

# FISHERIES of MAINE



Landlocked Sebago Lake Salmon

STATE OF MAINE  
DEPARTMENT OF  
INLAND FISHERIES AND GAME

W. Harry Everhart

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W. H. O.  
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# FISHES OF MAINE

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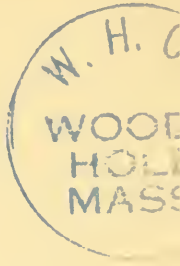
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## FOREWORD

Fishes of Maine is intended as an aid to the fishermen of Maine in identifying the fish which they catch and observe in Maine waters. The brief life histories point out salient features about each fish and will perhaps add to the interest and enjoyment of the many observations which fishermen make as they seek the many and various game fishes inhabiting Maine lakes and streams.

This publication would have been impossible without the splendid surveys of Maine waters conducted under the direction of Dr. Gerald P. Cooper. These surveys served as a guide to the species present in Maine. In addition they provided much of the information concerning the age, growth and food of the fish.

The color print of the blueback trout was photographed by Mr. James G. Garvin, photographer for the Agricultural Extension Service and the Agricultural Experiment Station at the University of Maine. An enthusiastic fisherman, Mr. Garvin donated his services to this work. Grateful acknowledgment is due the New Hampshire Fish and Game Commission for permission to use their color print of the Sunapee trout in preparing the color plate of this species. The remaining prints for the color plates were photographed by Mr. Arthur Rogers, Warden Supervisor, Department of Inland Fisheries and Game. All colored plates were prepared from photographs of living fish, excepting the Sunapee trout.

The keys to the families of fishes and to the species were modified to fit Maine fishes from those presented in the Fishes of the Great Lakes Region by Dr. Carl L. Hubbs and Dr. Karl F. Lagler published by the Cranbrook Institute of Science.

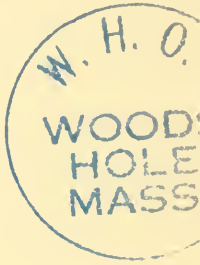
Mr. Robert Nichols, Waterville Sentinel Engraving Company, prepared the color plates. Mr. J. Palmer Libby, Art Student at the University of Maine, prepared the line drawings used throughout the illustrated keys. Mr. Kenneth White, Superintendent of the Craig Brook Federal Fish Hatchery, was very cooperative in providing the Atlantic salmon for the color plate of this species. Mr. Kenneth Shorey, Superintendent of the Enfield State Fish Hatchery, aided in the capture of the lake trout. Mr. Elmer Bickford, Superintendent of the Governor Hill State Fish Hatchery, cooperated in obtaining the rainbow and brown trout pictures. Mr. Albert Plummer, Superintendent of the Sebago Lake State Fish Hatchery, assisted in procuring the landlocked salmon.

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W. HARRY EVERHART

Orono, Maine  
March 1950





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## FISH

A fish has been defined as, "a back-boned, cold-blooded animal adapted for a life in the water with the limbs modified as fins and obtaining oxygen from the water through the gills." The number of different kinds of fishes present in the waters of the world today has been estimated at roughly 40,000. Since new forms are constantly being described this number is ever changing and always increasing. Fishes easily outnumber all other vertebrates, the amphibians, reptiles, birds and mammals, put together.

A glance at the fishes inhabiting the waters of Maine will convince the observer that they are streamlined ideally for moving through the medium in which they live. In general the shape may be described as torpedo or "cigar-like." Some of the fishes have become rounded as the eels and others have become flattened from side to side as the basses and are known as compressed. Fishes of Maine are either rounded or compressed in body form.

Covering the fish externally is a layer of mucus secreted by the glands of the skin. This mucus protects the fish from external infection. Fishermen have long been cautioned to wet their hands before handling fish which they intend to return to the water. Handling with dry hands would remove a large amount of this protective covering and leave the fish exposed to fungus and bacterial invasions. Immediately under the mucus lies the epidermis and under the epidermis are embedded the scales. The scales are laid down shortly after the fish is hatched and reflect changes which may occur in the life history of the fish. These changes may be noted in the sculpturing of the scale. Hence the age of fish can be determined from the number of annuli and periods of good growth and poor growth detected. Among the fishes of Maine the lamprey eel, hornpout and freshwater sculpin are without scales. Scales of the fishes of Maine may be divided into the cycloid type and the ctenoid type. Cycloid scales are usually small, round and embedded deeply in the skin. Trout and salmon are examples of fish with cycloid scales. Ctenoid scales are so-called because they have several rows of spines along their posterior or exposed edge. These spines or ctenii give the fish a rough or spiny feeling. Bass and white perch are examples of fish having ctenoid scales.

The fins of fishes are thin folds of skin supported by rays or spines or both. Frequently fish are classified as "soft-rayed" fish such as the trout or as "spiny-rayed" fish such as the bass. The rays are finely segmented and often branched while spines are unsegmented, unbranched and usually hard. Counts of rays and spines, since their number is constant, are frequently of value in the identification of closely allied forms. The fins are divided into paired and unpaired. Paired fins include the pectorals located behind the gill openings or

opercula and the ventral or pelvic fins located on the lower side of the body. Fish are frequently classified on the location of the ventral fins depending on whether these fins are placed posteriorly or anteriorly on the ventral side or belly of the fish. Most "advanced" fishes have the ventral fins placed under, or nearly under the pectoral fins when the location is spoken of as thoracic. If the ventral fins are in front of the pectoral fins then the location of the ventral fins is known as jugular. Unpaired fins include the dorsal, adipose, caudal or tail fin and the anal fin. Although a fish swims primarily by the muscular movements of its body it depends on the caudal fin lending power to the movements, on the dorsal and anal for stabilizing the movement and on the pectorals and ventrals for steering and maneuvering.

Fish obtain their oxygen from the water by means of the gills. Closing the gill covers and opening the mouth together with an expansion of the cheeks causes water to flow in. Closing the mouth, contracting the cheeks and opening the gill covers causes the water to flow out over the gills. In this manner the fish maintains a steady flow of water over the gills. The gills are made up of a very fine network of capillaries or very small blood vessels with walls so thin that oxygen can pass from the water into the blood and carbon dioxide can pass from the blood into the water.

The manner of reproduction in fish is interesting to the fisherman and of great importance to the correct management of the fishery concerned. Although internal fertilization and development is known in fishes all the fresh-water fishes of Maine fertilize the eggs externally. Development therefore takes place outside the body of the female. In some fishes the males take on spawning coloration or "breeding plumage" near and during the spawning time. The approach of the spawning season is the signal in most fishes for a migration to the spawning area. Distances traveled may be many miles as with the Atlantic Salmon or only a few feet as with the lake trout. Certain of the fishes particularly minnows and suckers develop tubercles on the fins and heads during the breeding season. More pronounced on the males these tubercles are supposedly used in grasping the female and in protecting the spawning area. Some of the fishes build nests. In the trout and salmon the female has the job of preparing the nest while in the sunfish family the male prepares the nesting area. While the bass and sunfish remain to guard the eggs and young the trout and salmon assume no responsibilities once the eggs are fertilized and covered. Many fishes prepare no nest but merely broadcast the eggs where they fall to the bottom to lodge on the surface or in crevices among the rocks. The pickerel and smelt are examples of the latter type. Most fish are polygamous with several males fertilizing the eggs of the female or with the eggs of several females fertilized by a single male.

Although no hard and fast rules can be drawn concerning the food habits of fishes they may be divided into two general groups; one of which feeds on plankton or the herbivorous feeders and the other group the carnivorous feeders.

In many instances the mouth and the dentition will serve as clues to the food habits of the fish concerned. An examination of the large mouth and teeth of the pickerel would leave no doubt as to the carnivorous food habits of this species as likewise an examination of the mouth of the whitefish would leave little doubt that this form was primarily a plankton feeder. Feeding habits of fish vary from those which seek their food alone and those which travel in schools. Some species make characteristic daily migrations coming into shoal areas in the evening when they are readily taken in shallow water. Temperature plays an important part in feeding of fish with extreme lows and highs tending to "throw the fish off their feed."

The sense organs of fish are variously developed. The eyes of the fish are very much like our own in their construction. However the eyes of the fish are adapted for seeing only short distances. The question of whether fish can distinguish different color patterns has long been argued by scientists although at present most are in agreement with the fishermen in believing that fish can, at least with objects under water, distinguish colors. Smell in fishes is probably the most acutely developed sense. It plays a large part in the capture of prey. The nostrils of a fish are located on top of the snout and open into small blind pouches lined with the organs of the sense of smell. Water is drawn in and out of the pouch. Although the fish does not have an external ear they undoubtedly hear the vibrations which are more readily transferred through the water. These vibrations travel through the skull to reach the inner ear of the fish. In addition the lateral line organ of fish is reported as receiving vibrations of low intensity. The lateral line easily observed along the sides of the fish may be traced onto the head where it may divide into as many as five different branches.

# IDENTIFICATION OF MAINE FISHES

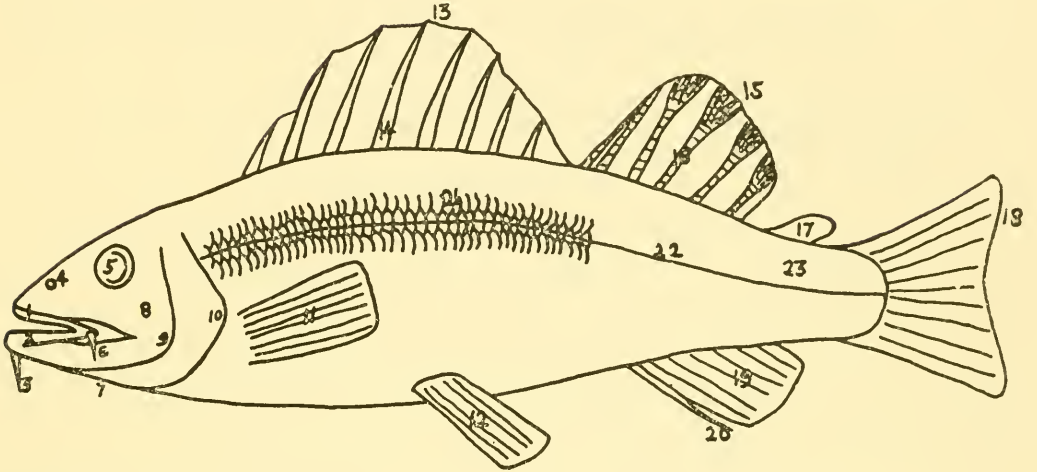
The average fisherman pursuing the sport of fishing for pleasure is little inclined to burden himself with the details of fish identification as practiced by the professional ichthyologist. Unknown animals or plants are identified through the use of keys defined as, "a tabulation of those characteristics which will most readily and reliably distinguish the form." An effort has been made in the following keys to provide characteristics readily apparent to the fisherman and to illustrate these characteristics whenever possible with line drawings emphasizing the important points or "key characteristics."

Since there is a great deal of confusion over common names of fishes it has been the policy of this book to use the common name as proposed by the American Fisheries Society. The scientific names have been included since in most cases they are standardized throughout the world.

Before attempting to use the keys it is suggested that the fisherman acquaint himself with the drawing on page 5 representing a generalized fish and showing the location of the principal characters used throughout the keys. The keys are set up to provide the observer with two choices. One of these choices will fit the fish which you are trying to identify. Following the choices which fit the fish at hand will lead to the name of the specimen. First determine the family to which the fish belongs by consulting the key to families on page 6. Some of the families of fish found in Maine have only a single representative so that once the family is determined the name of the fish will be known. In other cases the family may have several representatives among the Maine fishes. In such an instance determine the family to which the fish belongs and then turn to the page indicated and proceed through the key to the species of that family until the correct identification is reached. Good practice in learning to use the keys correctly would be the running through of a fish already known to the observer.



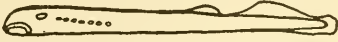
GENERALIZED FISH INDICATING CHARACTERS COMMONLY  
USED IN IDENTIFYING FISH



- |   |                         |
|---|-------------------------|
| 1. Upper jaw (premaxillary and maxillary bones) | 12. Ventral fin         |
| 2. Lower jaw (dentary bone)                     | 13. Spiny dorsal        |
| 3. Barbel                                       | 14. Fin spine           |
| 4. Nostril                                      | 15. Soft dorsal         |
| 5. Eye  | 16. Fin ray             |
| 6. Maxillary barbel                             | 17. Adipose fin         |
| 7. Branchiostegals                              | 18. Caudal fin          |
| 8. Cheek  | 19. Anal fin            |
| 9. Preopercle                                   | 20. Anal spine          |
| 10. Operculum                                   | 21. Lateral line scales |
| 11. Pectoral fin                                | 22. Lateral line        |
|   | 23. Caudal peduncle     |

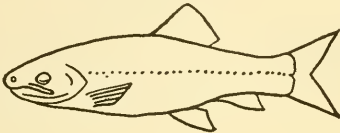
KEY TO THE FAMILIES OF FRESH-WATER FISHES OF MAINE

1. Mouth a sucker-like disc without jaws; gill openings seven; paired fins absent



Sea Lamprey  
Petromyzonidae  
p. 11

- Mouth with true jaws; gill slits four, covered by an operculum; paired fins present ..... 2

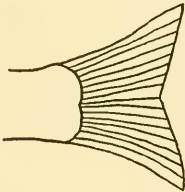


2. Tail not symmetrical (heterocercal), caudal vertebrae extending into the upper lobe of the tail

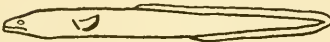


Atlantic Sturgeon  
Acipenseridae  
p. 12

- Tail more or less symmetrical (homocercal) ..... 3

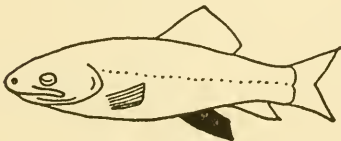


3. Body eel-shaped; ventral fins absent



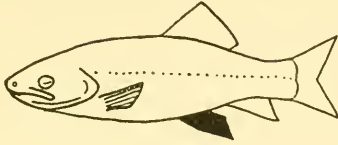
American Eel  
Anguillidae  
p. 40

- Body not eel-shaped; ventral fins present ..... 4

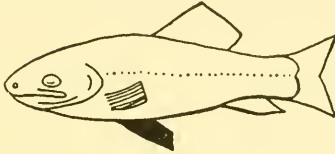




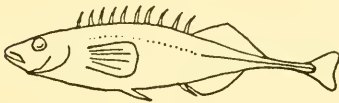
4. Ventral fins abdominal, inserted a considerable distance behind the pectorals ..... 5



- Ventral fins thoracic (in close proximity to the pectoral fins but behind) or jugular (ventral fins anterior to pectoral fins) ..... 14



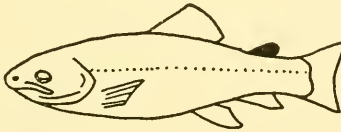
5. Dorsal fin preceded by free dorsal spines



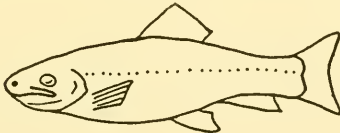
Sticklebacks  
Gasterosteidae  
p. 51

- Dorsal fin not preceded by free dorsal spines ..... 6

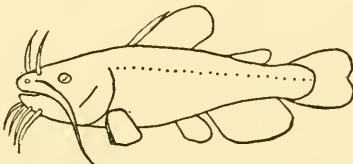
6. Adipose fin behind ..... 7



- No adipose fin present ..... 10



7. No scales; barbels on head; single stout spine in dorsal and pectoral fins; adipose fin present



Brown Bullhead  
Ameiuridae  
p. 39

- Scales present; barbels absent; pectoral fins without spines ..... 8

8. Mouth small; upper jaw not extending back to below center of eye; teeth on jaws and tongue weak



Whitefishes  
Coregonidae  
p. 28

- Mouth large; upper jaw extending back at least to below center of the eye; strong conical teeth on jaws and tongue . . . . . 9



9. Scales large, fewer than 75 along lateral line



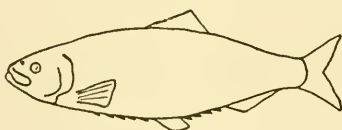
American Smelt  
Osmeridae  
p. 30

- Scales small, more than 105 along lateral line



Salmon and Trout  
Salmonidae  
p. 14

10. Midline of belly provided with saw-like keel



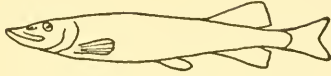
Alewife  
Clupeidae  
p. 12

- Midline of belly without a saw-like keel . . . . . 11

11. Head scaly or partially scaly . . . . . 12

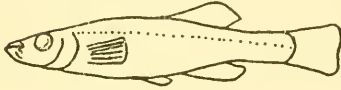
- Head without scales . . . . . 13

12. Jaws elongated, shaped like a duck's bill; large irregular teeth



Chain Pickerel  
Esocidae  
p. 39

Jaws not elongated; teeth weak; tail more or less rounded



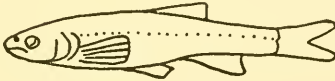
Killifish  
Cyprinodontidae  
p. 41

13. Mouth points downward (inferior), is sucker-like with thick, papillose lips; dorsal fin with 10 or more rays.



Suckers  
Catostomidae  
p. 31

Mouth opening toward the front (terminal or subterminal); dorsal fin with less than 10 rays



Minnows  
Cyprinidae  
p. 34

14. Body scaleless, but may be covered with spines or prickles; head large; eyes in top of head; pectoral fins large



Sculpin  
Cottidae  
p. 50

Body with scales ..... 15

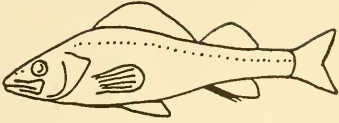
15. Single median barbel on chin



Burbot  
Gadidae  
p. 41

No barbel on chin ..... 16

16. Anal spines 2 or less

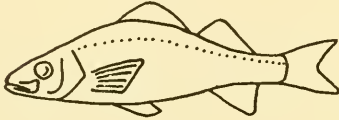


Perch  
Percidae  
p. 43

Anal spines 3 or more ..... 17

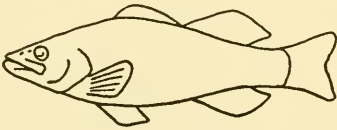


17. Dorsal fins entirely separated or but slightly joined



White Perch  
Serranidae  
p. 42

Without longitudinal dark stripes or with only one; dorsal fins confluent



Sunfishes  
Centrarchidae  
p. 46

## LAMPREY FAMILY (Petromyzonidae)

### SEA LAMPREY

*Petromyzon marinus* Linnaeus

The sea lamprey, representing a primitive group of fishes, is eel-like in appearance with a soft, cartilaginous skeleton. The general range is the Atlantic coasts of Europe and North America from Labrador south to Florida in the Western Atlantic. In recent years they have become "landlocked" in the Great Lakes basin. The distribution in Maine is confined to the coastal rivers and their tributaries.

Their adult life is spent in marine waters returning to fresh-water streams to spawn during May and early June. As the spawning time approaches the intestine atrophies and the entire animal becomes a reproductive machine. It seems unlikely that they do any damage to other fishes during this period. Apparently the bulk of the spawning runs moves up the streams after midnight and before daylight although stragglers are observed at all times. The mature adults continue up the streams seeking a suitable riffle area where they build their nests in shallow water. It is thought that the males make their way up the streams first and probably do most of the nest construction carrying stones in their sucking mouths. After the female arrives in the spawning area she may or may not help with the nest. The nest completed the male grasps the female behind the head and wrapping his body around hers shakes vigorously. The non-adhesive eggs are released and fertilized. A single female may have up to 235,000 eggs. After spawning the adults drift downstream to die.

Several days later larval lampreys, called ammocoetes in this stage, emerge from the nest and proceed downstream seeking a spot where the gradient has leveled off. Here they burrow into a mud bank. The nonparasitic larvae feed for from three to five years on organic material which they strain from the water. At the end of this larval period at a length of four to six inches they transform into the adult stage losing the fringe of cirri, the eyes come to the surface and the horny teeth with the rasping tongue are developed together with the anti-coagulant secreting glands. This transformation takes about two months. Along the coast of Maine these newly transformed lampreys begin their migration to the sea in the fall before the streams are frozen. Little is known about their range in the ocean. Here the lamprey eel feeds parasitically on other fishes hanging on with its sucking mouth and rasping with its tongue to obtain nourishment in the form of blood and body fluids of the unfortunate victim. After several years of this parasitic life the lamprey becomes mature and begins the spawning migration back to fresh water completing the life history. The entire cycle may take from five to eight years.

The average adult running the streams of Maine is from two to two and one-half feet in length although exceptional lengths of three feet have been observed.

Although in past history lampreys appear to have been considered a delicacy there is no market today. In some sections fishermen use the larvae for bait. At present there is no commercial market.

## STURGEON FAMILY (Acipenseridae)

### ATLANTIC STURGEON

*Acipenser oxyrhynchus* (Linnaeus)

The Atlantic sturgeon is characterized by the bony plates covering the head and the five rows of bony shields or scutes which armor the body. The snout is elongate and flattened. General range is both sides of the North Atlantic, from the St. Lawrence River to the Gulf of Mexico on the American coast. The Atlantic sturgeon is anadromous running to fresh water to spawn. In the past lengths of 18 feet have been recorded for this sturgeon but today where they are numerous they average much less.

These fish are apparently quite old when they first become sexually mature with estimations running from 20 to 30 years as the age when they first spawn. Females may spawn as many as 1,000,000 eggs, but present knowledge indicates that breeding probably does not take place every year. The spawning site is usually in water up to 10 feet in depth and over small rubble or gravel. The adult fish are supposed to begin their spawning runs in spring about the same time as the salmon, shad, and alewives. Actual spawning may not take place until July. There is no parental care of the eggs or young. A few days after spawning the young hatch and remain in the stream from one to three years.

The ventral mouth of the sturgeon preceded by the four barbels provides the fish with the ideal combination of a bottom feeder. Routing around in the bottom mud the barbels are quick to detect any food that may be uncovered and the protrusible mouth is used to suck up the food.

The scarcity of the sturgeon precludes a large commercial market for the species. The roe of the sturgeon is the well-known caviar.

## HERRING FAMILY (Clupeidae)

### ALEWIFE

*Pomolobus pseudo-harengus* (Wilson)

The alewife is characterized by a row of spiny scutes along the midline of the belly which are strong and sharp and have led to the use of the common name "sawbelly" in some sections. The general range of the alewife is from Nova Scotia and the Gulf of St. Lawrence to the Carolinas. Although the species has become landlocked in the Great Lakes as far as is known it is anadromous in all the waters of Maine.



The spawning runs of the adults begin the latter part of April and the runs may continue on into June. Average length of the migrating adults is 10 inches although they commonly reach a length of one foot. The fish move up to the spawning grounds during daylight hours. Most of the runs are restricted to a few miles although runs of 20 miles are not uncommon. Many times during the end of the run ripe fish coming up to spawn are passing spent fish on their way back to the ocean. Alewives spawn in fresh-water ponds. Females deposit from 60,000 to 100,000 eggs depending on the size. No parental care is given the eggs. In a period averaging slightly under a week the young hatch. They develop rapidly feeding on the minute animals and plants in the water. They descend to salt water throughout the latter part of the summer usually in successive waves at a length of 2 to 4 inches.

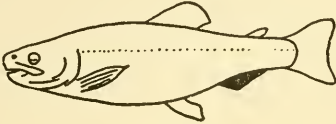
In general the larger the lake available to the young the larger the alewife run. To manage the fishery properly enough adult alewives to continue the run must be permitted to escape the fishery. Obstructions must be provided with fishways so constructed as to permit the free passage up and down of the adults and the downward migration of the young each year. Runs have been reestablished on occasion by planting mature adults.

The alewives are fished in Maine with dip nets during their spawning migrations upstream. Usually the fish are diverted into pools or runways where they are easily dipped and removed.

SALMON FAMILY (Salmonidae)

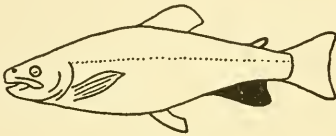
Key to the various species of the salmon and trout family found in Maine

1. Dorsal fin seldom spotted; anal fin longer than high, with 13 or more developed rays ..... 2



Pacific Salmon  
Genus *Oncorhynchus*

- Dorsal fin usually with many black spots in young and adults; anal fin higher than long with 12 or fewer developed rays ..... 4



Atlantic Salmon and Trout  
Genera *Salmo*, *Cristivomer*  
and *Salvelinus*

2. Without black spots; back light blue shading to silvery white below and on the belly; gill rakers long 30 to 40 in number

Kokanee  
*Oncorhynchus nerka* (Walbaum)  
p. 18

- With black spots ..... 3

3. Black spots large; dorsal fin rays 11; branchiostegals 15 to 19, anal rays 19 to 29; caudal peduncle more slender

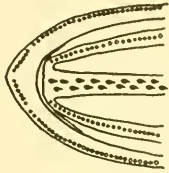
King Salmon  
*Oncorhynchus tshawytscha* (Walbaum)  
p. 17

- Black spots smaller; dorsal fin rays 10; branchiostegals 13 to 14; anal rays 13 to 15; caudal peduncle stout

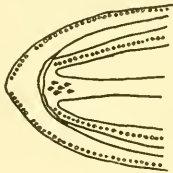
Silver Salmon  
*Oncorhynchus kisutch* (Walbaum)  
p. 17



4. Black or red spots (Atlantic salmon up to two years has a few red spots); vomer (bone in center of roof of upper jaw) with a plane shaft bearing teeth in alternate rows; scales conspicuous . . . . . 5



- Gray or red spots; vomer (bone in center of roof of upper jaw) boat-shaped with shaft depressed, toothed only on anterior end; scales inconspicuous . . . . . 7



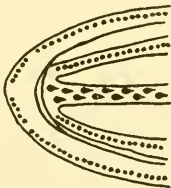
5. Bluish above, sides silvery; many black spots on head, body and fins; vomerine teeth little developed with those on the shaft of the bone few and deciduous



Atlantic Salmon  
*Salmon salar salar* Linnaeus  
p. 19

Landlocked Salmon  
*Salmo salar sebago* Girard  
p. 20

- Vomerine teeth well-developed, numerous and persistent in a double or zig-zag row . . . . . 6



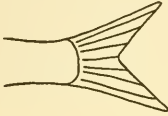
6. General color brownish yellow; usually a few red spots; lower fins pale yellow to white; adipose fin margined with red or orange never with black

Brown Trout  
*Salmo trutta* Linnaeus  
p. 22

Tail heavily spotted, lower fins light in color; adipose fin spotted or margined with black; no red spots. Red stripes on the sides of the body and gill covers in spawning males turning to a faint pink band during other seasons

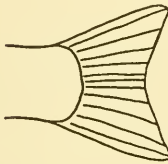
Rainbow Trout  
*Salmo gairdnerii* Gibbons  
 p. 23

7. Tail deeply forked; large whitish spots on background of darker color; no red spots; fins uncolored; general color usually dark gray

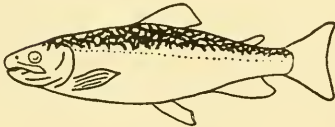


Lake Trout  
*Cristivomer namaycush* (Walbaum)  
 p. 24

- Tail little forked; red or orange spots; no black spots . . . . . 8



8. Wavy, olive worm-like lines on the back



Eastern Brook Trout  
*Salvelinus fontinalis* (Mitchill)  
 p. 25

- No wavy, olive worm-like lines on the back . . . . . 9

9. Back brownish colored; anal fin rays usually 8

Sunapee Trout  
*Salvelinus aureolus* Bean  
 p. 26

- Back dark blue; anal fin rays usually 9 or 10

Blueback Trout  
*Salvelinus oquassa* (Girard)  
 p. 27

## PACIFIC SALMON

### *Oncorhynchus*

At one time or another each of the five Pacific salmon has been introduced into the waters of Maine. At the present time only the silver salmon (*Oncorhynchus kisutch*) is being reared and planted in the streams and lakes. Aside from the large size of the Pacific salmon at maturity the greatest difference between the salmon and trout is one of habit and not structure. For example the Pacific salmon die after spawning. Since we are interested in the fishes found in the fresh waters of Maine it will be convenient to divide the Pacific salmon according to their fresh-water habits.

The first group, the king (*Oncorhynchus tshawytscha*) and the silver salmon (*Oncorhynchus kisutch*) furnish the best sport fishing of the entire group. These two are characterized by the young remaining in fresh water for a year or two.

King salmon, averaging 20-25 pounds in weight and three feet in length, is the largest of the Pacific salmon. These run the streams in the spring and fall with all spawning in the fall. The young remain in the streams for a year or two at which time they are frequently taken for trout by anglers. Migrating to salt water they reach their large size and maturity there, returning at an average age of four years to spawn and die completing their life history. King salmon were planted in Damariscotta Lake and Long Lake in 1940 and in Pemaquid River in 1941. Any of these fish would of course be dead and gone by now. In 1937 adult king salmon were observed migrating down out of Cobbosseecontee Lake for about one-half mile into the outlet where they were stopped by a permanent screen. At about the same time eight dead females examined had recently dropped their eggs. Eggs retained in the ovaries showed that they could develop normal-sized eggs while being confined in this fresh-water lake. Natural reproduction has not been successful when the fish have been confined to fresh water. Best success from king salmon plantings in Maine has been in Swan and Damariscotta Lakes. In these two lakes the king commonly attained a weight of 6 to 10 pounds.

The silver salmon, averaging about 9 pounds and up to 2¼ feet in length, ranks third in size of the Pacific salmon. Silver salmon commonly spend one summer in the stream and two in the ocean. Most of them return when they are three years old. Adults ascend the rivers just prior to spawning and may use rivers that do not have the deep pools necessary to carry over the Atlantic salmon. The Atlantic Salmon Commission of Maine has scheduled plantings of silver salmon in the Ducktrap River, Chandler River, and Tunk Stream. These fish provide excellent sport fishing in the estuaries of the Pacific coast streams, and should provide an additional sport fishery for Maine.

The next two salmon are classified together because their young migrate directly to the sea on hatching, spending little or no time in fresh water. Since

the young migrate on hatching, the spawning runs of these salmon are necessarily of short distances. The pink salmon, *Oncorhynchus gorbuscha*, and the chum salmon, *Oncorhynchus keta*, are usually not considered good game fish but may be persuaded to take a fly when landlocked. While neither of these fish are now present in Maine and there is little likelihood that they will ever be introduced in the future their life histories, out of interest, are included.

The pink salmon, averaging about 5 or 6 pounds and  $1\frac{3}{4}$  feet in length, is the most abundant of the Pacific salmon. They have a two year life cycle with runs occurring in the even and odd years. This is the salmon frequently known as the humpback because of the cartilaginous hump formed during the spawning period. The young spawned in the fall hatch in the spring and go immediately to the sea at a length of one to one and a quarter inches. Curiously enough the small fry migrate downstream only at night. They are rarely observed by day.

The chum salmon, averaging 10 pounds and  $2\frac{1}{2}$  feet in length, ranks as the second largest of the Pacific salmon. The young spawned in the fall hatch in the spring and go immediately to sea. However, unlike the pink salmon which returns after one year in the ocean the chum spends four or five years before they return to spawn and die. Chum salmon were introduced in Maine during 1938 in Damariscotta Lake, Megunticook Lake and in Swan Lake. Gill nets set by the 1941 survey crew in Maine failed to catch any of these fish. It is assumed that the introductions were apparently not successful.

The third and last separation on the basis of fresh-water habits leaves the Kokanee or "sockeye" (*Oncorhynchus nerka*). They are second in abundance along the Pacific coast and average from 6 to 7 pounds in weight. Their average length is about two feet. Ordinarily these fish spawn in the tributaries above a lake and the young on hatching drop back into the lake where they spend up to four years before migrating down to sea. They return to fresh water after two years in the ocean. The Kokanee of all the Pacific salmon has given the best results when landlocked. However, if they are landlocked and forced to complete their life cycle in fresh water, they rarely exceed a foot in length. Spawning normally takes place in the tributaries of the lake but may take place in a shallow gravelly spot if tributaries are not available. They die after spawning whether the life cycle is completed in fresh water or whether they have had a chance to run to the sea. During the spawning period they become vividly colored with olive green heads and blood red sides. In 1944 Kokanee were stocked in Narrows Pond, Damariscotta Lake and Swan Lake and in 1945 in Damariscotta Lake and Swan Lake. Fishermen take the Kokanee or "sockeye" on a fly, with bait, or by trolling.







ATLANTIC SALMON

## ATLANTIC SALMON

*Salmo salar salar* Linnaeus

The Atlantic salmon was originally distributed on both sides of the Atlantic Ocean from Portugal in Europe and from the Hudson River north on this continent. The number of rivers along the Atlantic Coast which the Atlantic salmon originally ran on their spawning migrations varied from 28 to 34.

The majority of the Atlantic salmon enter the rivers in the spring taking advantage of the freshets occurring at this time. Stragglers however continue to run through to October and November. Since most of the adults ascend the streams in early summer a good salmon river must have deep, cool pools for these fish to maintain themselves during the summer months before spawning time. Although the Atlantic salmon do not necessarily die after spawning it is apparent from an examination of the fish running the streams that by far the greater majority of them are "maiden fish" making the spawning journey for the first time. Roughly 90 per cent of the runs each year are fish returning to spawn for the first time. The spawning run is made up of fish from four or five years old although variations from this age occur. Some of the fish running the rivers are much smaller than the others and represent the "grilse" which have remained in the sea for only one year. These grilse are nevertheless sexually mature. The fish spawn from October through November with the peak of spawning during the last week in October. The Atlantic salmon river must have extensive spawning areas of large gravel or rubble in riffles.

The female, ready to spawn, seeks out a suitable area at the head of a riffle or the tail of a pool which will insure a good flow of water over the eggs. The nesting area of a salmon is properly called a redd and each redd is composed of several egg pits. The female digs the individual egg pits by turning on her side and flapping vigorously with her caudal fin and peduncle. The pectoral fins are usually held out to retard forward motion. Digging takes place every few minutes with a rest of 10 to 15 minutes. The male during this time is either attending the female or escorting smaller bucks from the nesting area. The actual act of spawning takes place with the male and the female side by side eggs and sperm being extruded into the egg pit. Natural fertilization is more efficient than was formerly recognized because of the small eddy currents set up in the egg pit. These eddy currents circulate the eggs and sperm insuring fertilization and hold them in the pit preventing them from being washed downstream. The only parental care of the eggs is the covering of the pit with gravel. Much of this covering is done while the female is digging the next egg pit when the gravel is carried downstream to the former pit. The number of pits dug by the female depends on the number of eggs which she may contain and how many she deposits in each pit. The completed redd of an Atlantic salmon may measure from 8-20 feet in length and 2 to 3 feet in width with the eggs buried as deep as 10 inches.

The majority of the adult fish migrate back to the ocean after the spawning act is completed. At this time they are known as "kelts." Occasionally one may linger in the river until spring and migrate then at which time they are commonly called "racers" because they are very thin from lack of nourishment during the winter months after spawning.

The eggs hatch in the pit in from 90 to 120 days depending on the temperature. The yolk is absorbed and they are out of the gravel nest in June or July. The larvae make their way up through the gravel by convulsive wiggling. They remain in the stream as fingerlings or parr generally for two years. Thus a salmon river must have sufficient nursery areas where the fingerlings or parr can find adequate food in the form of aquatic insects and smaller fish and where they will be safest from their enemies. At the end of their period in the stream they begin to drop downstream and also to lose their parr markings. The salmon in this stage are known as "smolts." The average length at this time is from 6 to 8 inches. The smolt reaches the sea where it will spend two growing seasons. Here in the salt water the salmon makes phenomenal growth before returning to the fresh-water rivers to spawn. Their primary food as adults is other fish.

The average length of an adult returning to spawn in Maine is about 2½ feet. At the end of one year they are about 1½ inches, at the end of two years in the stream about 4.3 inches, and at the end of three years in the stream about 6 inches in length.

## LANDLOCKED SALMON

### *Salmo salar sebago* Girard

The landlocked salmon is native to Maine. They were originally restricted in distribution to four widely separated areas; Grand Lake and other lakes on the western branch of the St. Croix River in Washington County; Green Lake or Reed's Pond, tributary of Union River in Hancock County; Sebec Lake, tributary to the Piscataquis and Penobscot rivers in Piscataquis County; and Sebago Lake, tributary to the Presumpscot River in Cumberland County. The landlocked salmon has become widely distributed throughout the state as a result of the stocking program begun as early as 1875.

Landlocked salmon spawn naturally in the tributary streams to the lakes they inhabit. If for one reason or another the mature adults cannot reach the tributaries they may go through the act of spawning on gravelly shoal areas in the lake itself. Hatching from nests made in the lake itself are thought to be inconsequential. The preparation of the redd or nest is very similar to that of the Atlantic salmon already described. Apparently, although the percentage is still low, a greater number of landlocked salmon than Atlantic salmon return to spawn a second time. To date the most that any salmon has been recorded spawning is five times. Three hundred fish examined on a spawning run showed



76 per cent to be first run fish who had never spawned before and the remainder had spawned at least once. As might be expected the bigger fish were those returning to spawn again. The migration of the landlocked salmon, as compared with the Atlantic, is very short rarely exceeding six to eight miles and generally very much less. This may account for the difference in survival of adult fish after spawning is over. The long migration of the Atlantic salmon may account for the higher mortality in this fish.

The landlocked salmon feeds primarily on smelt with minnows, suckers, yellow perch, and aquatic insects making up the diet.

Age and growth data taken from the Maine survey records indicate that the total length in inches and weight in ounces is as follows:

Age Group	III	IV	V	VI	VII	VIII	IX
Length .....	11.4	15.2	18.6	21.0	23.3	21.4	22.7
Weight .....	4.8	14.0	31.9	47.6	67.6	57.2	69.8

The maximum age recorded is nine years. The average age of the landlocked salmon at legal length was four years. Fish four, five and six years old make up the greatest part of the salmon populations available to the fisherman.

## BROWN TROUT

*Salmo trutta* Linnaeus

The brown trout, *Salmo trutta*, originally a native of Europe, has been distributed widely in this country since the latter part of the nineteenth century.

The brown trout migrate to their spawning areas in late summer and spawn from the latter part of October into February. Like the brook trout they select spring-fed tributaries with suitable riffle areas. Brown trout will, however, spawn in deeper water than the native Eastern brook trout. Since the browns spawn in deeper water their spawning run may be shorter than that of the brook trout. The mature females average about 2,000 eggs per fish. In stream populations the spawning migration may be only a few feet, in lake populations several miles and in the sea-run brown trout the migration may be for many miles.

Much interest has centered around the so-called "scotch sea-trout" frequently taken near Orland, Maine. These "scotch sea-trout" are sea-run brown trout. Few people can distinguish between these sea-run trout and the Atlantic salmon. The red spot on the adipose fin of the brown trout, see color plate, may serve as a field characteristic in distinguishing brown trout from young salmon. Tributaries of Alamoosook Lake such as Power House Brook and Gully Brook appear to have a sea-run population and a resident stream population.

Attempts have been made to establish the brown trout in some sections of southern Maine. The absence of adult brown trout in the sampling nets of the Maine survey are at least an indication that the brown trout have not been entirely successful in most of the areas stocked.

The brown trout has become popular as the logical successor to the native Eastern brook trout. Apparently the brown trout's ability to withstand higher temperatures, ranging from 76 to 80 degrees Fahrenheit, together with its greater tolerance of pollution are responsible for the success which it has enjoyed in some states. Best management practices would not introduce the brown trout into drainages occupied successfully by either the Eastern brook trout or the rainbow trout. Brown trout grow rapidly and at the expense of any other species which might be present.

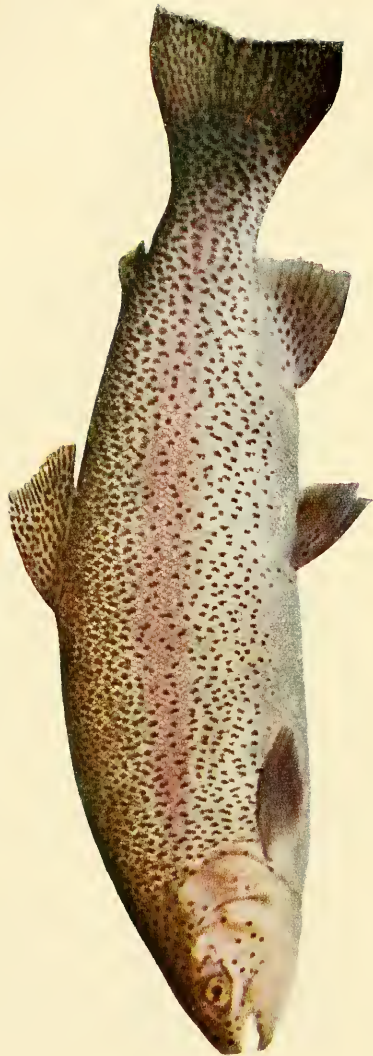
Most trout, including all the species found in Maine, grow much faster and larger when they are in a lake than in a stream. The following total lengths in inches of brown trout give some indication of the age and growth and also allow a size comparison between stream and lake fish.

Age	I	II	III	IV	V	VI
Stream fish	2.5	5.3	8.0	10.7	12.8	14.4
Lake fish	3.1	7.1	11.8	17.7	22.4	25.6

Young brown trout feed on minute animals and small aquatic insects. As they grow older and increase in size they turn more and more to a diet of fish. The larger the trout the more fish he consumes.



BROWN TROUT



RAINBOW TROUT

## RAINBOW TROUT

*Salmo gairdnerii*. Gibbons

The rainbow trout, *Salmo gairdnerii*, was originally distributed along our western coast from southern California to southern Alaska. They have been propagated in hatcheries and planted successfully in most parts of the United States. Much of the rainbows' popularity has been due to the ease with which they adapt themselves to intensive feeding under the crowded conditions found in hatcheries.

Originally the rainbows were anadromous fish returning to fresh water to spawn. For a time taxonomists differentiated between the sea-run rainbow commonly called the "steelhead" and the fresh-water form known merely as the rainbow. Now the two variations are recognized as a single species. One of the chief difficulties in starting a population of rainbows in fresh water is their migratory habits which are apparently greater than the brook or brown trout. It has been shown that they do not spawn successfully in lakes but must have suitable tributaries to spawn in. If they do not find suitable tributaries they will migrate down the inlets where they are lost to the original fishery. Fish screens are hard to maintain and in general very unsatisfactory since the trout would not spawn successfully in the lake anyway.

The rainbow trout, unlike the other trout, spawn in the spring. Rainbows may spawn from February to June. The rainbow is not as choosy as other trout in picking its spawning tributary, consequently they do not always run spring-fed streams but may follow temporary streams which dry up later resulting in a complete loss of the eggs. Mature females average 1200 eggs per fish.

The young in hatching remain in the stream for a varying time some of them migrating down to the lake and some, if conditions are acceptable apparently stay in the stream throughout their life. The food of the young is insects and crustaceans shifting more to fish as adults. However, insects play an important part in their food throughout life.

Average lengths in inches at ages listed are:

Age	I	II	III	IV	V
Total length .....	2.8	7.5	17.4	23.0	26.4

There has been some planting of rainbow trout in Maine but the species is at present rare in the state. They have been reported in the past from Upper Richardson Lake, Oxford County, Kennebago Lake, Franklin County, and Garland Pond, Piscataquis County. Apparently little or no natural reproduction has resulted.



## LAKE TROUT

*Cristivomer namaycush* (Walbaum)

The lake trout, or togue as it is known in Maine, was originally distributed in northern New England. This fish is usually found in large, cold-water lakes where it grows to a huge size, specimens up to 80 pounds in weight having been recorded. Ranking as the second largest of the salmon and trout family, the lake trout is exceeded in size only by the king salmon.

Mainly a lake feeder and spawner, they rarely enter fresh-water streams. Although the adults may be caught near the surface during the spring and fall turnovers, for the most part they are found in the colder, deeper waters of the lakes. Spawning takes place in the fall from late September through November. At this time the fish move into the spawning areas usually off a point over gravelly bottom where there is some wave action. They have been recorded as spawning in depths from a few inches to over 100 feet. At the time of spawning the males and females apparently swim together in groups with a crowding together at the time the eggs are spawned and fertilized. There is no parental care of the eggs which drop to the lake bottom to become lodged between stones and in crevices.

A voracious feeder the lake trout lives principally on such fishes as the smelt and whitefish.

The male lake trout usually is mature by six years of age and the female by seven. Length at maturity varies with the individual lakes ranging anywhere from 15 to 30 inches. The following figures taken from fish from two Maine lakes give the total length in inches for the age listed:

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Age	IV	V	VI	VII	VIII	IX
Moosehead .....	11.0	14.6	16.1	18.4	21.1	22.4
Branch .....	15.4	18.1	20.2	22.7	25.9	

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Lake Trout





EASTERN BROOK TROUT



## EASTERN BROOK TROUT

*Salvelinus fontinalis* (Mitchill)

The brook trout was originally distributed throughout the Great Lakes drainage, northward into Labrador and southward in the Appalachians into Georgia. One of the most attractive of our native fish it has since been distributed all over the country wherever suitable habitats are thought to occur.

The chief limiting factor in the distribution of the brook trout is water temperature. They are the most critical of the trout in this factor. Although they may exist in water temperatures much higher for short periods of time they naturally are rarely found thriving in temperatures much above 65-70 degrees Fahrenheit.

Brook trout are fall spawners seeking out suitable areas in the headwaters near the small, spring-fed tributaries. Here the eggs will be insured of clear, cold well oxygenated water. They are the choosiest of the trout in picking their spawning area. From late September to mid-December spawning brook trout may be observed. Mature females average around 1500 eggs per fish. Brook trout inhabiting lakes run up inflowing tributaries while the stream residents migrate upstream to the spawning areas. Brook trout have been reported as spawning successfully without access to streams in lakes or ponds having the gravelly shores with a seepage of spring water. After the female selects the nesting area she begins to dig the egg pits using the caudal fin and the caudal peduncle. Each egg pit when completed is from one to two feet in width and 6 or 7 inches deep. At the actual time of spawning the male swims along the side of the female both vibrating from side to side. The eggs are extruded and fertilized at this time. Eddy currents set up in the individual egg pits circulate the eggs insuring proper fertilization and preventing the eggs from washing down stream. At this time the eggs are adhesive and as they touch the bottom gravel they adhere to it. Digging activities of the female then cover the eggs with several inches of gravel. The eggs hatch in from one to three months depending on the temperature of the water. When first hatched the prolarvae remain in the gravel feeding on the yolk sac. As the yolk sac becomes absorbed they become more active and begin to work their way out of the gravel nest.

The young fry feed first on larvae and small aquatic insects. Brook trout in Maine lakes feed on smelt, sticklebacks and minnows and to a large extent on surface insects. By far the most important food in Maine lakes is the smelt.

The following total lengths in inches are taken from the Maine Survey reports of the Rangeley Lakes:

Age	II	III	IV	V	VI	VII
Total length in inches . . . . .	8.2	9.6	12.2	15.3	17.9	19.5

## SUNAPEE TROUT

*Salvelinus aureolus* Bean

The Sunapee trout was originally distributed in Maine only in Floods Pond in Otis. It is present at this time in Jordan's Pond on Mount Desert Island, Green Lake and perhaps in Harriman and Branch Lakes.

The Sunapee trout is much like the lake trout in its habits. They spawn in the fall over gravelly areas and apparently at night although in deeper waters they are reported to spawn throughout the day. They make no nest and move around in groups. No parental care has been observed.

Food analysis indicates that the Sunapee trout feeds on smelt, sticklebacks and other salmonids with aquatic insects forming merely a trace of the food.

Age and growth as recorded from 24 specimens from Floods Pond, Green Lake and Jordan Pond is as follows:

Age	II	III	IV	V	VI
Total length in inches . . . . .	6.0	9.8	12.7	16.4	19.5



SUNAPEE TROUT



BLUEBACK TROUT

## BLUEBACK TROUT

*Salvelinus oquassa* (Girard)

The blueback trout was originally distributed in western Maine. In the past they were very plentiful in the Rangeley Lakes. These fish were thought to have become extinct in the Rangeley Lakes in the early 1900's. Although the Maine Survey failed to take the blueback trout from the Rangeley Lakes they are now being reported and identified from Rainbow Lake, Red River District and the Munsungun Lake area.

Past accounts of the blueback trout report them as rarely being seen during most of the year. They appeared each year about the middle of October and migrated into streams to spawn. At this time, since they usually spawned in shallows not too far from the lakes and apparently in great numbers, they were removed in huge quantities by nets and spearing. Reports indicating the number taken range from bushels to cartloads.

While over fishing must have had some importance in the great decline of the blueback in the Rangeley Lakes district some workers contend that the decline of the blueback population coincided with the great increase in the salmon population. They attribute the status of the blueback trout to predation by the landlocked salmon.

Interest in the blueback trout was renewed in the summer of 1948 when a fisherman sent an "unusual" appearing trout to the University for identification. The fish was identified as the blueback trout. Since that time several more specimens have been received.

Although past records on size indicate that the bluebacks were small with the adults running from 6 to 9 inches present 4 year old fish are averaging 12 inches in length and 10 ounces in weight.

During the most of the year the fins are a salmon color with the belly slightly tinged. As the spawning season approaches the fins and the belly become red making a very striking fish.

## WHITEFISH FAMILY (Coregonidae)

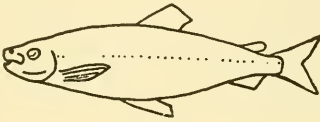
Key to the two species of the whitefish family found in Maine

1. Body nearly cylindrical (chub-like in outline); a single flap between the nostrils



Round Whitefish  
*Prosopium cylindraceum quadrilaterale*  
(Richardson)  
p. 29

- Body compressed (flattened from side to side); a double flap between the nostrils



Lake Whitefish  
*Coregonus clupeaformis* (Mitchill)  
p. 29



## ROUND WHITEFISH

*Prosopium cylindraceum quadrilaterale* (Richardson)

The round whitefish is distributed from New England west through the Great Lakes to Alaska. The whitefish family is close to the trout and salmon in both structural and environmental requirements.

The round whitefish spawn from October to December in the shallow waters of stream mouths. The young possess three rows of dusky spots along the sides. Specimens taken from Moosehead Lake by the Maine survey were from 8 to 14 inches in length.

Their food consists of midge larvae and other small aquatic organisms. They do not take a hook readily and are not classified as a game species.

## LAKE WHITEFISH

*Coregonus clupeaformis* (Mitchill)

The lake whitefish is found in all the Great Lakes and in other inland lakes from the Great Lakes basin to New England and southern Canada. They inhabit the larger and deeper lakes throughout their range.

Lake whitefish spawn in the fall with the peak of spawning coming in early November. They may breed on the shoals of lakes to which they migrate in the fall or they may ascend streams for the same purpose. Males become mature in the third or fourth year and females in their fifth year. The eggs are spawned and fertilized and fall to the bottom where they develop. There is no parental care of the young. After a lengthy incubation period which may extend to as much as 4 or 5 months the eggs are hatched in March or April.

Of the two whitefish in Maine the lake whitefish is the least abundant. Only ten were taken by the survey crew from Moosehead Lake. These fish ranged in length from 13 to 16 inches. The species is reported to reach a weight of 3 to 4 pounds.

The bulk of their food is small crustaceans, aquatic larvae of insects and occasionally small fishes. They are taken infrequently on flies but are not considered a game fish.

## SMELT FAMILY (Osmeridae)

### AMERICAN SMELT

*Osmerus mordax* (Mitchill)

The American smelt is distributed along our Atlantic Coast from Labrador to the vicinity of New York. They have become landlocked in many inland lakes. So far as is known these fresh-water smelts occur as natives on this continent only in New Hampshire and Maine and perhaps in the Lake Champlain basin, the St. Lawrence River and Lake Ontario.

The anadromous smelt running up from the ocean and the landlocked form running the tributaries of fresh-water lakes are one and the same species. Apparently there does exist a race of large smelts which feeds mostly on small fish and a smaller race which feeds largely on plankton or micro-organisms in the water. Most spawning of the smelts occurs in streams although there are records of smelts spawning normally in some lakes. The spawning period extends from late March to early May. Smelt from the larger race, average length 10 inches, usually spawn earlier than the smaller ones, average length 7 or 8 inches. As a rule whether the smelts are migrating from salt water or fresh water their journey upstream is in most cases only a few hundred yards. The actual act of spawning occurs at night in riffle areas in the running water. During the spawning act the male smelt, covered with tubercles, forces the female toward the bottom. About 50 eggs are liberated at each spawning. The eggs are adhesive and stick to the bottom. There is no parental care. The incubation period is around 10 days. The young migrate back to lake or sea in early summer.

Although smelts are recorded up to 13 and 14 inches few are seen longer than a foot.

The smelt, taken during their spawning runs, are of interest for their direct value as food to man and also as a forage fish for the larger cold-water game species, i.e., the landlocked salmon and the lake trout. It seems apparent from an examination of the data compiled by the Maine Fishery Surveys that the Brook Trout from the Rangeley Lakes fed almost entirely on forage fish of which the smelt was by far the most important, with minnows making up the balance. Landlocked salmon were found to be feeding almost exclusively on smelts. The reports conclude by stating that it is a well known fact that the smelt is the chief food of landlocked salmon in Maine lakes.

Smelts, like the trouts and salmons, live in deep, cold water during most of the summer at temperatures generally less than 60 degrees F. There are records which indicate that smelts occasionally school at the surface of lakes during the warm summer months.

SUCKER FAMILY (Catostomidae)

Key to the species of the sucker family found in Maine

- 1. Lateral line wholly lacking at all ages; body oblong; markings consist of narrow, vertical bars in adult; mouth subinferior

Creek Crubsucker

*Erimyzon oblongus oblongus* (Mitchill)

p. 32

Lateral line complete and continuous in adult; body round; mouth inferior or ventral . . . . . 2

- 2. Scales large, less than 80 in the lateral line; snout not pointed

White Sucker

*Catostomus commersonnii commersonnii* (Lacépède)

p. 32

Scales small, more than 80 in the lateral line; snout pointed extending considerably beyond the mouth

Longnose Sucker

*Catostomus catostomus catostomus* (Forster)

p. 33

## CREEK CHUBSUCKER

*Erimyzon oblongus oblongus* (Mitchill)

The creek chubsucker is distributed along the Atlantic drainage from New England south to Virginia.

The breeding season in Maine extends through May and occasionally into the first part of June. During the spawning period the males develop a few prominent tubercles on the head.

Little is actually known about the life history of this sucker. Young are frequently observed schooling and so may play an important part as forage fish.

The food of this sucker consists of insect larvae, aquatic plants and minute crustaceans.

The creek chubsucker is not as abundant in Maine as either the white sucker or longnose sucker.

## WHITE SUCKER

*Catostomus commersonnii commersonnii* (Lacépède)

The white sucker is the commonest and most abundant of the sucker family. It is distributed from Canada to Florida and as far west as Montana. In Maine it is probably one of the most abundant of the large fishes in the lakes and tributary streams.

In Maine the spawning run of the adult fish takes place during the month of May although the period may vary earlier or later depending on seasonal temperature. The spawning runs occur largely at night and are variable in the distance traveled. Many records are available which suggest the possibility that suckers may spawn successfully in lakes. During the breeding season the male develops tubercles on the anal fin, the lower part of the tail and on the upper sides of the paired fins.

Although the runs take place at night actual spawning goes on night and day. No nest is built and no parental care is exercised. Spawning occurs in riffle areas in shallow water. Usually the female is attended by more than one male with the males pressing in on either side of the female. The eggs and milt are released when the posterior of the bodies are vibrated rapidly. After the completion of spawning the adults drop downstream into the lakes or if a resident stream population to the deep pools.

After an incubation period of about three weeks the young are hatched. These young furnish the first fish food and are probably the most important food item for the young of many of the game fish. They continue to be valuable as

a forage fish until they reach sizes of eight inches or more. Suckers are frequently berated by fishermen who claim they are spawn eaters. Actually the suckers who have migrated from lakes are usually not in trout streams until the eggs of the trout have hatched. On the other hand resident stream suckers can eat only the trout eggs which have not been properly covered with gravel and are doomed to death anyway.

The main food of the suckers in Maine lakes is aquatic insects. This may explain the small sizes of the white sucker here in Maine. The average size in the lakes runs from 7 to 15 inches due probably to the scarcity of the bottom fauna in these lakes.

They make good bait and are one of the easiest fish to propagate. If and when laws are established prohibiting bait dealers from seining minnows wholesale from streams the sucker will gain great popularity with the bait dealers forced to raise their live bait.

## LONGNOSE SUCKER

*Catostomus catostomus catostomus* (Forster)

The longnose sucker is distributed from the St. Lawrence and Great Lakes basin westward. This species is not as abundant as the white sucker but ranks second only to the white sucker among the larger fishes in Maine. Fishermen seldom recognize this species as being different from the more common white sucker.

Their breeding migrations coincide in general with those of the white sucker occurring in May and early June. They are taken at greater depths than white suckers. The Maine surveys report this fish as living pelagically in the deeper waters and Lake Superior commercial fishermen report taking them at depths of 600 feet.

The two species of suckers, white and longnose, were found to make up the chief food of lake trout over 5 pounds. The young of the longnose, as the other suckers, are of value as forage fish.

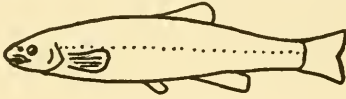
Longnose suckers taken from Maine waters averaged from 8 to 10 inches in total length. The largest specimen obtained was 11 inches in length.



MINNOW FAMILY (Cyprinidae)

Key to the various species of the minnow family found in Maine waters

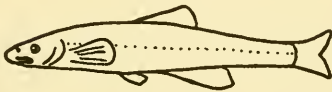
1. Upper lip connected with skin of snout by a bridge of tissue across which the premaxillary groove does not pass ..... 2



- Upper lip separated from skin of snout by a deep groove continuous across the midline ..... 3

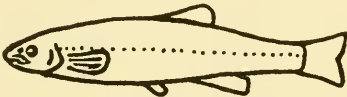


2. Snout projecting far beyond the horizontal mouth



Longnose Dace  
*Rhinichthys cataractae* (Valenciennes)

Snout scarcely projecting beyond the somewhat oblique mouth



Blacknose Dace  
*Rhinichthys atratulus* (Hermann)

3. Maxillary with a barbel requiring care to observe since it is small and often hidden in the groove about the upper jaw, which should be pulled out a little in searching for the barbel ..... 4



- Maxillary without a barbel ..... 7



4. Barbel at or near end of maxillary and always slender

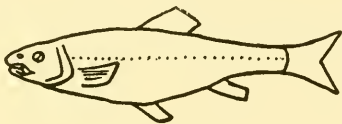


Lake Chub  
*Couesius plumbeus* (Agassiz)

- Barbel on lower edge of maxillary well in advance of posterior end usually concealed in groove between maxillary and premaxillary and often flaplike and obsolescent ..... 5

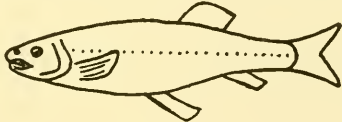


5. Dorsal fin beginning over base of ventral fins; scales large, 45 in lateral line and silvery



Fallfish  
*Semotilus corporalis* (Mitchill)

- Dorsal fin beginning just behind base of ventral fins; scales smaller, about 50 in lateral line and little silver ..... 6



6. A black spot on dorsal fin near front of base, indistinct in young; mouth large, upper jaw extending at least to below front of eye; sides not mottled by specialized dark scales; scales in lateral line fewer than 60

Creek Chub  
*Semotilus atromaculatus* (Mitchill)

- No black spot on dorsal fin; mouth small, upper jaw not extending to below front of eye; sides mottled by specialized dark scales; scales in lateral line about 65-75

Pearl Dace  
*Margariscus margarita* (Cope)

- 7. Lateral line scales more than 60 . . . . . 8
- Lateral line scales less than 55 . . . . . 10

- 8. Lateral line incomplete; more than 80 scales in lateral line
  - Finescale Dace
  - Pfrille neogaea* (Cope)

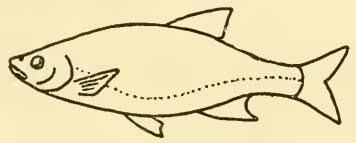
Lateral line complete; scales fewer than 80 in lateral line . . . . . 9

- 9. Intestine short, with a single main loop, and less than twice as long as body; body with a single dusky lateral band
  - Pearl Dace
  - Margariscus margarita* (Cope)

Body with two black lateral bands; intestine elongate, with two cross-wise coils in addition to the primary loops, and more than twice as long as the body
 

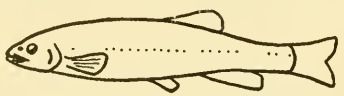
- Northern Redbelly Dace
- Chrosomus eos* (Cope)

- 10. Lateral line much decurved; anal fin falcate; abdomen behind pelvic fins with a fleshy keel over which the scales do not pass

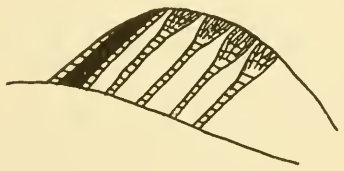


Golden Shiner  
*Notemigonus crysoleucas* (Mitchill)

Lateral line not greatly decurved; anal fin scarcely falcate; abdomen behind pelvic fins rounded over and sealed . . . . . 11

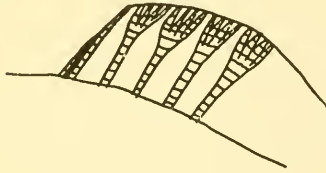


- 11. First dorsal ray more or less thickened, separated by membrane from first well developed ray, and with a thicker coating of adipose tissue; a dark spot, faint in young and some females, at front of dorsal fin near, but not at base; back flattish (these characters conspicuous only in adults)



Fathead Minnow  
*Pimephales promelas* Rafinesque

First dorsal ray a thin splint, closely attached to first well developed ray, and with a thinner covering of adipose tissue; no dark spot at front of dorsal near base; back little flattened . . . . . 12



12. Anal rays 9 to 12, rarely 8

Common Shiner

*Notropis cornutus* (Mitchill)

Anal rays 7 or 8, rarely 9 . . . . . 13

13. Anal rays typically 8; fins smaller, length of depressed dorsal about 1.5 in distance from occiput to dorsal; dorsal usually inserted nearer base of caudal than tip of snout and distinctly behind the pelvic insertion; predorsal scales rather irregularly arranged and 13 to 22 in number

Blacknose Shiner

*Notropis heterolepis* Eigenmann and Eigenmann

Anal rays typically 7; fins larger, length of depressed dorsal about 1.2 in distance from occiput to dorsal; dorsal usually inserted nearer tip of snout than base of caudal, and distinctly over or before pelvic insertion; predorsal scales rather regularly arranged and usually 12 or 13 in number

Bridled Shiner

*Notropis bifrenatus* (Cope)

## MINNOWS

To some the word "minnow" refers to any small fishes. In reality the name should be used in reference to the largest family of fresh-water fishes both in number and in species, the Cyprinidae. The largest minnow in Maine is the fall-fish, (*Semotilus corporalis*).

Despite the large numbers of genera and species most of the North American forms are built on the same essential pattern and thus are very hard to tell apart even with a thorough knowledge of the technical keys.

The minnows as a group occupy a great variety of habitats occurring in all types of waters whether lakes, ponds or streams. Some of their habitats include clear waters, silty or even bog waters, quiet pools or rapidly flowing riffles over sand, mud or gravel bottoms. They vary greatly in their food habits with some as insect eaters, some algae feeders and others are omnivorous.

Spawning migrations are limited with no species moving more than a short distance upstream or beyond the shoals of a lake. All are spring or summer spawners. Their incubation periods usually take less than 18 days. The breeding males are often conspicuous for the tubercles on the top of the head and on the fins. These are used in "butting" other males or intruders and for holding the female during the spawning act. During the spawning season the males frequently develop breeding colors which are greatly reduced or absent during the remainder of the year. Some of their spawning habits include making their nests under boards, stones and other objects with the male guarding the nest. Others build nests which take the shape of depressions in the gravel, or of ridges or piles of gravel on the stream bed. Others may scatter the eggs without the preparation of any nest. In some the males guard the nests and in others they leave the eggs immediately after spawning.

Young minnows are usually more slender than the adults and often possess a black lateral stripe and tail spot not possessed by adults.

Since the minnows are small they are rarely used as food by man. Their great importance in fisheries comes from their position in the food chain as one of the most efficient agents in the transformation of insignificant aquatic food into sizeable food for larger game fishes. As forage fish they serve in many cases as a buffer saving the small game fishes. Numbers of game species are largely conditioned upon the permanent stock of minnows.

## CATFISH FAMILY (Ameiuridae)

### BROWN BULLHEAD

*Ameiurus nebulosus* (LeSueur)

The brown bullhead is distributed from North Dakota into New England, southward to the northern part of the Ohio Valley, and along the Atlantic Coast to Virginia. These fish are commonly found in the weedy waters of lakes and sluggish streams. Young and adults are largely nocturnal in their habits increasing in activity with the approach of darkness.

The brown bullhead spawns in the spring sometime in May or June although ripe females are frequently taken after that date. Nests are usually found near some shelter over sandy bottoms in shallow bays in water from 6 inches to 2 feet in depth. The adhesive eggs, a cream color, are laid in masses similar to those of the frog. The incubation period lasts on an average of 3 to 5 days depending on the temperature. One or both of the parents remains to guard the eggs and young. Besides warding off any intruders the parents are supposed to fan the eggs. Observers report that in some cases the eggs are sucked into the mouth of the parent and then blown out again. It is presumed these operations serve in aerating the eggs as well as keeping them clean. The parent fish remain with the schools of young until they reach a length of 1 to 2 inches. The young remain together throughout the first summer and may be found in relatively shallow waters invariably in vegetation or other suitable shelter and usually over more or less muddy bottom.

The first food of the young bullheads is entomostraca. As the fish grow larger the size of organisms eaten increases through the larval stages of aquatic insects. The stomachs of 44 bullheads from Maine waters contained mostly algae and other plant remains, fish remains, bryozoans, and aquatic insects. They are commonly taken a foot in length and up to a foot and a half rarely.

## PIKE FAMILY (Esocidae)

### CHAIN PICKEREL

*Esox niger* LeSueur

The chain pickerel is distributed from New Brunswick to Florida and southwest to Texas. Within the limits of its distribution it is commonly found in quiet, weedy waters. The pickerel is one of the four abundant warm-water game fishes in Maine.

Chain pickerel are one of the first fishes to spawn in the spring when the temperature reaches the vicinity of 47 F. The pickerel makes no nest merely broadcasting the eggs in shallow water over the remains of dead vegetation



usually in swampy or marshy areas. The females are usually attended by several males all of whom lash their tails as the milt and eggs are spawned. No attempt is made to guard the eggs which are adhesive and cling to whatever they happen to fall upon. After a period of a week to two weeks, depending on the temperature, the young pickerel hatch.

Small pickerel can be seen throughout the summer along the shallows near shore.

The pickerel are well known as predaceous fish with an undisputed piscivorous diet. They have been accused of eating most anything including frogs, snakes, ducklings, mice and muskrats. They are solitary feeders lying motionless in wait for their prey and then capturing it in one quick lunge. The important food of the pickerel in Maine is the yellow perch, white perch, and minnows. These are the fish with which the pickerel is ecologically associated.

Two pound fish are common with a few taken weighing up to three and one-half pounds.

Where the pickerel and other warm-waters species have increased there follows logically a reduction in the numbers of the more desirable cold-water species.

## EEL FAMILY (Anguillidae)

### AMERICAN EEL

#### *Anguilla bostoniensis* (LeSueur)

The American eel is easily recognizable from all the other fishes of Maine with the possible exception of the lamprey eel. However, the American eel with its true jaws is readily distinguished from the lamprey eel possessing the oral sucking disk. The American eel is distributed throughout eastern North America.

The spawning migration of the fresh-water American eel has attracted the attention of natural historians for many years as one of the most unusual of the natural phenomena. Most fishermen have observed the fall, downstream migration of the eels particularly obvious in the fishways. Again in the spring of each year they have noted the upstream migration of millions of elvers three to four inches in length and slightly smaller than the diameter of a pencil. The elvers migrating up the stream are thought to be the females while the males remain behind in the estuaries. Both sexes feed voraciously during their stay in fresh water which may extend anywhere from five to twenty years. When the adults reach sexual maturity they grow darker, lose their voracious appetites and begin their downstream migrations. Their destination is somewhat southeast of Bermuda in the Sargasso sea in the warmest waters of the North Atlantic.



Here they spawn and die. When first hatched the small eels are known as leptocephali shaped in the manner of a leaf and transparent. These larval eels reach the coast of United States in autumn of their first year, attain their full larval development that winter and are ready to move up the rivers in the spring as elvers.

The eel has earned the reputation of being the most voracious of all flesh-eating fishes. Females commonly reach a length of three or four feet and occasional large ones are taken six feet in length. The males average smaller.

## KILLIFISH FAMILY (Cyprinodontidae)

### EASTERN BANDED KILLIFISH

*Fundulus diaphanus diaphanus* (LeSueur)

The range of the fresh-water killifish extends along the eastern coast of United States from South Carolina north to the Maritime Provinces and into the eastern parts of Pennsylvania and New York. Fishermen frequently refer to this fish as a minnow but the teeth on the jaws serve to distinguish it from the minnow family. It is a typical lake fish found mostly in the shallow areas. In Maine it is accepted as the most abundant small fish in the shoal areas of the lakes where it may be encountered in large schools. Killifish may be found in quiet rivers.

The peak of their spawning comes towards the end of July. During the spawning period the males take on a bright coloration. Schools of these fish may be observed swimming back and forth in shallow water. They appear to prefer aquatic vegetation in the spawning area. No nest or care of the young is practiced by the adults.

Since the killifish rarely strays into water much over a foot the fish that may prey on them are narrowed to the young of game fishes who frequent the shallows in search of food.

## COD FAMILY (Gadidae)

### BURBOT

*Lota lota maculosa* (LeSueur)

The burbot, sole representative of this marine family found in fresh water, can be easily distinguished from other fishes in Maine and in fact all fresh-water fishes by the single, prominent barbel on the underside of the chin near its tip. Distribution extends from Labrador south to the southern New England states, Great Lakes Basin and westward to the Missouri River basin, and the Columbia River. It is commonly found in deep, cool lakes in association with the lake trout and occasionally in cool streams in the riffle areas when young and in deep pools as adults.

A winter spawner the burbot has usually completed spawning by the time the ice is gone. Burbot have been observed spawning in the riffle areas of streams and the young have been observed in the streams. The fact that many newly hatched young are found on the shallow, sandy bottoms of lakes indicates that some burbot may spawn in lakes.

Burbot or cusk were taken from all parts and at all depths of Moosehead Lake, Maine. There is considerable competition between the cusk and togue in Moosehead Lake since both eat smelts and the larger members of both species feed on the larger suckers.

A size of three pounds is considered large in Maine waters although records from other sections of the country record lengths up to 30 inches and weights of 10 pounds.

## BASS FAMILY (Serranidae)

### WHITE PERCH

*Morone americana* (Gmelin)

The white perch, a member of the true bass family, is ordinarily found in both fresh and brackish waters along the Atlantic coast, sometimes, as in Maine, becoming landlocked in fresh water. The white perch is one of the four abundant warm-water game species in Maine and in some regions may well be the most important game fish.

Spawning takes place in June with some of the fish spawning along the shoreline and some entering the inlets. The eggs are very adhesive and stick together in masses or to any object on which they chance to rest. This adhesiveness makes it very difficult to propagate the species artificially. As young fish they swim about in large schools cruising over shallow areas of the lakes. The older fish exhibit a definite nocturnal migration into the shallow areas of lakes. During the day for the most part they are taken in deeper waters from 10 to 20 feet.

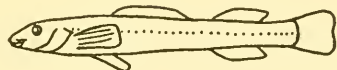
Studies on the food habits of the white perch in Maine indicate that roughly 60% of the food is made up of aquatic insects and 26% of a fish diet composed largely of smelt, yellow perch and white perch.

Perch over 10 inches in length may be found in most Maine lakes although fish much larger are not as common. Fish up to 14½ inches have been taken weighing over two pounds. Fish around 10 inches in length weigh about one-half pound and in most cases are 10 years old. Prized fish of over a pound are from 12 to 15 years of age. As compared to other fishes they have a slow growth rate. Like other warm-water species they tend to produce more than the productivity of the water can support. The result is stunted populations consisting of great numbers of fish but all of small size.

PERCH FAMILY (Percidae)

Key to the three species of the perch family found in Maine

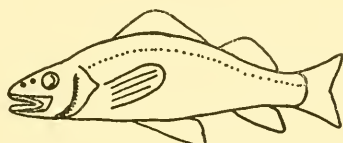
1. Preopercle with smooth edge; mouth small; small fishes not exceeding 4 inches



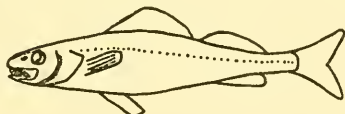
Fusiform Darter  
*Hololepis fusiformis* (Girard)  
p. 44

- Preopercle strongly serrate; mouth large; fishes of medium to large size .....

2

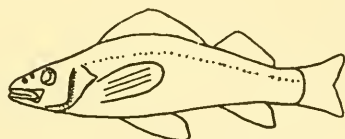


2. Canine teeth; crossbands indefinite or not apparent



Yellow Pikeperch  
*Stizostedion vitreum vitreum* (Mitchill)  
p. 44

- Canine teeth absent; body with definite crossbands



Yellow Perch  
*Perca flavescens* (Mitchill)  
p. 45

## FUSIFORM DARTER

*Hololepis fusiformis* (Girard)

This small darter, collected in the coastwise streams of Maine, has a general distribution extending from Maine to Texas. Although most darters prefer clear, running water the fusiform darter is taken in sluggish, lowland streams and mudholes among the vegetation.

The common name darter has been given this group of fishes because of their habit of darting swiftly when pursuing their prey or escaping from their predators. Normally they rest on the bottom poised on their large pectoral fins ready to dart away at the slightest disturbance.

Spawning takes place in the spring with the eggs left unguarded on the bottom. Young and adults feed on entomostraca.

## YELLOW PIKEPERCH

*Stizostedion vitreum vitreum* (Mitchill)

The yellow pikeperch or walleye pike is distributed from southern Canada to southern Alabama and Georgia ranging along the Atlantic coast to North Carolina. It is found in the Great Lakes region where it reaches its greatest abundance in Lake Erie. In Maine Great Pond of the Belgrade Lakes provides the greatest abundance of this species.

The yellow pikeperch is the largest member of the perch family being on record at over three feet in length and up to 15 or 18 pounds. Average fish taken by angling or spearing runs from 1 to 4 pounds.

Best habitat for this species is apparently where it has a wide range in lakes several miles in length. It is a fish of clean, cold water lakes entering larger rivers in the northern part of its distribution. During the summer months of the year it seeks the cold water and is taken at great depths. During the spring and fall they are found in shallower water and are taken by still fishing with live bait, by spearing, and by trolling or casting.

They may be found on their spawning grounds as the ice is leaving the lakes with a range of water temperature from 38 F. to 50 F. Spawning takes place in tributary streams in the riffles or on shallow gravelly reefs of the lake itself. Ordinarily the males precede the females to the spawning grounds. The females carry up to from 200,000 to 300,000 eggs. No nests are built so that the adhesive eggs are left to themselves uncovered and unguarded. Since the temperature of the water is low the young hatch in from two to three weeks.

Young walleyes are very voracious feeding readily on each other or other small fish. The diet of the adults is almost exclusively other fish although they will take crayfish and aquatic insects.

## YELLOW PERCH

*Perca flavescens* (Mitchill)

The yellow perch is distributed from southern Canada to the Carolinas and westward to the upper Mississippi valley. They may be found along the Atlantic drainage from Nova Scotia to South Carolina.

The yellow perch is one of the four most important warm-water game fish in Maine. The preferred habitat is a warm, weedy lake with the young being found in the shallows and the adults in deeper water.

Like the rest of the perch family the yellow perch spawns in the spring, usually in early May, when the water temperature ranges from 45 F. to 55 F. The spawning period may last from 2 to 4 weeks. Yellow perch make no nest and do not guard the eggs after they are spawned. The eggs of the perch are unique among fresh-water fishes since they are laid in hollow, ribbon-like bands which swell considerably upon contact with the water. In some cases these ribbons may be as long as eight feet. Many of the eggs and egg masses are eaten by predators or destroyed when the water dries up or they are washed ashore. Although spawning has not as yet actually been observed it is believed that most spawning occurs over weedy areas since the egg masses are frequently observed entwined among aquatic plants or submerged aquatics. Number of eggs produced depends on the size of the fish varying from 10,000 to 45,000.

The young fish hatch in three weeks depending on the water temperature. These small fish remain in schools usually among the aquatic vegetation.

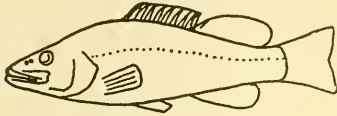
Yellow perch are voracious carnivores preferring a diet of fish but eating a considerable amount of aquatic insects. The food of the yellow perch is quite similar to that of the white perch with the exception that the yellow perch feeds more on other fish than insects and the white perch feeds more on insects than fish.



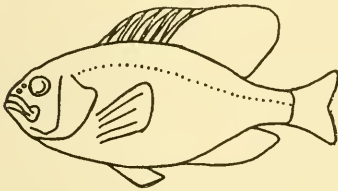
SUNFISH FAMILY (Centrarchidae)

Key to the species of the sunfish family found in Maine

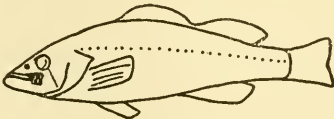
1. Body long, the depth being about one-third the length; dorsal fin deeply notched between the spinous and soft-rayed portion; scales small, 58 or more in lateral line ..... 2



- Body short and deep, its depth usually more than two-fifths the length; dorsal fin not deeply notched between the spinous and soft-rayed portion; scales large, 53 or fewer in lateral line ..... 3



2. Upper jaw not extending beyond eye; notch between spinous and soft-rayed dorsal not deep; scale rows on cheek from 15 to 18; pyloric caeca single



Smallmouth Bass  
*Micropterus dolomieu* Lacépède  
p. 48

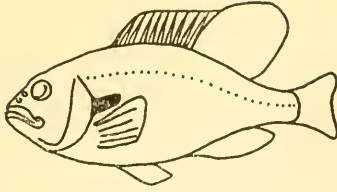
- Upper jaw extending beyond eye; notch between spinous and soft-rayed dorsal deep; scale rows on cheek from 10 to 11 rows; pyloric caeca forked



Largemouth Bass  
*Micropterus salmoides* (Lacépède)  
p. 48

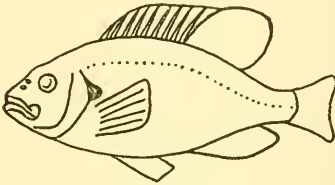


3. Ear flap elongated, dark



Yellowbelly Sunfish  
*Lepomis auritus* (Linnaeus)  
p. 49

Ear flap short, with vermillion tip present.



Pumpkinseed  
*Lepomis gibbosus* (Linnaeus)  
p. 49

## SMALLMOUTH BLACK BASS

*Micropterus dolomieu* Lacépède

The original distribution of the smallmouth bass included the Great Lakes, St. Lawrence drainage, upper Mississippi, Ohio and the Tennessee River systems. It has since been introduced throughout New England.

In the northern part of its range the smallmouth prefers large, clear water lakes. In the southern portion of its range it may be found commonly in streams. Adults are usually not abundant in streams less than 35 feet in width although the young may be found in creeks of smaller size.

Spawning time depends largely on the temperature of the water usually taking place at temperatures between 59 F. and 65 F. Depending on the geographic location this may run from the latter part of April through the first part of June. The male makes a nest out of carefully cleaned gravel. After persuading a female to enter the nest and spawn the male guards the eggs during the incubation period and the young for several days after hatching. The period of incubation may run from 2 to 9 days depending on water temperature. On an average the males mature at an age of three years and at a length of 9 inches. Females mature at an age of four years and at a length of 11 to 12 inches. Seasonal migrations for spawning may be up a tributary stream or merely from deep to shallow water. A stream may have a resident population and a lake run population, with the lake population entering the stream only during the spawning season.

The first food of the smallmouth bass is composed of minute animals graduating to larvae and other small aquatic insects. At a length of 1½ inches the young bass begin to feed on insects and small fishes. With an increase in age and size they turn more and more to a diet of fish and less to the insects. A bass over 10 inches feeds mostly on crayfish and other fish.

## LARGEMOUTH BLACK BASS

*Micropterus salmoides* (Lacépède)

The largemouth was originally distributed from Canada southward to Florida and Mexico east of the Rockies. It has much the same distribution as the smallmouth but the limits of the range of the largemouth do not extend quite as far north and run further south.

Growing well in small areas the largemouth may be found in sluggish streams or weedy bays or ponds where the water may be stained or even muddy. Temperatures as high as 80 F. to 90 F. may occur in the habitat.



SMALLMOUTH BLACK BASS



Spawning habits of the largemouth are not nearly as restricted as those of the smallmouth. Largemouth bass will spawn over muddy bottom which makes them more successful in some waters. Nesting and spawning habits are very similar to the smallmouth. The largemouth matures at lengths of 10 to 12 inches and at an age of three or four years. They exhibit a faster growth rate than the smallmouth. Spawning takes place during the months of May and June and in northern sections may extend into July. The young hatch in a few days depending on the temperature. They behave in a manner similar to the smallmouth with the exception that the young remain in the school for a longer period and the male continues to guard them for a longer time. The first year of their life they spend in weedy shallow areas.

Food of the adults is similar to the smallmouth with more of a leaning towards fish. They are more frequently caught in the winter than the smallmouth.

## YELLOWBELLY SUNFISH

*Lepomis auritus* (Linnaeus)

The yellowbelly sunfish is distributed from Maine to Florida and Louisiana with the greatest abundance being east of the Alleghenies and south of New York. This is one of the two species of "sunfishes" which are widely distributed in Maine. It is far outnumbered by the common sunfish or pumpkinseed. Since it rarely reaches a length much over 6 inches it is little sought after by fishermen.

Like the other members of the sunfish family the yellowbelly sunfish prepares a nest in shallow water easily recognized since it is an evenly scooped out hollow with gravel in the center. The nests average about 12 inches in diameter. The males begin to make these nests during the period of the first two weeks in June depending on the temperature which should be up around 65 F. or 70 F. The male escorts the female into the nest where after a few minutes' courtship the eggs are spawned and fertilized. The adhesive eggs drop to the bottom of the nest among the gravel. The male attends the eggs and the young for a short period.

The yellowbelly sunfish does well in warm-water lakes where the aquatic vegetation is relatively thick. They are commonly associated with the common sunfish and yellow perch.

## PUMPKINSEED

*Lepomis gibbosus* (Linnaeus)

The pumpkinseed is distributed from southern Canada south to the Gulf States. It is common in the Great Lakes region. Schools of the pumpkinseed may be found swimming around weedy areas or over and around rocky bottoms. They seem to prefer weedy lakes and ponds containing warm waters.

Spawning time of the common sunfish may be anytime within a period extending from the first of June until the beginning of August. The peak of spawning comes either at the end of June or the beginning of July. Like the yellow-belly the nests are built in colonies by the males. These nests are constructed in shallow water and may be made over mud, gravel or sand. After the nest is completed the male lures the female into the nest and spawning takes place, the fertilized eggs dropping to the bottom. The male guards the eggs preventing their destruction by small fishes.

The food of the common sunfish in Maine has been reported as molluscs, terrestrial insects and plant material. Most of the food is bottom fauna with snails making up a large portion.

Size of the pumpkinseed in Maine varies from 6 inches to 10 inches. A small boy's fish the pumpkinseed is little sought by the anglers of Maine.

## FRESHWATER SCULPINS (Cottidae)

*Cottus cognatus* Richardson

The freshwater sculpin or slimy muddler is distributed from southern Canada into the Great Lakes drainage and east of the Alleghenies. Ordinarily the freshwater sculpin is a bottom dweller found in gravelly areas. They are most frequently observed in riffle areas of cold trout streams or at great depths in cold-water lakes.

They spawn in the spring attaching the fertilized eggs in clumps under stones. The male guards the eggs until they hatch.

Food of the sculpin has been listed as aquatic insects, small fish and algae. The sculpins are frequently accused of feeding on trout eggs. This point needs further investigation and proof. Many of the trout eggs which a predator such as the sculpin could obtain would be trout eggs not properly covered and doomed to destruction at any rate.

The sculpins themselves furnish food for the lake trout and burbot.



## STICKLEBACK FAMILY (Gasterosteidae)

Key to the species of the stickleback family found in Maine

1. Three free dorsal spines



Threespine Stickleback  
*Gasterosteus aculeatus* Linnaeus

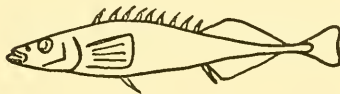
Free dorsal spines 5 to 11 ..... 2

2. Free dorsal spines 5 or 6



Brook Stickleback  
*Eucalia inconstans* (Kirtland)

Free dorsal spines 8 to 11



Ninespine Stickleback  
*Pungitius pungitius* (Linnaeus)

The threespine stickleback and the ninespine stickleback may be found in both salt and fresh waters. The brook stickleback is only found in fresh water. Since the sticklebacks have little economical importance their habits and life histories will be considered together.

The sticklebacks are fishes of quiet, cool waters. Their spawning season comes in the spring in May and June. Their spawning is interesting inasmuch as the male builds a small nest about the size of an English walnut among the aquatic vegetation. The nest is a hollow spherical or cylindrical mass of grass and small twigs, bound together by the secretions from a modified portion of the kidney of the male. The nest is constructed in quiet water where the flow is very slow and constant. Luring a female into the nest where she lays a few eggs the male follows and fertilizes them. As fish go the sticklebacks lay only a few eggs generally less than a hundred. The male guards the eggs with a very belligerent attitude readily attacking fishes much larger than he. The young are guarded for a short time after hatching.

Sticklebacks feed on smaller invertebrates, small fish fry and are accused of eating the spawn of other fishes.

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