Australia's deep-water squid

Unlikely though it may first appear, squid are closely related to the more sedentary and, to Australian seafood-eaters, more attractive oysters and scallops.

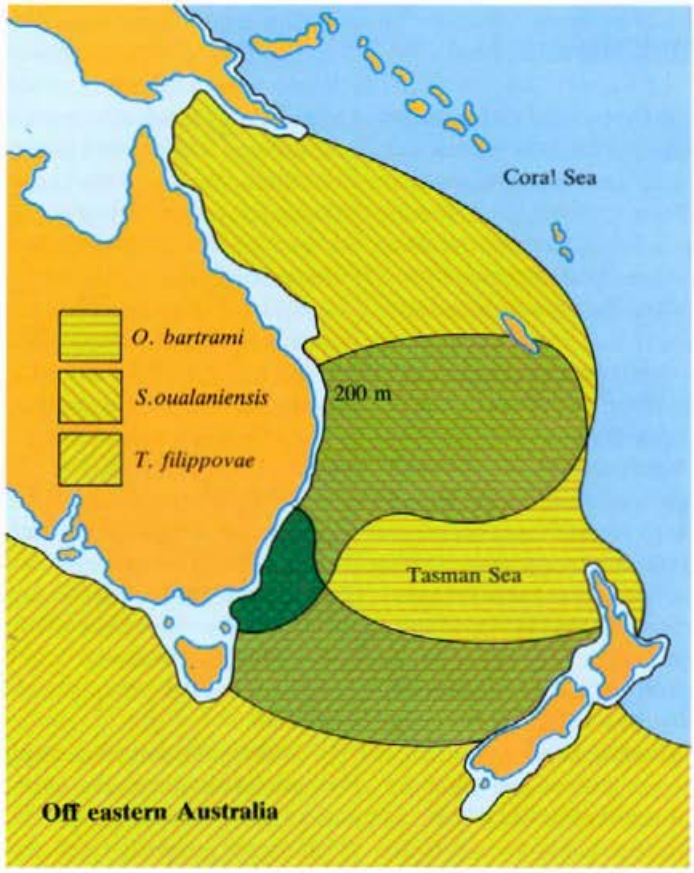
Relative tastes aside for the moment, the squid family renounced the placid bottom-dwelling life style to develop into the most advanced of the invertebrate group of animals. With improved nervous and optical systems, and unencumbered by a protective shell, their new-found speed and mobility transformed them into ferocious predators of both shell-fish and fish, as well as their smaller brethren. In turn, the larger squid are consumed by sharks, whales, and valued fish such as tuna. Some people, such as the Japanese, also relish the taste of squid.

Australians, like many other peoples of the Western world, have neglected their culinary virtues. However, the Japanese, confined to crowded islands where livestock are at a premium, learnt long ago to exploit the creatures of the sea, with the waters surrounding Japan being the major squid fishery on the earth. Squid are the single most important seafood item in the Japanese diet, with an annual consumption of approximately 2 kg per head.

The largest squid fishery in the world has only earned its title by being intensively exploited and, after record catches of about 700 000 tonnes in the late '60s, the fishery has begun to decline, with the annual catch dropping to some 250 000 tonnes. To make up the shortfall between local production and demand, Japanese trawlers and jigging boats have been forced to range into foreign waters where, through either joint fishing ventures or licensing arrangements, they can exploit an alternative source of squid.

Australian waters support large populations of squid, but little has been known about their distribution and habits. Among the deep-water (or pelagic) squid, about 20 species have recognized or potential commercial value, and at least eight of these can be found in the seas around Australia.

A Southern Ocean arrow squid.



The distributions of the three potentially commercial species overlap.

However, existence does not necessarily imply survival under commercial fishing pressures; and to find out more about the resource, Mr Malcolm Dunning and Dr Stephen Brandt, of the CSIRO Division of Fisheries Research, studied specimens collected in Australian waters by CSIRO, Japanese, and Taiwanese research vessels. Other specimens were provided by the Australian Museum in Sydney.

According to Mr Dunning three oceanic species — *Ommastrephes bartrami* (red ocean squid), *Todarodes filippovae* (Southern Ocean arrow squid), and *Sthenoteuthis oualaniensis* (yellowback squid) — have the greatest potential for commercial use. Their distributions overlap, with the yellowback squid predominating in tropical waters and the red ocean squid in the temperate regions, while the Southern Ocean arrow

squid lives up to its name with a distinct preference for the cooler waters to the south of Australia.

All three species have the marked advantage that they form large schools, with as many as a thousand individuals or more congregating together. Also, they may have a protracted spawning season — or even spawn all year round. This means that foreign fishing during the northern winter (our summer) will remove the larger members of the population, but still allow the smaller (but rapidly maturing) individuals in the population to reproduce.

And the squid do have a great capacity for reproduction and growth. One female Southern Ocean arrow squid, for example, was found to contain 250 000 eggs.

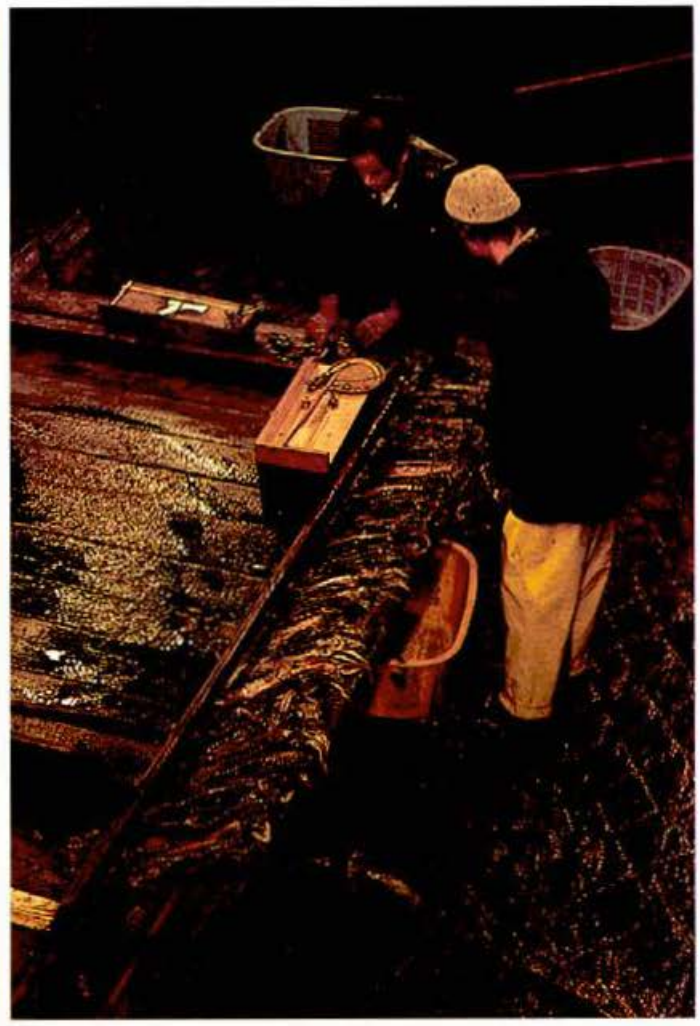
These eggs, embedded in a jelly that hinders fungal growth and is distasteful to any potential predator, hatch after a few weeks and, although they then suffer substantial predation, grow rapidly to reach, in the case of the large red ocean squid, a mature size spanning 100 cm from tip to tip, and a weight of 3–4 kg at 1–2 years of age. They mate soon after achieving sexual maturity then, after spawning and the release of the new generation, they die.

Commercial fishing for the oceanic species has not been attempted in Australian waters, although the red ocean squid is exploited elsewhere. As an indication of the potential, some Japanese research vessels occasionally caught more than 2·5 tonnes of the Southern Ocean arrow squid during a night's jig fishing. However, the many remaining gaps in our knowledge of pelagic squid need to be filled before the resource can be effectively exploited.

Red ocean squid, for example, are found from the surface right down to depths greater than 1400 metres in Atlantic waters, but does the same apply here? Similarly, other squid species are known to undertake migrations in excess of 1000 km and, while there are hints that the Australian species also like to travel, as yet we have no firm information.

At present the main squid species being exploited in Australian waters is Gould's squid, *Nototodarus gouldi*, which is generally found just off the coast of southern Australia, occasionally forming dense schools in estuaries such as the Derwent estuary near Hobart. Local fishermen take advantage of the proximity of the squid, and sometimes take large catches.

Korean and Taiwanese boats also work in the area but generally the catch is quite small — eight boats harvesting 2200 tonnes of squid during the summer and autumn of 1984/85.



Measuring red ocean squid caught off Tasmania.

Yet, as the scientists have shown, many other attractive squid occupy the deeper waters off the continental shelf. The Japanese use similar-quality species to prepare delicacies such as 'sashimi' (uncooked fish or squid dipped in soy sauce flavoured with horseradish) and 'sushi' (uncooked fish or squid served with vinegared rice).

Whether such novel food will ever take a hold on Australian palates is a moot point, but Australians are becoming increasingly cosmopolitan and the 'chop and two veg' diet is slowly giving way to other dishes. And among those new foods is the once rarely consumed squid: Australia currently imports more than 4000 tonnes of frozen squid from the United States each year and, given that we now know that many good-eating squid live in our own waters, this seems to be an anomaly that cannot continue for too long.

Wayne Ralph

Japanese squid jigging vessel.

Distribution and life history of deep-water squid of commercial interest from Australia. M.Dunning and S.B.Brandt. *Australian Journal of Marine and Freshwater Research*, 1985, **36**, 343–59.