

Final Evaluation Report

Your Details	
Full Name	Ramvilas Ghosh A
Project Title	Intertidal gorgonians of the Mumbai coast: a curious case of poorly known urban marine biodiversity in India
Application ID	31982-2
Date of this Report	14-01-2023

1. Indicate the level of achievement of the project's original objectives and include any relevant comments on factors affecting this.

Objective	Not achieved	Partially achieved	Fully achieved	Comments
To understand the diversity and distribution of intertidal gorgonians of Mumbai Metropolis.				The distribution map and species photos are attached (Fig. 1 & 2).
To identify critical habitats and species of conservation priority in the region.				All three reported gorgonian species and the entire extent of its distribution in the Mumbai intertidal region are highly vulnerable or threatened (discussed in detail in below). An offshore rocky patch (~3 km SW of Nariman Point) is proposed as a site of conservation priority (region marked in star on Fig.1.).
To increase the level of awareness and willingness of locals and other stakeholders towards protecting the gorgonian fauna in the region.				Questionnaire surveys and awareness classes in selected fishing villages and landing centres were carried out. Beach-walking groups were formed in association with colleges to report gorgonian sightings in future (discussed in detail in below).

2. Describe the three most important outcomes of your project.

a). Our team was able to map the presence and extent of gorgonians (both isolated and large patches) throughout the intertidal regions of urban Mumbai. Our observations suggest that the entire extent of the gorgonian patches is highly vulnerable to both natural and anthropogenic impacts. The mapping was done with the help of locals, fishers, government institutes (e.g., CMFRI), and local conservation NGOs (e.g., Marine Life of Mumbai).

b). Information on the knowledge, perception, and attitude of fishers toward conservation of gorgonians were collected from selected fishing villages and landing centres (Chimbai Koliwada, Sassoon Dock, Worli, Dandi) using questionnaire survey which will form the baseline reference for long-term conservation actions. Awareness campaigns in the form of education classes and distribution of brochures among the stakeholders (e.g., in fishing villages, landing centres, local colleges etc) throughout the project period helped in creating a better understanding of gorgonian fauna and the need for its conservation in the rocky intertidal regions of Mumbai Metropolis.

c). Though the entire intertidal region is vulnerable, after several field surveys and discussion with conservation experts our team has identified a potential region of gorgonian conservation priority - 18.933986 N, 72.793069 E – the location is ~3 km from Nariman Point and harbours rich gorgonian gardens and other marine life. This would be an ideal location for holistic marine diversity conservation of the region.

d). Better collaboration with research institutions Central Marine Fisheries Institute (CMFRI, Mumbai), Department of Forest and Environment, of the Government of India, local colleges (Ramnarain Ruia College) and NGOs (MLM - Marine Life of Mumbai) has ensured continued monitoring of gorgonians, report new sightings and threats in the region.

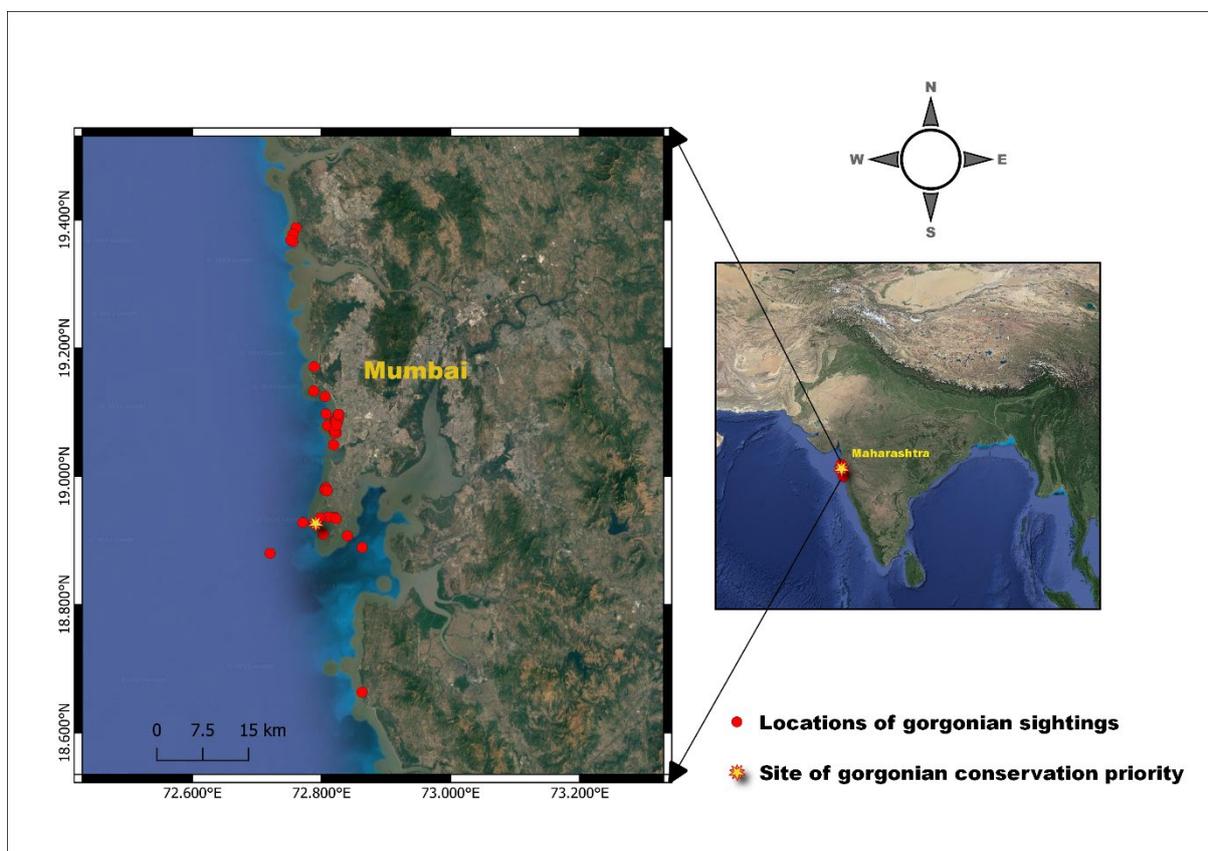


Fig.1. Map showing locations of gorgonian sightings (intertidal and offshore) in the rocky shores of Mumbai (19.382807N, 72.740508E to 18.661300N, 72.849088E).

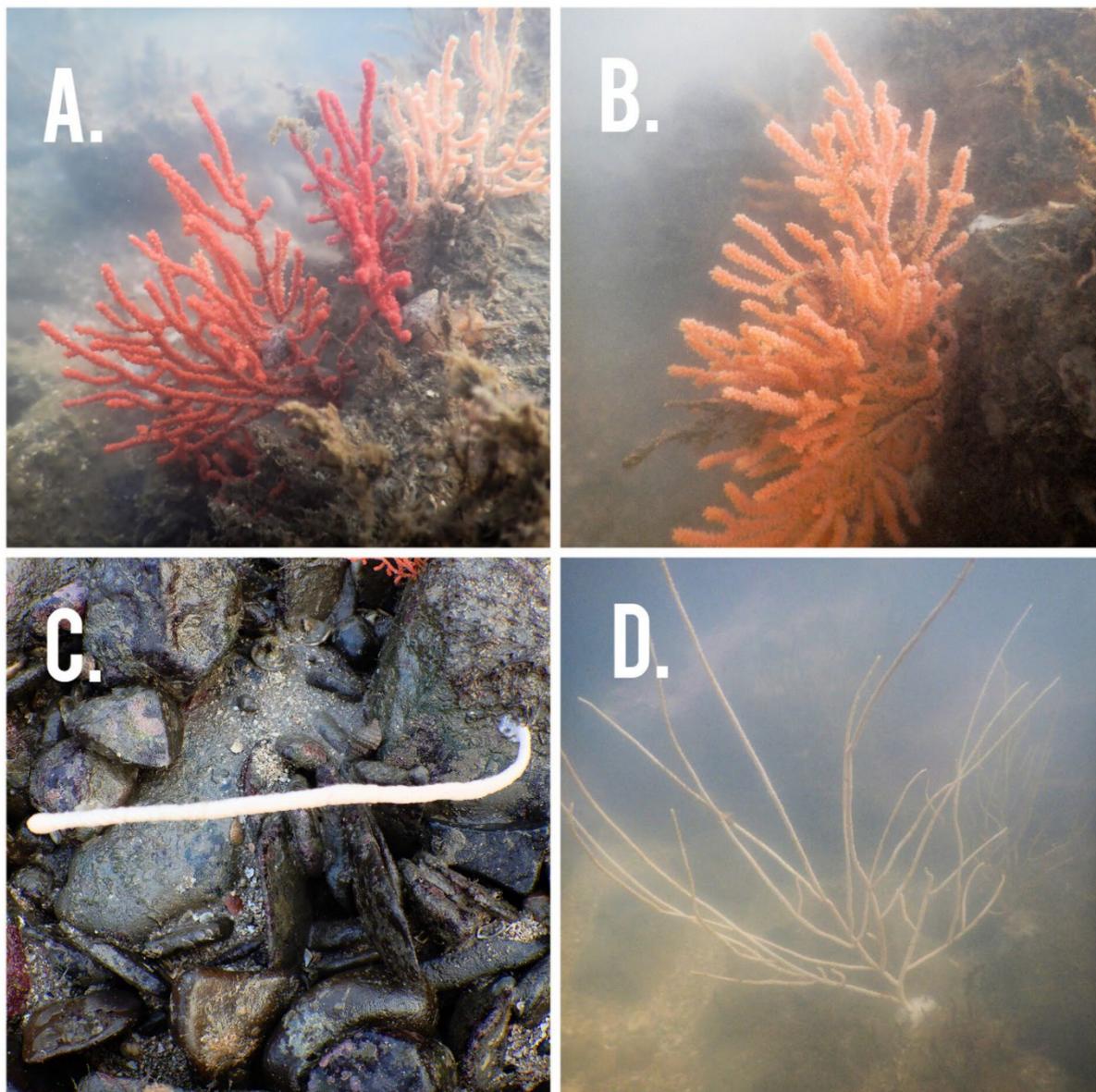


Fig.2. Gorgonian species recorded from the rocky shores of Mumbai. Provisionally identified as (clockwise from top left) A. *Echinogorgia* sp.; B. *Echinogorgia* sp. (colour variant); C. *Menella* sp.; D. *Pseudopterogorgia* sp.

3. Explain any unforeseen difficulties that arose during the project and how these were tackled.

One of the major challenges that we faced during the project was the unprecedented situation during the third and fourth wave of Covid-19 in India. The number of cases were very high in Mumbai from late 2021 to the first quarter of 2022 followed by a similar situation in our home state Kerala. We had to face restrictions during the field visits and for a long period of time our institute was partially shut. However, even in the absence of our team's physical presence on the field sites, we were able to run some project activities (including questionnaire surveys and field visits) using interns and our contacts within NGOs like MLM. A student intern (Ms. Rutuja

Bansod) from Mumbai was assigned the task of conducting the questionnaire survey during relaxations on Covid-19 restrictions. Mr. Pradeep Patade (MLM) and local fishers regularly updated the information on gorgonian sightings. Our team was constantly in communication with the interns and locals, sharing information on gorgonian sightings, ongoing developmental activities along the coastal belt and other threats. However, the Coastal Road Project reclaiming few metres of intertidal zones and oil spill (April-September 2022) along the coast must be assessed in the coming few months to understand the impact it had on gorgonians and the intertidal biodiversity.

4. Describe the involvement of local communities and how they have benefited from the project.

The Covid-19 pandemic has impacted all spheres of human society, as nations around the world prepare for the largest economic shock in decades. The economic and social impact was also evident within the fisher community as there was an initial hesitancy involving with our project activities. But with fishers adapting to the unprecedented situation, we began executing the project activities with their involvement.



Fig.3. Interaction and awareness campaign with fishers at Worli boat jetty, Mumbai.

Our first objective was to conduct a questionnaire survey (Nov 2021-Feb 2022) across fishing villages of Urban Mumbai to understand the knowledge, perceptions, and

attitudes of fishers towards gorgonian and its conservation. We surveyed more than 50 fishers (sustenance fishers, trawl operators, fisher representatives, retired fishers, etc.) across different fishing villages and landing centres. However, we eliminated incomplete or partial questionnaire surveys such that we consider only 40 fisher responses from the sampling size for better clarity and stability in data interpretation. All interviewed fishers were males with literacy rate varying from basic (n=12) to higher education (n=28) and fishing experience of ≥ 20 years. Most of the respondents used motorised boats (n=26), followed by mechanised (n=11) and traditional (n=3) crafts. The most preferred gear among the respondents were gill net (n=20), followed by seine and trawl (n=6). There were no target fisheries as the landings are influenced by seasonal variations. Almost 85% of the respondents could identify gorgonians (n=34) which they commonly term as Vanaspati (popular vernacular name), or Indrajaaal/Mahendrajaaal (common with vendors). Similarly, 85% (n=34) of the respondents have seen gorgonians in their usual fishing grounds. While most fishers do not perceive any economic uses for gorgonians, our team was aware of the prevalent trade in Mumbai as reported by forest department and media.

Interestingly, almost equal number of respondents showed negative (n=13) and positive (n=12) attitudes towards conservation of gorgonians in the surveyed area; while the rest gave a neutral response (n=15) (fig. 1.). When asked about the change in population size of gorgonians over the past 5 years in the region, only five fishers observed a decreasing trend, a majority (n=22) was unaware of any changes or observed a stable population (n=13). Also, all the respondents were unaware of the legal status of gorgonians and there are no reported cases of individuals within their community who were arrested or fined for collecting or selling of these organisms. However, few fishers (n=11) were aware of the use of gorgonians (Indrajaaal/Mahendrajaaal) as good omens in the practice of astrology and black magic.

This gathered information was used to plan the nature of awareness campaigns and related activities. We organised formal and informal awareness campaigns for the local communities, especially the fishers in two fishing villages and landing centres, viz. Chimbai Koliwada and Worli. About 40 attended the awareness campaign (both formal and informal). Fishers in Chimbai Koliwada use motorised fishing boats, operating gill nets in rocky area where lobsters and gorgonians are abundant. Though seasonal, almost all fishers land fragments of gorgonians as bycatch in their nets. In this regard, the fishers were given basic information on the importance of gorgonians as a fauna and how as an ecosystem builder will benefit their livelihood in the long run. The fishers were also made to share their knowledge and perceptions on gorgonians. The flyers were distributed among fisher representatives and NGOs to spread the project objectives and gorgonian conservation. Besides, the enumerators and interns (college students) from Mumbai will serve as models to spread the project information through word of mouth and remain a permanent contact in case of project extensions and monitoring programmes.

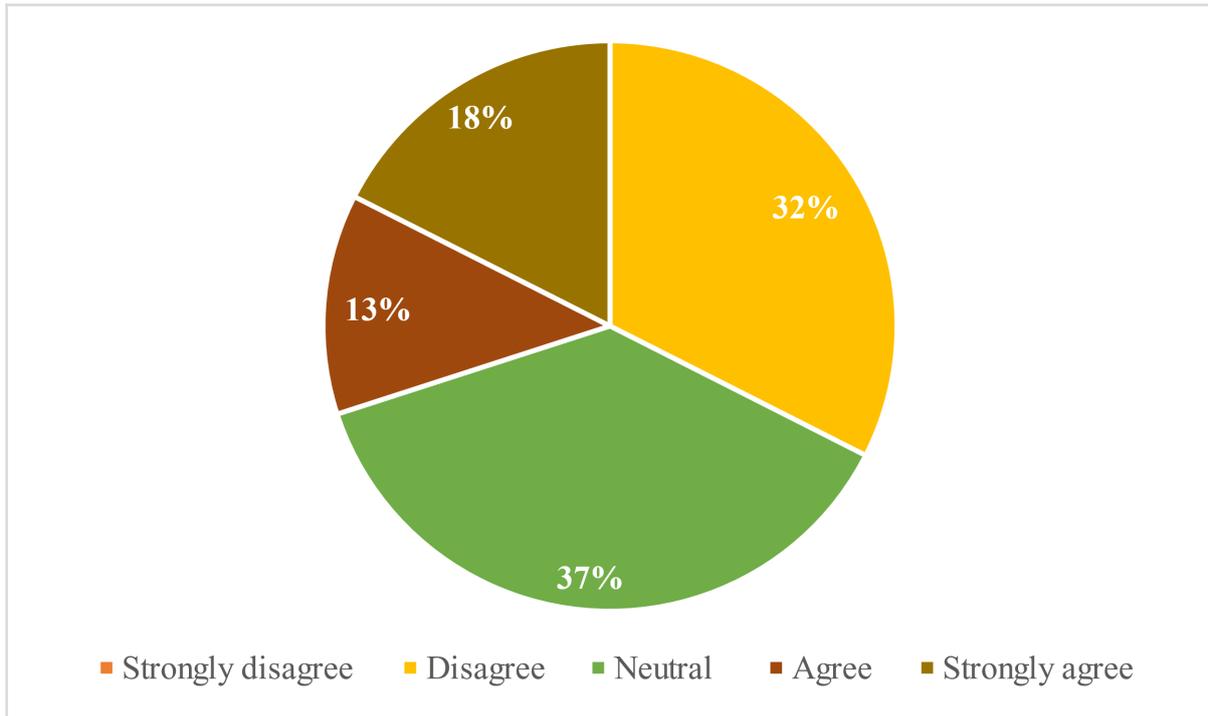


Fig.4. Conservation attitude of respondents (fishers) of Mumbai towards gorgonians

5. Are there any plans to continue this work?

Yes. Our study observed that gorgonian species and the entire extent of its distribution in the Mumbai intertidal region are highly vulnerable or threatened due to following reasons.

1. There are ongoing developmental activities and coastal road extension that has reclaimed shores some 100-300m away from the intertidal gorgonian gardens.
2. There are occasional oil spills and its associated formation and accumulation of "tarballs" in the region.
3. Siltation caused by both natural and anthropogenic activities is a looming threat to near shore isolated gorgonian colonies or individuals.
4. We have sighted an "invasive species" commonly known as snowflake coral (*Carijoa riisei*) near some rocky patches of the intertidal region.

These factors indicate that there must be regular monitoring the health and extent of gorgonian colonies in the entire extent of Mumbai coast. Our permanent contacts in NGOs, fishers' societies, local colleges, and institute collaborations would allow future endeavours in the region and the extension of project activities.



Fig. 4. Potential threats to gorgonian colonies in the intertidal regions of Mumbai. From top (clockwise) ongoing coastal road development in Carter Road, Bandra West; *C. riisei* sighted in rocky patches near Alibag (Picture courtesy Pradeep Patade); Tarball formation in Mahim beach. © Shaunak Modi.

6. How do you plan to share the results of your work with others?

The report and findings will be shared with the Municipal Corporation of Greater Mumbai (MCGM), local governing bodies, Forest Department, Maharashtra, and Department of Environment and Forests and Ministry of Environment, Forest and Climate Change, Government of India for further actions in implementing project recommendations and monitoring. Updating and curating gorgonian sightings from Mumbai in *iNaturalist* would be another effective way to promote citizen science in the conservation of gorgonians in the region. Similarly, a workshop was conducted for undergraduate students (Ruia College) regarding the recording and sharing the observance of gorgonian sightings from Mumbai. The project report will also be

communicated to various institutions and NGOs to be part of the EIA and biodiversity assessment reports. The findings (questionnaire survey) will be part of a manuscript that discuss fisher perceptions on protected taxa including gorgonians, which is now available as a preprint for further suggestions. A second manuscript on diversity of intertidal gorgonians of Mumbai (awaiting molecular results) will also be communicated to a peer-reviewed journal. Besides, the data will also be part of the PI's thesis titled 'Towards bridging the biodiversity shortfalls of gorgonian fauna of the Indian coast.'

7. Looking ahead, what do you feel are the important next steps?

1. As mentioned above, the gorgonian patches should be monitored on a regular basis for health and extent due to its vulnerability from natural and anthropogenic impacts.
2. Revisit existing conservation actions (e.g., Wildlife Protection Act) and help formulate improvements (formulating MPAs) and update the list of gorgonian species. Since the ongoing developmental projects cannot be stopped, our team have provisionally identified undisturbed rocky patches harbouring rich gorgonian gardens and other marine life about 3 km away from Nariman Point. An extended rocky patch (18.933986 N, 72.793069 E) that is exposed during low tides and fully submerged in monsoons is proposed as a site conservation importance which could be given the status for marine reserve/natural monument.
3. Continue creating the awareness among the stakeholders and improve the participation of stakeholders towards gorgonian conservation. This is important because gorgonians which are protected under Wildlife Protection Act are often neglected or does not form a part of policy decisions in EIA or biodiversity assessments.

Our team has initiated talks with the fisher societies and local governing bodies regarding the mentioned points and we have in theme agreed upon the proposal of the 'site' of conservation importance.

8. Did you use The Rufford Foundation logo in any materials produced in relation to this project? Did the Foundation receive any publicity during the course of your work?

Yes, we used the Rufford Foundation logo in the brochures, t-shirts, research presentations and posters, news articles, documentary, awareness programme activities and conservation workshop. Throughout the project dissemination, The Rufford Foundation has received publicity through the activities and direct mentions during the public lectures and awareness campaigns. Also, the Foundation's name was mentioned during online media interviews.

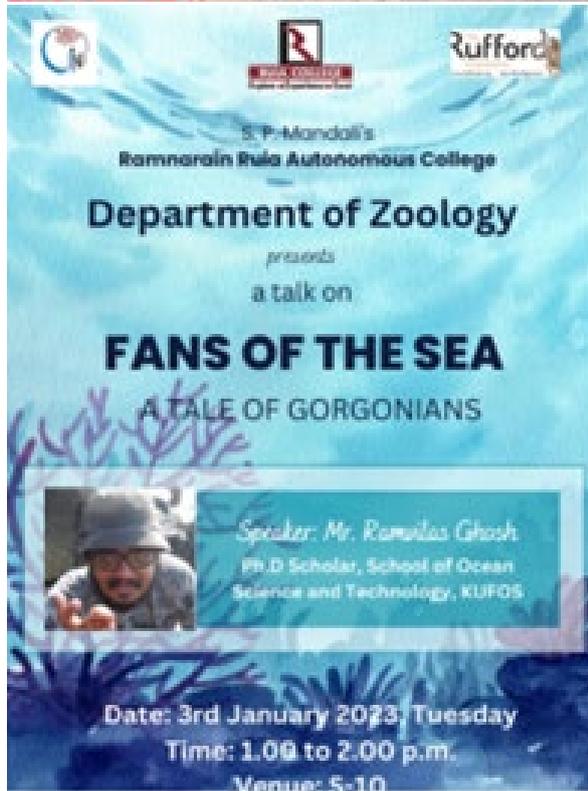


Fig.5. Banners and flyers in circulation during the project period.

9. Provide a full list of all the members of your team and their role in the project.

The project team includes:

Dr Ranjeet K, Kerala University of Fisheries and Ocean Studies (KUFOS) – technical advice and support (Project Advisor)

Ramvilas Ghosh A (KUFOS) – managed the whole activities of the project (Project leader)

Pradeep Patade (MLM, Mumbai) - Managed, advised, and organised community participation

Rutuja Bansod (Mumbai) – intern, conducted the questionnaire survey with fishers

Amal S (Mumbai) – field and logistic support

Akhil S Babu – Social media handling and marketing

My colleagues – **Shalu K**, **Liju Thomas** and **Sreesha G** – Managed and organised specimen sampling, cataloguing and supported other project activities.



Fig. 6. Interaction with fishers at Chimbai Koliwada, Mumbai

10. Any other comments?

We would like to thank our sponsor for providing an opportunity for the team to discuss the gorgonian conservation paradigms on online interviews regarding marine biodiversity as well as providing expert opinions for writing popular articles/book. The team is also looking forward to percolating the idea of gorgonian conservation in schools, colleges and higher education institutes through various awareness campaigns including classes, internships, and shore walking in association with local colleges (Ruia college) and NGOs such as Marine Life of Mumbai (MLM). We would like to thank the sponsors for providing the much-needed extensions during unprecedented events such as the COVID-19 restrictions. We would also like to thank Kerala University of Fisheries and Ocean Studies (KUFOS), Kochi, for providing lab facilities and timely release of funds.



Fig. 7. Gorgonian Awareness class and interactions with students at Ramnarain Ruia Autonomous College, Mumbai.