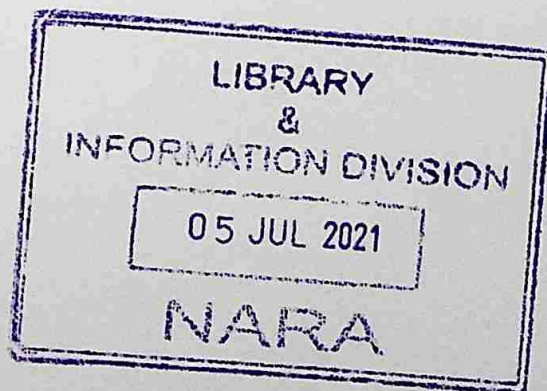


**Planktonic bioluminescence off the South coast and Puttalam
Lagoon of Sri Lanka**

By

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ABSTRACT

Marine bioluminescence is a unique phenomenon and a widely studied area in the world. However, limited information on bioluminescence is available in the Indian Ocean. This study was carried out to understand the spatial and temporal variations in planktonic bioluminescence in selected marine and lagoon waters to evaluate the relationship between planktonic bioluminescence organisms and oceanographic parameters, identify the bioluminescent zooplankton species and estimate their diversity and abundance in order to fill the existing knowledge gap in the region. Planktonic bioluminescence was assessed off the south coast ($5^{\circ}45'46.80''$ N - $6^{\circ}11'06.00''$ N, $80^{\circ} 6'57.60''$ E - $79^{\circ}47'34.80''$ E) and the Puttalam lagoon ($8^{\circ}30'14.40''$ N - $8^{\circ}19'44.40''$ N, $79^{\circ}47'24.00''$ E - $79^{\circ}49'22.80''$ E) of Sri Lanka from January to December 2016 in three months intervals. Sampling was carried out at selected five sampling locations off the south coast and six locations in the Puttalam lagoon. A fixed station ($6^{\circ}06'43.20''$ N, $79^{\circ}45'28.80''$ E) sampling was done off the south coast of Sri Lanka during monsoon and non-monsoon period. Variation in planktonic bioluminescence intensity and oceanographic parameters were measured using a Recoverable Bathypotometer (RBPM) and Conductivity Temperature Depth (CTD) profiler. Vertical hauls of zooplankton samples were collected from 10 m depth to the surface using WP-2 net with 180 μ m mesh size and lagoon zooplankton samples were collected by horizontal towing of the net, samples were preserved in 5% buffered formalin, and used to identify bioluminescent zooplankton species and their abundance (individuals/ m). Three water samples were collected at each sampling location and analyzed the nutrient level (nitrate,

orthophosphate and silicate) using UV-spectroscopic method. Bioluminescence intensity found to be varied with sampling time and sampling location and high intensity bioluminescence peaks were mostly concentrated to the mixed layer in most of the sampling sites. Analysis of bioluminescence and Chlorophyll profiles indicates the presence of both heterotrophic and autotrophic planktonic bioluminescence in the study area. Fixed station analysis indicates the variations in bioluminescence peaks showing the highest intensities at mid night and lowest at the dusk and dawn. Twenty two surface bioluminescent zooplankton species belonging to 15 families and 4 phyla were identified during this study. Of these, twenty one species were reported in offshore waters and eight were identified in the Puttalam lagoon. Seven species were common to off the south coast and the Puttalam lagoon of Sri Lanka. The most abundant bioluminescent zooplankton in the ocean is *Triconia conifera* and it is *Vargula hilgendorffii* in the lagoon. Surface bioluminescent zooplankton abundance exhibits significant difference ($p > 0.05$; Kruskal-Wallis test) with respect to the sampling season off the south coast of Sri Lanka. It was not revealed a significant relationship between bioluminescent zooplankton abundance and surface nutrient concentration ($p > 0.05$; Kruskal-Wallis test) though some positive and negative co-relations were observed. This study provides the first scientific evidence of the presence of bioluminescence in the marine and lagoon waters of Sri Lanka and preliminary results of intensity variations with respect to space and time and identified some zooplankton species responsible for the process of bioluminescence. This information will be useful to update the existing information regionally as well as globally.

Keywords: Bioluminescence, Recoverable bathyphotometer (RBPM), Chlorophyll profiles, Conductivity, Temperature, Depth, Zooplankton,