Fisheries and Oceans
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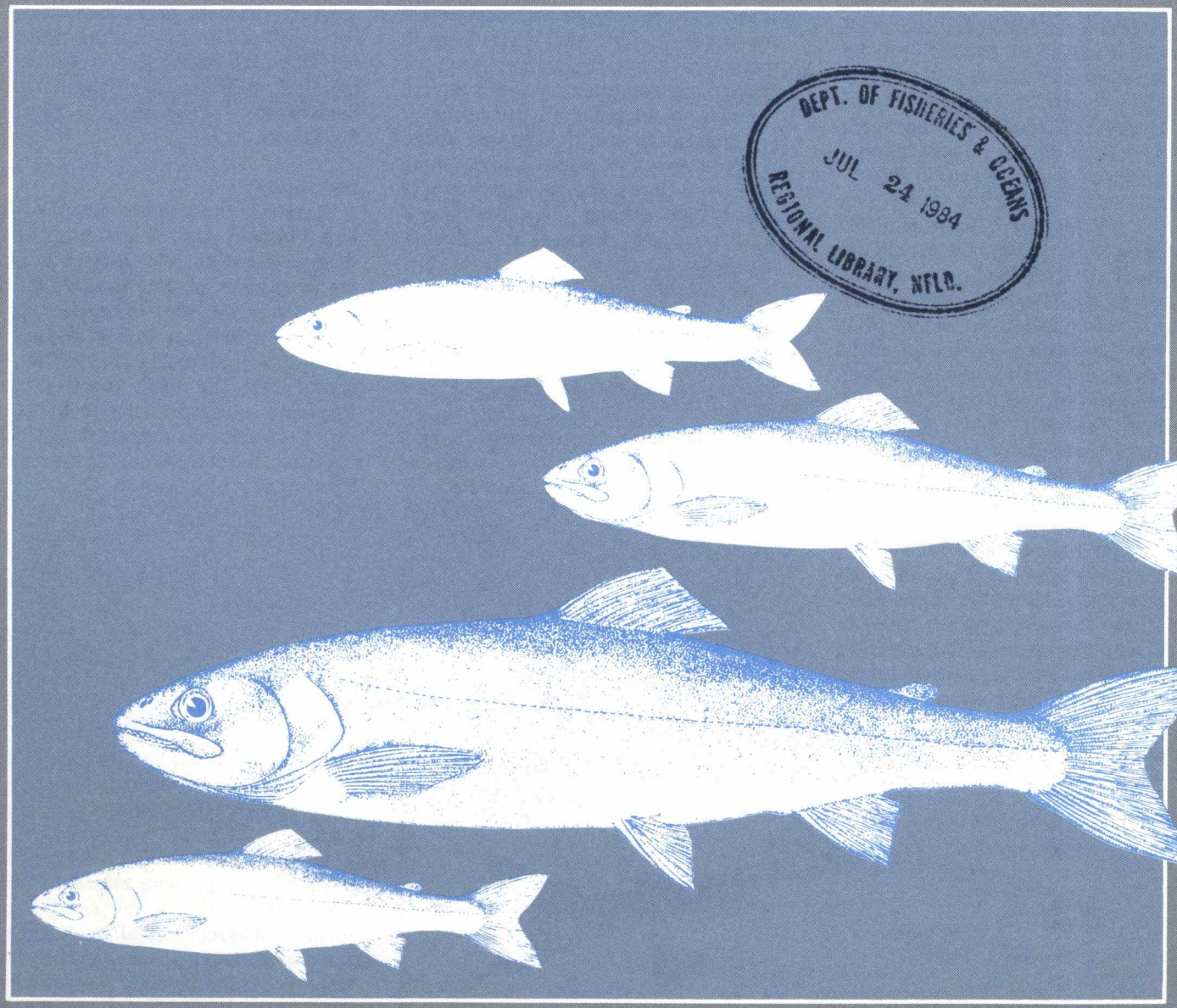
Underwater World

ARCTIC CHARR



Canada

ARCTIC CHARR

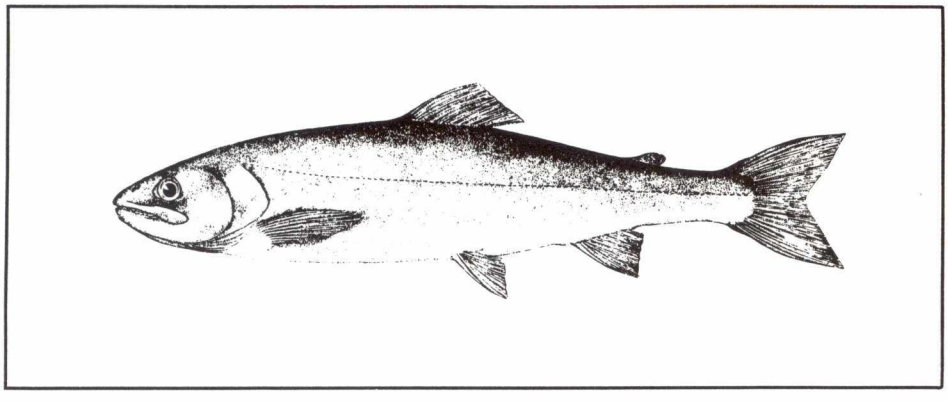
First cousin to the great fighting trout and the magnificent salmon, the arctic charr is a fish of distinguished family. In fact, to the uninitiated the differences between it and the other salmonids are so slight as to be negligible — a scattering of light-coloured dots, a novel arrangement of teeth and a slight variation in the bone structure of the mouth. Yet to the knowledgeable, these are the unmistakeable signs that say *charr*.

During much of the venerable history of angling, the charr was considered little more than a poor relation to the trout. Indeed, a noted American scientist wrote in 1887 that "the English maintain, generally with a note of implied disparagement, that our eastern brook is not a trout at all, but a charr."

The English were right in their facts, if not in their sentiments. Trout belong to a branch of the salmonid family called *Salmo*, whereas the eastern brook trout and arctic charr are both *Salvelinus*: ergo, the charr is not a trout. But if the fish has been denigrated for that fact, it has also had its share of praise. One turn-of-the-century angler assured his public that "nothing higher. . .can be said of a salmonid than that it is a charr."

Nineteenth century scientists, caught up in a classifying rampage, succeeded in identifying some 31 separate subspecies of charr. Modern scientists, however, have preferred to ignore the minor idiosyncracies produced by varying conditions of light, temperature and food among isolated groups. Today, in North America, there are only four types of charr that are recognized as true species.

Figure 1.
Arctic charr.



The most famous of the charrs, of course, is the eastern brook trout — *Salvelinus fontinalis*. This is probably one of the best known fishes on the continent since in the days before pollution they swam in virtually every river and stream to the east of Saskatchewan. Not so widely known is the Dolly Varden — *S. malma* — a crimson-spotted fish that was named in nineteenth century California after the brightly dressed heroine of a Dickens novel. The Dolly Varden is found in rivers and streams all around the Pacific Rim, from California to Japan. Then there is the lake trout — *S. namaycush* — a giant which is sought for trophies throughout the northern half of North America. And finally, in the cold, clear waters of the northern hemisphere is the arctic charr — *S. alpinus*.

Description

The arctic charr shares with the trout and salmon a long, slender body and a silvery coloration. The differences lie in the deep green or blue shading on the back and upper sides, in the pale-edged fins and sometimes in a scattering of small pink dots along and below the lateral line. The arctic charr has very fine scales, so deeply embedded that the skin has a smooth, slippery feel. Unlike the trout, it has teeth only in the central forward part of its mouth. Other differences are less obvious, as in the boat-shaped bone in the upper part of the mouth.

Distribution

The arctic charr is a most international fish, and one that has rejoiced in a wealth of names — *red charr* to the British, *saibling* to the Germans, *omble chevalier* to the French and *ilkalupik* to the Inuit. It swims in the circumpolar waters of Asia, Europe and North America — anywhere that the water is pure and cold.

There are two principal groups of arctic charr, the one living entirely in fresh water, the other — the *anadromous* form — making annual migrations to the sea. Because of the plentiful food resources in the ocean, the second kind tends to be larger than its landlocked brother and of more importance in terms of fisheries. This form has lost its

characteristic markings to take on an overall silvery sheen.

The landlocked charr is blocked from the sea by some physical barrier. It is found everywhere that the sea-run charr is known, but also occurs in smaller numbers much further to the south. Thus, the arctic charr is known as a glacial relict in cold, deep lakes as far south as New England, Switzerland and Britain — in fact, it is the only charr in Europe.

Reproduction

Most remarkable in the mature arctic charr, particularly in the north, is the change in coloration that occurs as it approaches spawning condition. From silver, the body colour gradually deepens to orange, through a range of reddish hues to bright red, and finally to deep vermillion. The leading edges of the lower fins and a fold of skin under the upper jaw turn white, and the males develop a protruding hook on the lower jaw.

In colder regions, the charr spawns in September or October — later if it lives further south as a water temperature of around 4°C is preferred. The spawning female seeks out a suitable bed of gravel or broken rock, rather than silt where the eggs might suffocate. It will choose a stretch of river or lake bottom deep enough to keep the eggs safe from the winter ice, or at the bottom of a rapid where ice does not form.

Figure 2.
Traditional Inuit stone-weir method of fishing Arctic charr.

Using her fins, the female scoops out a nest, or *redd*, in the loose gravel, little more than a shallow depression about the length and width of her own body. Here, she releases some of her 3,000 to 7,000 eggs at the same time that the male releases the milt. Then, the female fans the gravel lightly back over the fertilized eggs, usually in the course of digging another nest nearby. This process is repeated until the female is spent.

There appear to be few predators that live on charr eggs. In fact, with the exception of the nine-spined stickleback, the arctic charr is often the only species of fish-eating fish to swim in a given northern water. The spawning charr itself will eat any eggs that are improperly covered in the nest, but no deliberate excavation has been observed. It is only when the young finally emerge as free-swimming fish that they come into danger from predators — mainly their own kind — and begin to suffer in the competition for food.

The eggs incubate through winter at temperatures of 0° to 2.2°C and hatch some time in the first week of April, though the timing will depend on light and water temperature at the specific location. Temperatures above 8°C, at any time, will kill the eggs. The *alevin*, with a large food sac attached to their bellies, remain hidden in the gravel for many weeks, only emerging as free-swimming fish or *fry*, when the food reserves are used up. This occurs around the time of ice breakup — as late as mid-July in the most northerly regions — when their emergence coincides with the renewed growth of plankton.

Food

The young fry is not much longer than 2 cm when it emerges from the gravel, and at first it feeds almost exclusively on small vegetation and tiny animals. As the fish increases in size, however, its diet widens to include various insects, insect larvae and shellfish. Later, the adult charr is able to prey on any small swimming fish. After the age of four or so, when the sea-run charr migrates to the ocean, it has a much greater opportunity in terms of diet, and so tends to grow much larger than its lake-bound counterpart.

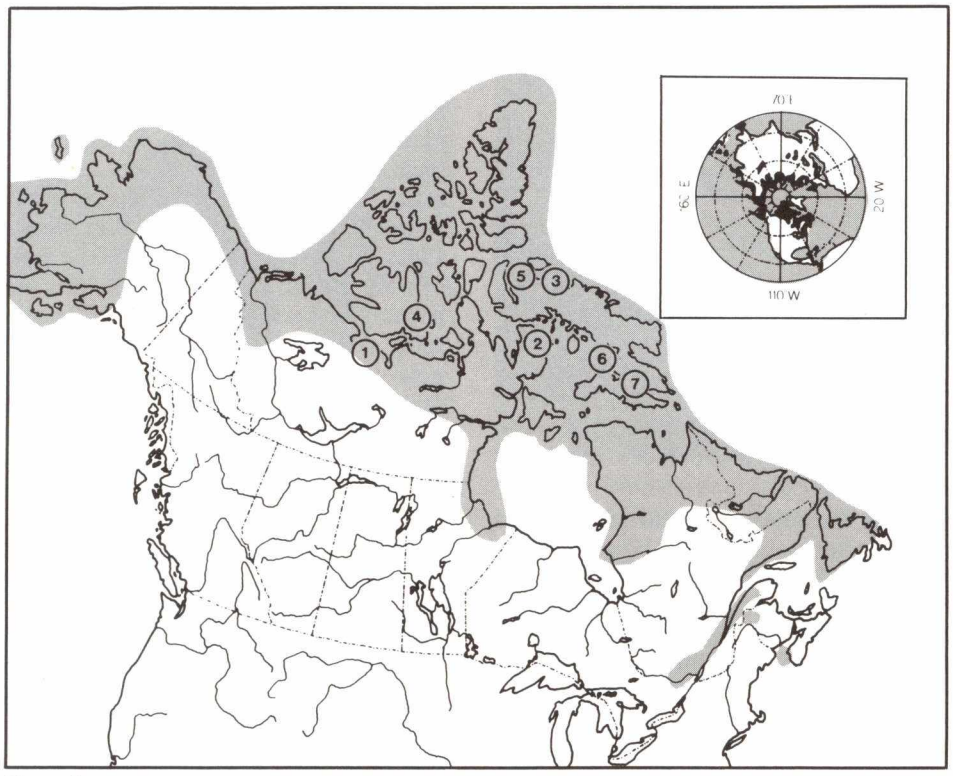
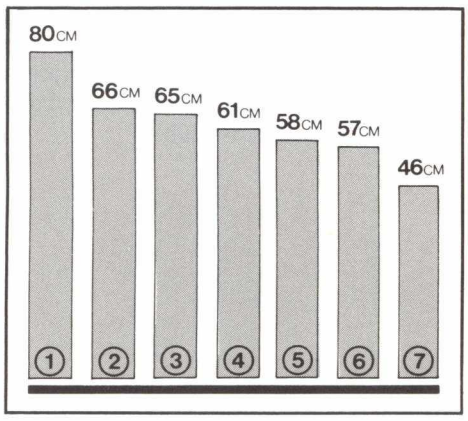


Figure 3.
North American and global distribution of Arctic charr.

1. Tree River
2. Hall Lake
3. Salmon River
4. Jayco River
5. Robertson River
6. Koukdjuak River
7. Sylvia Grinnell River

Figure 4.
Average fork length of 15-year-old Arctic charr at various locations in the Northwest Territories (see map figure 3).



The charr often does not eat in winter, when its metabolic rate slows in tune with a cooling environment. Rather, it lives on the fat it has accumulated during the summer, and growth is accordingly limited during the cold months.

Habits

The anadromous charr is about 15 to 20 cm long when it migrates to the sea for the first time. Spring comes, the rivers break free of ice, and the four- or five-year-old charr makes its first trip down to the ocean. It will return anywhere between mid-August and late September, before the ice begins to form again. The larger fish return first, even as soon as mid-July in some cases.

The charr matures sexually around its tenth year in the Arctic, when it has reached a length of about 65 cm, although maturity comes a couple of years earlier in Labrador, at about 45 cm. After that, the fish spawns every second or third year. Often it does not migrate to the sea during its reproductive years.

It is not known what mechanisms control migratory behaviour, but it is thought that hormonal changes are touched off by changes in light intensity. Once in the sea, it is clearly the availability of food that governs movement. When food is plentiful, the fish tend to remain near the mouth of the river from which they emerged. In times of scarcity, however, they move into offshore waters, sometimes travelling long distances. Tagged charrs are frequently recovered 30 to 50 km from their river of origin, and some fish have made recorded journeys of up to 600 km. The record is 1,000 km.

While in the sea, the charr from many different rivers meet and mingle, but when the time comes to return upriver, they tend in most cases to separate and return to the parent stream. In some instances, they even return to the exact spawning site of previous years.

Growth

The cold northern waters are not conducive to rapid growth. Even with its flexible eating habits and its fine adaptation to a cold environment, the charr grows slowly. At the age of one year, when scale development begins, the charr is often less than 5 cm long.

Growth rates vary greatly among individual fish within a given habitat. However, it is usual for a charr to reach full growth at two-and-a-half to three kilograms, or at about 12 years of age. A charr may live to be 30 years old, yet not grow appreciably larger than that. Trophy-sized charr weighing more than 14 kg and measuring nearly a metre in length have been caught in North America, and the Russians landed one in Novaya Zemlya that weighed 15.4 kg. It is difficult to establish the exact age of such fish, but it is clear that these are individuals that have responded very favourably to good growing conditions.

Enemies

The arctic charr has few enemies. Gulls and loons prey to a certain extent on small fish, and a few sea-going charr may fall prey to seals and white whales. The predators are few enough, however, to have an almost negligible effect on the stock as a whole. Cannibalism causes much greater damage, at least

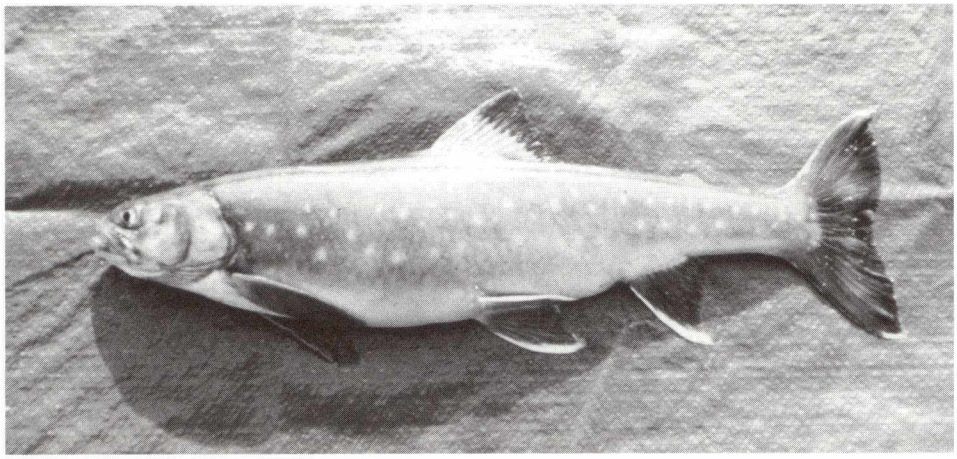


Figure 5.
This charr is from Lake Hazen on Ellesmere Island. The lake, about 920 km from the North Pole, is believed to be the most northerly lake inhabited by Arctic charr.

among the smaller fish of land-locked stocks, but this ceases to be a factor by the time the charr grows to adulthood.

Competition for food is likely to play a much more important part than predation in regulating the numbers of charr in a particular system. Food shortages restrict the growth of all fish within a lake and may impinge on the survival of the very young. However, it is only during the spawning period that the arctic charr become territorial, and larger individuals are seen to defend their space against lesser fish. During most of the year, there is a tendency towards schooling.

Figure 6.
Federal biologists have constructed a modern weir in Freshwater Creek, near Cambridge Bay in the N.W.T. As the charr pass through the weir they are counted. This enumeration of the upstream migration enables DFO personnel to estimate the number of fish in the population. Some charr are tagged for migration studies, while others are sampled so that the size and age composition of the run can be determined.

The Fishery

The charr has always been an important part of the Inuit food catch, and from about the 1860s, it has been exploited commercially on a very small scale in Labrador. It was not until the establishment of a government-sponsored fishery in Labrador in the 1940s, however, that it became the basis of a significant industry. The charr has become an increasingly coveted luxury food since then, and Inuit fishermen now undertake a systematic harvest in several areas, using gillnets, traps and spears. With some government assistance, the fish is processed and marketed in the south in the form of whole fresh or frozen fish (up to 60 per cent of the produce), fillets, chowder and smoked fish. Almost 250 metric tons (t) were harvested in Labrador in 1981.

Also in the 1940s, a commercial fishery was established in the Northwest Territories, at Frobisher Bay, only to decline in the 1960s as a result of overfishing. A second northern fishery was then initiated at Cambridge Bay on Victoria Island. An annual harvest of about 55 t is now taken in that area, with consequent seasonal employment for some 70 Inuit. There are a few other less concentrated charr fisheries scattered throughout the north, as at Pangnirtung where approximately 20 t a year are produced, and along the Hudson Bay coast near Rankin Inlet.

The slow development of the arctic charr means that in the southerly part of its range it reaches commercial size at seven or eight years of age. In the northern part of its range it may take 14 years to become of value to the commercial fishery. Especially in areas where the fishing is very concentrated, close monitoring is essential. Quotas have been implemented for some years now in Labrador and the Northwest Territories to ensure that stocks are maintained and the fishery remains viable.

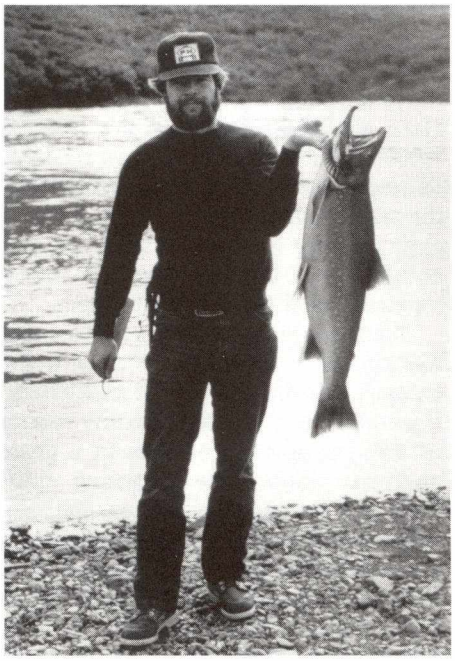


Figure 7.
An angler holds a typical trophy Arctic charr from Tree River. On the average, Tree River charr are larger than other sport catches of charr in the N.W.T.

A sport fishery has also developed in the Northwest Territories during the last 20 years or so, and the charr has earned a well deserved reputation as a formidable fighter.

While the sport catch in Labrador is almost entirely incidental, the sport fishery at Tree River, Northwest Territories, s world famous for its charr, and others ɔn Victoria and Baffin islands are becoming increasingly renowned.

Further Reading:

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