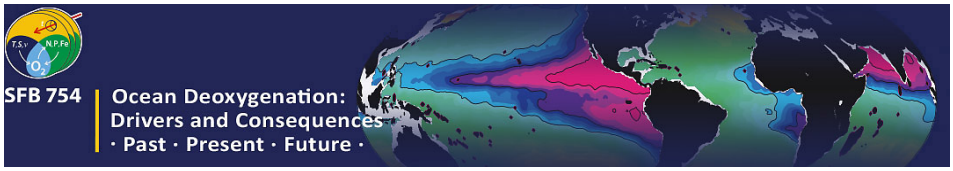

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Short-term ecosystem alterations produced by a strong natural hypoxia event in a shallow bay of the southern Humboldt Current System

In January 2008 there was an intensive and extensive upwelling event in the southern Humboldt Current System. This caused an intrusion of equatorial subsurface water into the coastal zone, generating severe hypoxic conditions (≤ 0.5 ml O2 l-1) on a time scale of hours-days. A massive mortality and the beaching of pelagic and benthic organisms, including fishes, megafauna and zooplankton occurred in Coliumo Bay, a shallow bay located in the southern Humboldt Current System (HCS). During the hypoxic event, in the pelagic environment Redox, pH, nitrate, phosphate, silicate and chlorophyll-a values were the lowest, while nitrate and the phaeopigment values were the highest. Nano- and microphytoplankton were at their lowest abundances. Macrozooplankton had the greatest abundance during hypoxia, dominated mainly by crustacean eggs, fish eggs and amphipods. During the initial stranding 26 fish species were identified: 23 teleosts, 1 myxiniform and 2 elasmobranchs. Most beached specimens were juveniles. Haematological and histological evidence indicate that the severe hypoxia which lasted for at least 48 hours was the most plausible cause of fish mortality. For the entire megafauna benthic community, including fishes, we found that (i) strong changes in total density, total biomass, and diversity occurred immediately after the hypoxic event, negatively affecting crustaceans and fishes, while gastropods were favoured, and (ii) initial changes were reverted over a period of three months. The hypoxia event generated a strong short-term alteration of all biotic and abiotic components of the pelagic system in Coliumo Bay and the neighboring coastal zone. These negative effects associated with strong natural hypoxia events could have important consequences for the productivity and ecosystem functioning of the coastal zone of the HCS if, as suggested by several models, winds favorable to upwelling should increase due to climate change. The effects of severe natural hypoxic events in this coastal zone can be dramatic, especially for pelagic and benthic species not adapted to endure conditions of low dissolved oxygen.
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