

Seasonal variation in vertical distribution of bioluminescence intensity at a fixed location of the south coast of Sri Lanka

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Bioluminescence is the emission of visible light by living organisms and this phenomenon is common in both terrestrial and marine animals. Bioluminescent organisms produce light as a result of a chemical reaction. This study was carried out to understand the variation in vertical distribution of bioluminescence intensity at a fixed location (6° 6' 43.68"N, 79° 45' 27.18"E) of the south coast of Sri Lanka during northeast (NE) and southwest (SW) monsoon periods in January and May 2016, respectively. On each sampling day, bioluminescence intensity was measured using a recoverable bathyphotometer at two hours interval from 7.00 pm to 5.00 am. The vertical hauls of zooplankton samples were also collected from surface to 10 m depth using WP-2 net with 180 µm mesh size and samples were immediately preserved in 5% buffered formalin. Bioluminescence intensity ranged from 6 to 98 intensity counts during the NE monsoon and the highest bioluminescence intensity was recorded at around midnight (98 counts) and the lowest was around 5.00 am (6 counts). During the SW monsoon period, the highest bioluminescence intensity was recorded at around 9.00 pm (22 counts) and the lowest was around 5.00 am (12 counts). It was observed that bioluminescence intensity increased from dusk to midnight and gradually decreased in dawn. This indicates that bioluminescence intensity varies with the time of the day. However, bioluminescence intensity was comparatively higher in SW monsoon than NE monsoon. There is a significant correlation between bioluminescence intensity and the depth ($r = 0.007$; $p < 0.05$). The highest bioluminescence intensity was found within the mixed layer depth (40-60 m) and it decreases with increasing depth. This study recorded seventeen bioluminescence zooplankton species belong to four phyla in the upper 10 m of the ocean. *Oncaea conifer* was the most abundant (124 ind./m³) species during the NE monsoon while *Okiopleura dioica* was most abundant (104 ind./m³) during the SW monsoon. This is the first observation of vertical migration in bioluminescent organisms in Sri Lankan waters. Further studies will be done to identify bioluminescent species around Sri Lankan waters with their distribution.

Keywords: Bioluminescence, Bathyphotometer, Thermocline, Zooplankton