one or more of the fins, or some of the rays have become modified into spines. The largest number of either dorsal or anal rays is almost always found in some Pacific slope species, and the range of variation is always greater in the Pacific slope species than in the Atlantic slope species of the same family, although the number of species is usually less. In most cases the differences are just perceptible, and, were it not for the consensus of differences in all groups they would stand for nothing. The most marked differences are found in those fishes which are generically distinct from their Atlantic slope relatives. In several cases these modifications themselves, aside from all others, are of generic importance, as in the genera *Archoplites*, *Meda*, *Lepidomeda*, *Columbia*, and the subgenus *Richardsonia*.

The modifications of the same set of organs being practically of the same nature, are unquestionably due to one definite cause. What that cause is I am at present unable to say. A comparatively short swift water course, as most of the Pacific rivers have, suggests itself at once, but, as will be seen under the head of "Local

The *Petromyzontidae* and *Centrarchidae* were not secured by me, but Mr. A. J. Woolman found these families in the headwaters of the Red River system.

GENERAL SUMMARY OF THE RESULTS.

The fish fauna of the whole region traversed is poor in comparison with that of the streams of the Ohio Valley. I obtained in all but 65 species, about 20 per cent of which were new to science. They belong to 14 families and 37 genera. In the Winnipeg system, *i. e.*, in the whole region drained by the tributaries of Lake Winnipeg, only 3 of the 10 families characterizing the Nearctic region were obtained, and the Pacific Slope contains only two.

The following notable additions to the knowledge of the North American fauna were made by these explorations:

1. A species of *Pantosteus* (*P. columbianus*—*P. jordani* of the Missouri) discovered on the Pacific Slope.
2. *Noturus flavus* found at the base of the Rockies at Craig, Mont.
3. Four new species of *Notropis* added to the east Canadian fauna.
4. Two new species of *Agosia* added to the Pacific fauna.
5. A new species of whitefish (*Coregonus coulteri*) discovered in the Rocky Mountain streams of a restricted region in British Columbia.
6. The family of *Percopidae* found to have a representative on the Pacific Slope in the new genus *Columbia*.
7. Several species of *Etheostoma* found in Canada, among them two new species.
8. One new *Cottus* (*C. onychus*) added to the fauna of the Saskatchewan.
9. A new *Cottus* (*C. philonips*) discovered in the Kicking Horse at Field.
10. A species of *Lota* reported both in the Columbia and the Fraser. A specimen since secured from the Columbia.
11. It was discovered that the fins of the fishes of the Pacific Slope vary from the fins of fishes of the Atlantic Slope in definite directions.
12. The extent of variation between the species of any given family of fishes on the Pacific coast was found to be greater than that between the species of the same family on the Atlantic Slope.
13. *Richardsonius* was proved to be a subgenus of *Leuciscus*. Its species were found to vary directly with the locality. Each locality examined has a variety which in the aggregate differs from the variety of every other locality.

NOTE.—Since this paper has been put in type Drs. Jordan and Evermann have placed the proofs of the Fishes of North America in my hands, and I have adopted all the changes in nomenclature suggested by them up to *Cyprinidae*. Dr. Jordan has also made many suggestions regarding the chapter on "Structural Peculiarities," etc., p. 123. I have not been able to give these suggestions the attention they merit, but they will receive due consideration in a more detailed study of this subject.

12.—NOTES ON THE FISHES OF WESTERN IOWA AND EASTERN NEBRASKA.

By SETH EUGENE MEEK,
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During the years of 1889 and 1890 I made some explorations of the streams of Iowa. The results were published in the Bulletin of the U. S. Fish Commission for 1890, pages 217 to 248. A few collections from western Iowa were not included in the above-named paper. In 1891 Prof. P. B. Burnet, Colner University, Lincoln, Nebr., and myself collected in a few localities in eastern Nebraska.

In 1892 and again in 1893, while making investigations for the selection of a site for a fish-cultural station in Iowa, Prof. Evermann made some observations upon the fishes at the places visited by him. The present paper is based upon these various small collections, and may be considered as supplementing my "Report upon the Fishes of Iowa," already mentioned.

Collections were made under the direction of the U. S. Commissioner of Fish and Fisheries in 1890 in Little Sioux River and Mill Creek (one of its tributaries), and in Storm Lake, Spirit Lake, and Floyd River; and in 1891 at the following points in eastern Nebraska: Salt Creek near Lincoln, Platte and Elkhorn rivers at Fremont, and Blue River at Crete.

Prof. Evermann's notes are chiefly upon fishes observed by him at Ames, Waterloo, and Spirit Lake.

All the streams in western Iowa are short and of small size. Those north have more or less sandy bottoms, while those in the southwestern part of the State are very muddy. The country is decidedly prairie and more rolling in the northwest.

Spirit Lake.—This lake is in Dickinson County, Iowa, in the northwestern part of the State. The Minnesota State line crosses the extreme northern part of the lake. The greatest length and width are each about 4 miles and the total area 10 to 12 square miles. The southern half is from 1 to 1½ miles wide from east to west. This portion of Iowa is, of course, a glaciated region, and the shores and bottom of Spirit Lake are composed of drift material. The shores are low and gently sloping, as a rule, and are made up of clay, sand, and fine and coarse gravel. No marl was noticed, and but little marshy shore was seen. No trustworthy information as to the depth of this lake could be obtained, but it is probably not greater than 100 feet. The water is clear and cold. There is not a great deal of vegetation in the lake, but patches of *Alga*, *Myriophyllum*, and *Chara* were seen in places. Several species of *Unionidae* are found in considerable numbers, and crawfish and frogs are abundant.

Spirit Lake is one of a group of lakes in Dickinson County. At the northwest corner of Spirit Lake, and separated from it by only a few rods, in some cases only a few feet, are Grover, Little Spirit, Hottel's, Sunken, and Marble lakes. All of these are small, but of considerable importance as furnishing large quantities of food fishes.