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Preliminary Study of Bioluminescence Species in the Southern Bay of Bengal

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Marine organisms ranging from bacteria to fish make their own chemically induced light called bioluminescence, it is used to hunt, frighten predators, attract mates, communicate, or camouflage them. The bioluminescence phenomenon was studied in the southern Bay of Bengal during August 2015 onboard R/V Roger Revelle operating from Colombo, Sri Lanka. The intensity of light produced by bioluminescence spices was measured using Recoverable Bathy Photometer (RBP). The RBP recorded light intensity while free falling at a speed of about 1-1.5 m/s. Several RBP profiles in the upper 200 m were collected at six different sites encompassing a region 5 - 8N, 85.5 - 88.5E. All samples were collected in the night time to minimize interferences from other light sources. Zooplankton samples were collected using 150 μm mesh size plankton net from each location to identify light producing zooplankton species. The RBP measurements showed the existence of bioluminescent organisms in all the sampling locations and high light intensity was found up to 150-200 m water depths. *Sapphirina sp* belonging to the family Sapphirinidae of phylum Arthropoda was identified as one of the light emitting zooplankton species. Studies are underway to examine the luminous substances, and vertical and spatial distribution of these species, especially around Sri Lankan coastal waters.

Key words: Bioluminescence, Recoverable bathy photometer, Zooplankton, Bay of Bengal.

Extended Abstract

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Introduction

Bioluminescence is the production and emission of visible light by living organisms. Bioluminescent organisms are rare on land, but extremely common in the oceans. It has been documented approximately 1–3% of the biomass in the surface ocean belongs to bioluminescent taxa (Morin, 1983). Reasons for these luminous displays appear to be varied from organisms to organisms but these can be divided into some basic categories such as predator avoidance, prey attraction, physiological maintenance and intra-species communication (Abrahams and Townsend, 1993; Morin, 1983; Morin and Cohen, 2010).

The bioluminescent marine organisms include a range of small single cell bacteria to large vertebrates representing over 700 genera belonging to 16 phyla (Herring, 1987). The major groups of bioluminescent marine organisms include dinoflagellates, ostracods, copepods, euphausiids, radiolarians, cnidarians, ctenophores, cephalopods, decapod shrimps, chetognaths and fish. Among these, zooplanktons are considered as major bioluminescent organisms in the marine environment (Moline, 2007).

Objectives

- To study the presence of bioluminescent organisms in the southern Bay of Bengal region
- To identify the vertical distribution of bioluminescent organisms in the southern Bay of Bengal region

Materials and Methods

- Sea surface was carefully observed at night time (7.00 pm to 5.00 am) to identify the presence of bioluminescent organisms in the southern Bay of Bengal region (5-8N, 85.5-88.5E) from 4th to 16th August 2015 during the R.V. Roger Revelle cruise.
- Intensity of light produced by bioluminescent organisms was measured using a Recoverable Bathyphotometer. The RBP recorded light intensity while free falling at a speed of about 1-1.5 m/s. Several RBP profiles in the upper 200 m were collected at six different sites encompassing a region 5-8N, 85.5-88.5E.
- Surface water samples were taken using 150 µm mesh size plankton net at each sampling location to identify light producing zooplanktons. Zooplanktons were identified using available keys and identification guides.

Results and Discussion

Bioluminescence was observed as blinking light. Those were observed during 8 p.m to 5.00 a.m close to the ship hull.

Vertical distribution

Data collected from RBP shows that light emitting organisms were present at all sampling sites. According to preliminary results, bioluminescence can be observed from sea surface to 170 m depth. However, light intensity seems to be varied in relation to depth and sampling locations. For an example, the highest light intensity was recorded in between 20 – 40 m depth at sampling site 1 (Fig 1) and it was in between 60 – 80 m at sampling site 6 (Fig 2).

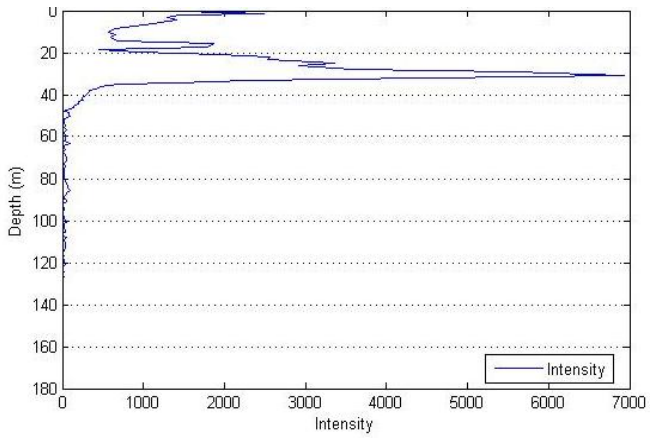

Fig 1. Vertical profile of bioluminescence intensity at first sampling point (8 1.423N and 85 32.069E)

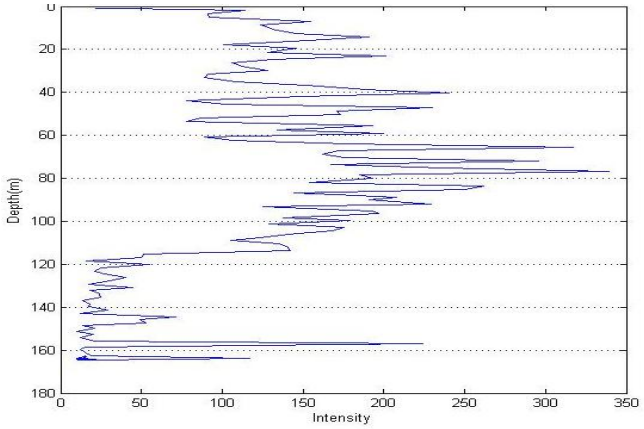

Fig2. Vertical profile of bioluminescence intensity at 6th site (6 25.27N and 85 12.72E)

However, RBP only detects the intensity of light and this instrument can't be used to identify the exact species or animal group/s responsible for light emission

Species identification

One of the light-emitting zooplankton species was identified as *Sapphirina sp* which belongs to the family Sapphirinidae of the phylum Arthropoda (Fig 3).

(a) (b)

Fig.3 Observed bioluminescence zooplankton *Sapphirina sp*

Conclusions

Light emitting zooplanktons are present in the southern Bay of Bengal region and their distribution seems to be varied horizontally and vertically. Further studies are needed to identify light emitting zooplankton species and their vertical and horizontal distribution patterns.

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