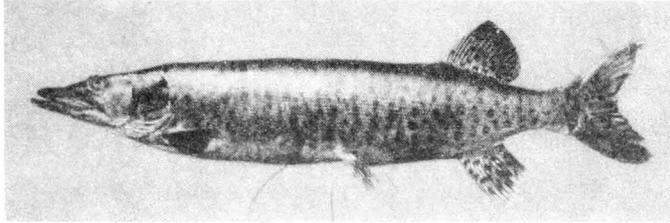


# THE TRUE PIKES

by Ernest G. Karvelis



The true pikes are members of the family Esocidae and of the genus, *Esox*. The following species are found in North America: muskellunge (*Esox masquinongy*), northern pike (*Esox lucius*), chain pickerel (*Esox niger*), redfin pickerel (*Esox americanus americanus*), and grass pickerel (*Esox americanus vermiculatus*). These common and scientific names are those recommended in 1960 by the Committee on Names of Fishes of the American Fisheries Society.

The pikes are known by various popular names. The muskellunge is known locally as masquinonge, musky, Great Lakes muskellunge, northern or tiger muskellunge, and Ohio or Chautauqua muskellunge. The northern pike is also called the great northern pike, pickerel, pike, and jackfish. The chain pickerel goes under such names as eastern pickerel, jack, and green pike; the redfin pickerel is known as the banded, barred, trout, or bulldog pickerel; and the grass pickerel is also known as the mud or little pickerel.

Other fish belonging to entirely different families unfortunately have "pike" or "pick-

erel" in their names. The varied popular names have caused considerable confusion. The true pikes (fig. 1) are readily identified by the following characteristics: they have slender bodies, which are deepest near the middle and taper backward to a slender caudal peduncle; the dorsal fin is posterior, opposite, and similar to the anal fin; the pectoral fins are small and inserted low. The ventral or pelvic fins are posterior and the caudal fin is well forked. No fins have spines. The head is long with a prolonged ducklike snout. The lower jaw contains strong, sharp teeth of various sizes. The roof of the mouth carries broad bands of fine, sharp, closely packed teeth. The tongue also has a band of small teeth.

All members of the pike family are predacious. They feed principally on fish, but include an occasional small muskrat, mouse, duckling, or frog in their diet. They consume enormous quantities of food throughout the year. It has been estimated that between 10 and 15 pounds of food are required to add 1 pound to any member of the pike family.

The pikes dwell in lakes, ponds, and streams, and are spring spawners. The eggs are broadcast over the vegetation in shallow waters,

Note.--Ernest G. Karvelis, Fishery Research Biologist, Bureau of Commercial Fisheries, Fish and Wildlife Service, U.S. Department of the Interior, Ann Arbor, Mich.

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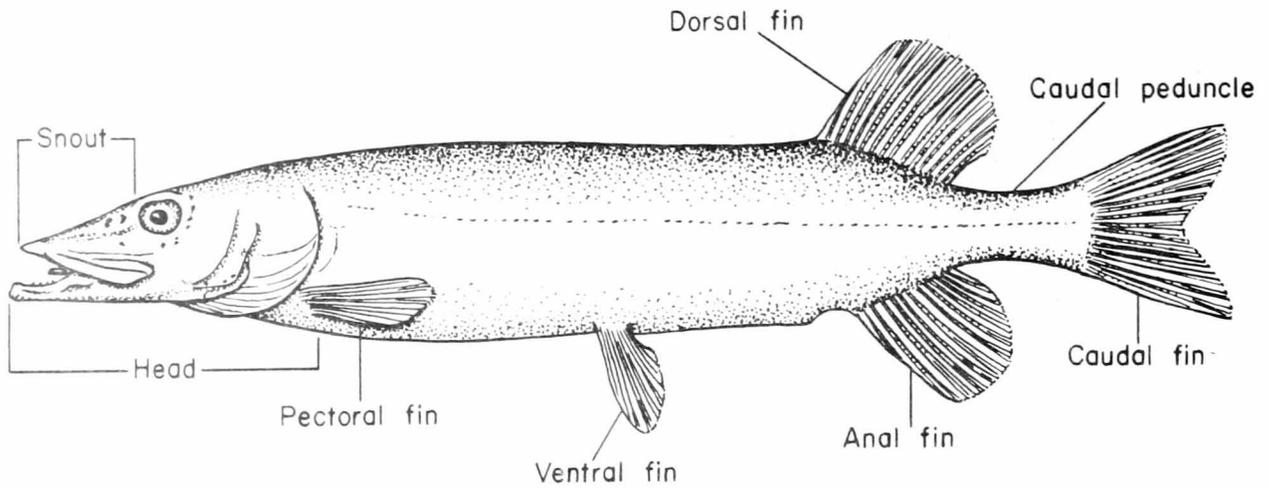


Figure 1.--Typical pike. [Illustration by Suzanne Runyan.]

usually in marshy areas. The eggs and fry receive no parental care.

Members of the pike family have been propagated artificially for a number of years. It is a costly process because of the cannibalistic tendency of the fish and their requirement for live food. The muskellunge and northern pike are the species generally propagated.

The method used is to extrude the eggs from the female and then fertilize them. The fertilized eggs are placed in a deep, round-bottom glass jar. Water is introduced at the bottom with sufficient force to keep all the eggs moving. When the fry hatch, they are carried out of the jar by the force of the water. They are collected and immediately placed in ponds.

The ponds have been prepared for the young fish by making sure that no other fish are present and that zooplankton is abundant for food. Soon after the pike or muskellunge fry are placed in the ponds the fry of suckers or minnows are put in for the pike fry to eat. The young fish grow rapidly and therefore require a large amount of live fish of proper size.

The ponds are constructed so that they can be drained and the young fish removed. They

are then stocked as needed. This method of propagating fish is expensive; it is the only method so far devised, however, that will regularly produce fish for stocking.

All members of this family excepting the redbfin pickerel and grass pickerel are important game fish. In some areas the northern pike is taken commercially.

The edible qualities of the pikes vary. Some species are considered more desirable than others. In general, the flesh is firm, white, and has a pleasant flavor. Numerous finely forked bones scattered throughout the flesh, however, make the smaller individuals difficult to eat.

The pikes are known to hybridize. When they do, they produce offspring which seem to be intermediate to the parents.

The following key is provided to aid in the identification of members of the pike family. To use the key, determine whether 1A or 1B agrees with the structure of the fish under examination. If 1A agrees, then refer to the numbers at the right, and compare the specimen with characteristics under 2A and 2B. If the fish matches the description under 2B, it is a chain pickerel; if not, refer to 3A and 3B. Similarly, if the fish under examination agrees with 1B, then refer to 4A and 4B for final identification.

- 1A Opercles wholly scaled, figure 2A . . . . . See 2A or 2B
- 1B Opercles scaleless on lower half, figure 2B and 2C . . . . . See 4A and 4B
- 2A Side and back marked with dark, wavy, vertical streaks; lateral line scales usually fewer than 110; branchiostegal rays 11-13 (fig. 3); small fish, seldom reaching a length of more than 14 inches . . . . . See 3A or 3B

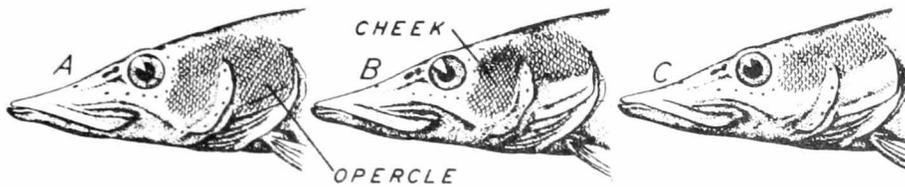


Figure 2.--Heads of members of the pike family, showing approximate extent of scale formation on cheeks and opercles (gill covers). (A) cheeks and opercle wholly scaled, grass pickerel; (B) cheek fully scaled, upper half of opercle scaled, northern pike; (C) cheek and opercle both scaled only on upper half, muskellunge. [From Hubbs and Lagler "Fishes of the Great Lakes Region."]

- 2B Sides and back marked with a dark network to give a chainlike appearance; lateral line scales approximately 125; branchiostegal rays 14-16; larger fish to 2 feet long . . . . . Chain pickerel (*Esox niger*)
- 3A Snout short (fig. 1), 2.8 to 3.1 times in the length of the head . . . . . Redfin pickerel (*Esox americanus americanus*)
- 3B Snout longer, 2.5 to 2.7 times in the length of the head . . . . . Grass pickerel (*Esox americanus vermiculatus*)
- 4A Markings in form of light spots; branchiostegals usually 14 to 16 (fig. 3); sensory pores of head large, typically 5 on each side of mandible (fig. 3); cheek fully scaled (fig. 2B). . . . . Northern pike (*Esox lucius*)
- 4B Markings in form of dark spots or bars or absent; branchiostegals 16-19; sensory pores of head minute, usually 6 to 9 on each side of mandible; cheek usually scaleless on lower half (fig. 2C). . . . . Muskellunge (*Esox masquinongy*)

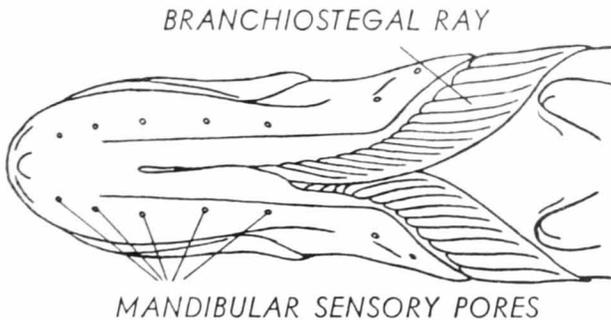


Figure 3.--Lower surface of head of northern pike showing 15 branchiostegal rays on left side (upper in figure) and 5 sensory pores on each side of mandible (lower jaw). [From Hubbs and Lagler "Fishes of the Great Lakes Region."]

### MUSKELLUNGE

The muskellunge is the largest member of the pike family. It reaches a length of over 5 feet and a weight in excess of 60 pounds. The average length of muskellunge taken by fishermen is from 33 to 44 inches, and the mean weight ranges from 10 to 21 pounds. The average size varies with lakes and localities.

The muskellunge is not fished commercially and is considered a fine game and food fish. It is usually caught by casting or trolling with large spoons or other active lures. Large, live minnows or suckers are also used for bait.

In the major fishing areas in North America the muskellunge is managed intensively. It is generally protected during the spawning season and has minimum size and creel limits.

The identifying characteristics of the muskellunge are as follows: the lower half of each cheek and each opercle scaleless (fig. 2C); the body color variable--typically olive to brown, dorsally; sides silvery-gray to light yellow-green with scattered dark spots or bars; ventral surface pale yellow or white; fins dark spotted; no white spots or chainlike reticulations.

The ideal habitat for the muskellunge is in cool, weedy, shallow waters of lakes, and to a lesser extent the slow-water areas of streams. It is found occasionally in deep, almost weed-free lakes.

The muskellunge is the most varied of all of the pike family as to color and spawning time. These variations are characteristic to three distinct regions, but the differences are not great enough to justify naming of subspecies. The muskellunge can be divided into

three groups on the basis of these regional differences.

The first group is known as the Great Lakes muskellunge. It is commonly marked with dark spots on a light background. It spawns from mid-May to mid-June. It inhabits both lakes and streams. This group is found in the Great Lakes, St. Lawrence River, and some of the inland waters of Michigan, Ontario, and southwestern Quebec (fig. 4).

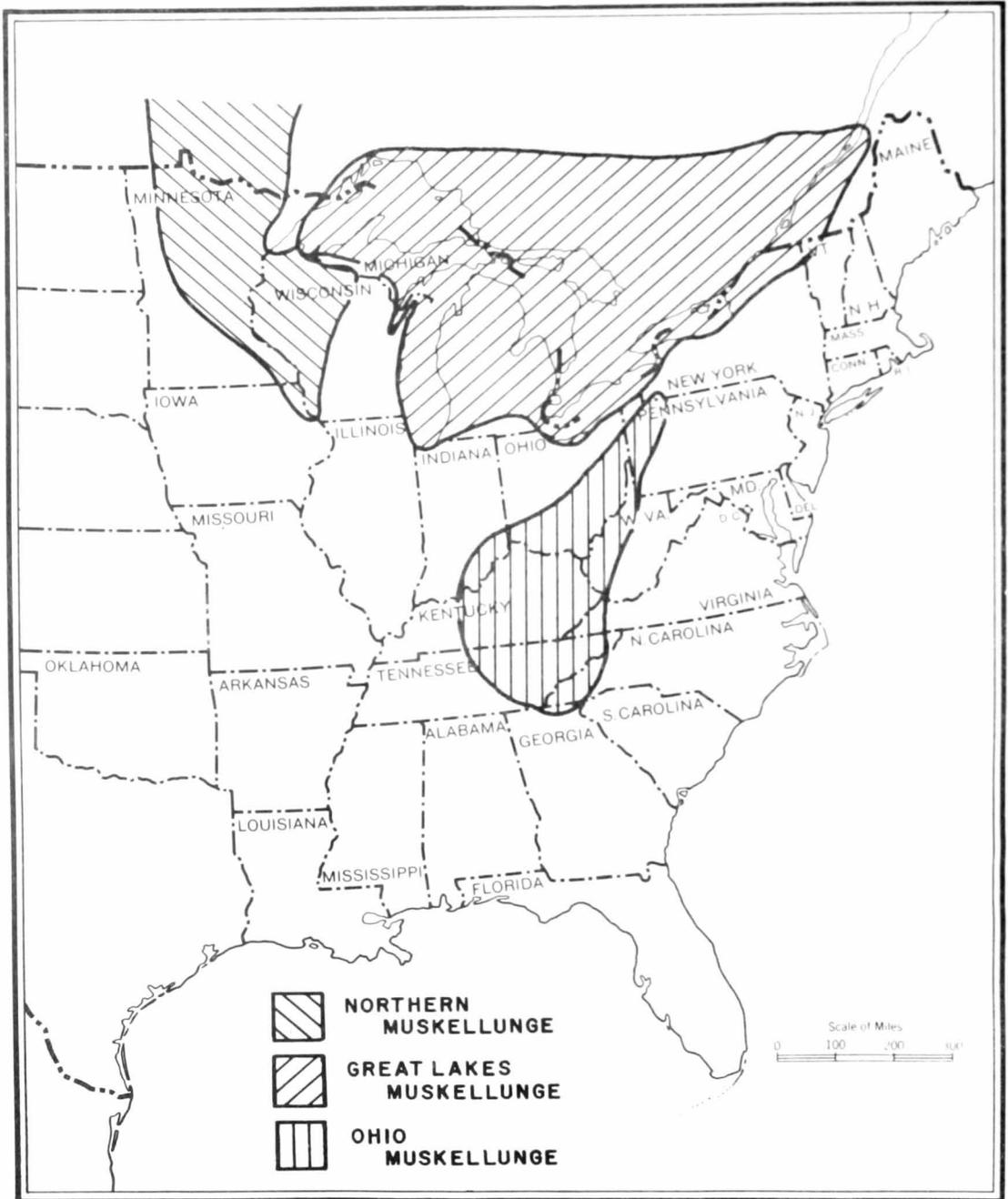


Figure 4.--Distribution of muskellunge.

The second group is the Ohio or Chautauqua muskellunge. This fish is usually dark-barred, but older fish are nearly a solid olive-green. It also spawns from mid-May to mid-June. It is predominantly a stream fish and is found in the drainage area of the Ohio River (fig. 4).

The third group is the northern or tiger muskellunge. The coloration is similar to that of the Ohio muskellunge. This group spawns earlier than the other two groups--from late April to mid-May. It inhabits both lakes and streams. It is found in the drainage of the upper Mississippi River above the Illinois-Wisconsin line. Northward it occurs across the divide in the Lake of the Woods, Rainy Lake, and in some areas beyond (fig. 4).

All of the muskellunge spawn in the shallow waters of lakes and streams, usually among logs, stumps, dead brush, and driftwood--rather than in flooded marshes or meadows.

Sexual maturity is reached in the fourth, fifth, or sixth year of life. A large female of about 35 pounds deposits over a quarter million eggs; the average per female, however, is about 100,000 eggs.

During the spawning period, the fish may move over a considerable distance. Spawning usually is at night, although under favorable conditions it may continue throughout the day. Spawning is completed within a week, after which time the adults return to deeper water.

Muskellunge spawn later than do northern pike--ordinarily late enough so that there

is no hybridization. The northern muskellunge is an exception as it spawns earlier and at times does hybridize with the northern pike.

Artificial propagation is now being carried on in several States. This work may make it possible to extend the distribution of the muskellunge.

The eggs hatch in 2 or 3 weeks; fry start to feed about 2 weeks after hatching. The first food consists of small aquatic animals. When the fish attain a length of about 2 inches, which is 4 or 5 weeks after hatching, they start to feed on the fry of other fish. Their growth is rapid, and as their size increases they eat larger fish. Adult muskellunge will devour any fish they encounter, but they prefer soft-rayed fishes such as suckers, ciscoes, and large shiners rather than spiny-rayed fish such as bluegill, black bass, or yellow perch.

The voracity and cannibalistic tendencies of the muskellunge may explain why it is seldom abundant in any one lake or stream and why its distribution is scattered.

The muskellunge grows rapidly (table 1). On the average, it exceeds 2 feet (26.4 inches) and weighs 5.5 pounds in 4 years, is about 3 feet long and weighs 13 pounds in 7 years, and is more than 4 feet long (48.7 inches) and weighs 32.8 pounds in 14 years. At 20 years the muskellunge averages more than 4 1/2 feet (54.3 inches) long.

## NORTHERN PIKE

The northern pike is the second largest member of the pike family. It reaches a length of over 4 feet and a weight of more than 40 pounds. The average length of fish taken by fishermen is about 2 feet, and the weight is about 3 pounds.

The northern pike is fished commercially in Canada and in five of the eight Great Lakes States in the United States.

The average annual commercial catch of northern pike in North America is almost 7 3/4 million pounds. Canada produces about 98 percent of the total catch or about 7 1/2 million pounds.

The northern pike is caught commercially by several types of nets. In the United States impounding nets are the major producers, but in Canada the gill net is the principal gear.

The northern pike is regarded as inferior to the muskellunge as a sport or food fish. It is still regarded, however, as a good game and food fish. The smaller ones are somewhat bony. Large secretions of mucus from the skin may give the flesh a strong flavor, but this can be avoided by skinning the fish.

Northern pike are caught by still fishing with live minnows and by trolling or casting with plugs, spoons, or live minnows. They are often speared through the ice in the winter.

In the United States northern pike are also managed intensively as sport fish. They are generally protected during the spawning season and by minimum size and creel limits. There is also a closed season and minimum size in four of the five Great Lakes States that allow commercial fishing for pike.

The characteristics that distinguish the northern pike from the other pikes are: cheek fully scaled, lower half of each opercle without scales (fig. 2B); body color variable--typically bluish or greenish gray, with a purple luster dorsally; sides dark with white or yellow-green spots; the young, under 11 inches, light-barred; ventral surface yellow or white; pectoral fins plain, others dark-spotted or barred.

The ideal habitat for the northern pike is in warm, weedy, shallow waters of lakes and sluggish streams. It is also found in the cold, clear waters of deep, rocky lakes of the north.

Among the North American pikes, the northern pike is the only species which is also found outside the continent (fig. 5); it inhabits the fresh waters of the northern parts of Europe and Asia. In North America, the

northern pike is distributed from Alaska to Labrador and south to northern New England, the Hudson River drainage of eastern New York, the northern part of the Ohio Valley, the entire Great Lakes area, Missouri, and eastern Nebraska (fig. 6). The range has been extended by recent introductions to new areas.

Northern pike spawn in the early spring, as soon as the ice leaves or shortly afterwards. They move from the lake to spawn in the shallow waters of flooded marshes or meadows. Spawning may occur also in the sluggish or swampy sections of streams and ditches or in any overflow area.

Northern pike reach sexual maturity at a minimum age of 2 years and at a length of about 17 inches. A large female of 10 pounds may produce as many as 100,000 eggs; the average per female is about 35,000 eggs.

Table 1.--Yearly average length and weight for muskellunge, northern pike, and chain pickerel

Age	Muskellunge		Northern pike		Chain pickerel	
	Total length	Weight <sup>1</sup>	Total length	Weight	Total length	Weight
<i>Years</i>	<i>Inches</i>	<i>Pounds</i>	<i>Inches</i>	<i>Pounds</i>	<i>Inches</i>	<i>Pounds</i>
1	10.5	0.5	9.9	0.2	7.1	0.1
2	17.0	1.5	15.6	0.8	10.2	0.2
3	22.4	3.8	21.0	1.3	12.9	0.5
4	26.4	5.5	24.8	2.1	15.4	0.9
5	30.3	7.1	27.7	3.0	17.7	1.5
6	33.4	10.1	30.6	4.2	19.6	2.0
7	36.3	13.0	33.0	5.4	21.0	2.6
8	39.0	15.5	35.3	6.8	22.1	3.3
9	41.0	18.4	37.4	8.6	...	...
10	42.8	21.3	39.2	10.4	...	...
11	44.2	24.0	41.2	12.5	...	...
12	45.8	26.8	42.9	14.8	...	...
13	47.3	29.9	44.6	17.4	...	...
14	48.7	32.8	46.1	20.2	...	...
15	49.9	...	...	...	...	...
16	51.0	...	...	...	...	...
17	51.9	...	...	...	...	...
18	52.9	...	...	...	...	...
19	53.8	...	...	...	...	...
20	54.3	...	...	...	...	...

<sup>1</sup>After the 14th year of life the numbers of muskellunge were small and the weights varied erratically. Consequently, the weights of fish over 14 years old are not given.

The spawning behavior is similar to that of the muskellunge. The eggs hatch in 2 to 3 1/2 weeks. The northern pike is known to hybridize with the northern muskellunge and chain pickerel.

Artificial propagation of the northern pike is not as extensive as that of the muskellunge, but it is being carried on by several States.

The feeding habits of the young northern pike are similar to those of the muskellunge.

The adult is voracious, feeding largely on other fish and any other animal life that may be available such as mice, young ducks, frogs, or insects.

The northern pike grows rapidly (table 1). It was only 0.6 to 1.6 inches shorter than muskellunge of corresponding age during the first 4 years of life, and 2.6 to 3.7 inches shorter at 5-14 years. The northern pike averaged 46.1 inches and 20.2 pounds in 14 years when the muskellunge averaged 48.7 inches and 32.8 pounds.

## CHAIN PICKEREL

The chain pickerel is smaller than the muskellunge or the northern pike. It reaches a maximum length of about 3 feet and a weight of almost 11 pounds. The average size of chain pickerel taken by fishermen is under 20 inches and the weight less than 2 pounds.

The chain pickerel is not an important commercial fish even though New York and Ontario allow it to be taken in Lake Ontario. It is regarded as a fine game and food fish, although it tends to be bony.

The chain pickerel is caught by still-fishing with live minnows and by trolling or casting with plugs, spoons, or live minnows.

In the northern States of the chain pickerel's range, they are considered an important sport fish. They are generally protected during the spawning season and by minimum size and creel limits. In the southern States, the regulations are more lenient.

The chain pickerel is identified by these characteristics: both cheeks and the opercles fully scaled; a dark streak running vertically downward below the eye; the color variable--typically olive to yellow-brown dorsally; sides lighter and covered with dark chainlike reticulations; young under 8 inches, dark-barred or mottled like adult grass or redfin pickerel; ventral surface pale yellow or white; fins plain; no white or black spots.

The ideal habitat for the chain pickerel is in shallow, warm waters with abundant vegetation over a mud bottom and a plentiful food supply. They are found also in deep, cold waters with little or no vegetation; here they tend to be larger but fewer.

The chain pickerel ranges from New Brunswick and the St. Lawrence River and Lake Ontario drainages southward to Florida and through the lower Mississippi Valley to Texas and southern Missouri (fig. 7). The natural range of the chain pickerel has been extended by stocking adults and young fish.

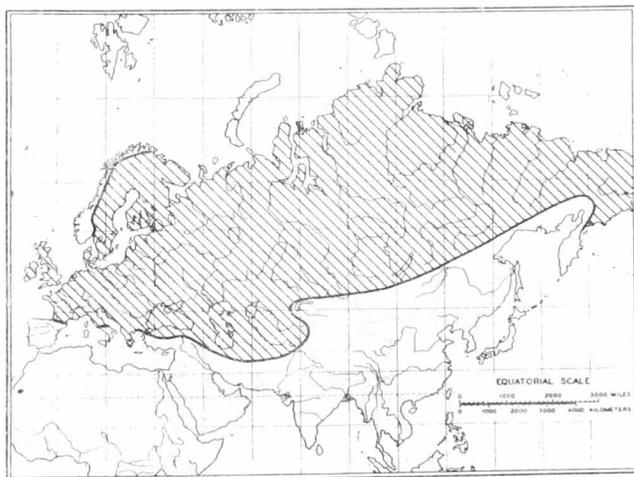


Figure 5.--Distribution of northern pike in Europe and Asia.

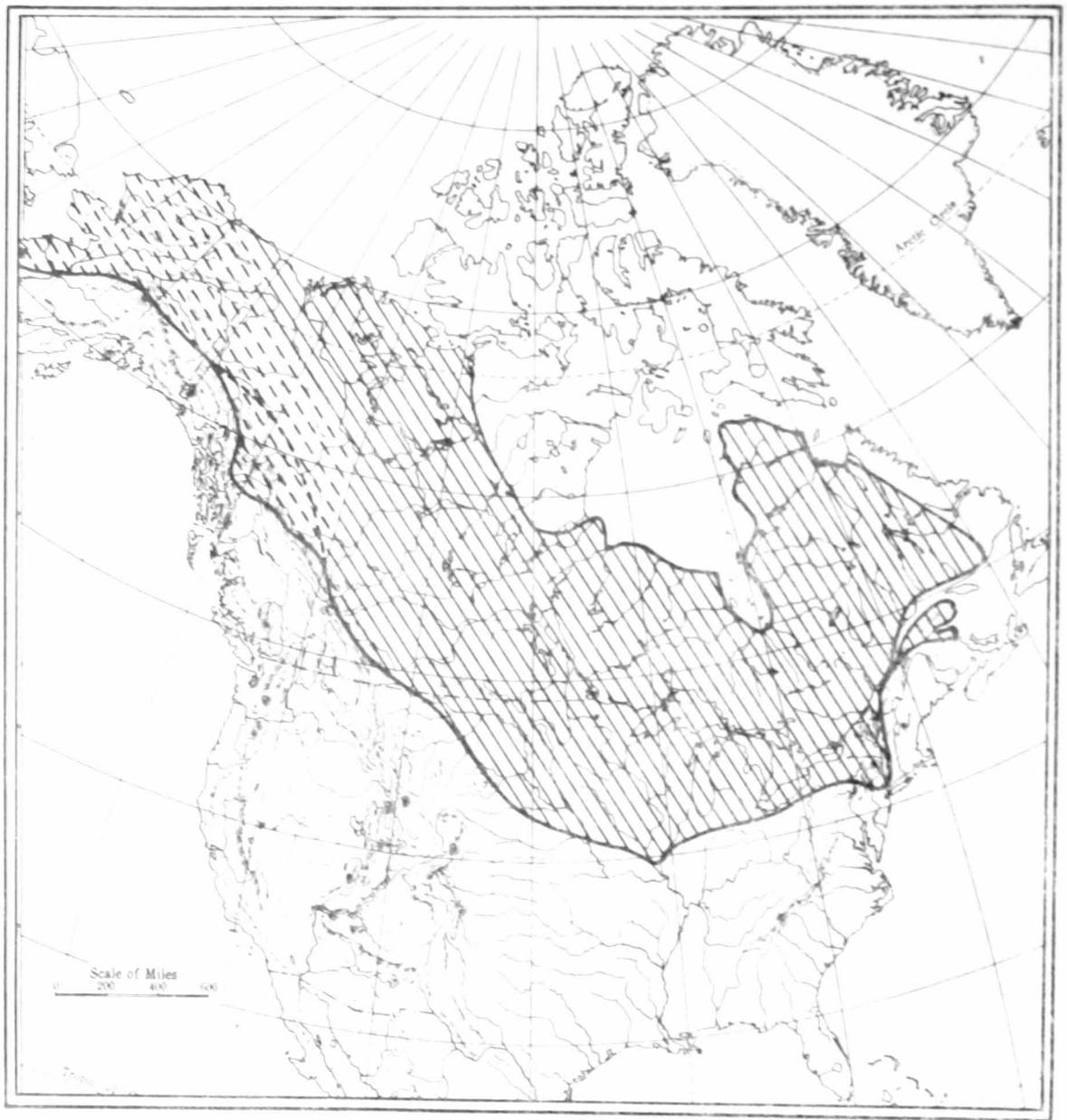


Figure 6.--Distribution of northern pike in North America.

The spawning habits of the chain pickerel are similar to those of the northern pike. The chain pickerel reaches sexual maturity during its second or third year of life when it is about 1 foot long. Little is known as to the number of eggs produced, but a 12-inch-long female may lay from 6,000 to 7,000 eggs. A 2-pound female was reported to have about 30,000 eggs. The eggs hatch in 6 to 12 days, and the fry begin to feed about a week after hatching.

The chain pickerel and the northern pike have been reported to hybridize when they

inhabit the same waters. In some areas, the chain pickerel hybridizes with the grass and redfin pickerel as well.

The chain pickerel is a voracious feeder, mostly on other fish.

The growth of the chain pickerel is much slower than that of the muskellunge or northern pike (table 1). At the age of 8 years the chain pickerel averaged 22.1 inches--16.9 inches shorter than muskellunge and 13.2 inches shorter than northern pike of the same age.

## GRASS AND REDFIN PICKEREL

The grass and redbfin pickerels are the smallest but probably the most numerous pikes in North America. They are also the least known. These two fish are closely similar but differ sufficiently anatomically and in range that they are separated into subspecies.

Due to their small size the grass and redbfin pickerels are not important game fish. They are generally caught incidentally when the individual is fishing for other species.

Grass and redbfin pickerel are often mistaken for the young of the larger pikes. Little is known of the life histories of these two fish.

### Grass Pickerel

The grass pickerel seldom reaches a length of 14 inches or a weight of 1 pound; average length is less than 10 inches.

The identifying characteristics of the grass pickerel are: both cheek and opercles entirely scaled (fig. 2A); branchiostegal rays 11-13; a dark streak running downward and backward from the eye; snout 2.5 to 2.7 times the length of the head; body color variable--typically olive to yellow-brown dorsally; sides lighter and heavily barred or mottled with a darker color; ventral surface pale yellow or white;

fins plain or vaguely blotched; no white or black spots or chainlike reticulations.

The grass pickerel is primarily a small-stream fish, although it may also be found in ponds, lakes, and sluggish rivers. It prefers quiet, weedy waters over a mud bottom.

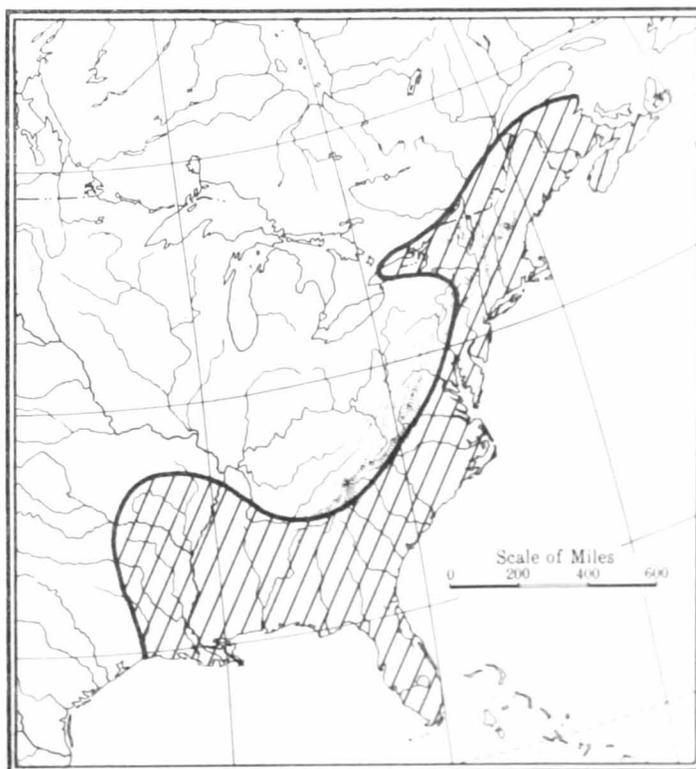
The range of the grass pickerel is from southern Wisconsin and eastern Iowa to the southern half of the Lower Peninsula of Michigan, southern Ontario, and upper St. Lawrence River, southward west of the coastal mountains to the Gulf coast from Alabama to eastern Texas and northward to Nebraska (fig. 8).

Little is known about the spawning habits of grass pickerel, but it is reported that they are similar to those of the northern pike and chain pickerel. They attain sexual maturity at a small size. A female of 6.2 inches was reported to contain 15,732 eggs, of which 803 were mature, the rest were small.

The grass pickerel is known to hybridize with the chain pickerel.

The grass pickerel feeds principally upon fish and to a lesser extent on other aquatic animals such as crayfish and immature insects.

Figure 7.--Distribution of chain pickerel.



The rate of growth of the grass pickerel has not been investigated extensively. Limited data indicate a wide variation of growth according to latitude and fertility of the water inhabited. In fertile, warm waters, the grass pickerel has been reported to reach 11 inches in 3 years. In cool, less fertile waters of eastern Ontario, 7 years were required for the fish to reach 10.8 inches.

### Redfin Pickerel

The redfin pickerel is the smallest of the pikes; it seldom reaches a length of 12 inches, and the average length is less than 10 inches.

The characteristics identifying the redfin pickerel are: both cheek and opercles entirely scaled (fig. 2A); branchiostegal rays 11-13; a dark streak running downward and backward from the eye; snout short, 2.8 to 3.1 times in the length of the head; body color variable--typically dark olive to black dorsally; sides lighter and heavily barred or mottled with a darker color; ventral surface pale yellow or white; fins plain or vaguely blotched; no white or black spots or chainlike reticulations.

The habitat of the redfin pickerel is similar to that of the grass pickerel.



Figure 8.--Distribution of grass and redfin pickerel.

The redbfin pickerel ranges from Lake St. Peter (St. Lawrence River in Quebec) southward along the Atlantic coastal plain to Florida and the Gulf coast (fig. 8). The ranges of the grass and redbfin pickerel do not overlap in the north. At the southern terminus, the two subspecies meet and there is a rather broad band of intergradation.

The spawning habits of redbfin pickerel are reported to be similar to those of northern pike. They attain sexual maturity at a small size. Females as small as 3.9 inches have been reported as mature. Females averaging 8.3 inches long contained an average of 3,716 eggs, of which 269 were mature; the rest were small.

The redbfin pickerel is known to hybridize with the chain pickerel.

The principal food of the redbfin pickerel is fish and to a lesser extent crayfish and the immature stages of aquatic insects.

The redbfin pickerel grows slowly. Limited data indicate the following average total lengths at five ages:

Age	Length
Years	Inches
1	4.6
2	5.8
3	7.3
4	8.7
5	10.5

At 5 years this fish averages 10.5 inches long--0.5 inch less than a 3-year-old grass pickerel, which averages 11.0 inches.

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