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No. 9: SOME FRESH-WATER FISHES OF BRITISH
COLUMBIA, BY J. R. DYMOND.

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APPENDICES.

SOME FRESH-WATER FISHES OF BRITISH COLUMBIA.

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The following notes are based largely on specimens and information obtained in British Columbia during the summers of 1926 and 1928, when the writer was engaged in a study of the trout and other game fishes of the Province. The results of those studies so far as they concern the trout have been reported elsewhere (Dymond, 1927, 1931, and 1932). The specimens and information on which these notes are based were secured more or less incidentally, which will explain the nature of the present contribution.

During the summer of 1926 no field-work was undertaken. Specimens of trout and occasionally of other fresh-water species were sent for study by officers of the Federal and Provincial Departments of Fisheries to the Pacific Biological Station at Nanaimo. In 1928 the months of June and July were spent in Southern British Columbia in visiting a number of lakes and streams in connection with the trout studies. At that time I was accompanied by C. McC. Mottley, of the Biological Board of Canada, and Messrs. T. B. Kurata and E. B. S. Logier, of the Royal Ontario Museum of Zoology, to whom I wish to express my thanks for assistance in connection with the field-work.

I am also indebted to Dr. W. A. Clemens, Director of the Pacific Biological Station, for the opportunity of becoming acquainted at first hand with the fresh-water fish fauna of British Columbia.

The waters visited during 1928 included Monroe Lake and other waters in the vicinity of Cranbrook, Kootenay Lake, and Kootenay River below Nelson as far as Bonnington Falls, Christina Lake, Okanagan Lake, Vaseaux Lake, Kalamalka Lake, Paul Lake, and Fish Lake near Kamloops, Cultus Lake, Chilliwack River above Sweltzer Creek, Stamp River, Diver Lake near Wellington, Cowichan Lake, Nanaimo River, and Horne Lake.

The most significant feature of the distribution of fresh-water fishes in British Columbia is the striking contrast between the fauna of the north and that of the south. The fish fauna of the northern part of the Province has many features in common with that of the Great Lakes, as the following list of genera and species common to these two areas will indicate: *Cristivomer namaycush*, *Leucichthys*, *Coregonus clupeaformis*, *Prosopium quadrilaterale*, *Chrosomus erythrogaster*, *Couesius*, *Esox lucius*, *Lota maculosa*, and *Eucalia inconstans*. Of these, only two, *Couesius* and *Lota maculosa*, are known to occur in the southern part of the Province, while there are found in the waters of that area many species quite distinct from any elements of the Great Lakes fauna. Included among these are *Prosopium williamsoni*, *Mylocheilus caurinus*, *Ptychocheilus oregonensis*, *Richardsonius balteatus*, and *Apocope falcata*. These are part of a fauna which extends southward. The explanation of this difference between the faunas of Southern and of Northern British Columbia may be partly ecological, but it is probably due more to the geological history of the areas.

ANNOTATED LIST.

Entosphenus tridentatus (Gairdner). (Sea lamprey.)

Specimens of this lamprey were taken from the Millstream at Nanaimo, V.I., from the Chilliwack River, and from the Slocan River at West Kootenay. C. Carl reports its occurrence in Beaver Lake, Stanley Park.

Lampetra ayresii (Günther).

Several specimens from Cultus Lake are in the collections of the Royal Ontario Museum of Zoology.

Acipenser sp. (Sturgeon.)

Sturgeon are taken in the Kootenay River in the Creston District and southward in the United States in the vicinity of Bonners Ferry, Idaho. Locally they are called rock-sturgeon and are said to average 100 to 150 lb. in weight, but a 375-lb. specimen has been reported. They are taken most commonly during high water in May and June.

These sturgeon must be permanent fresh-water residents, as it is impossible for them to ascend from the sea. As no specimens were seen, I am unable to offer an opinion as to the species.

A sturgeon weighing 171 lb., possibly of marine origin, was killed below Bonnington Falls by a blast of dynamite in April, 1925.

Oncorhynchus nerka kennerlyi (Suckley). (Kokanee.)

This landlocked sockeye occurs in many lakes in the Province. We have specimens from Kootenay, Okanagan, Christina, and Woods Lakes, and it has been reported by reliable observers as occurring in Shuswap, Adams, Niskonlith, Arrow, Slochan, Kalamalka, Skaha, Osoyoos, Mizzezzula, Blue, Round, and Burns Lakes and from Sooke, Cowichan, Shawnigan, Nanaimo, Horne, and Cameron Lakes on Vancouver Island. Babcock (1902) records it from Seton and Anderson Lakes, and Jordan (1894) and Green (1893) from Shawnigan Lake, Vancouver Island. Dawson (1879) refers to the occurrence of "landlocked salmon" in Okanagan, Shuswap, and other large lakes, also in Canim Lake, 70 miles east of the 100-Mile post on the Cariboo Wagon-road. The same fish, he said, was to be found in Lac la Hache. Evermann (1897), on the authority of Dr. Dawson, records it from "Chiloweyuck Lake (north latitude 49°) near Fraser River; Nicola, Francois, Fraser, Okanagan, Stuart, and Shuswap Lakes," and Evermann and Meek (1898) from Stuart and Nicola Lakes.

Kokanees vary in size from lake to lake, and in the same lake from year to year. In Christina Lake, we were informed, the greatest weight to which kokanees grow is 1 lb., and the smallest weight of adults about $\frac{1}{2}$ lb. It is said that in any one year the mature fish are all of the same size. A few kokanees of a greater weight than 1 lb. have been reported, but in general 1 lb. appears to be the maximum weight, while the average is considerably less.

The kokanee is important as a food for Kamloops trout. Although our information on the food of the latter is rather meagre, what is available suggests that kokanees are a staple food of trout over 16 inches in length, and trout seldom grow larger than this in lakes from which kokanees are absent, unless other species of fish are present to take their place. The Kokanee fills an important niche in the economy of lakes. It is a plankton feeder, and is thus a link between the smaller organisms and the large trout. In the absence of such a species it is doubted, as suggested above, whether trout usually grow much larger than 16 inches in length, the length at which trout turn from a diet of insects and other small organisms to fish. The conservation of the kokanee is therefore important from the standpoint of trout propagation. In British Columbia lakes lacking an adequate supply of trout food, this native plankton feeder should be preferred for introduction to non-native species of the same habit.

The abundance attained by kokanees in some waters is indicated by the fact that 14 tons of them have been seined in a single night in Christina Lake, about 1898 or 1899.

Two specimens 25.6 and 31.6 cm. long to end of vertebral column ($11\frac{1}{2}$ and $13\frac{3}{4}$ inches to fork of tail) taken in Christina Lake June 27th, 1928, gave the following measurements in per cent. of the body-length to end of vertebral column: Head-length, 22; head-depth, 15; eye, 4.8; snout, 4.9; maxillary, 10.4; body-depth, 23.6; body-width, 11 in case of female, 12.4 in case of male; caudal-peduncle length 16, and depth 8.2; dorsal fin with 10 or 11 fully developed rays preceded by 2 or 3 shorter ones, its height 13 and base 11; anal with 14 fully developed rays preceded by 2 shorter ones, its height 10 and base 13; pectoral, 17; ventral, 13; caudal, 22; scales, 131-132; gill-rakers, 14+20; branchiostegals, 13-14.

Salmo gairdnerii Richardson. (Steelhead.)

In previous account of this species (Dymond, 1932) it is stated that "it is not known how far steelheads ascend from the sea in the Fraser River, but it is probable that few, if any, penetrate beyond Hell's Gate." I have been informed, however, by Mr. W. A. Newcombe, who was stationed at the Gate for the Provincial Government, during several seasons when the salmon were running, that "it was well known by us working at the Gate that the steelhead could force his way through when the various species of *Oncorhynchus* would have to give up." He further states that "during the hold-up at the Gate in the earlier years, 1913-16, the fish were detained for much longer periods below and the Indians were still permitted to fish with nets and gaff. Steelhead were taken by them quite often, especially in October, and other runs were reported to be at the Gate early in the year (January and February), but I have never had the opportunity of personally checking these statements."

Mr. Newcombe's statements are corroborated by Mr. C. P. Hickman, assistant to the Commissioner of Fisheries, who says that "at the time of the first discovery of the obstruction

to salmon at the Fraser Canyon I was between Camp 16 and North Bend from early in October until December 15th in 1913. It was a common occurrence to see steelhead plough right through the swift water, where a sockeye could not begin to negotiate it."

The localities represented by specimens in the collections of the Royal Ontario Museum of Zoology are: In the Skeena drainage—Skeena River at Prince Rupert, Babine River and Lake, Meziadin River, Lakelse River, and Cluculz Lake; on Rivers Inlet—Hatchery Creek; on Howe Sound—Cheakamus River, Daisy Lake, Lake Marie, and Deadman's Lake; in the Fraser drainage—Upper Pitt River, Fraser River below Mission Bridge, Birkenhead Creek at Pemberton Hatchery, Chilliwack River, Cultus Lake, and Harrison River; on Vancouver Island—Cameron Lake, Lower Campbell Lake, Campbell River, Great Central Lake, Oliver Creek (Cowichan), Cowichan River, Stamp Falls, Comox Lake, Brown's River tributary to Puntledge River, Bevon, Millstream at Nanaimo.

Lord (1866) reported this species as "common in the Fraser, Chilukweyuk, and Sumas Rivers and in every stream along the mainland and island coasts up which salmon ascend." He gave the average weight as 8 to 11 lb.

Salmo kamloops Jordan. (Kamloops trout.)

The collections of the Royal Ontario Museum of Zoology contain specimens of the Kamloops trout from the following waters: Kootenay Lake and River and Lardeau River; Okanagan Lake; Farley, Fish, and McCullough Lakes, tributary to Okanagan Lake; Christina Lake, Kamloops Lake; Paul, Pinantan, Knouff, and Fish or Trout Lakes, and Tranquille Creek near Kamloops; Quilchena Creek; Kalamalka, Sugar, and Haddow Lakes, Squaw Valley Creek near Vernon; Mara Lake, Adams and Eagle Rivers and Manson Creek, tributaries of Shuswap Lake; Frog Lake and Creek, Tumtum Creek, Illecillewaet River, and Columbia River near Revelstoke; Louis Creek, tributary of the North Thompson; Coquihalla River and its tributary, the Nicolum; Thompson River 2 miles east of Lytton; Similkameen River and Bear Lake, near Tulameen; Clearwater Lake near Hedley; 1-Mile and 5-Mile Creeks near Princeton; Fraser and Burns Lakes near Prince George; Cunningham Lake, tributary to Stuart Lake.

Through fish-cultural operations the Kamloops trout has been distributed to many waters in British Columbia from which it was formerly absent.

Salmo kamloops whitehousei Dymond. (Mountain Kamloops trout.)

This dwarf form of Kamloops trout which is found in small lakes at high altitudes was described (1931) from specimens taken in 6-Mile Lake near Nelson. Besides the type locality we have specimens from Bear and Fish Lakes near Kaslo.

Salmo clarkii clarkii Richardson. (Coast cut-throat trout.)

The localities represented by specimens of this form in the collections of the Royal Ontario Museum of Zoology are as follows: Skeena drainage—Lakelse Lake and River; Rivers Inlet drainage—Owikeno Lake; Fraser drainage—Harrison River, Thompson River, Upper Pitt River, Chilliwack River and Lake, Sweltzer Creek, Cultus Lake, Anderson Lake, Stave Lake, 3 miles east of Ashcroft in the Thompson River; Vancouver Island—Nimpkish River, Lower Campbell Lake, Campbell River, Great Central Lake, Comox Lake, Bevon, Alberni, Diver Lake, Wellington Lake, stream at Departure Bay, Cowichan Lake, Shaw, Mead, and Nixon Creeks (Cowichan Lake), Tranquille Creek and Lake, Glendale River, Kennedy Lake and River, Salmon River, Oyster River, Clayoquot River.

Salmo clarkii lewisi (Girard). (Yellowstone cut-throat trout.)

This form is represented by specimens from Monroe Lake near Cranbrook and White River, a tributary of Upper Kootenay. A few cut-throats are reported as occurring in the upper reaches of the Columbia from Athalmer to Arrowhead, but I have seen no specimens and so cannot say whether they are of the *lewisi* or *alpestris* variety. The trout of this section of the Province deserve careful study.

Salmo clarkii alpestris Dymond. (Mountain cut-throat trout.)

The waters represented by specimens of this form are: The upper reaches of Isaac, Frog, and Canyon Creeks flowing into the Columbia River near Revelstoke; Crazy, Yard, and Frog Creeks, tributary to Eagle River and Mabel Lake in the Shuswap area; in some

small lakes on Griffin Mountain and in 6-Mile and 9-Mile Creeks flowing into the West Arm of Kootenay Lake.

Salmo trutta Linnæus. (Brown trout.)

The brown trout has been introduced into the Cowichan Lake and River and into the Little Qualicum River. The Annual Reports of the Biological Board of Canada for 1932 and subsequent years refer to these introductions. According to information supplied by Dr. Clemens, specimens have been taken in both the Cowichan and Qualicum Rivers; one taken during the early summer of 1936 was 15 inches in length and 1 lb. 7½ oz. in weight.

Salvelinus fontinalis (Mitchill). (Eastern speckled trout.)

The eastern speckled trout has been introduced into a number of waters of British Columbia. We have specimens from Tumtum Creek, near Revelstoke and Boundary Lake, and it has been reported to us as occurring in Leviathan Lake near Kaslo and Big Sheep Creek near Grand Forks, and a small stream tributary to Okanagan Lake. On Vancouver Island it has been placed in Cowichan Lake and River, Spectacle Lake, and Somenos Lake.

Cristivomer namaycush (Walbaum). (Great Lake trout.)

This char, which appears to be common in the lakes of the northern part of the Province, is not found south of the Shuswap, in British Columbia. There are specimens in the Royal Ontario Museum of Zoology from Lake Atlin and from Cunningham Lake, tributary to Stuart Lake.

Eigenmann (1895A) records the species from "Golden and Revelstoke . . . a large head in the University's collection from 20 miles east of New Westminster, B.C. . . ." Jordan (1889) had it from Canim Lake and Evermann and Goldsborough (1907) from Lake Atlin, Tagish Arm, Lake Bennett, and Summit Lake (at White Pass). We have reports from reliable observers of the occurrence of the species in Victor and Three Valley Lakes near Griffin Lake, also in Stuart, Fraser, and Francois Lakes in the north. In the latter lake it is said to reach a weight of 60 lb.

Salvelinus malma (Walbaum). (Dolly Varden.)

The Dolly Varden char seems to be generally distributed throughout the Columbia, Fraser, and Skeena River basins and on Vancouver Island. There are specimens in the collection of the Royal Ontario Museum of Zoology from Kootenay Lake, Shuswap Lake, and Scotch and Ross Creeks entering Shuswap Lake, Eagle River, Kamloops Lake, Cultus Lake, 11-Mile Creek near Revelstoke, stream entering Sugar Lake, Upper Pitt River, Owikeno Lake, Glendale River (Knight Inlet), Livingstone River (Crow's Nest Forest Reserve), Seeley Lake near Hazelton, stream on Kaien Island near Prince Rupert, and mouth of Salmon River (Vancouver Island).

The species has also been reported by reliable observers as occurring in Harrison Lake, Columbia River from Waneta and Arrow Lakes to Arrowhead, Whatshan Lake, Arrow Park Lake, Slocan Lake, Goat River, Moyie Lake, St. Mary Lake, Elk River, White River (a tributary of the Kootenay), Columbia Lake, Sugar and Mabel Lakes. Babcock, in Report of the Commissioner of Fisheries for 1902, reports it as occurring in Seton and Anderson Lakes. H. H. Beadnell, of Comox, reported on October 28th, 1927, that many Dolly Vardens were coming up from the sea with the cohoes, which he said was unusual; some of them weighed a pound. C. Hearn, of Skeena, reports the species as "found in nearly all waters along the lower reaches of the Skeena River watershed, ascending some of the larger tributaries such as the Copper River in large numbers during early spring."

Proportionate measurements of specimens 20–30 cm. to end of vertebral column (10–14 inches to fork of tail) are as follows, in per cent. of body-length to end of vertebral column: Head-length, 24 (21–27.5); head-depth, 14.5 (14–16); eye, 4.5 (4.0–5.0); snout, 7.3 (6.5–9.5); interorbital, 8 (6.7–9.5); maxillary, 13 (11–17); body-depth, 21 (17–25); body-width, 13 (11–15); caudal-peduncle length, 16.5 (15–18.5); caudal-peduncle depth, 9 (8–10); dorsal fin with 8 to 10 fully developed rays preceded by 1 or 2 shorter ones, its height 14 (12.5–16) and base 12 (11–13.5); anal fin with 7 or 8 fully developed rays preceded by 1 or 2 shorter ones, its height 13.5 (12–14.5) and base 9.7 (8.2–10.7); pectoral, 16 (15–17); ventral, 13 (12.5–15); caudal, 18 (16.5–20.8); snout to occiput, 17.5 (14.5–19.5); snout to dorsal insertion, 46.5 (43.5–48.8); snout to ventral insertion, 53.8 (52–55.4); diagonal rows of scales,

222 (197-244); gill-rakers, 6+10 (5+10 to 8+10), about 5 mm. long in specimens 30 cm. to end of vertebral column; branchiostegals, 10 to 12 (13 in one specimen).

Leucichthys pusillus (Bean). (Cisco.)

There is a specimen of cisco from Lake Atlin in the Provincial Museum, which has been provisionally identified as being of this species. Bean (1889) in his original description regards this form as very close if not identical with the Asiatic *merki* (*sardinella*).

Coregonus clupeaformis (Mitchill). (Eastern whitefish.)

The eastern whitefish has been planted in the waters of British Columbia on a number of occasions, but in no instance has it fulfilled the expectations of those responsible for its introduction.

On July 11th, 1928, we took seventy-five specimens of this whitefish in Okanagan Lake opposite Kelowna. They ranged in length from 14 and 3/16 inches to fork of tail (1 lb. 1/2 oz.) to 7 1/2 inches. These were all taken in 3-, 2-, 1 1/2-, and 1 1/4-inch gill-nets, although a length of 4 1/2 inches was included in the gang set. The nets were in the water about forty-three hours. The small size to which this species grows in Okanagan Lake, together with the comparative scarcity, is an indication that conditions here are far from ideal for it. Their scarcity is indicated by the failure of our nets to take them off Summerland, and by the fact that their presence in the lake was practically unknown.

The stomach of one of the specimens taken in our nets in Okanagan Lake contained a number of eggs, probably those of the Kamloops trout. It is not known whether the eggs were dead or not when eaten, and it is perhaps unfair to condemn a species on such evidence, but such an occurrence should serve as a reminder of the dangers attendant on indiscriminate introduction of species into waters to which they are not native.

The following statement with regard to the introduction of these whitefish was supplied me by Mr. Price Ellison, of Vernon:—

"I cannot remember the exact date that the above event took place, but it was somewhere between 1894 and 1898. I obtained the fry through our Dominion Government member at that time, Mr. J. Mara. The Fish Commissioner at New Westminster was named MacNabb, and he told me that the eggs came from Selkirk and were hatched at New Westminster. They were sent up here, under the care of a man named MacNeish, in galvanized containers holding about 10 or 12 gallons of water, having concave covers with a hole in the centre. MacNeish's orders were to put a piece of ice on each cover, and not to touch them again until they arrived at Vernon. They were put in the express baggage-car, and as it was early summer the ice had all melted by the time they reached North Bend, about 200 miles from New Westminster, but MacNeish's orders were not to touch them until he arrived at Vernon, and he carried them out by not placing more ice on the covers. By the time they reached here he was under the impression that they were all dead.

"However, I took them out to the lake, and, according to instructions, they were deposited in about 10 feet of water, and whatever they were they all sank, so I concluded that there must be some life in them, but when I put my hand in the container I could not feel anything but water. They certainly were not fry, though possibly eggs hatched to some extent. There were 3,000,000 deposited in Okanagan Lake and 2,000,000 in Long Lake, now known as Kalamalka Lake."

The records of the Vancouver office of the Fisheries Branch contain the following record of the distribution of whitefish in British Columbia in 1896:—

Waters stocked.	Number.
Coquitlam Lake.....	250,000
Deer Lake.....	125,000
Harrison Lake.....	2,225,000
Pitt Lake.....	250,000
Shawnigan Lake.....	1,125,000

The fry were all distributed by the Fraser River Hatchery and came originally from Selkirk.

Although there is no official record of the distribution of whitefish to Okanagan Lake in 1896, it is highly probable that such occurred in that year. It was Major Allan Brooks, of

Okanagan Landing, who first told me that it was Mr. Ellison who was instrumental in having whitefish planted in the lake, and the date given me by Major Brooks was 1896.

The annual reports of the Commissioner of Fisheries for British Columbia contain references to introductions of the eastern whitefish in 1911 and 1913. In the report for 1907 occurs the following:—

“I believe that great good would be accomplished by the introduction of the Lake Superior whitefish to Kootenay, Okanagan, Shuswap, and Harrison Lakes.”

In the 1911 report it is recorded that “the long-continued efforts of the Provincial Department looking to the establishment of the whitefish of the Great Lakes (*Coregonus clupeaformis*) in the lake system tributary to the Fraser seem about to be crowned with success. A hatching-battery is being established in the Harrison Lake Hatchery and a shipment of eggs will be sent thither from the Dominion egg-taking stations during the next distribution.”

And again in 1913 it is reported that “the 5,000,000 whitefish-eggs which through the courtesy of the United States Bureau of Fisheries were received from Put-in-Bay Station were successfully hatched at the Harrison Lake Hatchery of the Dominion Government and planted in Harrison Lake. A further shipment of 3,500,000 from the Dominion egg-taking stations in the East were also hatched and planted.”

Introductions into Okanagan Lake were also made in the years 1928 and 1929. In each year approximately 5,000,000 eggs were brought from the Fort Qu'Appelle Hatchery to the Summerland Hatchery.

As previously indicated, *Coregonus clupeaformis* is indigenous in Northern British Columbia. Specimens have been examined by Dr. W. A. Clemens and Dr. J. L. Hart.

Prosopium quadrilaterale (Richardson). (Round whitefish.)

This species, which occurs from New England, through the Great Lakes region and north-westward, is confined, so far as present records for British Columbia are concerned, to the extreme northern part of the Province. It has been recorded from Lake Bennett, Lake Atlin, and Cariboo Crossing by Evermann and Goldsborough (1907), who remark that it is apparently the most abundant species of whitefish in the headwaters of the Yukon.

Two specimens from Lake Atlin, a male and female, 36.8 and 35.4 cm. long respectively to end of vertebral column, gave the following measurement (in per cent. of the standard length): Head-length, 19; head-depth, 12.1; eye, 4; snout, 4.7; interorbital, 5.8; maxillary, 4.4; body-depth, 20.5; body-width, 14; caudal-peduncle length, 14; caudal-peduncle depth, 7.4; dorsal with twelve fully developed rays preceded by one or two shorter ones, its height 13.1 and base 10.7; anal with 11 fully developed rays preceded by 1 shorter ray, its height 10.5 and base 9.8; pectoral length, 15.4; ventral, 12.8; caudal, 19.4; adipose, 6; branchiostegals, 7 or 8; scales, 97; gill-rakers, 6+11; pyloric cæca, 107 (104–110). The stomach of one of these specimens contained 140 shells of a snail *Valvata* sp. Except in the greater number of scales, these specimens closely resemble Great Lake specimens of the same species.

Prosopium williamsoni (Girard). (Rocky Mountain whitefish.)

There are specimens of this species in the collection of the Royal Ontario Museum of Zoology from Kootenay Lake, Kootenay River at Slocan Pool, Okanagan Lake, Kalamalka Lake, Cultus Lake, Harrison Lake, Chilliwack River, Columbia River at Revelstoke, Adams River, and Eagle River. It has also been reported to us as occurring in Moyie and St. Mary Lakes, and Goat and Elk Rivers, Columbia Lake, Lake Windermere, Slocan Lake, Watshan Lake, Arrow Lakes, Christina Lake, and in Sugar and Mabel Lakes.

Eigenmann (1895A) records it from the Columbia River at Golden and Revelstoke and from Shuswap Lake at Sicamous. Evermann and Goldsborough (1907) record it from Kootenay Lake at Nelson.

The collection consists of twenty-six specimens ranging in size from 7 to 18½ inches in length; the majority, however, are rather small, averaging 9 to 10 inches. The species appears to be very variable in body proportions, but none of the differences shown by the present collection are correlated in such a way as to indicate that more than a single species is represented. While some of the differences may indicate the existence of local or geographical forms, the majority appear to be the result of individual differences in rates of growth, sex, and sexual maturity. Following are average measurements of the various body-parts

in percentages of the body-length to end of vertebral column. The percentages in parentheses indicate the range of variations shown by the present collection: Head-length, 21 (20-23); specimens with heads 22-23 per cent. of the total length are usually the larger, sexually mature individuals. Such specimens have long snouts and maxillaries and wide interorbitals. Head-depth, 13.8 (13-15); eye, 5 (4-6). The eye, of course, is relatively larger in small individuals, but there seems to be considerable variation between specimens of the same size from different localities, perhaps correlated with the transparency of the water. Snout, 6 (5.5-7); the snout is especially long in older, sexually mature individuals, reaching in the case of the 18½-inch individual, a ripe female, 18.6 per cent. of the standard length; inter-orbital, 6 (5-7); maxillary, 6 (5-7); body-depth, 21 (18-25); body-width, 13 (10-16.7); larger, sexually mature individuals have much deeper and wider bodies than small, immature ones; caudal-peduncle length, 14 (12-16); caudal-peduncle depth, 6.5 (5.5-7.5). Dorsal fin with 11 to 13 fully developed rays preceded by 1 or 2 shorter ones, its height 14.5 (13-17); dorsal base, 12.5 (10-14.5); anal with 10 to 12 developed rays preceded by 1 or 2 shorter ones, its height 12 (10-16), its base 10 (8-11); pectoral length, 17 (15-20); ventral, 14.5 (12-18); caudal, 20 (18-22); adipose, 10 (8.7-11.7); branchiostegals, usually 8, sometimes 9; scales, 82 (78-86); gill-rakers, 8+13 (8+12 to 9+14), quite short, 2 to 3½ mm. in length; pyloric cæca usually nearly 100, ranging from 82 to 133. Ripe males have pearl organs on the scales especially pronounced on the four or five rows immediately above and below the lateral line.

As indicated above, some of the differences shown by the present collection suggest the existence of geographical or ecological forms. For instance, a collection of seven specimens from the Columbia River at Revelstoke have much deeper caudal peduncles than those from other localities represented, being 7 to 7.5 per cent. of the standard length, whereas others are rarely 7 per cent. These Revelstoke specimens also have much longer fins than the others. In other body proportions, however, as well as in number of gill-rakers, scales, and pyloric cæca, the Revelstoke specimens agree with those from other parts of the Province. As already indicated also, larger, sexually mature individuals differ considerably from smaller, immature specimens with respect to some body proportions. Large, sexually mature specimens have relatively much longer and deeper heads with longer snouts, and maxillaries, and wider interorbitals; the body is also much deeper and wider.

As indicated by the above description, *williamsoni* differs from *quadrilaterale* in the more numerous gill-rakers, fewer scales, longer and deeper head, snout not only longer relative to the body, but also when compared with the longer head; since the depth and width of the body varies so much with size and state of sexual maturity, it is difficult to arrive at a comparison of the two species from a comparison of the specimens at hand, but it seems probable that *williamsoni* has a somewhat deeper body than *quadrilaterale*; *williamsoni* is also characterized by a much longer adipose fin.

This species is said to spawn in the Okanagan region about November 15th.

Thymallus signifer (Richardson). (Arctic grayling.)

There are eight specimens of grayling from Lake Atlin in the collections of the Royal Ontario Museum of Zoology.

Catostomus catostomus (Forster). (Long-nosed sucker.)

This sucker was taken from deep water in Kootenay and Okanagan Lakes. Eigenmann (1895A) took it at Golden and Revelstoke and Evermann and Goldsborough (1907) reported it from the Watson River at Caribou Crossing. It is also known to occur in Shuswap Lake.

A specimen taken in Okanagan Lake, 39.5 cm. long to end of vertebral column (17⅞ inches to fork of caudal fin), gave the following proportionate measurements in per cent. of standard length: Head, 24.3; eye, 3.5; snout, 13; interorbital, 8.8; body-depth, 18.2; body-width, 14.4; caudal-peduncle length, 14.4; caudal-peduncle depth, 7.8; dorsal fin with 11 fully developed rays and 1 shorter one in front, its height 15.7 and base 13.9; anal with 7 fully developed and 1 shorter ray, its height 15.9 and base 7.6; pectoral, 19.7; ventral, 14.2; scales, 18-107-14.

Small or dwarf specimens, identified as *Catostomus catostomus*, were taken from shallow water in Garnet Valley Lake, near Summerland. A similarly dwarfed, lacustrine form has been described from the lakes of Jasper Park under the name *Catostomus catostomus lacustris* by Bajkov (1927).

Catostomus macrocheilus Girard. (Columbia River sucker.)

This is the common sucker of Southern British Columbia. Our specimens are from Kootenay, Okanagan, Christina, and Harrison Lakes, and a grassy lake along the course of Tumtum Creek near Revelstoke. It has also been reported by reliable observers as occurring in Columbia and Windermere Lakes and in the following lakes in the Columbia system: Arrow Lakes, Slocan Lake, Little Slocan Lake, Whatshan Lakes, Arrow Park Lake, and Summit Lake; and it is also said to occur in Hawser or Duncan Lake, Trout Lake, Stobbard Lake, and Erie Lake, and in the following lakes in the Moyie system: Moyie, St. Mary, and Premier. Eigenmann (1895A) has recorded it from Sicamous and Kamloops.

Measurements in per cent. of body-length to end of vertebral column of specimens 30 to 40 cm. in standard length (13 to 17 inches to fork of tail) are as follows: Head, 25; eye, 3.8; snout, 12.7; interorbital, 9.5; body-depth, 21.5 (20–23); body-width, 15.5 (14–16); length of caudal peduncle, 15; depth of caudal peduncle, 7.8; dorsal fin with 14 or 15, sometimes 13 developed rays, preceded by 1 or 2 shorter ones, its height 16 (14–17) and base 19; anal with 7 developed rays, preceded by 1 shorter ray, its height 18 (17–19.5) and base 8 (7–9); pectoral length 20 (19–22) and ventral 15 (14–17); scales, 13 (12–15)–70 (66–72)–12 (10–13). A male 11 inches long taken in Harrison Lake in October, 1925, had traces of tubercles on the anal fin, and also at the base of the lower three or four caudal rays.

Tinca tinca (Linnæus). (European tench.)

Specimens of this European species were taken in Christina Lake, to which they have no doubt gained entrance from the south through the outlet stream. They are said to have been first noticed in the lake about 1915. I am indebted to Dr. L. P. Schultz, of the College of Fisheries, University of Washington, for the following information on the introduction of this species:—

“The European tench was brought to Seattle for the World’s Fair, and afterwards were dumped into geyser basin (a large goldfish-pond on the campus) and probably at that time or perhaps later some were taken to Lake Union. They remain in the geyser basin to-day in abundance and are collected occasionally for laboratory dissection. No attention is paid to them at all; they propagate naturally. Specimens have been reported from Lake Union that were nearly 2 feet long.”

Two specimens measured gave the following proportions: Head, 28 per cent. of body-length to end of vertebral column; eye, 3.9; snout, 10–11; body-depth, 30–32; body-width, 14–16; dorsal rays I, 9, anal I, 8; scale, 92–94; teeth, 5–6.

Cyprinus carpio Linnæus. (Carp.)

Carp are not uncommon in the shallower parts of Okanagan Lake. Quite a number of small specimens were seined at the northern end of the lake, and many larger ones were seen at the foot of Okanagan Falls.

It is also known to occur in Kalamalka, Woods, and Shuswap Lakes.

Mylocheilus caurinus (Richardson). (Chub; Peamouth.)

The chub is common in most of the lakes visited in Southern British Columbia. We have specimens from Kootenay, Okanagan, Cultus, and Harrison Lakes, Columbia River in the vicinity of Revelstoke, from Babine Lake and some unspecified water in the vicinity of Prince George, and also from Cecilia Lake, on Vancouver Island.

Jordan and Evermann (1896) say of this species: “Often entering the sea . . . specimens from Nanaimo sent by Mr. Ashdown H. Green, who says that this is the only cyprinoid found in Vancouver Island.” It has been recorded from Fishhook Lake, Vancouver Island, by Green (1893). Confirmation of the occurrence of this species in salt water is furnished by C. Carl, who took it in English Bay while fishing along the shore for the surf-smelt, *Hypomesus pretiosus*. Eigenmann (1895A) records this species from Mission, Kamloops, Sicamous, Revelstoke, and Golden. Our largest specimen, taken in Cultus Lake, measured 12½ inches (13.5 cm.) to fork of tail.

Hubbs and Schultz (1931) have discussed the scientific name of this species and conclude that Richardson’s (1836) name *caurinus* must stand. They point out that previous to 1905 the name *Mylocheilus caurinus* was generally accepted, but in that year Snyder (1905) stated

that the name should be *Mylocheilus lateralis* Agassiz and Pickering, and many have adopted the latter name in consequence.

Proportionate measurements based on twelve specimens ranging from 16 to 23 cm. in length to end of vertebral column are as follows in per cent. of standard length: Head-length, 22.5 (21.5-24); eye, 4.9 (4.7-5.3); snout, 7.0 (6.6-7.6); maxillary, 5.6 (5.0-6.3); interorbital, 7.3 (7.0-7.9); body-depth, 20 (19.5-21); body-width, 13.8 (13-14.2); caudal-peduncle length, 18 (17-19); caudal-peduncle depth, 8 (7.7-8.5); dorsal fin with 8 fully developed rays preceded by 1 or 2 shorter ones, its height 18 (16-20) and base 10.5 (10-11); anal with 8 fully developed rays preceded by 1 or 2 shorter ones, its height 14 (13-15) and base 10 (9.5-10.3); pectoral length, 19 (17-22); ventral length, 15.5 (14-17); scales, 13 to 15 - 71 (68-74) - 8 or 9; teeth, usually 1-5-5-1, occasionally 4 in one of the outer rows, hooked in young, one or more becoming stump-like with age; premaxillary protractile, a barbel near end of maxillary; peritoneum dusky, tubercles on top of head, on opercle and on scales of back and sides nearly to lateral line, of specimen 20 cm. long to end of vertebral column, taken in Kootenay Lake June 12th, 1928.

Chrosomus erythrogaster Rafinesque. (Red-bellied dace.)

A specimen sent by Dr. Clemens to the Royal Ontario Museum of Zoology was taken in Charlie Lake in the Peace River Block. This lake lies west of Fort St. John and is tributary to the Peace River.

Ptychocheilus oregonensis (Richardson). (Squawfish.)

The squawfish is one of the commonest and most generally distributed fish in Southern British Columbia. Specimens were secured in Kootenay, Okanagan, Christina, and Harrison Lakes, and it has been reported by reliable observers as occurring from Columbia and Windermere Lakes throughout the Columbia River, including the Arrow Lakes, Slocan Lake, Little Slocan Lake, Whatshan Lakes, Arrow Park Lake, Summit Lake, the Kootenay River between Nelson and Castlegar and between Kootenay Landing and the United States border, Goat River below the Canyon, Hawser or Duncan Lake, Trout Lake, Stobbard Lake, Erie Lake, Kalamalka, Woods, Duck, Cultus, Blue, Cluculz Lakes, and the Nechako and Lower Fraser Rivers. It has also been recorded from the Thompson River at Kamloops and Shuswap Lake at Sicamous by Eigenmann (1895A).

It grows to a large size, a specimen 8 lb. in weight having been taken in Arrow Lakes near Edgewood in June, 1928.

Proportionate measurements based on five specimens averaging 27 cm. in length to end of vertebral column are as follows in per cent. of standard length: Head-length, 28 (27-29); eye, 4.5 (4.2-5.0); snout, 10 (9-11); maxillary, 11.5 (11-12); interorbital, 7.8 (7.3-8.8); body-depth, 20 (18-21); body-width, 14; caudal-peduncle length, 18 (16.5-19.5); caudal-peduncle depth, 9; dorsal fin with 9 fully developed rays preceded by 1 or 2 shorter ones, its height 16 (15-17) and base 12 (11.5-13); anal with 8 fully developed rays preceded by 1 or 2 shorter ones, its height 13.5 (12.5-16) and base 10.5 (9.5-12); pectoral, 18 (15.5-21.5); ventral, 13.5 (12-16); scales in lateral line, 73 (69-77); teeth, 2-4-5-2, outer row sometimes 3 instead of 2 and inner sometimes 4-4, some or all of teeth hooked.

Richardsonius balteatus (Richardson). (Shiner.)

The shiner is usually common and generally distributed at least in the southern part of the Province. There are specimens in the collection of the Royal Ontario Museum of Zoology from Kootenay, Okanagan, Cultus, and Shuswap Lakes, the Thompson River at Kamloops, Summit Lake near Revelstoke, and Garnet Valley Lake, a small lake near Summerland. C. Carl reports having taken the species in Burnaby Lake and Dr. W. A. Clemens from Kalamalka, Woods, Duck, and Blue Lakes.

It has also been recorded by Eigenmann (1895A) from Kamloops and Mission, and as variety *lateralis* from Sicamous, Griffin Lake, Kamloops, Revelstoke, and Golden. Later, Eigenmann (1895B) made a rather extensive study of variation in this species and in the paper in which he published his results regarded *lateralis* as a synonym of *balteatus*.

This minnow does not reach a very large size, our largest specimen being 6.6 cm. to end of vertebral column (3 inches to fork of tail). It is characterized by its deep, rather compressed body, long anal fin, and insertion of the dorsal well behind a vertical through ventral

insertion. A dark lateral band on posterior half of the body; the lateral line follows the contour of the ventral surface.

The species is said to show wide variations from one locality to another. The following measurements in per cent. of the standard length were secured from specimens from Okanagan Lake, 5.7 to 6.6 cm. long, to end of vertebral column: Head, 26 (25–27); eye, 8.3 (7.7–8.7); depth of body, 28.5 (27–29.5); width of body, 16 (15–18); dorsal with 10 fully developed rays preceded by 1 or 2 shorter ones; and with 15 to 17 fully developed and 1 or 2 preceding shorter rays; scales, about 58; teeth, usually 2–5–4–2, sometimes 1 or 3 in the inner row on one or both sides.

Couesius plumbeus (Agassiz). (Lake chub.)

A number of specimens of the lake chub were taken in Garnet Valley Lake near Summerland, July 6th, 1928. Only four of them are large enough to furnish useful comparative measurements; these are as follows, in percentage of the body-length to end of vertebral column: Head, 26.3; eye, 6.5; snout, 7.8; interorbital, 7.5; body-depth, 21.8; body-width, 15.0; caudal-peduncle length 21.7 and depth 9.3; dorsal fin with 8 fully developed rays, preceded by 1 shorter one, its height 16.8; anal fin with 8 fully developed and 1 shorter ray, its height 14.3; pectoral length, 18.3; ventral length, 14.2; scales, 60 (58–64), 27 scales before dorsal; teeth, 2–4–4–2; barbel evident, attached above and near posterior end of maxillary.

Specimens of a lake chub collected in Stuart Lake near Fort. St. James, B.C., have been described by Jordan (1894) as *Couesius greeni*; Green (1893) mentions the same locality. Evermann and Goldsborough (1907) also record specimens taken by Evermann in Kootenay Lake.

The specimens collected in Garnet Valley Lake and described above agree closely with specimens of *C. plumbeus* from Lake Nipigon (Dymond, 1926) and they are accordingly regarded as being of the same species.

Specimens have also been taken in Jewel Lake.

Rhinichthys cataractæ (Cuvier and Valenciennes). (Long-nosed dace.)

During the course of our studies this species was taken in Kootenay Lake at Kaslo, at the north end of Okanagan Lake, and in Garnet Valley Lake, a small lake near Summerland. There is also a specimen in the collection of the Biological Station, from Morrison Lake, taken December 15th, 1928. C. Carl reports specimens from streams tributary to Burnaby Lake.

Apocope falcata (Eigenmann and Eigenmann).

This species was taken in the seine at the north end of Okanagan Lake. I have also examined specimens taken in Shuswap Lake by Dr. Clemens. It has previously been recorded from the latter locality by Eigenmann and Eigenmann (1893) as *Agosia shuswap*.

Apocope nubila (Girard).

This species has been recorded from Yellowhead Lake, Mount Robson National Park, by Bajkov (1927).

Ameiurus nebulosus (Le Sueur). (Common bullhead.)

A specimen of this species was taken July 18th, 1925, in Sumas River and presented by Dr. R. E. Foerster to the collection of the Royal Ontario Museum of Zoology. Catfish are said to be rather common in the area.

The records of *Ameiurus melas* from New Westminster and Shawnigan Lake in the Report of the Provincial Museum for 1931 may refer to the present species.

Esox lucius Linnæus. (Common pike.)

Inspector T. V. Sandys-Wunsch, of the Royal Canadian Mounted Police, informs me that pike occur in Northern British Columbia. He first found them in Dease Lake and from there down the Dease River, in the Liard River, and in all the lakes adjacent.

According to Mr. W. M. Ferrier, Fisheries Inspector at Prince George, pike are native to the waters of Northern British Columbia tributary to the Arctic Ocean, but he has never known of any pike found in the waters of Northern British Columbia tributary to the Pacific Ocean.

Lota maculosa (Le Sueur). (Burbot; Ling.)

This species is generally distributed through British Columbia. From information secured by personal observation and from the reports of Fishery Officers, it is known to occur in the large lakes such as Kootenay, Okanagan, Arrow, and Shuswap, also in all suitable waters throughout the Columbia system, including Slocan Lake, Christina Lake, at Revelstoke, and Golden (Eigenmann, 1895A), and in Windermere and Columbia Lakes. In the Upper Kootenay drainage it is found in Moyie, St. Mary, and McBains Lakes, and in suitable situations in the river to its upper reaches. In the Fraser drainage it occurs, in addition to Shuswap Lake, in Cluculz, Sugar, Mabel, Mara, Nicola, Douglas, and Seton. Macoun (1883) records it from Fort McLeod in Northern British Columbia. Babcock (1902) records the species from Seton and Anderson Lakes, and Evermann and Goldsborough (1907) believe it to be "common in Lake Bennett, Tagish Arm, Lake Atlin, and probably in all suitable waters in the Yukon basin."

In Christina Lake it is caught on set-lines in winter and used as food. Of it Cobb (1926) says, "rarely utilized as food except in British Columbia and Washington, where small quantities are marketed." Babcock (1907) also speaks of the ling as furnishing excellent food to some sections.

Gasterosteus aculeatus Linnæus. (Common stickleback.)

The common stickleback of Southern British Columbia, both fresh-water and marine, is now regarded as of the same species as the common three-spined stickleback of the Northern Atlantic—namely, *Gasterosteus aculeatus*. Considerable differences do occur between sticklebacks of this species in fresh water as compared with salt water, and southward as compared with those in the north, but, as Hubbs (1929) has pointed out, "So numerous are these local races, so confused their geographical distribution, that it seems unwise to recognize any one of them as a distinct species." *Gasterosteus cataphractus* and *Gasterosteus williamsoni microcephalus* therefore become synonyms of *G. aculeatus*.

Our specimens are from Millstream, Nanaimo, Big Lake, Wellington, V.I., Cultus Lake, and Harrison Lake. It is also known to occur in the Nanaimo Lakes, and Dr. L. P. Schultz has identified specimens collected by Dr. A. L. Pritchard from Meyer Lake, Queen Charlotte Islands. It will be noticed that none of these localities are beyond Hell's Gate Canyon, which seems to mark the limit of the distribution of a number of anadromous species.

Lord's (1866) classic account of the nest-building habit of the stickleback was based on observations made in British Columbia.

Eucalia inconstans (Kirtland). (Brook stickleback.)

A specimen taken in Charlie Lake, tributary to the Peace River, in the Peace River Block, west of Fort St. John, was sent to the Royal Ontario Museum of Zoology by Dr. Clemens.

Micropterus dolomieu Lacépède. (Small-mouthed black bass.)

The story of the introduction of black bass into Christina Lake and other British Columbia waters is recounted by Prince (1902). The fry were placed in Christina Lake in the autumn of 1901. Such poor care was taken of them from the time they were taken from the train at Revelstoke until they were placed in the lake that few survived the journey. According to information given us by Mr. Sandner, it was five years before bass began to be noticed in the lake. After that they steadily increased until they became fairly common, but at the time of our visit in 1928 their numbers had been decreasing for several years. This circumstance we attributed to the depletion of food. Crayfish and shiners (*R. balteatus*) were said to have been formerly very common around the shores, but in 1928 both were quite scarce. The largest bass taken in Christina Lake weighed 6 lb.

It is difficult to estimate the effect of the bass on the native Kamloops trout of the lake. The latter were said to be quite scarce as compared with former conditions, but how much of this can be attributed to the bass, and how much to overfishing, or other causes, is impossible to state.

The only report of bass in Moyie Lake was furnished by C. H. Robinson, Fishery Overseer of Nelson, who said that about 1925 Mr. H. Ryder, in charge of the Cranbrook Hatchery, had found a dead bass on the shore of that lake. Dr. J. L. Hart has sent us a specimen of young small-mouthed black bass taken in Spider Lake, Vancouver Island, on June 15th, 1930.

Aplites salmoides (Lacépède). (Large-mouthed black bass.)

This species, which of course is not native to the Province, is now rather common towards the southern end of Kootenay Lake, where there is a good deal of shallow water. It is said to have escaped into the Kootenay River at Bonners Ferry in 1916 from private ponds. It was caught near Kootenay Landing for the first time about 1921. In that year Mr. A. Bush, of Nelson, caught a specimen weighing 5½ lb. at Sirdar. By the summer of 1928 they had spread to Pilot Bay.

The large-mouthed black bass also occurs in Osoyoos and Vaseaux Lakes, having gained access to it from the south. It has also been reported by anglers as occurring in a lake on Saltspring Island, near Vancouver Island.

Pomoxis sparoides (Lacépède). (Calico bass.)

Hart (1934) has recorded the calico bass from Hatzic Lake, a backwater of the Fraser River near Mission.

Eupomotis gibbosus (Linnæus). (Pumpkinseed.)

The pumpkinseed is rather common in Christina Lake, to which it was probably introduced along with the black bass.

Perca flavescens (Mitchill). (Yellow perch.)

Perch occur in Vaseaux Lake, to which they are said to have gained entrance from the south.

Cottus asper Richardson. (Prickly bullhead.)

This sculpin appears to be very generally distributed throughout South-western British Columbia, including Southern Vancouver Island. There are specimens in our collections from Okanagan Lake, Christina Lake, Shuswap Lake, Summit Lake near Revelstoke, Cultus Lake, pond at Harrison Hatchery, Nass River, Horne Lake, and Spider Lake on Vancouver Island, Millstream at Nanaimo, and a small stream entering Departure Bay near the Biological Station. Eigenmann (1895A) records the species from Mission, Sicamous, Kamloops, and Griffin Lake and remarks that it is very abundant in the Fraser system from tide-water to an altitude of 1,900 feet. Bean and Weed (1920) record "five specimens 12.5–18.5 cm. long, mouth of Fraser River, B.C. A. Halkett." Dr. Clemens reports the species as occurring in McClinton Creek, Queen Charlotte Islands, on the basis of identification by Dr. L. P. Schultz.

In percentage of the length to end of vertebral column following are measurements of various body-parts: Head, 33 (30–35); eye, 7.5 (6.7–8.0); snout, 9.8 (9.0–11.5); interorbital, 4.8 (4.2–5.3); body-depth, 22 (21–24); body-width, 20 (19–21.5); length of caudal peduncle, 11 (10–13); depth of caudal peduncle, 7.2 (7.0–7.4); first dorsal with 9 spines in fourteen specimens and 8 in one, its height 8.5 (8.0–9.0) and base 17.5 (15.5–20); second dorsal with 20 rays in seven specimens, 21 in six and 22 in two, its height 14 (12–16.5) and base 42 (36–46); last membrane of first dorsal connected to lower half of first ray of second dorsal; anal with 16 rays in seven specimens and 17 in eight, its height 12.5 (10–15) and base 33 (32–34); pectoral length, 28 (25–30); ventral rays I, 4 in every one of fifteen specimens examined, its length 20 (17–22); one almost straight upward and backward pointing preopercular spine; a prominent dark vertical bar at base of caudal, a few dark saddle-shaped markings on back and upper sides, especially anteriorly, a round dark spot on membrane between last few spines of first dorsal, edge of fin reddish; the extent to which prickles are present varies from that in which they are confined to a small patch behind the pectoral fin to that in which they cover most of the body with the exception of the ventral surface, and in front of and beside the dorsal fin; they are commonly absent from the caudal peduncle; lateral line sometimes complete, but often lacking on part or all of caudal peduncle.

Cottus rhothea (Rosa Smith).

Following are some of the characters of specimens of this sculpin taken at Slocan Pool, in the Kootenay River below Bonnington Falls: First dorsal rays, 7 or 8; second dorsal rays, 16 or 17; anal rays, 12 or 13; ventral rays I, 4; body, including top of head, covered with prickles, except on ventral surface and on lower sides in front; lateral line incomplete, a few pores missing on caudal peduncle, sometimes the whole caudal peduncle on one or both sides lacking pores: largest specimen, 5.5 cm. to end of vertebral column.

Cottus aleuticus Gilbert.

This species is found in both fresh and salt water. Specimens were obtained in a small stream entering Departure Bay; this is probably the same locality as that for which Gilbert (1895) records "four specimens were collected by us May 26th, 1889, in a small stream entering Departure Bay, Vancouver Island."

I am also indebted to W. E. Ricker for a number of specimens 3-4 cm. in length taken from the stomach of a specimen of *Salvelinus malma* collected in Cultus Lake.

There is a specimen at the Pacific Biological Station collected by Dr. A. L. Pritchard from McClinton Creek, Queen Charlotte Islands, and identified by Dr. Schultz.

Cottus cognatus Richardson. (Miller's thumb.)

Specimens of this species were taken at Kaslo in Kootenay Lake and in Christina Lake. Of the three specimens taken, two had ventral rays I, 3 and one had I, 4; first dorsal rays were 7 in one case and 8 in two; second dorsal rays were 16, 15, and 17 respectively, and anal 12, 12, and 10. The lateral line was quite short, in one case not reaching a vertical through the insertion of the first dorsal, in others extending only a little beyond this point; there was a patch of prickles behind the pectoral fins. Length of specimens, 2.8, 3.0, and 3.7 cm. to end of vertebral column.

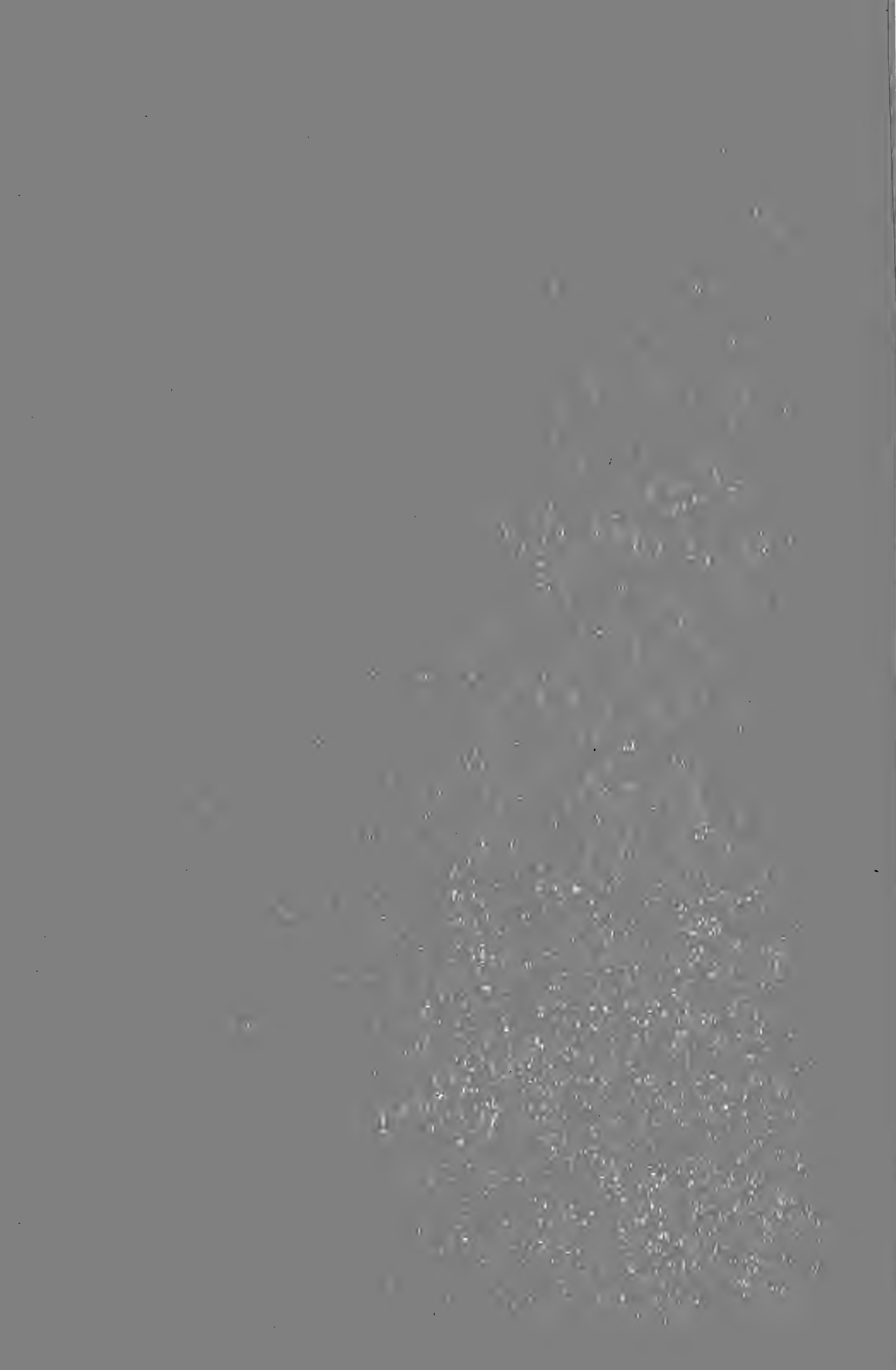
Evermann and Goldsborough (1907) report having taken forty-five specimens which they identified as belonging to the present species in Lake Bennett, Northern British Columbia.

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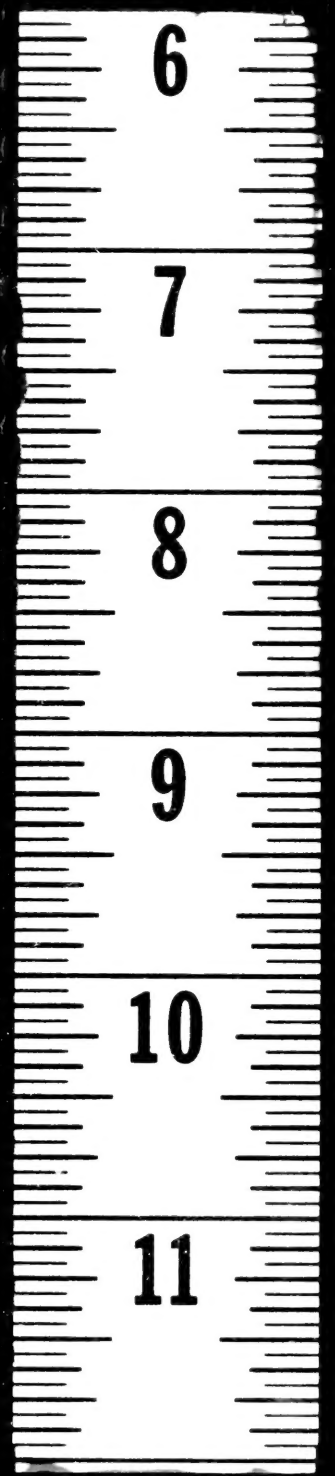
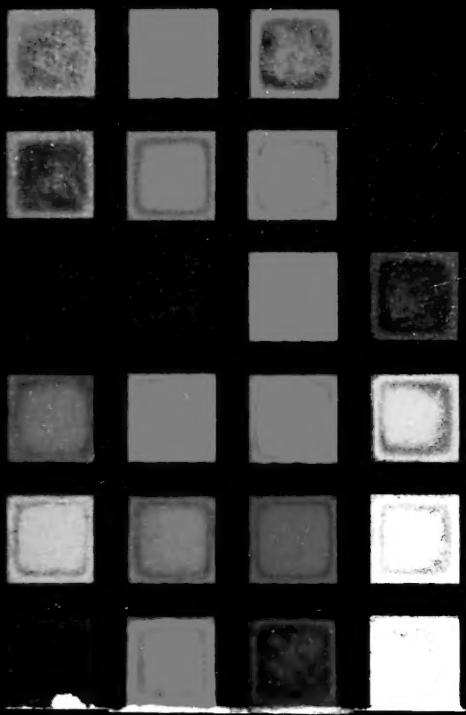
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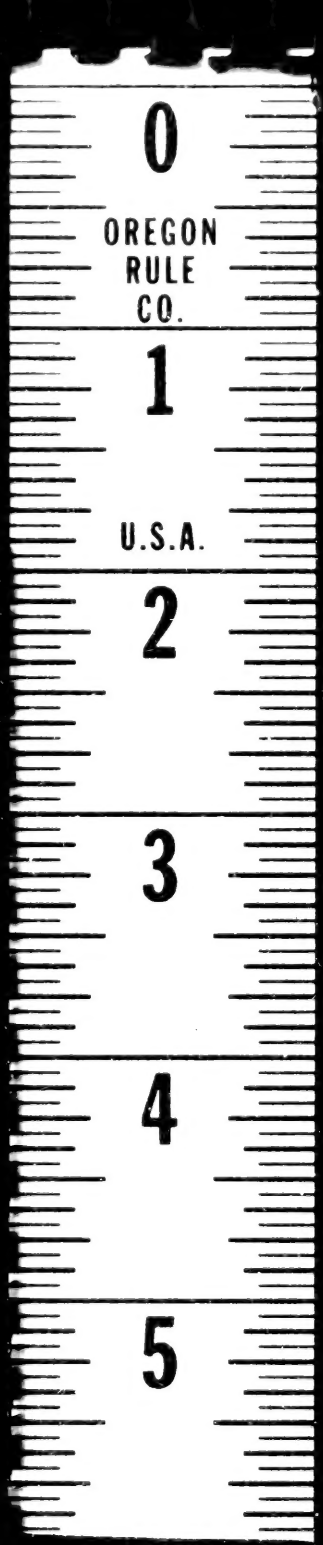
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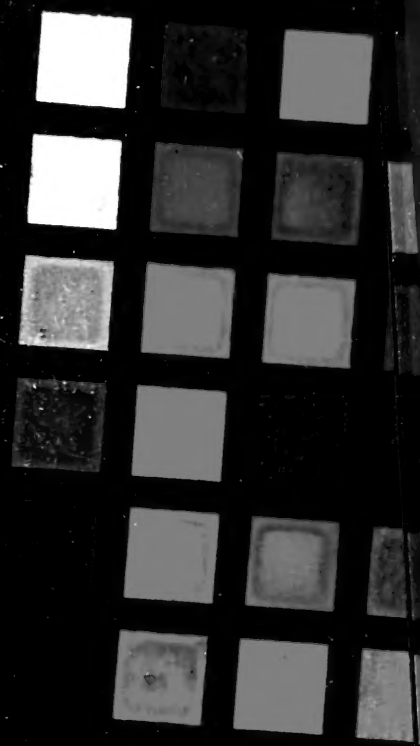
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