

Oceans where fishes choke

November 30 2010

(PhysOrg.com) -- Australian marine scientists have expressed disquiet over the continued worldwide spread of large, dead zones in the ocean.

Professor Ove Hoegh-Guldberg and Associate Professor Mark McCormick of the ARC Centre of Excellence for Coral Reef Studies have recently published scientific articles which raise concern about the impact of large areas of [ocean](#) emerging which are so low in oxygen that [fish](#) and other sea life cannot survive.

Hundreds of dead zones are being reported around the world in areas that have been overfished and where rich nutrient runoff from the land is causing blooms of [algae](#) which lead in turn to blooms of [bacteria](#) that strip the oxygen from the water.

“We think this problem is also linked to climate change,” Professor Hoegh-Guldberg of CoECCRS and The University of Queensland said in a recent review article in the leading international journal Science.

“Warmer oceans tend to form layers which, like stagnant ponds, are low in oxygen,” he said.

“Changes in wind strength and ocean currents driven by climate change affect the degree of mixing that goes on between surface and deep waters and this is changing the nutrient distribution, causing anoxic zones to form.”

A total of 405 dead zones have been reported by oceanographers

worldwide during the period 2000-08, compared with 300 in the 1990s and 120 in the 1980s.

The number has been doubling every decade since the 1960s. Some zones are as small as a square kilometre, while others are 70,000 sq kms in extent. Together they cover about 245,000 sq kms of the planet's oceans.

Associate Prof Mark McCormick of CoE CRS and James Cook University said the loss of oxygen from waters in the world's major ocean basins was one of several factors contributing to increased stress on world fish populations.

"We know from our recent work that increases in stress result deformities leading to poorer survival of fish larvae," he said.

"Low oxygen levels increase stress on fish.

"It has also been found they can cause fish to have smaller ovaries, produce fewer eggs, so larvae are also smaller and less likely to survive."

He said a large area of the central Pacific, between 200-600 metres deep, had only a tenth of its normal oxygen levels, causing profound changes to the type of sea life that could inhabit it.

"As the ocean warms it is likely this hypoxic (low oxygen) zone will move closer to the surface and spread out onto the continental shelves. This will have repercussions for both recreational and professional fisheries."

Professor McCormick said that in cases where anoxic (zero oxygen) zones occurred along heavily populated coastlines, major fish kills were often reported and coastal communities incensed.

Scientists fear the increase in the number and size of the dead zones may herald a mass extinction of [sea life](#).

In a recent review paper published in the journal *Science*, Professor Hoegh-Guldberg and co-author John Bruno linked the phenomenon to mass extinctions of the past, saying “There is growing paleontological evidence that declining oxygen concentrations have played a major role in at least four or five mass extinction events.”

Low [oxygen](#) zones have now been found in all the world’s oceans, with particular hotspots in places such as the Gulf of Mexico, off Namibia in the South Atlantic, in the Bay of Bengal, in the Baltic, Black Sea, the tropical South Pacific, off China and southeastern Australia.

These anoxic zones are likely to be connected to an observed decline in ocean phytoplankton -which supports the entire marine food web - of about one per cent a year, Professor Hoegh-Guldberg says.

In a chain reaction, this loss of the marine food base may be a factor in the worldwide decline in fisheries.

“Coastal [dead zones](#) correlate strongly with heavy human populations, runoff and overfishing,” Professor Hoegh-Guldberg said.

"In the open oceans changes in winds and currents and the formation of warm layers may be the main factors.

“It adds up to a conclusion that our ocean ecosystems are in a lot of trouble – and it all bears the hallmarks of human interference,” Professor Hoegh-Guldberg said.

"We are changing the way the Earth’s oceans work, shifting them to entirely new states which we have not seen before.

“Among them are these black anoxic zones which belch up dead sealife.

"It may be happening in pockets today, but the risk is that it will happen on a far greater scale in future unless we take urgent steps to reduce the impact of human activities on the world's oceans and their life.”

More information: The Impact of Climate Change on the World's Marine Ecosystems by Ove Hoegh-Guldberg and John F. Bruno was publishing in *Science* vol 328, June 2010, and Gagliano M and McCormick MI (2009) Hormonally mediated maternal effects shape offspring survival potential in stressful environments. *Oecologia* 160:657-665.

Provided by University of Queensland

Citation: Oceans where fishes choke (2010, November 30) retrieved 12 May 2024 from <https://phys.org/news/2010-11-oceans-fishes.html>

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