# Manual Process of Extracting Facts and Relationships

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## 1/ Sentence separation & Subject Identification:

### a/ Paper 1: Diversity of fishing gears and crafts used for harvesting the Asian seabass, Lates calcarifer along the Bay of Bengal, Bangladesh coast

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| **Sentence Separation** | **Subject Identification** |
| **S1:** These fishing boats are built traditionally by the rural carpenters with wooden planks. | These fishing boats [Sub: Boats] |
| **S2:** Till the mid ‘60s, fishing operations in the estuaries and offshore waters were carried out by traditional craft. | Fishing operations [Sub: Fishing operations] |
| **S3:** The first initiatives of motorized fishing boats started in 1966-67 with outboard engines. | Motorized fishing boats [Sub: Boats] |
| **S4:** Subsequently, these were replaced by inboard marine diesel engines. | These [Sub: Outboard engines] |
| **S5:** The marine fishing fleet consists of about 34,810 traditional boats, 32,859 motorized boats and 247 trawlers. | Marine fishing fleet [Sub: Fishing fleet] |
| **S6:** The total number of marine fishing gears were operated in Bangladesh was 1,88,707. | The number of marine fishing gears [Sub: Number of fishing gears] |
| **S7:** The number of marine fishermen was about 5,16,000 out of a total of 1.16 million fishermen in the country (DoF 2016). | The number of marine fishermen [Sub: Number of fishermen] |
| **S8:** In Bangladesh the major fishing of Asian seabass was based on mechanized crafts and gear. | Major fishing [Sub: Fishing operations] |
| **S9:** There was almost nonexistence of the primitive fishing crafts like Dug-out canoe, Bamboo raft etc. but the wooden boats used for harvesting seabass in coastal and offshore areas of Bangladesh. | There [Sub: Fishing crafts] |
| **S10:** These plank built boats are covered with wooden or bamboo frames. | These plank built boats [Sub: Artisanal boats] |
| **S11:** The smaller sized boats are used in coastal rivers, canal and estuaries. | The smaller sized boats [Sub: Artisanal boats] |
| **S12:** Kosha nauka is a low cost, most traditional country boat with flat bottom and decking half split bamboo. | Kosha nauka [Sub: Kosha nauka] |
| **S13:** Dingi nauka is a small rowing boat. | Dingi nauka [Sub: Dingi nauka] |
| **S14:** It is a shallow boat with a pointed bow and the hull is strengthened by ribs and cross beams. | It [Sub: Dingi nauka] |
| **S15:** Medium sized boats are mainly used in commercial fishing. | Medium sized boats [Sub: Motorized boats] |
| **S16:** These boats are also used for harvested fish transportation. | These boats [Sub: Motorized boats] |
| **S17:** Motorized dingi boats are of the same design and structure to non-mechanized Dingi but large in size, powered by marine engine. | Motorized dingi boats [Sub: Dingi boats] |
| **S18:** Sampan fish boats are crescent shaped boats indigenous to Cox’s Bazar and Chattagram region | Sampan fish boats [Sub: Sampan] |
| **S19:** The Koral jal which is a modified version of the large meshed gill net, the local fishers developed for harvesting seabass in Cox’s Bazar region. | Koral jal [Sub: Gill net] |
| **S20:** “J’’ shaped steel hook is mostly used for hook and line fishing. | “J” shaped steel hook [Sub: Hook] |
| **S21:** They reported that gillnets, hooks and lines, cast nets and traps were used to catch the mature seabass. | They [Sub: Researchers] |
| **S22:** The form and size of the gear depends on the use of gears and the environmental condition of the water body. | The form and size of the gear [Sub: Fishing gears] |
| **S23:** Among the documented gears and crafts, one new gear (single hook and line) and one fishing boat (Sampan) were found to be involved in Seabass harvesting at BoB coast, which earlier has not been reported from Bangladesh. | One new gear (single hook) and one fishing boat (Sampan) [Sub: Hook and Sampan] |
| **S24:** Front head of Sampan is high and curved, but backside strait. | Front head of Sampan [Sub: Front of Sampan] |
| **S25:** With the introduction of the marine engine the primary utility of the shape has forgone. | Primary utility of the shape (Front head of Sampan) |
| **S26:** The bow and stern Balam fishing boat are slightly raised. | Balam fishing boat [Sub: Balam] |
| **S27:** The sides are built by fitting planks to the dug-out portion of the hull. | Sides [Sub: Sides of Balam] |
| **S28:** The seagoing mechanized fishing vessels (trawlers) are made from the best quality planks and are covered with wooden frames having a cabin, a kitchen and latrine facilities. | Seagoing mechanized fishing vessels [Sub: Trawlers] |
| **S29:** They have insulated cold storage facilities for preserving the harvested fishes up to 15 days in the sea. | They [Sub: Trawlers] |
| **S30:** Behundi jal is a conical shaped net and has two extensions | Behundi jal [Sub: Behundi jal] |
| **S31:** Mouth of the net is spread and fixed on tide by bamboo, wood or iron. | Mouth of the net [Sub: The net’s mouth] |
| **S32:** Fish is trapped in the centre pouch of the net. | Fish [Sub: Fish] |

### b/ Paper 2: Fishing Gears and Practices in the Bukbhora Oxbow Lake: Implications for Biodiversity Conservation in South-west Bangladesh

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| **Sentence Separation** | **Subject Identification** |
| **S1:** Among 16 fishing gears 5 of these were found illegal in this study due to its mesh size and destructive behavior of fish biodiversity. | These [Sub: Fishing gears] |
| **S2:** Except some, majority fish species trapped in the recorded fishing traps were Small Indigenous Species, whereas fishing hooks and lines were used to catch carnivorous fish species mainly. | Majority fish species [Sub: Fish species trapped in fishing traps] |
| **S3:** Wounding fishing gears were used for wounding large size fishes during heavy flood or when water level becomes low. | Wounding fishing gears [Sub: Fishing gears that are wounding] |
| **S4:** The choice of fishing gear, method of operation, number of fishermen, fishing intensity, and level of exploitation all has a significant impact on the future of the fishing industry | Choice of fishing gear, method of operation, number of fishermen, fishing intensity, level of exploitation [Sub: Factors affecting the fishing industry] |
| **S5:** Bukbhora Baor (23.1759° N, 89.1170° E) is one of the prominent oxbow lakes located in Jashore Sadar Upazila. | Bukbhora Baor [Sub: Bukbhora Baor lake] |
| **S6:** The catch per unit effort (CPUE) of the angling gears were taken dependent on the weight of fish discovered amid an angling day (kg gear-1haul-1) for the various species consolidated and the gear efficiency (kg gear-1person-1haul-1) additionally assessed based on the weight of fish got and a number of individuals drew in with each fishing gear per hour. | The catch per unit effort of the angling gears [Sub: CPUE] |
| **S7:** The fishery of the ox-bow lakeis multispecies and multigear in nature. | The fishery of the ox-bow lake [Sub: Fishery of the lake ox-bow] |
| **S8:** Fishermen use numerous types of fishing gears for fishing based on seasons and water depth of the baor. | Fishermen [Sub: Fishermen] |
| **S9:** It was observed that huge number of fishes was caught by seine net (Ber jal) and the rare species were damaged through these bulk catches and it is considered as one of the most detrimental gears compared to others. | It [Sub: The event that huge number of fishes was caught by seine net and the rare species were damaged] |
| **S10:** The catch per unit effort (CPUE) is the average daily catch per gear type standardized per fishing unit. | The catch per unit effort (CPUE) [Sub: CPUE] |
| **S11:** CPUE is influenced by several factors, primarily the type of gear used and its efficiency, how many hours it is operated for in a day, weather conditions, and location of fishing. | CPUE [Sub: The catch per unit effort] |
| **S12:** This type of fishing gear was made from bamboo plate with twine. | This type of fishing gear [Sub: Fishing Traps] |
| **S13:** Fish traps are not considered as destructive gear until it creates any barrier on the migratory route of fish. | Fish Traps [Sub: Fishing Traps] |
| **S14:** Vair is a Long box like trap with a door extending from its base to its apex used in shallow portion of the baor. | Vair [Sub: Box-like Trap] |
| **S15:** Made of split bamboo sticks tied with creeper or cane. | Charo/Vair [Sub: Vair] |
| **S16:** Small opening at the apex for collecting fish. | Small opening [Sub: Small opening of Vair] |
| **S17:** In front of Vair a barrier is created with split bamboo made Bana. | A barrier [Sub: Barrier in front of Vair] |
| **S18:** The trap checked up every one or two hour interval. | The trap [Sub: Vair] |
| **S19:** Rectangular box shaped. | Rectangular Box [Sub: Ghuni/Kholsun] |
| **S20:** Made of split bamboo tied with jute rope or cane. | Ghuni/Kholsun [Sub: Ghuni/Kholsun] |
| **S21:** Kholsun consists of two doors from its apex for fish opening. | Kholsun [Sub: Ghuni/Kholsun] |
| **S22:** Small opening present at its apex for collect the fish. | Small opening present at its apex [Sub: Small opening present at the Kholsun’s apex] |
| **S23:** Usually it set in shallow part of the Baor with the help of bamboo pole or tree branches during early morning or evening. | It [Sub: Ghuni/Kholsun] |
| **S24:** Basket shaped, made of split bamboo with two or three entrances. | Basket [Sub: Bitte] |
| **S25:** There is an opening on the trap for collecting fish. | There [Sub: The opening on the trap] |
| **S26:** The trap is sunken (1 to 1.5 feet below from water surface) in shallow, where small current is present during early morning and evening. | The trap [Sub: Bitte] |
| **S27:** Checked up every one or two hour interval. | The trap [Sub: Bitte] |
| **S28:** The terms kochal (Seine net) and komor (drag net) fishing were local name in the study area, which were mostly used for fishing the carps. | The terms kochal and komor [Sub: The terms for Seine net and drag net] |
| **S29:** Initially, the kochal jal (seine net) is operated for 5 to 10 days and by this time the runaway fish took shelter into bush parks (locally called komor) that set in nearby areas. | The kochal jal (seine net) [Sub: Seine net] |
| **S30:** At that stage, the fishers were stopped operating the kochal jal and started fishing in the komors by encircling those with komor jal (drag net). | The fishers [Sub: Fishermen] |
| **S31:** Maximum fishers had pieces of kochal jal and komor jal (2-5 pieces) and those were jointed together (each of 18 fishers groups separately work) during the harvesting period. | Maximum fishers [Sub: Fishermen] |
| **S32:** Komor fishing (drag netting) was principally adopted as a method to catch the remaining fishes in the baor after kochal fishing. | Komor fishing [Sub: Drag netting] |
| **S33:** Different fishing gears such as entangle net of selective mesh size, borshi, ghuni/britti etc. were used for SIS harvesting. | Different fishing gears [Sub: Fishing gears] |
| **S34:** Seine net was the most destructive gear as large amount of fishes were caught per tow by it and there is every possibilities to extinct the rare species if this gear are used in the early breeding season. | Seine net [Sub: Seine Net] |
| **S35:** The choice of fishing gears by the fishermen depends on many factors like types of fish species available and the physical condition of the baor. | The choice of fishing gears by the fishermen [Sub: Choice of fishing gears] |
| **S36:** “Different shapes of fishing gears were enlisted such as rectangular shape (ber jal, current jal), conical shape (jhaki jal), square shape (khora jal) and triangular shape (thela jal) with mesh size ranged from 0.5 to 10 cm, in the study area. | Different shapes of fishing gears [Sub: Shapes of Fishing Gears] |
| **S37:** Maximum fishing efforts per day were correlated with the highest catch composition of any fishing gear. | Maximum fishing efforts per day [Sub: Maximum efforts put in fishing per day] |
| **S38:** However, most of the fishermen caught fish species by using ber jal, komar jal, current jal, thela jal to bring their livelihood. | Most of the fishermen [Sub: Fishermen] |
| **S39:** Fishing (harvesting of carp species) started in November-December and completed on 30th June in each season. | Fishing [Sub: The Harvesting of sarp species] |
| **S40:** Fishermen caught fish throughout the year but comparative higher amount fish was caught during winter season (November to January) which was agreed with Farid et al. | Fishermen [Sub: Fishermen] |
| **S41:** Mainly the fishermen operate their trap in rainy season when the water flows of the baor are much higher. | The Fishermen [Sub: Fishermen] |
| **S42:** Different types and sizes of trap are used by the fishermen and it’s completely depending upon the target species and their sizes that they would be caught, water depth and seasonality. | Different types and sizes of trap [Sub: Types and sizes of trap] |
| **S43:** The operation method of these traps are more or less similar. | The operation method of these trap [Sub: The Traps’ operation method] |
| **S44:** Due to easy operating method and cheap rate, marginal fishermen widely used these trap for commercial and household consumption purposes. | Marginal fishermen [Sub: Fishermen] |
| **S45:** Size of the gear, mesh size, craft and fisherman required for operation vary with the fishing method and targeted fish species. | Size of the gear, mesh size, craft and fisherman required for operation [Sub: Size of the gear, mesh, craft and fisherman required] |
| **S46:** It depends on season, water level, size of fish, fishing area and availability of fisherman. | It [Sub: Size of the gear, mesh size, craft and fisherman required for operation] |

### c/ Paper 3: When hazards become disasters: Coastal fishing communities in Bangladesh

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| **Sentence Separation** | **Subject Identification** |
| **S1:** The region is particularly vulnerable to cyclonic storm surge floods due to its location in the path of tropical cyclones, the wide and shallow continental shelf, and the coast’s funnelling shape. | The region [Sub: Coastal regions of Bangladesh] |
| **S2:** In the recent decade, the coastal zone of Bangladesh witnessed the historic deadliest cyclones, Cyclone Sidr and Cyclone Aila, that significantly affected the southern coastal region, both causing hundreds of deaths and enormous losses to properties and households. | The coastal zone of Bangladesh [Sub: The coastal zone of Bangladesh] |
| **S3:** Climate-related hazards will have severe implications for coastal fisheries-dependent communities that often already live at a marginal level. | Climate-related hazards [Sub: Climate-related hazards] |
| **S4:** Most of the coastal fishers in Bangladesh depend on the hilsa shad (Tenualosa ilisha) fishery, as about half a million fishers are directly engaged in hilsa fishing. | Most of the coastal fishers in Bangladesh [Sub: Most of the coastal fishers in Bangladesh] |
| **S5:** But the species is threatened by climatic variability: climate change impacts under greenhouse emissions scenario A1B are likely to reduce the potential production of the hilsa population by 10% in the Bangladesh Exclusive Economic Zone (EEZ). | The species [Sub: The species] |
| **S6:** Small-scale fishers are among the most vulnerable groups to the impacts of climate change and disasters, also because they live in the most seaward communities and are thus at risk in terms of personal safety as well as damage to property and livelihoods. | Small-scale fishers [Sub: Small-scale fishers] |
| **S7:** In response to frequent natural hydrological hazards, Bangladesh’s government has been developing or maintaining infrastructures such as coastal embankments, cyclone shelters, early warning and evacuation systems or coastal afforestation to protect coastal communities from increased risks. | Bangladesh’s government [Sub: The government of Bangladesh] |
| **S8:** These pre-disaster responses have proven successful in disaster situations, but some occupational groups remain at risk because of context-specific factors. | These pre-disaster responses [Sub: These pre-disaster responses] |
| **S9:** For example, small-scale fishers remain vulnerable and are often subject to injustice, exploitation, and political neglect. | Small-scale fishers [Sub: Small-scale fishers] |
| **S10:** The DPSIR framework, which developed from an earlier Pressure State Response (PSR) structure, was introduced by the European Environment Agency in the 1990s to help policymakers identify cause–effect relationships between environmental and social systems. | The DPSIR framework [Sub: The DPSIR framework] |
| **S11:** The framework has been endorsed to structure the analysis of environmental problems and to integrate approaches from across social and natural sciences. | The framework [Sub: The DPSIR framework] |
| **S12:** The model assesses the causes, consequences, and responses to change holistically (Atkins et al., 2011) and consists of five components: driver, pressure, state, impact, and response. | The model [Sub: The model] |
| **S13:** Drivers are defined as global, regional, or local social, demographic, and economic factors. | Drivers [Sub: Drivers] |
| **S14:** Pressures can generate intended or unintended environmental quality and functioning changes that trigger negative implications on natural systems and human communities. | Pressures [Sub: Pressures] |
| **S15:** Impacts are changes in the state caused by the pressure. | Impacts [Sub: Impacts] |
| **S16:** The state presents the condition of both natural and socioeconomic systems. | The state [Sub: The state] |
| **S17:** Responses are the actions taken by individuals or groups in society and government to minimise the negative impacts imposed on the environment and society, and feedback to the drivers or pressures. | Responses [Sub: Responses] |
| **S18:** The DPSIR framework is characterised by conceptual simplicity and comprehensibility. | The DPSIR framework [Sub: The DPSIR framework] |
| **S19:** It widens the view of underlying relationships among distinct factors in response to direct policy and management essentials in the context of sustainability. | It [Sub: The DPSIR framework] |
| **S20:** It has significant potential for connecting the gap between scientific disciplines and linking science to policy and management by involving stakeholders because of its ability to integrate facts across the different discipline. | It [Sub: The DPSIR framework] |
| **S21:** In 2009, the study areas were affected by cyclone Aila, which also left a devastating trail in the nearby Sundarbans region. | The study areas [Sub: The study areas] |
| **S22:** The region is crisscrossed by several rivers with a connection to upstream rivers and coastal downstream systems. | The region [Sub: The region] |
| **S23:** This geophysical setting makes the area vulnerable to different climate change-related hydro-meteorological events such as cyclones, storm surges, and rising tidal waters from the Bay of Bengal. | This geophysical setting [Sub: This geophysical setting] |
| **S24:** The fishers’ settlements are mostly located along with the water/seafront site of the coastal embankments. | The fishers’ settlements [Sub: The fishers’ settlements] |
| **S25:** Some fishers deliberately choose habitation in this high-risk zone (owned mainly by the government) because they lost their previous homestead land due to erosion; for migrants, there is often no alternative to settling on the embankment. | Some fishers [Sub: Some fishers] |
| **S26:** The crew fishers’ monthly average income is close to the poverty line, and most of them have no or little savings. | The crew fishers’ monthly average income [Sub: The crew fishers’ monthly average income] |
| **S27:** Almost all fishing teams agree with a middleman (local patron) to sell their catches; this person usually provides crews with advance money (locally known as dadon). | Almost all fishing teams [Sub: Almost all fishing teams] |
| **S28:** Fishers pay a commission to the middleman from the sale of their catch, which is already fixed at a lower price due to contractual obligations. | Fishers [Sub: Fishers] |
| **S29:** This patron-client relationship is often disbalanced, with the patron being able to determine the prices and little bargaining power at the patron’s side. | This patron-client relationship [Sub: This patron-client relationship] |
| **S30:** The remotely located settlements, far from urban centres, prevent access to shelter infrastructures, thus increasing fishers’ vulnerability to disaster. | The remotely located settlements [Sub: The remotely located settlements] |
| **S31:** A major section of landless fishers lives besides coastal embankments, which are owned by the government (locally known as khas land). | A major section of landless fishers [Sub: A major section of landless fishers] |
| **S32:** Social stratification among the fishing communities acts as a driver of vulnerability to a disaster. | Social stratification among the fishing communities [Sub: Social stratification among the fishing communities] |
| **S33:** Fishers’ vulnerability in the sea is also shaped by fishing boat conditions. | Fishers’ vulnerability in the sea [Sub: Fishers’ vulnerability in the sea] |
| **S34:** Some fishers also reported constraints of weather forecasts. | Some fishers [Sub: Some fishers] |
| **S35:** Inaccurate weather forecasts have led to underestimating the intensity of cyclones. | Inaccurate weather forecasts [Sub: Inaccurate weather forecasts] |
| **S36:** Sometimes, weather forecast and warnings are issued too late to enable the safe return of fishers, or fishers cannot receive the weather forecast properly because of the absence of a radio signal. | Weather forecast and warnings [Sub: Weather forecast and warnings] |
| **S37:** While experienced fishers can predict adverse conditions by observation, inexperienced fishers may fail to return to the shore. | Experienced fishers, inexperienced fishers [Sub: Experienced fishers, inexperienced fishers] |
| **S38:** Nevertheless, some fishers are desperate to continue fishing even if they receive a weather forecast of rough weather. | Some fishers [Sub: Some fishers] |
| **S39:** Besides cyclones, community members report facing frequent and severe risks from coastal erosion and saline water intrusion. | community members [Sub: community members] |
| **S40:** The riverbanks lost a noticeable amount of land that settled onto riverbeds, which resulted in decreases in depths and reductions in the refuge, breeding, and nursery grounds of fishery species. | The riverbanks [Sub: The riverbanks] |
| **S41:** Further, sediment carried by tidal surges is continuously deposited on the riverbed floor as the surge recedes. | sediment carried by tidal surges [Sub: sediment carried by tidal surges] |
| **S42:** The exposure of extreme events coupled with socioeconomic factors creates pressure on the region’s social and ecological systems. | The exposure of extreme events coupled with socioeconomic factors [Sub: The exposure of extreme events coupled with socioeconomic factors] |
| **S43:** According to interviewed fishers, any tropical depression or cyclone rolling in from the Bay of Bengal causes fishers to discontinue fishing for at least a week. | any tropical depression or cyclone [Sub: any tropical depression or cyclone] |
| **S44:** They estimate the loss to be around 86,000 BDT (1025US$) for cancelling a 7-day fishing trip. | They (interviewed fishers) [Sub: They (interviewed fishers)] |
| **S45:** Respondents said that such income loss is quite common. | Respondents [Sub: Respondents] |
| **S46:** As most fishers are crew hired by the boat owner, they have little freedom to skip fishing trips, even during unfit weather. | most fishers [Sub: most fishers] |
| **S47:** Most of the respondents perceived that the intensity and frequency of cyclones and other rough weather events are on an increasing trend over the past few decades. | Most of the respondents [Sub: Most of the respondents] |
| **S48:** Overall, this situation creates an increased dependency on fishery resources. | this situation [Sub: this situation] |
| **S49:** Due to saline water intrusion, agricultural activities are hampered, which is reflected in reduced food production. | agricultural activities [Sub: agricultural activities] |
| **S50:** Flooding and saltwater intrusion left many areas unsuitable for habitation for a prolonged period. | Flooding and saltwater intrusion [Sub: Flooding and saltwater intrusion] |
| **S51:** Biodiversity is also in decline in the region. | Biodiversity [Sub: Biodiversity] |
| **S52:** The respondent fishers were asked to compare their overall situation before and after major cyclones Sidr and Aila. | The respondent fishers [Sub: The respondent fishers] |
| **S53:** Fishers were unanimous about the negative changes in the ecological environment. | Fishers [Sub: Fishers] |
| **S54:** The drinking water crisis increased as saltwater is creeping into both surface and groundwater, with far-reaching social and health impacts. | The drinking water crisis [Sub: The drinking water crisis] |
| **S55:** The connected loss of seasonal standing crops contributes to food insecurity so that poorer fishers suffer from malnutrition and weak health conditions as they cannot take quality and sufficient food. | The connected loss of seasonal standing crops [Sub: The connected loss of seasonal standing crops] |
| **S56:** To rebuild houses, buy food, medical care, or restore the livelihoods, many have to take a loan from moneylenders of micro-credit organisations. | Many [Sub: Many people] |
| **S57:** After extreme events, boat owners face difficulties to start fishing immediately to rebuild fishing boats. | Boat Owners [Sub: boat owners] |
| **S58:** Thus, hired fisher lose fishing capacities, remaining workless for extended periods. | Hired Fisher [Sub: hired fisher] |
| **S59:** Fishers adopt several short- and long-term responses to cope with the adverse situation. | Fishers [Sub: Fishers] |
| **S60:** Primarily, respondents depend on their food storage and savings and rely on relief distributed by the government. | Respondents [Sub: Respondents] |
| **S61:** According to participants, many fishers reduce the frequency and quality of food by switching to cheaper and less nutritious food ingredients. | Many fishers [Sub: Many fishers] |
| **S62:** Some slightly better-off respondents reported selling household assets or mortgage their lands to reconstruct houses and rebuild fishing capacities by repairing gears and boats. | Some slightly better-off respondents [Sub: Some slightly better-off respondents] |
| **S63:** After losing boats and fishing gears, some boat owners left sea fishing and reduced their fishing capacity to riverine/estuarine fishing. | Some boat owners [Sub: Some boat owners] |
| **S64:** In some cases, fishers reported migrating to nearby cities searching for works like rickshaw pulling and van driving, working in brick making, or other daily labouring activities. | Fishers [Sub: fishers] |
| **S65:** The immediate response from the government after the cyclones was the provision of relief materials to affected communities. | The immediate response from the government [Sub: The immediate response from the government] |
| **S66:** Most respondents report having received government supports after the cyclones. | Most respondents [Sub: Most respondents] |

### d/ Paper 4: Small in Scale, Big in Contributions: Advancing Knowledge of Small-Scale Fisheries in Bangladesh

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| **Sentence Separation** | **Subject Identification** |
| **S1:** Among these, ‘artisanal’ is a term that is most frequently used to describe small-scale fisheries. | ‘Artisanal’ [Sub: The term ‘Artisanal’] |
| **S2:** Globally, Bangladesh ranks third in inland capture fisheries and all fishing in these open-water bodies can be considered small-scale. | Bangladesh [Sub: Bangladesh] |
| **S3:** These also include artisanal coastal and marine sector, which contributes more than eighty percent of the total marine landing. | These (artisanal coastal and marine sector) [Sub: These (artisanal coastal and marine sector)] |
| **S4:** The Department of Fisheries refers to coastal small-scale fisheries as artisanal fishing occurring in shallow waters, typically below 40 meters in-depth and using mechanized or non-mechanized boats. | The Department of Fisheries [Sub: The Department of Fisheries] |
| **S5:** Small-scale fisheries also include those fishing practices with low-technology and low capital, undertaken by individual fishing households, who often make short fishing trips (rarely overnight) close to shore. | Small-scale fisheries [Sub: Small-scale fisheries] |
| **S6:** Artisanal fisheries can be for subsistence and/or commercial purpose, providing for local consumption and exports. | Artisanal fisheries [Sub: Artisanal fisheries] |
| **S7:** Accordingly, the small-scale fishery sector in Bangladesh is highly diverse, both in coastal and inland waters. | The small-scale fishery sector in Bangladesh [Sub: the small-scale fishery sector in Bangladesh] |
| **S8:** This diversity embraces a variety of fishing practices, from traditional to modern fishing, from non-motorized boats to larger mechanized vessels owned by commercial fishers. | This diversity [Sub: Species diversity] |
| **S9:** The small-scale coastal fisheries are multigear, multi-craft, and multi-species fisheries. | The small-scale coastal fisheries [Sub: The small-scale coastal fisheries] |
| **S10:** Traditional fishing crafts equipped with low-tech gears require labour-intensive fishing methods. | Traditional fishing crafts [Sub: Traditional fishing crafts] |
| **S11:** However, these traditional wooden boats are now in decline due to an increasing trend of mechanization, thus enabling variation in construction and equipment varies in terms of size, engine power, and gear handling systems, depending on the area of operation and the type of gear. | These traditional wooden boats [Sub: these traditional wooden boats] |
| **S12:** The Bangladesh fisheries employs more than 17 million people, which represents about 10 percent of the population. | The Bangladesh fisheries [Sub: The Bangladesh fisheries] |
| **S13:** Small-scale fisheries often absorb the excess labour when other livelihood options are lost due to extreme events, such as a cyclone or river bank erosion. | Small-scale fisheries [Sub: Small-scale fisheries] |
| **S14:** Among the fishing population, there are 1.4 million women whose contributions remain largely invisible and underappreciated, despite the fact that fisherwomen have a larger range of fisheries job portfolios than man. | There are 1.4 million women [Sub: there are 1.4 million women] |
| **S15:** Fisherwomen catch fish, make and repair nets and boats, and sort, wash, grade, process, package, transport, and market fish products, according to Sultana et al. | Fisherwomen [Sub: Fisherwomen] |
| **S16:** Traditional low-caste fishers are firmly rooted in small-scale fisheries as a way of life and these play a significant role in livelihood, food, nutritional security, employment, culture, and faith. | Traditional low-caste fishers [Sub: Traditional low-caste fishers] |
| **S17:** Bangladesh is famous for its hilsa shad fish species (Tenualosa ilisha), a prized delicacy with huge social, economic, and political significance. | Bangladesh [Sub: Bangladesh] |
| **S18:** The species generates billions of dollars in economic value per year and contributes about 1 percent to the country’s GDP. | The species [Sub: The species] |
| **S19:** Small-scale fishers are adaptable and creative in the way they respond to different challenges. | Small-scale fishers [Sub: Small-scale fishers] |
| **S20:** These responses are mostly short-term, adopted simply to cope with the unfavourable situations. | These responses [Sub: These responses] |
| **S21:** Equity and justice are big subjects for small-scale fishers and several case studies in this volume call for ensuring procedural and distributive justice as the right step forward. | Equity and justice [Sub: Equity and justice] |
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## 2/ Structuring facts & Relationship Identification and Representation:

### a/ Paper 1: Diversity of fishing gears and crafts used for harvesting the Asian seabass, Lates calcarifer along the Bay of Bengal, Bangladesh coast

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| **Fact Identification** | **Relationship Identification** | **Relationship Representation** |
| These fishing boats are built traditionally by the rural carpenters with wooden planks. | Relationship: Boats are built traditionally by rural carpenter with wooden planks | Boats (vehicle) [:are\_built\_by] rural carpenter (identity) [:with] wooden planks (objects) |
| Till the mid ‘60s, fishing operations in the estuaries and offshore waters were carried out by traditional craft. | Relationship: Until the middle of the 1960s, fishing operations in small bodies of water used traditional craft. | Fishing operations (activity) [:in] small bodies of water (location) [:used] traditional craft (objects) |
| The first initiatives of motorized fishing boats started in 1966-67 with outboard engines. | Relationship: Fishing boats that are motorized first started in 1966-67 with outboard engines | Motorized boats (vehicle) [:first\_started\_in] 1966-67 (time) [:with] outboard engines (engines) |
| Subsequently, these were replaced by inboard marine diesel engines. | Relationship: These (outboard engines) were replaced by inboard marine engines that used diesel. | Outboard engines (engines) [:were\_replaced\_by] inboard marine engines (engines) [:that\_used] diesel (fuel) |
| The marine fishing fleet consists of about 34,810 traditional boats, 32,859 motorized boats and 247 trawlers. | Relationship: The marine fishing fleet ≡ 34,810 traditional boats, 32,859 boats that are motorized and 247 trawlers. | The marine fishing fleet (identity) ≡ [:34,810] boats (vehicle), [:32,859] motorized boats (vehicle) and [:247] trawlers (vehicle). |
| The total number of marine fishing gears were operated in Bangladesh was 1,88,707. | Relationship: The number of fishing gear were operated in Bangladesh ≡ 1,88,707. | The number of fishing gear (number) [:were\_operated\_in] Bangladesh (location) ≡ 1,88,707 (number). |
| The number of marine fishermen was about 5,16,000 out of a total of 1.16 million fishermen in the country (DoF 2016). | Relationship: The number of fishermen ≡ about 5,16,000 of 1.16 million fisherment that is in the country (Bangladesh) | The number of fishermen (number) ≡ [:about] 5,16,000 (number) [:of] 1.16 million (number) [:in] Bangladesh (location) |
| In Bangladesh the major fishing of Asian seabass was based on mechanized crafts and gear. | Relationship: Major fishing of Asian seabass was based on mechanized crafts and gear. | Major fishing (activity) [:of] Asian seabass (species) [:was\_based\_on] mechanized crafts (objects) and gear (objects) |
| There was almost nonexistence of the primitive fishing crafts like Dug-out canoe, Bamboo raft etc. but the wooden boats used for harvesting seabass in coastal and offshore areas of Bangladesh. | Relationship: The fishing crafts that are primitive was almost nonexistence , but the wooden boats used for harvesting seabass in small bodies of water of Bangladesh. | Fishing crafts (objects) [:that\_are\_primitive] [:was\_almost] nonexistence (attribute) [:but] the wooden boats (vehicle) [:used\_for] harvesting seabass (activity) [:in] small bodies of water (location) [:of] Bangladesh (location) |
| These plank built boats are covered with wooden or bamboo frames. | Relationship: These boats that are built with plank are covered with wooden or bamboo frames | Boats (vehicle) [:that\_are\_built\_with] plank (objects) [are\_covered\_with] wooden or bamboo frames (objects) |
| The smaller sized boats are used in coastal rivers, canal and estuaries. | Relationship: Boats that are smaller are used in small bodies of water. | Boats (vehicle) [:that\_are] smaller (attribute) [:are\_user\_in] small bodies of water (location). |
| Kosha nauka is a low cost, most traditional country boat with flat bottom and decking half split bamboo | Relationship: Kosha nauka ≡ most traditional country boat that is low cost with flat bottom and decking half split bamboo | Kosha nauka (identity) ≡ [:most] traditional boat [:that\_is] low cost (attribute) [:with] flat bottom (attribute) and decking half split bamboo (attribute) |
| Dingi nauka is a small rowing boat. | Relationship: Dingi nauka ≡ a rowing boat that is small | Dingi nauka (identity) ≡ rowing boat (vehicle) [:that\_is] small (attribute) |
| It is a shallow boat with a pointed bow and the hull is strengthened by ribs and cross beams | Relationship: It (Dingi nauka) ≡ a shallow boat with pointed bow and hull that is strengthened by ribs and cross beams. | Dingi nauka (identity) ≡ a shallow boat (vehicle) [:with] pointed bow (attribute) and the hull (attribute) [:is\_strengthened\_by] ribs (objects) and cross beams (objects) |
| Medium sized boats are mainly used in commercial fishing. | Relationship: Boats that are medium size are mainly used in commercial fishing. | Boats (vehicle) [:that\_are] medium size (attribute) [:are\_mainly\_used\_in] commercial fishing (activity) |
| These boats are also used for harvested fish transportation. | Relationship: These boats (motorized boats) are also used for transporting harvested fish | Motorized boats (vehicle) [:are\_also\_used\_for] transporting harvested fish (activity) |
| Motorized dingi boats are of the same design and structure to non-mechanized Dingi but large in size, powered by marine engine. | Relationship: Motorized dingi boats have the same design and structure to non-mechanized Dingi but large in size and powered by marine engine. | Motorized dingi boats (vehicle) [:same\_design\_and\_structure\_to] non-mechanized Dingi (vehicle) [:but] large size (attribute) and [:powered\_by] marine engine (objects) |
| Sampan fish boats are crescent shaped boats indigenous to Cox’s Bazar and Chattagram region | Relationship: Sampan boats ≡ boats that are crescent and indigenous to Cox’s Bazar and Chattagram region. | Sampan boats (vehicle) ≡ boats [:that\_are\_crescent] and [:indigenous\_to] Cox’s Bazar (location) and Chattagram (location). |
| The Koral jal which is a modified version of the large meshed gill net, the local fishers developed for harvesting seabass in Cox’s Bazar region. | Relationship: Koral jal ≡ a modified version of the large meshed gill net, that the local fishers developed for harvesting seabass in Cox’s Bazar region. | Koral jal (identity) ≡ [:modified] gill net (objects) [:that\_is] large (attribute) and meshed (attribute) [:that] the local fishers (identity) [:developed\_for] harvesting seabass (activity) [:in] Cox’s Bazar region (location) |
| “J’’ shaped steel hook is mostly used for hook and line fishing. | Relationship: Steel hook that is “J” shaped is mostly used for hook and line fishing | Steel hook (objects) [:that\_is] “J” shaped (attribute) [:is\_mostly\_used\_for] hook (objects) and line fishing (objects) |
| They reported that gillnets, hooks and lines, cast nets and traps were used to catch the mature seabass. | Relationship: They (researchers) reported that gillnets, hooks and lines, cast nets and traps were used to catch mature seabass | Reseachers (identity) [:reported\_that] gillnets (objects), hooks (objects) and lines (objects), cast nets (objects) and traps (objects) [:were\_used\_to\_catch] mature seabass (species) |
| The form and size of the gear depends on the use of gears and the environmental condition of the water body. | Relationship: Form and size of the gear depends on the gears’ use and the condition of the environment water | Form and size (attribute) [:of] gears (objects) [:depends\_on] use [:of] gears (objects) and the condition (attribute) [:of\_the\_environment] water (identity) |
| Among the documented gears and crafts, one new gear (single hook and line) and one fishing boat (Sampan) were found to be involved in Seabass harvesting at BoB coast, which earlier has not been reported from Bangladesh. | Relationship: Single hook and line and Sampan boat were involved in Seabass harvesting at BoB coast | Single hook and line (identity) and Sampan boat (identity) [:were\_involved\_in] Seabass harvesting (activity) at BoB coast (location) |

### b/ Paper 2: Fishing Gears and Practices in the Bukbhora Oxbow Lake: Implications for Biodiversity Conservation in South-west Bangladesh

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| **Fact Identification** | **Relationship Identification** | **Relationship Representation** |
| Among 16 fishing gears, 5 were found illegal in this study due to mesh size and destructive behavior towards fish biodiversity. | Relationship: Among 16 fishing gears, 5 were found illegal in this study due to mesh size and destructive behavior towards fish biodiversity. | Illegal fishing gears (objects) [:quantity] 5 (quantity) [:among] 16 (quantity) [:found\_in] study (context) [:due\_to] mesh size (property) [:due\_to] destructive behavior (property) [:towards] fish biodiversity (impact). |
| Except some, majority fish species trapped in the recorded fishing traps were Small Indigenous Species. | Relationship: Except some, majority fish species trapped in the recorded fishing traps were Small Indigenous Species. | Fish species (objects) [:trapped\_in] fishing traps (objects) [:majority] Small Indigenous Species (category) |
| Fishing hooks and lines were used to catch carnivorous fish species mainly. | Relationship: Fishing hooks and lines were used to catch carnivorous fish species mainly. | Fishing hooks and lines (objects) [:used\_to\_catch] carnivorous fish species (category). |
| Wounding fishing gears were used for wounding large size fishes during heavy flood or when water level becomes low. | Relationship: Wounding fishing gears were used for wounding large size fishes during heavy flood or when water level becomes low. | Wounding fishing gears (objects) [:used\_for] wounding large size fishes (activity) [:during] heavy flood (condition) [:when] low water level (condition). |
| Bukbhora Baor (23.1759° N, 89.1170° E) is one of the prominent oxbow lakes located in Jashore Sadar Upazila. | Relationship: Bukbhora Baor (23.1759° N, 89.1170° E) is one of the prominent oxbow lakes located in Jashore Sadar Upazila. | Bukbhora Baor (location) [:coordinates] (23.1759° N, 89.1170° E) (coordinates) [:type] oxbow lake (type) [:located\_in] Jashore Sadar Upazila (location). |
| The catch per unit effort (CPUE) of the angling gears was taken dependent on the weight of fish discovered amid an angling day (kg gear-1haul-1) for the various species consolidated and the gear efficiency (kg gear-1person-1haul-1) additionally assessed based on the weight of fish got and a number of individuals drew in with each fishing gear per hour. | Relationship: The catch per unit effort (CPUE) of the angling gears was taken dependent on the weight of fish discovered amid an angling day (kg gear-1haul-1) for the various species consolidated and the gear efficiency (kg gear-1person-1haul-1) additionally assessed based on the weight of fish got and a number of individuals drew in with each fishing gear per hour. | CPUE (measurement) [:dependent\_on] weight of fish (measurement) [:during] angling day (time period) [:for] various species (category)  Gear efficiency (measurement) [:assessed\_based\_on] weight of fish (measurement) number of individuals (count) [:per] fishing gear (objects) [:per] hour (time period). |
| A measuring scale was used as a tool to measure mesh size of existing fishing gears. | Relationship: A measuring scale was used as a tool to measure mesh size of existing fishing gears. | Measuring scale (tool) [:used\_as] tool (role) [:used\_to\_measure] mesh size (property) [:of] existing fishing gears (objects). |
| The fishery of the ox-bow lake is multispecies and multigear in nature. | Relationship: The fishery of the ox-bow lake ≡ multispecies and multigear in nature. | Fishery (activity) ≡ multispecies (property) multigear (property). |
| Fishermen use numerous types of fishing gears for fishing based on seasons and water depth of the baor. | Relationship: Fishermen use numerous types of fishing gears for fishing based on seasons and water depth of the baor. | Fishermen (identity) [:use] fishing gears (objects) [:for] fishing (activity) [:based\_on] seasons (time period), water depth (property) [:of] baor (location). |
| It was observed that a huge number of fishes was caught by seine net (Ber jal) and the rare species were damaged through these bulk catches and it is considered as one of the most detrimental gears compared to others. | Relationship: It was observed that a huge number of fishes was caught by seine net (Ber jal) and the rare species were damaged through these bulk catches and it is considered as one of the most detrimental gears compared to others. | Seine net (Ber jal) (objects) [:caught] huge number of fishes (quantity).  Rare species (category) [:damaged\_by] bulk catches (activity)  Seine net (Ber jal) (objects) [:considered\_as] most detrimental gears (property) [:compared\_to] other gears (objects). |
| The catch per unit effort (CPUE) is the average daily catch per gear type standardized per fishing unit. | Relationship: The catch per unit effort (CPUE) is the average daily catch per gear type standardized per fishing unit. | CPUE (measurement) [:is] average daily catch (measurement) [:per] gear type (category) [:standardized\_per] fishing unit (unit). |
| CPUE is influenced by several factors, primarily the type of gear used and its efficiency, how many hours it is operated for in a day, weather conditions, and location of fishing. | Relationship: CPUE is influenced by several factors, primarily the type of gear used and its efficiency, how many hours it is operated for in a day, weather conditions, and location of fishing. | CPUE (measurement) [:influenced\_by] gear type (property), gear efficiency (property), operation hours (property) [:per] day (unit), weather conditions (property), fishing location (location). |
| This type of fishing gear was made from bamboo plate with twine. | Relationship: This type of fishing gear was made from bamboo plate with twine. | Fishing gear (objects) [:made\_from] bamboo plate (material), [:with] twine (material). |
| Fish traps are not considered as destructive gear unless they create any barrier on the migratory route of fish. | Relationship: Fish traps are not considered as destructive gear unless they create any barrier on the migratory route of fish. | Fish traps (objects) [:not\_considered\_as] destructive gear (property) [:unless] creates barrier (activity) [:on] migratory route (property) [:of] fish (objects). |
| Vair is a long box-like trap with a door extending from its base to its apex used in shallow portions of the baor. | Relationship: Vair is a long box-like trap with a door extending from its base to its apex used in shallow portions of the baor. | Vair (objects) [:type] long box-like trap (property) [:has] door (property) [:extending\_from] base (property) [:to] apex (property) [:used\_in] shallow portion (location) [:of] baor (location). |
| The fishing gear is made of split bamboo sticks tied with creeper or cane. | Relationship: The fishing gear is made of split bamboo sticks tied with creeper or cane. | Fishing gear (objects) [:made\_of] split bamboo sticks (material) [:tied\_with] creeper (material), cane (material). |
| There is a small opening at the apex for collecting fish. | Relationship: There is a small opening at the apex for collecting fish. | Fishing gear (objects) [:has] small opening (property) [:at] apex (location) [:for] collecting fish (purpose). |
| In front of Vair, a barrier is created with split bamboo made Bana. | Relationship: In front of Vair, a barrier is created with split bamboo made Bana. | Vair (objects) [:has] barrier (objects) [:in\_front] [:made\_with] split bamboo (material) [:type] Bana (type). |
| The trap is checked every one or two hours. | Relationship: The trap is checked every one or two hours. | Trap (objects) [:checked\_every] one hour (time interval) two hours (time interval). |
| The fishing gear is rectangular box-shaped. | Relationship: The fishing gear is rectangular box-shaped. | Fishing gear (objects) [:shape] rectangular box (shape). |
| The fishing gear is made of split bamboo tied with jute rope or cane. | Relationship: The fishing gear is made of split bamboo tied with jute rope or cane. | Fishing gear (objects) [:made\_of] split bamboo (material), [:tied\_with] jute rope (material), cane (material). |
| Kholsun consists of two doors from its apex for fish opening. | Relationship: Kholsun consists of two doors from its apex for fish opening. | Kholsun (objects) [:consists\_of] two doors (property) [:from] apex (location) [:for] fish opening (purpose). |
| There is a small opening at its apex for collecting fish. | Relationship: There is a small opening at its apex for collecting fish. | Fishing gear (objects) [:has] small opening (property) [:at] apex (location) [:for] collecting fish (purpose). |
| It is usually set in the shallow part of the Baor with the help of bamboo pole or tree branches during early morning or evening. | Relationship: It is usually set in the shallow part of the Baor with the help of bamboo pole or tree branches during early morning or evening. | Fishing gear (objects) [:set\_in] shallow part (location) [:of] Baor (location), [:set\_with] bamboo pole (tool), tree branches (tool) [:set\_during] early morning (time period), evening (time period). |
| The fishing gear is basket-shaped, made of split bamboo with two or three entrances. | Relationship: The fishing gear is basket-shaped, made of split bamboo with two or three entrances. | Fishing gear (objects) [:shape] basket (shape) [:made\_of] split bamboo (material) [:has] two entrances (property), three entrances (property). |
| There is an opening on the trap for collecting fish. | Relationship: There is an opening on the trap for collecting fish. | Trap (objects) [:has] opening (property) [:for] collecting fish (purpose). |
| The trap is sunken 1 to 1.5 feet below the water surface in shallow areas with small currents during early morning and evening. | Relationship: The trap is sunken 1 to 1.5 feet below the water surface in shallow areas with small currents during early morning and evening. | Trap (objects) [:sunken] 1 foot (depth) [:below] water surface (location), 1.5 feet (depth) [:below] water surface (location) [:set\_in] shallow areas (location) [:has] small current (property) [:set\_during] early morning (time period), evening (time period). |
| The trap is checked every one or two hours. | Relationship: The trap is checked every one or two hours. | Trap (objects) [:checked\_every] one hour (time interval), two hours (time interval). |
| The terms kochal (Seine net) and komor (drag net) fishing were local names in the study area, mostly used for fishing carps. | Relationship: The terms kochal (Seine net) and komor (drag net) fishing were local names in the study area, mostly used for fishing carps. | Kochal (objects) [:local\_name\_for] seine net (objects), komor (objects) [:local\_name\_for] drag net (objects), [:used\_for] fishing carps (purpose), fishing carps (purpose). |
| Initially, the kochal jal (seine net) is operated for 5 to 10 days, and runaway fish take shelter in bush parks (locally called komor) in nearby areas. | Relationship: Initially, the kochal jal (seine net) is operated for 5 to 10 days, and runaway fish take shelter in bush parks (locally called komor) in nearby areas. | Kochal jal (objects) [:operated\_for] 5 days (duration), 10 days (duration).  Runaway fish (objects) [:take\_shelter\_in] bush parks (location) [:locally\_called] komor (local name). |
| At that stage, fishers stop operating the kochal jal and start fishing in the komors by encircling them with komor jal (drag net). | Relationship: At that stage, fishers stop operating the kochal jal and start fishing in the komors by encircling them with komor jal (drag net). | Fishers (identity) [:stop\_operating] kochal jal (objects) [:start\_fishing\_in] komors (location) [:encircled\_with] komor jal (objects). |
| Maximum fishers had pieces of kochal jal and komor jal (2-5 pieces) and those were jointed together (each of 18 fishers groups separately work) during the harvesting period. | Relationship: Maximum fishers had pieces of kochal jal and komor jal (2-5 pieces) and those were jointed together (each of 18 fishers groups separately work) during the harvesting period. | Fishers (identity) [:had] kochal jal pieces (objects), komor jal pieces (objects) [:quantity] 2-5 pieces (quantity) [:jointed\_together]  Fishers groups (identity) [:quantity] 18 (quantity) [:work\_separately] |
| Komor fishing (drag netting) was principally adopted as a method to catch the remaining fishes in the baor after kochal fishing. | Relationship: Komor fishing (drag netting) was principally adopted as a method to catch the remaining fishes in the baor after kochal fishing. | Komor fishing (activity) [:adopted\_as] method (purpose) [:to\_catch] remaining fishes (objects) [:after] kochal fishing (activity). |
| Different fishing gears such as entangle net of selective mesh size, borshi, ghuni/britti, etc. were used for SIS harvesting. | Relationship: Different fishing gears such as entangle net of selective mesh size, borshi, ghuni/britti, etc. were used for SIS harvesting. | Fishing gears (objects) [:used\_for] SIS harvesting (purpose) [:includes] entangle net (objects), borshi (objects), ghuni (objects), britti (objects), [:has] selective mesh size (property). |
| Seine net was the most destructive gear as large amounts of fish were caught per tow by it, and there is a possibility of extinguishing rare species if used in the early breeding season. | Relationship: Seine net was the most destructive gear as large amounts of fish were caught per tow by it, and there is a possibility of extinguishing rare species if used in the early breeding season. | Seine net (objects) [:considered\_as] most destructive gear (property)  Seine net (objects) [:catches] large amount of fishes (quantity) [:per] tow (unit)  Seine net (objects) [:has\_possibility] extinct rare species (impact) [:if\_used\_in] early breeding season (time period). |
| The choice of fishing gears by the fishermen depends on the types of fish species available and the physical condition of the baor. | Relationship: The choice of fishing gears by the fishermen depends on the types of fish species available and the physical condition of the baor. | Fishing gears (objects) [:choice\_depends\_on] fish species (objects), physical condition (property) [:of] baor (location). |
| Different shapes of fishing gears were listed: rectangular shape (ber jal, current jal), conical shape (jhaki jal), square shape (khora jal), and triangular shape (thela jal) with mesh sizes ranging from 0.5 to 10 cm. | Relationship: Different shapes of fishing gears were listed: rectangular shape (ber jal, current jal), conical shape (jhaki jal), square shape (khora jal), and triangular shape (thela jal) with mesh sizes ranging from 0.5 to 10 cm. | Fishing gears (objects) [:shape] rectangular (shape) [:examples] ber jal (objects), current jal (objects)  Fishing gears (objects) [:shape] conical (shape) [:examples] jhaki jal (objects)  Fishing gears (objects) [:shape] square (shape) [:examples] khora jal (objects)  Fishing gears (objects) [:shape] triangular (shape) [:examples] thela jal (objects)  fishing gears (objects) [:mesh\_size\_range] 0.5 cm (minimum) to 10 cm (maximum). |
| Maximum fishing efforts per day were correlated with the highest catch composition of any fishing gear. | Relationship: Maximum fishing efforts per day were correlated with the highest catch composition of any fishing gear. | Fishing efforts (activity) [:correlated\_with] catch composition (property) [:of] fishing gear (objects). |
| Most fishermen use ber jal, komar jal, current jal, and thela jal to catch fish for their livelihood. | Relationship: Most fishermen use ber jal, komar jal, current jal, and thela jal to catch fish for their livelihood. | Fishermen (identity) [:use] ber jal (objects), komar jal (objects), current jal (objects), thela jal (objects) [:for] livelihood (purpose). |
| Fishing (harvesting of carp species) starts in November-December and is completed by 30th June in each season. | Relationship: Fishing (harvesting of carp species) starts in November-December and is completed by 30th June in each season. | Fishing (activity) [:starts\_in] November (time period), December (time period) [:completed\_by] 30th June (date). |
| Fishermen caught fish throughout the year, but a comparatively higher amount of fish was caught during the winter season (November to January), which aligns with findings by Farid et al. | Relationship: Fishermen caught fish throughout the year, but a comparatively higher amount of fish was caught during the winter season (November to January), which aligns with findings by Farid et al. | Fishermen (identity) [:caught\_fish] throughout the year (time period).  Higher fish catch (quantity) [:during] winter season (time period) [:from] November (month) [:to] January (month) |
| Fishermen mainly operate their traps in the rainy season when the water flows in the baor are much higher. | Relationship: Fishermen mainly operate their traps in the rainy season when the water flows in the baor are much higher. | Fishermen (identity) [:operate\_traps] in rainy season (time period)  Baor (location) [:has] higher water flows (property) [:during] rainy season (time period). |
| Different types and sizes of traps are used by the fishermen, depending on the target species and their sizes, water depth, and seasonality. | Relationship: Different types and sizes of traps are used by the fishermen, depending on the target species and their sizes, water depth, and seasonality. | Traps (objects) [:types\_and\_sizes\_depend\_on] target species (objects), species sizes (property), water depth (property), seasonality (time period). |
| The operation method of these traps is more or less similar. | Relationship: The operation method of these traps is more or less similar. | Traps (objects) [:operation\_method] similar (property). |
| Due to easy operating methods and cheap rates, marginal fishermen widely use these traps for commercial and household consumption purposes. | Relationship: Due to easy operating methods and cheap rates, marginal fishermen widely use these traps for commercial and household consumption purposes. | Traps (objects) [:used\_by] marginal fishermen (identity) [:due\_to] easy operating method (property), marginal fishermen (identity) [:due\_to] cheap rate (property), commercial purposes (purpose), household consumption (purpose). |
| The size of the gear, mesh size, craft, and fishermen required for operation vary with the fishing method and targeted fish species. | Relationship: The size of the gear, mesh size, craft, and fishermen required for operation vary with the fishing method and targeted fish species. | Gear size (property) [:varies\_with] fishing method (activity), targeted fish species (objects)  Mesh size (property) [:varies\_with] fishing method (activity), targeted fish species (objects)  Craft (objects) [:varies\_with] fishing method (activity), targeted fish species (objects)  Fishermen (identity) [:required\_varies\_with] fishing method (activity), targeted fish species (objects). |
| It depends on the season, water level, size of fish, fishing area, and availability of fishermen. | Relationship: It depends on the season, water level, size of fish, fishing area, and availability of fishermen. | Fishing method (activity) [:depends\_on] season (time period), water level (property), fish size (property), fishing area (location), availability of fishermen (identity). |
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### c/ Paper 3: When hazards become disasters: Coastal fishing communities in Bangladesh

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| **Fact Identification** | **Relationship Identification** | **Relationship Representation** |
| The region is particularly vulnerable to cyclonic storm surge floods due to its location in the path of tropical cyclones, the wide and shallow continental shelf, and the coast’s funnelling shape. | Relationship: The region is vulnerable to cyclonic storm surge floods because of its location, the continental shelf, and the coast’s shape. | The region (identity) [:is\_vulnerable\_to] cyclonic storm surge floods (event) [:due\_to] location in the path of tropical cyclones (location property), wide and shallow continental shelf (geographical property), coast’s funnelling shape (geographical property) |
| In the recent decade, the coastal zone of Bangladesh witnessed the historic deadliest cyclones, Cyclone Sidr and Cyclone Aila, that significantly affected the southern coastal region, both causing hundreds of deaths and enormous losses to properties and households. | Relationship: The coastal zone of Bangladesh witnessed Cyclone Sidr and Cyclone Aila which caused deaths and losses. | Coastal zone of Bangladesh (location) [:witnessed] Cyclone Sidr (event), Cyclone Aila (event) [:causing] hundreds of deaths (impact), enormous losses (impact) [:to] properties (objects), households (objects) |
| Climate-related hazards will have severe implications for coastal fisheries-dependent communities that often already live at a marginal level (Islam & Jentoft, 2017). | Relationship: Climate-related hazards will affect coastal fisheries-dependent communities. | Climate-related hazards (event) [:will\_have] severe implications (impact) [:for] coastal fisheries-dependent communities (identity) [:living\_at] marginal level (condition) |
| Most of the coastal fishers in Bangladesh depend on the hilsa shad (Tenualosa ilisha) fishery, as about half a million fishers are directly engaged in hilsa fishing. | Relationship: Coastal fishers depend on hilsa shad fishery. | Coastal fishers (identity) [:depend\_on] hilsa shad fishery (activity) [:with] half a million fishers (quantity) [:engaged\_in] hilsa fishing (activity) |
| But the species is threatened by climatic variability: climate change impacts under greenhouse emissions scenario A1B are likely to reduce the potential production of the hilsa population by 10% in the Bangladesh Exclusive Economic Zone (EEZ). | Relationship: The species is threatened by climatic variability which will reduce production. | The species (identity) [:is\_threatened\_by] climatic variability (event) [:likely\_to\_reduce] potential production (impact) [:by] 10% (quantity) [:in] Bangladesh EEZ (location) |
| Small-scale fishers are among the most vulnerable groups to the impacts of climate change and disasters, also because they live in the most seaward communities and are thus at risk in terms of personal safety as well as damage to property and livelihoods. | Relationship: Small-scale fishers are vulnerable to climate change and disasters. | Small-scale fishers (identity) [:are\_vulnerable\_to] climate change impacts (event), disasters (event) [:due\_to] living in seaward communities (location), risk to personal safety (impact), damage to property (impact), damage to livelihoods (impact) |
| In response to frequent natural hydrological hazards, Bangladesh’s government has been developing or maintaining infrastructures such as coastal embankments, cyclone shelters, early warning and evacuation systems or coastal afforestation to protect coastal communities from increased risks. | Relationship: Bangladesh’s government develops infrastructures to protect coastal communities. | Bangladesh’s government (identity) [:has\_been\_developing] coastal embankments (infrastructure), cyclone shelters (infrastructure), early warning systems (infrastructure), evacuation systems (infrastructure), coastal afforestation (infrastructure) [:to\_protect] coastal communities (identity) [:from] increased risks (impact) |
| These pre-disaster responses have proven successful in disaster situations, but some occupational groups remain at risk because of context-specific factors. | Relationship: Pre-disaster responses are successful but some groups remain at risk. | Pre-disaster responses (activity) [:have\_proven] successful (attribute) [:but] some occupational groups (identity) [:remain\_at] risk (condition) [:due\_to] context-specific factors (property) |
| For example, small-scale fishers remain vulnerable and are often subject to injustice, exploitation, and political neglect. | Relationship: Small-scale fishers are subject to injustice, exploitation, and political neglect. | Small-scale fishers (identity) [:remain] vulnerable (condition) [:subject\_to] injustice (event), exploitation (event), political neglect (event) |
| The DPSIR framework, which developed from an earlier Pressure State Response (PSR) structure, was introduced by the European Environment Agency in the 1990s to help policymakers identify cause–effect relationships between environmental and social systems. | Relationship: The DPSIR framework was introduced by the European Environment Agency to help policymakers. | The DPSIR framework (identity) [:developed\_from] Pressure State Response (PSR) structure (identity) [:introduced\_by] European Environment Agency (organization) [:in] the 1990s (time) [:to\_help] policymakers (identity) [:identify] cause–effect relationships (concept) [:between] environmental systems (identity), social systems (identity) |
| The framework has been endorsed to structure the analysis of environmental problems and to integrate approaches from across social and natural sciences. | Relationship: The framework is endorsed to structure analysis and integrate approaches. | The framework (identity) [:has\_been\_endorsed\_to] structure analysis (activity) [:of] environmental problems (concept) [:and\_to] integrate approaches (activity) [:from] social sciences (discipline), natural sciences (discipline) |
| The model assesses the causes, consequences, and responses to change holistically (Atkins et al., 2011) and consists of five components: driver, pressure, state, impact, and response. | Relationship: The model assesses causes, consequences, responses and consists of five components. | The model (identity) [:assesses] causes (concept), consequences (concept), responses (concept) [:to] change (concept) [:holistically] (Atkins et al., 2011) (reference) [:and\_consists\_of] driver (component), pressure (component), state (component), impact (component), response (component) |
| Drivers are defined as global, regional, or local social, demographic, and economic factors. | Relationship: Drivers are defined as social, demographic, economic factors. | Drivers (identity) [:defined\_as] social factors (concept), demographic factors (concept), economic factors (concept) [:at] global level (scale), regional level (scale), local level (scale) |
| Pressures can generate intended or unintended environmental quality and functioning changes that trigger negative implications on natural systems and human communities. | Relationship: Pressures generate changes that trigger negative implications. | Pressures (identity) [:can\_generate] intended changes (concept), unintended changes (concept) [:in] environmental quality (concept), functioning (concept) [:that\_trigger] negative implications (impact) [:on] natural systems (identity), human communities (identity) |
| Impacts are changes in the state caused by the pressure. | Relationship: Impacts are changes in the state caused by pressure. | Impacts (identity) [:are] changes (concept) [:in] the state (concept) [:caused\_by] the pressure (concept) |
| The state presents the condition of both natural and socioeconomic systems. | Relationship: The state presents the condition of natural and socioeconomic systems. | The state (identity) [:presents] the condition (concept) [:of] natural systems (identity), socioeconomic systems (identity) |
| Responses are the actions taken by individuals or groups in society and government to minimise the negative impacts imposed on the environment and society, and feedback to the drivers or pressures. | Relationship: Responses are actions taken to minimize negative impacts and feedback. | Responses (identity) [:are] actions (concept) [:taken\_by] individuals (identity), groups (identity) [:in] society (identity), government (identity) [:to\_minimise] negative impacts (impact) [:imposed\_on] environment (identity), society (identity) [:and\_feedback\_to] drivers (identity), pressures (identity) |
| The DPSIR framework is characterised by conceptual simplicity and comprehensibility. | Relationship: The DPSIR framework is characterised by simplicity and comprehensibility. | The DPSIR framework (identity) [:is\_characterised\_by] conceptual simplicity (attribute), comprehensibility (attribute) |
| It widens the view of underlying relationships among distinct factors in response to direct policy and management essentials in the context of sustainability. | Relationship: The DPSIR framework widens the view of relationships among factors. | The DPSIR framework (identity) [:widens] the view (concept) [:of] underlying relationships (concept) [:among] distinct factors (concept) [:in\_response\_to] policy essentials (concept), management essentials (concept) [:in] the context of sustainability (context) |
| It has significant potential for connecting the gap between scientific disciplines and linking science to policy and management by involving stakeholders because of its ability to integrate facts across the different disciplines. | Relationship: The DPSIR framework has potential for connecting gaps and linking science to policy. | The DPSIR framework (identity) [:has] significant potential (attribute) [:for] connecting the gap (activity) [:between] scientific disciplines (discipline) [:and\_linking] science (discipline) [:to] policy (field), management (field) [:by] involving stakeholders (activity) [:because\_of] its ability (attribute) [:to\_integrate] facts (concept) [:across] different disciplines (discipline) |
| The primary data was obtained from fieldwork from July 2017 to December 2017. | Relationship: Primary data was obtained from fieldwork during a specific period. | The primary data (identity) [:was\_obtained\_from] fieldwork (activity) [:from] July 2017 (time) [:to] December 2017 (time) |
| The fieldwork was conducted in four study sites situated in Patuakhali and Barguna districts of Bangladesh’s southern coast. | Relationship: Fieldwork was conducted in specific locations. | The fieldwork (activity) [:was\_conducted\_in] four study sites (location) [:situated\_in] Patuakhali district (location), Barguna district (location) [:of] Bangladesh’s southern coast (location) |
| The districts were chosen as they appeared very vulnerable to a range of natural disasters and were hit hardest by the 2007 super cyclone Sidr. | Relationship: Districts were chosen due to vulnerability and impact from cyclone Sidr. | The districts (location) [:were\_chosen] [:because\_they\_appeared] very vulnerable (condition) [:to] natural disasters (event) [:and\_were\_hit\_by] 2007 super cyclone Sidr (event) |
| In 2009, the study areas were affected by cyclone Aila, which also left a devastating trail in the nearby Sundarbans region. | Relationship: Study areas were affected by cyclone Aila in 2009. | The study areas (location) [:were\_affected\_by] cyclone Aila (event) [:in] 2009 (time) [:which\_left] devastating trail (impact) [:in] Sundarbans region (location) |
| Primary data was collected through qualitative data collection tools, including semistructured interviews, focus group discussion (FGD), and key informant interviews. | Relationship: Primary data was collected using specific tools. | Primary data (identity) [:was\_collected\_through] qualitative data collection tools (method) [:including] semistructured interviews (method), focus group discussion (FGD) (method), key informant interviews (method) |
| A total of 120 individual face-to-face interviews were conducted with respondents whose main occupation is fishing. | Relationship: Interviews were conducted with specific respondents. | 120 individual face-to-face interviews (quantity) [:were\_conducted\_with] respondents (identity) [:whose\_main\_occupation\_is] fishing (occupation) |
| Respondents were fishermen and-women, and aratder (fish entrepreneur and fish trader). | Relationship: Respondents were specific groups. | Respondents (identity) [:were] fishermen and women (identity), aratder (fish entrepreneur and fish trader) (identity) |
| Interviews were conducted in respondent’s houses, working areas of nearby rivers, fishing boats, or landing sites. | Relationship: Interviews were conducted in specific locations. | Interviews (activity) [:were\_conducted\_in] respondent’s houses (location), working areas of nearby rivers (location), fishing boats (location), landing sites (location) |
| The study areas in Patuakhali and Borguna districts are situated in the river mouth system of a low-lying coastal ecosystem. | Relationship: Study areas are situated in a specific ecosystem. | The study areas (location) [:are\_situated\_in] river mouth system (location) [:of] low-lying coastal ecosystem (ecosystem) |
| The region is crisscrossed by several rivers with a connection to upstream rivers and coastal downstream systems. | Relationship: The region has specific geographical features. | The region (location) [:is\_crisscrossed\_by] several rivers (geographical feature) [:with\_connection\_to] upstream rivers (geographical feature), coastal downstream systems (geographical feature) |
| This geophysical setting makes the area vulnerable to different climate change-related hydro-meteorological events such as cyclones, storm surges, and rising tidal waters from the Bay of Bengal. | Relationship: Geophysical setting causes vulnerability to specific events. | This geophysical setting (property) [:makes] the area (location) [:vulnerable\_to] climate change-related hydro-meteorological events (event) [:such\_as] cyclones (event), storm surges (event), rising tidal waters (event) [:from] the Bay of Bengal (location) |
| The fishers’ settlements are mostly located along with the water/seafront site of the coastal embankments. | Relationship: Fishers’ settlements are located in specific areas. | The fishers’ settlements (location) [:are\_mostly\_located\_along] water/seafront site (location) [:of] coastal embankments (infrastructure) |
| Some fishers deliberately choose habitation in this high-risk zone (owned mainly by the government) because they lost their previous homestead land due to erosion; for migrants, there is often no alternative to settling on the embankment. | Relationship: Fishers choose habitation in high-risk zones due to land loss and lack of alternatives. | Some fishers (identity) [:deliberately\_choose] habitation (activity) [:in] high-risk zone (location) [:owned\_by] government (organization) [:because\_they\_lost] previous homestead land (property) [:due\_to] erosion (event); migrants (identity) [:have\_no\_alternative\_to] settling on the embankment (activity) |
| The crew fishers’ monthly average income is close to the poverty line, and most of them have no or little savings. | Relationship: Crew fishers’ income is low and savings are minimal. | The crew fishers’ monthly average income (identity) [:is\_close\_to] the poverty line (economic condition) [:and\_most\_have] no savings (condition), little savings (condition) |
| Almost all fishing teams agree with a middleman (local patron) to sell their catches; this person usually provides crews with advance money (locally known as dadon). | Relationship: Fishing teams agree with middlemen for sales and advances. | Almost all fishing teams (identity) [:agree\_with] middleman (local patron) (identity) [:to\_sell] their catches (activity) [:this\_person\_usually\_provides] crews (identity) [:with] advance money (dadon) (financial assistance) |
| Fishers pay a commission to the middleman from the sale of their catch, which is already fixed at a lower price due to contractual obligations. | Relationship: Fishers pay commissions to middlemen at fixed lower prices. | Fishers (identity) [:pay] commission (payment) [:to] the middleman (identity) [:from] the sale of their catch (activity) [:which\_is\_fixed\_at] lower price (condition) [:due\_to] contractual obligations (agreement) |
| This patron-client relationship is often disbalanced, with the patron being able to determine the prices and little bargaining power at the patron’s side. | Relationship: The patron-client relationship is imbalanced. | This patron-client relationship (relationship) [:is\_often] disbalanced (condition) [:with] the patron (identity) [:able\_to\_determine] the prices (activity) [:and] little bargaining power (condition) [:at] the patron’s side (location) |
| The remotely located settlements, far from urban centres, prevent access to shelter infrastructures, thus increasing fishers’ vulnerability to disaster. | Relationship: Remote settlements prevent access to shelters, increasing vulnerability. | The remotely located settlements (location) [:prevent] access to shelter infrastructures (infrastructure) [:thus\_increasing] fishers’ vulnerability (condition) [:to] disaster (event) |
| A major section of landless fishers lives besides coastal embankments, which are owned by the government (locally known as khas land). | Relationship: Landless fishers live near government-owned embankments. | A major section of landless fishers (identity) [:lives\_besides] coastal embankments (infrastructure) [:which\_are\_owned\_by] the government (organization) [:locally\_known\_as] khas land (term) |
| Social stratification among the fishing communities acts as a driver of vulnerability to a disaster. | Relationship: Social stratification drives vulnerability to disasters. | Social stratification (concept) [:among] the fishing communities (identity) [:acts\_as] a driver (factor) [:of] vulnerability (condition) [:to] a disaster (event) |
| Fishers’ vulnerability in the sea is also shaped by fishing boat conditions. | Relationship: Fishing boat conditions shape fishers’ vulnerability at sea. | Fishers’ vulnerability in the sea (condition) [:is\_also\_shaped\_by] fishing boat conditions (condition) |
| Some fishers also reported constraints of weather forecasts. | Relationship: Fishers report issues with weather forecasts. | Some fishers (identity) [:reported] constraints (issues) [:of] weather forecasts (information) |
| Inaccurate weather forecasts have led to underestimating the intensity of cyclones. | Relationship: Inaccurate forecasts lead to underestimation of cyclone intensity. | Inaccurate weather forecasts (information) [:have\_led\_to] underestimating (misjudgment) [:the\_intensity\_of] cyclones (event) |
| Sometimes, weather forecast and warnings are issued too late to enable the safe return of fishers, or fishers cannot receive the weather forecast properly because of the absence of a radio signal. | Relationship: Late or unreceived forecasts affect fishers’ safety. | Weather forecast and warnings (information) [:are\_issued] too late (timing) [:to\_enable] the safe return of fishers (activity) [:or] fishers (identity) [:cannot\_receive] the weather forecast properly (information) [:because\_of] the absence of a radio signal (condition) |
| While experienced fishers can predict adverse conditions by observation, inexperienced fishers may fail to return to the shore. | Relationship: Experience affects ability to predict and respond to adverse conditions. | Experienced fishers (identity) [:can\_predict] adverse conditions (event) [:by] observation (method) [:while] inexperienced fishers (identity) [:may\_fail\_to] return to the shore (activity) |
| Nevertheless, some fishers are desperate to continue fishing even if they receive a weather forecast of rough weather. | Relationship: Some fishers continue fishing despite rough weather forecasts. | Some fishers (identity) [:are\_desperate\_to] continue fishing (activity) [:even\_if\_they\_receive] a weather forecast of rough weather (information) |
| Besides cyclones, community members report facing frequent and severe risks from coastal erosion and saline water intrusion. | Relationship: Community members face risks from erosion and saline water intrusion. | community members (identity) [:report\_facing] frequent risks (condition), severe risks (condition) [:from] coastal erosion (event), saline water intrusion (event) |
| The riverbanks lost a noticeable amount of land that settled onto riverbeds, which resulted in decreases in depths and reductions in the refuge, breeding, and nursery grounds of fishery species. | Relationship: Riverbanks losing land affects fishery species. | The riverbanks (location) [:lost] a noticeable amount of land (quantity) [:that\_settled\_onto] riverbeds (location) [:which\_resulted\_in] decreases in depths (change), reductions in refuge (change), breeding grounds (change), nursery grounds (change) [:of] fishery species (identity) |
| Further, sediment carried by tidal surges is continuously deposited on the riverbed floor as the surge recedes. | Relationship: Sediment deposition on riverbeds. | Sediment (identity) [:carried\_by] tidal surges (event) [:is\_continuously\_deposited\_on] the riverbed floor (location) [:as] the surge recedes (event) |
| The exposure of extreme events coupled with socioeconomic factors creates pressure on the region’s social and ecological systems. | Relationship: Extreme events and socioeconomic factors pressure systems. | The exposure of extreme events (event) [:coupled\_with] socioeconomic factors (concept) [:creates] pressure (impact) [:on] the region’s social systems (identity), ecological systems (identity) |
| According to interviewed fishers, any tropical depression or cyclone rolling in from the Bay of Bengal causes fishers to discontinue fishing for at least a week. | Relationship: Tropical depressions or cyclones cause fishing discontinuation. | Any tropical depression (event), cyclone (event) [:rolling\_in\_from] the Bay of Bengal (location) [:causes] fishers (identity) [:to\_discontinue] fishing (activity) [:for] at least a week (duration) |
| They estimate the loss to be around 86,000 BDT (1025US$) for cancelling a 7-day fishing trip. | Relationship: Estimated financial loss for cancelling fishing trips. | They (identity) [:estimate] the loss (financial impact) [:to\_be\_around] 86,000 BDT (amount) [:for] cancelling a 7-day fishing trip (activity) |
| Respondents said that such income loss is quite common. | Relationship: Income loss is common. | Respondents (identity) [:said\_that] income loss (financial impact) [:is\_quite] common (frequency) |
| As most fishers are crew hired by the boat owner, they have little freedom to skip fishing trips, even during unfit weather. | Relationship: Fishers' employment status affects their freedom. | Most fishers (identity) [:are] crew hired by the boat owner (employment status) [:they\_have] little freedom (condition) [:to\_skip] fishing trips (activity) [:even\_during] unfit weather (condition) |
| Most of the respondents perceived that the intensity and frequency of cyclones and other rough weather events are on an increasing trend over the past few decades. | Relationship: Perception of increasing intensity and frequency of weather events. | Most of the respondents (identity) [:perceived\_that] the intensity (attribute) [:and] frequency (attribute) [:of] cyclones (event), rough weather events (event) [:are\_on] an increasing trend (trend) [:over] the past few decades (time period) |
| Overall, this situation creates an increased dependency on fishery resources. | Relationship: Situation increases dependency on fishery resources. | this situation (condition) [:creates] increased dependency (condition) [:on] fishery resources (resources) |
| Due to saline water intrusion, agricultural activities are hampered, which is reflected in reduced food production. | Relationship: Saline water intrusion hampers agriculture and reduces food production. | agricultural activities (activity) [:are\_hampered\_by] saline water intrusion (event) [:which\_is\_reflected\_in] reduced food production (impact) |
| Flooding and saltwater intrusion left many areas unsuitable for habitation for a prolonged period. | Relationship: Flooding and saltwater intrusion affect habitation. | Flooding (event), saltwater intrusion (event) [:left] many areas (location) [:unsuitable\_for] habitation (condition) [:for] a prolonged period (duration) |
| Biodiversity is also in decline in the region. | Relationship: Biodiversity decline. | Biodiversity (concept) [:is\_in] decline (trend) [:in] the region (location) |
| The respondent fishers were asked to compare their overall situation before and after major cyclones Sidr and Aila. | Relationship: Fishers asked to compare situations. | The respondent fishers (identity) [:were\_asked\_to] compare (activity) [:their\_overall\_situation] before and after major cyclones Sidr (event), Aila (event) |
| Fishers were unanimous about the negative changes in the ecological environment. | Relationship: Fishers agree on negative ecological changes. | Fishers (identity) [:were\_unanimous\_about] the negative changes (impact) [:in] the ecological environment (concept) |
| The drinking water crisis increased as saltwater is creeping into both surface and groundwater, with far-reaching social and health impacts. | Relationship: Drinking water crisis increases due to saltwater intrusion. | The drinking water crisis (condition) [:increased\_as] saltwater (identity) [:is\_creeping\_into] surface water (location), groundwater (location) [:with] far-reaching social impacts (impact), health impacts (impact) |
| The connected loss of seasonal standing crops contributes to food insecurity so that poorer fishers suffer from malnutrition and weak health conditions as they cannot take quality and sufficient food. | Relationship: Crop loss contributes to food insecurity and health issues. | The connected loss of seasonal standing crops (impact) [:contributes\_to] food insecurity (condition) [:so\_that] poorer fishers (identity) [:suffer\_from] malnutrition (condition), weak health conditions (condition) [:as\_they\_cannot\_take] quality food (resource), sufficient food (resource) |
| To rebuild houses, buy food, medical care, or restore the livelihoods, many have to take a loan from moneylenders of micro-credit organisations. | Relationship: Many take loans for various needs. | Many (identity) [:have\_to\_take] a loan (action) [:from] moneylenders (identity) [:of] micro-credit organisations (identity) [:to] rebuild houses (action), buy food (action), medical care (action), restore the livelihoods (action) |
| After extreme events, boat owners face difficulties to start fishing immediately to rebuild fishing boats. | Relationship: Boat owners face difficulties after extreme events. | Boat owners (identity) [:face] difficulties (condition) [:to\_start] fishing (action) [:immediately\_to] rebuild fishing boats (action) [:after] extreme events (event) |
| Thus, hired fisher lose fishing capacities, remaining workless for extended periods. | Relationship: Hired fishers lose fishing capacities and remain workless. | Hired fisher (identity) [:lose] fishing capacities (condition) [:remaining] workless (condition) [:for] extended periods (duration) |
| Fishers adopt several short- and long-term responses to cope with the adverse situation. | Relationship: Fishers adopt responses to cope. | Fishers (identity) [:adopt] several short- and long-term responses (action) [:to\_cope\_with] the adverse situation (condition) |
| Primarily, respondents depend on their food storage and savings and rely on relief distributed by the government. | Relationship: Respondents depend on food storage, savings, and government relief. | Respondents (identity) [:depend\_on] their food storage (resource), savings (resource) [:and\_rely\_on] relief (resource) [:distributed\_by] the government (identity) |
| According to participants, many fishers reduce the frequency and quality of food by switching to cheaper and less nutritious food ingredients. | Relationship: Fishers reduce food frequency and quality. | Many fishers (identity) [:reduce] the frequency (attribute) [:and] quality (attribute) [:of] food (resource) [:by\_switching\_to] cheaper food ingredients (resource), less nutritious food ingredients (resource) |
| Some slightly better-off respondents reported selling household assets or mortgage their lands to reconstruct houses and rebuild fishing capacities by repairing gears and boats. | Relationship: Better-off respondents sell assets or mortgage lands. | Some slightly better-off respondents (identity) [:reported] selling household assets (action), mortgage their lands (action) [:to] reconstruct houses (action), rebuild fishing capacities (action) [:by] repairing gears (action), boats (action) |
| After losing boats and fishing gears, some boat owners left sea fishing and reduced their fishing capacity to riverine/estuarine fishing. | Relationship: Boat owners change fishing practices after losses. | Some boat owners (identity) [:left] sea fishing (action) [:and\_reduced] their fishing capacity (condition) [:to] riverine/estuarine fishing (action) [:after] losing boats (event), fishing gears (event) |
| In some cases, fishers reported migrating to nearby cities searching for works like rickshaw pulling and van driving, working in brick making, or other daily labouring activities. | Relationship: Fishers migrate for work. | Fishers (identity) [:reported] migrating (action) [:to] nearby cities (location) [:searching\_for] works (action) [:like] rickshaw pulling (action), van driving (action), working in brick making (action), other daily labouring activities (action) |
| The immediate response from the government after the cyclones was the provision of relief materials to affected communities. | Relationship: Government provides relief materials. | The immediate response from the government (action) [:was\_the\_provision\_of] relief materials (resource) [:to] affected communities (identity) [:after] the cyclones (event) |
| Most respondents report having received government supports after the cyclones. | Relationship: Respondents received government support. | Most respondents (identity) [:report] having received government supports (resource) [:after] the cyclones (event) |

### d/ Paper 4: Small in Scale, Big in Contributions: Advancing Knowledge of Small-Scale Fisheries in Bangladesh

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| **Fact Identification** | **Relationship Identification** | **Relationship Representation** |
| Among these, ‘artisanal’ is a term that is most frequently used to describe small-scale fisheries. | Relationship: Artisanal is frequently used to describe small-scale fisheries. | ‘artisanal’ (term) [:is\_most\_frequently\_used\_to] describe (action) small-scale fisheries (concept) |
| Globally, Bangladesh ranks third in inland capture fisheries and all fishing in these open-water bodies can be considered small-scale. | Relationship: Bangladesh ranks third in inland capture fisheries and all fishing in open-water bodies is small-scale. | Bangladesh (country) [:ranks] third (position) [:in] inland capture fisheries (sector) [:and\_all] fishing (activity) [:in] these open-water bodies (location) [:can\_be\_considered] small-scale (classification) |
| These also include artisanal coastal and marine sector, which contributes more than eighty percent of the total marine landing. | Relationship: Artisanal coastal and marine sector contributes significantly to marine landing. | These (artisanal coastal and marine sector) [:include] artisanal coastal sector (sector), marine sector (sector) [:which\_contributes] more than eighty percent (percentage) [:of] the total marine landing (quantity) |
| The Department of Fisheries refers to coastal small-scale fisheries as artisanal fishing occurring in shallow waters, typically below 40 meters in-depth and using mechanized or non-mechanized boats. | Relationship: Department of Fisheries defines coastal small-scale fisheries. | The Department of Fisheries (organization) [] coastal small-scale fisheries (concept) [:as] artisanal fishing (concept) [:occurring\_in] shallow waters (location) [:typically\_below] 40 meters (depth) [:in-depth\_and\_using] mechanized boats (equipment), non-mechanized boats (equipment) |
| Small-scale fisheries also include those fishing practices with low-technology and low capital, undertaken by individual fishing households, who often make short fishing trips (rarely overnight) close to shore. | Relationship: Small-scale fisheries include low-tech, low-capital practices by individual households. | Small-scale fisheries (concept) [:also\_include] fishing practices (activity) [:with] low-technology (attribute), low capital (attribute) [:undertaken\_by] individual fishing households (identity) [:who\_often\_make] short fishing trips (activity) [:rarely] overnight (time) [:close\_to] shore (location) |
| Artisanal fisheries can be for subsistence and/or commercial purpose, providing for local consumption and exports. | Relationship: Artisanal fisheries serve subsistence and commercial purposes. | Artisanal fisheries (concept) [:can\_be\_for] subsistence (purpose), commercial purpose (purpose) [:providing\_for] local consumption (concept), exports (concept) |
| Accordingly, the small-scale fishery sector in Bangladesh is highly diverse, both in coastal and inland waters. | Relationship: The small-scale fishery sector in Bangladesh is diverse. | the small-scale fishery sector in Bangladesh (sector) [:is\_highly] diverse (attribute) [:both\_in] coastal waters (location), inland waters (location) |
| This diversity embraces a variety of fishing practices, from traditional to modern fishing, from non-motorized boats to larger mechanized vessels owned by commercial fishers. | Relationship: Diversity in fishing practices and equipment. | This diversity (attribute) [:embraces] a variety of fishing practices (concept) [:from] traditional fishing (concept) [:to] modern fishing (concept) [:from] non-motorized boats (equipment) [:to] larger mechanized vessels (equipment) [:owned\_by] commercial fishers (identity) |
| The small-scale coastal fisheries are multigear, multi-craft, and multi-species fisheries. | Relationship: Small-scale coastal fisheries are diverse in gear, craft, and species. | The small-scale coastal fisheries (concept) [:are] multigear (attribute), multi-craft (attribute), and multi-species fisheries (attribute) |
| Traditional fishing crafts equipped with low-tech gears require labour-intensive fishing methods. | Relationship: Traditional fishing crafts with low-tech gears require labor-intensive methods. | Traditional fishing crafts (equipment) [:equipped\_with] low-tech gears (equipment) [:require] labour-intensive fishing methods (method) |
| However, these traditional wooden boats are now in decline due to an increasing trend of mechanization, thus enabling variation in construction and equipment varies in terms of size, engine power, and gear handling systems, depending on the area of operation and the type of gear. | Relationship: Traditional wooden boats are declining due to mechanization. | These traditional wooden boats (equipment) [:are\_now\_in] decline (condition) [:due\_to] an increasing trend of mechanization (trend) [:thus\_enabling] variation in construction (concept), equipment (concept) [:varies\_in\_terms\_of] size (attribute), engine power (attribute), and gear handling systems (attribute) [:depending\_on] the area of operation (location), the type of gear (equipment) |
| The Bangladesh fisheries employs more than 17 million people, which represents about 10 percent of the population. | Relationship: Bangladesh fisheries employs a significant portion of the population. | The Bangladesh fisheries (sector) [:employs] more than 17 million people (quantity) [:which\_represents] about 10 percent (percentage) [:of] the population (demographic) |
| Small-scale fisheries often absorb the excess labour when other livelihood options are lost due to extreme events, such as a cyclone or river bank erosion. | Relationship: Small-scale fisheries absorb excess labor during crises. | Small-scale fisheries (sector) [:often\_absorb] the excess labour (labor) [:when] other livelihood options (concept) [:are\_lost\_due\_to] extreme events (event), such as a cyclone (event), river bank erosion (event) |
| Among the fishing population, there are 1.4 million women whose contributions remain largely invisible and underappreciated, despite the fact that fisherwomen have a larger range of fisheries job portfolios than man. | Relationship: Women in fishing population have diverse roles but their contributions are underappreciated. | There are 1.4 million women (demographic) [:among] the fishing population (demographic) [:whose\_contributions\_remain] largely invisible (condition), underappreciated (condition) [:despite\_the\_fact\_that] fisherwomen (demographic) [:have] a larger range of fisheries job portfolios (concept) [:than] men (demographic) |
| Fisherwomen catch fish, make and repair nets and boats, and sort, wash, grade, process, package, transport, and market fish products, according to Sultana et al. | Relationship: Fisherwomen perform various tasks in the fishing industry. | Fisherwomen (demographic) [:catch] fish (activity), make and repair nets and boats (activity), and sort (activity), wash (activity), grade (activity), process (activity), package (activity), transport (activity), and market fish products (activity) [:according\_to] Sultana et al. (source) |
| Traditional low-caste fishers are firmly rooted in small-scale fisheries as a way of life and these play a significant role in livelihood, food, nutritional security, employment, culture, and faith. | Relationship: Traditional low-caste fishers are integral to small-scale fisheries and play significant roles. | Traditional low-caste fishers (demographic) [:are\_firmly\_routed\_in] small-scale fisheries (sector) [:as] a way of life (concept) [:and\_these\_play] a significant role (impact) [:in] livelihood (concept), food (concept), nutritional security (concept), employment (concept), culture (concept), and faith (concept) |
| Bangladesh is famous for its hilsa shad fish species (Tenualosa ilisha), a prized delicacy with huge social, economic, and political significance. | Relationship: Bangladesh is known for hilsa shad fish, which has significant importance. | Bangladesh (country) [:is\_famous\_for] its hilsa shad fish species (species) [:a] prized delicacy (concept) [:with] huge social significance (concept), economic significance (concept), and political significance (concept) |
| The species generates billions of dollars in economic value per year and contributes about 1 percent to the country’s GDP. | Relationship: Hilsa shad fish species has significant economic impact. | The species (species) [:generates] billions of dollars (quantity) [:in] economic value (concept) [:per] year (time) [:and\_contributes] about 1 percent (percentage) [:to] the country’s GDP (economic indicator) |
| Small-scale fishers are adaptable and creative in the way they respond to different challenges. | Relationship: Small-scale fishers are adaptable and creative in responding to challenges. | Small-scale fishers (identity) [:are] adaptable (attribute), creative (attribute) [:in\_the\_way\_they] respond (action) [:to] different challenges (concept) |
| These responses are mostly short-term, adopted simply to cope with the unfavourable situations. | Relationship: Responses are short-term and adopted to cope with unfavorable situations. | These responses (concept) [:are\_mostly] short-term (attribute) [:adopted\_simply\_to] cope (action) [:with] the unfavourable situations (condition) |
| Equity and justice are big subjects for small-scale fishers and several case studies in this volume call for ensuring procedural and distributive justice as the right step forward. | Relationship: Equity and justice are important for small-scale fishers, and case studies call for ensuring justice. | Equity (concept), justice (concept) [:are] big subjects (concept) [:for] small-scale fishers (identity) [:and] several case studies (concept) [:in] this volume (source) [:call\_for] ensuring (action) procedural justice (concept), distributive justice (concept) [:as] the right step forward (concept) |
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