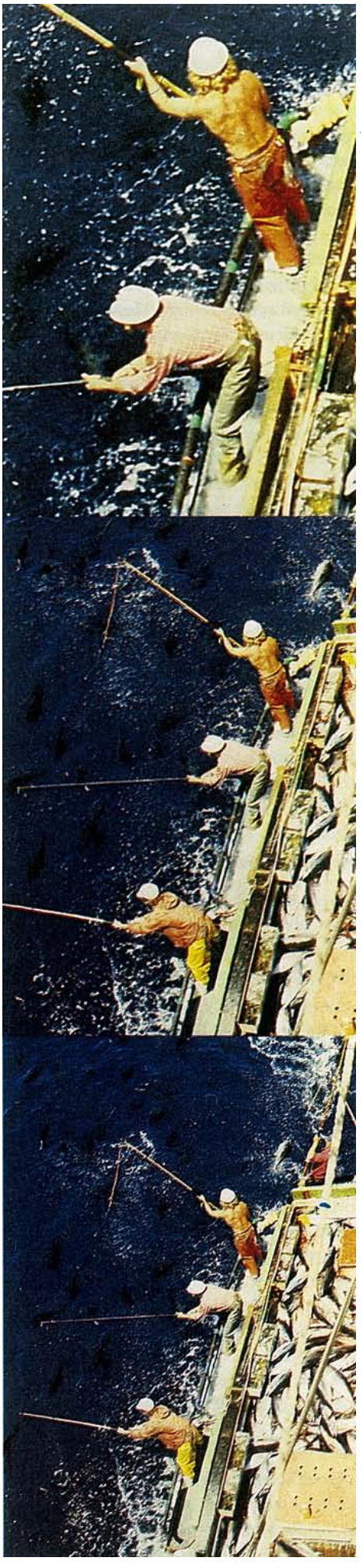


The southern bluefin tuna may be in trouble

Researchers from CSIRO suspect that the southern bluefin tuna, the fish landed in greatest quantity by the Australian fishing industry, is being over-exploited. They fear that, unless the annual catch is reduced, a population crash similar to those experienced by a succession of whale species is likely.

The scientists base their concern on calculations indicating that numbers caught exceed the numbers of young fish joining the exploitable population each year, with the result that the spawning stock is being reduced. In recent years the measured average weight, and hence the average age, of the fish caught has declined substantially — a sign of trouble ahead.

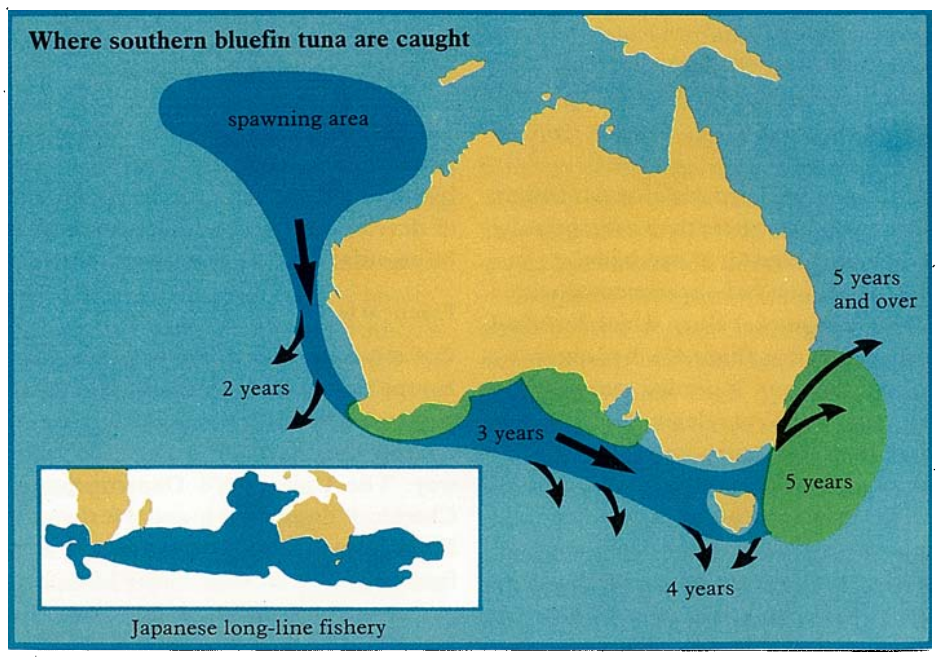
Southern bluefin tuna spawn only in an area of the Indian Ocean south of Java. Before they reach biological maturity at the age of about 7 years and return to the spawning grounds, the young fish go on a long and perilous journey that exposes them to Australian and Japanese fishing fleets.

Many follow a migration path that takes them around Australia's southern coastline, and schools of tuna are fished off Western Australia, South Australia, and southern New South Wales. When they meet the Western Australian fleet, based at Albany, the fish are mostly 1–2 years old and weigh up to about 2 kg. Off South Australia, they are usually 3 years old and about three times heavier. In the New South Wales fishing grounds, most fish are 4 or 5 years old and weigh 10–17 kg. (A fully grown specimen can weigh as much as 200 kg.)

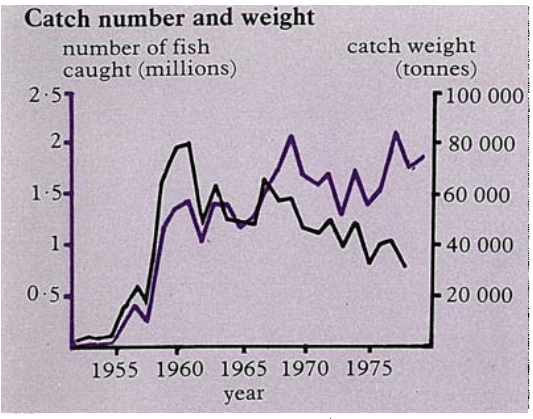
The tuna then head south, and can be found in southern waters anywhere from west of Africa to well east of New Zealand. From there the mature fish move north to the spawning grounds every year.

Some young ones go directly to the southern seas without travelling around the Australian coastline, and fish moving from these waters to the South Australian and New South Wales fishing grounds introduce a sprinkling of younger-than-average tuna there.

The Japanese fish for the southern bluefin tuna across wide stretches of the southern Indian and Pacific Oceans. Their countrymen regard the species as a



Australian fishermen operating in the areas shown catch fish from schools migrating around the coastline. Japanese long-liners operate far and wide.



While the total southern bluefin tuna catch has increased in number since 1960, its weight has fallen substantially.

delicacy — especially in the 'sashimi', or raw fish, market. Hence, despite the fact that the fish in these waters are scattered rather than concentrated in schools, catching them can be a highly profitable enterprise.

The catch begins

Serious exploitation of the species began in the early 1950s, by Japanese long-line fishing fleets. Australian fishermen joined the hunt, mainly using the live-bait and pole method, nearly 10 years later. New Zealand fishermen have recently also begun taking the southern bluefin.

Because of its economic importance, Australian and Japanese fisheries scientists have put a lot of effort into studying this fish, with the result that it has become the best understood of all tuna species. Tags have been inserted in some 70 000 specimens, and information about individuals from which tags have been recovered has provided data not only on migration patterns, but also on growth and mortality rates. Catch-sampling has provided information on the age distribution of the fish.

The information gathered enables the scientists to estimate the size of the spawning stock and the number of young fish entering the fishable population each year. They use these estimates to calculate what catch rates can be sustained indefinitely.

A major problem in reaching firm conclusions about the state of the southern bluefin population, however, is that the effects of a year's catch on the numbers of young fish leaving the spawning grounds cannot be measured with any accuracy until perhaps 9 years after the catch. For example, the Australian catch this financial year will not affect the spawning stock until 1983/84, and 7 more years will pass before recruitment to the fishable stock from that year's spawning can be estimated. If there is a dramatic population decline, of course, it will show up earlier — possibly in the fishing results for 1985/86.

Calculations by Dr Garth Murphy and Dr Jacek Majkowski, of the CSIRO Division of Fisheries Research, show a steady reduction in the spawning stock from 1967 to 1974. The researchers cannot be certain yet what has happened since then, but they point out that the continuing decline in total catch weight in the face of increasing fishing effort and fairly stable catches in terms of numbers of fish taken is symptomatic of a stock being continually reduced in size (see the graph).

Their calculations indicate that, before fishing began, the spawning stock of southern bluefin tuna was around 650 000 tonnes, and by 1974 had been at least cut in half. However, this is not as drastic as it might sound because, in general, fish stocks are remarkably resilient. Most stocks, when first reduced by fishing, produce more young than they did before, and a substantially reduced spawning stock can maintain a thriving fishery.

Nevertheless, fisheries scientists generally regard half the initial stock as the lower limit for reliable production of the young ones needed to sustain a fishery. The signs are that that limit has been passed.

Setting a limit

In 1979, the last year for which complete figures are available, the total southern bluefin catch was about 35 000 tonnes. Recent calculations by Dr Majkowski and his colleagues suggest that, to prevent stocks declining further, the annual catch should be reduced to about 28 000 tonnes.

Calculations indicate that the spawning stock is being reduced.

But that is a lot easier said than done. Imposing catch-weight quotas is the obvious solution. However, as Western Australia, South Australia, and New South Wales are all major participants in the fishery, individual quotas would have to be determined and accepted for each State. Account would also have to be taken of the Japanese and New Zealand involvement. Dr Murphy suggests that establishing an international committee empowered to introduce and enforce limits on catches may be the only way to impose quotas successfully.

At present, there are no restrictions on southern bluefin tuna catches. For the 5 years up to 1981 a freeze was imposed on the number of live-bait and pole boats operating from Australia. However, illustrating how difficult it is to control catches of a valuable fish, this freeze proved ineffective, mainly because operators were transferring their licences to larger boats capable of catching more fish.

Robert Lehane

More about the topic

State of the southern bluefin tuna population: fully exploited. G. I. Murphy and J. Majkowski. *Australian Fisheries*, 1981, **40**(11), 20–9.

The decline of the southern bluefin tuna population. J. Somers and G. Murphy. *Australian Natural History*, 1982, 25 (in press).

Australia's fishing zone — vast and largely unknown. *Ecos* No. 24, 1980, 24–31.

This one was caught off the South Australian coast.