

TITLE: Macrofaunal colonization across the Indian margin oxygen minimum zone

AUTHOR: ['Lisa A. Levin', 'A. L. McGregor', 'Guillermo Mendoza', 'Clare Woulds', 'Paul C. Cross', 'Ursula Witte', 'Andrew J. Gooday', 'Gregory L. Cowie', 'Hiroshi Kitazato']

## ABSTRACT:

Abstract. There is a growing need to understand the ability of bathyal assemblages to recover from disturbance and oxygen stress, as human activities and expanding oxygen minimum zones increasingly affect deep continental margins. The effects of a pronounced oxygen minimum zone (OMZ) on slope benthic community structure have been studied on every major upwelling margin; however, little is known about the dynamics or resilience of these benthic populations. To examine the influence of oxygen and phytodetritus on short-term settlement patterns, we conducted colonization experiments at 3 depths on the West Indian continental margin. Four colonization trays were deployed at each depth for 4 days at 542 and 802 m (transect 1°16'58' N) and for 9 days at 817 and 1147 m (transect 2°17'31' N). Oxygen concentrations ranged from 0.9 ?M (0.02 mL L<sup>-1</sup>) at 542 m to 22 ?M (0.5 mL L<sup>-1</sup>) at 1147 m. All trays contained local defaunated sediments; half of the trays at each depth also contained <sup>13</sup>C/<sup>15</sup>N-labeled phytodetritus mixed into the sediments. Sediment cores were collected between 535 m and 1140 m from 2 cross-margin transects for analysis of ambient (source) macrofaunal (>300 ?m) densities and composition. Ambient macrofaunal densities ranged from 0 ind m<sup>-2</sup> (at 535-542 m) to 7400 ind m<sup>-2</sup>, with maximum values on both transects at 700-800 m. Macrofaunal colonizer densities ranged from 0 ind m<sup>-2</sup> at 542 m, where oxygen was lowest, to average values of 142 ind m<sup>-2</sup> at 800 m, and 3074 ind m<sup>-2</sup> at 1147 m, where oxygen concentration was highest. These were equal to 4.3 and 151% of the ambient community at 800 m and 1147 m, respectively. Community structure of settlers showed no response to the presence of phytodetritus. Increasing depth and oxygen concentration, however, significantly influenced the community composition and abundance of colonizing macrofauna. Polychaetes constituted 92.4% of the total colonizers, followed by crustaceans (4.2%), mollusks (2.5%), and echinoderms (0.8%). The majority of colonizers were found at 1147 m; 88.5% of these were *Capitella* sp., although they were rare in the ambient community. Colonists at 800 and 1147 m also included ampharetid, spionid, syllid, lumbrinerid, cirratulid, cossurid and sabellid polychaetes. Consumption of <sup>13</sup>C/<sup>15</sup>N-labeled phytodetritus was observed for macrofaunal foraminifera (too large to be colonizers) at the 542 and 802/817 m sites, and by metazoan macrofauna mainly at the deepest, better oxygenated sites. Calcareous foraminifera (*Uvigerina*, *Hoeglundina* sp.), capitellid polychaetes and cumaceans were among the major phytodetritus consumers. These preliminary experiments suggest that bottom-water oxygen concentrations may strongly influence ecosystem services on continental margins, as reflected in rates of colonization by benthos and colonizer processing of carbon following disturbance. They may also provide a window into future patterns of settlement on the continental slope as the world's oxygen minimum zones expand.

SOURCE: Biogeosciences

PDF URL: <https://bg.copernicus.org/articles/10/7161/2013/bg-10-7161-2013.pdf>

CITED BY COUNT: 10

PUBLICATION YEAR: 2013

TYPE: article

CONCEPTS: ['Transect', 'Phytodetritus', 'Benthic zone', 'Bathyal zone', 'Oxygen minimum zone', 'Upwelling', 'Continental margin', 'Geology', 'Sediment', 'Oceanography', 'Colonization', 'Oxygen', 'Ecology', 'Environmental science', 'Geomorphology', 'Biology', 'Paleontology', 'Chemistry', 'Foraminifera', 'Tectonics', 'Organic chemistry']