Importance of the coral genus *Leptoseris* to mesophotic coral communities in the Indo-Pacific

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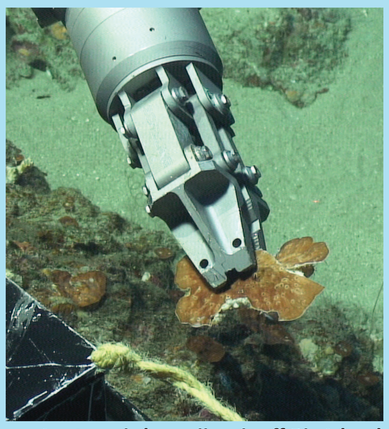
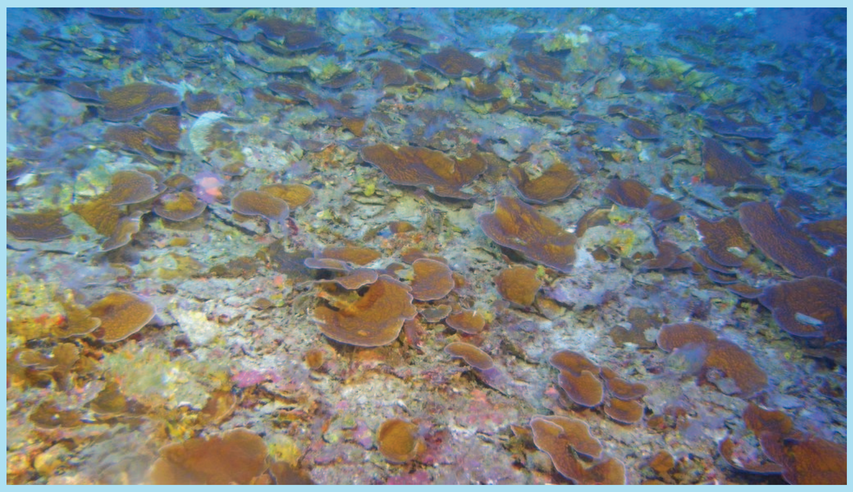


***Leptoseris hawaiiensis* off Big Island, Hawai'i at 120 m. Photo HURL**

Introduction

Mesophotic coral reef ecosystems (MCEs) are typically found at depths from 30 to 40 m and extending to over 150 m in tropical and subtropical regions. Zooxanthellate *Leptoseris* species appear to be ubiquitous in the deeper parts of the mesophotic zone (*1*) in the Indo-Pacific. Here we look at maximum depth distributions of *Leptoseris* in Hawai'i and the Great Barrier Reef (GBR), and consider recent evidence about its ability to dominate deeper habitats inhospitable to most other zooxanthellate corals.

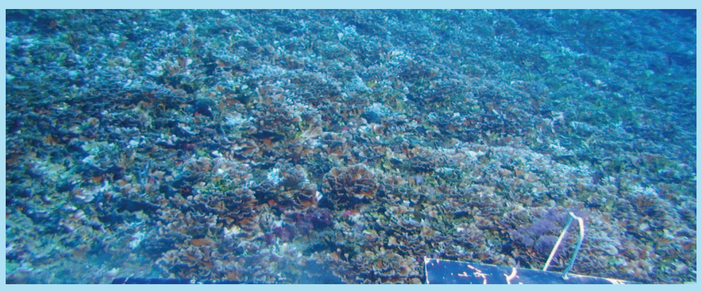


***Leptoseris hawaiiensis* in Au'au Channel, Hawai'i at 88 m. Photo HURL**

Methods

We collated available data on maximum recorded depths of *Leptoseris* in the Hawaiian Archipelago and GBR including unpublished records from recent expeditions. Records are based on collections and observations from SCUBA and technical dives, manned submersible dives, autonomous underwater vehicles, and recent dredge surveys conducted parallel to depth contours within a narrow and reliable range (we exclude Vaughan's data (*2*) due to uncertainty about depth data).

Species reported here are consistent with Dinesen's taxonomic revision (*3*) except that we include *L. yabei* as a *Leptoseris* speçies and recognise *L tubulifera* / cf *tubulifera* and *L. striata* as valid species for this poster. Taxonomy and phylogeny of Hawaiian *Leptoseris* are being investigated by Luck (*4*).



***Leptoseris papyracea* in Au'au Channel, Hawai'i at 60 - 70 m. Photo HURL**

Results

Maximum recorded depths for *Leptoseris* species from Hawai'i and the GBR are shown in Table 1 (based on available data). For comparison, we include the maximum depth reported for these species by Carpenter *et al.* (*5*). In the Hawaiian and GBR regions, the two deepest recorded species are *L. hawaiiensis* (at 153 m and 106 m, respectively) and *L. scabra* (at 127 m and 99 m). Images taken from submersible vehicles show *Leptoseris* filmed *in situ* in deeper parts of MCEs, and these recent surveys indicate that some species are locally very abundant at substantial depths.

Table 1. Deepest available records of *Leptoseris* from the Hawaiian Archipelago and Great Barrier Reef. **S** = Specimens collected from SCUBA, technical or manned submersible dive. **O** = *in situ* observation. **D** = Dredged specimens. JM = collected by J. Maragos. TD = Observed by T. Done. ET = Observed by E. Turak. N/A = Recorded from GBR but accurate depth data not available. Italic numbers in brackets are published references Records for Hawai'i without citations are new reports from the current studies.

Species	Hawaiian Archipelago	GBR	Carpenter *et al. (4)* Indo-Pacific
L. foliosa	-	**>30 m (O)** Mantis and Tydeman Reefs (ET)	30 m
L. gardineri	-	**70 m (O)** Myrmidon Reef (TD)	30 m
L. glabra	-	**44 m (S)** Jewell Reef (*3*)	-
L. hawaiiensis	**153 m (S)** Kealakekua Bay, Hawai'i Island HURL dive M-288 (*6*)	**103 m (D)** Jaguar Reef (*7*)	30 m
L. incrustans	At least **50 m (O)** Main Hawaiian Islands (*8*)	N/A	20 m
L. mycetoseroides	**66 m (S)** Off French Frigate Sholas (JM)	**46 m (S)** Jewell Reef (*3*)	30 m
L. papyracea	**89 m (S)** Off Au'au Chanel HURL dive P4-221	**55 m (D)** Hydrographer's Passage (*7*)	25 m
L. scabra	**127 m (S)** West Maui HURL Dive P5-739	**100 m (D)** Lion Reef (*7*)	30 m
L. solida	-	**>30 m (O)** Mantis Reef (ET)	30 m
L. striata	-	**103 m (D)** Jaguar Reef (*7*)	30 m
L. tubulifera/ *L.* cf. *tubulifera*	**65 m (S)** Pearl & Hermes JM	-	25 m
L. yabei	**75 m (S)** Off Maui HURL dive P5-568	N/A	20 m

Discussion

While some *Leptoseris* species may occur as shallow as 3 m in shaded conditions and may be locally abundant in relatively shallow water (e.g. <15 m) (*3*), *Leptoseris* is capable of flourishing at depths beyond the range of most zooxanthellate corals. Records from recent Hawai'i Undersea Research Laboratory (HURL) studies extend the known depth range of *L. papyracea* and *L. yabei* in the Hawaiian archipelago. The *in situ* images also emphasise that *Leptoseris*, in forming dense stands over tens or hundreds of square metres, can provide an important structural framework for other benthic and demersal fauna in MCEs.

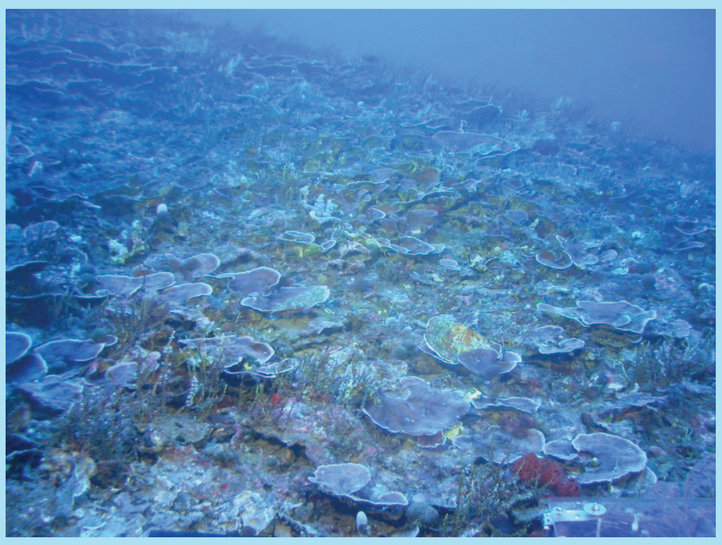
***Leptoseris gardineri* at Myrmidon Reef, GBR. Photo T. Done/D. Hopley**

A preliminary assessment of *Symbiodinium* diversity in mesophotic coral communities from the GBR (*9*) found that the symbiont type C3i, previously reported only in *Acropora*, was present in the five *L. hawaiiensis* specimens analysed, and three other genera tested. The study suggests that mesophotic habitats on the GBR may not be isolated in terms of symbiont diversity, which could be important in terms of their potential to act as refugia.

The ability of *Leptoseris* to dominate deeper MCEs may be in part attributed to its greater light harvesting efficiency compared to shallow water corals (*10*). These authors found that *Leptoseris* exhibited higher spectral absorbance and, surprisingly, lower areal photosynthetic pigment concentrations than *Porites*, the dominant shallow water coral in Hawai'i. The flat growth form of deep water (> 80 m) *Leptoseris* and its skeletal micro-scale geometry (e.g. deep, narrow septo-costae) may cause light to travel through the coral tissue multiple times, increasing light absorption by pigments.

The bathymetric habitat range of *Leptoseris* highlights the deficiencies of past analyses of the lower depth distribution of coral species, e.g. Carpenter *et al.* 2008 (*5*), which have greatly underestimated the depths at which such corals can grow. Contemporary studies such as this one are greatly expanding the recognised biogeographic and bathymetric ranges of mesophotic coral species.

***Leptoseris* sp. in Au'au Channel, Hawai'i at ~ 70 – 80 m. Photo HURL**



***Leptoseris yabei* in Au'au Channel, Hawai'i at 75 m. Photo HURL**

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Acknowledgements

We thank the Museum of Tropical Queensland, T. Done, J. Maragos, E. Turak and D. Wagner for assistance with bathymetric records. We thank HURL for logistical support, also Australian Geographic and L'Oreal; and M. Gomez for help with poster layout.