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THE FRESH WATER FISHES OF NOVA SCOTIA

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ABSTRACT

Keys are given for the identification of forty-four species of fresh-water fishes, only thirty-three of which are definitely known to occur in Nova Scotia. Of these thirty-three, four have been introduced, seventeen are believed to have entered through the sea, and twelve are more or less strictly freshwater forms. Detailed information on occurrence within the Province, a synoptic account of total range and a short descriptive account are given for each Nova Scotia species.

The distribution pattern indicates that the twelve strictly fresh-water species have entered Nova Scotia by way of the Isthmus of Chignecto since the recession of the last ice sheet. There is some evidence that the nature of the local rock formation influences the distribution of several species.

SOURCES OF INFORMATION

The information concerning occurrence and distribution of fresh-water fishes in Nova Scotia was obtained mainly from seventy-three collections made by the author during the years 1947-50 inclusive. The collection localities are scattered throughout the province, but the Cumberland-Colchester-Pictou area has been covered less thoroughly than the rest of Nova Scotia. Also used were some fishes collected during 1946 by the Nova Scotia Inland Fisheries Survey and the

previous collections of the Nova Scotia Museum of Science, a rather poorly assorted lot of miscellaneous fishes, in most cases consisting of only a few specimens of one or two species from each locality and in many cases without even minimum information concerning collector, date, and locality of collection. Further data concerning the distribution of *Cyprinidae* in the province were obtained from the files of the Royal Ontario Museum of Zoology.

The collections of the present author and the 1946 collections of the Nova Scotia Inland Fisheries Survey will be added to those of the Museum of Science. The 1949 and 1950 collections, 48 in all, are accompanied in most cases by full information concerning date, place, and methods of capture, water and air temperature, water colour and pH, vegetation and nature of bottom. The earlier collections are accompanied by scantier field notes.

The combined collection will provide a nucleus for the detailed study of many aspects of fish biology, such as breeding times, growth, diet, habitat preference and ecological interrelation.

The information on ranges was taken from Hubbs and Lagler's "Fishes of the Great Lakes Region," J. R. Dymond's "A List of the Freshwater Fishes of Canada" and Jordon and Evermann's "Fishes of North and Middle America", in that order. Most of the keys are modified from the same sources.

METHODS

Although poison, lime bomb, D. C. electric shocker, trawl, rod with fly, spinner or bait, dip net, minnow trap, four-angled lift net, hoop lift net, gill net, triple-fyke net with leaders, and four-foot seines in lengths from 6 to 150 feet were all used in the field work, the great bulk of the specimens were taken with 4 x 25 foot seine without brails, operated by two men, at least one of whom wore a swimming suit and sneakers. Almost all the seining was done during the day.

The fish were fixed in 4% formaldehyde solution, and preserved in either 4% formaldehyde or 70% alcohol.

MARINE FISHES

A number of sea fishes, such as the Saltwater Killifish; *Fundulus heteroclitus*; the Silverside, *Menidia notata*; and the Winter Flounder, *Pseudopleuronectes americanus*; are said to invade brackish water almost or quite to fresh water. Except for a single specimen of *Fundulus heteroclitus* they have not been found in fresh water, even in the tidal reaches of rivers, during this investigation. Persons collecting in such places, however, should bear them in mind.

GENERAL REMARKS

The most striking characteristic of the fresh-water fish fauna of Nova Scotia is the small number of species and the variety of places where each species lives. Thus half a dozen seine hauls in a place such as the Huron River in Michigan will yield fifteen or more species of fish, but in no case has a day's careful seining on a lake or stream in Nova Scotia yielded more than seven or eight species. Most lakes and streams will provide only three or four. Agassiz once called New England a "zoological island." The description applies even more closely to Nova Scotia.

In the more isolated regions of the province this is particularly marked. Bluff Lake, a small pond in the granite area of the Halifax Peninsula, contains only Speckled Trout, *Fundulus diaphanus*, and probably Eels. The Bluff Lake *Fundulus* grow to a large size and these large individuals can be seen swimming amongst the rooted aquatic vegetation not only near shore, where they usually occur, but also out in deeper water, in regions held by large Golden Shiners and White and Yellow Perch in similar lakes with a richer fauna.

Even more striking examples of the sparse fish fauna are to be found on the plateau of northern Cape Breton Island. This plateau drops off to the sea very precipitously, the streams draining its lakes being cataracts along much of their courses. This appears to have effectively sealed off the plateau from most fish, and although Speckled Trout (possibly introduced) seem to occur in all the lakes large and cool enough to support

them, there are no other fish which can be taken by seining in the lakes of the plateau. In the place of the Killifish, the various sticklebacks, the minnows and young suckers which populate the shallows of most Nova Scotian lakes, the lakes of the plateau support a very heavy population of the newt, *Triturus viridescens*, which occurs elsewhere in the Province, but nowhere in such numbers.

Although a total of forty-four species is treated in the present paper, the number is deceptively large. The following eleven are not definitely known to occur here, but are included partly because further collecting may disclose their presence and partly for the convenience of people in New Brunswick who may wish to use the keys:

	Page
1. Johnny Darter, <i>Boleosoma nigrum</i>	64
2. Eastern Sturgeon Sucker, <i>Catostomus catostomus</i>	33
3. Common Slimy Muddler, <i>Cottus cognathus</i>	67
4. Creek Chubsucker, <i>Erimyzon oblongus</i>	30
5. Brook Stickleback, <i>Eucalia inconstans</i>	71
6. Pumpkinseed, <i>Lepomis gibbosus</i> . (one record)	66
7. Fallfish, <i>Leucosomus corporalis</i>	37
8. Burbot, <i>Lota lota maculosa</i>	59
9. Finescale Dace, <i>Pfrittle neogara</i>	43
10. Blueback, <i>Pomolobus aestivalis</i>	20
11. Alpine Trout, <i>Salvelinus alpinus</i>	26

In addition the following four are known to be introduced forms not native to the province.

	Page
1. Chain Pickerel, <i>Esox niger</i>	53
2. Small mouth Bass, <i>Micropterus d. dolomieu</i>	64
3. Rainbow Trout, <i>Salmo gairneri</i>	23
8. Brown Trout, <i>Salmo trutta</i>	24

Of the remaining twenty-nine, seventeen are species which either spend a large part of their lives in salt water or venture into it as a matter of course:

	Page
1. Sturgeon, <i>Acipenser oxyrinchus</i>	18
2. Shad, <i>alosa sapidissima</i>	20

3. Eel, <i>Anguilla rostrata</i> , Le Sueur	55
4. Four-spine Stickleback, <i>Apeltes quadracus</i>	68
5. Common Whitefish, <i>Coregonus clupeaformis</i>	28
6. Lake Trout, <i>Cristivomer namaycush</i> , (?)	26
7. Three-spine Stickleback, <i>Gasterosteus aculeatus</i>	69
8. Tomcod, <i>Microgadus tomcod</i>	60
9. White Perch, <i>Morone americana</i>	61
10. Smelt, <i>Osmerus mordax</i>	29
11. Lamprey, <i>Petromyzon marinus</i>	16
12. Gaspereau, <i>Pomolobus pseudoharengus</i>	21
13. Round Whitefish, <i>Prosopium cylindraceum</i> , (one record) ...	27
14. Nine-spine Stickleback, <i>Pungitius pungitius</i>	70
15. Striped bass, <i>Roccus saxatilis</i>	60
14. Atlantic salmon, <i>Salmo salar</i>	23
17. Brook trout, <i>Salvelinus fontinalis</i>	25

Lake Trout, *Cristivomer namaycush*, is included in this list with some hesitation. There is no positive evidence available that it does venture readily into salt water. It is a lake-spawning fish and is not so likely to migrate anywhere as most salmonids, but it seems quite probable that it is able to tolerate sea water. In any case its distribution in Nova Scotia is not well known enough at present to add anything to our understanding of the factors which control fresh-water fish distribution. For these reasons it is included tentatively among the fishes which are to be found in every place that they can live which is accessible from the sea.

There remain, then, only the following twelve purely fresh-water species which are native to this province.

	Page
1. Catfish, <i>Ameiurus n. nebulosus</i>	50
2. Sucker, <i>Catostomus c. commersonni</i>	30
3. Northern Redbelly Dace, <i>Chrosomus eos</i>	41
4. Northern Lake Chub, <i>Couesius p. plumbeus</i>	35
5. Fundulus, Killifish, <i>Fundulus d. diaphanus</i>	56
6. Northern Pearl Dace, <i>Margariscus margarita nachtriebi</i>	40
7. Eastern Golden Shiner, <i>Notemigonus c. crysoleucas</i>	43
8. Common Shiner, <i>Notropis cornutus</i>	47
9. Northern Blacknose Shiner, <i>Notropis h. heterolepis</i>	46
10. Yellow Perch, <i>Perca flavescens</i>	62

11. Eastern Blacknose Dace, *Rhinichthys a. atratulus*..... 35
 12. Northern Creek Chub, *Semotilus a. atromaculatus*..... 37

These twelve species are the fishes which must be dealt with most closely in any consideration of the mechanisms of fresh-water fish dispersal. Their present distribution, in so far as it is known, is plotted in Figure 1.

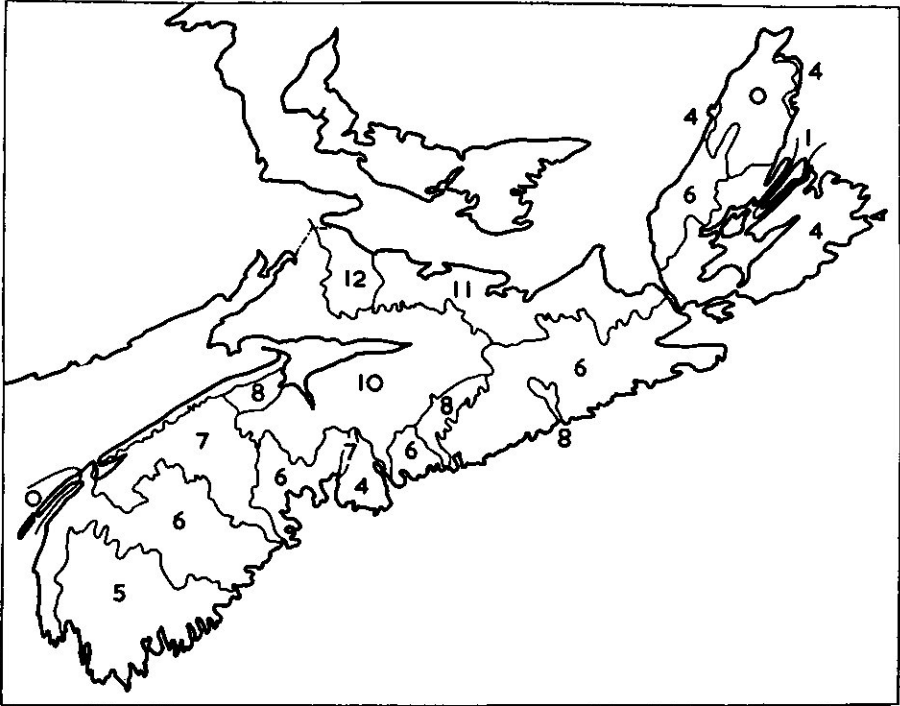


Figure 1: Distribution of fresh water fishes in Nova Scotia. The numbers denote the number of species in each area which do not venture freely into the sea.

This map admittedly rests on a comparatively small number of collections, and further work is bound to bring its inaccuracies to light. The general picture, however, is one of a series of rings centred upon the Isthmus of Chignecto, each ring representing the range limit of one or more species, so that all twelve are found in northern Cumberland County, and fewer and fewer towards the extremities of the Province. By the time Digby Neck and the plateau of northern Cape Breton Island are reached, we no longer find a single one of the fishes under consideration.

These rings are not, of course, perfect circles, because they follow the divides of the watersheds. In a general way, there is a rich fish fauna in the northern half of the province, a poor one in the southern half, depending on the presence or absence of the following minnows:

Northern Redbelly Dace, *Chrosomus eos*.

Northern Lake Chub, *Couesius p. plumbeus*.

Northern Pearl Dace, *Margariscus margarita nachtriebi*.

Common Shiner, *Notropis cornutus*.

Northern Blacknose Shiner, *Notropis h. heterolepis*.

In only a few places have any of these minnows broken through the backbone of the province to reach the Atlantic drainages. Examples are *Couesius plumbeus* in the La Have River, Lunenburg County, *Notropis cornutus* in Pockwock Lake, Halifax County, *Notropis cornutus* and *Couesius plumbeus* in the Musquodoboit and Moser Rivers, Halifax County. The occurrence of several minnows in the Dartmouth Lakes chain is to be regarded as a special case, since these lakes are properly part of the Shubenacadie River system, their connection to Halifax Harbour being an artificial one.

The only discontinuity of range is provided by the Moser River system which in the light of present knowledge seems to support a population of *Couesius plumbeus* and *Notropis cornutus* separated from the main range of these species. The Moser River records, however, are from the files of the Royal Ontario Museum of Zoology, and are a reflection of the fact that this stream was intensively investigated for two years by the Fisheries Research Board of Canada. Thorough collection might well reveal the presence of these two minnows in the adjacent river systems. It is indeed to be expected that several additional species could be found in many of the river systems, but at any given level of collecting intensity the relative richness of the fish populations in the various drainages should be approximately the same, although the absolute numbers might change.

This lack of range discontinuities indicates that complete destruction of the pre-Pleistocene fish fauna occurred during

the glaciation of Nova Scotia, and that the species now here have repopulated the province since the recession of the ice sheet. The species abundance in the various regions indicates that they entered Nova Scotia by way of the present Isthmus of Chignecto, not by some land bridge no longer existing.

A portion of the Nova Scotia vascular flora consists of plants commonly found much farther south. This has led botanists to suggest that these plants entered over the exposed coastal plain at a time when the relative sea level was much lower (Fernald 1918, 1921, 1924). Although this suggestion may be challenged on other grounds, such as the lack of physiographic evidence of extensive recent subsidence (Goldthwait 1924), the distribution of fishes does not necessarily refute it. If the contour of the sea bottom between Nova Scotia and New England were the same as it is today, and the relative sea level were fifty fathoms lower, George's Bank would form part of a broad peninsula joined to Cape Cod and Long Island, the Nova Scotia coastline would extend much farther southwest, and Brown Bank would form an island in between them (U.S. Coast and Geodetic Survey Chart *Cape Sable to Cape Hatteras* scale 1/1200,000, issued Feb. 1881). Under these circumstances it would be quite possible for vascular plants to invade Nova Scotia over the coastal plain from the south, but the remaining salt water gaps of twenty-eight and nineteen miles would present a formidable barrier to fresh-water fishes moving up the coastal plain towards Nova Scotia. A fall of at least one hundred and fifty fathoms in relative sea level would be required for fresh-water fishes to enter Nova Scotia over George's and Brown Banks.

Though the fish fauna of Nova Scotia is poor in number of species and each species lives in a great variety of places, the number of species is increasing by natural diffusion and much more rapidly by artificial stocking. It is interesting to consider what changes are likely to occur as this process goes on.

As the variety of species becomes greater the territory occupied by each species will decrease. For example, *Fundulus*

diaphanus now lives, among other places, in swift-flowing streams. It will probably be displaced from the swift streams by *Cottus cognathus* when it reaches here, for in the parts of North America where the two co-exist it is *Cottus* which occupies the riffles while *Fundulus* is restricted to the lakes and slow streams.

Similarly the salmonids will probably disappear from many of the marginal waters in which they now occur when faced by the competition of pikes and centrarchids. An example has already been given by *Esox niger* in Digby County. This pickerel was introduced in a small lake with no outlet near Comeauville about a generation ago. It has since spread to the nearby Spectacle Brook drainage where it is now very common and where the trout population has declined to almost nothing.

The present fish fauna of Nova Scotia is characterised by large numbers of salmonids which are highly regarded as game fishes, and the introduction of new species is very likely to decrease the population of these salmonids. It is advisable, therefore, for those concerned with fisheries management to consider all the foreseeable consequences before artificially introducing new species of fish.

If the twelve fresh-water species arrived at the Isthmus of Chignecto at the same time, the range differences they present today must be indicative of either differences in habitat preference or differences in dispersal rate. If they did not arrive at the isthmus simultaneously, then the order in which they did arrive should bear some relation to their rates of dispersal, so it may be interesting to search for a correlation between existing ranges and factors which might affect speed of dispersal. The approximate descending order of range extent is as follows:

	Page
Killifish <i>Fundulus d. diaphanus</i> . Figure 25	56
Common Sucker, <i>Catostomus c. commersonni</i> . Figure 5	30
Eastern Golden Shiner, <i>Notemigonus c. crysoleucas</i> , Figure 16 . .	43
Northern Creek Chub, <i>Semotilus a. atromaculatus</i> . Figure 10 . . .	37

Yellow Perch, <i>Perca flavescens</i> . Figure 29	62
Catfish, <i>Ameiurus n. nebulosus</i> . Figure 22	50
Northern Lake Chub, <i>Couesius p. plumbeus</i> . Figure 8	35
Common Shiner, <i>Notropis cornutus</i> . Figure 20	47
Northern Redbelly Dace, <i>Chrosomus eos</i> . Figure 14	41
Northern Pearl Dace, <i>Margariscus margarita nachtribei</i> . Figure 12	40
Northern Blacknose Shiner, <i>Notropis h. heterolepis</i> . Figure 18..	46
Eastern Blacknose Dace <i>Rhinichthys a. atratulus</i> . Figure 7....	35

An obvious method of fish dispersal which might be species-selective is migration around from stream to stream by the sea. It should be interesting therefore to consider the salinity tolerance of these fishes, especially the first six which are of almost universal distribution throughout the province. The first, *Fundulus diaphanus*, belongs to a family which is characteristic of salt and brackish water. It would not be surprising to find that *F. diaphanus* was capable of enduring moderate salinities, or even full sea water, for a short time. *Catostomus commersonni* thrives in the Quill Lakes, Saskatchewan, which have a salinity about half that of sea-water, while *Perca flavescens* and "catfish" (possibly *Ameiurus*) have been reared successfully in the similar water of Devil's Lake, North Dakota (Huntsman, 1922). It is commonly believed by ichthyologists (Hubbs, Carl L., personal communication) that *Notemigonus crysoleucas* is able to migrate from stream to stream through the sea. To sum up, then, it is rather to be expected that five of the six most widely distributed species are capable of at least a limited amount of dispersal by sea. Admittedly the evidence is not completely convincing. Two of the alleged salt-tolerating species, *Amieurus nebulosus* and *Perca flavescens*, do not seem to have bridged the Strait of Canso, and both *Margariscus margarita* and *Chrosomus eos* have done so, although neither of them is believed to tolerate sea water. It seems that the fishes of wide dispersal in Nova Scotia are those which have some salinity tolerance, but experimental data on the salinity tolerance of the species in question would be welcome.

Presence or absence of a fish species from a given body of water depends not only upon the ability of the species to reach the water, but also upon its ability to survive there. A factor which seems to limit the fish fauna of Nova Scotia lakes and streams is the rock formation in which they are situated. Unfortunately the field work of this study was mostly conducted in regions where it was not possible to separate clearly the effects of dispersal and of rock formation. It was, however, noticed that in rich farming country, i.e. regions of slate, sandstone or limestone, the number of species was larger than in the barren areas of granite, quartzite and diorite. For a few species the evidence is rather clear-cut:

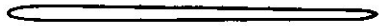
Apeltes quadracus has never been found in fresh water in granite areas, although, being freely tolerant of sea water (in fact some believe it to be intolerant of fresh water) it is very widely distributed in Nova Scotia. Although it is never wise to be dogmatic about the absence of a fish from any given region, it seems unlikely that further collecting will disclose the presence of *Apeltes quadracus* in the granite areas. The Halifax Peninsula has been very thoroughly collected, for it is convenient to the city of Halifax and contains the seven experimental lakes used by Hayes and co-workers in their limnological studies. It is composed almost entirely of granite except for a small patch of Lower Carboniferous soft rocks near Seabright on the St. Margaret's Bay shore. *Apeltes quadracus* has been found in Brine Lake in this soft-rock region, but nowhere else on the Peninsula. It appears that *Apeltes quadracus* cannot tolerate the low salt content of the very soft waters flowing over granite areas.

Morone americana and *Ameirus nebulosus* are two other fishes of very wide range which have not been found in granite areas and it appears likely that they do not thrive under the conditions prevailing in such areas. The minnows *Notropis heterolepis*, *Margariscus margarita* and *Chrosomus eos* have not been found in granite regions, perhaps because these species, which have a rather narrow distribution, have not yet reached the hard-rock areas.

To sum up, the distribution of fresh-water fish species in Nova Scotia indicates very strongly that the post-glacial recolonization of the Province is still going on. The small number of species in parts of the Province may be due in part to the unsuitability of hard-rock areas for some fishes. The present small number of species is increasing gradually by migration, over the Isthmus of Chignecto and more quickly by artificial stocking. As new fishes enter, the present ones will be driven from marginal waters and restricted to those waters where they thrive better than the newcomers.

KEY TO THE FAMILIES OF FRESH WATER FISHES

1. Body naked-shaped
—see 2



Body fish-shaped—see 3



2. Sucker-like mouth without jaws, gill slits 7—the lamprey family, *Petromyzonidae*. Page 16

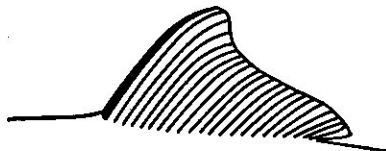


Mouth with jaws, gill slits 1—the eel family,

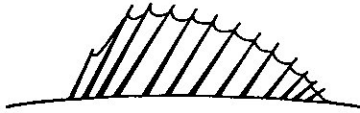


Anguillidae. Page 55.

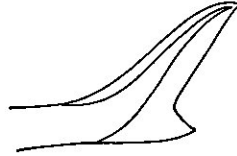
3. Fins with one spine or none—see 4.



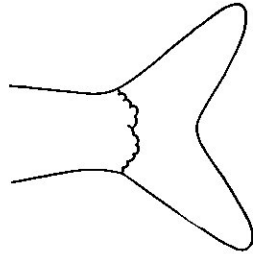
Fins with more than one spine—see 14



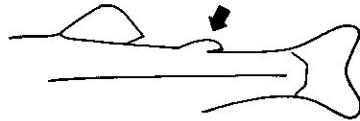
4. Tail heterocercal—the sturgeon family, *Acipenseridae*. Page 18.



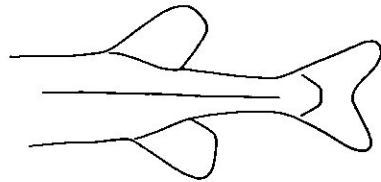
Tail homocercal—see 5



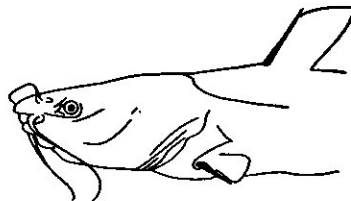
5. Adipose fin present—see 6



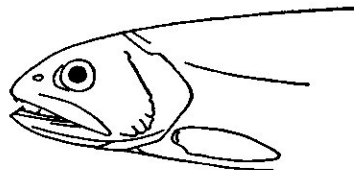
Adipose fin absent—see 9



6. Barbels about mouth, body scaleless—the North American catfish family, *Ameiuridae*. Page 50.



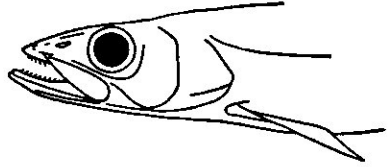
No barbels, body-scales—see 7



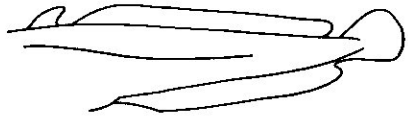
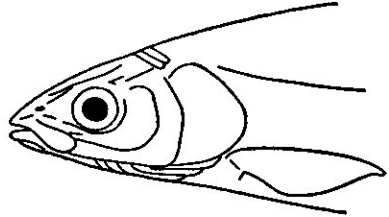
7. Scales in lateral line usually more than 100—
the salmon family. *Salmonidae* Page 22

Scales in lateral line fewer than 100—see 8

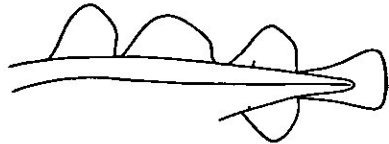
8. Teeth strong—the smelt
family, *Osmeridae*. Page
29



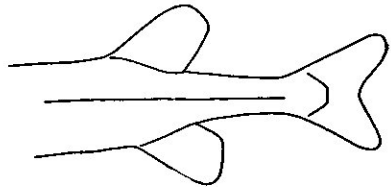
- Teeth weak or absent—
the whitefish family—
Coregonidae. Page 26



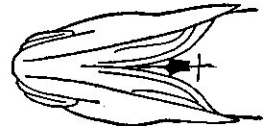
9. 2 or 3 dorsal fins—the
cod family, *Gadidae*.
Page 59



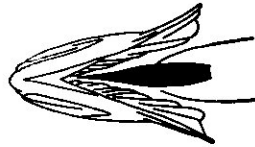
- 1 dorsal fin—see 10



10. Gill membranes joined
to isthmus—see 11.



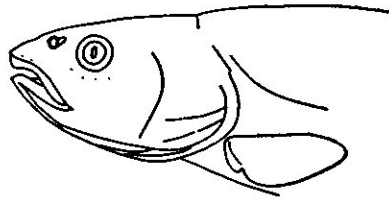
Gill membrane free from isthmus—see 12



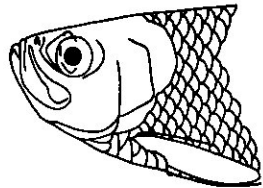
11. Mouth ventral, with thick lips—the sucker family, *Catostomidae*. Page 30



Mouth terminal—the minnow family, *Cyprinidae*. Page 33



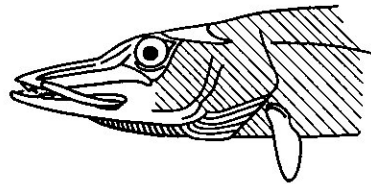
12. Head naked—the herring family, *Clupeidae*. Page 19.



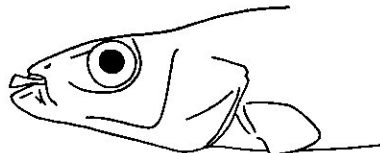
Head scaled—see 13.

13. Body scaled—see 14.

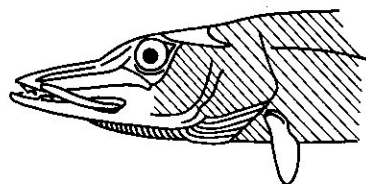
Body scaleless—the sculpin family, *Cottidae*. Page 67.



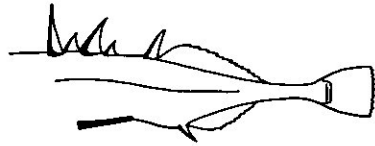
14. Upper jaw protractile—the killifish family, *Cyprinodontidae*. Page 56



Upper jaw not protractile—the pike family, *Esocidae*. Page 53.



15. Dorsal spines isolated—the stickleback family, *Gasterosteidae*. Page 67.



Dorsal spines connected by membrane—see 15.



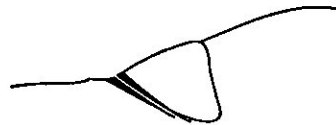
16. Dorsal fin single—the sunfish family, *Centrarchidae*. Page 64.



Dorsal fins 2—see 17.



17. Anal spines 1 or 2—the perch family, *Percidae*. Page 62.



Anal spines 3—the bass family, *Serranidae*. Page 60.



THE LAMPREY FAMILY—*Petromyzonidae*

Only one species in Nova Scotia.

Sea Lamprey—*Petromyzon marinus*. Linnaeus.

OTHER COMMON NAMES: Great Sea Lamprey; River, Green or Shad Lamprey; Lamper-eel; Lamprey-eel; Sucker; Nine-eyes; Lamper; Lake-Lamprey; Grosse Lamproie, Fifre; Oillet, Lamproie marine.

RANGE: Both sides of the Atlantic, from northern Norway to West Africa on the East, and from Greenland to Florida on the West. Landlocked in the Great Lakes. Drainage.

OCCURRENCE IN NOVA SCOTIA: Anadromous in those streams such as the St. Mary's, Sackville, Annapolis, La Have, Shubenacadie, Musquodoboit, Mersey and Medway, which provide suitable gravelly spawning grounds and muddy flats for the maintenance of the larvae, but absent in others, such as the Margaree and Moser rivers, which do not.

Specimens in Nova Scotia Museum of Science collections from;

La Have River, Lunenburg Co., N. S. June 20, 1948.

Benery Brook, Enfield, Halifax Co., N. S. 1914.

Grand Lake, Halifax Co., N. S. 1912.

DESCRIPTION: The Lamprey feeds by attaching itself with its sucker-like mouth to other fishes, rasping away their skin and scales and sucking their blood. It has recently made its way through canals into the Great Lakes above Niagara, where it has become very plentiful and extremely destructive. Although the landlocked form is said to attack bathers in Lake Ontario, the lamprey fasts during the breeding-season, so no harm is to be expected from it while ascending Nova Scotia rivers to spawn.

In New England the Lamprey ascends streams to spawn from the end of March to early June. The spawning time in Nova Scotia is not known exactly, but dead lampreys have been washed down the La Have River, from June 15th to July 8th, indicating that spawning may occur later here.

The eggs are laid along stretches of stream where the bottom is stony or pebbly, in depressions two or three feet in diameter and about six inches deep excavated by both parents which die soon after spawning. The eggs develop into larvae which burrow in the mud and live on microscopic organisms suspended in the stream water. After a period believed to last from three to five years the larvae undergo transforma-

tion into the adult form and run to sea, where they spend an unknown length of time.

The length of lampreys at the time of transformation is from 100 to 200 mm. The sexually mature adults average about 2 to 2½ feet in length, with a maximum recorded size of about three feet.

REFERENCES: Bigelow, Henry B. & Schroeder, William C., 1948;
Vladykov, Vadin D., 1949.

THE STURGEON FAMILY—*Acipenseridae*

Only one species in Nova Scotia.

American Sturgeon—*Acipenser oxyrinchus*. Mitchill.

OTHER COMMON NAMES: Common sturgeon, Sea Sturgeon, Esturgeon noir, Ecaille, Guinde, Escargot, Gang, Bâtard, Esturgeon, Esturgeon d'eau, Salée, Pelican, River Sturgeon.

OCCURRENCE IN NOVA SCOTIA: Vladykov and McKenzie, in their paper on the marine fishes of Nova Scotia, say that it is rather common throughout the water surrounding Nova Scotia. It probably spawns in or above the estuaries of many of the larger streams.

There is one age-whitened specimen in the collections of the Nova Scotia Museum of Science, bearing the label "Jordan no. 41., *Acipenser sturio* L., Common sturgeon, Nova Scotia."

This specimen is the one depicted in Figure 2.

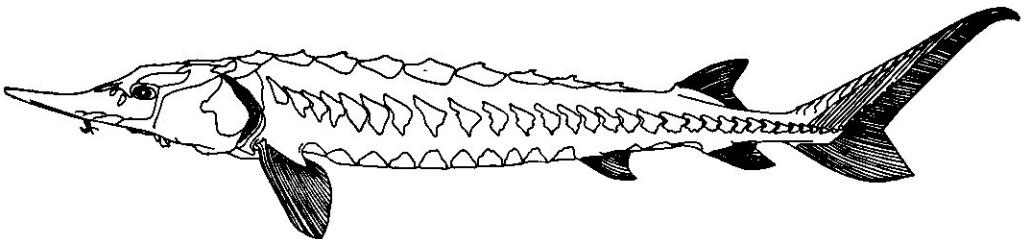


Figure 2. American Sturgeon—*Acipenser oxyrinchus*.

DESCRIPTION: The American Sturgeon is one of the few survivors of a group of fishes that was dominant in early geological

history. It feeds by straining food organisms out of the bottom material with its toothless mouth. Much of its time is spent in salt water, about the bays and near estuaries. Spawning occurs a short way up the rivers on hard bottom swept by a swift current. The spent fish return to sea, but the young remain in the rivers for at least a year. Large adults attain a weight of some 500 pounds and a length of 10 or more feet.

Where it abounds the Sturgeon is an important commercial fish, both for its flesh and for the caviar made from its roe, but in Nova Scotia the annual catch of 3,500 lbs. is of negligible importance, being valued at about \$240.

REFERENCES: Borodin, K. 1925.

Vladykov, V. D. and Gerald Bealieu, 1946.

Vladykov, V. D. and R. A. McKenzie 1935.

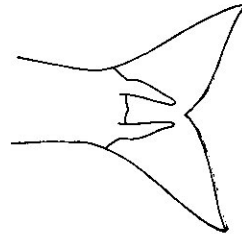
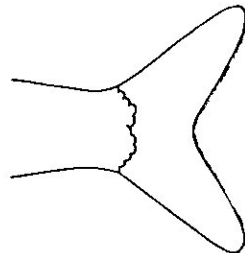
THE HERRING FAMILY—*Clupeidae*.

1. Two wing-like folds of skin present at base of caudal fin, each covered with one elongated scale; point of junction of lower jaw with skull under posterior edge of eye.

No wing-like folds with elongated scale at base of caudal fin; junction of lower jaw with skull under middle of eye. *Pomolobus*—see 2.

2. Diameter of eye about equal to length of snout; body about three and a half times as long as deep; peritoneal lining of belly black. Blueback, *Pomolobus aestivalis*, Mitchill. Page 20.

Diameter of eye greater than length of snout; body only about three times as long as deep; peritoneal lining of belly not so dark, in most individuals pale. Gaspereau, *Pomolobus pseudoharengus*, Wilson. Page 21.



Shad—*Alosa sapidissima*. Wilson.

OTHER COMMON NAMES: American Shad; Common Shad; Atlantic Shad; North River, Potomac, Connecticut River, Delaware, Susquehanna, etc., Shad.

RANGE: Atlantic Coast of America from the St. Lawrence to Alabama.

OCCURRENCE IN NOVA SCOTIA: Vladykov and McKenzie say that the shad is "common throughout the whole region." It is probably anadromous in most, if not all, of the rivers of the province.

Specimens in Nova Scotia Museum of Science from the La Have River, Lunenburg County, N. S. June 20, 1948.

DESCRIPTION: The Shad spends most of its life in the sea but migrates up rivers in spring for the purpose of spawning. Adults running upstream feed little if at all, but will sometimes strike at a fly, small minnow or other small shining objects when in fresh water. Though rather bony, the Shad is a delicious food dish. About 80,000 pounds, valued at \$8,600. are caught annually.

This is one of the largest of the herrings, attaining a weight of some 5 or 10 pounds and a length of nearly 2 feet.

REFERENCES: Vladykov, V. D. and McKenzie, R. A. 1935.
Leim, A. H. 1924.

Blueback—*Pomolobus aestivalis*. Mitchill.

OTHER COMMON NAMES: Glut herring; Summer Herring; Black-belly; Kyack; Saw-belly.

RANGE: Atlantic Coast of North America, more southerly than *Pomolobus pseudoharengus*.

OCCURRENCE IN NOVA SCOTIA: The Blueback was listed for the Bay of Fundy by Huntsman in 1921, and, on his authority, by Vladykov and McKenzie in 1935. Dr. Huntsman is now of the opinion that *P. pseudoharengus* is the only species of *Pomolobus* in Nova Scotia (personal communication) and the present investigation completely confirms his revised opinion.

There is such a variation in the peritoneal color of *P. pseudoharengus* that some individuals would be placed in *P. aestivalis* on the basis of this character alone, but examination of about a hundred specimens from Grand Lake and a smaller number from the La Have River has shown that the other characters are all those of *P. pseudoharengus*. It seems, then, that all the Nova Scotia gaspereaux belong to this species.

There are no specimens in the Nova Scotia Museum of Science collections.

REFERENCES: Vladykov, V. D. and McKenzie, R. A., 1935;
Leim, A. H., 1924.

Gaspereau—*Pomolobus pseudoharengus*. Wilson.

OTHER COMMON NAMES: Alewife; Ellwife; Branch Herring; Sawbelly; Wall-eyed Herring; Big-eyed Herring; Gray Herring; Blear-eyed Herring; Spring Herring; Golden Shad; Seth Green Shad; Skipjack; Bang; Mullhaden; Racer (spent fish).

RANGE: Atlantic Coast of United States and Canada; landlocked in the lakes of Western New York and in Lake Ontario; since 1931 in Lake Erie whence it has spread to Lake Huron.

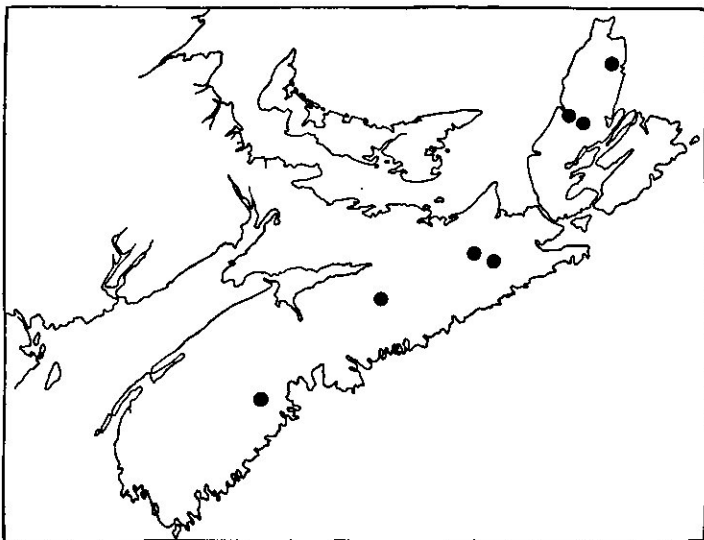


Figure 3. Distribution of Gaspereau—*Pomolobus pseudoharengus* in Nova Scotia.

OCCURRENCE IN NOVA SCOTIA: Anadromous in streams throughout the province.

Specimens in the Nova Scotia Museum of Science collections from:

Goshen Lake, Guysborough Co., N. S.....	August 3, 1948
Lake o' Law, Inverness Co., N. S.....	September 8, 1948
2nd Indian Harbour Lake, Guys. Co., N. S.....	August 1, 1948
Grand Lake, Halifax Co., N. S.....	June 4, 1948
La Have River, Lunenburg Co., N. S.....	June 20, 1948
Margaree River, Inverness Co., N. S.....	August 20, 1948
Warren Lake, Victoria Co., N. S.....	August 26, 1949

DESCRIPTION: In the spring spawning migration, the Gaspereau runs from the sea up the rivers where it is dipped out commercially and salted. It is very abundant, but because of its many small bones is not much esteemed, despite its excellent flavor. Adults weigh a little less than a pound.

The annual commercial catch of 2,150,000 pounds has a value of \$30,000.

REFERENCES: Gilpin, J. Bernard 1864.

THE SALMON FAMILY—*Salmonidae*.

1. Vomer flat, the teeth on its backward extension in one or two rows (sometimes lost with age) mostly black-spotted.—see 2. Vomer boat-shaped, the shaft depressed and without teeth on its backward extension; species with reddish or pale spots—see 4.
2. Anal usually with 9 fully-developed rays; caudal usually unspotted.—see 3. Anal with 10 or more fully-developed rays; caudal spotted. Rainbow Trout. *Salmo gairdneri*, Richardson. Page 23.
3. Vomerine teeth little developed, those on shaft few and deciduous; scales from adipose fin to lateral line 10 to 13; maxillary to below hind edge of pupil at 150 mm., never far behind in adult; caudal generally emarginate even in large adults; black spots on body small without halos. Atlantic Salmon, *Salmo salar*, Linnaeus. Page 23.
Vomerine teeth well-developed; those on shaft of bone numerous and persistent; scales from adipose fin to lateral line 12 to 16;

mouth larger, maxillary to below hind edge of eye at 150 mm., farther back in larger specimens; caudalless emarginate, truncate in adults; black spots on body large, many surrounded by halos. Brown trout, *Salmo trutta*, Linnaeus. Page 24.

4. Sides with light or pinkish spots, hyoid teeth present.—see 5. Sides with red spots surrounded by blue borders; back vermiculated; hyoid teeth usually lacking. Eastern Speckled Trout, *Salvelinus fontinalis*, Mitchill. Page 25.
5. Tail deeply forked; back and sides with light-coloured spots. Lake Trout, *Cristivomer namaycush*, Walbaum. Page 26. Tail less deeply forked; back uniformly coloured and sides with light-coloured spots. Alpine Char, *Salvelinus alpinus*, Linnaeus. Page 26.

Rainbow Trout—*Salmo gairdneri*. Richardson.

OTHER COMMON NAMES: McLeod Trout; Shasta Trout; Steelhead Trout.

RANGE: Native to western America, introduced widely elsewhere.

OCCURRENCE IN NOVA SCOTIA: Numerous attempts have been made to introduce this trout into Nova Scotia, but it appears to have established itself in few places, if any.

There are no specimens in the Nova Scotia Museum of Science collections.

Atlantic Salmon—*Salmo salar*. Linnaeus.

OTHER COMMON NAMES: Common Atlantic Salmon; Kennebec Salmon; Ouananiehe (when landlocked in Quebec); Grayling (when landlocked in Nova Scotia); Kelt or Slink (spent fish); Grilse, or Grilt, or Fiddler (small sea-run fish); Smolt (young running to sea); Parr (young before running to sea); Saumon; Bratan.

RANGE: In the North Atlantic Ocean and (during the spawning run and early life) in tributary streams. On the American side from southern Greenland and Labrador south, originally to the Hudson River and occasionally to the Delaware; at present to Maine.

OCCURRENCE IN NOVA SCOTIA: Anadromous in the rivers and smaller streams throughout the province. A landlocked form designated *Salmo salar sebago*, Girard, and known to anglers as Grayling occurs in Grand Lake and its tributary waters.

One specimen in the Nova Scotia Museum of Science collections from Lake Charlotte, Halifax Co., N. S., collected in the spring of 1950.

DESCRIPTION: Sea-run salmon get most of their growth in the sea, returning to fresh water to spawn. Unlike the various salmons of the Pacific Coast, the Atlantic Salmon returns to the sea after spawning, and may spawn more than once, but the proportion of fish actually doing so is very small.

The term "landlocked salmon" is rather unfortunate. There is no actual barrier to prevent *s. sebago* from running to sea from most of the lakes in which it occurs, and the opinion is widely held among biologists that the sea-run and the land-locked salmon are not genetically distinguishable.

REFERENCES: Kendall, W. C. 1935.

Brown Trout—*Salmo trutta*. Linnaeus.

OTHER COMMON NAMES: German Brown Trout, German Trout, German, English Brown Trout, Von Behr Trout, Loch Leven Trout, European Brown Trout, Truite, Breac, Gealag.

RANGE: Native to Europe and widely introduced into other regions.

OCCURRENCE IN NOVA SCOTIA: Introduced in several rivers. It is said to be rather abundant at Guysborough Inlet, where it is known as German Trout. Specimens up to 6 pounds are said to be taken on plugs in the tidewater of Guysborough Inlet.

There are no specimens in the Nova Scotia Museum of Science Collections.

The Brown Trout thrives in warmer water than the Brook Trout.

Eastern Speckled Trout—*Salvelinus fontinalis*. Mitchill.

OTHER COMMON NAMES: Eastern Brook Trout, Lake Trout; Sea Trout; Native Trout; Mountain Trout; Squaretailed trout or Squaretail; Truite; Brook Trout; Breac.

RANGE: From Labrador coastwise to Cape Cod, southward along the Appalachians to South Carolina and Georgia, and in the interior to the Great Lakes basin, the Nelson River in Manitoba, and in a few far northern headquarters of the upper Mississippi River system; also in southeastern Minnesota and northeastern Iowa.

OCCURRENCE IN NOVA SCOTIA: Probably the most widely distributed fish in Nova Scotia. Although collected seldom during the present study because of the methods used, it is taken by anglers throughout the province. It is found even on the plateau of northern Cape Breton, where no other fish seems to occur. Large numbers are distributed throughout the province annually by artificial stocking.

Specimens in N. S. Museum of Science collections from:

Copper Lake, Antigonish Co., N. S.....	August	1948
Pembroke Lake, Inverness Co., N. S.....	August 22,	1949
Warren Lake, Victoria Co., N. S.....	August 26,	1949
Dalem Lake, Victoria Co., N. S.....	August 29,	1949

DESCRIPTION: The Speckled Trout is found in clear cold lakes and streams. It prefers a temperature of from 45 —50 F. Some individuals run to sea where they assume a silvery appearance. Like the other members of the *Salmonidae* it is a fall spawner, laying its eggs on gravelly bottoms in the smaller streams. In Nova Scotia a 5 pound sea-run trout is a large one; land-locked specimens are smaller.

REFERENCES: White, H. C. 1940.
Hayes, F. R. 1946.

Lake Trout—*Cristivomer namaycush*. Walbaum.

OTHER COMMON NAMES: Great Lakes Trout; Mackinaw Trout; Salmon Trout; Laker; Namaycush; Masamacush; Longue; Tague; Grey Trout; (N. S. Angling regulations); Great Gray Trout.

RANGE: From Alaska to Labrador south to northern New England, the northern margin of the Mississippi watershed and headwaters of the Columbia and Fraser Rivers. Widely introduced in lakes of the Western United States.

OCCURRENCE IN NOVA SCOTIA: Various deep-water lakes in Halifax, Lunenburg, Shelburne, Annapolis and Kings Counties. It has been believed that the Lake Trout is not native to Nova Scotia, for Lanman in 1872 expressed doubt of its existence in the Province. However Gilpin in 1866 recorded it from several lakes in Nova Scotia under the name of *Salmo Confinis* (DeKay). It seems unlikely that *C. namaycush* was artificially introduced into Nova Scotia before that time.

Specimens in the Nova Scotia Museum of Science collections from:—

Pockwock Lake, Halifax Co., N. S.....	June 1900
Nine Mile Lake, Lunenburg Co., N. S.....	1902
Nine Mile Lake, Lunenburg Co., N. S.....	1903
Dollar Lake, Halifax Co., N. S.....	1908

DESCRIPTION: The Lake Trout is distinctly a deep-water fish, seldom occurring in lakes less than 40 feet deep. It spawns in the fall on reefs and shoals in the lakes where it is found. Thus it is less migratory than our other salmonids, which tend to wander away from their parent breeding grounds during most of their lives, returning only to spawn.

In the Great Lakes this fish grows to 100 pounds, but in Nova Scotia it probably does not exceed 25 pounds.

Alpine char—*Salvelinus alpinus*. Linnaeus.

OTHER COMMON NAMES: Hearne's Salmon.

RANGE: Anadromous in streams of Gulf of St. Lawrence (rare) coast of Labrador, northern coast of Canada and of islands to the north; in streams entering Hudson Bay, but not James Bay.

OCCURRENCE IN NOVA SCOTIA: This fish is not known to occur in Nova Scotia, but as it has been found in cold New Brunswick lakes, it may be found at some time in the future. in the waters of this province which flow into the Gulf of St. Lawrence.

There are no specimens in the Nova Scotia Museum of Science collections.

THE WHITEFISH FAMILY—*Coregonidae*

A single flap between nostrils; body subterete.

Round Whitefish—*Prosopium cylindraceum quadrilaterale*,
Richardson. Page 27

Two flaps between nostrils; body somewhat compressed.

Common Whitefish—*Coregonus clupeaformis*, Mitchill.
Page 28

Round Whitefish—*Prosopium cylindraceum quadrilaterale*.
Richardson.

RANGE: Northern North America from the Arctic Ocean south through lakes and streams of Eastern Canada to the Great Lakes and New England. Probably also in the Bering Sea drainage of Siberia.

OCCURRENCE IN NOVA SCOTIA: Recorded only once, from the mouth of the Sissibou River, St. Mary's Bay, Digby County, in 1919, by Huntsman.

There are no specimens in the Nova Scotia Museum of Science collections.

The usual size entering the catch in the Great Lakes is about 2 pounds.

REFERENCES: Vladykov, V. D. and McKenzie, R. A. 1935

Common Whitefish—*Coregonus clupeaformis*. Mitchill.

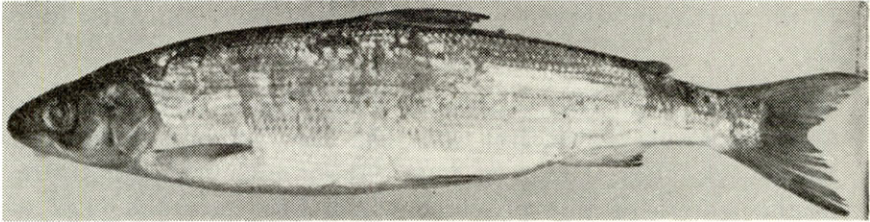


Figure 4. Whitefish—*Coregonus clupeaformis*.

OTHER COMMON NAMES: Sault Whitefish; Bass.

RANGE: From Nova Scotia and northern New Brunswick, throughout Canada to the Northwest Territories and the Yukon; south to New England, New York, Michigan and Wisconsin.

OCCURRENCE IN NOVA SCOTIA: Dymond mentions this whitefish from Lunenburg and Yarmouth counties, possibly introduced. In Lunenburg County it occurs in several lakes at the headwater of the Petite Riviere, whence it was first recorded by Piers in 1924. From Yarmouth county it has been recorded only once, from Yarmouth Harbour.

Specimens in the Nova Scotia Museum of Science Collections from:—

Leipsigate Lake, Lunenburg Co., N. S.	1923
Leipsigate Lake, Lunenburg Co., N. S.	June 5, 1950

DESCRIPTION: Little is known about the habits of the Whitefish in Nova Scotia, but it is a fall spawner elsewhere, broadcasting its eggs on the bottom in shoal areas. Although the supply is seriously depleted at present the Whitefish is still the most valuable food fish in the Great Lakes. The average size taken there by commercial fishermen is about 22 inches and $3\frac{1}{2}$ pounds, but the Nova Scotian fish are much smaller than this, seldom if ever exceeding 18 inches, and usually weighing only a little over 1 pound.

The Whitefish can be taken in streams by the methods used to catch the Speckled Trout, and it is occasionally taken while trolling in lakes as well.

REFERENCES: Piers, Harry 1924.
Lanman, C. 1872.

THE SMELT FAMILY—*Osmeridae*

Only one species in Nova Scotia.

American Smelt—*Osmerus mordax*. Mitchill.

OTHER COMMON NAMES: Smelt, leefish.

RANGE: Anadromous in the streams of the Atlantic coast from Virginia to the Maritime Provinces. A naturally permanent resident in many large fresh-water lakes, and an introduced permanent resident in all of the Great Lakes.

OCCURRENCE IN NOVA SCOTIA: Probably spawning in streams throughout the province. A permanent resident in Centreville Lake, Digby County, Copper Lake, Antigonish Co., (introduced) and probably elsewhere.

Specimens in Nova Scotia Museum of Science from:

Grand Lake, Hants Co., N. S.	1930
Dauphinee Mill Lake, near Hubbards, Lunenburg Co., N. S. . . .	1936
Sailors' Lake, Hubbards Halifax Co., N. S.	1934
Copper Lake, Antigonish Co., N. S.	August 1948
Centreville Lake, Digby Neck, Digby Co., N. S.	July 28 1499

DESCRIPTION: Sea run Smelt move into estuaries from the open sea each autumn and remain there during the winter. After the spring break-up they run into the coastal streams and spawn in the fresh and brackish water.

The Land-locked Smelt is a fish of cold waters, usually found at depths greater than 40 feet during the summer. In the Great Lakes, it attains a length of about 14 inches, as compared to 10 for the sea-run smelt, but probably all Nova Scotia Land-locked Smelt are smaller than this.

The Smelt is a fish of considerable commercial importance. The annual catch of about 800,000 pounds is valued at \$115,000.

REFERENCES: Van Ossten, John 1940.
McKenzie, R. A. and Day, L. R.

THE SUCKER FAMILY—*Catostomidae*.

1. Lateral line well developed; greatest depth less than one-fifth standard length.—see
Lateral line absent; greatest depth more than one-fifth standard length. Creek Chubsucker, *Erimyzon oblongus oblongus*. Mitchill. Page 30.
2. Scales fewer than 80 in lateral line. Common White Sucker, *Catostomus commersoni commersoni*, Lecepede. Page 30.
Scales more than 85 in lateral line. Northern Sucker, *Catostomus catostomus catostomus*. Forster. Page 33.

Creek Chubsucker—*Erimyzon oblongus oblongus*. Mitchill
RANGE: Atlantic Coast drainage from Nova Scotia and New Brunswick (and possibly from the St. Lawrence River) to Virginia. In the Great Lakes confined to the eastern part of the Lake Ontario basin.

OCCURRENCE IN NOVA SCOTIA: Listed as *Erimyzon sucetta* by Jones in his "List of the Fishes of Nova Scotia," 1879. He gave no information on collection locality, and the species has not been collected since his time, if ever, so it seems probable that it does not occur in the province.

There are no specimens in the Nova Scotia Museum of Science collections.

Common White Sucker—*Catostomus commersoni commersoni*. Lacépède

OTHER COMMON NAMES: Sucker; White, Brook, Mud, Black, June or Fine-scaled Sucker; Fine-scaled Mullet; Bay Mare; Black Mullet; Truitu.

RANGE: North America east of the Great Plains, from the MacKenzie River in northern Canada to the Hudson Bay drainage and to the Labrador Peninsula; south on both sides of the Appalachians to Georgia and to Arkansas and northeastern Oklahoma.

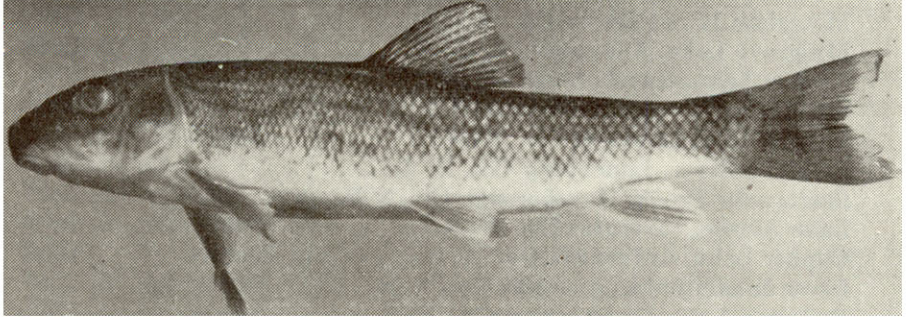


Figure 5. Common White Sucker—*Catostomus c. Commersonni*.
2/3 life size.

OCCURRENCE IN NOVA SCOTIA: One of the commonest fishes throughout the province. It occurs in some lakes and streams, but not all, in every region except the plateau of northern Cape Breton. It is more common in the soft rock areas than in the granite areas.

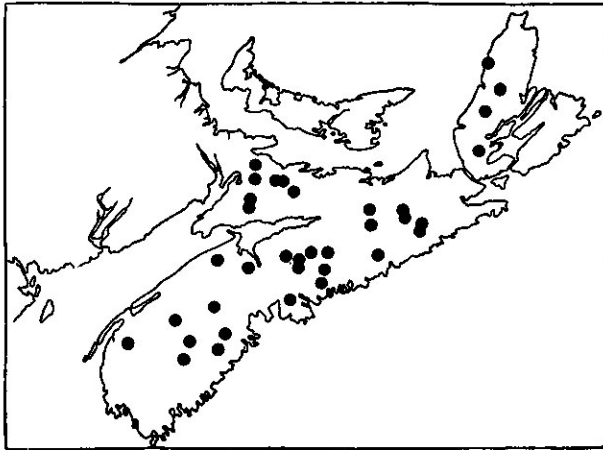


Figure 6: Distribution of Common White Sucker in Nova Scotia.

Specimens in the Nova Scotia Museum of Science from:—

Sherbrooke Lake, Lunenburg Co., N. S.....	1946
Gully Brook, Lunenburg Co., N. S.....	1946
Black Brook Lake, Pictou Co., N. S.....	August 1946

Meteghan River, Digby Co., N. S.	July 27, 1949
Mulgrave Lake, Annapolis Co., N. S.	July 6, 1949
Goshen Lake, Guysborough Co., N. S.	August 3, 1948
St. Mary's River, Guysborough Co., N. S.	August 3, 1948
Lake o' Law, Inverness Co., N. S.	September 8, 1948
La Have River, Lunenburg Co., N. S.	June 19, 1948
Sherbrooke Brook, Guysborough Co., N. S.	August 2, 1948
Lake Ainslie, Inverness Co., N. S.	September 9, 1948
Copper Lake, Antigonish Co., N. S.	August, 1948
River Inhabitants, Inverness Co., N. S.	September 5, 1948
Fullerton Lake, Cumberland Co., N. S.	September 25, 1948
Gilbert Lake, Cumberland Co., N. S.	September 24, 1948
Grand Lake, Halifax Co., N. S.	June 6, 1948
Liverpool River, Annapolis Co., N. S.	July 6, 1949
Mink Lake Brook, Annapolis Co., N. S.	July 6, 1949
Tributary of the Musquodoboit River, Halifax Co.	June 12, 1949
Whiteburn Brook, Queens Co., N. S.	July 1, 1949
Whiteburn Brook, Queen Co., N. S.	July 2, 1949
Le Grand Lac, Grand Etang, Inverness Co., N. S.	August 22, 1949
Little Lake, Grand Lake, Colchester Co., N. S.	September 1, 1949
Ninamkeak Lake, Lunenburg Co., N. S.	June 4, 1950
Nine-Mile River, St. Margaret's Bay Rd., Halifax Co.	1918
Porter's Lake, Halifax Co., N. S.	1900
Elmsdale, Shubenacadie River, Halifax-Hants Co.	1919
Grant Brook, Hants Co., N. S.	June 12, 1949
Small Brook, near 3-mile Plain, Hants Co., N. S.	July 13, 1950
East River, Sheet Harbour, Halifax Co., N. S.	July 18, 1950
Small Lake near Lorne, Pictou Co., N. S.	July 19, 1950
Ponds near Cornwallis River, Kings Co., N. S.	May 31, 1950

DESCRIPTION: The Common White Sucker spawns in spring in swift water with a gravel bottom. It feeds upon small molluscs, insect larvae and crustaceans by browsing along the bottom, straining food organisms from the mud with its mouth. Although it is said to attain a weight of 5 pounds, specimens of over 1 pound are very unusual, at least in Nova Scotia, and many waters do not seem to contain individuals of more than 4 or 5 inches length, at which size they are quite mature.

REFERENCES: Adams and Hankinson 1928.

Eastern Sturgeon Sucker—*Catostomus catostomus catostomus*.
Forster.

OTHER COMMON NAMES: Northern Sucker, Long-nosed, Red, Red-Striped, Sturgeon, Fine-scaled or Black Sucker.

RANGE: From the Yana River in Asia to Labrador, south to the northern Rocky Mountains, the northern part of the Mississippi River system in Minnesota, the southern part of the Great Lakes basin, the Youghiogheny River in Pennsylvania, the St. Lawrence River system and northeastern New England.

OCCURRENCE IN NOVA SCOTIA: This species has never been recorded from Nova Scotia. It is included here only because it occurs in New Brunswick, and may perhaps be found in this province at some later date.

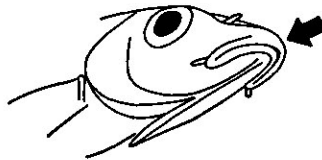
There are no specimens in the Nova Scotia Museum of Science.

This sucker commonly attains a length of 2 feet.

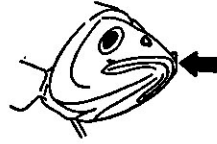
THE MINNOW FAMILY—*Cyprinidae*.

1. Premaxillaries nonprotractile (upper lip connected to snout by a bridge of tissue across which the premaxillary groove does not pass.) Eastern Blacknose Dace, *Rhinichthys atratulus atratulus*, Hermann, Page 35

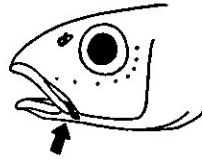
Premaxillaries protractile (upper lip separated from snout by a deep groove continuous across the midline)—see 2.



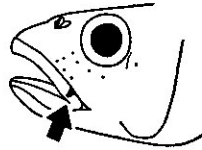
2. Maxillary with a barbel which is usually inconspicuous and often hidden in the groove about the upper jaw—see 3.
Maxillary without a barbel—see 6.



3. Barbel at or near end of maxillary—Lake Northern Club, *Couesius plumbeus plumbeus*, Agassiz. Page 35.



Barbel well in advance of posterior end of maxillary—see 4.



4. Scales less than 50 in lateral line—Fallfish, *Leucosomus corporalis*, Mitchill. Page 37.
Scales more than 50 in lateral line—see 5.
5. Black spot at base of dorsal fin—Northern Creek Club, *Semotilus atromaculatus atromaculatus*, Mitchill. Page 37.
No black spot at base of dorsal fin—Northern Pearl Dace, *Margariscus margarita nachtriebi*, Cox. Page 40.
6. Scales more than 60 in lateral line—see 7.
Scales fewer than 55 in lateral line—see 9.
7. Intestine short with only one loop—see 8.
Intestine long, with a loop and two crosswise coils—Northern Redbelly Dace, *Chrosomus eos*, Cope. Page 41.
8. Peritoneum black—Finescalé Dace, *Pfritille neogaea*, Cope. Page 43.
Peritoneum pale—Northern Pearl Dace, *Margariscus margarita nachtriebi*, Cox. Page 40.
9. Abdomen behind pelvic fins with a fleshy keel over which the scales do not pass. Eastern Golden Shiner, *Notemigonus crysoleucas*, Mitchill. Page 43.
Abdomen behind pelvic fins rounded over and scaled—see 10.

10. With a well-developed black lateral band which extends forward to the tip of the snout. Northern Blacknose Shiner, *Notropis heterolepis heterolepis*, Eigenmann. Page 46.

Lateral band not pronounced, not extending to snout—Common Shiner, *Notropis cornutus*, Mitchill. Page 47.

Eastern Blacknose Dace—*Rhinichthys atratulus atratulus*.
Hermann.

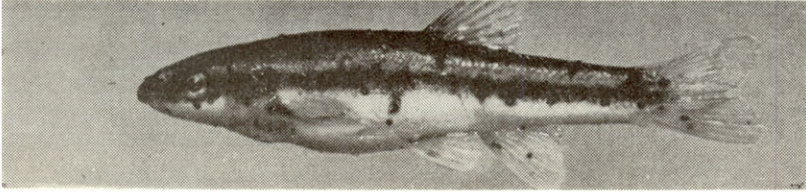


Figure 7. Eastern Blacknose Dace,—*Rhinichthys a. atratulus*.
Life Size.

OTHER COMMON NAMES: Dace; Striped or Redfin Dace; Brook Minnow; Potbelly; Pottlebelly;

RANGE: From Nova Scotia through the St. Lawrence and lower Great Lakes region, north to Lake Simco and Grey County, Ontario; southward, east of the Appalachian Divide, to the Roanoke watershed in Virginia (known on the western slope only in the headwaters of the Youghiogheny in West Virginia.)

OCCURRENCE IN NOVA SCOTIA: This species is known to occur only in Cumberland County.

Specimens in Nova Scotia Museum of Science collections from:—

Branch of Shinimicas River, Cumberland Co., N. S. . . . August 23, 1950

River Phillip, Cumberland Co., N. S. August 23, 1950

DESCRIPTION: This small minnow, reaching a length of some 3 inches, is here recorded for the first time from Nova Scotia.

Lake Northern Chub—*Couesius plumbeus plumbeus*. Agassiz

OTHER COMMON NAMES: Chub Minnow; Plumbeus Minnow; Moose Lake Minnow.

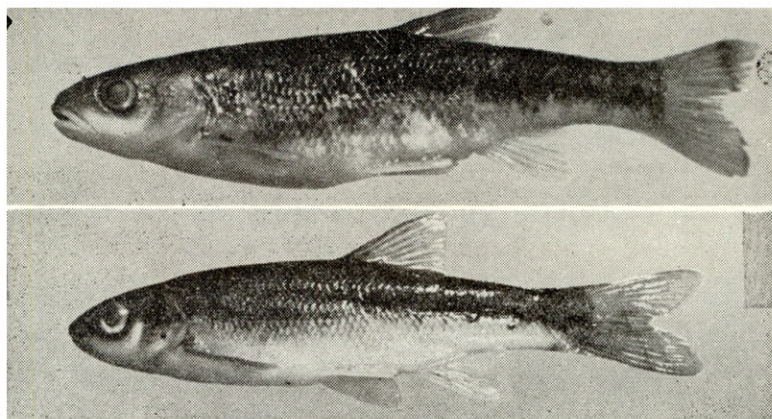


Figure 8. Lake Northern Chubb—*Couesius p. plumbeus*.

RANGE: Nova Scotia to the MacKenzie River: south to the Great Lakes (except Lake Erie) and northern New England.

OCCURRENCE IN NOVA SCOTIA: Occasional throughout the mainland of the province from Moser River, Halifax County to Bear River, Annapolis County. Although this subspecies is characteristic of lakes over most of its range it is commonly found in streams in Nova Scotia.

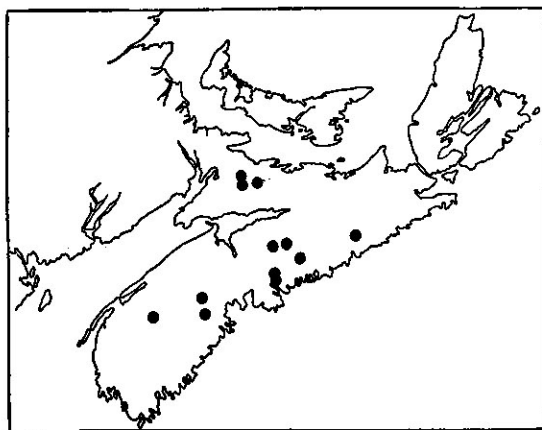


Figure 9. Distribution of Lake Northern Chub, *Couesius p. plumbeus* in Nova Scotia.

Specimens in the Nova Scotia Museum of Science Collections from:

La Have River, Lunenburg Co., N. S.....	June 19, 1948
Grant Brook, Hants Co., N. S.....	June 12, 1949
La Have River, Lunenburg Co., N. S.....	June 20, 1948
Shubenacadie River, Enfield, Halifax-Hants Co.	1948
Penhorn Lake, West of Dartmouth, Halifax Co.....	1910
Mink Lake Brook, Annapolis Co., N. S.....	July 6, 1949

DESCRIPTION: There appears to be an almost complete lack of published information concerning the life history of *Couesius plumbeus*. Some information should be forthcoming shortly however, as Vernon C. Applegate is currently investigating the subject in Michigan.

Couesius p. plumbeus grows to a length of about 6 inches.

Fallfish—*Leucosomus corporalis*. Mitchill

OTHER COMMON NAMES: American Chub; Mohawk, White; Silver or Rough-nosed Chub; Dace; Windfish; Corporal; Chivin; Whiting.

RANGE: From northern tributaries of James Bay to New Brunswick, northern tributaries of the St. Lawrence River and eastern drainages of Lake Ontario, southward, east of the Appalachians, to Virginia.

OCCURRENCE IN NOVA SCOTIA: Not known from Nova Scotia as yet, but it may possibly be found here at some later date.

There are no specimens in the Nova Scotia Museum of Science collections.

DESCRIPTION: The Fallfish is a large minnow. Although it usually matures at a much smaller size occasional individuals are said to exceed 12 inches under favourable conditions.

Northern Creek Chub—*Semotilus atromaculatus atromaculatus*. Mitchill

OTHER COMMON NAMES: Chub: Brook, Silver, Mud, Black-spot Chub; Horned Dace; Tommycod.

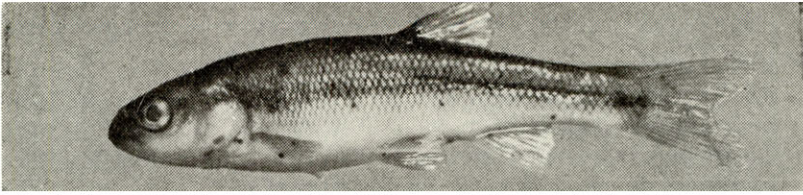


Figure 10. Northern Creek Chub—*Semotilus atromaculatus atromaculatus*.

RANGE: From Montana and from the Red River of the North Drainage, north to the north shore of Lake Huron, east to Nova Scotia, southward on both sides of the Appalachians to Georgia and other Gulf States, southwesterly to the Ozark Upland and to the Arkansas and upper Pecos river systems in New Mexico.

OCCURRENCE IN NOVA SCOTIA: Except for *Notemigonus crysoleucas*, the most widely distributed minnow in the province. It occurs in some, but not all, lakes and streams everywhere except on the plateau of northern Cape Breton.

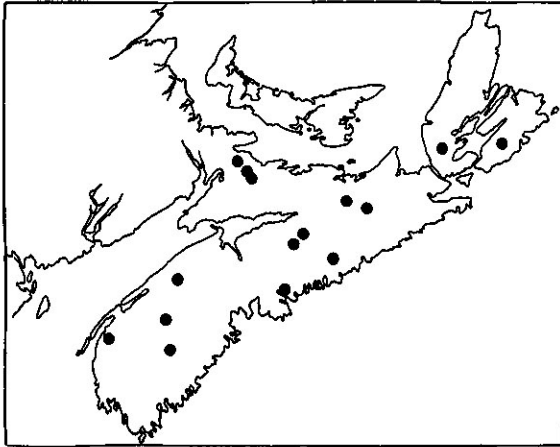


Figure 11. Distribution of Northern Creek Chub—*Semotilus a. atromaculatus* in Nova Scotia.

Specimens in Nova Scotia Museum of Science collections from:

Copper Lake, Antigonish Co., N. S. June 28, 1946
 Elliott Lake, Annapolis Co., N. S. July 11, 1946

Black Brook Lake, Pictou Co., N. S.	August	1946
Meteghan River, Digby Co., N. S.	July 27,	1949
River Inhabitants, Inverness Co., N. S.	September 5,	1948
Loch Lomond, Cape Breton Co., N. S.	September 26,	1948
Copper Lake, Antigonish Co., N. S.	August 2,	1948
Grant Brook, Hants Co., N. S.	June 11,	1949
Whiteburn Brook, Queens Co., N. S.	July 1,	1949
Whiteburn Brook, Queens Co., N. S.	July 2,	1949
Nictaux River, near Middleton, Annapolis Co., N. S.		1910
Shubenacadie River, Milford, Halifax-Hants Co.		1919
Big Dam Lake, Annapolis Co., N. S.	July 5,	1949
Grant Brook, Hants Co., N. S.	June 12,	1949

DESCRIPTION: The Creek Chub is believed by some to be a serious competitor of the speckled trout, because it eats the same sort of food—insects, crustaceans, molluscs, small fish and so forth. In actual fact too little evidence is available to arrive at a reliable conclusion concerning the relation of chub to trout.

The breeding habits of the Creek Chub are somewhat similar to those of the Common Shiner, the eggs being laid in a gravel nest, usually at the head of rapids. The peculiar form of animal behavior known as deferred combat has been well described for the Creek Chub by Reighard. When a strange male approaches the side of the nest, he is joined by the guarding male, whereupon the two fish "swim upstream with great deliberation for a distance of 15 to 20 feet . . . In their course they move slowly and swing their tails from side to side in unison, as though keeping step with them. At the end of their course, they settle to the bottom and bring their heads and their tails together, as though about to swim away from one another. They then commonly again bring their heads together, and finally separate, the owner to return to his nest, his companion to some near-by shelter."

This is one of our largest minnows. In some places it reaches a total length of 12 inches at an age of seven winters for the male and 11 inches at six winters for the female. Although Perly, in his catalogue of the fishes of Nova Scotia and New Brunswick, gave a maximum size of over 3 pounds for

the Creek Chub, it is very unlikely that such a size is attained anywhere, let alone in Nova Scotia.

REFERENCES: Reighard, Jacob 1910.
Hubbs, Carl L. and Cooper, Gerald P. 1936.

**Northern Pearl Dace—*Margariscus margarita nachtriebi*.
Cox.**

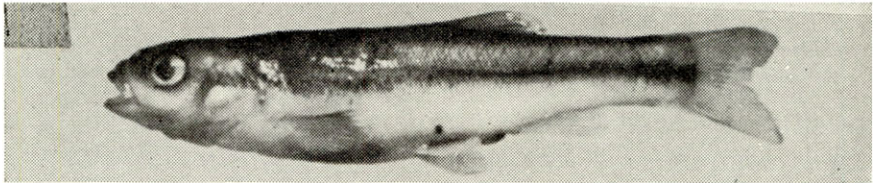


Figure 12. Northern Pearl Dace—*Margariscus margarita nachtriebi*.
7/8 Life Size.

RANGE: From Nova Scotia nearly to the Rocky Mountains; in Ontario north to Lake Nipigon; south to Maine, Lake Champlain and some tributaries of Lake Ontario in New York; west to the Dakotas and as rare relicts in the Sand Hills of Nebraska.

OCCURRENCE IN NOVA SCOTIA: Known only from Lake Ainslie and the Margaree drainage on Cape Breton Island, from a small lake in Pictou Co., and doubtfully from the Shinimicas River in Cumberland Co. but probably common in the drainages emptying into Northumberland Strait and the Gulf of St. Lawrence.

Specimens in Nova Scotia Museum of Science collections from:

- Lake Ainslie, Inverness Co., N. S. September 9, 1948
- Small lake near Lorne, Pictou Co., N. S. July 19, 1950
- Shinimicas River, Cumberland Co., N. S. August 23, 1950

DESCRIPTION: The food and growth of the Northern Pearl Dace are not well investigated. Its large mouth, however, suggests that it is largely carnivorous, feeding upon such small animals of all kinds as come its way. Langlois has described the breeding habits of this fish. He found that it spawns in streams,

where it does not build a nest, but does guard its spawning area against intruders.

In Nova Scotia *Margariscus* grows to at least 5 inches.

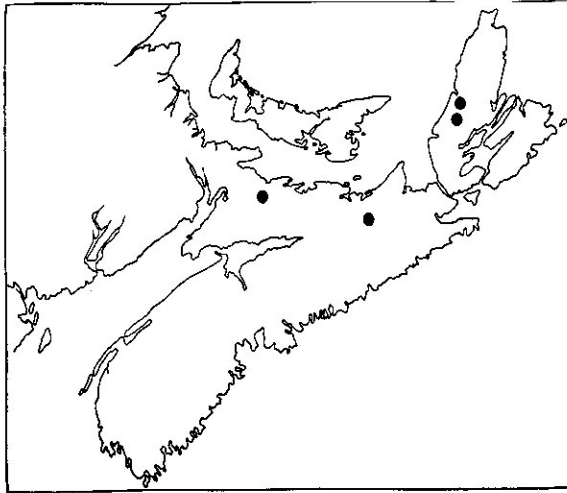


Figure 13. Distribution of Northern Pearl Dace—*Margariscus margarita nachtriebi* in Nova Scotia.

REFERENCES: Langlois, T. H. 1929.

NORTHERN REDBELLY DACE—*Chrosomus eos*. Cope

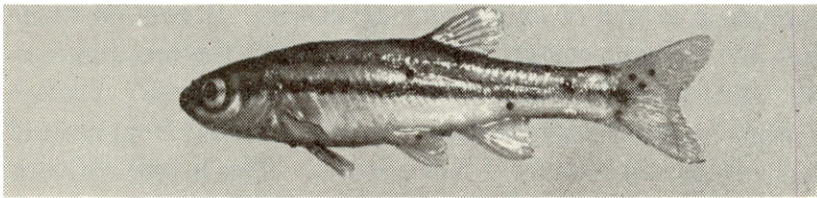


Figure 14. Northern Redbelly Dace—*Chrosomus eos*. Cope.
7/8 Life Size.

RANGE: From Nova Scotia to northern British Columbia south to Maryland, Wisconsin and Colorado

OCCURRENCE IN NOVA SCOTIA: From Windsor, Hants County to Lake Ainslie on Cape Breton Island.

Specimens in Nova Scotia Museum of Science from:—

Shubenacadie River, Halifax-Hants Co., N. S.	1919
Little Lake, Grand Lake, Hants Co., N. S.	Sept. 1, 1949

Small Lake on Windsor Road, near St. Croix, Hants Co., N. S.....	July	13, 1950
Cameron Lake, Hants Co., N. S.....	July	13, 1950
Small Lake near Lorne, Pictou Co., N. S.....	July	19, 1950
Ponds by Cornwallis River, west of bird sanctuary, Kings Co., N. S.....	May	31, 1950

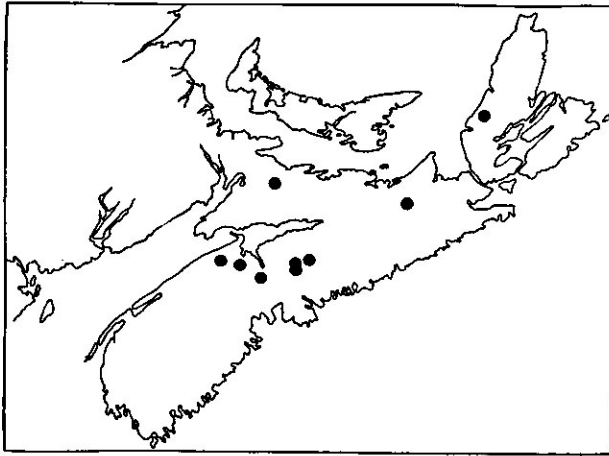


Figure 15. Distribution of Northern Redbelly Dace—*Chrosomus eos* in Nova Scotia. Cope.

DESCRIPTION: The Northern Redbelly Dace is a small minnow, reaching a length of only about $2\frac{1}{2}$ inches. It gets its name from the brilliant colours of the male during the breeding season, which extends from May to August in Michigan. Though it seems to prefer boggy waters, this fish is absent from most of the big lakes and streams of Nova Scotia. This is probably due to incomplete dispersal rather than unsuitability of the waters from which it is absent.

The food of this Dace consists mostly of plants, such as algae and the remains of seed plants, although some insects and animal plankton are also eaten. This diet, combined with its small size, has led to the suggestion that *Chrosomus eos* might be an excellent forage fish for trout and deserves stocking for that reason.

REFERENCES: Hubbs, Carl L. and Cooper, Gerald P. 1934.

Finescale Dace—*Pfrille neogaea*. Cope.

OTHER COMMON NAMES: BRONZ MINNOW.

RANGE: New Brunswick to Northwest Territories, south to Maine, New Hampshire, New York, southern Ontario, southern part of Michigan and Wisconsin, northern Minnesota; glacial relict populations in the Black Hills of South Dakota and the Sand Hills of Nebraska.

OCCURRENCE IN NOVA SCOTIA: Though not known to occur in Nova Scotia, the Finescale Dace may be found here at some future time.

There are no specimens in the Nova Scotia Museum of Science collections.

The Finescale Dace is characteristic of boggy waters.

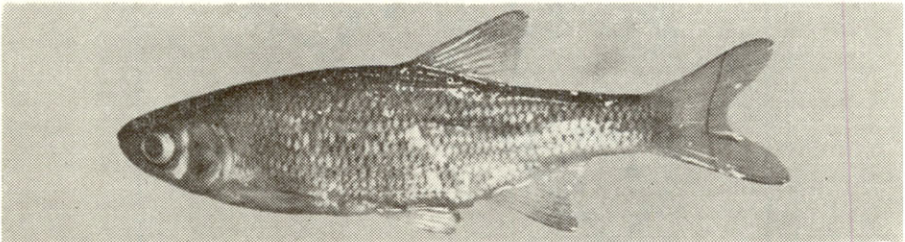
Eastern Golden Shiner—*Notemigonus crysoleucas crysoleucas*
Mitchill

Figure 16a. Eastern Golden Shiner—*Notemigonus c. crysoleucas*.
Life Size. Adult

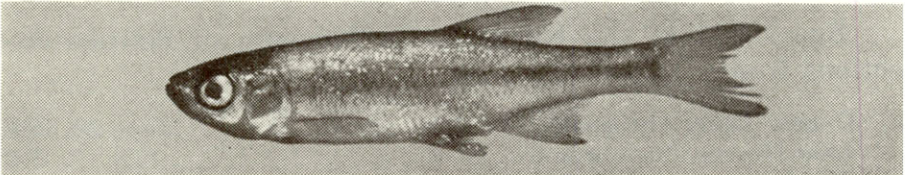


Figure 16b. Eastern Golden Shiner—*Notemigonus c. crysoleucas*.
Life Size. Juvenile

OTHER COMMON NAMES: Roach; Shiner; American Roach; American Bream; Bream; Sunfish; Dace; Bitterhead; Chub; Gudgeon; Young Shad; Windfish; Goldfish.

RANGE: Nova Scotia, Prince Edward Island, New Brunswick, Quebec, the St. Lawrence River and the eastern part of the Lake Ontario basin, southward on the eastern slope of the Appalachians to Virginia.

OCCURRENCE IN NOVA SCOTIA: The most widely distributed and also the most common minnow in Nova Scotia. Common throughout, even in granite areas, except for extremely isolated regions such as the Cape Breton plateau and Digby Neck.

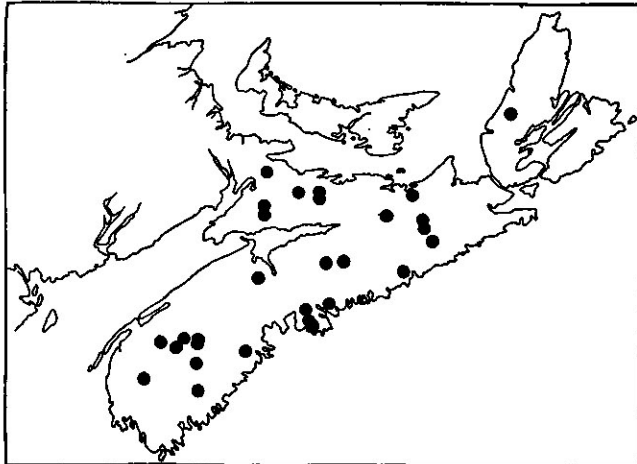


Figure 17. Distribution of Eastern Golden Shiner—*Notemigonus c. crysoleucas* in Nova Scotia.

Specimens in the Nova Scotia Museum of Science collections from:

Copper Lake, Antigonish, Co N. S.....	June 28, 1946
Lake George, Shelburne Co., N. S.	July 6, 1946
Red Lake, Annapolis Co., N. S.....	June 29, 1949
Little River, Annapolis Co., N. S.	July 5, 1949
Mill Lake, Annapolis Co., N. S.....	June 20, 1949
Medway River, near Caledonia, Queens Co., N. S.....	June 30, 1949

Fullerton Lake, Cumberland Co., N. S.	September 25, 1948
Gilbert Lake, Cumberland Co., N. S.	September 27, 1948
Goshen Lake, Guysborough Co., N. S.	August 3, 1948
White's Lake, Halifax Co., N. S.	June 26, 1948
Hubley Big Lake, Halifax Co., N. S.	June 24, 1948
Copper Lake, Antigonish Co., N. S.	August 2, 1948
Pearl Lake, Yarmouth Co., N. S.	September 16, 1948
Sherbrook Brook, Guysborough Co., N. S.	August 2, 1948
Lake Ainslie, Inverness Co., N. S.	September 9, 1948
Big Dam Lake, Annapolis Co., N. S.	July 5, 1949
Pretty Mary Lake, Annapolis Co., N. S.	June 30, 1949
Mink Lake Brook, Annapolis Co., N. S.	July 6, 1949
Little Lake, Grand Lake, Hants Co., N. S.	September 1, 1949
Minamkeak Brook, Lunenburg Co., N. S.	June 4, 1950
River at Antigonish, Antigonish Co., N. S.	1908
Maynard's Lake, Halifax Co., N. S.	1910
Shubenacadie River, Elmsdale, Halifax-Hants Co.	1920
Blueberry Lake, Bay Road, Halifax Co.	1897
Small Lake on Windsor Road near St. Croix, Hants Co., N. S.	July 13, 1950
East River Sheet Harbour, Halifax Co., N. S.	July 18, 1950
Small lake near Lorne, Pictou C., N. S.	July 19, 1950
Ponds near Cornwallis River, Kings Co., N. S.	May 31, 1950

DESCRIPTION: The Eastern Golden Shiner is said to tolerate salt water for a short time (Hubbs, Carl L., (personal communication) and this may explain in part its wide dispersal through Nova Scotia.

This Shiner feeds more on animal plankton, chiefly water flies, than on any other main group of organisms, but also upon insects, molluscs, water mites, protozoans, algae, remains of higher plants and small fishes. No detailed description of its spawning act is available, but the eggs are said to be scattered over beds of rooted aquatic plants or masses of filamentous algae.

Cooper (1935) has studied the age and growth of the western subspecies quite extensively. He found the following relation between age and size:

Summer	Length in inches
2	3.0
3	4.0

Summer	Length in inches
4	4.5
5	5.0
6	5.5

The oldest fish found was 8 years of age.

REFERENCES: Cooper, Gerald P. 1935.

Northern Blacknose Shiner—*Notropis heterolepis heterolepis*. Eigenmann

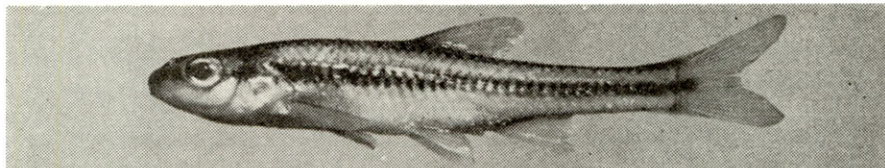


Figure 18. Northern Blacknose Shiner—*Notropis h. heterolepis*.
Life Size.

OTHER COMMON NAMES: Black-nosed Minnow.

RANGE: Nova Scotia to Saskatchewan, south to Pennsylvania and North Dakota.

OCCURRENCE IN NOVA SCOTIA: Common in the soft-rock areas from Windsor, Hants county, to Goshen Lake, Guysborough County.

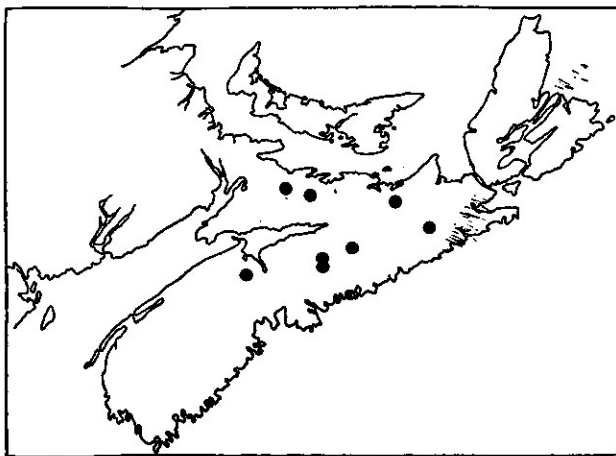


Figure 19. Distribution of Northern Blacknose Shiner—*Notropis h. heterolepis* in Nova Scotia.

Specimens in Nova Scotia Museum of Science collections from:—

Little Lake, Grand Lake, Hants Co., N. S.	September 1, 1949
Goshen Lake, Guysborough Co., N. S.	August 3, 1949
Small Lake on Windsor Road, near St. Croix, Hants Co.	July 13, 1950
Small lake near Lorne, Pictou Co., N. S.	July 19, 1950

DESCRIPTION: This little minnow is one of our lesser-known species. So far as can be discovered, there is no detailed description of its spawning behavior available, and very little information exists concerning its food and growth. It is believed however, to feed principally on microscopic plants, although small crustaceans, insects and other invertebrates are also eaten. Maturity is attained at lengths of 2 to 3 inches. Because it never attains a large enough size to compete with game fishes, the Northern Blacknose Shiner is probably a very valuable forage fish.

REFERENCES: Adams and Hankinson 1928.

Common Shiner—*Notropis cornutus*. Mitchill

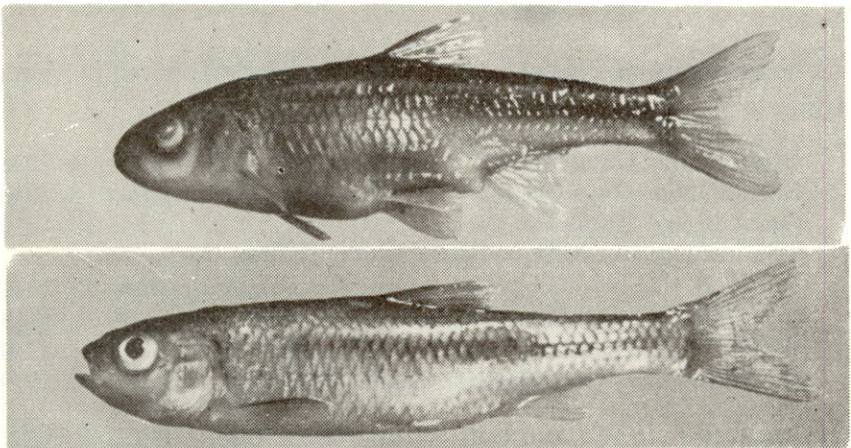


Figure 20. Common Shiner—*Notropis cornutus*.

OTHER COMMON NAMES: Eastern Shiner; Redfin Shiner; Silver Shiner; Dace; Silverside; Rough-head; Hornyhead.

RANGE: Nova Scotia to Saskatchewan, south to Missouri, Arkansas, Oklahoma and Alabama.

OCCURRENCE IN NOVA SCOTIA: From Goshen Lake, Guysborough Co. to Pockwock Lake, Halifax County, and north-westward to Gilbert Lake, Cumberland County.

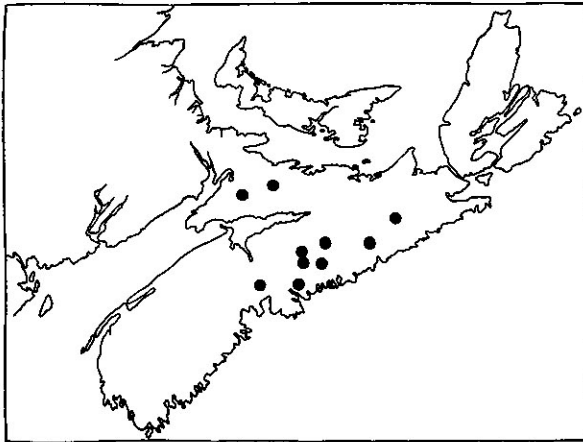


Figure 21. Distribution of Common Shiner—*Notropis cornutus* in Nova Scotia.

Specimens in Nova Scotia Museum of Science collections from:

Gilbert Lake, Cumberland Co., N. S.	September 24, 1948
Goshen Lake, Guysborough Co., N. S.	August 3, 1948
Grant Brook, Hants Co., N. S.	June 12, 1949
Tributary of the Musquodoboit River, Halifax Co., N. S.	June 12, 1949
Little Lake, Grand Lake, Colchester Co., N. S.	September 1, 1949
Wright's Lake, south of Pockwock P.O., Halifax Co.	1918
Shubenacadie River, Elmsdale, Halifax-Hants Co.	1919

DESCRIPTION: The Common Shiner is an omnivorous feeder, eating small fishes, insects, crustacea, algae, and even the remains of rooted plants. Like most of the Cyprinidae, or true

minnows, the Common Shiner exhibits a rather complex and interesting spawning behaviour, which has been very thoroughly investigated by a number of workers. Raney summarizes it as follows:

"1. In May an inshore migration in lakes, and, in some cases at least, an upstream movement is made by *Notropis cornutus*.

"2. Sexual dimorphism is pronounced. Breeding males have well developed pearl organs or breeding tubercles, are highly colored and reach a larger size than breeding females. The breeding tubercles on the various parts of the body are of value in the fighting which occurs among the males, in driving away predators and in the breeding act.

"3. Spawning occurs from the first of May through the middle of July in the northeastern states, beginning usually when the water has reached a temperature of 60 to 65 F. At any one locality, spawning lasts about ten days and is limited to the daylight hours.

"4. The common shiner may (1) spawn over gravel beds in running water, (2) excavate small depressions in gravel or sand in running water or (3) utilize the nests built by any other species such as *Nocomis micropogon*, *Nocomis biguttatus*, *Leucosomus corporalis*, *Semotilus atromaculatus*, *Exoglossum maxillingua* and *Compostoma anomalum*, whether these are built in running water or the still waters of shallow pools. They prefer to spawn over the nests of other species when these are available.

"5. Hybridization often occurs with *Notropis cornutus* as one parent largely as a result of their spawning over the nests of other fishes.

"6. The number of males that will spawn over one nest varies considerably, there being from one hundred or more over a gravel bed to as few as one male over a small depression. More females are present at the nests than males.

"7. Males fight continuously for the leading position, the position furthest upstream in the nest.

"8. A male shiner recognizes a female and takes a semi recumbent position alternately from one side to the other, when the female approaches from the downstream side of the nest, head facing upstream and moving slightly from side to side.

"9. The female takes the initiative in the breeding act by dipping downward to lie beside the male. The male throws his caudal peduncle over that of the female, curves his body by bringing his head and tail in close proximity with his pectoral fin underneath the head of the female. The eggs are forced from the female at this moment while she lies, usually on her side, her ventral surface facing upstream and her head pointing toward shore. The entire breeding act is over in a fraction of a second and the details cannot be seen clearly with the unaided eye.

"10. Probably fewer than fifty eggs are laid at once. The demersal eggs become adhesive after water-hardening in about two minutes after being laid and drop between the pebbles on the bottom of the nest to which they adhere. When first laid, they are orange and average 65 mm. in diameter."

Because it spawns in clear streams, the breeding behavior of *Notropis cornutus* can easily be observed by any interested person with patience enough to remain still for half an hour or so.

The males reach a length of up to 8 inches; the females are somewhat smaller. (Our subspecies appears to be the typical one.)

REFERENCES: Raney, E. C. 1940.

Hubbs, Carl L. and Cooper, Gerald P. 1936.

THE NORTH AMERICAN CATFISH FAMILY—

Ameiuridae

Only one species is found in Nova Scotia.

Northern Brown Bullhead—*Ameiurus nebulosus nebulosus*.

Le Sueur

OTHER COMMON NAMES: Common Catfish; Small, Marbled, Square-tail, Bullhead or Black Catfish; Schuylkill Cat; Sacra-

mento Cat; Common Bullhead; Horned Pout; Hornpout; Minister; Barbotte.

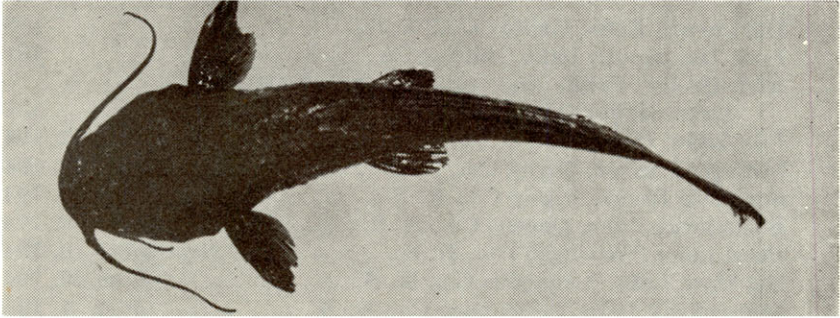


Figure 22. Northern Brown Bullhead—*Ameiurus n. nebulosus* Top view
6/5 Life Size

RANGE: From Nova Scotia to Manitoba and south to Virginia and the northern part of the Ohio Valley.

OCCURRENCE IN NOVA SCOTIA: Locally abundant in lakes and occasionally in streams from Hants and Halifax counties except in the granite areas. Probably occurs throughout the rest of the Nova Scotia mainland.

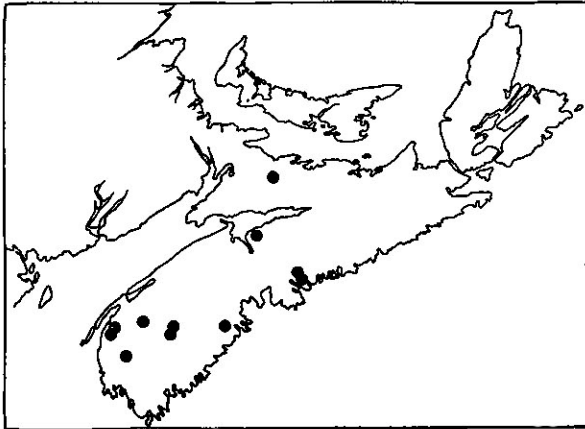


Figure 23. Distribution of Northern Brown Bullhead—*Ameiurus n. nebulosus* in Nova Scotia.

Specimens in Nova Scotia Museum of Science collections
from:

Dartmouth Lake, Halifax Co., N. S.....	1885
First Dartmouth Lake, Halifax Co., N. S.....	1910
Red Bridge Pond, east side of 2nd Dartmouth Lake, Halifax Co., N. S.....	1910
Lily Lake, Hants Co., N. S.....	July 12, 1947
Meteghan River, Digby Co., N. S.....	July 30, 1949
Spectacle Brook, Digby Co., N. S.....	July 30, 1949
Kejimkujik Lake, Queens Co., N. S.....	June 29, 1949
Pearl Lake, Yarmouth Co., N. S.....	September 16, 1948
Big Dam Lake, Annapolis Co., N. S.....	June 29, 1949
Minamkeak Lake, Lunenburg Co., N. S.....	July 4, 1950

DESCRIPTION: The Bullhead is a very hardy fish, tolerating higher temperatures and lower oxygen tensions than most Nova Scotia fishes. It is characteristic of quiet waters, where it feeds on small fish, molluscs, crustaceans, insects—in short any available animals which it can catch and devour. The Bullhead spawns in spring in sandy bays up to 2 feet deep, where the parents excavate a nest by removing a bushel or so of the bottom material in their mouths. Both parents, but particularly the male, are very zealous in their care of the developing eggs, fanning them with their lower fins and also agitating the eggs by taking them into their mouths and blowing them out. The adults continue to watch over the fry for some time after hatching, but aquarium observations indicate that finally this parental behaviour is overcome by their predacious feeding habits, and they will eat the young if possible.

The Bullhead reaches a length of 18 inches and a weight of 6 pounds, but this is unusual. Very few exceed a pound or two in weight.

REFERENCES: Adams and Hankinson 1928.
Breder, C. M. Jr., 1935, 1939

THE PIKE FAMILY—*Esocidae*

Only one species in Nova Scotia.

Chain Pickerel—*Esox niger*. Le Sueur

OTHER COMMON NAMES: Pickerel; Eastern, Federation, Lake, Pond, Reticulated or Grass Pickerel; Green Pike; Black Chain, Duck-billed or Lake Pike; Jack; Picquerelle.

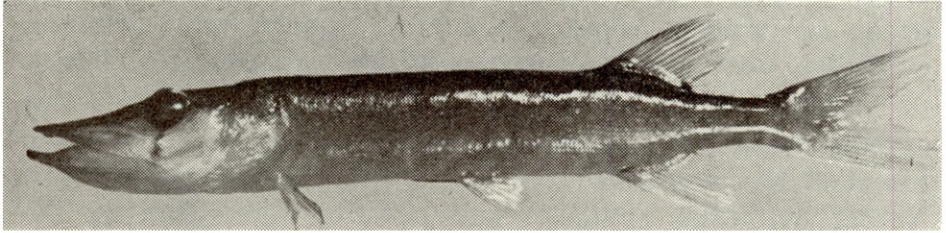


Figure 24. Chain Pickerel—*Esox niger*. Juvenile.
5/6 Life Size

RANGE: New Brunswick to Lake Ontario, south to Florida, Texas, Missouri and Alabama; introduced into the Lake Erie drainage of New York.

OCCURRENCE IN NOVA SCOTIA: Occurs only in several lakes on or near the Spectacle Brook drainage near Comeauville, Digby County, N. S. According to local tradition it was introduced from the United States about a generation ago by a man named Comeau. It is very common within its limited range.

Specimens in Nova Scotia Museum of Science collections from:

Lac a Jeune, Digby Co., N. S.	September 16, 1948
Upper Spectacle Lake, Digby Co., N. S.	July 26, 1949
Lower Spectacle Lake, Digby Co., N. S.	July 26, 1949
Henriette Lake, Digby Co., N. S.	July 27, 1949
Upper Spectacle Lake, Digby Co., N. S.	July 30, 1949
Spectacle Brook, Digby Co., N. S.	July 30, 1949
Lower Spectacle Lake, Digby Co., N. S.	July 28, 1949

DESCRIPTION: Raney has studied the summer food of *Esox niger* in a small New York pond. He summarizes his results

thus: "The main difference, as one might expect, between the food of young and older pickerel is largely in the sizes of the food organisms . . . With the very small pickerel, micro-crustaceans were important. After the middle of June insects were the dominant food, but young golden shiners were taken in numbers and made up about 14% of the stomach contents Among the insect food, mayfly nymphs predominated, though those of dragonflies were also eaten. Gradually more fishes, such as golden shiners common shiners and common sunfishes, were eaten and in general fewer insects were taken.

"With older pickerel, fishes and crayfishes were about equally important Insects were of minor value and those found in the stomachs were mostly large dragonfly nymphs. Young bullheads, sunfishes and pickerel were eaten by the larger pickerel but all of the golden shiners taken were more than one year old. No crayfishes were found in the stomachs of young pickerel, but they were very important food for those over 150 mm. in standard length at all times during the summer. An increasing tendency for the specimens larger than 300 mm. standard length to eat crayfishes was noted"

Chain pickerel reach a weight of 5 pounds and a length of about 2 feet.

Esox niger spawns in the spring, about two weeks after the ice goes out. The eggs are laid in shallows or flooded meadows, the two parents swimming along gently with sides touching, occasionally lashing the water with their tails as roe and milt are expelled.

The Digby county Pickerel are thriving mightily and may be expected to extend their range. They are not at all popular with the local inhabitants, who regard them as severely inimical to the best interests of trout and perch.

REFERENCES: Adams and Hankinson 1928.

Raney, Edward C. 1942

Hunter, George W. III, and Rankin, John S. Jr. 1939

THE FRESHWATER EEL FAMILY—*Anguillidae*
Only one species in Nova Scotia.

American Eel—*Anguilla rostrata*, Le Sueur

OTHER COMMON NAMES: Common Eel; Freshwater or Silver Eel; Easgann.

RANGE: Eastern North America, and (rarely) southern North American, from southern Greenland and Labrador to Brazil.

OCCURRENCE IN NOVA SCOTIA: Probably common throughout, with the possible exception of the plateau of northern Cape Breton. Most of the gear used in the present study would not catch Eels, so the small number of collection localities should not be considered an indication of scarcity.

Specimens from the Nova Scotia Museum of Science collections are:

Nictaux River, near Middleton, Annapolis Co.....	June,	1910
Copper Lake, Antigonish Co., N. S.....	June	27, 1946
Spectacle Brook, Digby Co., N. S.....	July	30, 1949
Lower Spectacle Lake, Digby Co., N. S.....	July	30, 1949
Small Lake on Windsor Road near St. Croix, Hants Co., N. S.....	July	13, 1950

DESCRIPTION: The Eel spawns only in deep waters of the ocean, between Bermuda and the West Indies. The time of spawning lasts from late winter and early spring until summer. After hatching, the young leaf-shaped larvae spend about a year in migrating from the spawning area to the American coast, where they change into the small Eels known as Elvers. The Elvers enter fresh water during the spring of the year, and live there until they mature, at an age of about $6\frac{1}{2}$ to $8\frac{1}{2}$ years. (A case is recorded, however, of an Eel living in captivity for 37 years.)

At maturity the Eel undergoes a remarkable change. It gradually ceases to feed; the underpart of the body becomes clearer and whiter, the dorsal region turns darker, and the eyes enlarge. The Silver Eel, as it is now commonly called, heads for the ocean breeding ground, where it spawns and dies.

It is an interesting fact that male Eels very seldom attain a length of over 16 inches, and as a rule do not ascend the rivers above tidewater, so that the large Eels found in the lakes and streams at the river headwaters are all females. These females may attain a size of as much as 6 feet, but the majority are less than half this length.

Its body shape brings down upon the Eel much of the prejudice and superstition traditionally associated with snakes. Thus, although its flesh is very tasty, whether fresh or smoked, and forms the basis of a \$13,000. fishery in this province alone, many people will not eat it. Similarly, although almost nothing is known concerning the relation of the Eel to other fishes, a general belief exists that it is the principal enemy of all game fishes.

REFERENCES: Adams, Charles C. and Hankinson, F. L. 1928.
 Bishop, S. C. 1935
 Frost, W. E. 1945.
 Hartley, P. H. T. 1940.

THE KILLIFISH FAMILY—*Cyprinodontidae*

Only one species in the fresh water of Nova Scotia.

Eastern Banded Killifish—*Fundulus diaphanus diaphanus*.
 Le Sueur.

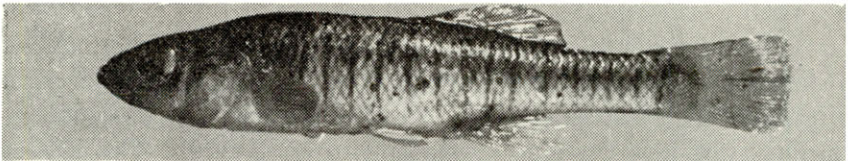


Figure 25. Eastern Banded Killifish, *Fundulus d. diaphanus* Life side.

RANGE: From the Maritime Provinces south to South Carolina; west through the eastern parts of Pennsylvania, Ontario and New York including the Lake Champlain basin.

OCCURRENCE IN NOVA SCOTIA: One of the most widely distributed fishes in the province. Very common in the shallow waters of lakes and streams throughout the province, except on the plateau of northern Cape Breton.

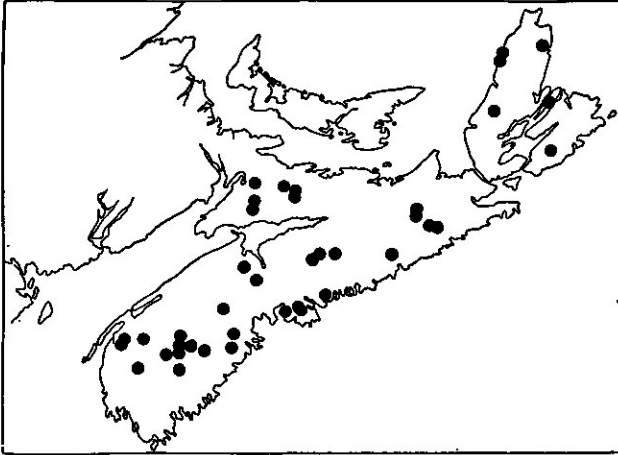


Figure 26. Distribution of Eastern Banded Killifish, *Fundulus d. diaphanus* in Nova Scotia.

Specimens in the Nova Scotia Museum of Science collections from:

Sherbrooke Lake, Lunenburg Co., N. S.....	1946
Lake Henry, Halifax Co., N. S.....	June 11, 1946
Elliott Lake, Annapolis Co., N. S.....	July 11, 1946
Doyle Lake, Halifax Co., N. S.....	August 22, 1947
Red Lake, Annapolis Co., N. S.....	July 1, 1949
Kejimkujik Lake, Queens Co., N. S.....	June 19, 1949
Lower Spectacle Lake, Digby Co., N. S.....	July 26, 1949
Meteghan River, Digby Co.....	July 27, 1949
Mulgrave Lake, Annapolis Co., N. S.....	July 6, 1949
Mill Lake, Annapolis Co., N. S.....	June 30, 1949
Medway River, near Caledonia, Queens Co., N. S....	June 30, 1949
Freeman Lake, Queens Co., N. S.....	June 30, 1949
Copper Lake, Antigonish Co., N. S.....	August 1948
2nd Indian Harbour Lake, Guysborough Co., N. S..	August 1, 1948
Lake Ainslie, Invesness Co., N. S.....	September 9, 1948
Indian Harbour River, Guysborough Co., N. S....	August 1, 1948
Goshen Lake, Guysborough Co., N. S.....	August 3, 1948
Pearl Lake, Yarmouth Co., N. S.....	September 16, 1948
La Have River, Lunenburg Co., N. S.....	June 20, 1948
Fullerton Lake, Cumberland Co., N. S.....	September 25, 1948
Loch Lomond, Cape Breton Co., N. S.....	September 26, 1948
Gilbert Lake, Cumberland Co., N. S.....	September 24, 1948
Big Dam Lake, Annapolis Co., N. S.....	July 5, 1949

Liverpool River, Annapolis Co., N. S.....	July 6, 1949
Pollock Lake, Queens Co., N. S.....	July 2, 1949
Pretty Mary Lake, Annapolis Co., N. S.....	June 30, 1949
Mink Lake Brook, Antigonish Co., N. S.....	July 6, 1949
Le Grand Lac, Grand Etang, Inverness Co., N. S..	August 22, 1949
Le 'ti Lac, Grand Etang, Inverness Co., N. S....	August 22, 1949
Warren Lake, Victoria Co., N. S.....	August 26, 1949
Dalem Lake, Victoria Co., N. S.....	August 29, 1949
Little Lake, Grand Lake, Hants Co., N. S.....	September 1, 1949
Leipsigate Lake, Lunenburg Co., N. S.....	June 5, 1950
Minamkeak Brook, Lunenburg Co., N. S.....	June 4, 1950
Shubenacadie River, Near Milford, Hants Co., N. S.	1919
Dauphinee Beach, Hubbards, Halifax Co., N. S....	1915
Little Salmon River, Cole Harbour, Halifax Co., N. S.	1910
Small Lake on Windsor Road, near St. Croix, Hants Co., N. S.....	July 13, 1950
Cameron Lake, Hants Co., N. S.....	July 19, 1950
East River, Sheet Harbour, Halifax Co., N. S.....	July 18, 1950
Ponds near Cornwallis River, Kings Co., N. S.....	May 31, 1950

Another species of *Fundulus*, *F. heteroclitus* inhabits the salt and brackish waters of the province. It can be distinguished from *F. diaphanus* by its much shorter snout, stouter body and rounded tail.

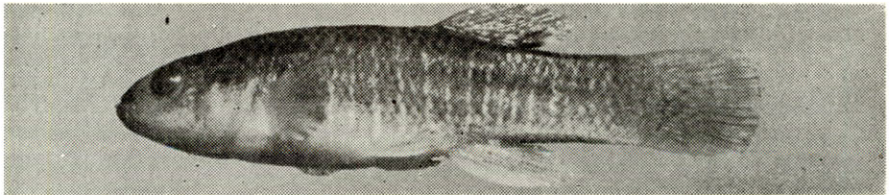


Figure 27. Mummichog—*Fundulus heteroclitus* (Life size)

DESCRIPTION: *Fundulus diaphanus* along with its marine relative, is the "minnow" of Nova Scotia anglers. It is so much hardier than the true minnows or Cyprinidae, that they are not used for bait at all.

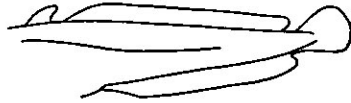
The anglers keep *Fundulus* alive by packing it in dry leaves in an old tin can. It will live in this way, completely without water, for several days, and successful air shipments

of the salt water species from Halifax to Central Canada have been made by commercial bait dealers.

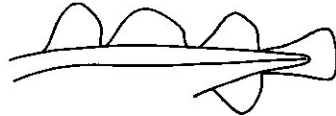
Both species of *Fundulus* grow to about 4 inches.

THE COD FAMILY—*Gadidae*

1. Two dorsal fins, one short, one very long—American Burbot. *Lota lota maculosa*, LeSueur—Page 59.



2. Three subequal dorsal fins—Tomcod. *Microgadus tomcod*, Walbaum. Page 60.



American Burbot—*Lota lota maculosa*. Le Sueur

OTHER COMMON NAMES: Lake Lawyer; Ling; Skin Ling; Alekey Trout; Eelpout; Longtailed Cat; Mud Blower; Fresh-water Cusk; Gudgeon; Lush.

RANGE: New Brunswick to the Yukon; south to the Connecticut, Delaware and Susquehanna systems and all the Great Lakes basins; in the Missouri River system south to Missouri, Kansas and Wyoming; in the Mississippi River and tributaries throughout Minnesota; also in the Columbia River watershed.

OCCURRENCE IN NOVA SCOTIA: Not known to occur in Nova Scotia; but since it is found in New Brunswick, it may possibly be found here at some later date.

There are no specimens in the Nova Scotia Museum of Science collection.

DESCRIPTION: Until the discovery recently by M. Vianney Legendre of a landlocked population of Tomcod in Lake St. John, Quebec, the Burbot was believed to be the only fresh-water member of the cod family. It is a deep-water fish, coming into shallower water at night to feed, and is generally found over muddy bottoms, except during early spring, when it spawns on

hard or rocky bottoms. The Burbot is a voracious fish, feeding largely upon small fishes, but also upon crustaceans and insects. A size of 2 or 3 feet is common.

REFERENCES: Adams and Hankinson 1928.

Tomcod—*Microgadus tomcod*. Walbaum

OTHER COMMON NAMES: Frostfish, Tommycod.

RANGE: Atlantic coast of America, from Labrador to Virginia.

OCCURRENCE IN NOVA SCOTIA: Vladykov and McKenzie state that this fish is very common in the coastal waters of the whole region. It is probably anadromous in practically all of the province's streams, although, since it ascends into fresh water only in winter, it is seldom caught away from the sea.

There are three specimens in the Nova Scotia Museum of Science collections, but they bear no locality label beyond "Nova Scotia."

DESCRIPTION: In Nova Scotia the Tomcod is a salt-water fish running up the estuaries in the winter to spawn. A landlocked population has been discovered in Lake St. John, Quebec, and it is perhaps within the limits of possibility that similar populations exist in some of the larger Nova Scotia lakes, such as Grand Lake. Sea-run individuals grow to about 14 inches.

About 28,000 lbs. of Tomcod are caught annually in the estuaries, with a value of some \$400.00

REFERENCES: Valdykov, V. D. and McKenzie, R. A. 1935.

THE BASS FAMILY—*Serranidae*

Dorsal fins separate; 3 spinous, 12 soft anal rays; lower jaw projecting. Striped Bass, *Roccus saxatilis*, Walbaum.

Dorsal fins joined; 3 spinous, 9 soft anal rays; jaws subequal. White Perch, *Morone americana*, Gmelin. Page 61.

White Perch—*Morone americana*. Gmelin

OTHER COMMON NAMES: Silver Perch, Sea Perch; Bass; Gatte; Narrow-mouthed Bass;

RANGE: Atlantic Coast of America, from the Maritime Provinces to South Carolina.

OCCURRENCE IN NOVA SCOTIA: In lakes throughout the province, except in the granite areas and on the plateau of northern Cape Breton. The White Perch is also found in the sea.

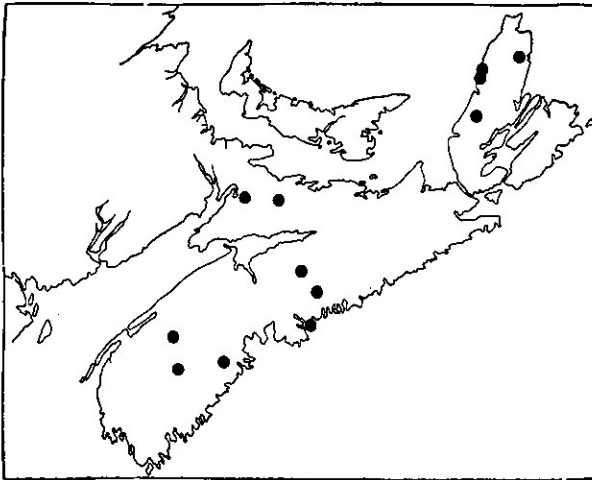


Figure 28. Distribution of White Perch—*Morone americana* in Nova Scotia.

Specimens in the Nova Scotia Museum of Science from:

Lake Ainslie, Inverness Co., N. S.	September 8, 1948
Grand Lake, Halifax Co., N. S.	June 4, 1948
Big Dam Lake, Annapolis Co., N. S.	July 5, 1949
Pollock Lake, Queens Co., N. S.	July 2, 1949
Le Grand Lac, Grand Etang, Inverness Co., N. S.	August 22, 1949
Le 'ti 'Lac, Grand Etang, Inverness Co., N. S.	August 22, 1949
Warren Lake, Victoria Co., N. S.	August 26, 1949
Minamkeak Lake, Lunenburg Co., N. S.	June 3, 1950
Cow Bay Pond, Halifax Co., N. S.	August 5, 1910
Near Cow Bay, Halifax Co., N. S.	1901
Creeks off Musquodoboit, Halifax Co., N. S.	June 23, 1924

DESCRIPTION: The White Perch reaches a maximum length of 15 inches, with a weight of about 3 pounds, but most specimens taken by anglers are much smaller than this. Observations by field workers of the Nova Scotia Inland Fisheries Survey on the La Have River indicate the existence of a seaward migration during the summer.

THE PERCH FAMILY—*Percidae*.

Bones of head serrate; mouth large, upper jaw extending to middle of eye or beyond; branchiostegals 7; reaching a moderately large size. Yellow Perch, *Perca flavescens*, Mitchill, Page 62.

Bones of head smooth; mouth small, upper jaw not reaching middle of eye; branchiostegals 6, maximum length only about 2½ inches. Johnny Darter, *Boleosoma nigrum*, Rafinesque, Page 64.

Yellow Perch—*Perca flavescens*. Mitchill

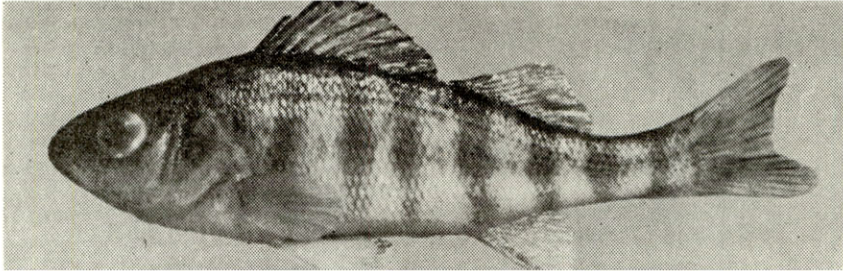


Figure 29. Yellow Perch—*Perca flavescens* Juvenile. Life size.

OTHER COMMON NAMES: Perch; American Perch; Ringed or Raccoon Perch.

RANGE: Nova Scotia to Great Slave Lake, south to Missouri, Illinois, Indiana, Ohio, Pennsylvania and South Carolina.

OCCURRENCE IN NOVA SCOTIA: Very common in lakes and streams throughout the soft rock areas on the mainland of Nova Scotia, known from only one locality (Mulgrave Lake, Annapolis County, N. S.) in the granite area; has not been recorded from Cape Breton Island as yet.

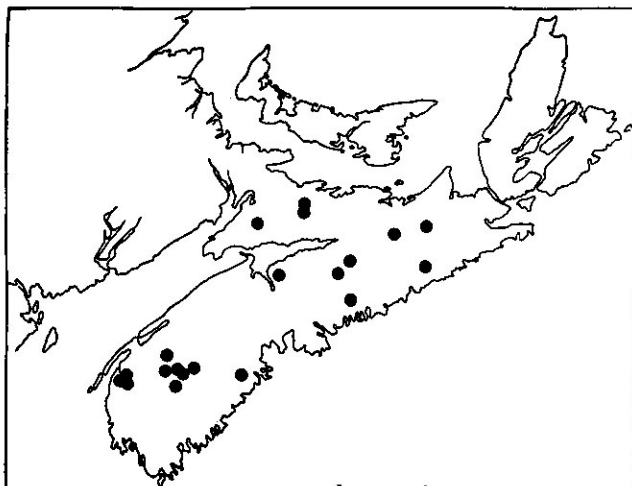


Figure 30. Distribution of Yellow Perch—*Perca flavescens* in Nova Scotia.

Specimens in Nova Scotia Museum of Science collections from:—

REFERENCES

- Copper Lake, Antigonish Co., N. S. June 27, 1946
 Lily Lake, Hants Co., N. S. July 15, 1947
 Red Lake, Annapolis Co., N. S. July 1, 1949
 Kejimkujik Lake, Queens Co., N. S. June 29, 1949
 Red Lake, Annapolis Co., N. S. June 29, 1949
 Minard Lake, Queens Co., N. S. June 30, 1949
 Little River, Annapolis Co., N. S. July 5, 1949
 Lower Spectacle Lake, Digby Co., N. S. July 26, 1949
 Meteghan River, Digby Co., N. S. July 27, 1949
 Upper Spectacle Lake, Digby Co., N. S. July 29, 1949
 Kejimkujik Lake, Queens Co., N. S. June 29, 1949
 Mulgrave Lake, Annapolis Co., N. S. July 6, 1949
 Mill Lake, Annapolis Co., N. S. June 30, 1949
 Medway River, near Caledonia, Queens Co. June 30, 1949
 Freeman Lake, Queens Co., N. S. June 30, 1949
 Copper Lake, Antigonish Co., N. S. August 1948
 Gilbert Lake, Cumberland Co., N. S. September 24, 1948
 Sherbrook Brook, Guysborough Co., N. S. August 2, 1948
 Big Dam Lake, Annapolis Co., N. S. July 5, 1949
 Pollock Lake, Queens Co., N. S. July 2, 1949
 Pretty Mary Lake, Annapolis Co., N. S. June 30, 1949

Mink Lake Brook, Annapolis Co., N. S.	July 6, 1949
Little Lake, Grand Lake, Colchester Co., N. S.	September 1, 1949
Minamkeak Brook, Lunenburg Co., N. S.	June 3, 1950
Creeks off Musquodoboit River, Halifax Co., N. S.	June 23, 1924
Shubenacadie River, Milford, Hants Co.	August 1919
Grand Lake, Halifax Co., N. S.	June 10, 1911
East River, Sheet Harbour, Halifax Co., N. S.	July 18, 1950
Small lake near Lorne, Pictou Co., N. S.	July 19, 1950

DESCRIPTION: Although the Yellow Perch is said to attain a weight of 3 or 4 pounds, specimens of over 1 pound are unusually large, at least in Nova Scotia. This is an excellent pan-fish and in places less favored with salmonids than this province, it is regarded as something of a game fish as well.

Tessellated Johnny Darter—*Boleosoma nigrum olmstedii*.
Storer

RANGE: From the Maritime Provinces to the Ottawa River, and the eastern part of the Lake Ontario drainage; southward, near the coast, to North Carolina.

OCCURRENCE IN NOVA SCOTIA: Though said to occur in the Maritime Provinces, the Johnny Darter has not been found in Nova Scotia during the course of this investigation.

There are no specimens in the Nova Scotia Museum of Science collections.

THE SUNFISH FAMILY—*Centrarchidae*

Northern Small-mouth Bass—*Micropterus dolomieu dolomieu*. Lacépède

OTHER COMMON NAMES: Black Bass; Freshwater, Brown, Dwarf, Gold, Green, Hog, Little, Minny, River, Spotted River, Streak-checked River, Swago, Trout, or Yellow Bass; Bass Hogfish; Black Perch; Green Perch; Mountain or White

Trout; Jumper; Speckled Hen; Swego; Achigan Noir; Achigan Petite Bouche.

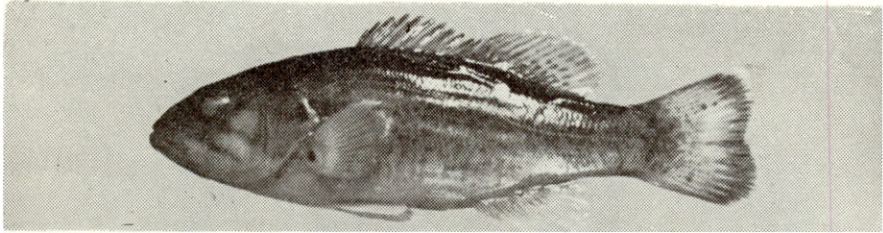


Figure 31. Small-mouth Bass.—*Microterus d. dolmieu*. Juvenile. Life size.

RANGE: Originally from northern Minnesota to Lake Nipissing and Quebec (with a relict population in the Nipigon River) and south to the Tennessee River drainage of Alabama and to Eastern Oklahoma. Introduced extensively elsewhere.

OCCURRENCE IN NOVA SCOTIA: This fish is a native of the central part of North America, but it has been introduced very widely. Plantings have been made in a number of Nova Scotia lakes, including several around Yarmouth and Amherst, and Lily Lake in Hants County.

The only specimens in the Nova Scotia Museum of Science collections are from the Huron River, Michigan U.S.A. September 23rd, 1949.

DESCRIPTION: In the central part of the continent this is a highly prized game fish. It is very vigorous when hooked, and reaches a weight of some 5 pounds. Since it is suspected of destroying trout in marginal trout waters, it should not be stocked indiscriminately in Nova Scotia.

The Bass is a spring and early summer spawner. The male excavates a nest of some 2 or 3 feet in diameter on a gravelly bottom. After spawning, the male watches over the nest and drives off intruders.

REFERENCES: Adams and Hankinson 1964.

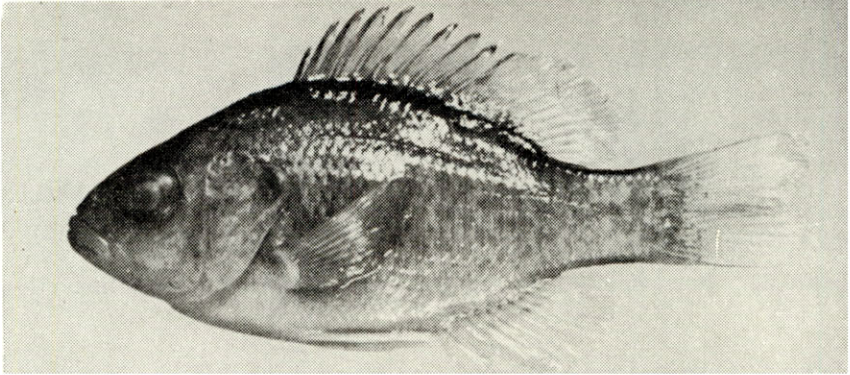
Pumpkinseed—*Lepomis gibbosus*. Linnaeus

Figure 32. Pumpkinseed—*Lepomis gibbosus*. Juvenile. Life size.

OTHER COMMON NAMES: Sunfish; Common or Eastern Sunfish; Sun Bass; Sunny, Punky; Perch; Pond, Robin, Sand, Female or Yellow Perch; Harlequin Roach; Roach; Northern Pomotis; Bream; Kiver; Quiver; Redbelly; Robin; Ruff; Tobaccobox; Yellowbelly; Flatfish; Founder; Crapet Jaune.

RANGE: Southern Canada, and from the Dakotas and the Red River of the north to the Maritime Provinces; south to South Carolina and possibly northern Georgia along the coast, and the western Pennsylvania, Ohio and Iowa in the Mississippi River system.

OCCURRENCE IN NOVA SCOTIA: Recorded only once from Nova Scotia, as Common Pond-fish *Pomotis vulgaris*, Cuv. in Knight's *Fishes of Nova Scotia*, 1866. He gave no collection locality, and may have included it in expectation of its future discovery.

The only specimens in the Nova Scotia Museum of Science collections are from the Huron River, Michigan, U. S. A., September 23rd, 1949.

DESCRIPTION: The pumpkinseed reaches a length of about 8 inches.

THE SCULPIN FAMILY—*Cottidae*

Only one species is likely to be found in the fresh water of Nova Scotia.

Common Slimy Muddler—*Cottus cognathus gracilis*.
Richardson

OTHER COMMON NAMES: Miller's Thumb; Northern Sculpin; Stargazer.

RANGE: From the Great Lake to Labrador, south to Virginia, west to Minnesota and, in relict colonies, Iowa.

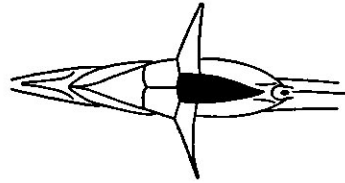
OCCURRENCE IN NOVA SCOTIA: This species is not known to occur in the province, but since it is very common in some New Brunswick streams, such as the Miramichi, it is to be expected in Cumberland County.

There are no specimens in the Nova Scotia Museum of Science.

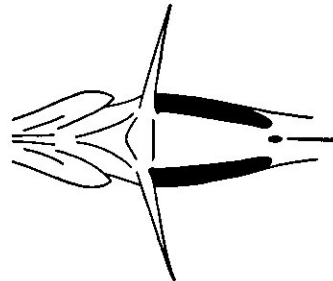
DESCRIPTION: This is a small fish, seldom larger than 4 inches.

THE STICKLEBACK FAMILY—*Gasterosteidae*

1. Innominate bones of the pelvis joined forming a median plate on belly, behind ventrals—see 6.



Innominate bones not joined, each extending as a strong process under the skin, outside the ventrals, the area between them flat and not bony; dorsal spines usually 4.



Four-spine Stickleback,
Apeltes quadracus. Mitchill.
Page 68.

- 2 Dorsal spines 5 to 11—see 3.
Dorsal spines 3—Three-spine Stickleback, *Gasterosteus aculeatus*,
Linnaeus. Page 69.

3. Dorsal spines 7 to 11—Nine-spine Stickleback, *Pungitius pungitius*, Linnaeus. Page 70.
Dorsal spines usually 5.—Brook Stickleback, *Eucalia inconstans* Kirtland. Page 71.

Four-spine Stickleback—*Apeltes quadracus*. Mitchill

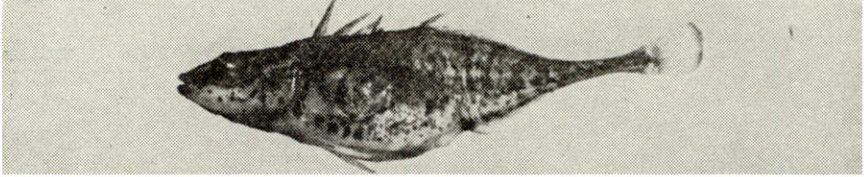


Figure 33. Four-spine Stickleback—*Apeltes quadracus*.

OTHER COMMON NAMES: Pinfish, Mud-pouch; Mud-perch.

RANGE: Prince Edward Island to New Jersey.

OCCURRENCE IN NOVA SCOTIA: Vladykov and McKenzie say "Rather common along the coast of the whole region, being, however, almost exclusively a salt and brackish water species." It has been found in the course of the present investigation in a number of places far removed from the sea and possessing a rich freshwater fish fauna. Although it has not been found on Cape Breton Island as yet, it is probably to be expected in soft-rock regions throughout the province.

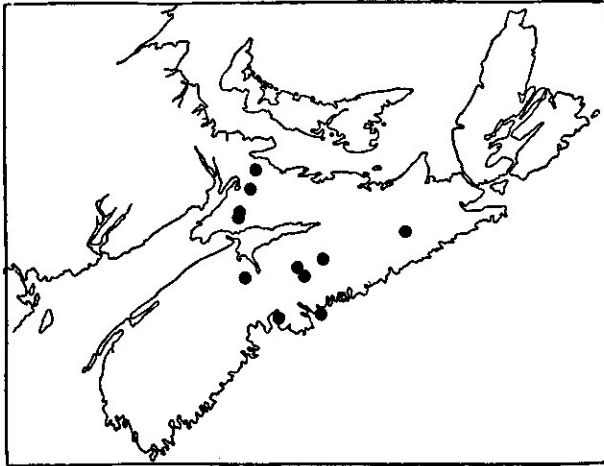


Figure 34. Distribution of Four-spine Stickleback—*Apeltes quadracus* in Nova Scotia.

Specimens in the Nova Scotia Museum of Science from:—

Cole Harbour, Halifax Co., N. S.....	July 17, 1947
Gilbert Lake, Cumberland Co., N. S.....	September 24, 1948
Fullerton Lake, Cumberland Co., N. S.....	September 25, 1948
Goshen Lake, Guysborough Co., N. S.....	August 3, 1948
Grant Brook, Hants Co., N. S.....	June 12, 1949
Brook near Three-mile Plain, Hants Co., N. S.....	July 13, 1950

DESCRIPTION: This Stickleback attains a length of less than 3 inches.

Cole Harbour, Halifax Co., N. S.....	July 17, 1947
Lake o' Law, Inverness Co., N. S.....	September 8, 1948
Middle River, Victoria Co., N. S.....	September 7, 1948
River Inhabitants, Inverness Co., N. S.....	September 5, 1948
Copper Lake, Antigonish Co., N. S.....	August 1948

Three-Spine Stickleback—*Gasterosteus aculeatus*. Linnaeus.

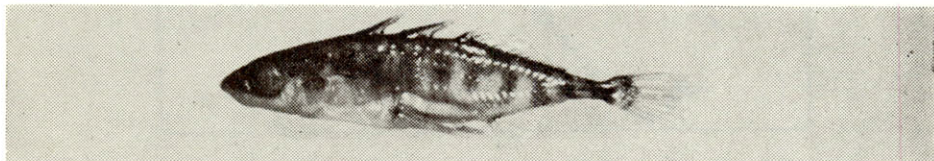


Figure 35. Three-spine Stickleback—*Gasterosteus aculeatus*

OTHER COMMON NAMES: Two-spined Stickleback; Common, European, Eastern, New York, Stickleback; Burnstickle; Tiddler; Pinfish.

RANGE: Salt and fresh waters of the Northern Hemisphere, south to northern Africa, northern China, Southern Japan, Lower California and Chesapeake Bay.

OCCURRENCE IN NOVA SCOTIA: Throughout the province except in the granite areas and on the plateau of northern Cape Breton.

Specimens in Nova Scotia Museum of Science from:—

Le Grand Lac, Grand Etang, Inverness Co., N. S.	1949
Little Lake, Grand Lake, Colchester Co., N. S.	1949
Grant Brook, Hants Co., N. S.....	June 12, 1949

DESCRIPTION: In the spring Sticklebacks, including this species, construct an elaborate nest somewhat resembling that of an oriole. Fewer than a hundred eggs are usually produced, and these are zealously guarded by the male.

This is our largest Stickleback. It exceeds 3 inches in length.

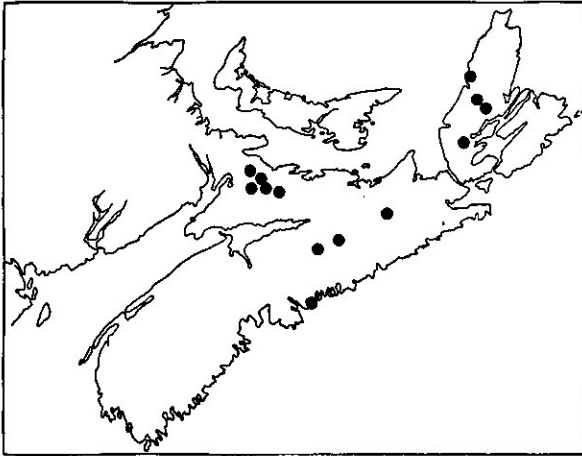


Figure 36. Distribution of Three-spine Stickleback—*Gasterosteus aculeatus* in Nova Scotia.

REFERENCES: Hubbs and Lagler, 1947.

Nine-spine Stickleback—*Pungitius pungitius*. Linnaeus.

OTHER COMMON NAMES: Ten-spine Stickleback; Pinfish.

RANGE: Salt and fresh waters of the Northern Hemisphere, south to central Europe, the northern parts of China and Japan, Alaska and New Jersey.

OCCURRENCE IN NOVA SCOTIA: The most widely distributed of our sticklebacks; it occurs throughout the province, in both granite and soft-rock areas, except on the plateau of northern Cape Breton. This is one of the larger sticklebacks; it grows to about 3 inches.

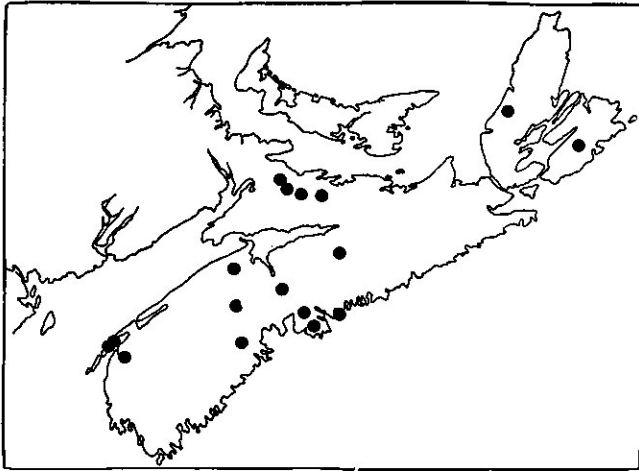


Figure 36. Distribution of Nine-spine stickleback—*Pugitius pungitis* in Nova Scotia.

Specimens in Nova Scotia Museum of Science from:—

Gully Brook, Lunenburg Co., N. S.....	1946
Zwicker Brook, Lunenburg Co., N. S.....	1946
Cole Harbour, Halifax Co., N. S.....	July 17, 1947
Cranberry Lake, St. Margaret's Bay Road, Halifax Co., N. S.....	August 4, 1947
Meteghan River, Digby Co., N. S.....	July 27, 1949
Centreville Lake, Digby Neck, Digby Co., N. S.	July 24, 1949
Bog Hole, Digby Neck, Digby Co., N. S.....	July 24, 1949
Lake Ainslie, Inverness Co., N. S.....	September 9, 1948
Loch Lomond, Cape Breton Co., N. S.....	September 26, 1948
Hublely Big Lake, Halifax Co., N. S.....	June 24, 1948
LaHave River, Lunenburg Co., N. S.....	June 20, 1948
Little Lake, Grand Lake, Hants Co., N. S.....	September 1, 1949
Cameron Lake, Hants Co., N. S.....	July 13, 1950
Ponds near Cornwallis River, Kings Co., N. S.....	May 31, 1950

Brook Stickleback—*Eucalia inconstans*. Kirtland

OTHER COMMON NAMES: Common Freshwater Stickleback; Common Stickleback; Pinfish.

RANGE: British Columbia to the Maritimes (doubtfully from Greenland) south to Montana, Kansas, Illinois, Indiana, Ohio, Pennsylvania and New York.

OCCURRENCE IN NOVA SCOTIA: The Brook Stickleback has not been encountered during the course of this investigation, but it is included here because of the possibility that it may be found in the province at some later date. It reaches a length of some $2\frac{1}{2}$ inches.

There are no specimens in the Nova Scotia Museum of Science collections.

GLOSSARY

adipose fin—a fleshy fin-like projection, without rays or spines, found on the backs of some fishes behind the dorsal fin.

anadromous—running up streams to spawn.

anal—pertaining to the anus.

barbel—a fleshy projection, sometimes long and whiskery, sometimes short and fingerlike, found about the mouths of some fishes.

branchiostegal—a membrane supported by bony rays underneath the operculum of a fish.

caudal—pertaining to the tail.

compressed—flattened from side to side.

deciduous—falling out.

dorsal—pertaining to the back.

emarginate—slightly notched on the end.

heterocercal fin—the unsymmetrical caudal fin of sturgeons and sharks, in which the vertebral column extends so far into the upper half that it is much bigger than the lower half.

homocercal fin—the type of caudal fin possessed by most fishes, in which the two halves, upper and lower, are of equal size.

innominate—a backward extending bone of the pelvic girdle.

- isthmus*—the narrow portion of the body projecting forward below the head and between the branchiostegals.
- lateral band*—a more or less prominent band of black pigment running along the midline of certain fishes, especially Cyprinidae.
- lateral line*—a line of sensory pores along the side of many fishes.
- lateral line scale count*—the number of scales along the lateral line (or the line where a normal lateral line would be, if it is absent) from the shoulder girdle to the structural caudal fin base, as determined without dissection by moving the caudal fin from side to side.
- maxillary*—the bone which forms most of the upper jaw.
- pectoral fins*—the paired fins of fishes just back of the head above and usually in front of the pelvic fins. The pectorals correspond to the forelegs of mammals.
- pelvic fins*—the second pair of ventral fins, usually behind the pectorals. They correspond to the hind legs of land vertebrates.
- peritoneum*—the membrane lining the abdominal cavity.
- premaxillary*—the bone forming the front portion of the upper jaw.
- protractile*—the term applied to the premaxillary bones of fishes when they may be drawn forward leaving a groove between them and the bones of the skull.
- serrate*—notched like a saw.
- standard length*—the distance from the most anterior part of the head (including both jaws) backward to the end of the vertebral column or structural base of the caudal rays.
- subequal*—almost the same size.
- subterete*—almost rounded.
- terminal*—at the end of the head.
- total length*—the greatest dimension between the most anteriorly projecting part of the head and the farthest tip of the caudal fin when the rays are squeezed together.

truncate—flat on the end.

vermiculate—covered with worm-like markings.

ventral—pertaining to the under side.

ventral fins—the unpaired fins usually placed behind the pelvic fins.

vomer—the bone which forms the roof of the mouth in a fish.

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