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Press Release

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An unprecedented carbon sink

– New study reveals important impact of benthic organisms –

January 13, 2010/Kiel. They need calcium carbonate ($CaCO_3$) for many aspects of their life cycle, releasing this material to the seabed when they die: Echinoderms, such as starfish, or sea lilies, have a much larger impact on the global marine carbon cycle than assumed originally. Accordingly, their reactions to ocean acidification have also extensive consequences for life on the ground as well as in the water column. A group of scientists from the Leibniz Institute of Marine Sciences (IFM-GEOMAR) in Kiel, Germany, the National Oceanography Centre (NOCS) in Southampton, UK, and the Pacific Marine Environmental Laboratory (NOAA) in Seattle, USA provide first estimations, demanding a precise re-assessment on the contribution of benthic organisms to the global carbon cycle.

Animals living at the sea floor incorporate in many cases carbon directly from the seawater in the form of calcium carbonate ($CaCO_3$) in a process known as calcification. Among them, the echinoderms are present in all oceans and latitudes from the intertidal pools to the deep-sea. They are divided into five groups: starfish, sea urchins, brittle stars, sea cucumbers and sea lilies. In their bodies, they incorporate calcium and magnesium in different proportions, forming carbonates. This means that they lock up in their skeletons a substantial amount of inorganic carbon. This process directly extracts the element from the water, which is supplied from the atmosphere. When echinoderms die, they release carbon directly into the sediments instead of being remineralized in the water column as it happens with planktonic animals and algae. A new study published in ESA Ecological Monographs lead by Ph.D student Mario Lebrato from the Leibniz Institute of Marine Sciences (IFM-GEOMAR) in Kiel, provides the first estimation on the contribution of echinoderms to the oceanic carbonate budget (including inorganic and organic carbon).

“Our paper highlights the limited understanding of large-scale carbon processes associated with calcifying taxa such as echinoderms and tackles some of the uncertainties in the global calcium carbonate budget. We draw attention on the need for a major re-assessment of the contribution of benthic organisms such as echinoderms to the global marine carbonate cycle”, says Mario Lebrato, lead author of the study. “It also calls for the incorporation of a benthic compartment in models of the biological pump. We have a very limited understanding of these biogeochemical processes globally and we need to re-assess their relative importance compared to pelagic processes in the water column.”

The authors also conclude that a deeper insight is especially necessary to assess the consequences of ocean acidification for echinoderms and other calcifying animals. The first experiments investigating the effects of an increasing amount of carbon dioxide in seawater – a consequence of human-induced burning of fossil fuels - heralded a catastrophic future for this species. “As more research has been conducted, contradicting trends emerge, complicating the understanding of the process as a whole”, explains Mario Lebrato. “Echinoderms exemplify one of these contradictory responses, showing a priori unexpected patterns that just challenge our understanding".

Original publication:
Lebrato, M., D. Iglesias-Rodriguez, R. Feely, D. Greeley, D. Jones, N. Suarez-Bosche, R. Lampitt, J. Cartes, D. Green, and B. Alker, 2009: Global contribution of echinoderms to the marine carbon cycle: a re-assessment of the oceanic CaCO3 budget and the benthic compartments. ESA Ecol. Monogr., doi: 10.1890/09-0553.

Figures:
At www.ifm-geomar.de/presse images are available for download.

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