

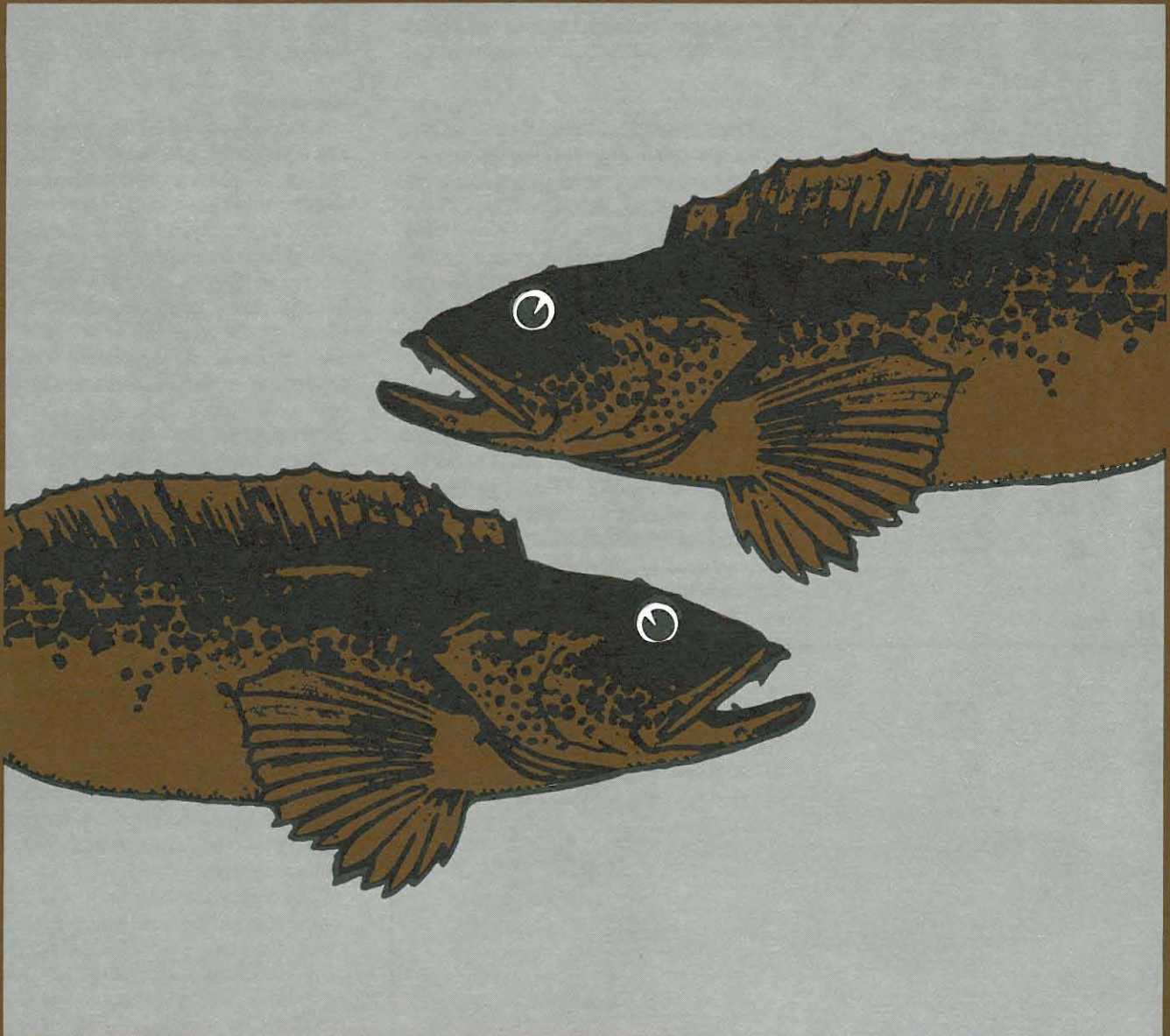
Pêches
et Océans

Fisheries
and Oceans



Underwater World

LINGCOD



Canada

LINGCOD

Strangely enough, the lingcod is not a cod at all, nor is it any relation to the ling. Yet it is commonly called the *lingcod*, also the *blue*, *buffalo*, *green*, *leopard* or *cultus cod*.

In fact, the lingcod has no relative other than the greenling, which it resembles. The largest of 11 species belonging to a family that includes greenling and sculpin, the lingcod is a fish valued by both commercial and recreational fishermen for its great size and firm-textured, mild-tasting flesh. In the Strait of Georgia, for instance, the lingcod is an important component of the recreational fishery.

Description

The scientific name of the lingcod gives some indication of its appearance: *Ophiodon elongatus* — from the Greek *ophis* and *odons*, meaning “snake” and “tooth”, and from the Latin, “elongate”. Indeed, one of the most notable features of the fish is its great, gaping mouth with a projecting lower jaw and numerous, sharp teeth interspersed with large fangs.

The lingcod’s back is adorned along its length by a high dorsal fin notched into two sections. The tail is truncated, and the anal fin runs from the tail to near the mid-point of the belly. The large, fan-like pectoral fins are complemented by a second, smaller pair of pelvic fins just below. The scales are small and smooth and cover the entire body and head.

Colour varies a great deal and depends upon environmental conditions. Most lingcod, however, tend toward bold, mottled colours in some shade of brown, grey or — especially for smaller fish — green on the back and sides, fading into paler shades on the belly. An occasional specimen is blue, and while the colour causes some apprehension among fishermen, the flesh turns white when cooked and is quite tasty.

The lingcod is noted for its voracious appetite and its large size. The largest individual on record reached 152 cm in length, and weighed 36.3 kg.

Distribution

Lingcod are found all along the western coast of North America from California to Alaska, but landing records suggest that they occur in greatest abundance in the region off British Columbia. They are found in very shallow waters to depths of more than 200 m. Mostly, they prefer to inhabit rocky areas or the edge of underwater reefs and, at times, the relatively flat banks associated with the continental shelf.

Reproduction and Growth

Maturing female lingcod congregate late in the year. Occasionally, commercial fishermen encounter these groups in relatively deep offshore waters, with the result that catches during the winter consist entirely of large females. In October and November, the males begin to appear on the spawning grounds, usually in shallow water over rocky bottom, and in January the females follow them. Spawning occurs during January and February. It appears to take place at night, when the females quickly release their eggs — 150,000 for smaller fish, but up to 500,000 for larger individuals — then immediately leave the spawning area.

The eggs are laid in rock crevices where a good current will ensure sufficient oxygen. The eggs, pinkish and about 3.5 mm in diameter, are deposited in large, sticky masses, some of them weighing as much as 14 kg. The eggs, when exposed to cold water, develop a tough, protective membrane.

fig. 1 Lingcod

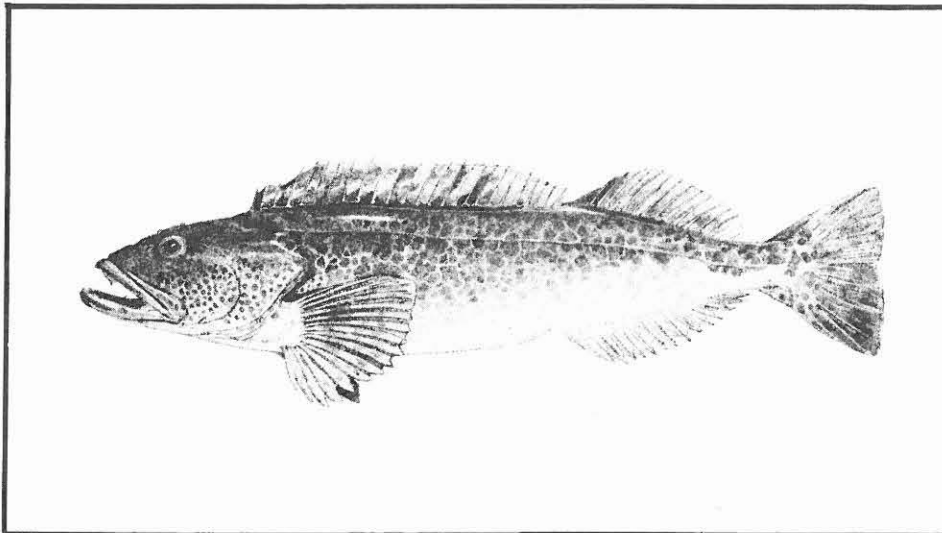


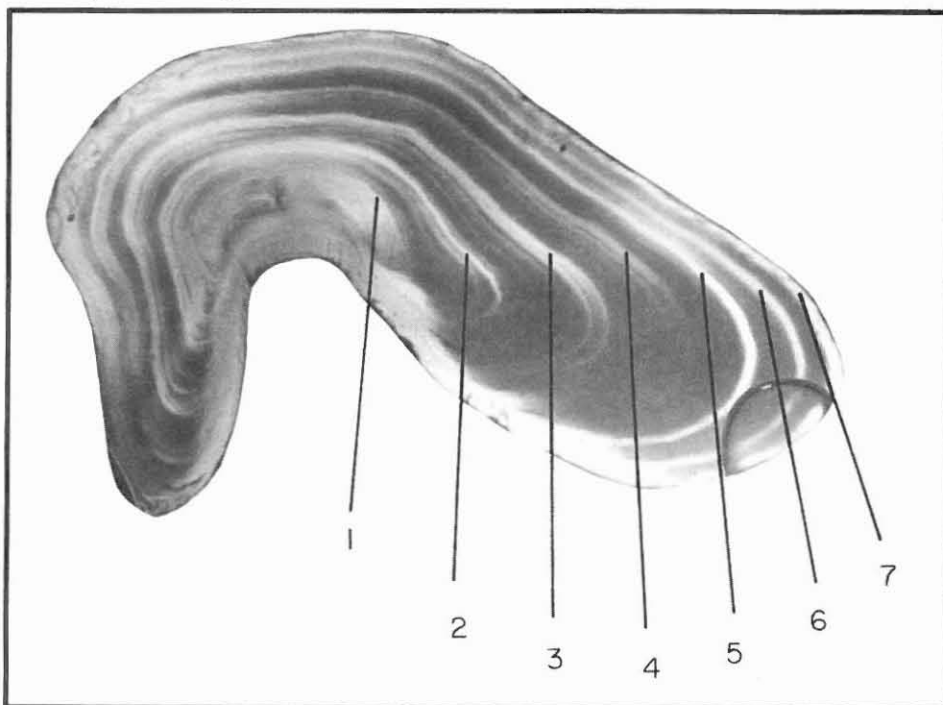


fig. 2 *Lingcod in natural habitat*

Once the female has left, the male takes up the role of guardian, hovering over the nest. If the guardian male is removed, other males may assume the responsibility. However, in most cases, the eggs are consumed by predators.

Hatching takes place after about seven weeks, in late March, but may occur as late as June in some areas. The emergence of larvae is progressive, with

fig. 3 *Microscopic view shows annual growth increments for seven year old lingcod*



eggs on the outside of the mass hatching first. The small, blue-eyed larvae, about 7 mm in length, swim immediately upward into the surface waters where they will remain for about two or three months, feeding on plankton and growing rapidly.

In late May, the larvae begin to move in large numbers into shallow inshore areas. Having reached a length of about 8 cm by early June, they swim down toward the seabed. The change in habitat is accompanied by a change in diet as the lingcod begin to feed almost exclusively on small fish.

Little is known about the juvenile fish, except that they remain in large groups for up to one year, by which time they have grown to about 27 cm in length. Then, they begin to move into offshore waters and to penetrate the reefs and rocky areas that inundate the British Columbia coast. There, in this propitious habitat, they will remain for several years before they join the adult population.

Lingcod grow rapidly, and most mature sexually at age four or five, by which time the females have reached a length of anywhere from 65 to 75 cm and a weight of from 2.7 to 4.5 kg. Males mature at a much smaller size, however, somewhere between 46 and 51 cm and possibly at a younger age. In fact, females grow much larger than males. The female lingcod reaches a length of more than 100 cm between the ages of 10 and 14 years, while males seldom grow any larger than 90 cm. The largest fish on record, therefore, have all been female.

Both sexes may live for approximately 17 years, although most lingcod taken in the commercial fishery are aged between four and 10 years.

Migration

The few tagging studies that have been conducted in the Strait of Georgia and off the west coast of Vancouver Island indicate that most lingcod are not migratory. Their failure to recolonize some areas that have been overfished also suggests that lingcod do not disperse over great distances. On the other hand, some fish have been caught by trawlers on relatively smooth bottom

that is far from the lingcod's normal rocky habitat. The problem of identifying stock units and movements is an important one. If the lingcod are to be effectively managed, much more research is needed.

Food

When the lingcod larvæ emerge from the eggs, they are sustained for some days by a yolk sac attached to the belly. Once the sac is absorbed, the larvæ begin to feed on small plankton. When the fish sink down into the deeper waters, there is an abrupt change in food intake to juvenile herring.

Adult lingcod prey on a variety of fishes, including herring, sand lance, pollock, cod and even octopus. The lingcod is also cannibalistic. Its large mouth enables it to eat fish only slightly smaller than itself.

Predators

The unhatched eggs are actively guarded by the male lingcod. Although not as aggressive as formerly thought, the male will attack large predators, such as greenling and sea perch. Even so, small invertebrates such as the sea urchin and sunflower star and several species of smaller fish manage to escape

the attention of the guardian fish and feed actively on lingcod eggs. Also juvenile fish are subject to a whole range of predators, including adult lingcod.

The large adult lingcod has few natural enemies among fish. However, marine mammals such as sea lions are known to feed on lingcod, particularly males that are protecting nests. In the Strait of Georgia, sea lion predation may be an important cause of declining stocks.

The Fishery

Lingcod were once an important source of food for native peoples, and subsequently for early settlers along the B.C. coast. In modern days, they are fished commercially by bottom trawl, handline, troll, longline, and to a lesser extent by sunken gillnets, traps, beach seines and spear.

The early commercial fishery depended on handlining, or jigging, with live bait from small or medium-sized vessels fitted with "live wells" where captured lingcod were kept alive in continually circulating water. The live fish were later transferred to floating wooden storage boxes where they were kept until sold.

Before 1950, line fisheries accounted for most of the annual catch of 3,600 metric tons (t) by Canadian fishermen. After 1950, the trawl catch of lingcod made up a greater percentage of the total landings. During the 1960s, approximately 60 per cent of the average annual Canadian catch of 2,900 t was taken by trawl gear. This was the result of both a decrease in effort by the line fishery, and an increase in trawling. In the 1970s, the average annual commercial landings by Canadian vessels declined to 2,300 t of which 56 per cent was taken by trawlers.

In addition to the traditional and important hook-and-line sport fishery, scuba divers take a substantial number of the fish.

Both commercial and sport fishermen have become aware of the substantial decline in lingcod in the 1970s. In the Strait of Georgia, for example, there was a 70 per cent decrease in the landings of the commercial fishery over the decade. In the U.S. waters of Puget

fig. 4 Typical handline vessel used in lingcod fishing



Sound, declines in catches have been greater than those observed in Canadian waters, and total closures on lingcod fishing are currently in effect in some areas.

The decline in catches, considered to represent a decline in abundance, is of concern to biologists, fishermen and processors alike. While the factors that affect the size of the lingcod stocks are not well known, it is suspected that over-fishing is a major cause of the decrease. Since lingcod show cycles of abundance, the factors controlling year-class strengths are an important facet of the population studies of lingcod.

Management

Currently, there is an annual winter closure on all lingcod fishing in the Strait of Georgia and off the west coast of Vancouver Island. The intention is to protect spawning and nesting lingcod and to reduce the catch at a period when the quality of the flesh is allegedly poor. The effects of these closures are being evaluated through surveys to provide estimates of the abundance of larval and juvenile lingcod in the surface waters shortly after hatching and by examining the year-class strengths of lingcod as they enter the fishery three to five years after hatching.

As more becomes known about the factors that affect the abundance of lingcod, particularly the juveniles, other approaches to management may be developed. It appears that recreational and commercial fisheries at their current levels are capable of depleting lingcod stocks. Thus, management strategies for all aspects of the fishery must be developed and enforced. There is a need to rebuild overfished stocks while maintaining viable commercial and recreational fisheries.

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Published By:

Communications Directorate
Department of Fisheries and Oceans
Ottawa, Ontario
K1A 0E6

DFO/859 UW/30

© Minister of Supply and Services
Canada 1983
Catalogue Number
Fs 41-33/30-1983E
ISBN 0-662-12715-3

Disponible en français