



Short Communication

Mass mortality of gorgonians: A catastrophic phenomena in the marine national park and sanctuary, Gulf of Kachchh, India

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This study records the mass mortality of gorgonids, a Schedule I species at the Mundeka Island, Gulf of Kachchh, marine national park and sanctuary. This event coincided with unusually heavy rains and storm surge associated with the cyclone 'HIKAA' which led to the conclusion that a strong storm surge coupled with heavy rainfall might have caused the mortality.

[**Keywords:** Cyclone HIKAA, Gorgonian, Gulf of Kachchh, Intertidal]

Introduction

India is one of the 12 mega biodiversity countries in the world with sensitive ecological habitats and marine ecosystems which harbour and sustain immense biodiversity. The southern shore of the Gulf of Kachchh (GoK) in the north west coast, is one such distinct marine habitat that has some of the most northerly reefs in the world and is demarcated as Marine National Park and Sanctuary (MNPS) under the provisions of the Wildlife (Protection) Act, 1972 of India.

The gorgonian (generally known as sea fan), belonging to Subclass Octocorallia and Order Alcyonacea, is a type of soft coral commonly found in sessile benthic communities found in the subtidal regions of the GoK up to 20 m depth¹. Out of 171 gorgonian species belonging to 36 genera and 12 families recorded from the Indian coastline², only 4 species have been reported from the GoK region³. All these 171 gorgonian species are protected under Wildlife (Protection) Act, 1972 (Schedule I (Part-IVA)). The present note reports a dramatic case of mass mortality involving gorgonian populations from intertidal zones of the Mundeka Reef, GoK during

October 2019 and the hypothetical causes of the event.

Materials and Methods

Mundeka bet is a large island comprising a total area of 4615 hectares (22°30.8' N to 22°33.2' N and 69°51.8' E to 69°56.2' E) in the southern part of GoK (Fig. 1a) is a part of the MNPS. The northern part has rich coral reefs and associated biota. During a routine monitoring program, masses of dead gorgonians were observed in the intertidal zone of the Mundeka Reef during October 2019, some of them were entangled in ghost nets. Atmospheric (rainfall data) and oceanographic (wave height and tidal level) parameters were analysed to understand the cause behind the event.

Results and Discussion

On 1st October 2019, a survey was conducted during the low tide to map the reef communities on Mundeka. During this survey, several hundreds of dead sea fans (in colonies) were observed in the sandy intertidal zone of the Island (Fig. 1d – g). Such occurrences were not observed during a previous similar survey undertaken on 29th April 2019 (Fig. 1b & c).

Numerous biological and physical factors have been documented to have been responsible for mass mortality of sea fans, even though it is very difficult to attribute their mortalities to any particular agent⁴. Few of such factors include: (1) drastic changes in the sea water temperature and salinity, (2) increase in sedimentation rates, (3) severe wave-action, (4) pathogenic agents, (5) effect of chemical pollutants, (6) greater predator pressure, and (7) advanced stage of algal “tumor” phenomenon in gorgonians⁵.

In the present observation, it was hard to attribute any specific causative factor because the mortality event was observed probably days after its occurrence and the sea fan colonies were found in a deteriorated condition. However, given the characteristics of the event (massive dead sea fans lying in the intertidal zone, buried in sand and also entangled in ghost nests), it was probably the strong wave action during October that brought the dead sea fans from the nearby subtidal zones to the littoral zone of the island during the high tide.

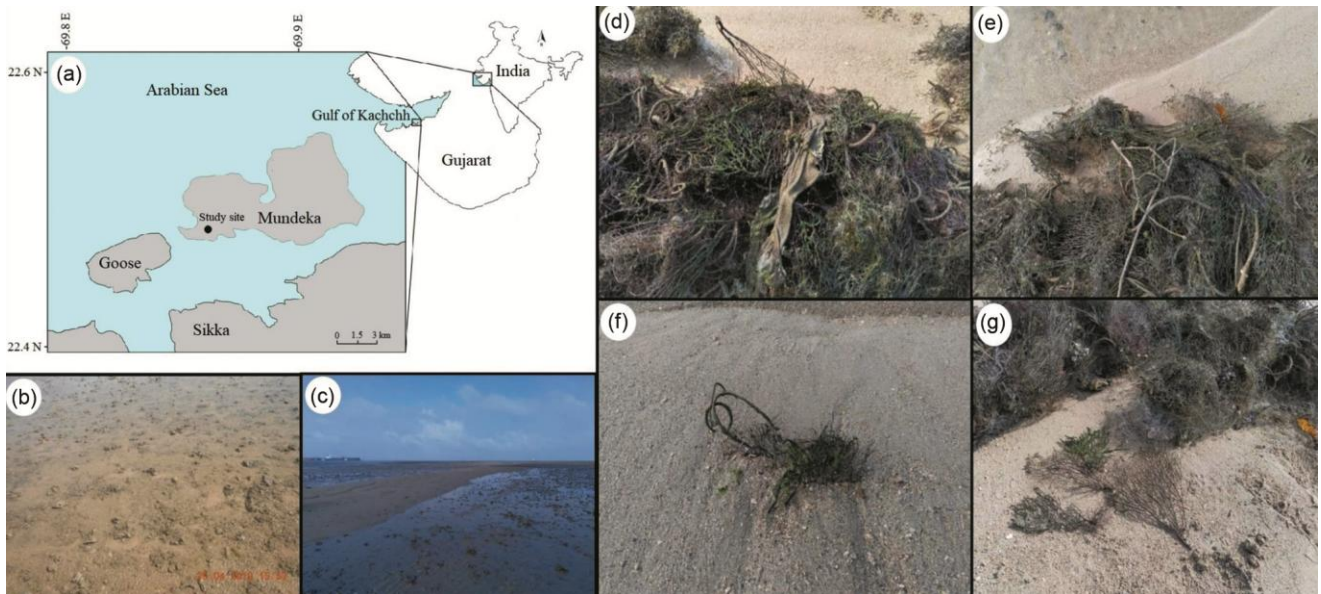


Fig. 1 — a) Location map of the study area, b) Photograph showing the intertidal region of the study site during low tide on 29th April 2019, c) Photograph showing the sand bar in the intertidal region of the Mundeka reef during October 2019, and d – g) Photographs showing the dead sea fans entangled in ghost nets lying on the intertidal zone of the study site during low tide on 1st October 2019

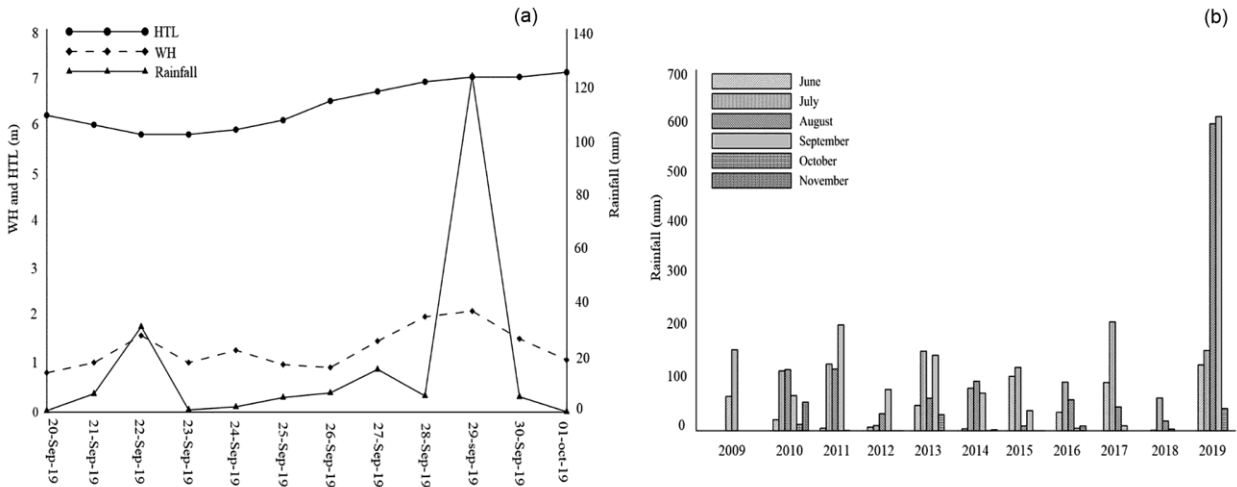


Fig. 2 — a) Atmospheric (rainfall) and oceanographic (HTL-High Tide Level and WH-Wave Height) parameters of the study region during cyclone “HIKAA” and post cyclonic event, and b) Monthly average rainfall (mm) of the study region during 2009 – 2019 (Source: World Weather Online)

One hypothetical cause of this event could be the storm surge that occurred during the cyclone “HIKAA”. This cyclone originated in the Arabian Sea (AS) on 20th September which later developed into a very severe cyclonic storm on 24th September over northwest and adjoining west central AS. It brought adverse weather conditions like heavy rainfall, strong wind and storm surge in the central and northern parts of AS and also along and off the Gujarat coast. We compared the wave height, tidal elevation and rainfall from the region during the cyclone and post cyclonic

periods which indicated a storm surge along with heavy rainfall days before the survey (Fig. 2a). Moreover, the heavy rainfall (600 mm - highest in last 10 years)⁶ which occurred during September 2019 (Fig. 2b) might have changed the water temperature and salinity of the water column in the study region besides resulting in scouring and erosion of seafloor due to hydrodynamic forcing. The strong storm surge coupled with heavy rainfall might have uprooted the gorgonian colonies, thus causing their mortality in the subtidal region and subsequently depositing them on

the intertidal zones of the island. During the October 2019 observation, depositions of sand dunes were observed on Mundeka reef (Fig. 1c) which was not observed during April 2019. An earlier study indicated similar sand deposition due to the storm surge generated by a cyclone in the same area in June 1998^(ref. 7). As the number of cyclones has increased by 32 % in the past five years in the Indian subcontinent and are predicted to be more prevalent in future due to global climate change, the frequent examinations of these mortality events can be useful in evaluating the impact of climate change on coastal marine communities, particularly in marine protected zones.

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Conflict of Interest

The authors declare that they have no conflict of interest.

Author Contributions

Conceptualization, formal analysis and investigation: TS, SS & SP. Funding acquisition,

resources and supervision: SS. Software, roles/writing – original draft and writing – review & editing: TS & SS.

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