Application of 3D photogrammetry on the quantification of complex morphometric hard coral, *Acropora digitifera*

Zaidi Puteri[1], Chun Hong Tan[1], Hin Boo Wee[2], and Zainudin Bachok[1]

[1]Universiti Malaysia Terengganu
[2]Universiti Kebangsaan Malaysia

June 1, 2022

Abstract

1. Coral growth rate is one of the common measurements used as an indicator of coral reef health. The traditional approach is by directly measuring the linear extension rate. Yet, this method is a one-dimensional measurement where it underestimated actual coral growth due to coral morphotypes. Therefore, a multidimensional measurement would provide a better understanding on coral dynamic growth. Moreover, current practices are either invasive or needs a sample to be sacrificed therefore unfeasible for repeated sampling. This study aims to evaluate the accuracy of 3D-photogrammetry by comparing with standardised stainless steel gauge blocks of known dimensions. Also, aluminium foil wrap methods were compared with 3D photogrammetry to examine coral surface area of different morphotypes. 2. To explore the application of 3D-photogrammetry, 10 coral nubbins (approximately 3cm) of *Acropora digitifera* were taken from Pulau Bidong and transported back to the mesocosm system. Three different approaches were tested, they are (1) Photo-geometry linear extension (LE) rate using ImageJ software, (2) buoyant weight (BW), and (3) surface area (SA) estimation via 3D-photogrammetry modelling using Agisoft Photoscan software. Coral growth rates were measured every 14 days. 3. The coral growth was significantly reduced at week-8 as showed by the reduction in LE rate and BW values, while SA values increased exponentially. This was believed due to energy shift to form thin calcified layer at the base of the nubbins for stabilisation. 4. This finding suggests corals prioritise in establishment of a base for stability over linear growth after the asexual fragmentation. 3D photogrammetry allows a better understanding of corals' life history strategy by recreating fairly accurate estimates of real objects (irregular coral) without sacrificing and removing it from water. In conclusion, this method further contributes to understanding coral performances after it is transplanted and for future in-situ long term coral monitoring purposes.

Hosted file

`Puteri et al. Application of 3D photogramm_2022.docx` available at https://authorea.com/users/486367/articles/571381-application-of-3d-photogrammetry-on-the-quantification-of-complex-morphometric-hard-coral-acropora-digitifera