

Variations in bioluminescence intensity with depth and vertical temperature profile in the East coast of Sri Lanka

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Bioluminescence is the production and emission of visible light by living organisms. Although a handful of studies have been carried out to identify light producing marine organisms, their spatial and temporal distribution pattern and other aspects related to bioluminescence in the Indian Ocean, no such studies have been conducted in the coastal waters around Sri Lanka. Variations in bioluminescence intensity with respect to depth and vertical temperature profiles in the east coast of Sri Lanka were studied from 9th to 11th November 2015 using the Research Vessel (r/v) Samudrika. The intensity of light produced by bioluminescence organisms was measured using Recoverable BathypphotoMeter (RBPM). The RBPM recorded light intensity while free falling at a speed of about 1 m/s. Several RBPM profiles in the upper 125 m were collected at six different sampling sites encompassing a region 81° 38'E, 82°02'E and 7°56'N, 8°00'N. All RBPM measurements were taken during night in a dark environment (2000 h to 0430 h) to minimize interferences from other light sources. The temperature, density and salinity profiles of each sampling site were collected using a conductivity temperature depth (CTD) profiler. The generalized additive model (GAM) was used to examine the relationships between the bioluminescence intensity with the depth and vertical temperature profile. Bioluminescence was recorded from all the sampling sites with varied intensity. The recorded bioluminescence intensity ranged from 25 to 200 counts and the highest intensity of 200 counts, was observed in the sampling site 4 at the depth range of 20 to 40 m. According to the GAM analysis, bioluminescence intensity decreased with increasing depth and the highest intensity was in the shallow depths range from 20 - 40 m. An average thermocline depth of all the sampling sites was ~ 70 m except for site 6 where it was ~ 90 m. This study proved that the bioluminescence intensity was comparatively higher above the thermocline than the below it. This was further proven by GAM output which, clearly showed that the highest bioluminescence intensity was in the 26 – 29 °C temperature range and it decreased with decreasing water temperature.

Keywords: Bioluminescence, Generalized Additive Model (GAM), Recoverable Bathy Photometer (RBP)