Fish growth changes enhanced by climate change

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Changes in growth rates in some coastal and long-lived deep-ocean fish species in the south west Pacific are consistent with shifts in wind systems and water temperatures, according to new Australian research published in the United States this week.

“We have drawn correlations between the growth of fish species related to their environmental conditions – faster growth in waters above a depth of 250 metres and slower rates of growth below 1,000 metres,” says lead author, Dr Ron Thresher.

“These observations suggest that global climate change has enhanced some elements of productivity of shallow-water stocks but at the same time reduced the productivity and possibly the resilience of deep water stocks,” he says.

A biological oceanographer with CSIRO’s Wealth from Oceans Research Flagship, Dr Thresher said the research – published in the latest edition of the US science journal, *Proceedings of the National Academy of Sciences* – is based on the examination of fish earbones, or otoliths, which show similar characteristics to the growth rings used to date the age of trees. The work was done in collaboration with the Victorian Marine and Aquatic Fisheries Research Institute, which has specialist skills in analysing otoliths.

Water temperatures have been obtained from a 60-year-long record at Maria Island on the Tasmanian east coast, and using 400-year-old deep-

ocean corals to measure temperate at depth.

Dr Thresher said populations of large marine species are widely subject to two major stressors – commercial fishing and climate change. Heavy exploitation increases the sensitivity of species to environmental effects and could be magnifying the effects of long-term climate change and short-term climate variability on the viability of some species.

He said correlations for long-lived shallow and deep-water species suggest that water temperatures have been a primary factor in determining juvenile growth rates in the species examined – Banded morwong, redfish, Jackass Morwong, Spiky, black, smooth and Warty Oreo and Orange roughy. Because of the pervasive effect of temperature on the physiology and growth of marine animals, it was likely that similar effects would be seen in many other species.

The science team examined 555 specimens ranging in age from two to 128 years, with birth years from 1861 to 1993.

Growth rates of a coastal species, juvenile morwong, in the 1990s were 28.5 per cent faster than at the beginning of the period under assessment in the mid-1950s. By comparison, juvenile oreos, a species found at depths of around 1,000 metres, were growing 27.9 per cent slower than in the 1860s. There was no or little change in the growth rates of species found between 500 and 1,000 metres.

Growth rates of the juveniles of the deep-water species all began decreasing well before the onset of commercial fishing.

Dr Thresher said slower growth in fishes has been correlated with a variety of life history traits – from higher mortality to reduced food availability and increased age or smaller size at sexual maturity.

He said comparisons of historical and modern oceanographic data indicate temperature trends very similar to the apparent changes in growth rates. In the south west Pacific east of Tasmania sea surface temperatures have risen nearly two degrees, based on the results of a monitoring program at Maria Island. Coinciding with this has been a southward shift in South Pacific zonal winds which has strengthened the warm, poleward-flowing East Australian Current.

“Modelling suggests that, with increasing global warming, temperatures at intermediate depths are likely to rise near-globally,” Dr Thresher said. “This could mean that over the course of time, the decrease in growth rates for the deep-water species could slow or even be reversed,” Dr Thresher said.

Source: CSIRO Australia