Depth ranges of occurrence for major functional groups of invertebrates, fish, and algae on global shallow and mesophotic reefs, 1973–2017

Website: https://www.bco-dmo.org/dataset/772745
Data Type: Other Field Results
Version: 1
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Project
» Collaborative Research: Sponge Growth is Nitrogen Limited over the Shallow to Mesophotic Depth Gradient (MCESponge)

Contributors	Affiliation	Role
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Abstract
Depth ranges of occurrence for major functional groups of invertebrates, fish, and algae on global shallow and mesophotic reefs. Studies were found in published literature from 1973 to 2017.

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Coverage

Spatial Extent: **N**:35 **E**:145 **S**:-20 **W**:-160

Temporal Extent: 1973 - 2017

Dataset Description

All data are the result of multiple transects at different depths from shallow to mesophotic (<30 m-120 m) where 1 m^2 quadrants were placed and all major taxa identified.

These data are published as Appendix S1 in Lesser et al (2019).

Acquisition Description

Technical diving with closed circuit rebreathers, transect tapes and quadrats.

Processing Description

Data quality control and analyzed in spread sheets for descriptive statistics, and statistical software (JMP) for analysis of significant depth differences.

BCO-DMO Processing Notes:
- added BCO-DMO conventional header
- replaced special characters with ascii characters: eg. è with e; ø with o

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Related Publications

Lesser, M. P., Slattery, M., Laverick, J. H., Macartney, K. J., & Bridge, T. C. (2019). Global community breaks at 60 m on mesophotic coral reefs. Global Ecology and Biogeography. doi:10.1111/geb.12940

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Parameters

Parameter	Description	Units
Publication_Short_title	abbreviated citation	unitless
Species	species name	unitless
MinDepth	depth minimum of occurrence	meters
MaxDepth	depth maximum of occurrence	meters
Taxon	major taxon group	unitless
Location	location of species occurrence	unitless
Analysis	whether benthic or fish were examined in the citation	unitless

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Project Information

Collaborative Research: Sponge Growth is Nitrogen Limited over the Shallow to Mesophotic Depth Gradient (MCESponge)

Coverage: Curacao, Cayman Islands

NSF Award Abstract: Coral reefs are well known biodiversity hotspots of considerable interest to the public and scientific community. Reefs around the world are currently under threat from multiple factors such as pollution, coastal development, overfishing and climate change, where both the warming and acidification of tropical waters contributes to the loss of coral reefs and the many services they provide for us, such as protection from hurricane damage. Many studies are focused on corals, the conspicuously dominant group of organisms on many coral reefs, but other organisms are also important. One group, sponges, are essential for healthy reef function as they provide food and homes for many other reef organisms, they dramatically effect the nutrient cycles on reefs, and they synthesize important compounds of interest to the biomedical community. An emerging area of coral reef science is the study of deep reefs at depths greater than 30 meters. These coral reef systems, known as mesophotic coral reef ecosystems, were largely inaccessible until the transfer of technical diving approaches to the scientific community. In this project the investigators will study sponge populations from 3 meters to over 100 meters to examine their ability to utilize both dissolved and particulate food sources that may help explain increasing sponge biodiversity and growth rates with increasing depth. This project will provide training opportunities for undergraduate and graduate students as well as veterans and post-doctoral researchers, especially from underrepresented groups. Additionally, the investigators will develop unique outreach programs for public education.

Sponges are ubiquitous members of Caribbean coral reef communities, where they have multiple roles. There is evidence accumulating that sponge populations are increasing as coral cover declines due to anthropogenic and natural factors. Trophic interactions play crucial roles in controlling the distributions of species and community structure; however, the relative importance of top-down (predation) and bottom-up (nutrient resources) control of populations remains a hotly debated topic. Recently, it has been proposed that sponges consume large amounts of dissolved organic carbon (DOC) and release large numbers of choanocytes that fuel a "sponge loop" detrital pathway of significance to higher trophic levels. A largely overlooked, but clearly stated, requirement for the "sponge-loop" hypothesis to be broadly generalizable is that sponges must exhibit little, or no, net growth as the only way to balance the loss of carbon in the form of choanocytes (=detritus), with the intake of both particulate organic carbon (POC) and DOC; however, sponges do grow. Additionally, on both shallow and mesophotic coral reefs (MCEs: 3-150m depth), there is a strong vertical gradient in bacterioplankton resources on which sponges feed, and enhanced growth in the presence of spongivory argues for the importance of particulate organic carbon (POC). Missing so far in this discussion is the important role of dissolved and particulate organic nitrogen (DON/PON) that would be essential for sponge growth on coral reefs. This proposal has two goals: 1) quantify the DOC/POC and DON/PON resources available across the shallow to mesophotic depth gradient that has never been done before, and 2) quantify the depth dependence on these resources by a broad taxonomic representation of sponges that also includes multiple life-history strategies across shallow to mesophotic depths. To accomplish this second task the investigators will conduct studies on the growth of sponges from shallow to mesophotic depths to tease apart the independent and interactive roles of DOC/POC and DON/PON in sponge growth. They will also construct carbon, nitrogen and energetic budgets for sponges utilizing these resources. The project will provide the first comprehensive inventory of DOC/POC and DON/PON on several coral reefs. This will be complemented by studies of feeding and growth across the shallow to mesophotic depth gradient. With continuing changes in the community structure of both shallow and mesophotic reefs, understanding whether we can predict, using models of ecosystem function, which reefs will undergo transitions to sponge dominated communities and what factors contribute to these transitions, will be of use to local marine resource managers. These data will also inform the broader field of marine ecology, as well as provide new insights into mesophotic reef structure and function. Finally, sponge samples collected from mesophotic coral reefs often represent new species and they will be made available to scientists upon request.

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Funding

Funding Source	Award
NSF Division of Ocean Sciences (NSF OCE)	OCE-1632348

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