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Jelly Fish (*Lobonemoides robustus* Stiasny, 1920) Bloom in the Cox's Bazar Coast During 3-4 August 2022: Factors Identification and Minimization Approaches

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Abstract: Jellyfish are a very important animal that is crucial for the marine ecosystem. But massive growth of jellyfish in a short time can be detrimental. A huge occurrence of jellyfish was noticed on the Cox's Bazar coast (Najirartek to Sabrang) during 3-4 August. The present study was conducted to identify the species, whether it was a bloom or not and factors of that bloom. A mixed method (natural science data and social science data) was used to find out these causes. A total of 127 fishermen were selected randomly for the study. About, 34% of fishermen reported that they saw 200-500 jellyfish while 16% of fishermen mentioned they saw 70-100 jellyfish within a small area. Some reported that they saw 5000 or above with the naked eye on the water surface. This incidence can be termed a jellyfish bloom. They identified the causes like banning of fishing, red water or black water, lack of rainfall and increase in salinity were the main regulating factors. The species aggregated in the Darianagar to Laboni beach due to the wind and current direction. *Lobonemoides robustus* is edible and this can be a great component to meet the blue economy goal.

Key words: Jellyfish · Bloom · Mixed Method · *Lobonemoides robustus* · Blue Economy · Cox's Bazar

INTRODUCTION

Any animal in marine waters that are gelatinous is commonly referred to as a "jellyfish" [1, 2]. There are both stinging and non-stinging jellyfish among them. The oldest living thing on Earth is a jellyfish, which has undergone natural selection for 500 million years [1, 3]. The name "jellyfish" often refers to gelatinous zooplankton, such as planktonic members of the phylum Ctenophora, Salps and Pyrosomes, as well as medusae of the phylum Cnidaria (scyophomedusae, hydromedusae, cubomedusae and siphonohores) [4, 5].

Scyphozoa, Cubozoa and Hydrozoa are the three primary groups of cnidarian jellyfish [6]. There are 187 and 46 recognized species for Scyphozoa and Cubozoa, respectively, according to the World Register of Marine Species (http://www.marinespecies.org) [7]. Coronatae (crown jellyfish), Rhizostomeae (real jellyfish), Stauromedusae (stalked jellyfish) and Semaestomeae (sea nettle) are the four orders of widely dispersed scyphozoan jellyfish [8]. The cubozoan jellyfish (box jellyfish) species, in contrast, are split into the two orders Carybdeida and Chirodropida. With 3, 676 recognized species, hydrozoan jellyfish are the most diverse category, according to the World Hydrozoa database [6, 9].

Simple organisms, jellyfish have three layers of tissue: endoderm, ectoderm and mesoderm [10]. The bell-shaped body, which is formed like an umbrella, has oral arms or tentacles covering the underside. In jellyfish, a variation in the bell margin is used to distinguish between various groupings [11]. Tentacles are found on the bell border in members of the order Semaeostomeae, while they are found on the tips of the oral arms in members of the order Rhizostomeae. Jellyfish are semi-transparent and made up of 97 percent water [12, 13].

There is a general belief that the number of gelatinous plankton in the oceans has increased [14, 15]. Seasonal blooms are a common occurrence for many of these species and at these times, they are known to completely dominate the water column [16]. While jellyfish in open waters are mostly influenced by the flow of water masses and currents, they can overcome water movement in

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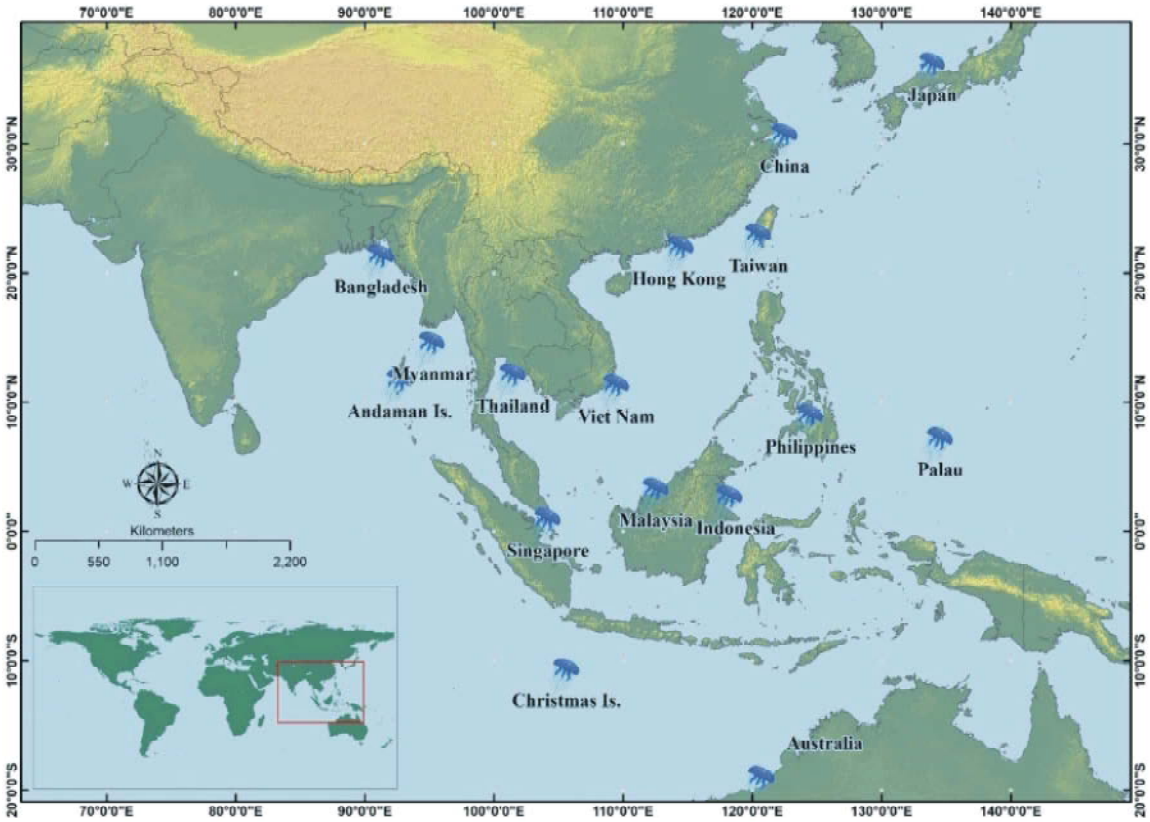

Fig. 1: Global distribution of Jellyfish

semi-enclosed locations and cause swarming occurrences [17-20]. Additionally, studies that assess the distance to the coast assert that blooming scyphozoan species are primarily collected close to shore and that the likelihood of finding jellyfish increases with increasing distance from the coast [20-23].

Only a small portion of the class of scyphozoan species have blooming events documented [24]. However, it should be emphasized that over the past ten years, this figure has climbed from the 14 percent [25]. There is still a great deal of doubt regarding this after 20 years of increased awareness that jellyfish abundance is increasing due to natural or manmade stresses [26]. Pitt *et al.* [27] noted that the majority of research using the term "jellyfish bloom" refers to hypothetical reasons as proof in this regard.

Jellyfish blooms are significant population increases in species belonging to the phyla Cnidaria and Ctenophora [27, 28]. Although their incidence is thought to have grown over the previous several decades in near-shore regions and shallow oceans all over the world, blooms may occur naturally as a result of ocean and wind patterns, ecological shifts and jellyfish behaviors [29]. Increased jellyfish blooms are believed to be mostly caused by changes in ocean conditions, such as eutrophication, hypoxia, rising ocean temperatures, overfishing, aquaculture, climate change, coastal development and the introduction of alien species [30-32].

Global distribution of jellyfish is showed in Figure 1. The distribution of jellyfish populations may eventually be impacted by the correlation between sudden temperature fluctuations and strobilation that has been documented [7, 33, 34]. As a result, populations and blooms will be more numerous and abundant in the tropics and subtropics while decreasing in polar regions, which is consistent with the increase-decrease temperature standard deviation forecast for those regions [35]. This suggests that poor countries' terrestrial zones as well as their marine ecosystems will be severely impacted by climate change in this sense [36]. Although this is a major area of inquiry, little is known about how future environmental circumstances may affect jellyfish blooms.

Because fewer higher predators have access to prey during jellyfish blooms, the composition and organization of biological communities is drastically affected [37].

They serve as food for fish, refuges for some species of juvenile fish, predators of zooplankton, fish eggs and ichthyoplankton, parasite vectors and predators of zooplankton [38-40]. Blooms also change the availability of microbial communities by drastically changing the cycling of carbon, nitrogen and phosphorus [41-43]. Blooms are noticeable and have a range of economic effects on coastal tourism, fishing and aquaculture and can interfere with the functioning of coastal power plants because they occur in inshore locations [44-46]. Recent blooms have frequently affected several industries, lowering fisheries catch, clogging fishing nets and overrunning popular beaches, causing closures, stinging fishers, destroyed gear, capsized boats, injuries and fish fatalities, as well as pens polluted by polyps [39, 47-49].

Jellyfish are vital to the ecosystem, yet their blooms can be hazardous [50, 51]. *L. robustus* is both edible and non-toxic. Southeast Asia is a significant market for it. Since the 1970s, fisheries for edible jellyfish have increased in many Southeast Asian nations including the Philippines, Vietnam, Malaysia, Thailand, Singapore, Indonesia and Myanmar due to rising demand from markets in China, Japan and Korea [52-54]. The goal of the current study was to pinpoint the reasons behind the widespread incidence of jellyfish.

MATERIALS AND METHODS

The study is interdisciplinary and hence methods were used from both social sciences and natural sciences. This study was conducted on Cox's Bazar coast (BFDC Ghat to Sabrang), Bangladesh.

Study Area: The present study was carried out in the BFDC Ghat, Daria Nagar coast, BORI beach, Inani beach, Patuartek coast, Shamlapur coast and Sabrang coast. All of the sites are on the coast of the Bay of Bengal situated along the Cox's Bazar coast (Figure 2).

Methods from Natural Sciences

Sample Collection and Preservation: Jellyfish samples were collected from the different beaches (during the high occurrence of jellyfish) using hand gloves. Samples were cleaned in situ using seawater. Then the samples were taken in a plastic bucket. The size was big; hence a plastic bucket was used for a single specimen. After that, samples were preserved in 10% formalin and transferred to the Biological Oceanography Laboratory, Bangladesh Oceanographic Research Institute (BORI) for further study.

Jellyfish preserved in the bucket were in relatively good condition and the least damaged. Initial identification of species was based on live specimens as well as photographs and videos were taken in the field. Specimens were photographed immediately after capture to record their live coloration. Exumbrella (bell) diameter and length of oral arms were measured on-site while other measurements were recorded from formalin-preserved specimens in the laboratory.

Species Identification: The samples were collected and cleaned. Photography and videography were done both in the field and laboratory. Then the species were identified using Marine Species Identification Portal (http://species-identification.org/index.php?groep=Jellyfish+and+related+species&selectie=9&hoofdgroepen_pad=%2C1%2C9), Sea life base (https://www.sealifebase.ca/summary/Lobonemoides-robustus.html). The Jellyfish App (https://thejellyfishapp.com/) and different articles and books were used to identify the species.

Methods from Social Sciences: This research was conducted using a mixed-methods study design using both quantitative and qualitative methods. Participatory approaches were applied involving stakeholders, particularly the sea-going fishermen in the Bay of Bengal, NGOs and government officials, who work on the issue.

Target Groups: Sea-going fishermen were selected to identify the exact number and the status of the jellyfish (Figure 3). What are the reasons behind this phenomenon and what is their perspective about jellyfish?.

Data Collection and Analysis Methods: Data will be collected using surveys, key informant interviews and direct observations. A structured questionnaire survey was conducted for this study and interviewees were selected randomly [55].

Semi-Structured Interviews: Sea-going fishermen were interviewed in the coastal area (during net and boat repair) and their homes. Interviews of each sea-going fisherman required about 40 mins to one hour. Photography and video were done for visualizing the interview section. Additional data were collected from key informants (such as Bangladesh Fisheries Research Institute, Upazilla Fisheries Officer, AFO, Journalists and relevant NGO workers).

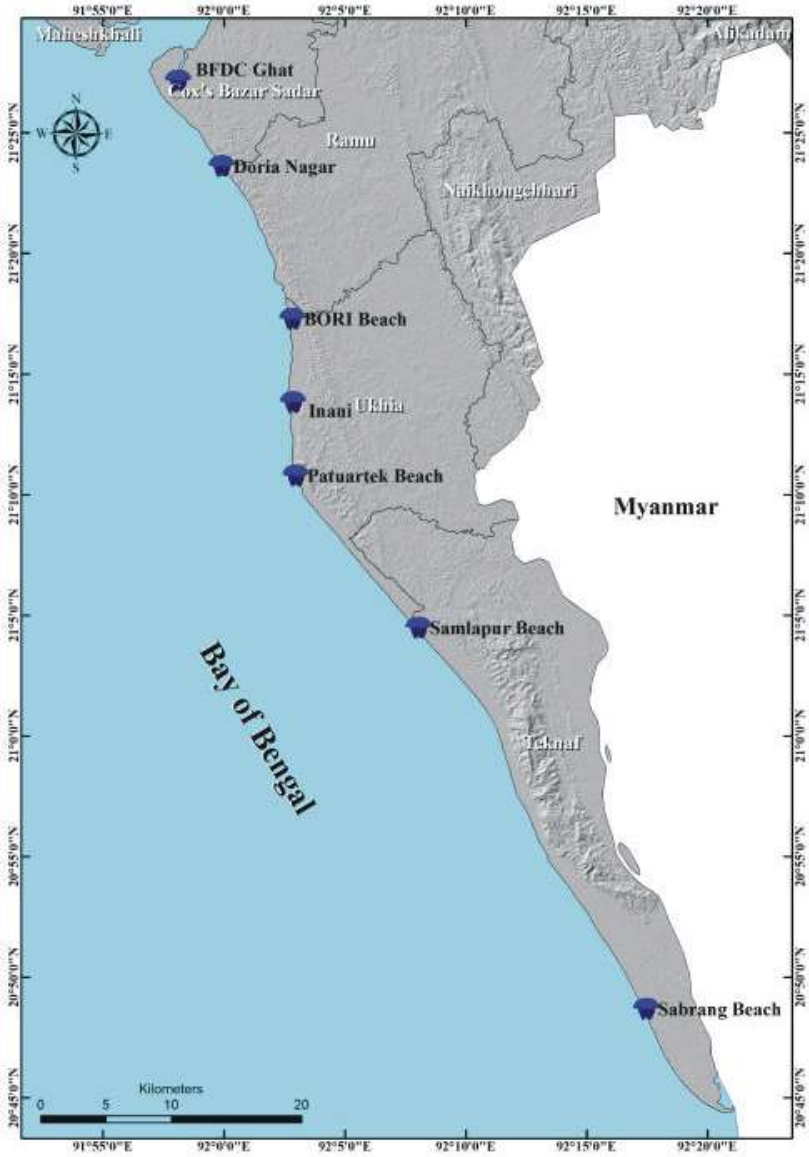

Fig. 2: Map showing the sampling sites of the study area

Fig. 3: Sea-going fishermen

Survey and Statistical Analysis: The sample size was determined during the sample design. It was estimated that approximately a total of 127 fishermen were selected from seven coastal areas for the study. Samples were selected randomly from sites. A questionnaire was prepared following the objective set for the study for collection from sea-going fishermen. First of all, a draft questionnaire was developed and then pre-tested in the study area before preparing the final questionnaires. The questionnaire was changed, modified and rearranged according to the experience gathered in the pre-tested survey. The final questionnaire was then developed on logical sequences. The question includes those related to jellyfish occurrence and its impacts on fishing and their health. The questionnaire was constructed in English and Bengali. After the preparation of the questionnaire, it was validated with key informants. Data from the survey were analyzed using statistical methods, including descriptive statistics and regression analysis.

RESULTS AND DISCUSSION

Field Observation: Jellyfish were found dead at Cox's Bazar coast and was collected and examined (Figure 4). Most of the specimen's gastric cavity, manubrium and oral arms were absent. Some parts of the specimens were found below the sand and there was sand on the oral surface. The entire specimen was preserved in 10% buffered formalin as reference material.

Species Identification: The species were examined in the laboratory (Figure 5) and species were identified as *Lobonemoides robustus*.

Characteristics of *Lobonemoides robustus*: The species are commercially known as "white type" jellyfish [53] and usually present seasonally in large numbers. It inhabits the coastal area of the Bay of Bengal and could be harvested for human consumption and export. Jellyfish found in BORI beach shown here (Figure 6).

Description: An umbrella is flatter than a sphere and has a width of 30-105 cm. Exumbrella with noticeable, acute papillae (Figure 7). The papillae are long in the apical, short in the middle and absent in the marginal third of the exumbrella containing 13-15 rhopalia. Between adjacent rhopalia, there are three or four elongated, tentacle-like marginal lappets, short rhopalar lappet with a rounded tip. 25-33 radial canals make up the *canal system*. Rhopalar canals were evident from the base to the marginal end, where they branched and ended at the tips of the rhopalar lappets (Figure 8). Extra-circular anastomosing canals are formed by the fusion of interrhopalar canals. Only the rhopalar and ring canals are in communication with the intra-circular anastomosing canal system. The mesh size of the anastomosing canal system is coarse in the proximal subumbrella, fine in the marginal section and elongated in the marginal lappets.

In intra-circular regions, the *subumbrellar muscle* is strongly developed; nevertheless, extra-circular regions are feeble. In the lappets on the periphery, no muscle formed. Except for the area along the margin, where the muscle continues in a ring, radial canals are broken by muscle fields.

Mouth-arm lengths range from 39 to 58 cm. There are eight of them, not all of them combined (Figure 9). Three rows of window-like apertures in the membranes of the mouth-arms. Bigger upper openings, some specimens have no thread-like appendages on the outer wings of the mouth-arm but have numerous, long spindle-shaped appendages. In the specimens, the inner wing of the mouth-arm has a thread-like appendage in the upper proximal region and a spindle-shaped appendage near the distal end of the arm (Figure 10).

There are four, widely opened *genital ostia*. On each lower border, there are two to four small gelatinous extensions. Color: mostly white, however, some specimens can be a little pink.

Factors That Contribute *Tolobonemoides robustus* Bloom: The majority of blooms are noted in semi-enclosed spaces, such as semi-enclosed bays, coastal lagoons, marine lakes, fjords, harbors, estuaries, bights and marshes. Due to their restricted connectivity to the open sea and their naturally stressed system conditions, these habitats, which are thought to be more favorable to host jellyfish blooms, exhibit considerable thermal fluctuations not only throughout the year but also daily [18, 56]. As was already indicated, abrupt temperature changes are associated with strobilation events and it has been suggested that these variations can activate certain genetic pathways [7, 57]. Therefore, the existence of blooms is primarily seen in semi-enclosed locations, followed by open coastal areas and their absence in deep seas, which is explained in part by the naturally dynamic and varied behavior of these systems [58]. The main causes of bloom are temperature, the availability of food and overfishing, eutrophication and nutrient loads, habitat, invasion, the building of submerged structures, salinity, meteorology and atmospheric indices [18, 59, 60].

Fig. 4: Measuring of Jellyfish in the beach

Fig. 5: Identification in the laboratory

Fig. 6: Jellyfish *Lobonemoides robustus* found in BORI beach

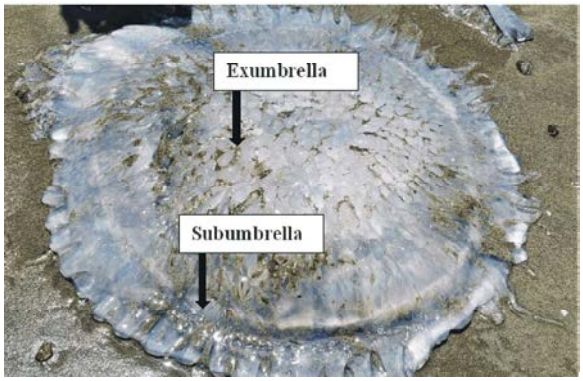

Fig. 7: View of beached medusa at Cox's Bazar Beach

Fig. 8: Rhopalar and lappets of a beach medusa found at Najirartek beach

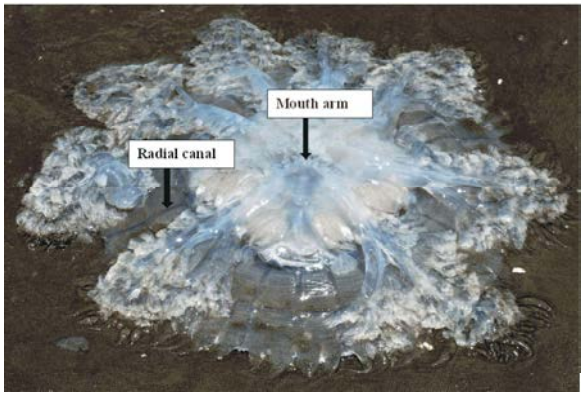

Fig. 9: Mouth arm and radial canal of a beach medusa found at Inani beach

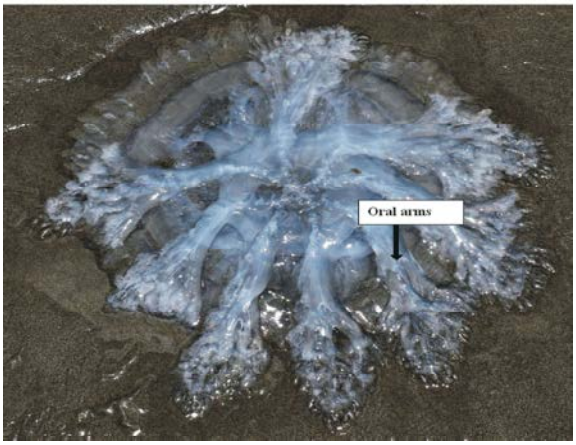

Fig. 10: Oral arms of a beach medusa found at Darianagar beach

The primary component controlling jellyfish strobilation and life cycles is temperature. According to the majority of reports [61-63], the temperature is the primary cause of blooming episodes. The effect of temperature as a bloom promoter is typically hidden by long-term studies, which is likely influenced by the existence of long-term oscillations in abundance. Along with temperature, the salinity of the water also has an impact on dispersal. Evidence of the role of salinity in the occurrence of different types of jellyfish [64, 65]. It has been established that jellyfish settlement and dispersal patterns are impacted by freshwater inputs and salinity gradients in semi-isolated settings [66, 67].

Eutrophication and nutrient loading are also identified as bloom-regulating factors, whereas food availability and overfishing are noted as elements that promote bloom [68-70]. The abundance of the species that benefit from more nutrients or food is typically directly correlated with their availability, with gelatinous plankton abundance being higher during upwelling [71, 72]. Additionally, this impact has been discovered to only apply to the Scyphozoa class. In a coastal lagoon that is undergoing severe eutrophication, *Rhizostoma pulmo* exhibits a significant relationship with nitrate inputs. *Nemopilema nomurai* polyps are also said to have a higher rate of asexual reproduction when there is high plankton availability in a laboratory. Finally, *Stomolophus meleagris* requires readily accessible food to survive after strobilation [73-75].

Species of larger jellyfish will require more nutrition to maintain growth rates of more than 4 mm/day [18, 76]. It seems possible that the presence of complex bottom-up and top-down linkages within the trophic net control and modulate the intensity of a bloom. Larger species are more prone to bloom, which is likely linked to an increase in the gonadosomatic index with size [27, 28, 77, 78].

Similar factors should be taken into account when evaluating the category "Construction of submerged structures." Some articles [79-82] show evidence of polyps developing on submerged artificial structures, however, they do not compare these structures to hard natural substrates under the same environmental conditions. According to Duarte *et al*. [83], the presence of polyps in environments where none had been found in earlier surveys following the placement of artificial substrate is a sign that the species prefers manmade structures. Furthermore, two studies showed that artificial substrates offer a similar or superior location for planulae colonization than natural ones. The dispersion of some species and the colonization of new settings can both be impacted by these structures, which can also facilitate and/or improve the connection between populations [84, 85].

Predation and mortality that may exist in non-Medusa stages have not received as much attention but may also influence the intensity of the blooms [18]. The study of those stages is hampered by the fact that polyps have not often been discovered in the field and that early ephyrae and planulae cannot be observed without the use of a microscope. Despite reports to the contrary, the primary predators of jellyfish polyps are believed to be nudibranchs, amphipods, pycnogonids and decapods [20, 86]. Here, it should be highlighted that the resistant structures developed at the polyps' pedal discs, known as podocysts, can aid in the polyps' survival during times of food scarcity and predator activity, hence promoting the development of blooms [61]. According to Ishii *et al.* [87], the mortality rate of newly released ephyrae can reach up to 99 percent when they are preyed upon by naturally occurring zooplankton. Despite an information vacuum regarding predation on planulae, it can be assumed that this stage can also be predated [88].

Although habitat does not cause strobilation, it helps create the circumstances for it when it offers stable settlement and moderate water renewal rates [89, 90]. Additionally, the depth in which they live is the primary distinction between genera that bloom and those that do not. The most important variables for jellyfish detection are minimum, main and maximum depth; more specifically, taxa that can live in the top 27.1 meters of the water column are more likely to bloom [91, 92].

Although alien species invasion and species relocation do not cause strobilation, they have a significant impact on increasing jellyfish abundance in terms of habitat functioning [18, 93-95]. A given species may be able to bloom in certain regions where the conditions are ideal, but it may not be able to reach those areas due to its swimming ability [47, 84, 96].

What were the reasons for their massive occurrence in the Bay of Bengal?

In the present study, a lot of dead jellyfish (*L. robustus*) was observed in the Cox's Bazar Sea beach. They were carried out in the beach during high tide and they are being trapped in the sand deposit during low tide from the Cox's Bazar to the Teknaf. These dead jellyfish remained in the beach for about six hours and washed out by the next high tide. This huge occurrence happened in the sea due to favorable condition of growth. Fishing ban

for 65 days is an important factor that creates this environment in the sea. Nutrients rich water and high salinity also act as influential parameters in the huge growth of jellyfish. After fishing ban, when fishermen went for fishing lot of jellyfish were caught in their net and their weight varied from 5-50 kg. During the investigation period, some reasons were found.

- Polluted water
- High salinity
- Lack of rainfall
- Red or black color of seawater
- Rough weather/ bad weather
- Southern air or low pressure in the sea
- Banning of fishing for 65 days

Depending on these situations more jellyfish are being observed in the seaon1-2August 2022 and 3-4 August 2022 at the beach.

Was this jellyfish phenomenon in the Cox's Bazar coast a bloom?

A jellyfish bloom is defined as a substantial increase in a jellyfish population within a short period; the result of a higher reproduction rate [97, 98]. Since jellyfish naturally have high reproductive rates, high-density blooms can occur as a result of both behavioral and ecological causes [28, 99].

Massive dead jellyfish were found on the Cox's Bazar beach on 3-4 August 2022. This amount was recorded from BFDC Ghat to Sarbang. According to the fishermen, they noticed this phenomenon in the sea on 1-2 August 2022. Some fishermen also noticed in the 29-31 July 2022 but most of them reported that massive occurrence was observed on 1-2 August 2022 (Figure 11). A total of 127 fishermen were interviewed to prove the massive occurrence. Age ranged between 15-70 years and 7.9% of the fishermen belong to age 35. Most of the fishermen were fishing for 20 years (29%). Some fishermen go fishing for a day while others go for 5-15 days. BFDC ghat fishermen go fishing for 5-15 days in the sea while Daria Nagar coast, BORI beach, Inani beach, Patuartek coast, Shamlapur coast and Sabrang coast fishermen go for only one day.

Fishermen who go for 5-15 days fishing noticed a huge quantity of jellyfish on 1-2 August. About 38% of fishermen went to sea on 4 & 5 August and return to the coast on that specific day. They saw a small quantity but they saw a massive quantity on 1-2 August in the sea. They saw a huge amount on the coast during 4-5 August. They said that jellyfish came to the beach during high tide and stayed until the next high tide and they washed out. It took only 6 hours and then disappear. This some noticed this phenomenon and some didn't.

The massive occurrence was recorded from Daria Nagar coast, BORI beach, Inani beach but fewer amounts was found on Patuartek coast, Shamlapur coast and Sabrang coast. This may be due to the wind and current.

Most of the fishermen (76.4%) went fishing in the west. Since most of the fishermen went for one day, they set a net for 2 hours (32.3%). 20.5% of fishermen set a net for 3-4 hours. They usually use Illish net (85%), current net (14%), lomba net (12%), duba net (7.1%), behendi net (3.1%). 10.2% of fishermen went fishing about 10 km from the coast and 10.2% of fishermen went to 20 km from the coast. They went to 10-30 m depth for fishing. 51.2% of fishermen caught jellyfish in their net during high tide while the rest of the fishermen caught it during low tide. Most of the fishermen observed 3 types of jellyfish. 34% of fishermen reported that they saw 200-500 jellyfish while 16% of fishermen mentioned they saw 70-100 jellyfish.

25% of fishermen observed 30-60 jellyfish (Figure 12). Some fishermen said that they saw over 5000 jellyfish with bare eyes. 2 fishermen mentioned that they observed 1 lakh jellyfish on a specific day. 75% of fishermen mentioned that they found fewer fish due to jellyfish. 74% of fishermen reported that they did not see this huge jellyfish occurrence during the last 10 years (Figure 13).

Based on the above evidence and triangulation with the jellyfish bloom definition, we can conclude that during 3-4 August, a bloom occurred on the beach. While, this bloom of jellyfish occurred in the sea during 1-2 August.

Why the dead jellyfishes were aggregated in the Darianagar to Laboni beach most?

Most of the fishermen use current or Ilish net for fishing. Some use behendi net for fishing (Figure 14). As a result, huge amount of jellyfish were caught in their net as bycatch. Jellyfish were caught in massive number in behendi net than other nets. Trawl fishing also responsible for jellyfish catch in the sea. All of the caught jellyfish were discarded in the seawater as by catch. Since jellyfish have no value in the existing fish market though it has huge value in Southeast Asia. Since huge occurrence reported in sea on 1-2 August 2022, they were then caught in fishermen net and then discarded in the sea.

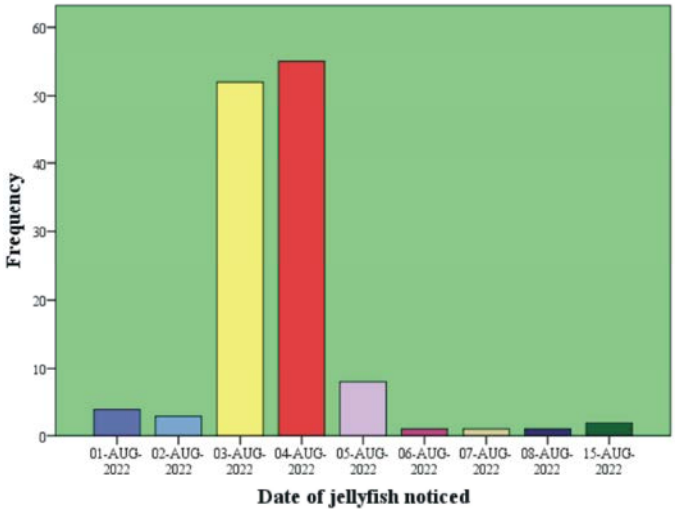

Fig. 11: Date when fishermen saw most of the jellyfish in the beach

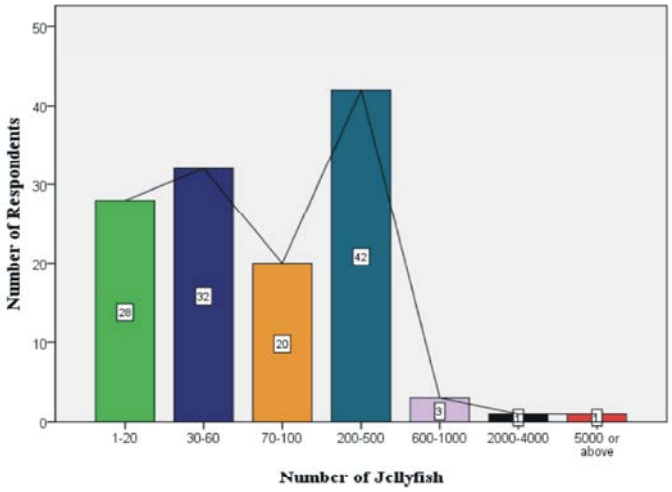

Fig. 12: Number of jellyfish observed by fishermen

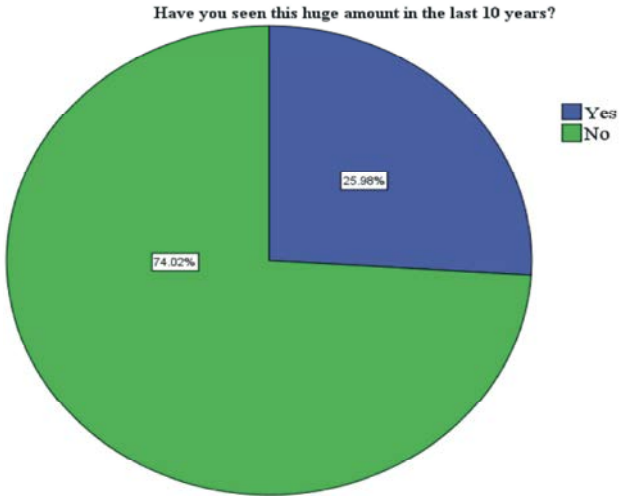

Fig. 13: Perception of fishermen on the massive occurrence of jellyfish history

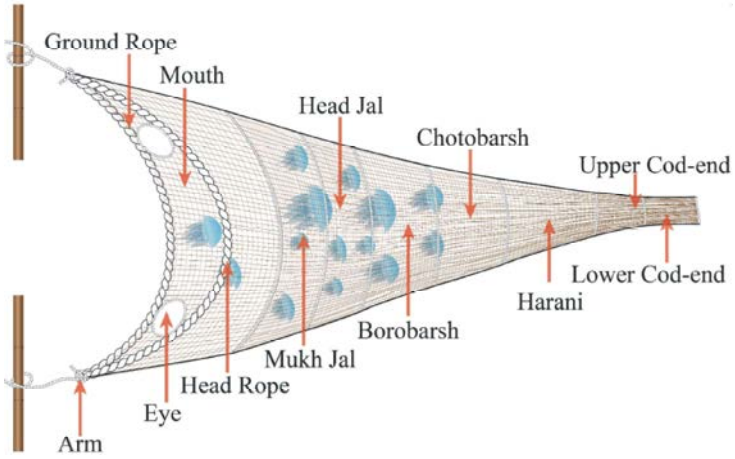

Fig. 14: Jellyfish trapped in the behendi net

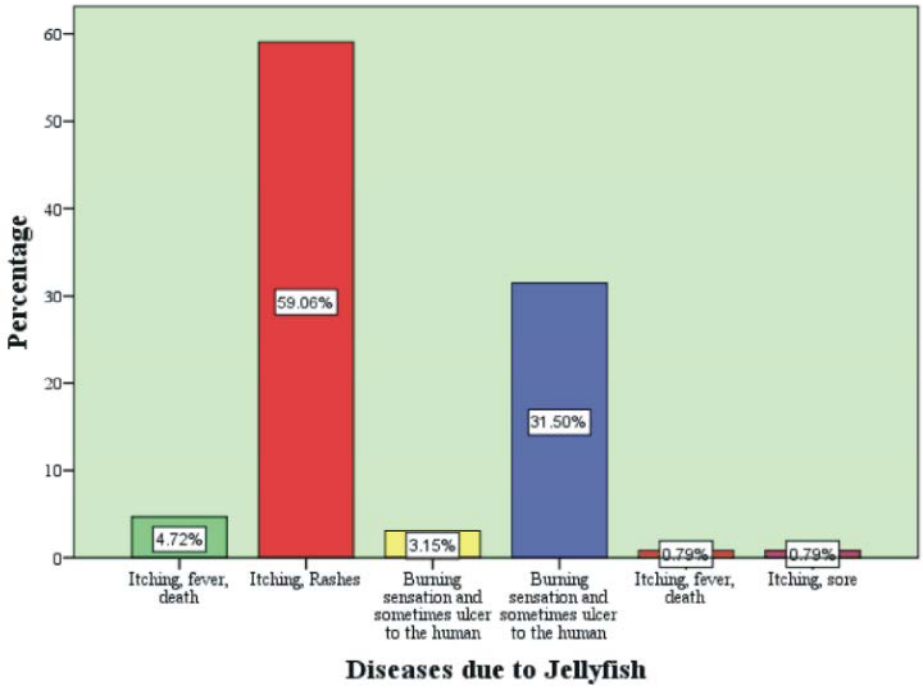

Fig. 15: Diseases caused due to jellyfish touch

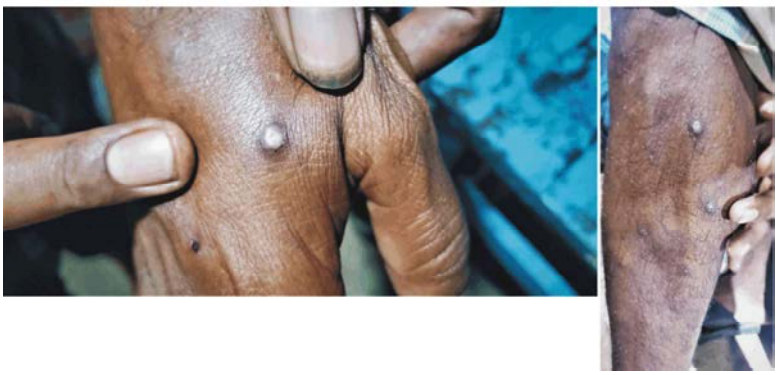

Fig. 16: Rashes to the hand and leg due to jellyfish

These dead jellyfish were amassed carried by the wind and current to the beach. The wind and current were toward the Darian agar to Laboni beach instead of Inani to Sabrang beach. That's why jellyfish were aggregated in the Darian agar to Laboni beach.

Diseases from Jellyfish Attachment: Some jellyfish is a very poisonous animal. Several diseases may occur by touching them. These diseases are not only *L. robustus*, but also from other species like button jellyfish and one type of thread-like red jellyfish, etc. According to the fishermen, they experienced below mentioned diseases (Figure 15).

- Itching to the hand or body
- Rashes to the whole body (Figure 16)
- Fever and headache
- Burning sensation and sometimes ulcer to the human body.
- Blackening of skin and causing boil to the hand if you touch them.
- It causes vomiting and various skin diseases in the fisherman.
- Some of the jellyfish release toxin that causes baldness
- Swelling of scrotal area, anorexia
- Develop psychosis in the fishermen and
- People may die within 3-4 minutes, in touch of jellyfish.

Jellyfish Fishery in Southeast Asia: Jellyfish are caught in Southeast Asia using set-nets, driftnets, push-nets, beach-seines, weirs and hooks. The methods of fishing used for various species are not noticeably different from one another [54]. Hooks are used and small shrimp trawls have been employed. On the end of a bamboo pole that is 4-5 meters long, four wood sticks make up the hook. On board, two or three fisherman searches for jellyfish near the surface and hand-hook each one. A set-net with a rectangular mouth put across a tidal current is used to catch jellyfish. Gill-nets are another tool employed. While fishermen frequently chop off the mouth-arms of the White type while at sea and simply bring the umbrellas into the boat, the whole bodies of the Cilacap type and Ball type are carried back and transported to the nearby processing factory. This is because only semi-dried umbrellas are in demand in the Japanese market. The mouth-arms, however, are more popular in China, therefore demand for them has recently surged.

Recommendations/ Approaches to Reduce Bloom and Save *L. robustus* Jellyfish: In particular, Southeast Asia harvests some jellyfish species that are edible for human consumption worldwide. The edible species *L. robustus* and *R. esculentum* make up a sizeable portion of the jellyfish catch. The *L. robustus* jellyfish is highly valuable and edible. They maintain the salinity of the water. They serve as food for some fish and turtles. Only when the water is turbulent do they float. Sometimes, when the conditions are right, they multiply rapidly and blossom. If we want to save them and lessen their blossom, we must abide by the guidelines listed below.

- It is necessary to harvest *L. robustus* jellyfish from the sea due to its high market price.
- It is urgent to create a foreign market to export this jellyfish.
- Need to educate the fishermen about its importance and not kill them.
- Trawl fishing in the deep sea should be prohibited or limited or technical. It causes trouble for the jellyfish and also death.
- An increase of tortoises in the sea decreases the number of jellyfish.
- Marine pollution should be reduced.
- Controlled use of behendi net and hilsha net.
- Need to stop dumping chemical waste into the sea.
- Lastly counsels and provides this information to the fisherman that they can also be cautious about their actions towards the jellyfish.

If everything is going well only then we can save this little but lovely animal and also others.

CONCLUSION

The majority of jellyfish species, especially the edible ones, were prevalent in large numbers in the coastal waters. This study has given us much-needed background knowledge on the reasons behind the widespread prevalence of jellyfish species. This enormous number contributes to the Cox's Bazar coast's jellyfish outbreak. *L. robustus*, a species of flower, is edible and popularly consumed as food in Southeast Asia. This s pecies has a high commercial value and is not poisonous. We will be able to export seafood like shrimp and fish and earn foreign currency if we can establish an international market and collect from the sea.

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