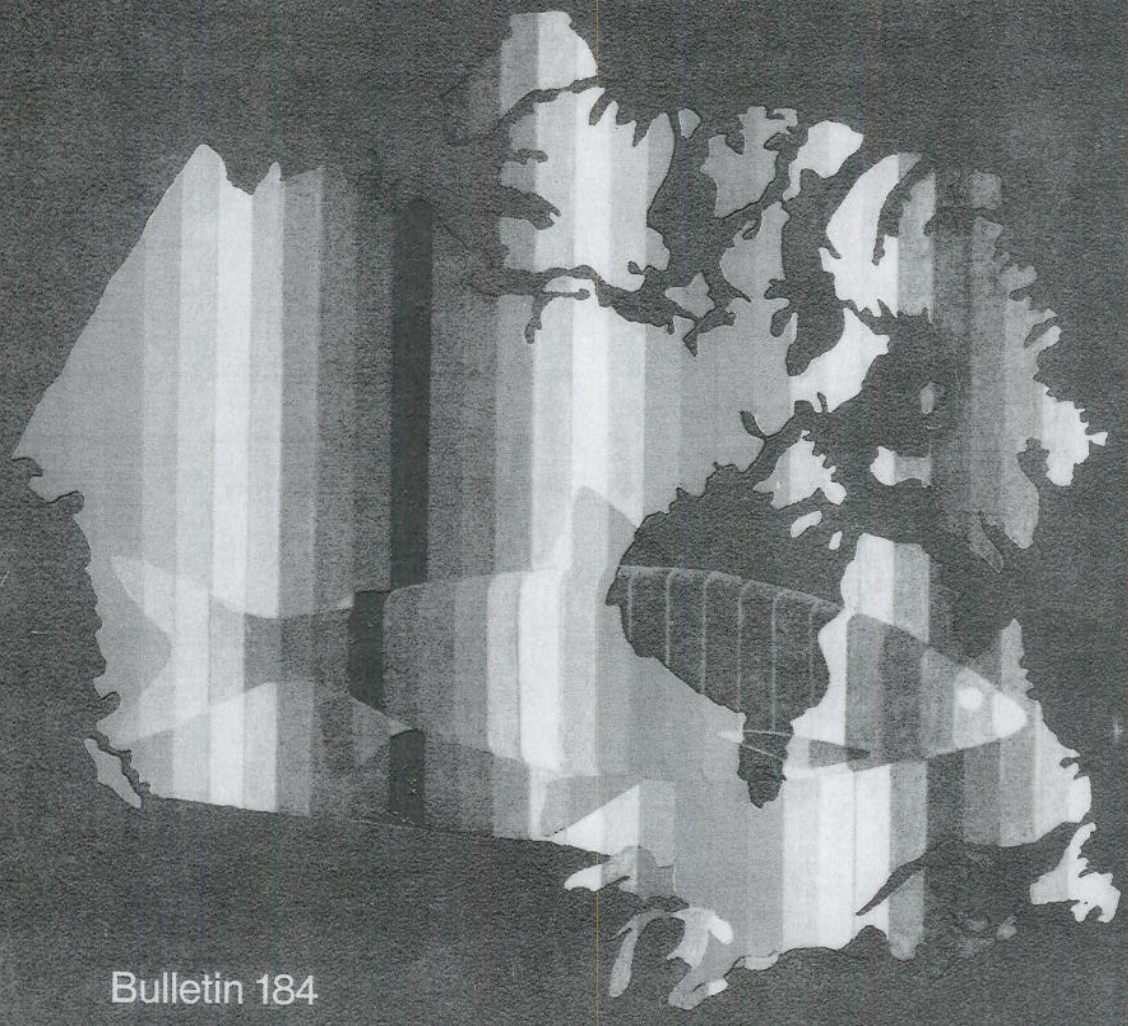
W.B. Scott * E.J. Crossman

FRESHWATER FISHES OF CANADA



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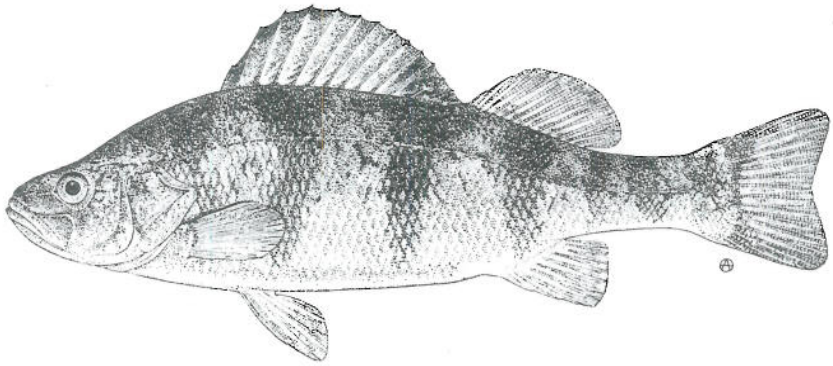
YELLOW PERCH

Perca flavescens (Mitchill)



Description Meristics and proportional measurements are for populations from Nova Scotia to Alberta, *see* table in *Systematic notes* for variability. Body elongate, oval rather than tubular or subcylindrical, average length 4–10 inches (102–254 mm), laterally compressed, greatest body depth 16.3–28.1% of total length. Head moderately deep, rounded at tip, its length 23.1–29.3% of total length, narrow, interorbital distance 16.9–27.3% of head length; gill membranes extended forward, not joined, nor broadly joined to isthmus, preopercular bone serrate at least on angle; short spine at tip of operculum; eye diameter 15.8–30.4% of head length (greatest in young); snout moderately long, blunt, not extending beyond lower jaw, its length 23.4–34.2% of head length; premaxillaries protractile; mouth moderately large, terminal, slightly oblique, jaws equal; maxillary extending at least to mid-point of eye; teeth in brush-like bands on jaws, palatines and vomer, small, decreasing in size posteriorly, no canines. Gill rakers fine, comblike, and usually 12–16 on lower limb, 4–8 on upper limb. Branchiostegal rays 6:7, 7:7, 7:8 or 8:8, usually 7:7. Fins: dorsals 2, obviously separated, first dorsal spiny, high, rounded, spines strong, usually 13–15, second dorsal smaller, but of about same height, with 1 or 2 spines and 12–15 rays; caudal peduncle long and narrow; caudal shallowly forked, tips rounded; anal with 2 spines and 6–8 rays, fin about ½ size of second dorsal, square to rounded; pelvics thoracic, space between them less than ½ base of 1 fin, moderate length, a little longer than pectoral fins, square, 1 spine and 5 rays; pectorals broad, rounded, 13–15 rays. Scales ctenoid, cheeks scaled, opercles mostly naked, breast and belly scaled; lateral line complete, high, little arched, scales 51–61, usually 53–57. Peritoneum silvery; intestine well differentiated, 3 short, thick pyloric caeca. Vertebrae 38–41.

No nuptial tubercles.

Colour Variable with size and habitat; dorsal surface of back and head bright green to olive, to golden brown; sides to below pectoral fins yellow-green to yellow, the colour of the back extending down sides in about seven tapering bars; eye yellow to green; ventral surface of head and body grey to milk-white, dorsal and caudal fins yellow to green, edge of first dorsal often black, black on membranes between spines 1 and 2 and last four or five membranes in adults, anal and pelvic fins opaque, yellow to silver white, pectoral fins amber and transparent. Colours

of spawning males more intense, bronze-green, bright yellow, bars darker, lower fins suffused with orange to bright red, females less highly coloured. The young are transparent, then silvery or dull pale green.

At times strikingly coloured individuals are seen. These are grey-blue or red, lack bars, and result from the dominance or absence of some part of the pigment compliment (*see* Dymond 1932b; Crossman 1962e). *See* colour illustration facing p. 730.

Systematic notes The perch of Eurasia and the yellow perch of North America have long been considered distinct species, *P. fluviatilis* the perch, and *P. flavescens* yellow perch. A study, published in 1963, by the Russian scienists Svetovidov and Dorofeeva concluded that there was a single, circumpolar species, for which the older name *P. fluviatilis* should be retained. They designated three subspecies, *P. f. fluviatilis* (Eurasia generally), *P. f. intermedius* (Kolyma River, Siberia), and *P. f. flavescens* (North America). This has been accepted by some North American authors (Scott and Crossman 1967; McPhail and Lindsey 1970) but rejected by others (Bailey et al. 1970) on the basis that the data (very few yellow perch examined) was not conclusive. Lack of conviction in the evidence presented, the discontinuous distribution, and differences in growth rate, body form and colour, have led to a feeling that the original name should be retained for such a well-known fish until the evidence is more convincing.

McPhail and Lindsey (1970) gave details of postglacial dispersal from the Mississippi River. The only meristic trends east to west or north to south in Canada in the material examined (*see* following table) were a slight tendency toward one more dorsal spine west from western Ontario and a slight shift westward toward fewer lateral line scales. Re-examination of yellow perch from Lake Nipigon yielded second dorsal spines counts of 2 and rarely 1, rather than the unique "3 and rarely 2" of Dymond (1926). Driver and Garside (1966) reported on the effect on meristics of this species of salinities approaching $\frac{1}{3}$ sea water in saline lakes in Manitoba. They concluded that it was not as great as would be expected and difficult to separate from that resulting from differences in water temperature of the different habitats.

Distribution The yellow perch and the Eurasian perch combined have an almost circumpolar distribution in the fresh waters (and rarely in brackish waters) of the northern hemisphere. The yellow perch occurs in North America, from Nova Scotia south along the Atlantic coast, previously to South Carolina now apparently to the Florida panhandle and Alabama, west on the west side of the Appalachian Mountains from western Pennsylvania to upper Missouri, from eastern Kansas northwest to Montana, north to Great Slave Lake, southeast to James Bay, Quebec, and New Brunswick. This species has been introduced into almost all the states to the west and south of this general area, including Washington, Oregon, California, Utah, New Mexico, and Texas.

	Dorsal fins									Anal fin						Pectoral rays			Branchiostegal rays				Lateral line scales																Vertebrae			
	Spines of first dorsal					Rays of second dorsal				Spines			Rays																														
	11	12	13	14	15	12	13	14	15	1	2	3	6	7	8	13	14	15	6,7	7,7	7,8	8,8	51	52	53	54	55	56	57	58	59	60	61	38	39	40	41
N.S.	–	6	1	–	–	–	4	2	–	–	6	–	2	4	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	2	4	–
N.B.	–	9	7	–	–	–	11	7	–	–	29	–	1	17	1	–	–	–	–	7	2	1	–	–	1	1	–	1	3	2	1	–	1	–	3	8	9
Que.	–	2	8	–	–	–	8	2	–	–	10	–	–	7	3	–	–	–	–	11	1	–	–	–	–	–	–	–	–	–	–	–	–	2	9	1	–
Ont.																																					
L. Simcoe	–	1	6	–	–	5	2	–	–	–	7	–	–	5	2	4	3	–	–	–	–	–	–	–	–	1	2	2	1	1	–	–	–	1	6	1	–
L. Nipissing	–	4	6	–	–	3	7	–	–	–	10	–	–	4	6	–	–	–	–	11	–	–	–	–	–	–	–	–	–	–	–	–	–	1	10	–	–
Kenora Dist.	–	–	1	8	–	1	8	–	–	–	9	–	–	6	3	–	9	–	–	–	–	–	3	1	6	2	4	1	–	–	1	–	–	–	–	–	–
Man.	3	33	8	–	–	4	19	11	1	–	10	–	–	2	8	–	–	–	1	18	–	–	–	1	4	1	2	–	1	1	–	–	–	2	25	4	–
Sask.	–	–	1	6	–	1	6	–	–	–	7	–	–	7	–	4	3	–	–	–	–	–	–	–	1	2	1	3	–	–	–	–	–	–	–	–	–
Alta.	–	–	3	5	–	–	3	5	–	–	8	–	–	6	2	–	–	–	–	–	–	–	–	–	–	2	1	1	1	–	1	1	1	–	–	–	–

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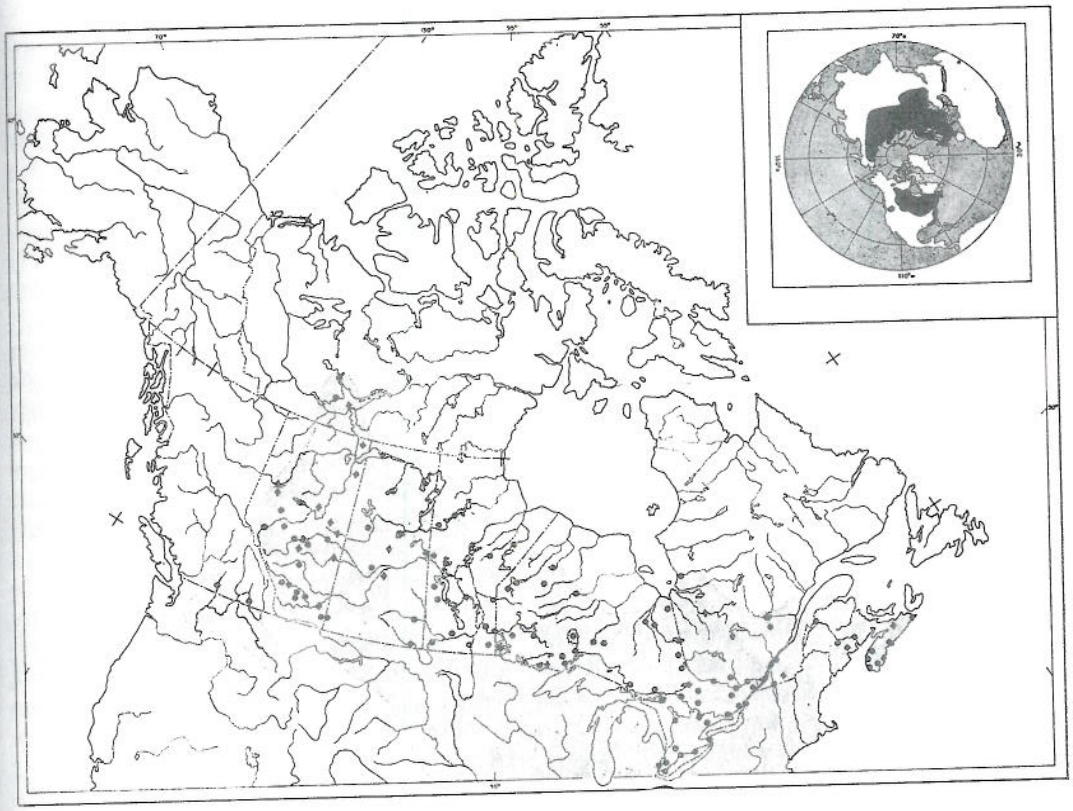

In Canada it occurs from Nova Scotia (not Cape Breton Island) west across New Brunswick to Baie Comeau, Que., across Quebec to James Bay, in Abitibi Lake, west across Ontario at the latitude of the upper Albany River, north through central Manitoba but not to the Hudson Bay coast, through all of Saskatchewan, north to Great Slave Lake, and south through Alberta extending to the foothills in the south. It occurs in British Columbia in the Pend Oreille, Kootenay and Okanagan watersheds as a result of a northward spread from introductions in Washington State.

Biology As a result of its commercial and recreational importance there is considerable literature on various aspects of the life history of the yellow perch, particularly age, growth, and production. Among discussions of populations in Canadian habitats are those of Harkness (1922), Carlander (1950b), Lawler (1953), Scott (1955), Ferguson (1958), Coble (1966), Sheri and Power (1969c). There are many more on United States populations, especially Harrington (1947b), several by Jobes and Hile (*see* Jobes 1952), Herman et al. (1959), and Muncy (1962).

The yellow perch spawns in the spring, usually from April 15 to early May, but spawning may extend into July in some areas. Water temperatures of 44°–54° F (6.7°–12.2° C) have been cited. Adults migrate shoreward into the shallows of lakes, and often into tributary rivers to spawn. Where this species occurs in brackish water, they move up into fresh water to spawn. The smaller males move to the spawning grounds first, are followed by the females, and males remain longer on the spawning grounds than do the females. Spawning takes place during the night and early morning, usually near rooted vegetation, submerged brush, or fallen trees, but at times over sand or gravel. The ac-

tual spawning act appears to be undocumented but thought to involve a single larger female and many males which swim about in a long, compact queue, the first males with their snouts pressed against the female. Total number of eggs per female increases with size and has been reported at 36,600–109,000 for fish 6.8–10.0 inches (147–254 mm) total length in Maryland, and 3035–61,465 for females 5.1–10.1 inches (131–257 mm) fork length in Lake Ontario. No nest is built. The transparent eggs, which when shed and swollen are usually 3.5 mm in diameter, are extruded in a unique, transparent, gelatinous, accordion-folded string or tube. This mass, which may be as long as 7 feet (2.1 m), as wide as 2–4 inches (51–102 mm) and weigh up to 2 pounds, may contain 2000–90,000 eggs with an average of about 23,000 eggs. Aeration of the eggs is accomplished by means of water circulation through holes and a central canal. These egg masses are semi-buoyant. They undulate with water movement and adhere to submerged vegetation or, at times, to the bottom. They can be easily cast ashore by wind, waves, and current and lost. No protection is given the egg masses or young by the parents. Hatching usually takes approximately 8–10 days, but has been reported to take as long as 27 days at 47° F (8.3° C). The young, when they hatch, are transparent, about 5 mm in length and have 16–21 postanal myomeres. They are inactive for about 5 days during the absorption of the yolk. Early development was given in detail by Fish (1929, 1932) and by Mansueti (1964). Means of separating the superficially similar young of this species and the walleye were given by Norden (1961b).

Growth is rapid at first. Trautman (1957) said yellow perch in Ohio in October were 1.8–4.0 inches (46–102 mm) long. In the first summer large, compact schools of young are often seen. Growth is extremely variable depending on population size, habitat size, and productivity. Ages are usually determined from scales in North America and by scales or opercles in Europe. The validity of the scale method of aging, and the body-scale size relation, were described for Lake Michigan by Jobes (1952) and Joeris (1957). The following table, giving age–length and age–weight relations for various Canadian habitats, exhibits this variability. Yellow perch 2 years and older were, on the average, 3 inches (76 mm) longer in Lake Erie and Lake Ontario than they were in Lake Jesse, N.S.

Stunting often occurs in crowded populations with adults never exceeding 6 inches (152 mm) in length.

Females grow faster than males even at age 1 and achieve a greater ultimate size. Northern populations grow more slowly and live longer. Sexual maturity is usually achieved

		Age									
		0+	1+	2+	3+	4+	5+	6+	7+	8+	9+
Lake Jesse, N.S. (Smith 1939)	FL *inches*	1.4	3.0	3.6	4.3	4.9	–	–	–	–	–
	mm	36	77	92	108	125	–	–	–	–	–
	Wt (*oz*)	.02	.19	.29	.49	.78	–	–	–	–	–
Bay of Quinte, L. Ontario (Sheri and Power 1969c)	FL *inches*	–	–	6.2	6.8	7.2	8.0	8.5	8.2	10.1	–
	mm	–	–	158	172	182	202	216	209	257	–
	Wt (*oz*)	–	–	2.3	3.0	3.8	4.5	6.0	5.0	10.9	
Lake Erie, Ont. (Harkness 1922)	TL *inches*	–	–	6.6	7.7	8.5	9.9	10.8	11.0	–	–
	mm	–	–	168	196	216	251	274	279	–	–
	Wt (*oz*)	–	–	1.5	4.3	5.7	9.2	11.6	12.8	–	–
Heming Lake, Man. (Lawler 1953)	FL *inches*	1.9	2.8	3.4	4.9	5.6	6.7	8.4	9.1	10.2	11.9
	mm	48	71	86	124	142	170	213	231	259	302

by males at 3 years and females at 4 years of age. Yearling males in Lake Erie are often fertile. Maximum age is usually 9 or 10 years but a female from Lake Erie, 12.2 inches (310 mm) in total length, which weighed 0.78 pounds, was aged at 11+ years. Yellow perch in Ontario are most often 4–10 ounces but one taken in Baie du Doré, Lake Huron, was 14.3 inches (363 mm) in length and weighed 1 pound 8 ounces. Weights to 3 pounds have been reported from Lac la Biche in Saskatchewan, and 2 pounds 3 ounces from Baptiste Lake in northern Alberta. Another Alberta perch, from Tucker Lake, was 15 inches (381 mm) in fork length and weighed $2\frac{1}{4}$ pounds. In 1935, Ontario commercial fishermen reported maximum size for Lake Erie as $13\frac{3}{16}$ inches (334 mm) and 1 pound 1 ounce. A 14-inch (356-mm) perch was taken in the Saugeen River (Lake Huron) in 1929, and one weighing 4 pounds 1 ounce was caught in Quebec. Trautman (1957) gave maximum size for Ohio as 13.5 inches (343 mm) and 1 pound 5 ounces. The present angler record is an individual 4 pounds $3\frac{1}{2}$ ounces in weight which was caught in New Jersey in 1865. Yellow perch caught by anglers in Canada are usually 8–12 inches (203–305 mm) in length.

Yellow perch are very adaptable and able to utilize a wide variety of warm to cooler habitats from large lakes to ponds, or quiet rivers. They are most abundant in the open water of lakes with moderate vegetation with clear water and bottoms of muck to sand and gravel. Numbers will decrease in a body of water in which turbidity increases or vegetation decreases. The yellow perch is a freshwater fish but it is found in brackish water along the Atlantic coast and in saline lakes in the Prairies (to 10,300 ppm total dissolved solids). McKenzie (1959) recorded their capture near Newcastle, N.B., in the brackish water of the Miramichi River, in early summer during the American shad and alewife fishery. Salinities at Newcastle, on July 15, 1956, were 15‰ at the bottom and 6‰ at the surface. The yellow perch is apparently more tolerant of low oxygen than sunfishes. In nature yellow perch are usually found at temperatures of 66.2°–69.8° F (19°–21° C) (Ferguson 1958). Seasonal vertical movements suggest they move to follow the 68° F (20° C) isotherm. Upper lethal temperature has been experimentally determined at 79.7° F (26.5° C) in British Columbia and at 92° F (33° C) elsewhere. Final temperature preference has been experimentally determined at 69.8°–77.0° F (21°–24° C).

They are usually considered shallow-water fishes and are usually not taken below 30 feet (9.2 m) but they have been taken as deep as 150 feet (45.7 m) in May. Adults and young are gregarious, often moving about in loose aggregation of 50–200 individuals, segregated by size. The young, in shallower water and nearer shore than the adults, are often in mixed schools which include many individuals of a species of minnow, such as the spottail shiner. The discrete schools of adults are close together in summer and more separated in winter. Yellow perch are inactive at night and rest on the bottom. There are migratory movements in the spring, movements inshore and out, up and down over the day, and seasonal movements out of and into deeper water in response to temperature, and probably, to distribution of food. Yellow perch are active all winter under the ice in shallow water or in deeper water (*see* Scott 1955; Hergenrader and Hasler 1968, for greater detail).

The food of the yellow perch has been extensively studied in Canadian habitats (*see* Tharratt 1959; Keast and Webb 1966; Keast and Welsh 1968; Keast 1968b). Food changes with size and season but is largely immature insects, larger invertebrates, and fishes, taken in open water or off the bottom. In Lake Opinicon, Ont., the young feed on cladocerans, ostracods, and chironomid larvae. By the end of their first year, they have shifted to Odonata nymphs (to 40% volume), Ephemeroptera (30%), molluscs (35%), ostracods (30%), chironomid larvae (30%), and small fishes (30%). Fish over 6 inches (150 mm) length feed on decapods (to 70%), small fishes (75%), and Odonata nymphs (40%). Yellow perch apparently prey on the eggs and young of a wide variety of fishes.

Active feeding takes place morning and

evening (7 AM to 6 PM), with little to none at night. Food is actively taken all through the winter, and may include fish eggs. Feeding is said by some to be suspended just prior to spawning, but others say anglers catch large numbers during the spawning run using minnows as bait.

The yellow perch is preyed on by almost all other warm to cool water predatory fishes such as basses, sunfishes, crappies, walleye, sauger, other yellow perch, northern pike, muskellunge, and to some extent, lake trout. Even the adults do not escape this predation. Water birds such as gulls, mergansers, loons, and kingfishers eat this perch. The young and adults may compete for food with brook trout, ciscoes, lake whitefish, basses, crappies, and bluegill. Their high reproductive potential, voracious appetite, and effectiveness at feeding can in some places lead to serious competition with more valued species, such as trout and basses, and with themselves. Those characteristics are probably the cause of the many populations of stunted yellow perch.

A wide variety of parasites afflict this fish. Parasites listed by Hoffman (1967) for the whole of its range were as follows: protozoans (16), trematodes (52), cestodes (11), nematodes (17), acanthocephalans (10), leeches (6), molluscs, crustaceans (8).

Guilford (1963) described three new species of Myxosporidia, *Myxosoma neurophila, M. scleroperca*, and *Henneguya doori*, from yellow perch in Lake Michigan. Tedla and Fernando (1969a) reported in great detail on the external and internal parasite fauna of this species in Lake Ontario, and seasonal changes in incidence and intensity of infestations. The same authors (1969b, c, 1970) discussed copepod parasites and gill parasites of this species. Lawler (1969) dealt with the effect on perch of the parasite *Triaenophorus nodulosus*. Dechtiar and Loftus (1965), Bangham and Hunter (1939), Bangham and Venard (1946), Bangham and Adams (1954), and Bangham (1955) gave lists of the parasites of this species in Canadian habitats. Other than the growth reducing or mortality factors exerted by many species of parasites, parasites of the yellow perch which are of more direct interest to man are black-spot, yellow grub, and the broad tapeworm *Diphyllobothrium latum*. The first two, although harmless to man, render the fish unsightly and often cause an angler to discard his catch. The last is a parasite which could infect man if raw, or poorly cooked, infected fish were eaten. Yellow perch suffer as well from a number of fish diseases and such pathological conditions as tumors.

Relation to man The yellow perch has long been of prime importance to man. It inhabits a vast territory, a wide variety of habitats, is a schooling fish, and congregates near shore in the spring. All of these factors make it readily available to fishermen, both commercial and recreational. It is an active feeder the whole of the year so can be angled summer and winter. The yellow perch is a sport fish of variable importance from the Maritimes to British Columbia. It is taken commercially from Ohio to Alberta. Its flesh is white, flaky, delicious, and popular. This species is sold, fresh and frozen, almost everywhere. It was one of the first species to be exploited in the mid- to late 1800's by the seine fishery of the Great Lakes. Production, commercial landings, and price paid for this fish, depend on a wide variety of factors such as varying year-class strength, availability of more favoured species, availability of fishermen, presence or absence of predators, and temperature and food-dependent growth rate. The Great Lakes are the major producers of yellow perch and catches there have, at various times, suffered from all these effects. This leads to a widely fluctuating fishery. Of the total yearly production in Canada, the Great Lakes contribute all but about 1 million pounds. Annual catches varied from a low of approximately 16.5 million pounds in 1919 to a high of 72.1 million pounds in 1934, to an all time low of 3.2 million pounds in 1948, to another high of nearly 27 million pounds in 1968. The dominance of the Great Lakes is obvious from the fact that commercial fishermen in Lake Erie alone (Canada and United States) recently harvested 30 million pounds worth 3.2 million dollars. Price fluctuations

have been such that the greatest catch did not always yield the greatest return, and the price is now stabilized largely by federal price support funds. The Ontario catch in 1968 was 24,968,515 pounds, worth $2,107,470. Of this, Lake Erie contributed 24,435,187 pounds (97%). The next largest catches were from lakes Ontario, Huron, and St. Clair. The Freshwater Fish Marketing Corporation listed prices per pound for yellow perch, in November, 1970, as 40¢ (over ¾ pound) and 30¢ (under ¾ pound).

Anglers usually catch yellow perch, summer and winter, by still fishing for them with minnows, worms, or cut fish as bait. The problem of bait for the winter fishery is solved by freezing or salting minnows when they are available. They do not fight hard, but the challenge of catching a species which bites so lightly, the possibility of large catches and the high quality of their flesh compensate for this. There is generally no size or bag limit for anglers.

Yellow perch are used as live bait for other fishes such as northern pike and muskellunge and as cut bait for a variety of other fishes. Use of the young as live bait is often restricted to the water in which they were captured.

The yellow perch is the study animal most commonly used to familiarize students with the internal and external anatomy of a teleost fish.

Nomenclature

Morone Flavescens	— Mitchill 1814: 18 (type locality New York)
Perca notata	— Rafinesque 1818b: 205
Perca acuta	— Cuvier and Valenciennes 1828: 49
Perca flavescens (Cuvier)	— Richardson 1836: 1
perca fluviatilis	— Perley 1852: 82
Perca americana	— Wright 1892: 453
Perca americanus Schranck	— Cox 1896b: 70
Perca flavescens (Mitchill)	— Evermann and Goldsborough 1907a: 108
Perca fluviatilis Linnaeus	— Scott and Crossman 1967: 21
Perca flavescens (Mitchill)	— Scott and Crossman 1969: 23
Perca fluviatilis flavescens (Mitchill)	— McPhail and Lindsey 1970: 343

Etymology *Perca* — dusky, and possibly the ancient common name of the Eurasian perch; *flavescens* — yellow.

Common names Yellow perch, perch, lake perch, American perch. French common name: *perchaude*.