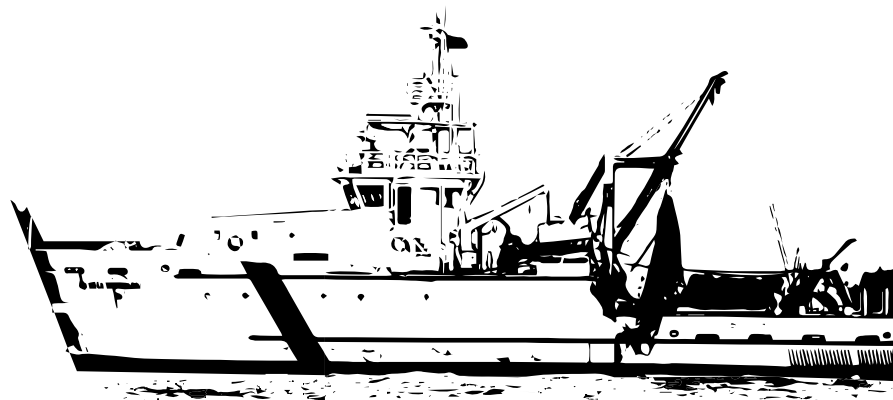


MARINE FISHERIES SURVEY REPORTS AND STOCK ASSESSMENT 2019

**Based on
R/V Meen Sandhani surveys from 2016 to 2019**



**BANGLADESH MARINE FISHERIES CAPACITY BUILDING PROJECT
DEPARTMENT OF FISHERIES, MINISTRY OF FISHERIES AND LIVESTOCK**

Matshya Bhaban, Ramna, Dhaka

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The Authors, Contributors and Scientists

Executive Summary of Marine Fisheries Status for 2019

L. Paul Fanning

The Department of Fisheries, via the Bangladesh Marine Fisheries Capacity Building Project (BMFCBP), with assistance from FAO has completed the first round of stock assessments of marine fisheries resources in Bangladesh waters in over 20 years.

Data Sources

The findings are based on analysis of reported fisheries statistics from the annual Handbook of Statistics (1983 - 2017) together with survey data from both the *R/V Anushandhani* (1983 – 1999) and the *R/V Meen Sandhani* (2017 - 2018).

While some analyses were completed there are various issues with these data sets that severely limit the types of analyses, the specificity, and the confidence in the results. The most important stock assessment information, the catches and corresponding fishing effort had to be derived from the fisheries statistical data. Because of highly manual process to compile these statistics, the underlying raw data for the last 38 years were not available. The Statistical Handbook information was never intended for stock assessment purposes and is too aggregated to allow individual species analyses. Fortunately, in the past 6 years both industrial logbook reporting and the artisanal catch monitoring have been capturing much more detailed information on both species-wise catches and fishing effort. Unfortunately, these time series are still too short to provide reliable stock assessment advice but these data series will become much more valuable as the time series lengthens. With the information that is available Only 7 multispecies groups are identified in the statistics and there are also clear changes in reporting practices over time. Because of the inconsistent data series it cannot be determined when results of analyses reflect 'real' changes in stocks or merely changes in recording practices. The large but variable proportion of the catch that is reported as 'Other Fish' or 'Other shrimp' is a further source of uncertainty in any of these analyses.

The Sustainable Coastal and Marine Fisheries project has a mandate to address a national marine fisheries statistical system and, when implemented, this will provide a coherent, comprehensive and accurate record of fisheries catches and corresponding effort. This is urgently needed and will resolve such problems for future analysts. It will not however improve the historical information and so will require many years before the full value of the new system emerges.

The new research vessel *R/V Meen Sandhani* has been operational for 2 survey seasons now. This is not long enough to provide time series of biomass or abundance trends. It does however provide a thorough and detailed set of species identification, size distribution (length frequency) and biomass (length-weight) data. Since the size distribution is often considered a critical and sensitive indicator of stock status this was used to estimate population mortality for several species groups. The data from the *R/V Anushandhani* was used to some extent but suffers from both limited quality and quantity. Improved use of these data may be possible in future.

The *R/V Dr. Fridtjof Nansen* has completed a single echosounder survey in Bangladesh waters in 2018. This was specifically targeted towards small pelagic species, such as the Clupeids which make up the main catch of midwater trawlers.

Although survey analysis can provide biomass estimates it must be clearly understood that these are always relative estimates, intended to provide an index over time. Survey derived biomass estimates are widely expected to under-estimate actual biomass by unknown but consistent factors.

Stock Status

Two analyses were used where possible. Catch curve analysis of survey data provides a snapshot view with respect to two reference points. Biomass dynamics models provide an estimate of the stock abundance and trend over time using the time series of catch and effort data. More detailed results are provided in the figure and table at the end of this summary. Analyses using the industrial catch and effort are affected by the reporting regime which was significantly tightened in 2011. This resulted in apparent, but unrealistic, increases in total catches. This may mean that recent declines in catch rate are actually considerably worse than they appear.

There are mixed trends for the different finfish groups. The larger bodied and generally more valuable species groups are showing more indications of depletion and overfishing. The exceptions are species which are generally incidental catches, i.e. not directly targeted by fishermen.

The increasing catches of small pelagics, particularly sardines, are a matter of concern. The data series, available since 2011, is too short to make a quantitative assessment of this group but several observations are possible. The shift to midwater trawling should allow for reduced bycatch and better selection of the small pelagics however it does not appear to be the case. The increasing catches of shrimp by the midwater trawlers suggest that this gear is being deployed on bottom, negating the potential selectivity benefits. As it is, the mortality estimates for sardines suggest the group is being overexploited and is somewhat depleted.

The overall shrimp biomass trend has been consistently downward over the last 30 years and at present it is estimated to be somewhat depleted. During most of this period there is no information on the species mix in the shrimp catches but since 2005 the industrial catch is in 4 species groups. Over this 12 year period the catch rates for tiger shrimp (most valuable group) and brown shrimp have declined slowly but steadily. White shrimp catch rates were declining, increased sharply in 2013 and then have declined since. The 'Other shrimp' group is a mixture of the smaller and less valuable species. This group has shown a generally increasing catch rate trend. Thus, for the overall shrimp trend, the increasing trend in lower valued species is offsetting the declining trends in more valuable groups.

The overall conclusion is that the marine fisheries resources are heavily exploited with some species severely depleted and in urgent need of rebuilding. The most heavily over-exploited species groups include many of the larger and more valuable species such as Tiger shrimp, Indian salmon and large croakers.

Ecosystem Considerations

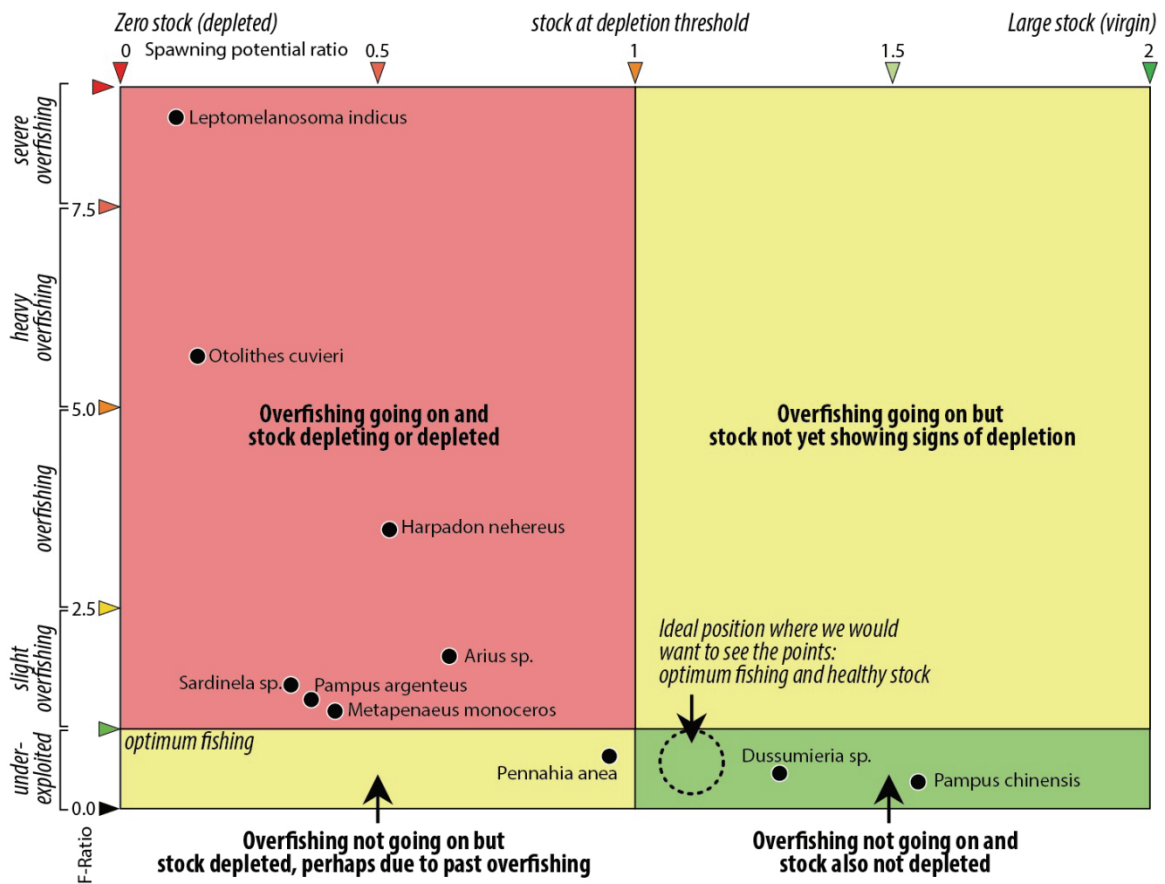
Overall catch, all species combined, may well maintain or increase in spite of intense fishing. This results from replacement of larger, slower growing and reproducing groups such as Indian salmon with small-sized, fast growing and reproducing species such as sardines and scads. Normally these small species are the forage base supporting larger

predatory species. Thus the increase in these small species reflects a significant alteration to the ecosystem structure which may or may not be reversible in a reasonable time period. The ability to rebuild the stocks of larger and more valuable species can be significantly impaired if such an ecosystem shift has become well established.

Management Recommendations

It is clear that the present management regime is permitting an excessive and increasing fishing effort in the marine fisheries. Efforts to stop fleet growth and to responsibly begin reducing total fleet size are urgently required. The management intervention and the resulting benefits are both going to require some years of consistent and effective control. More specific, targeted management measures will be required as well but this first step is the most pressing and will have the greatest long term impact. The exact scale of effort reduction is not known yet, but it is likely to be significant and can be refined in the medium term.

Summary plot of all species groups and scenarios considered in the 2019 stock assessment working group is shown below.



Results from length-converted catch curve analysis of survey data. Species were selected to represent the species groups identified in the fisheries statistical data. The higher the F ratio, the greater the fishing mortality. F ratio greater than 1.0 indicates degrees of over-fishing. The SPR ratio is an index of biomass with values less than 1.0 indicating degrees of depletion.

It is to be noted here that, standing biomass and MSY has not been used in this assessment to determine stocks' conditions and guide management decisions. This is because management attempts based on the over-simplified MSY approach have largely failed around the world. There is a new consensus view that what has sustained fisheries is less prescriptive, more process oriented and adaptive.

From these analyses, only three species (*Pampus chinensis*, *Dussumieria* sp., and *Pennahia anea*) are not presently being overfished, that is the estimated F ratio is below 1.0. All three of these can be considered incidental catch species with the primary target species being *Pampus argenteus*, *Sardinella* sp. and *Otolithes cuvieri* respectively. All three primary target species are overfished to some degree and depleted to some degree, quite severely in the case of *Otolithes cuvieri*. Indian salmon (*Leptomelanosoma indicum*) is one of the most valuable finfish species in Bangladesh and is severely overfished and depleted. Species in this condition are at significant risk of commercial extinction and may in fact be extirpated without specific management protection.

Table: Stock status summary for selected groups.

Group	Biomass dynamics (fisheries statistics)	Species	Catch curve (survey)	Stock status conclusion
Pomfrets	Data reporting seems inconsistent and likely to distort results over time however the severe downward trend since 2009 in the species combined model is likely indicative of real changes.	Silver pomfret <i>Pampus argenteus</i>	slightly overfished, significantly depleted	Pomfrets overall are declining in the catch and appear to be declining in biomass, particularly <i>P. argenteus</i> , appears depleted. The degree of overfishing is moderate. This group should be capable of a rapid recovery from modest reductions in fishing mortality.
		Chinese pomfret <i>Pampus chinensis</i>	not overfished, not depleted	
Croakers (Jewfish)	This group includes more than 10 species. The model indicated a near constant decline since about 2000. However the model fit was not satisfactory which may be a result of data reporting issues or some other cause.	Lesser tigertooth croaker <i>Otolithes cuvieri</i>	severely overfished, severely depleted	Croakers overall are in decline in the catch and appear to be declining in biomass. The degree of overfishing may be variable by species but appears to be severe in some cases. Larger, more valuable species may be severely depleted and recovery will require significant reductions in fishing mortality and may be quite slow.
		Donkey croaker <i>Pennahia area</i>	not overfished, not depleted	
Catfishes	This group includes more than 8 species. The model indicated a significant decline since about 2000. Data reporting issues may be affecting this model but the downward trend is unlikely to change.	Catfishes <i>Arius</i> sp.	overfished, significantly depleted	Catfish overall are in decline in the catch and are declining in biomass. The degree of overfishing may be variable by species but appears to be severe in some cases. Larger, more valuable species may be severely depleted and recovery will require significant reductions in fishing mortality and may be quite slow.
Indian salmon	No biomass dynamic model could be fitted for this species due to the limited catch data available.	Indian threadfin <i>Leptomelanosoma indicum</i>	severely overfished, severely depleted	One of the largest and most valuable finfish species, this stock is at significant risk of commercial extinction or extirpation. Strong efforts to reduce fishing effort affecting this species are required.

Group	Biomass dynamics (fisheries statistics)	Species	Catch curve (survey)	Stock status conclusion
Sardines	No biomass dynamic model could be fitted for this multispecies group due to the limited catch data available.	Rainbow sardines <i>Dussumieria sp.</i>	not overfished, not depleted	The intense fishery targeting sardines is focused on the sardinellas. The rainbow sardines are very lightly exploited, probably only as incidental catches. In addition to the depletion of the sardinellas, there is considerable concern about other bycatch species in this fishery.
		Sardinellas <i>Sardinella sp.</i>	slightly overfished, severely depleted	
Shrimp	This group includes more than 10 species. Since 2005 it has been separated to the species level for 3 species and an 'Other shrimp' group.	Total shrimp, mostly <i>Penaeidae</i>		The overall shrimp biomass trend has been consistently downward over the last 30 years and at present it is estimated to be somewhat depleted.
		Tiger shrimp <i>Penaeus monodon</i>	model fit not accepted	Trend appears to be a shift in species composition with higher valued species declining and lower valued 'Other' species offsetting the decline
		White shrimp <i>Fenneropenaeus indicus</i>	model fit not accepted	
		Brown shrimp <i>Metapenaeus monoceros</i>	slightly overfished, significantly depleted	Fitting catch curve models was difficult as shrimp do not have the same characteristics as fish.
		All other shrimp	no model fitted	

সামুদ্রিক মৎস্য সম্পদের অবস্থা ২০১৯-এর সারসংক্ষেপ

সাইদুর রহমান চৌধুরী

জাতিসংঘের খাদ্য ও কৃষি সংস্থা (FAO)-এর সহায়তায় বাংলাদেশ মেরিন ফিশারিজ ক্যাপাসিটি বিল্ডিং প্রকল্পের মাধ্যমে মৎস্য অধিদপ্তর বাংলাদেশ বিগত ২০ বছরের তথ্য-উপাত্তের ভিত্তিতে সামুদ্রিক মৎস্যসম্পদের মূল্যায়ন সম্পন্ন করেছে।

উপাত্তের উৎস

এই সারসংক্ষেপে উল্লিখিত ফলাফল তৈরীর জন্য মৎস্য অধিদপ্তরের বার্ষিক মৎস্য পরিসংখ্যানের (১৯৮৩-২০১৭) সারণীর তথ্যের সাথে *আর/ভি অনুসন্ধানী* (১৯৮৩-১৯৯৯) এবং *আর/ভি মীন সন্ধানী* (২০১৭-২০১৮) দ্বারা পরিচালিত গবেষণা জরিপের উপাত্ত একীভূত করে বিশ্লেষণ করা হয়েছে।

অতীতের উপাত্তের প্রকৃতি ও গুণগত মানের কারণে তথ্য প্রক্রিয়াকরণ, তথ্যের নির্ভরযোগ্যতা এবং ব্যবহারযোগ্য বৈশিষ্ট্য বিভিন্নভাবে বাধাগ্রস্ত হয়েছে বলে প্রয়োজনীয় সব ধরনের তথ্য বিদ্যমান উপাত্ত থেকে বিশ্লেষণ করা সম্ভব হয়নি; সীমিত আকারে সংশ্লিষ্ট তথ্য উপাত্ত বিশ্লেষণ করা হয়েছে। সবচেয়ে গুরুত্বপূর্ণ মজুদ অ্যাসেসমেন্ট বিষয়ক তথ্যাদি যেমন ধৃত মাছের পরিমাণ এবং মৎস্য আহরণে নিয়োজিত নৌযান ও জালের সংখ্যা বিষয়ক উপাত্ত অন্তর্ভুক্ত থাকে, সেসব তথ্যাদির ক্ষেত্রে প্রকাশিত মৎস্য পরিসংখ্যান হতে প্রাপ্ত সংখ্যার কোন বিকল্প নেই। অতীতে সাধারণভাবে যোগবিয়োগ করে অত্যন্ত শ্রমসাধ্য পদ্ধতিতে এসব তথ্য তৈরী করা হতো বলে মৌল উপাত্তগুলো ৩৮ বছরের সংকলনসমূহে পাওয়া যায়নি। পরিসংখ্যান গ্রন্থগুলো কখনোই স্টক অ্যাসেসমেন্ট করার উদ্দেশ্যে সংকলন করা হয়নি বিধায় প্রজাতি ভিত্তিক বিশ্লেষণ এর ওপর ভিত্তি করে করা সম্ভব নয়। তবে সুখের বিষয় ৬ বছর আগে চালু হওয়া ইন্ডাস্ট্রিয়াল ও আর্টিসানাল উভয় খাতের ধৃত মাছের তথ্য সংরক্ষণ ও প্রতিবেদনের নতুন পদ্ধতিতে আগের চেয়ে বিস্তারিত তথ্য প্রকাশের সুযোগ সৃষ্টি হয়েছে এবং এতে করে অনেক ক্ষেত্রে প্রজাতি ভিত্তিক উপাত্ত সন্নিবেশিত হয়েছে। অপরপক্ষে বাস্তবতার নিরীখে নির্ভরযোগ্য স্টক অ্যাসেসমেন্টের জন্য ৬ বছরের জন্য প্রাপ্ত বিস্তারিত উপাত্ত যথেষ্ট নয়, তবে সময়ের পরিক্রমায় এই উপাত্তমালা মূল্যবান হতে থাকবে। বর্তমানে সংগৃহীত উপাত্তসমূহ থেকে মাত্র ৭টি মৎস্য গ্রুপ চিহ্নিত করা সম্ভব হয়েছে এবং মধ্যবর্তী সময়ে প্রতিবেদন প্রণয়নের পদ্ধতিগত পরিবর্তনও সাধিত হয়েছে। উপাত্তমালায় বছরভেদে কিছু কিছু ভিন্নতার কারণে এই স্টক অ্যাসেসমেন্ট প্রচেষ্টায় পাওয়া ফলাফলকে প্রকৃত ফলাফল হিসাবে গ্রহণ করা যাবে বলে নিশ্চিত হওয়া যাচ্ছে না। *অন্যান্য মাছ* এবং *অন্যান্য চিংড়ি* হিসাবে পরিসংখ্যানে উল্লিখিত গ্রুপগুলিতে কোন বছরে কী কী মাছের/চিংড়ির প্রজাতি অন্তর্ভুক্ত রয়েছে তা স্পষ্ট নয় বিধায় ফলাফলে অধিকতর অনিশ্চয়তা বিরাজমান।

বিশ্ব ব্যাংক অর্থায়নের নতুন সাসটেনেবল কোস্টাল অ্যান্ড মেরিন ফিশারিজ প্রকল্পে জাতীয় সামুদ্রিক মৎস্য পরিসংখ্যান ব্যবস্থা উন্নত ও যথাযথ করার লক্ষ্য সন্নিবেশিত রয়েছে। যখন এই পরিসংখ্যান ব্যবস্থাটি কাঙ্ক্ষিত পর্যায়ে উন্নীত হবে তখনই সামুদ্রিক মৎস্য আহরণের সুসঙ্গত, ব্যাপক ও সঠিক উপাত্ত ও পরিসংখ্যান পাওয়া সম্ভব হবে। এই ধরনের উন্নত উপাত্ত সংগ্রহ পদ্ধতি ও সংরক্ষণ ব্যবস্থা অত্যন্ত জরুরী, যদিও এটি বাস্তবায়িত হলেও অতীতের উপাত্তসমূহের ত্রুটি দূর করার কোনই উপায় নেই, ফলে মৎস্য সম্পদের ভালো মানের তথ্য পাওয়ার জন্য আরও অপেক্ষা করতে হবে।

নতুন গবেষণা জাহাজ *আর/ভি মীন সন্ধানী* কেবলমাত্র দুই পূর্ণ বছর জরিপ সম্পন্ন করতে পেরেছে (২০১৭-১৮, ২০১৮-১৯), কারণ ২০১৬-১৭ বর্ষে আংশিক জরিপ হয়েছে। মাত্র এই কয়টি জরিপে সংগৃহীত উপাত্ত মাছের মজুদ ও প্রাচুর্যতায় কী পরিবর্তন ঘটছে তা জানার জন্য যথেষ্ট নয়। তবে এই উপাত্ত বিভিন্ন প্রজাতির মাছের পরিচিতি, তাদের ভৌগোলিক ও গভীরতা ভেদে অবস্থান, দৈর্ঘ্য ও ওজন ভিত্তিক বন্টন ইত্যাদি বিষয়ে বিস্তারিতভাবে জানার সুযোগ করে দিয়েছে। মৎস্যবিজ্ঞানে একটি মাছের মজুদের অবস্থা জানার জন্য তার দৈর্ঘ্য (আকার) ভিত্তিক বন্টন একটি অপরিহার্য ও সংবেদনশীল সূচক হিসাবে ব্যবহৃত হয়ে থাকে। তাই আকার বন্টনের এই উপাত্ত থেকে কতিপয় মাছের গ্রুপের পপুলেশন মর্টালিটি (মৃত্যুহার) নির্ধারণ করা হয়েছে। অতীতের *আর/ভি অনুসন্ধানী* জাহাজের উপাত্তও কোন কোন ক্ষেত্রে ব্যবহার করা হয়েছে, তবে এ সকল উপাত্তের পরিমাণ ও গুণগত মান অত্যন্ত সীমিত। ভবিষ্যতে এই পুরনো উপাত্তের আরো ভালো ব্যবহার পদ্ধতি বের করতে পারার সম্ভাবনা আছে।

সম্প্রতি (আগস্ট ২০১৮) *আর/ভি ড. ফ্রিটজফ ন্যানসেন* জরিপ ও গবেষণা জাহাজ বাংলাদেশের সমুদ্রাঞ্চলে একটি ইকো-সাইন্ডার (অ্যাকুস্টিক) পদ্ধতিতে জরিপ সম্পন্ন করেছে। এই জরিপের প্রধান ঈঙ্গিত লক্ষ্য ছিলো ছোট আকারের পেলাজিক মাছ, যেমন মিড-ওয়াটার ট্রলসমূহের মাধ্যমে প্রধান আহরণকারী ক্লুপিড গোত্রের মাছের মজুদ নিরূপনের চেষ্টা করা।

যদিও জরিপের উপাত্ত প্রক্রিয়াকরণ শেষে এক ধরনের মজুদের ধারণা পাওয়া সম্ভব, কিন্তু এক্ষেত্রে অবশ্যই স্মরণে রাখতে হবে যে এ জাতীয় ধারণা সব সময়ই আপেক্ষিক হয়ে থাকে, যাতে করে বিভিন্ন বছরে মজুদের ওঠানামা পর্যবেক্ষণ করা সম্ভব হয়। সাধারণত ধরে নেয়া হয় যে, জরিপ থেকে পাওয়া মজুদের প্রাক্কলন প্রকৃত মজুদের চাইতে কম হয়ে থাকে, কিন্তু কতটা কম তা সাধারণত অজানাই থেকে যায়।

মজুদের অবস্থা

বর্তমান মজুদ নিরূপন প্রচেষ্টার অংশ হিসেবে পরিস্থিতি ভেদে দুই ধরনের উপাত্ত বিশ্লেষণ প্রক্রিয়া অনুসরণ করা হয়েছে। দুটি রেফারেন্স অবস্থার বিপরীতে মজুদের অবস্থা জানার চেষ্টা করা হয়েছে আহরণ মাত্রা বিশ্লেষণের মাধ্যমে। পরিমাণগত তারতম্য বিশ্লেষণের গাণিতিক মডেল থেকে মজুদের একটি সম্ভাব্য হিসাব পাওয়া গেছে এবং বছর থেকে বছরে আহরণ ও আহরণমাত্রার তারতম্যের বিশ্লেষণ থেকে মজুদের গতি-প্রকৃতির আভাস পাওয়া গেছে। এই সারাংশের শেষাংশে যুক্ত চিত্র ও সারণীতে বিস্তারিত বিবরণ লিপিবদ্ধ করা হয়েছে। অতীতে ইন্ডাস্ট্রিয়াল খাতে ধৃত মাছের প্রতিবেদনের অপূর্ণতা উপাত্ত বিশ্লেষণকে সমস্যাসংকুল করেছে, যা ২০১১ সালের পরে অনেকটাই নিয়ন্ত্রিত হয়ে এসেছে। এই সমস্যার কারণে ২০১১ সাল থেকে ধৃত মাছের পরিমাণে অবাস্তব বৃদ্ধি পরিলক্ষিত হয়। এর মর্মার্থ হলো, ধৃত মাছের পরিমাণ হ্রাসের যে চিত্র এই বিশ্লেষণে ফুটে উঠেছে, বাস্তব পরিস্থিতি তার চেয়েও খারাপ হওয়ার সম্ভাবনা রয়েছে।

বিভিন্ন প্রকার মাছের মজুদ ও আহরণের হার ভিন্ন ভিন্ন প্রবণতা প্রদর্শন করেছে। বৃহদাকার ও অধিক মূল্যবান মাছের গ্রুপসমূহ প্রায় নিঃশেষিত হবার পথে। উপজাত হিসাবে ধরা হয় এমন কিছু মাছের ক্ষেত্রে অবশ্য ব্যতিক্রমী প্রবণতা লক্ষণীয়।

ক্ষুদ্রাকার উপরিস্তরের মাছ, বিশেষত সার্ভিন/চাপিলার আহরণ বেড়ে যাওয়া দুর্শ্চিত্তার বিষয়। ২০১১ সাল থেকে এই গ্রুপটির ওপর উপাত্ত সংগ্রহ ও সংরক্ষণ শুরু করা হয়। তবে এত স্বল্প মেয়াদী উপাত্ত থেকে এদের প্রকৃত মূল্যায়ন করা কঠিন হলেও কিছু পর্যবেক্ষণ তৈরী করা সম্ভব হয়েছে। বটম ট্রলকে পর্যায়ক্রমে মিড-ওয়াটার ট্রলে রূপান্তরের বাধ্যবাধকতা বাস্তবায়ন শুরু হলেও প্রকৃত চিত্র পাওয়া যায় ভিন্নতর। এই রূপান্তরের উদ্দেশ্য ছিলো ছোট আকারের সার্ভিন/চাপিলা জাতীয় মাছের ক্রমবর্ধমান মজুদকে আহরণ করা। বাস্তবে যখন দেখা যায় যে, মিডওয়াটার ট্রলে চিংড়িও ধরা পড়ছে, তখন এই উপসংহারেই উপনীত হতে হয় যে, মিডওয়াটার ট্রলগুলো বস্তুত কম গভীরতায় বটম ট্রল হিসাবেই ব্যবহৃত হচ্ছে। এতে কাজিত সুফল পাওয়া যাচ্ছে না। অবশ্য, সার্ভিন/চাপিলাও এখন অতি-আহরিত হচ্ছে এবং তাদের মজুদ হ্রাস পেতে শুরু করেছে।

বিশ্লেষণে দেখা যায়, বিগত ৩০ বছর ধরে সকল প্রকার চিংড়ির মজুদ ধারাবাহিকভাবে ক্রমহ্রাসমান প্রবণতা প্রদর্শন করেছে, এবং বর্তমানে এদের মজুদ কিছুটা নিঃশেষিত পর্যায়ে আছে। এই দীর্ঘ সময়ের উপাত্তে চিংড়ি হিসাবে প্রদর্শিত পরিসংখ্যানে কী কী চিংড়ি অন্তর্ভুক্ত তা জানা যায় নি, তবে ২০০৫ সাল থেকে ইন্ডাস্ট্রিয়াল ট্রলারের উপাত্তে ৪টি গ্রুপের অন্তর্ভুক্তি দেখা যায়। এই ১২ বছর সময়ের উপাত্ত বিশ্লেষণ করে দেখা যায়, সবচেয়ে মূল্যবান বাগদা চিংড়ি ও হরিণা চিংড়ির মজুদ ক্রমাগত হ্রাস পেয়েছে। সাদা চিংড়ির মজুদও ক্রমাগত হ্রাস পেয়ে হঠাৎ ২০১৩ সালে বৃদ্ধি পায়, কিন্তু এরপর আবার হ্রাস পেতে থাকে। অন্যান্য চিংড়ি হিসাবে বিবৃত গ্রুপটিতে মূলত কম মূল্যমানের ও ক্ষুদ্রাকার চিংড়িগুলোকেই ধরা হয়েছে। এই চিংড়িগুলোর আহরণের পরিমাণ বেড়েছে। মোটা দাগে, মূল্যবান চিংড়ির আহরণ কমে গেলেও কম মূল্যবান চিংড়িগুলোর আহরণ বৃদ্ধি পরিস্থিতিকে কিছুটা সামাল দিয়েছে।

উপসংহারে এ কথা বলা যায় যে, সামুদ্রিক মৎস্যসম্পদ মারাত্মকভাবে অতি-আহরিত হয়েছে এবং হচ্ছে। ফলে কিছু প্রজাতির মাছের মজুদ মারাত্মক ভাবে হ্রাস পেয়েছে, এদের মজুদ পূর্বাবস্থায় ফিরিয়ে আনা জরুরী। সবচেয়ে বেশি আহরিত প্রজাতিগুলোর মধ্যে আছে বৃহদাকার ও দামী মাছগুলোই; যেমন: বাগদা চিংড়ি, লাফা মাছ ও বড় বড় পোয়া মাছ।

ইকোসিস্টেম বিষয়ক বিবেচনা

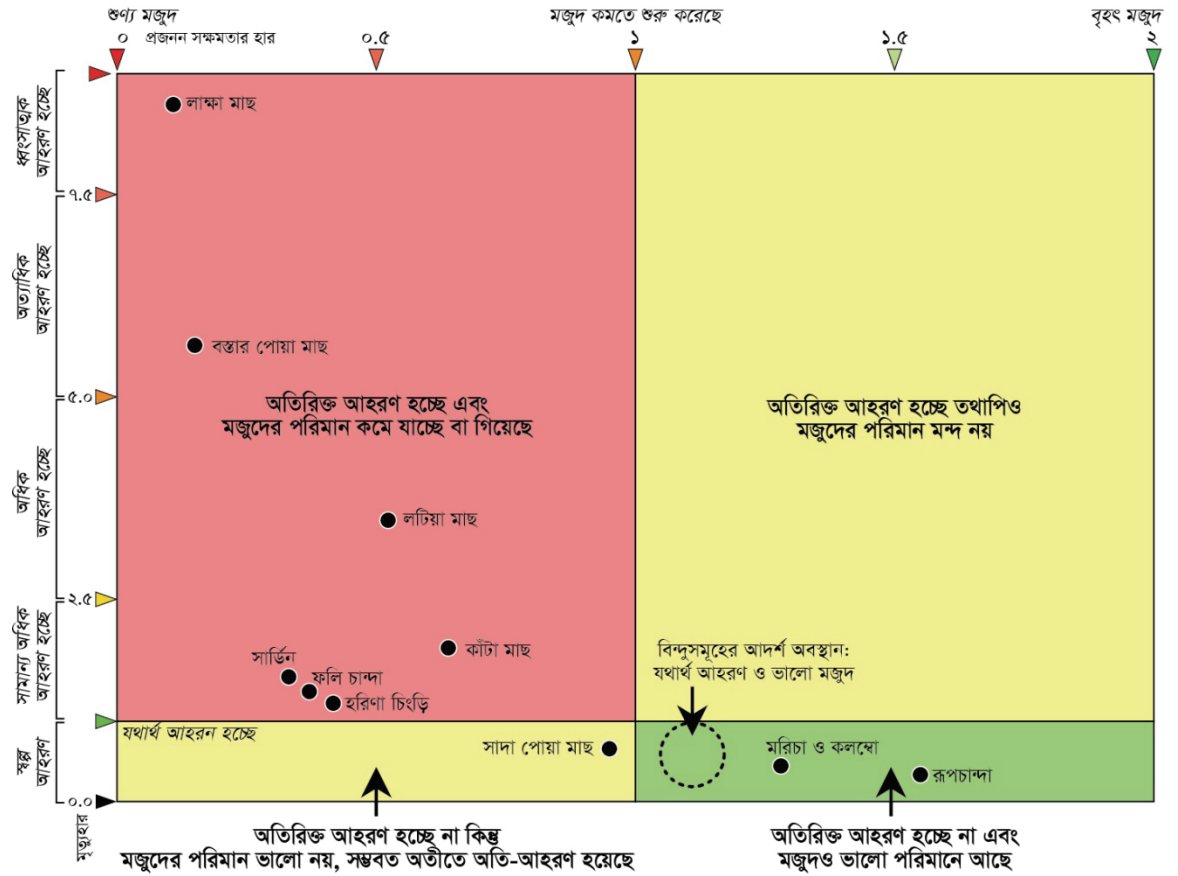
সমুদ্র থেকে প্রজাতি নির্বিশেষে মোট আহরিত মৎস্যের পরিমাণ অতি-আহরণ করেও সার্বিক অবস্থা বজায় রাখা, এমনকি বাড়ানোও সম্ভব। এটি ঘটে যখন ধীরে বর্ধনশীল ও ধীরে প্রজননশীল বৃহদাকার মাছগুলোর (যেমন: লাফা) স্থান দখল করে ফেলে ক্ষুদ্রাকার, দ্রুত প্রজননশীল ও দ্রুত বর্ধনশীল মাছেরা (যেমন: সার্ভিন)। সাধারণত এই সকল ছোট মাছগুলিই সামুদ্রিক পরিবেশে বড় মাছের খাদ্য হিসাবে ব্যবহৃত হয়। ফলে এই সব ছোট মাছের ক্রমাগত মজুদ বৃদ্ধি সামুদ্রিক

পরিবেশতন্ত্রে বড় ধরনের পরিবর্তনের ইঙ্গিত বহন করে, যা স্বল্প সময়ে পূর্বাভাস্য ফিরিয়ে আনা সম্ভব হতেও পারে, না-ও হতে পারে। সামুদ্রিক পরিবেশতন্ত্রের এই ধরনের পরিবর্তন স্থায়ী রূপ পরিগ্রহ করলে বড় ও দামী মাছের মজুদ বৃদ্ধির প্রক্রিয়া মারাত্মকভাবে বাধাগ্রস্ত হবে।

ব্যবস্থাপনার সুপারিশমালা

এটি পরিষ্কার যে বর্তমান মৎস্য ব্যবস্থাপনা পদ্ধতি অতিরিক্ত ও ক্রমবর্ধমান হারে সামুদ্রিক মৎস্য আহরণের অনুকূল পরিবেশ বজায় রেখে চলেছে। নৌযানের সংখ্যা বৃদ্ধি রহিত করা এবং এদের সংখ্যা কমিয়ে আনা জরুরী ভিত্তিতে প্রয়োজন। ব্যবস্থাপনা কৌশল প্রয়োগ এবং তার সুফল পরিলক্ষিত হওয়ার জন্য বেশ কিছু বছর ধরে ধারাবাহিকতা ও কার্যকারিতা অব্যাহত রাখা প্রয়োজন। সুফল পাওয়ার জন্য সুনির্দিষ্ট ও লক্ষ্যভেদি ব্যবস্থাসমূহ গ্রহন করা করা প্রয়োজন, কিন্তু ব্যবস্থাপনার প্রথম ধাপটি হবে সবচেয়ে কঠোর এবং এর সুফলও হবে দীর্ঘমেয়াদি। ঠিক কত পরিমাণে নৌযানের সংখ্যা কমিয়ে আনতে হবে তা এখনই নিশ্চিত করে বলা সম্ভব নয়, তবে সংখ্যাটি একেবারে নগণ্য হলেও আশাপ্রদ ফল পাওয়া যাবে না, তবে মধ্য মেয়াদে এই নৌযান হ্রাসের পরিমাণকে পুনঃনির্ণয় করা যেতে পারে।

২০১৯ সালের মজুদ মূল্যায়ন ওয়ার্কিং গ্রুপ কর্তৃক গৃহিত বৈজ্ঞানিক সিদ্ধান্তের আলোকে কয়েকটি মাছের মজুদের অবস্থা নিচের চিত্রে দেখানো হলো।



মৎস্যসম্পদের কতিপয় নির্বাচিত গ্রুপের স্টকের অবস্থার সারাংশ চিত্র: চিত্রের উল্লম্ব অক্ষে (বামে) আহরণের কারণে মাছের মৃত্যুর হার, এবং অনুভূমিক অক্ষে (উপরে) মজুদের পরিমাণের একটি সূচক দেখানো হয়েছে। এই চিত্রে চারটি খণ্ডাংশ আছে, ডান দিকের সবুজ খণ্ডাংশে অবস্থিত বৃত্তটির ভিতর মাছের অবস্থান হলে সবচেয়ে ভালো অবস্থা বিরাজমান বলে ধরে নেয়া যায়। বাম পাশের লাল খণ্ডে অবস্থিত মাছগুলো অতিরিক্ত আহরণিত হচ্ছে এবং নিঃশেষ হবার পথে আছে।

এ পর্যায়ে উল্লেখ্য যে, চলমান অ্যাসেসমেন্ট প্রক্রিয়ায় মাছের মজুদ নিরূপন ও ব্যবস্থাপনা নির্দেশক হিসাবে স্ট্যাভিং বায়োমাস এবং সর্বোচ্চ আহরণমাত্রা (এম.এস.ওয়াই) ব্যবহার করা হয়নি, কারণ অতি-সরলীকৃত এইসব সূচক ব্যবহার করে মৎস্য সম্পদের ব্যবস্থাপনা বিশ্ব জুড়ে অধিকাংশ ক্ষেত্রে ব্যর্থ হয়েছে। আধুনিক সামুদ্রিক মৎস্য ব্যবস্থাপনায় এ ধরনের ব্যবস্থাপত্র প্রয়োগের পরিবর্তে *প্রক্রিয়া ভিত্তিক* এবং *পরিবর্তিত পরিস্থিতিতে অভিযোজনে সক্ষম* ব্যবস্থাপনা প্রয়োগের কৌশল গৃহীত হচ্ছে।

বিশ্লেষণে প্রতিয়মান হয় যে, মাত্র তিন ধরনের মাছ, যথা রূপচান্দা, কলম্বো/মরিচা এবং পেনাহিয়া এনিয়া (সাদা পোয়া মাছ) এর মজুদ অতিরিক্ত আহরিত হচ্ছে না, অর্থাৎ প্রাক্কলিত এফ-রেসিও ১.০ এর কম। এই তিনটি মাছের প্রতিটিকেই প্রকৃতপক্ষে অন্য মাছের সাথে ঘটনাক্রমে ধরা পড়া মাছ হিসাবে বিবেচনা করা যেতে পারে। যে ঈঙ্গিত মাছগুলোকে ধরার উদ্দেশ্যে ফিশিং করা হয় সেগুলো হলো ফলি চান্দা, সার্ডিন/চাপিলা এবং আরেক প্রজাতির পোয়া মাছ বস্তার পোয়া। এই তিনটি ঈঙ্গিত মাছের সব কটির মজুদই কিছুটা অতিরিক্ত আহরিত হচ্ছে, এবং কিছুটা নিঃশেষিত হয়ে যাবার পথে, বিশেষ করে বস্তার পোয়া মাছটি মারাত্মকভাবে অতিরিক্ত আহরিত হয়েছে। লাক্ষা মাছ বাংলাদেশের অন্যতম প্রধান অর্থকরী ও মূল্যবান মাছ এবং এই মাছটি অতিরিক্ত আহরিত হয়ে প্রায় নিঃশেষ হয়ে গিয়েছে। এরকম অবস্থায় যে কোন মাছ বাণিজ্যিকভাবে বিলুপ্ত হয়ে যাবার প্রবল ঝুঁকি থাকে এবং সুরক্ষার ব্যবস্থা করা না হলে সম্পূর্ণভাবে বিলুপ্ত হয়ে যাবার সম্ভাবনা থাকে।

সারণী: মৎস্য সম্পদের নির্বাচিত কতিপয় গ্রুপের স্থলের অবস্থার সারাংশ

মাছের গ্রুপ	মজুদের অবস্থা (মৎস্য পরিসংখ্যান থেকে)	প্রজাতি	মৎস্য আহরণের অবস্থা (জরিপ থেকে)	মজুদের অবস্থা বিষয়ক উপসংহার
চান্দা	অতীত উপাত্ত প্রতিবেদন অসামঞ্জস্যপূর্ণ ছিলো বিধায় ফলাফলের বিচ্ছিন্নতা প্রত্যাশিত। তথাপিও ২০০৯ সাল থেকে এর প্রাচুর্য্য মারাত্মক কমে যাবার বিষয়টি প্রকৃত অবস্থারই প্রতিফলন বলে ধরে নেয়া যায়।	ফলি চান্দা <i>Pampus argenteus</i> রূপচান্দা <i>Pampus chinensis</i>	কিছুটা অতিরিক্ত আহরিত, যথেষ্ট পরিমানে নিঃশেষিত অতিরিক্ত আহরিত নয়, নিঃশেষিতও নয়	চান্দাসমূহের আহরণ হার এবং মজুদ উভয়ই কমতির দিকে, বিশেষত ফলি চান্দা প্রায় নিঃশেষিত বলে প্রতীয়মান হয়। মাঝারি ধরনের অতিরিক্ত আহরণ বিরাজমান। আহরণের হার কিছুটা কমিয়ে আনা গেলে এই মাছগুলি দ্রুতই আগের অবস্থায় ফিরতে পারবে।
পোয়া	এই গ্রুপে ১০ প্রজাতির মাছ আছে। গাণিতিক বিশ্লেষণ থেকে প্রতীয়মান হয় যে, আনুমানিক ২০০০ সাল থেকে এর মজুদ ধারাবাহিকভাবে নিম্নগামী, যদিও এই গাণিতিক বিশ্লেষণ উপাত্তের গুণগত মানের কারণে সম্পূর্ণ প্রশ্নাতীত নয়।	বস্তার পোয়া <i>Otolithes cuvieri</i> সাদা পোয়া <i>Pennahia anea</i>	মারাত্মকভাবে অতিরিক্ত আহরিত, মারাত্মক পরিমানে নিঃশেষিত অতিরিক্ত আহরিত নয়, নিঃশেষিতও নয়	পোয়া মাছসমূহের আহরণ হার এবং মজুদ উভয়ই কমতির দিকে। অতিরিক্ত আহরণের ধরন ও হার প্রজাতি ভেদে ভিন্ন ভিন্ন, তবে কিছু প্রজাতির ক্ষেত্রে মারাত্মক অতিরিক্ত আহরণ পরিলক্ষিত হয়েছে। বড় আকারের ও অর্থকরী প্রজাতিগুলোর মজুদ মারাত্মকভাবে হ্রাস পেয়েছে, এবং মজুদের পরিমাণ স্বাভাবিক অবস্থায় ফিরিয়ে আনতে বড় ধরনের আহরণ হ্রাস ঘটাতে হবে এবং এতে যথেষ্ট সময় লাগবে।
কাঁটা	এই গ্রুপে ৮ এর অধিক প্রজাতির মাছ আছে। গাণিতিক বিশ্লেষণ থেকে প্রতীয়মান হয় যে, আনুমানিক ২০০০ সাল থেকে এর মজুদ ধারাবাহিকভাবে নিম্নগামী। উপাত্তের গুণগত মানের কারণে এই বিশ্লেষণে ক্রটি থাকতে পারে, যদিও নিম্নগামী প্রবণতায় তুল হবার সম্ভবনা নেই।	কাঁটা মাছ <i>Arius sp.</i>	অতিরিক্ত আহরিত, যথেষ্ট পরিমানে নিঃশেষিত	কাঁটা মাছসমূহের আহরণ হার এবং মজুদ উভয়ই কমতির দিকে। অতিরিক্ত আহরণের ধরন ও হার প্রজাতি ভেদে সম্ভবত ভিন্ন ভিন্ন, যদিও কিছু প্রজাতির ক্ষেত্রে তা মারাত্মক। বড় আকারের ও অর্থকরী প্রজাতিগুলোর মজুদ মারাত্মকভাবে হ্রাস পেয়েছে, এবং মজুদের পরিমাণ স্বাভাবিক অবস্থায় ফিরিয়ে আনতে বড় ধরনের আহরণ হ্রাস ঘটাতে হবে এবং এতে যথেষ্ট সময় লাগবে।

মাছের গ্রুপ	মজুদের অবস্থা (মৎস্য পরিসংখ্যান থেকে)	প্রজাতি	মৎস্য আহরণের অবস্থা (জরিপ থেকে)	মজুদের অবস্থা বিষয়ক উপসংহার
লাক্ষা	অপর্যাপ্ত আহরণের উপাত্তের কারণে মাছটির জন্য মজুদের গাণিতিক বিশ্লেষণ সম্পন্ন করা যায় নি।	লাক্ষা <i>Leptomelanosoma indicum</i>	মারাত্মকভাবে অতিরিক্ত আহরিত, মারাত্মকভাবে নিঃশেষিত	লাক্ষা হচ্ছে অন্যতম বড় ও অর্থকরী মাছগুলোর একটি, এর মজুদ বাণিজ্যিক বিলুপ্তি বা সম্পূর্ণ বিলুপ্তির দাবিপত্র। একে রক্ষা করার জন্য কঠোর ব্যবস্থা গ্রহণ করা জরুরী।
সার্ডিন	অপর্যাপ্ত আহরণের উপাত্তের কারণে এই গ্রুপের মাছগুলির জন্য মজুদের গাণিতিক বিশ্লেষণ সম্পন্ন করা যায় নি।	মরিচা ও কলম্বো <i>Dussumieria sp.</i> সার্ডিন/চাপিলা <i>Sardinella sp.</i>	অতিরিক্ত আহরিত নয়, নিঃশেষিতও নয় সামান্য অতিরিক্ত আহরিত, মারাত্মকভাবে নিঃশেষিত	এই গ্রুপের আহরণ প্রধানত চাপিলা/সার্ডিন কে ঘিরে। রেইনবো সার্ডিন মাছটি খুব কম পরিমাণেই আহরিত হচ্ছে, সম্ভবত শুধুমাত্র উপজাত হিসাবে। সার্ডিনসমূহের নিঃশেষ হয়ে যাওয়া ছাড়াও এর উপজাত হিসাবে ধৃত মাছগুলি নিয়ন্ত্রণেও যথেষ্ট শংকার কারণ আছে।
চিংড়ি	এই গ্রুপে ১০ এর অধিক প্রজাতির চিংড়ি আছে। ২০০৫ সাল থেকে এর উপাত্ত সংগ্রহের পদ্ধতিতে পরিবর্তন আনা হয় - ৩টি প্রজাতি তিন্স তিম্ন এবং অন্য সকল প্রজাটিকে 'অন্যান্য চিংড়ি' হিসাবে তথ্য সংরক্ষণ শুরু হয়।	মোট চিংড়ি, প্রধানত পিনীতে গোত্রের বাগদা চিংড়ি <i>Penaeus monodon</i> চাকা ইচা/সাদা চিংড়ি <i>Fenneropenaeus indicus</i> হরিণা চিংড়ি <i>Metapenaeus monoceros</i> অন্যান্য চিংড়ি	- দুর্বল উপাত্তের কারণে গাণিতিক মডেল প্রয়োগ করা যায় নি দুর্বল উপাত্তের কারণে গাণিতিক মডেল প্রয়োগ করা যায় নি কিছুটা অতিরিক্ত আহরিত, যথেষ্ট পরিমাণে নিঃশেষিত গাণিতিক মডেল প্রয়োগ করা হয় নি	চিংড়ির মোট মজুদের গতি ৩০ বছর ধরেই নিম্নগামী, বর্তমানে এদের মজুদ কিছুটা নিঃশেষিত পর্যায়ে রয়েছে। ধৃত চিংড়ির প্রজাতি বিশ্লেষণে দেখা যায় বেশি দামী চিংড়ির পরিমাণ হ্রাস পেয়েছে, তাদের স্থান দখল করেছে কম দামী চিংড়ি। চিংড়ির ক্ষেত্রে ঈপ্সিত গাণিতিক মডেল তৈরী করা যায়নি, কারণ মাছের জীবনের ক্ষেত্রে প্রযোজ্য অনেক কিছুই চিংড়ির জন্য প্রযোজ্য নয়।

Introduction

With the settlement of maritime border disputes with neighbouring Myanmar and India in 2012 and 2014 respectively, a new era has begun in marine resources planning and management in Bangladesh. Political will at the highest level of the Government to develop the country's economy based on marine resources, dubbed Blue Economy, has generated thrust in all marine sectors including marine fisheries.

After a long pause since 1999, marine fisheries research survey in the Bay of Bengal has started with the newly acquired *R/V Meen Sandhani* in 2016. Since then the research vessel has carried out shrimp and demersal fish surveys over the shelf sea of Bangladesh in three survey seasons – 2016-17, 2017-18 and 2018-19. These surveys generated highly accurate distribution, relative abundance and biological data on most available fish, shrimp, crab and cephalopod species. So far 344 species of fishes including sharks, rays & skates; 45 species of shrimps, crabs & lobsters; 14 species of cephalopods (squids, cuttle fishes & octopuses) have been captured & identified up to species level. Additionally, 50 fish specimens have been identified up to genus level, making the total up to 457 varieties.

Shrimp and Demersal surveys in the first survey seasons were incomplete due to various technical reasons and time lost in multiple training cruises. In the subsequent survey seasons (i.e., 2017-18 and 2018-19) both Shrimp and Demersal surveys were completed according to design. Data collected during these 6 surveys becomes an invaluable component of marine fisheries assessment. However, research survey alone cannot provide all necessary data and information for fisheries assessment and management directives. Therefore, historical data from *R/V Anusandhani* surveys and commercial catch & effort data from industrial trawlers and artisanal fish landing centers were analysed along with *R/V Meen Sandhani* survey data.

This report presents an executive summary based on results of data analyses and synthesis of Stock Status Reports (SSRs) of seven selected groups of commercially important fish & shrimp. It also contains Survey Annual Reports (SARs) of all 6 surveys completed so far. Some analyses and results contained in this report are on *ad hoc* basis. They will change over the course of time as more and more values are extracted from historical data and current survey & catch-effort data time series gets longer. Some results may also change as the analytical framework gets improved over time.

Methodology

This section provides a very brief overview of the methods of fisheries survey in the Bay of Bengal by *R/V Meen Sandhani*, and stock assessment procedures from fisheries dependent and fisheries independent research survey data.

Overview

The Survey Design Working Group (SDWG) which is formed by order of the MoFL meets at least once a year to plan the next survey season which is identical to the fiscal year and creates design of shrimp and demersal surveys to be carried out by *R/V Meen Sandhani*. The SDWG also provided inputs to the design of the *R/V Dr. Fridtjof Nansen* acoustic survey in Bangladesh waters in August 2018. For 2017-18 and 2018-19 seasons Pelagic Surveys were designed, but the execution of these surveys are still in experimental stage. A *survey program (SP)* document is created for each survey during the SDWG meeting. The *Survey Manual (SM)*, developed and maintained by the Survey Management Unit (SMU), is used in conjunction with the SP to guide surveys. SM lays out the scientific principles of survey methods, general standing order & procedures, while an SP lays out objectives of the survey, number and tentative schedule of cruises, participating scientists in each cruise, sampling stations, and other rules and highlights of methods to be followed during the survey. The following figure shows the overall workflow of activities from survey design to management recommendations.

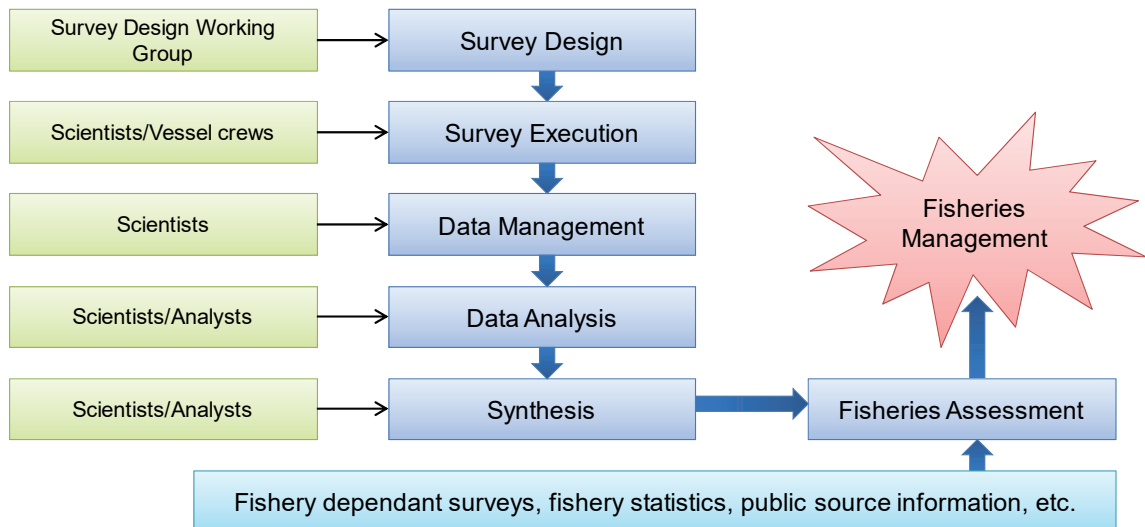


Figure: Survey design to fisheries management workflow

Fishery independent research surveys provide highly accurate distribution, relative abundance and biological data, but they do not provide any information on the existing fishery and catch & effort data. Therefore, accurate stock assessment and management directives must be based on data and information derived from both research survey and fishery dependant surveys. Fishery statistics and public source information are also necessary to resolve many parameters used in these processes. The following figure shows a more elaborate form of fishery information and decision support system.

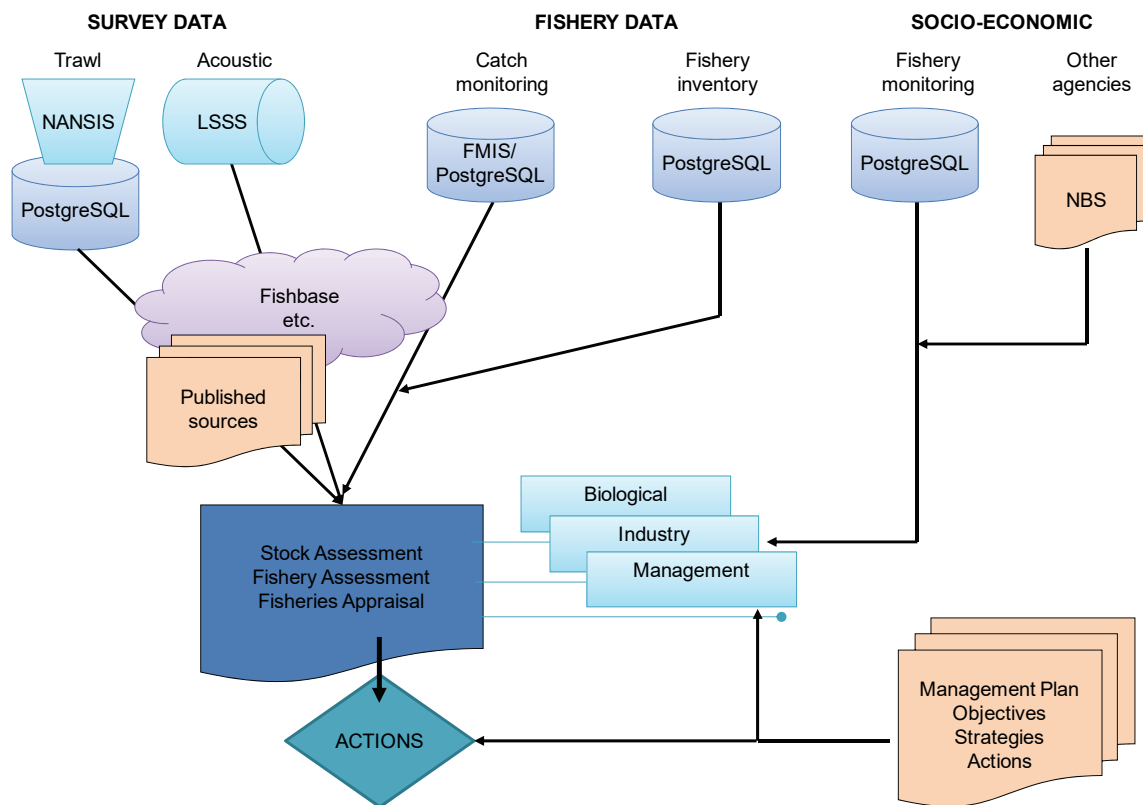


Figure: Fisheries Information and decision support system

Summary of surveys

In 3 survey seasons (2016-2019) *R/V Meen Sandhani* has so far carried out 13 surveys which include 3 shrimp and 3 demersal surveys, 2 experimental pelagic surveys and 5 equipment testing and/or training surveys. The table below provides other information on those surveys.

Survey #	Type	Description	Note
2016201	Training	Survey Training cruise no 1 & 2	
2016202	Shrimp	Shrimp survey 2016	Season 2016-17
2017200	Training	Pre-demersal training	Training with new skipper and gear
2017201	Demersal	Demersal survey 2017	Season 2016-17
2017203	Training	Sighting trial/training cruise	
2017204	Shrimp	Shrimp survey 2017	Season 2017-18
2018201	Demersal	Demersal survey 2018	Season 2017-18
2018202	Training	Pelagic Training/Equip. Testing	Net sonar, echo sounder testing
2018203	Pelagic	Pelagic survey	Season 2017-18
2018204	Training	Pelagic Training/Sonar Testing	SIMRAD SX90 testing
2018205	Shrimp	Shrimp Survey 2018	Season 2018-19
2018206	Pelagic	Pelagic Survey 2018	Season 2018-19
2019201	Demersal	Demersal Survey 2019	Season 2018-19

Each survey is given a 7-digit number in such a way that first 4 digits indicate the calendar year the survey is actually being carried out, 5th digit indicates the survey vessel, in this case it is always 2 for R/V Meen Sandhani, and the last 2 digits is a sequential number restarting from 01 each survey season. Thus the first survey of the season 2016-17 becomes 2016201, for example.

Survey design

For the shrimp surveys the shelf sea of Bangladesh between 10 meter and 100 meter depth has been divided into 3 depth zones, namely inshore, midshore, and offshore. Each of these depth zones is again divided into existing named fishing grounds, namely swatch of no-ground, middle ground, and south patches. Thus this area is divided into 9 sampling strata. For the demersal survey an additional stratum from 100m to 200m depth has been considered. Water below 10 meter depth was considered too shallow and hazardous for the vessel and/or survey operation. Additionally the total survey area between 10 and 200m is divided into 3x3-nautical-mile squares, the *sampling quadrates*. Each of these quadrates is a potential trawl sampling location.

Considering the time budget for each survey, *i.e.*, 24 working days in 3 cruises, SDWG decided to sample 80 quadrates by trawl nets in each of shrimp and demersal surveys. It was also decided to assign lesser (40%) sampling weight to the deepest strata based on *a-priori* knowledge on fish abundance and other assumptions. A number of sampling quadrates, generally called *stations*, are selected randomly from each strata corresponding to the area of the stratum and sampling weight in a manner that the total number of stations remain 80. These are called *primary stations*. A number of additional randomly selected stations are also taken, to be called *alternate stations*; in case a primary station can not be sampled for unavoidable reasons, a nearby alternate station would be sampled instead within the same stratum.

The following table and the map show other details of the sampling strata.

Stratum#	Ground	Depth zone	Depth (m)		Area (km ²)	Target survey
			Min	Max		
10201	Swatch	Inshore	10	40	1,814	Both
10202	Middle				2,681	
10203	South				6,833	
10204	Swatch	Midshore	40	80	1,350	
10205	Middle				3,180	
10206	South				3,978	
10207	Swatch	Offshore	80	100	2,522	
10208	Middle				6,083	
10209	South				2,025	
10210	All	Deep offshore	100	200	11,376	
Shrimp survey total area					30,465	
Demersal survey total area					41,842	

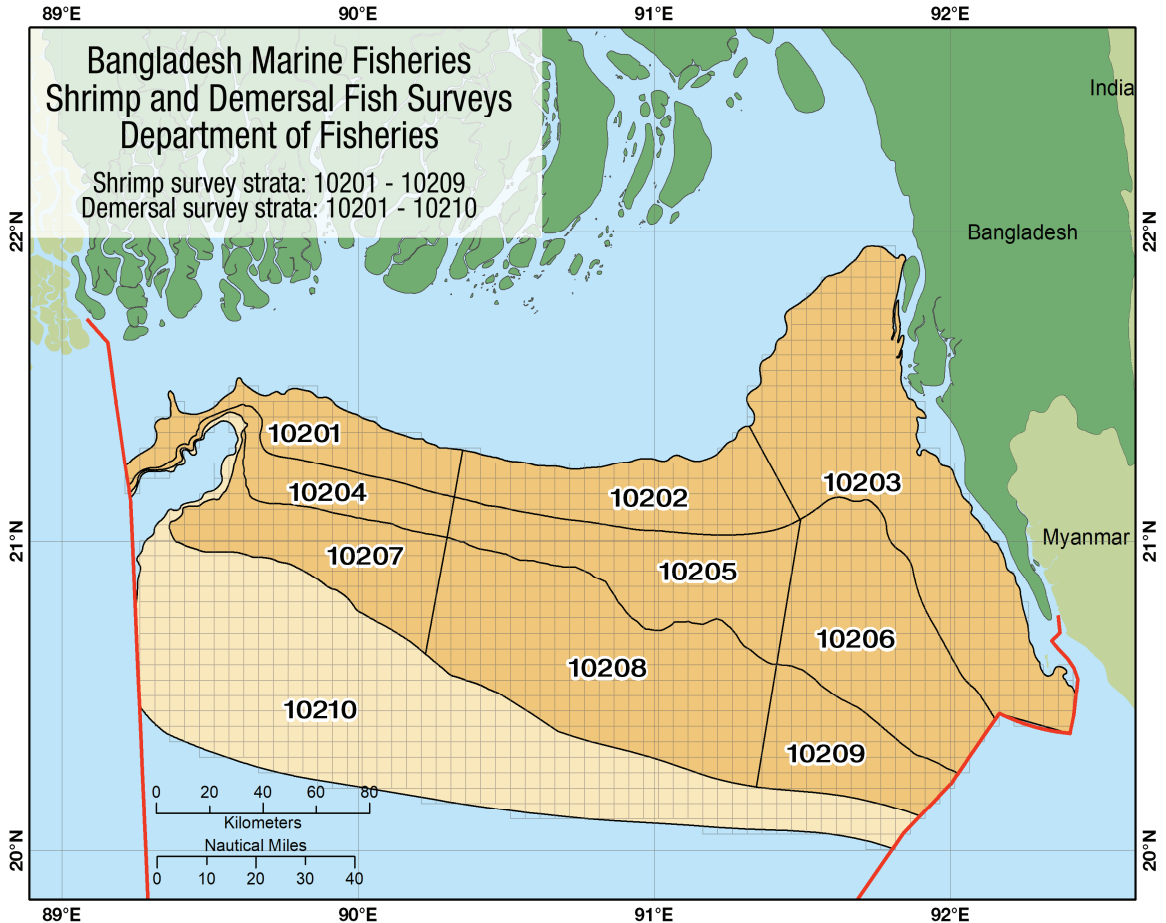


Figure: Survey strata and sampling quadrats

Actual survey maps with selected primary and alternate stations may be seen in subsequent Survey Annual Report (SAR) section with a station list at the end of each SAR.

Pelagic survey sampling design: R/V Meen Sandhani was not designed for acoustic survey of pelagic fisheries resources, therefore, is not fitted with scientific echosounder. However, the vessel is equipped with a SIMRAD ES-80 echosounder and a SIMRAD SX90 Sonar. Therefore, the SDWG decided to utilize these equipments to experimentally survey the pelagic resources using a sighting method akin to wildlife and marine mammal surveys. For this purpose 23-25 parallel transects are drawn at 7.5 nautical miles apart on the shelf sea between 10 and 200 meter depth so that the total transect length remains about 1,700 kilometers, an estimated effort which can be completed in 24 days or 3 cruises. Sighting of fish schools on Sonar and ecosounder are recorded for subsequent analyses. This survey is still in an experimental stage, and needs to be perfected in the coming years for tangible results. The following map shows a distance sampling transects on the shelf sea area.

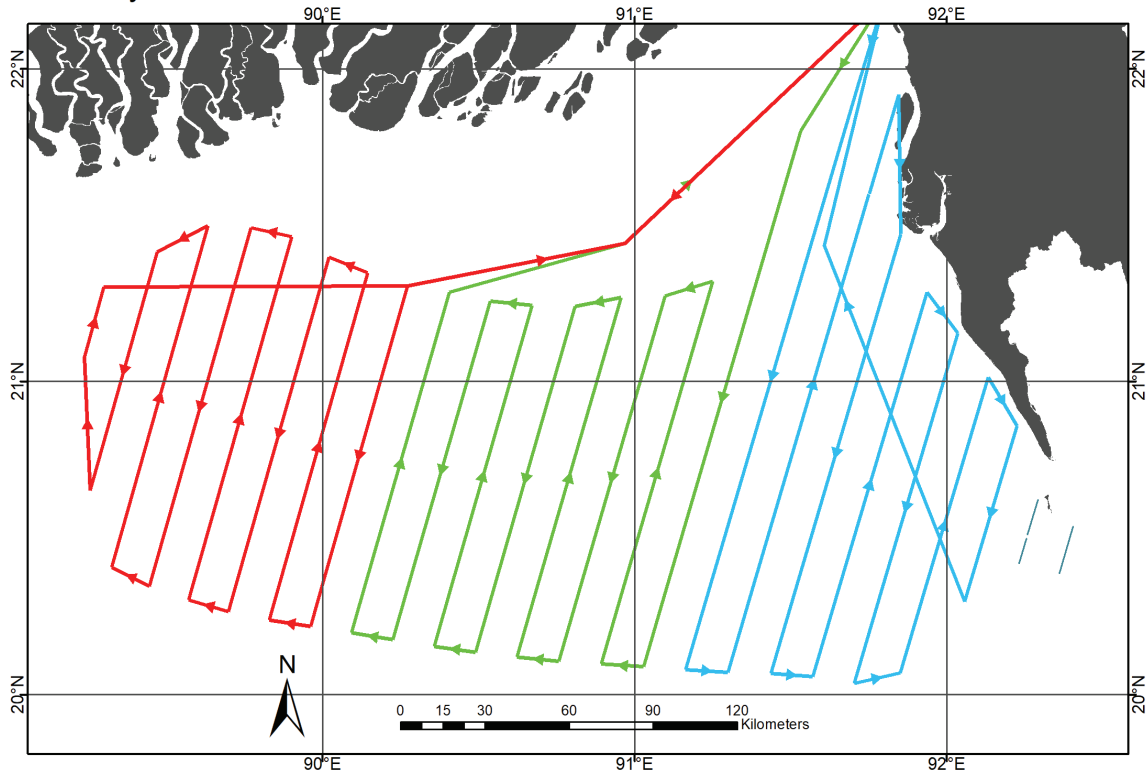


Figure: Pelagic survey design

Survey execution

For convenience of operation and considering the endurance of the vessel, each survey is divided into 3 (three) 10-days cruise consisting of at least 8 working days – starting and ending days are generally spent in cruising and other works. Each cruise is manned by 6-8 scientists and other crew members. Taking sea worthiness of the vessel into account, survey operations are restricted only to 5 (five) fair-weather months, *i.e.*, November-March. On shrimp and demersal surveys each of the 80 designed stations are visited and sampled by a 30-minute haul using shrimp or demersal trawl nets of predetermined specifications and mesh size (30mm) maintaining hauling speed at around 3 knots. Generally 3-5 hauls are possible on a single working day. On the experimental pelagic/sighting surveys, the vessel is made to cruise along transects and observations on fish schools within a predetermined radius are recorded. Pelagic trawl samples are taken to identify and sample the fish in the observed schools. For all trawl samples on all surveys, species composition, total catch weight, and weight of individual species are recorded. Each individual fish/ shrimp/ crab/ cephalopod species is identified to the finest taxonomic degree possible and subsequently sampled to determine total number, length distribution, and individual weights. If the catch volume is large it may be quantitatively subsampled, otherwise the whole catch of the species is sampled.

Data management

Generally at the end of the day, recorded species composition, length-weight and length-frequency data are entered into the survey data management software. Initially NANSIS software created by EAF-Nansen program of the FAO was used. Considering some unique requirements, a substitute software called BANSIS (Bangladesh Survey

Information System) was developed in-house. The survey team is currently transitioning from NANSIS to BANSIS; from survey season 2019-20 onwards NANSIS will no longer be used and BANSIS will take over. In both software, all survey data including fisheries and oceanographic, are stored in an industry standard relational database management systems called PostgreSQL.

Data analysis and synthesis

The stock status report (SSR) provides a synthesis view drawn from analysis of survey data (from AS and MS), analysis of fisheries statistics (Catch and Effort from the Statistical Handbook), and biological information from published sources (Fishbase etc). The synthesis combines model results, biological understanding, and expert interpretation, to provide the best available scientific information at the time. There remain significant uncertainties in results.

Catch curve analysis, using survey data together with published information, provides estimates of mortality, the rate at which the stock is being depleted by fishing and natural means. The survey data provides high quality and detailed information but is limited to very short time intervals with a 25 year gap.

Biomass dynamics analysis, using fisheries statistics together with published information, provides indices of population biomass with respect to some conventional reference points (MSY biomass, spawning biomass, F0.1). Analysis of the fisheries statistics was hampered by the aggregated and inconsistent information available. Considerable tinkering and adjustment was required to achieve plausible results.

Reporting

Survey Annual Report (SAR) for each of Shrimp and Demersal surveys during the period (2016-2019) is prepared which include groups of fishes and shrimps of interest. Strata-wise relative abundance indices, map of observed geographical distribution (occurrence), length-frequency distribution and length-weight curve are standard reporting elements for each of the groups. These reports mainly provide information of scientific interest.

Stock Status Report (SSR) for selected groups of fish/shrimp provides fishery information, as well as biomass dynamics, intended to serve both scientific interests and management targets. To date preliminary assessments for seven groups have been prepared. Groups were selected based on data availability and importance to fisheries.

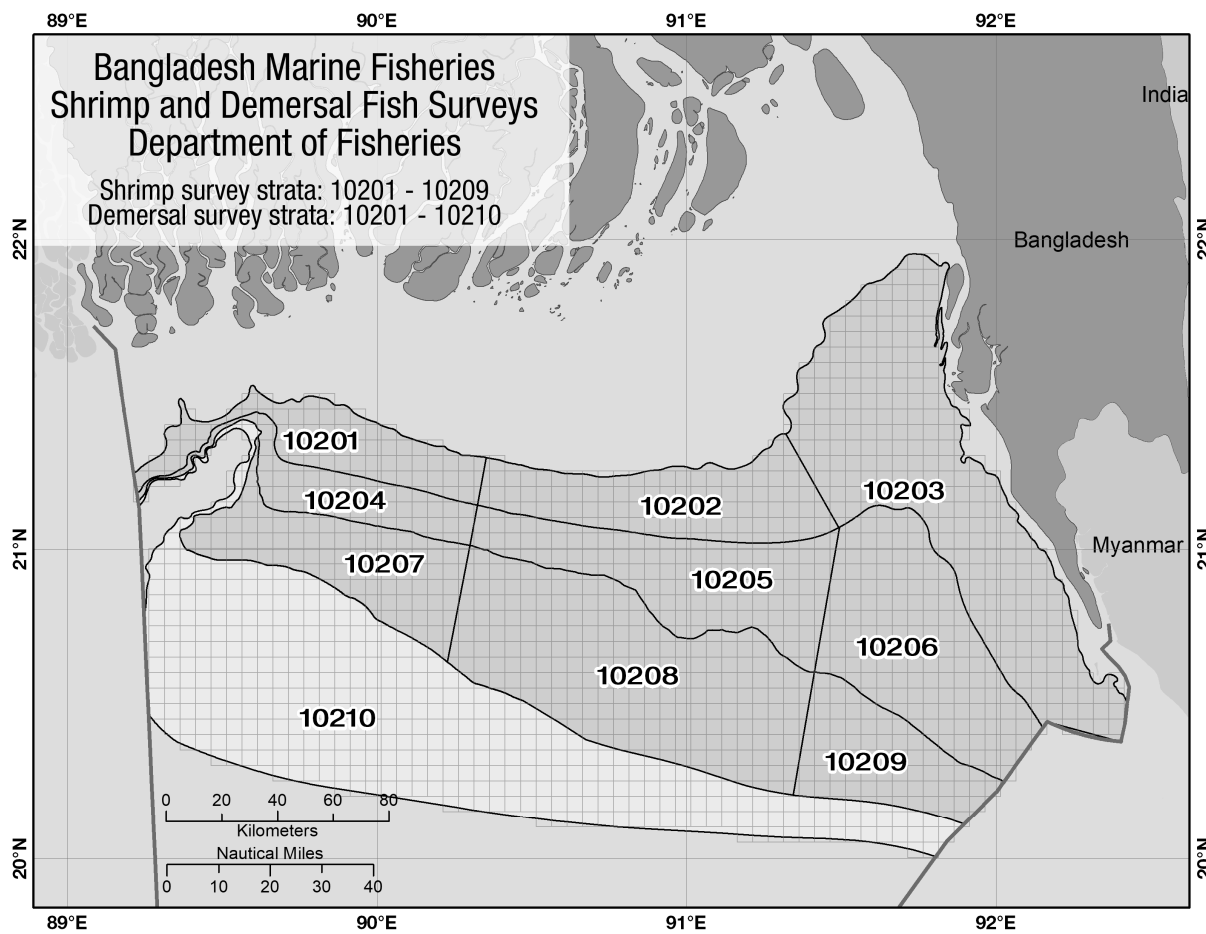
SURVEY REPORTS



DoF Survey Working Group
12 December, 2018
Survey number: 2016202

Survey Operations

The R/V Meen Shandhani conducts annual shrimp and demersal trawl surveys. Each survey required approximately one month at-sea and samples approximately 80 pre-selected stations on the Bangladesh continental shelf. Survey stations are allocated according to a depth and area stratification plan. Shrimp surveys have 9 strata within 10 and 100 m depth range. The demersal fish surveys include the same 9 strata as the shrimp plus 1 more stratum for the 100 to 200 m range.



Trawl survey strata



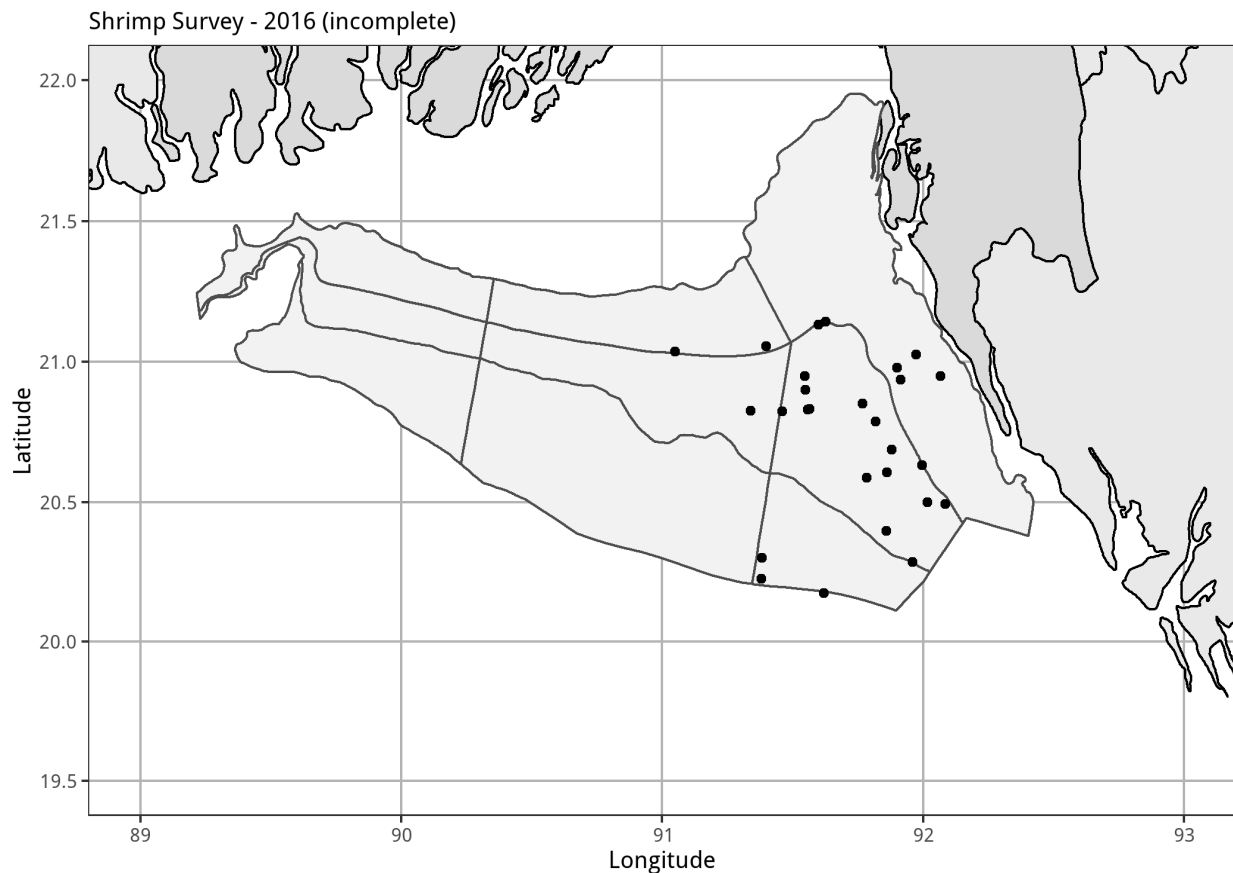
Survey Annual Report for Shrimp Survey 2016-17 (Incomplete)

SAR/2016202

The number of stations allocated to each stratum is dependent on the area (km²), which is used to calculate the stratum weight as the proportion of the total area in a given stratum.

Stratum	Name	Depth (m)	Area (km ²)	Weight	Sets completed*
10201	Swatch Inshore	10 - 40	1814	0.060	0
10202	Middle Inshore	10 - 40	2681	0.088	2
10203	South Inshore	10 - 40	6833	0.224	6
10204	Swatch Midshore	40 - 80	1350	0.044	0
10205	Middle Midshore	40 - 80	3180	0.104	2
10206	South Midshore	40 - 80	3978	0.131	14
10207	Swatch Offshore	80 - 100	2522	0.083	0
10208	Middle Offshore	80 - 100	6083	0.200	0
10209	South Offshore	80 - 100	2025	0.066	3

*The sets completed column is the actual number of trawl samples taken in the survey.



The survey locations plotted are the starting locations of valid fishing stations.

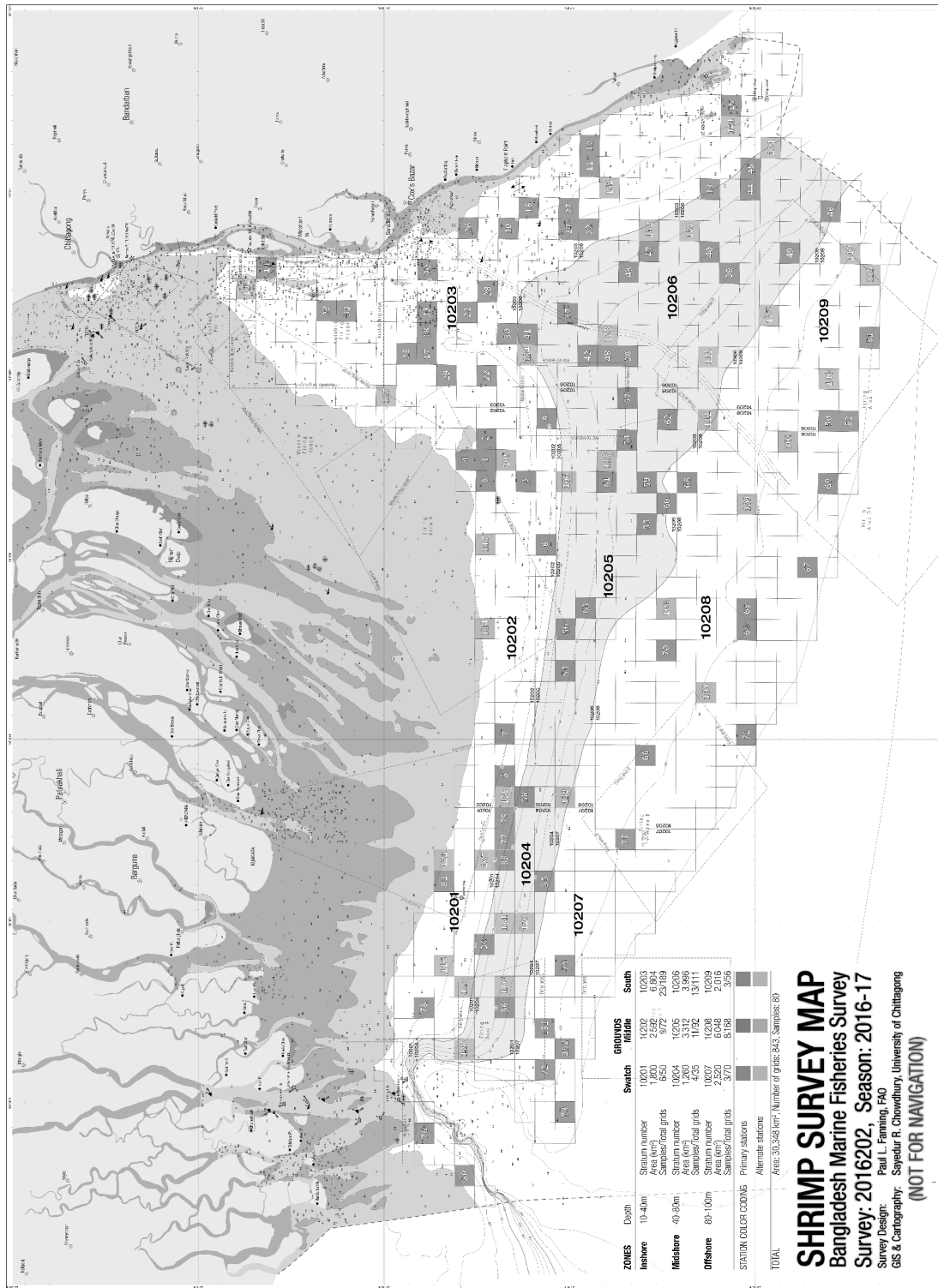
This was the first ever survey of the R.V. Meen Sandhani. The survey activities suffered from (i) unusual bad weather condition in January 2017 (c.f. cruise 1 report), (ii) torn nets and not having spare nets, and (iii) problem in the gear-throttle system of the vessel (c.f. cruise 2 report). Eventually this survey was called off to make room for the demersal survey, the third



Survey Annual Report for Shrimp Survey 2016-17 (Incomplete)

SAR/2016202

planned cruise of the survey was never conducted due to delays caused by various disruptions. Before being called off a total of 25 stations were sampled.



Shrimp Survey Map 2016202

Species group: Penaeid shrimps (Excluding tiger shrimp)

Majority of penaeid shrimp species that are presently exploited are common to both in Artisanal and Industrial fisheries. The artisanal fishery harvest pre-adult, post juveniles, juveniles and even the post larvae (PL) but the industrial fishery harvest mostly the adult phase of penaeid shrimp. Most of the species are commercially important. The highest contribution in the total production is made by *Metapenaeus monoceros* the brown shrimp.

Species in group and number of catches

Scientific name	Occurences
<i>Metapenaeus brevicornis</i>	4
<i>Metapenaeus monoceros</i>	22
<i>Parapenaeopsis sculptitis</i>	1
<i>Penaeus indicus</i>	2
<i>Penaeus semisulcatus</i>	2

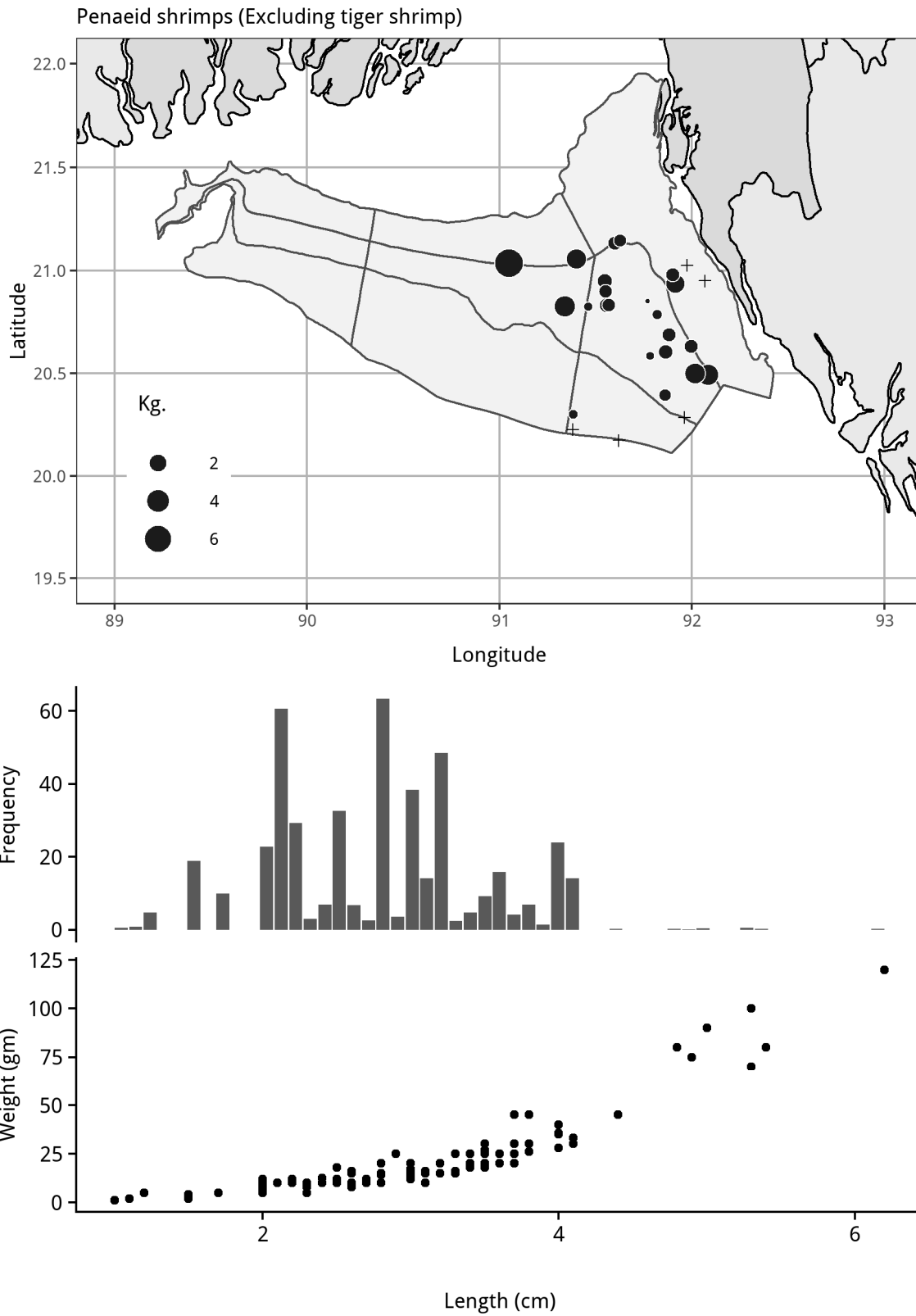


Stratum mean catch per tow (kg)

Stratum	Mean catch (kg)
10202	4.950
10203	0.875
10205	1.810
10206	1.064
10209	0.100

Overall mean catch per tow, stratum weighted.

Overall
1.169



Species group: Tiger shrimp

Among the penaeid shrimp *Penaeus monodon* the Tiger shrimp is the most target species of commercial shrimp trawlers and some artisanal fishing gears (MSBN and Trammel net etc.). Because this shrimp fetches a very good prices both in local and international market. Principal breeding season is January-February.

Species in group and number of catches

Scientific name	Occurences
Penaeus monodon	15

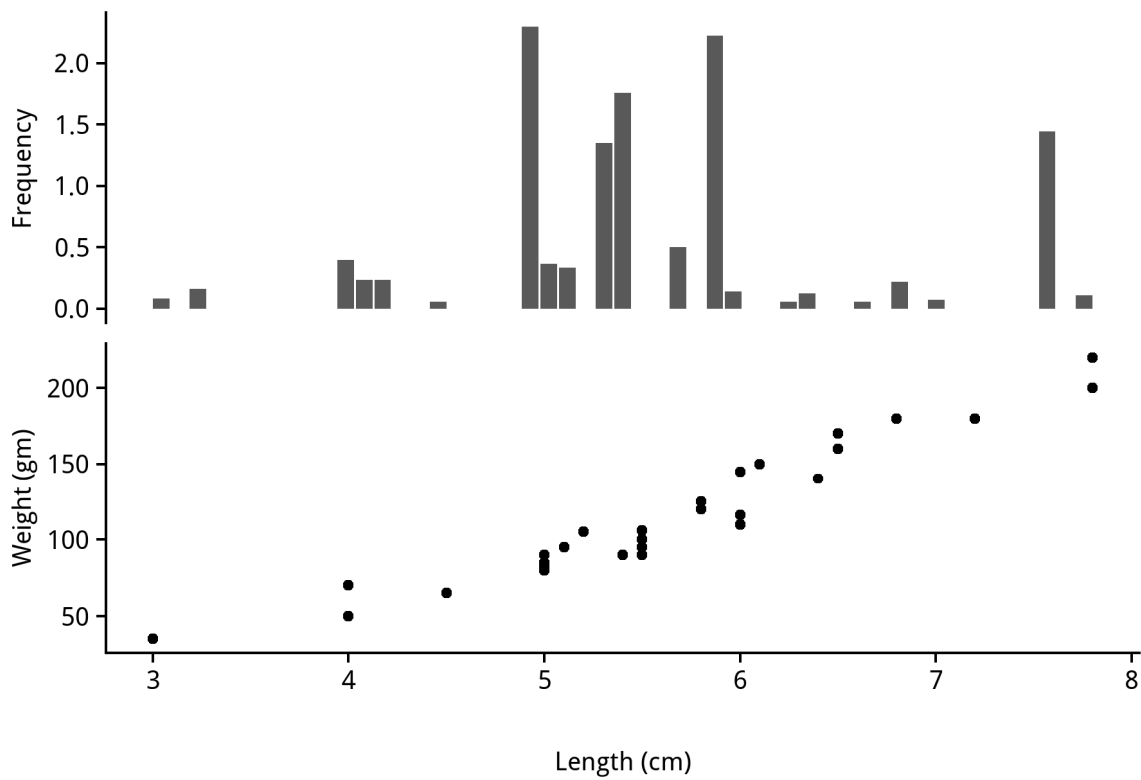
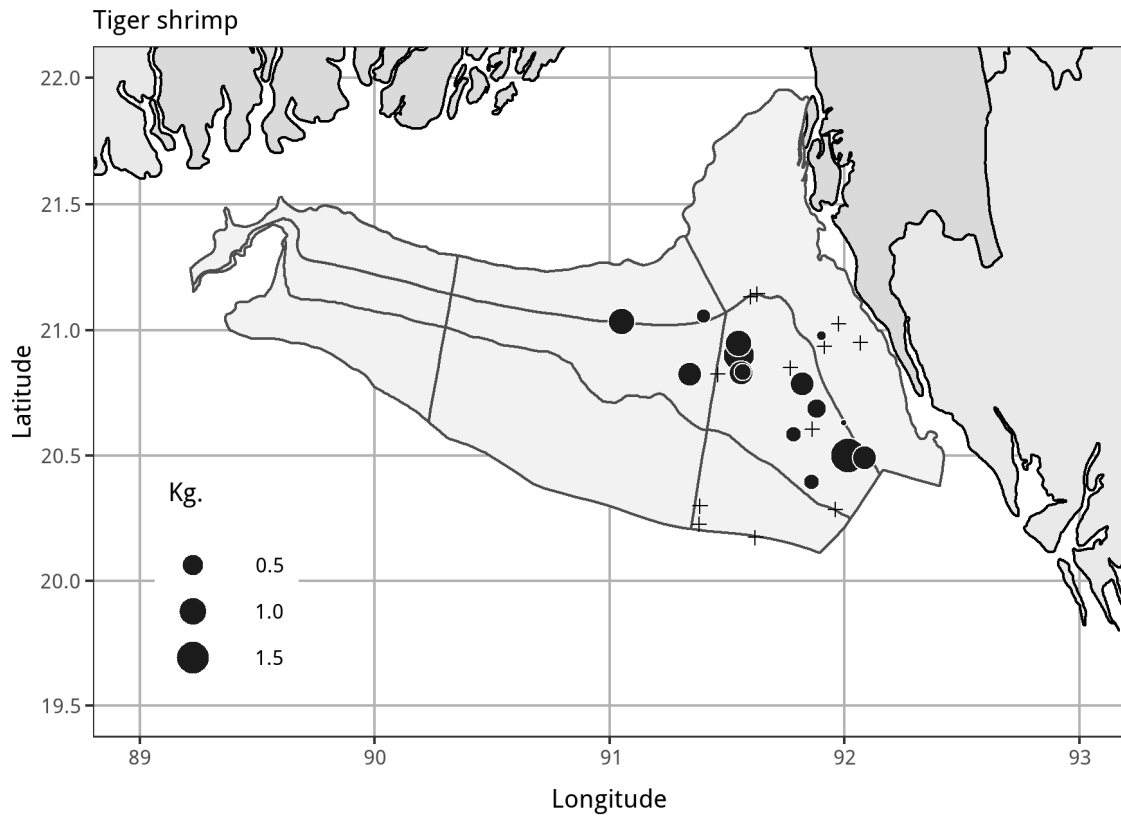


Stratum mean catch per tow (kg)

Stratum	Mean catch (kg)
10202	0.535
10203	0.021
10205	0.338
10206	0.507
10209	0.000

Overall mean catch per tow, stratum weighted.

Overall	0.298
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Species group: Non-penaeid shrimps

Non-penaeid shrimp are found mainly coastal areas, brackish water and estuaries and caught in artisanal gears (ESBN and MSBN) in different stages of their life cycle. Most of them are economically important in our local market. Some of non-penaeid found in dipper water and harvest by shrimp trawlers. Some non-penaeid shrimp *Squilla mantis* the mantis shrimp are used as poultry feed and fish meal.

Species in group and number of catches

Scientific name	Occurences	Scientific name	Occurences
S H R I M P S	1	Solenocera hextii	16
Solencera indica	10	Solenocera sp.	1
Solenocera crassicornis	8	SOLENO CERIDAE	1

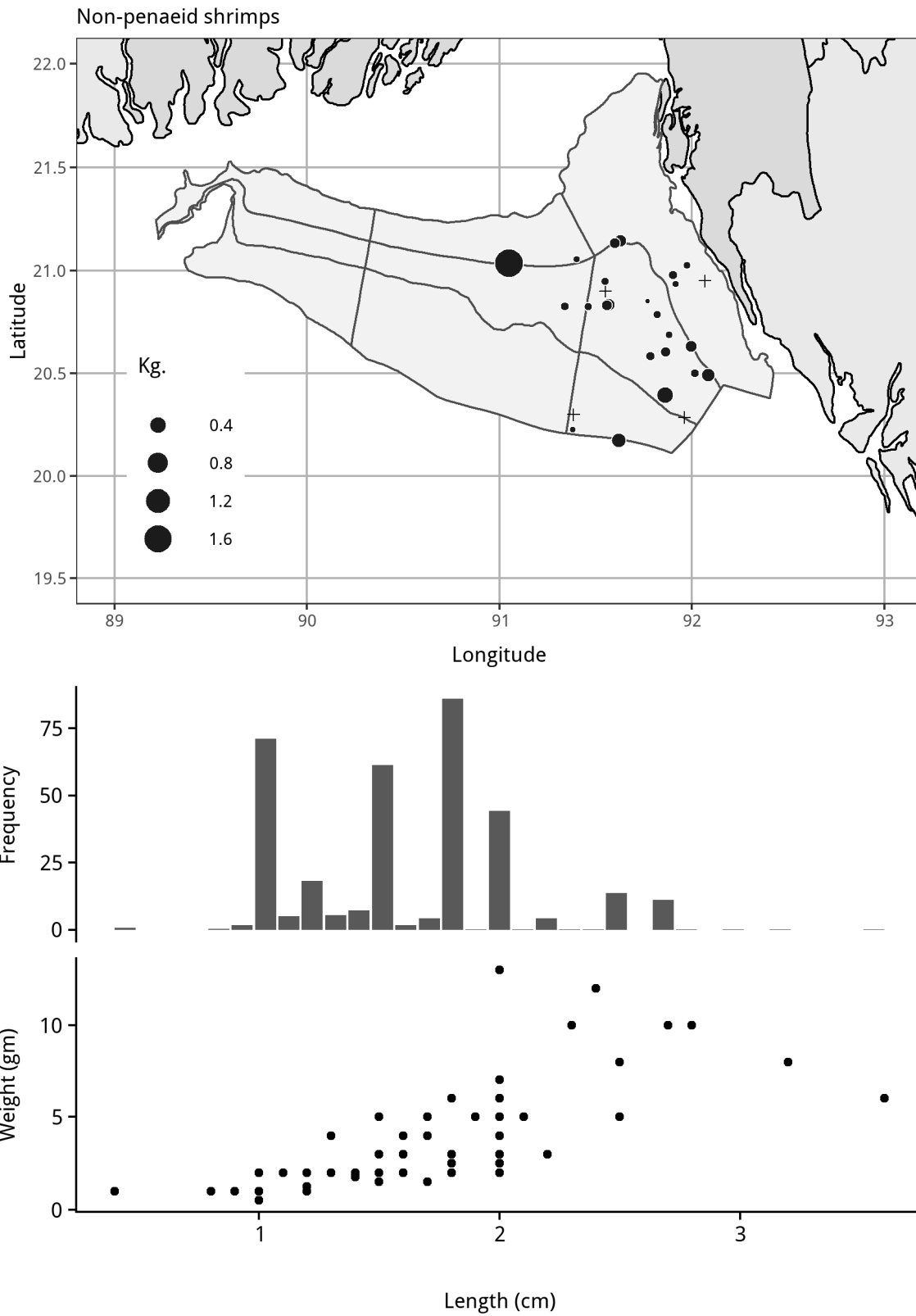


Stratum mean catch per tow (kg)

Stratum	Mean catch (kg)
10202	0.850
10203	0.060
10205	0.032
10206	0.082
10209	0.089

Overall mean catch per tow, stratum weighted.

Overall
0.108



Species group: Small pelagics - Clupeidae and Pristigasteridae

Shads, Anchovies, Sardines and Herring which lie under the family of Clupeidae and Pristigasteridae are the most significant fish group of seawater of Bangladesh. They are commercially important and abundantly available but exploited as by catch of Small Mesh Drift gill Net, Set Bag Net and commercial trawl fishery. Among these groups *Hilsa ilisha* the National fish (Hilsa) is the dominant species both inland and marine catch.

Species in group and number of catches

Scientific name	Occurences
Dussumieria acuta	4
Escualosa thoracata	1
Ilisha filigera	5
Sardinella longiceps	1
Tenualosa ilisha	2

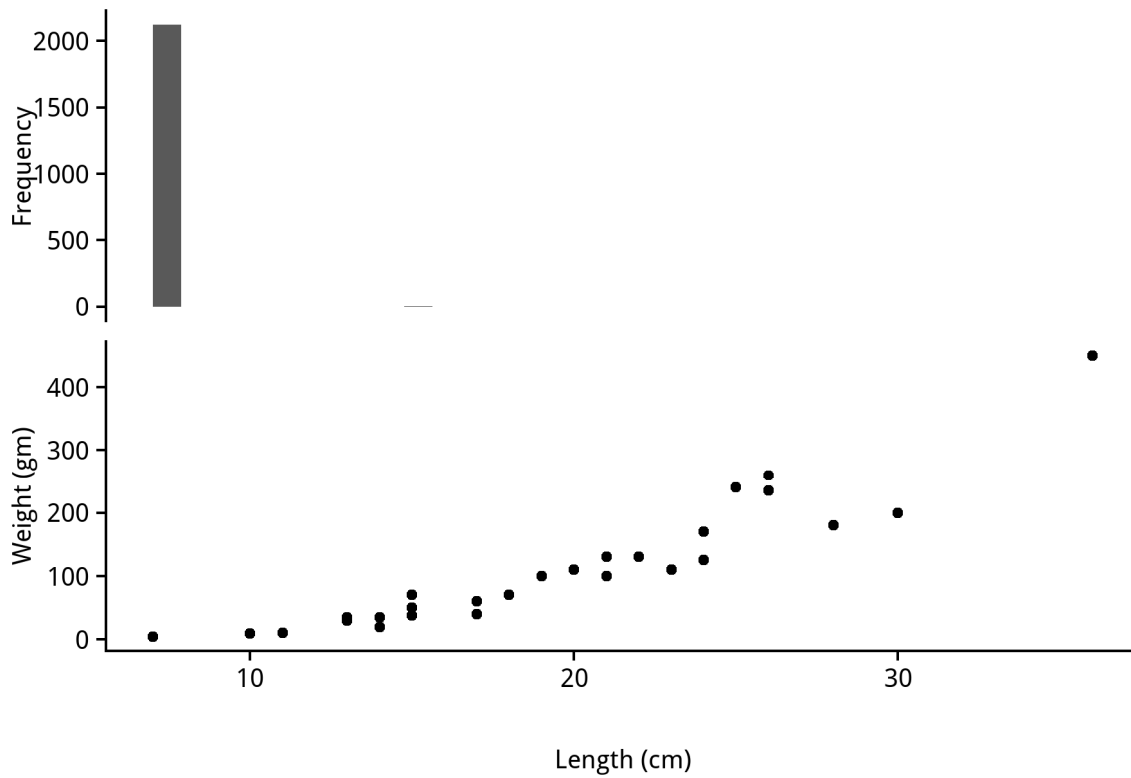
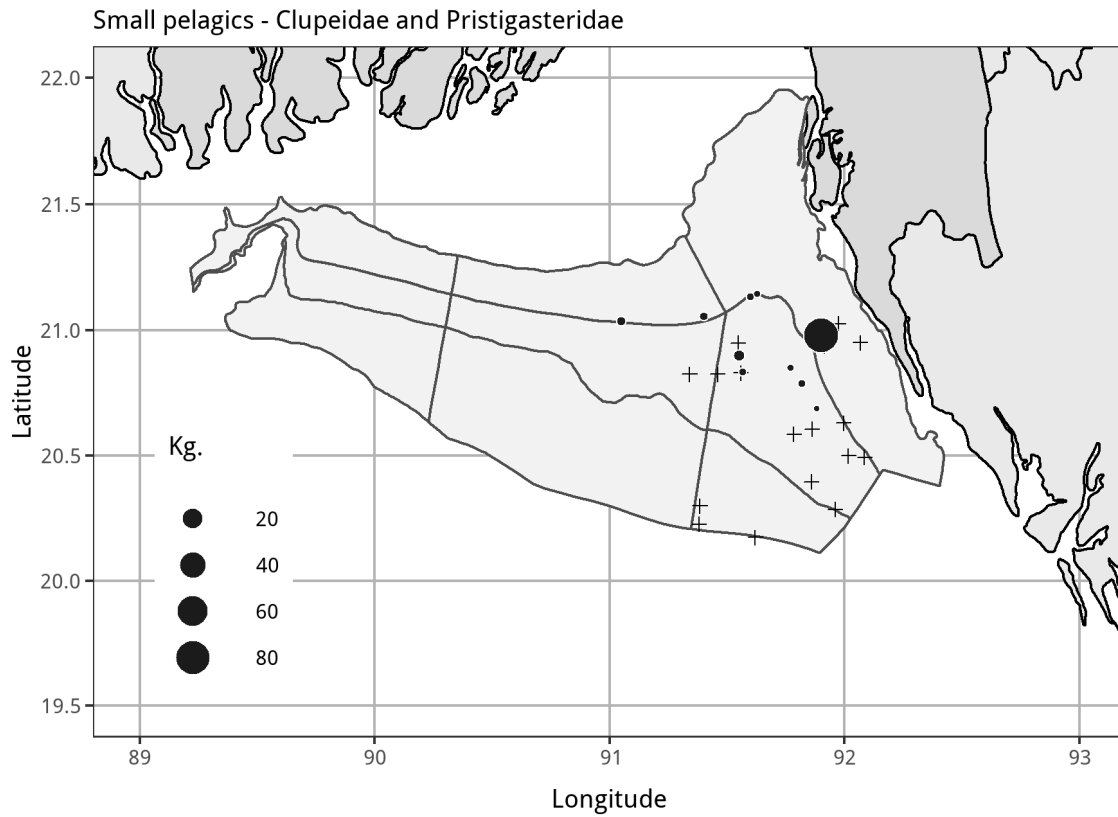


Stratum mean catch per tow (kg)

Stratum	Mean catch (kg)
10202	0.690
10203	13.851
10205	0.000
10206	0.221
10209	0.000

Overall mean catch per tow, stratum weighted.

Overall	5.1
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Species group: Carangidae - Jacks and scads

Carangids are commercially important but exploited as by-catch or incidental catch of gill net, mid water trawl, demersal trawl and shrimp trawl though these groups are mostly pelagic. Within this group *Megalaspis cordyla* the Hard tail Scad and *Parastromateus niger* the Black pomfret are abundantly available in our territory.

Species in group and number of catches

Scientific name	Occurences	Scientific name	Occurences
Carangoides armatus	1	Megalaspis cordyla	6
Carangoides malabaricus	1	Scomberoides commersonianus	1
Carangoides sp.	1	Selar crumenophthalmus	6
Decapterus russelli	2	Seriolina nigrofasciata	1
Decapterus sp.	1		

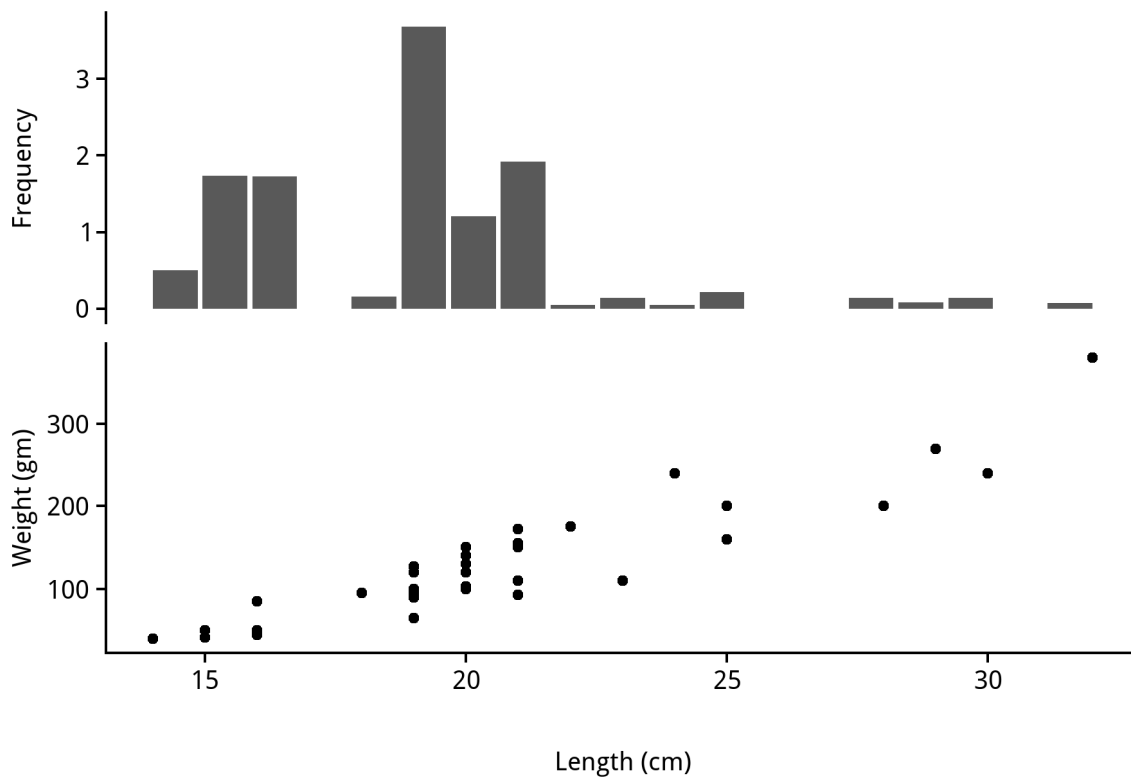
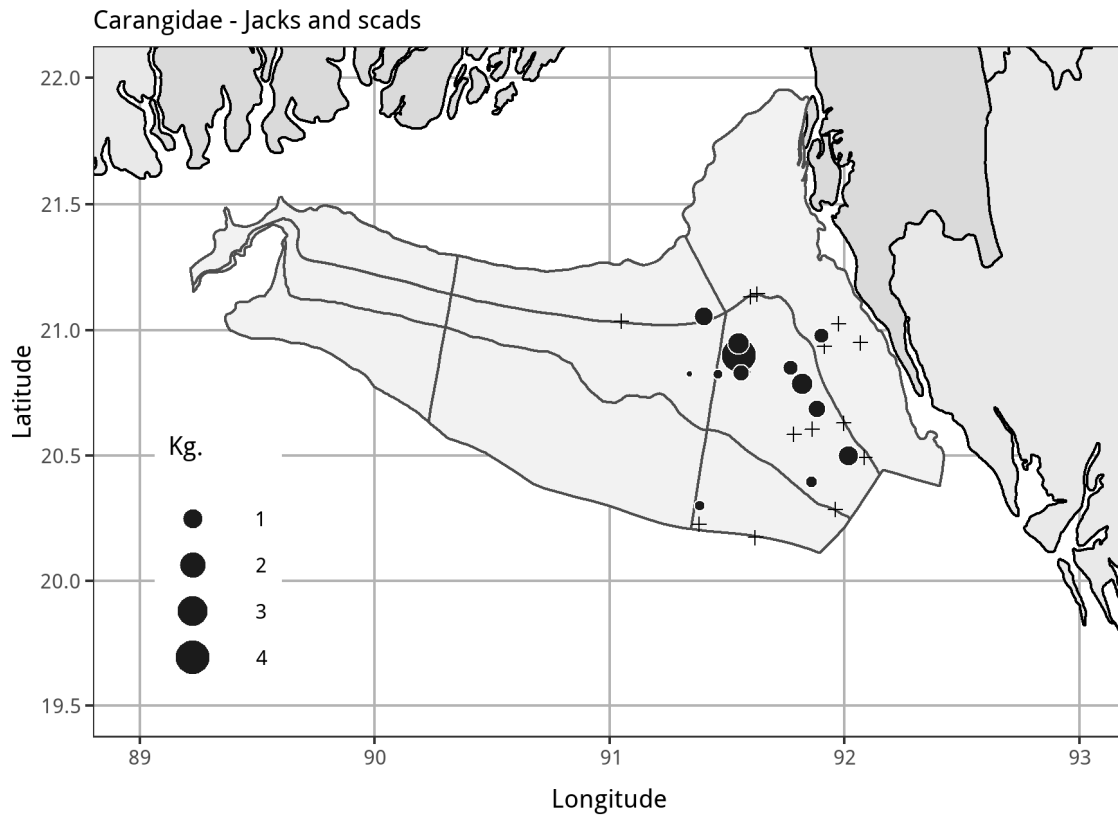


Stratum mean catch per tow (kg)

Stratum	Mean catch (kg)
10202	0.415
10203	0.078
10205	0.140
10206	0.669
10209	0.058

Overall mean catch per tow, stratum weighted.

Overall
0.384

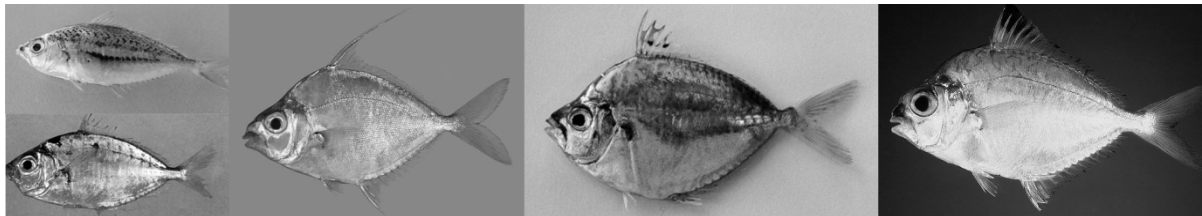


Species group: Leiognathidae - Ponyfish

Leiognathids or pony fish the small sized fishes consume locally and used as poultry feed and fish meal as cheap price. This group are abundantly caught in Artisanal fishing gear (MSBN), demersal trawl and shrimp trawl.

Species in group and number of catches

Scientific name	Occurences
Gazza minuta	10
Leiognathus bindus	2
Leiognathus brevisrostris	20

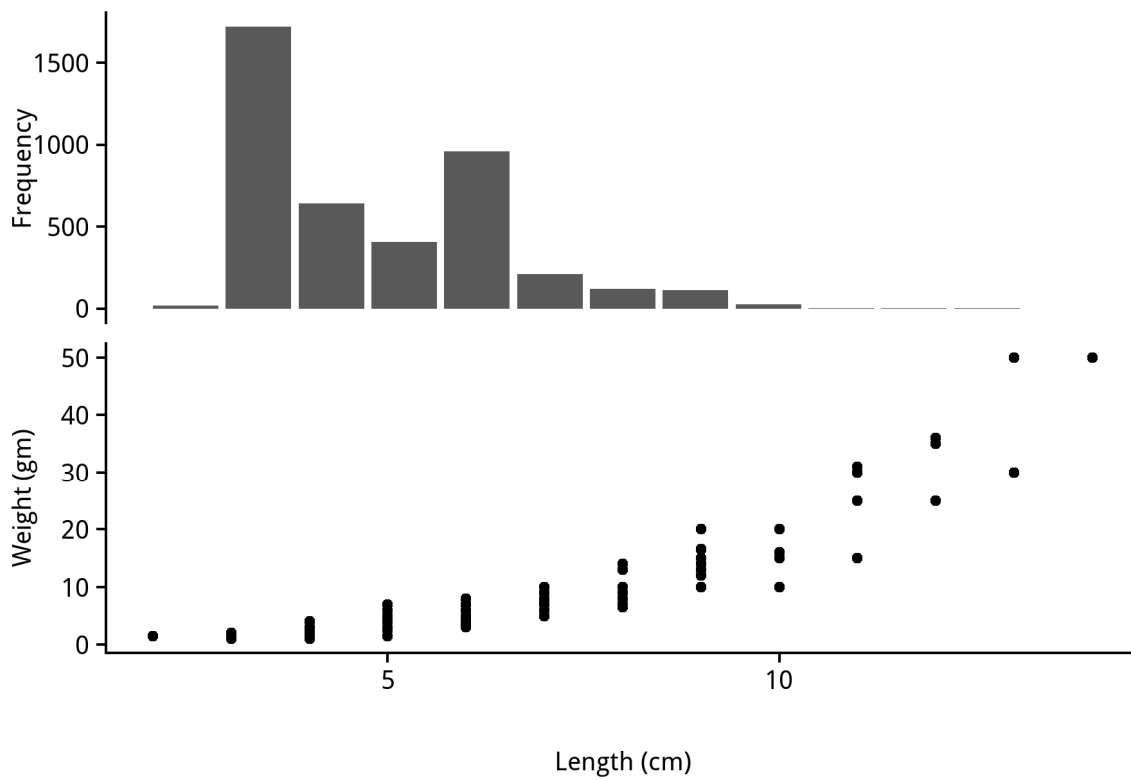
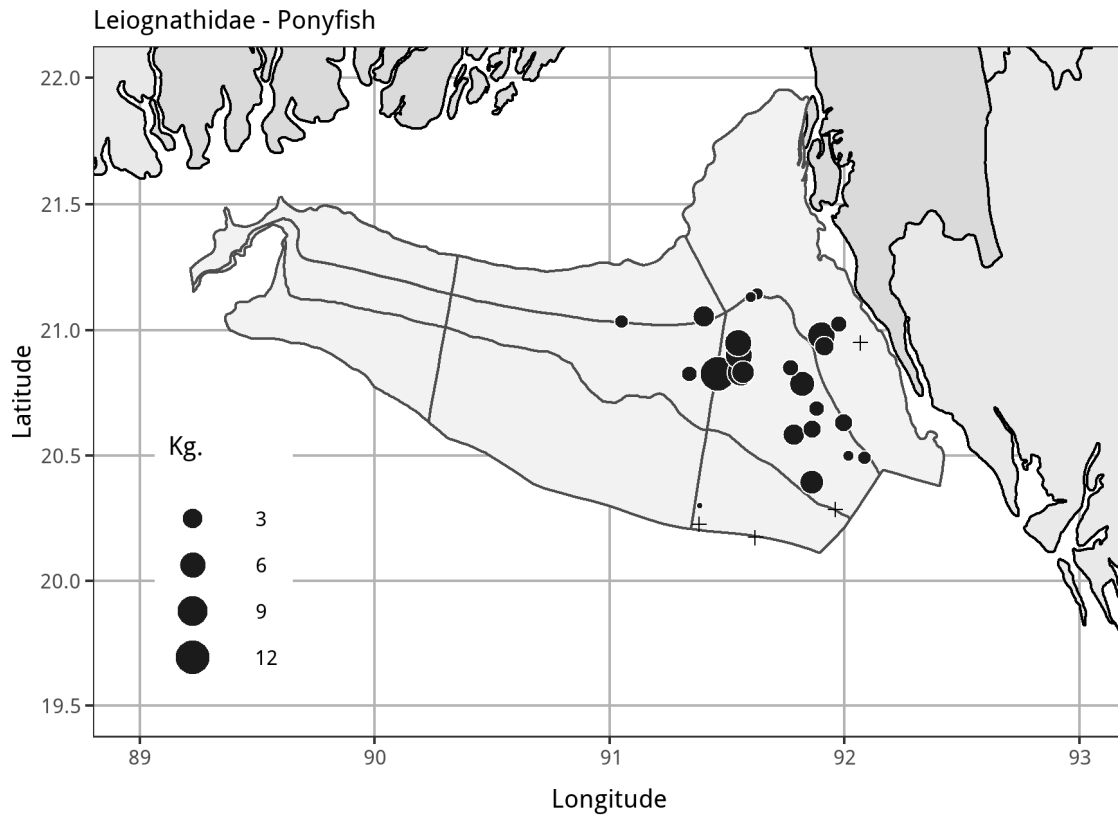


Stratum mean catch per tow (kg)

Stratum	Mean catch (kg)
10202	2.120
10203	2.234
10205	6.775
10206	3.038
10209	0.007

Overall mean catch per tow, stratum weighted.

Overall	2.754
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Species group: Mullidae - Goatfish

Mullidae – Goatfish, the small sized fish is consumed locally and harvest mainly in mid water trawl and found significantly in coral reef areas.

Species in group and number of catches

Scientific name	Occurences
Upeneus guttatus	2
Upeneus sulphureus	19

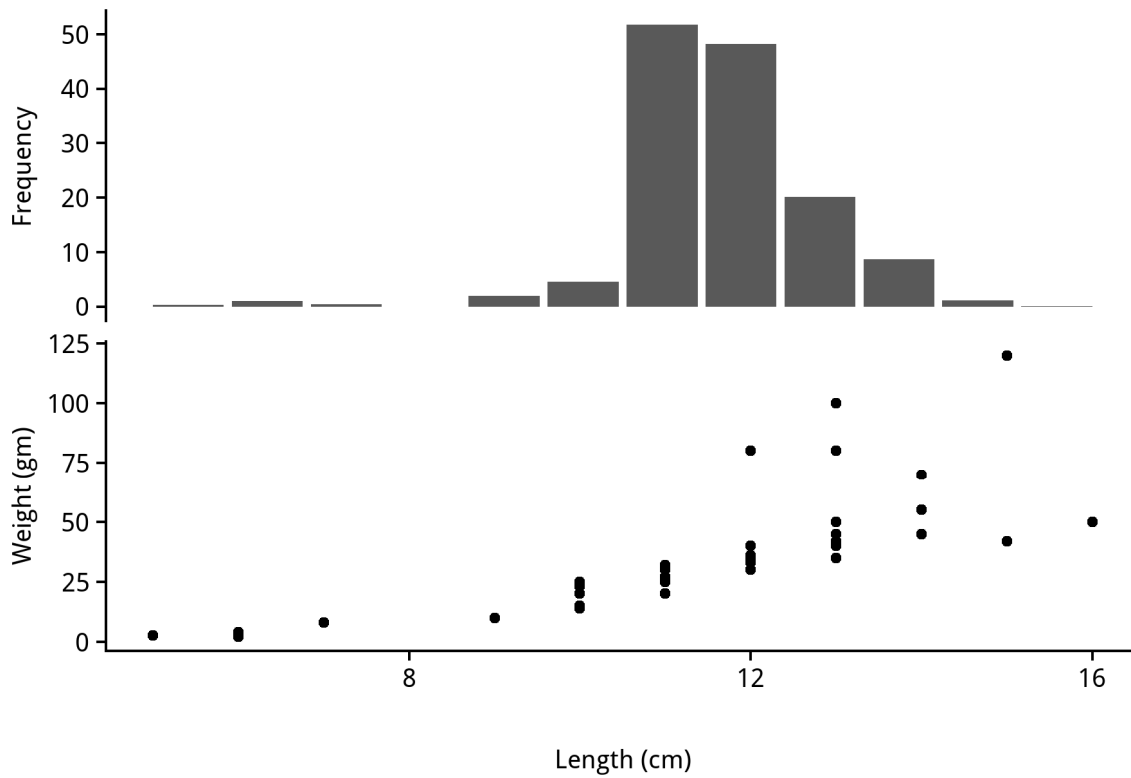
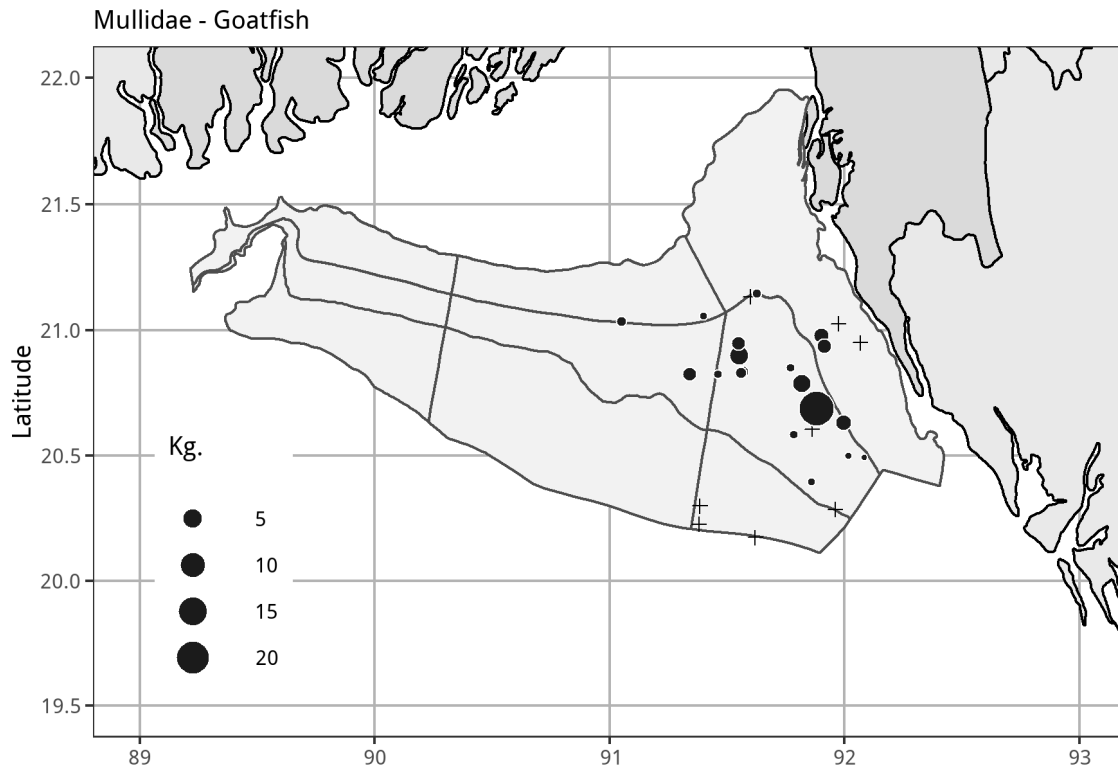


Stratum mean catch per tow (kg)

Stratum	Mean catch (kg)
10202	0.220
10203	1.087
10205	0.785
10206	2.543
10209	0.000

Overall mean catch per tow, stratum weighted.

Overall
1.68



Species group: Nemipteridae - Threadfin breams

Threadfin breams are commercially important fishes and considered as good fish. This are mainly caught bottom trawl, gill net and long lines. This fishes are occurring in muddy and sandy bottom and known to control of population of crustaceans and small fishes in the marine ecosystem.

Species in group and number of catches

Scientific name	Occurences
Nemipterus japonicus	20
Parascolopsis aspinosa	1

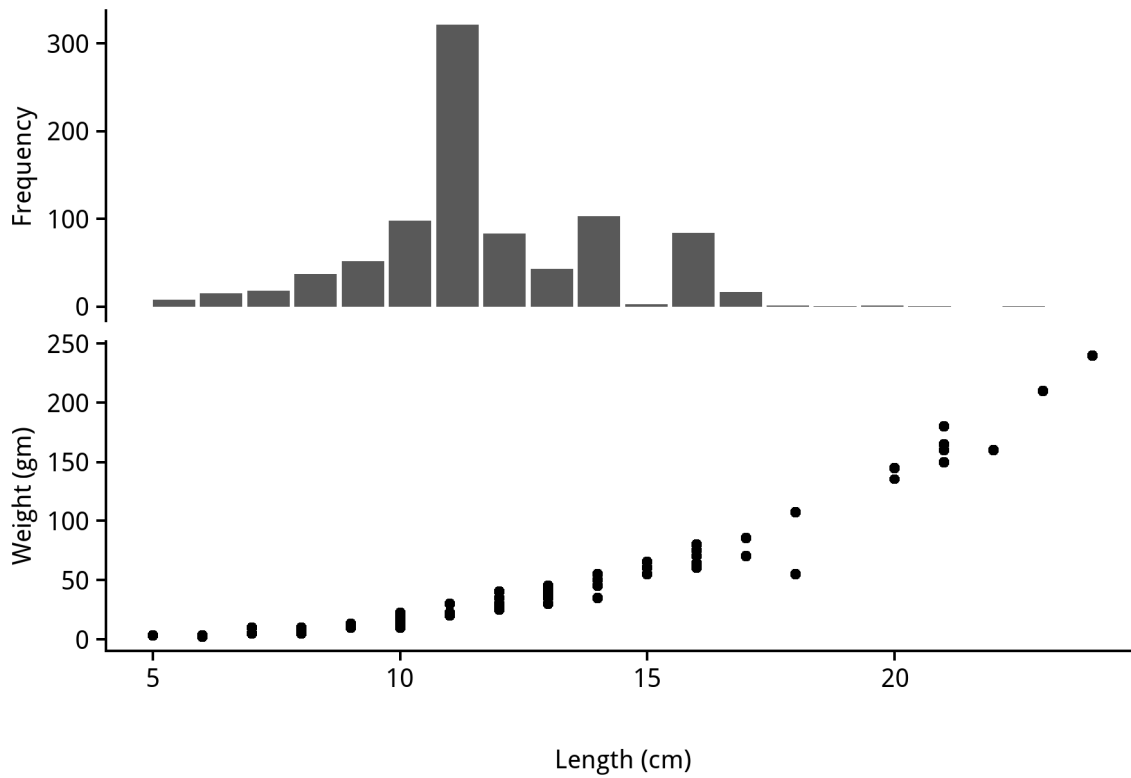
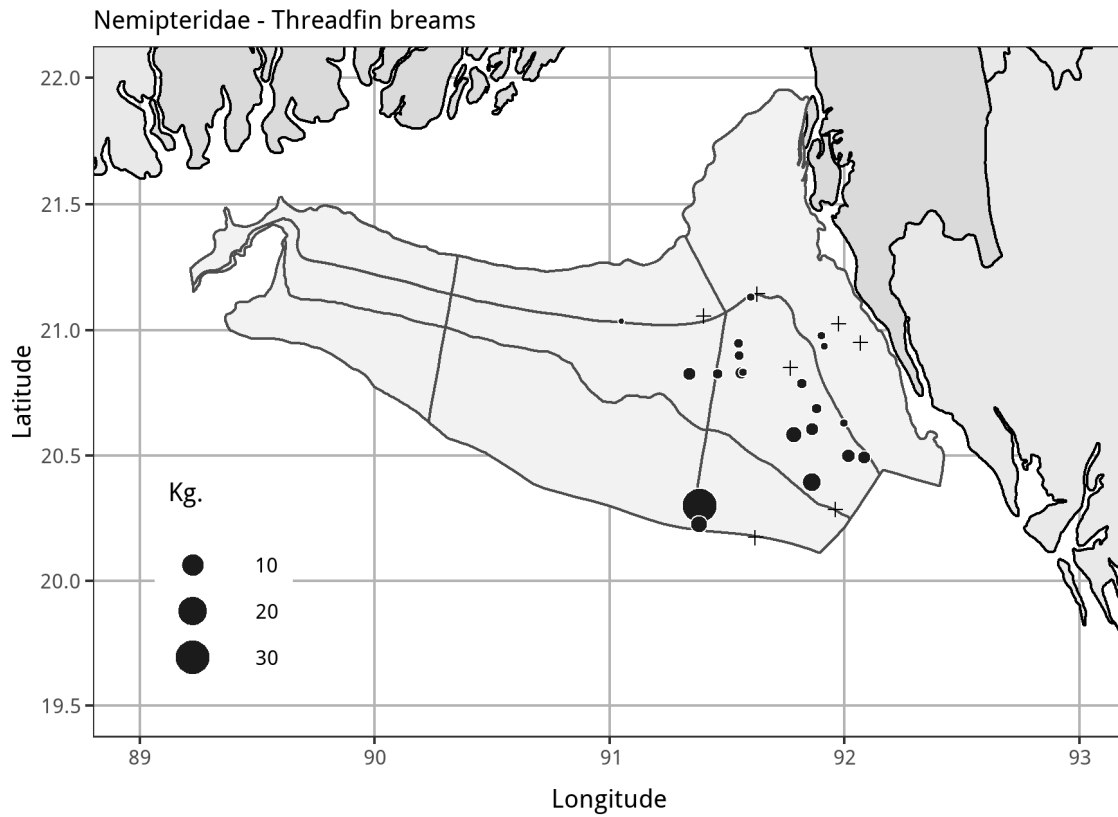


Stratum mean catch per tow (kg)

Stratum	Mean catch (kg)
10202	0.010
10203	0.074
10205	1.070
10206	1.291
10209	11.508

Overall mean catch per tow, stratum weighted.

Overall	1.325
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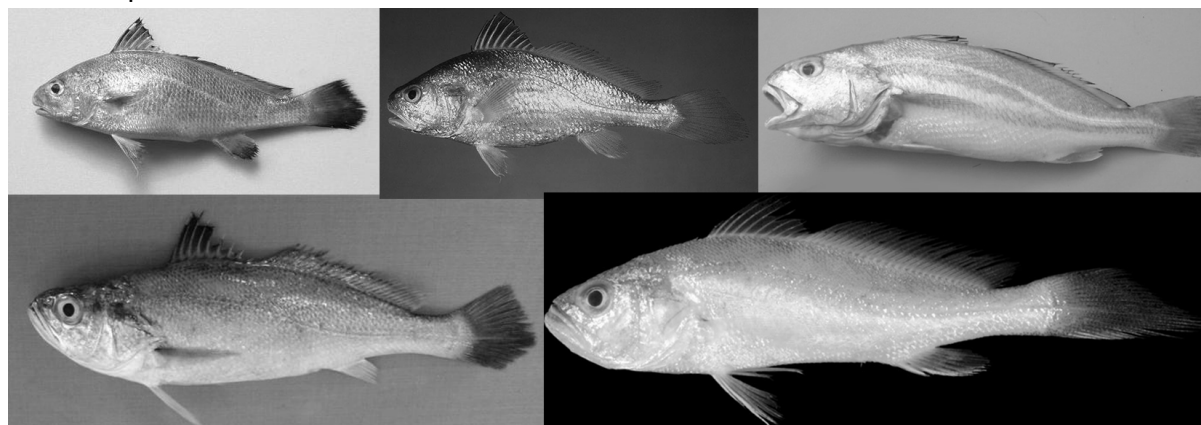


Species group: Sciaenidae - Croakers

Croakers are the largest group in the commercially important fishes in our sea water. These are bottom dwelling and carnivores' fishes known as drums feeding on benthic invertebrates and small fishes. They are caught bottom trawl, gill net and long lines. They are exported as dry and fresh form and fetch a good foreign currency and have a local demand.

Species in group and number of catches

Scientific name	Occurences	Scientific name	Occurences
Johnius belangerii	2	Otolithes cuvieri	3
Johnius carutta	1	Pennahia anea	5
Johnius dussumieri	1	Protonibea diacanthus	3
Johnius sp.	1		

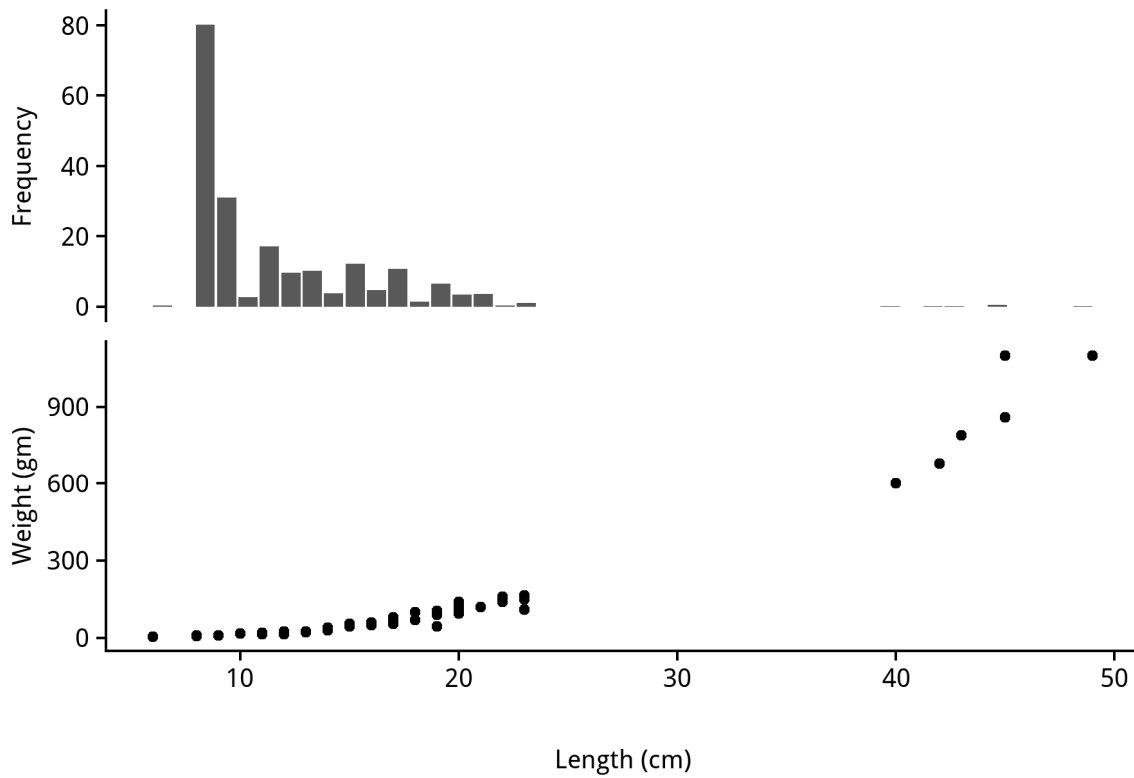
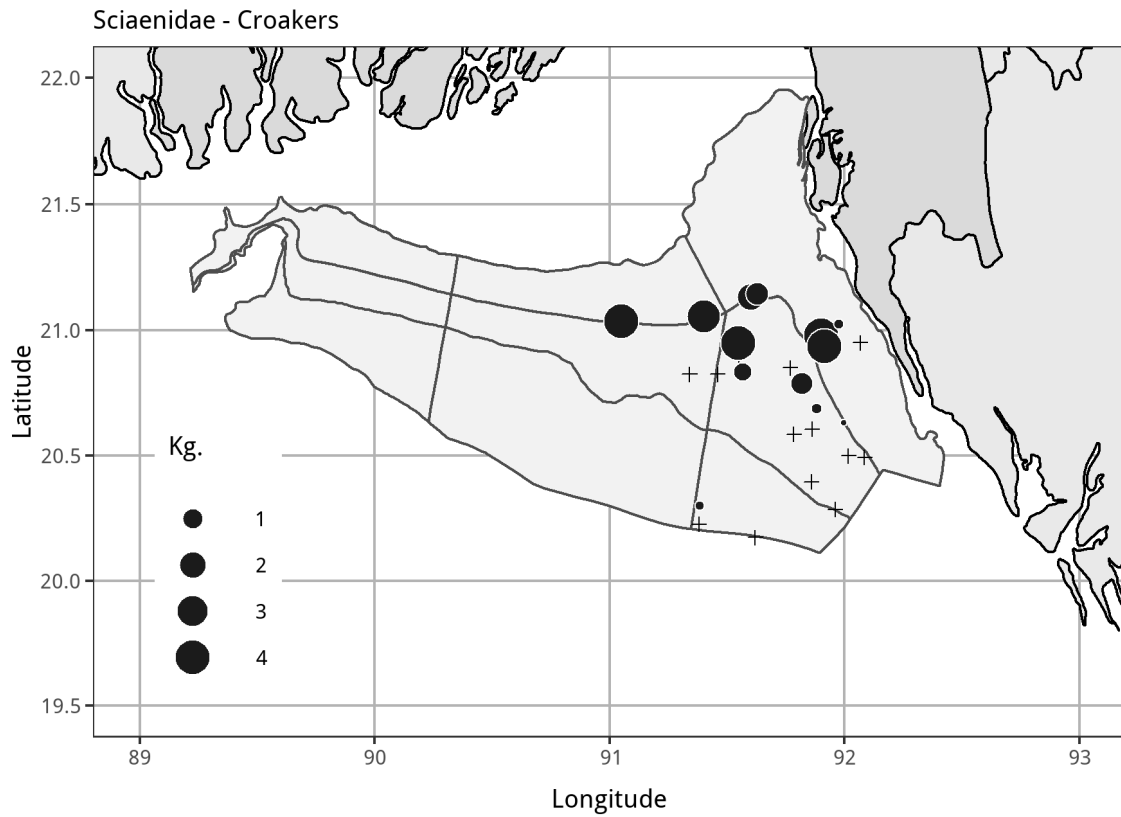


Stratum mean catch per tow (kg)

Stratum	Mean catch (kg)
10202	3.750
10203	1.603
10205	0.000
10206	0.598
10209	0.067

Overall mean catch per tow, stratum weighted.

Overall	1.044
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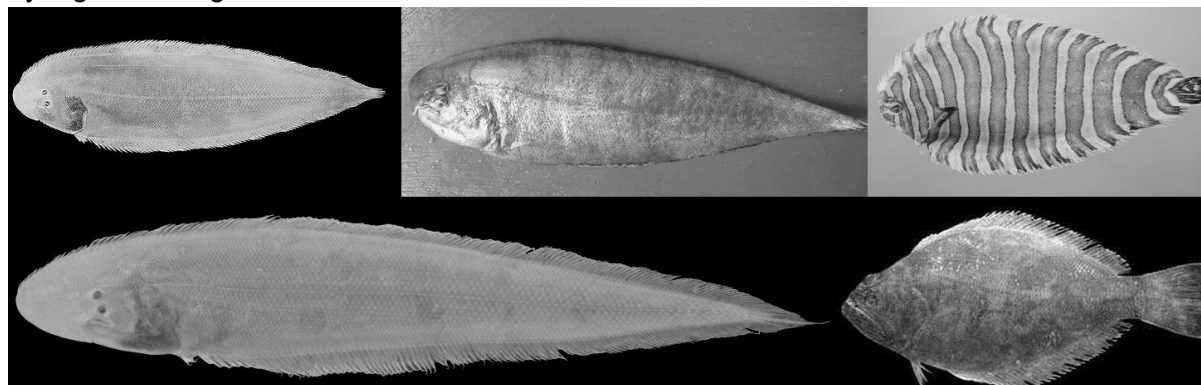


Species group: Pleuronectiformes - Flatfish

As before Flatfish are thrown as trash in shrimp trawl and demersal trawl catch. But at present flat fishes are used in fish meal and poultry feed. These groups mainly harvest in shrimp trawl but sometimes caught in MSBN. In Bangladesh only some tribal peoples having some species of flat fish, but now days these export in foreign countries mainly in China, Korea and Singapore. These groups are inhabits in sand and mud bottoms and eat only crutaceans.

Species in group and number of catches

Scientific name	Occurences	Scientific name	Occurences
Aesopia cornuta	4	Leops nigrescens	1
Brachirus orientalis	8	Solea sp.	1
Cynoglossus capensis	1	Zebrias zebra	1
Cynoglossus lingua	24		

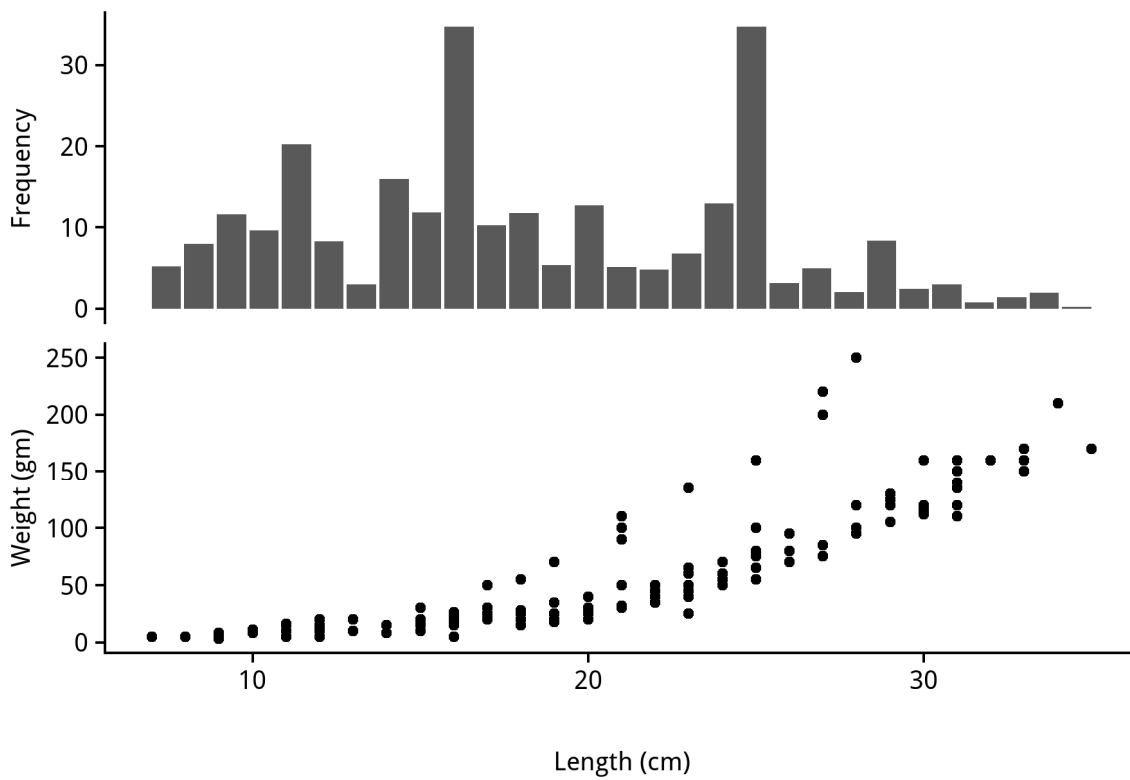
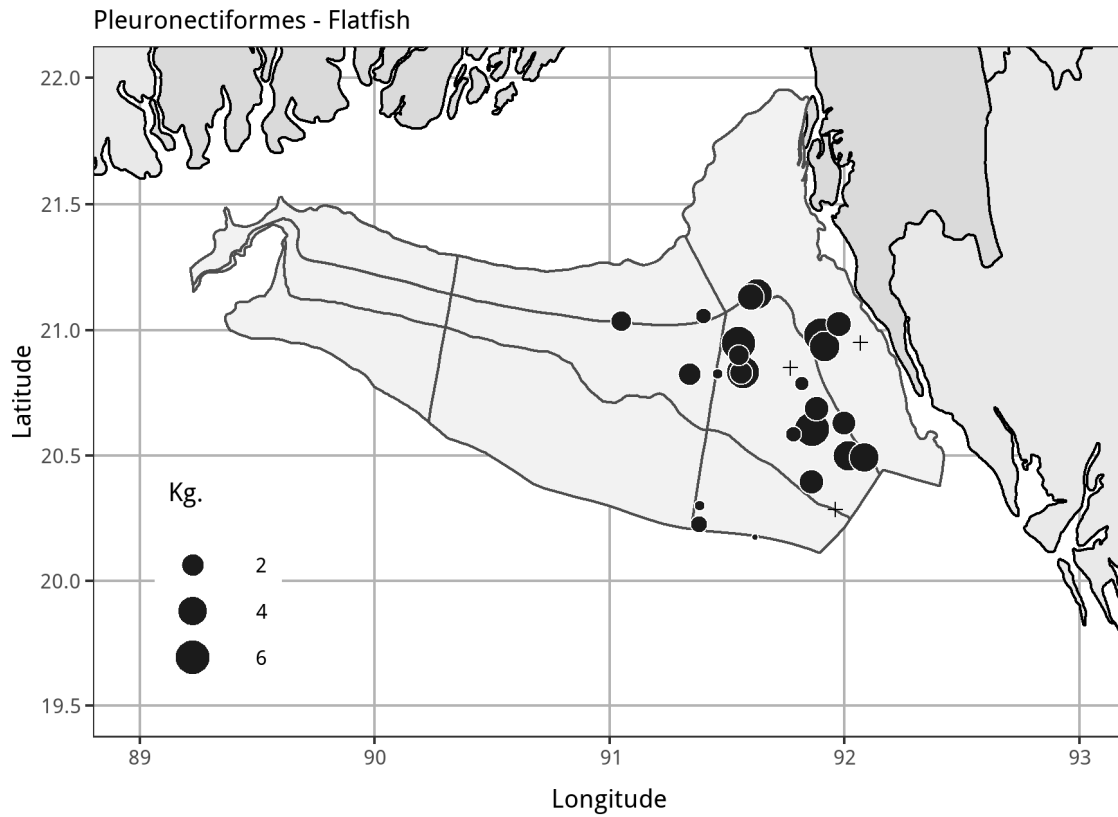


Stratum mean catch per tow (kg)

Stratum	Mean catch (kg)
10202	1.190
10203	3.317
10205	1.175
10206	2.750
10209	0.450

Overall mean catch per tow, stratum weighted.

Overall
2.67

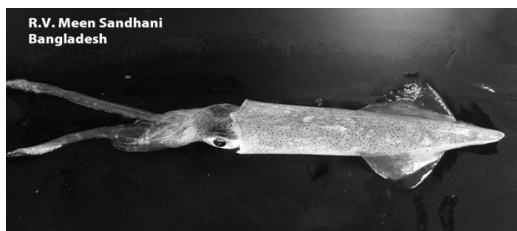


Species group: Squids and cuttlefish

Two major groups of cephalopods e.g. Squid and cuttle fish which are available in Bangladesh coast. Cephalopods are not exploited by any specialised fishing gear but a small quantity is being caught as by-catch of bottom trawl and shrimp trawl and even MSBN also. Now days it's are exportable item in different countries.

Species in group and number of catches

Scientific name	Occurences
Sepia sp.	22
Uroteuthis duvauceli	22

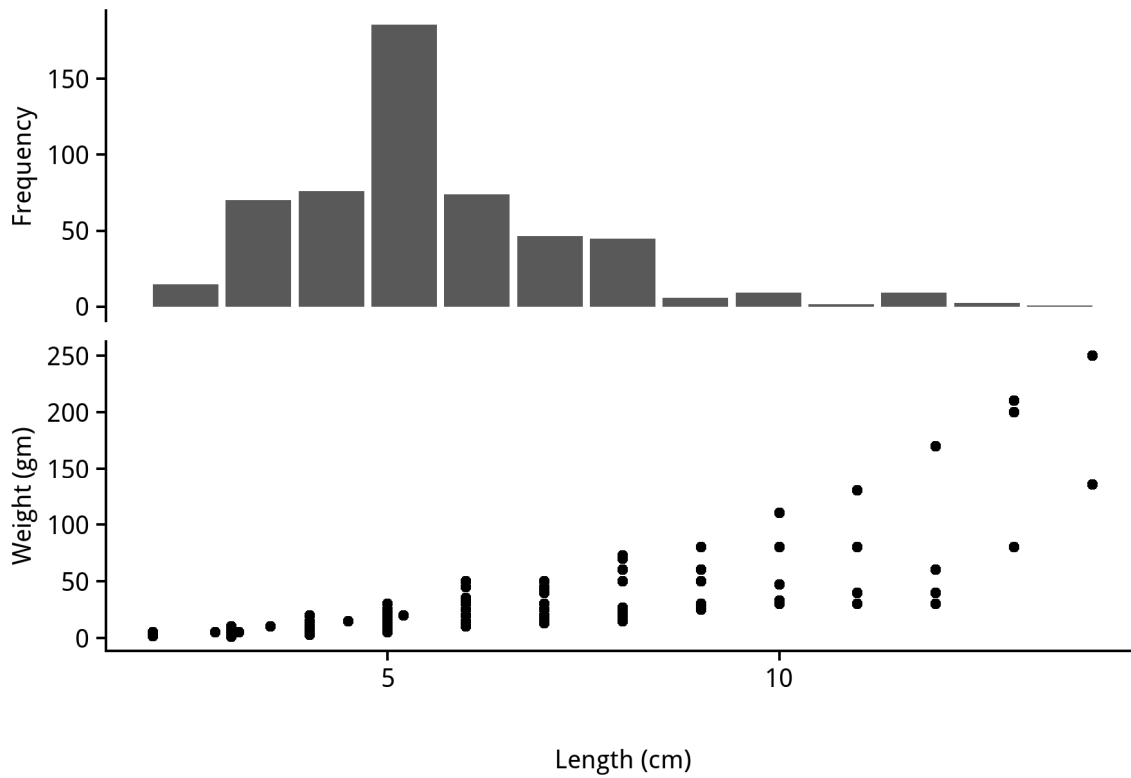
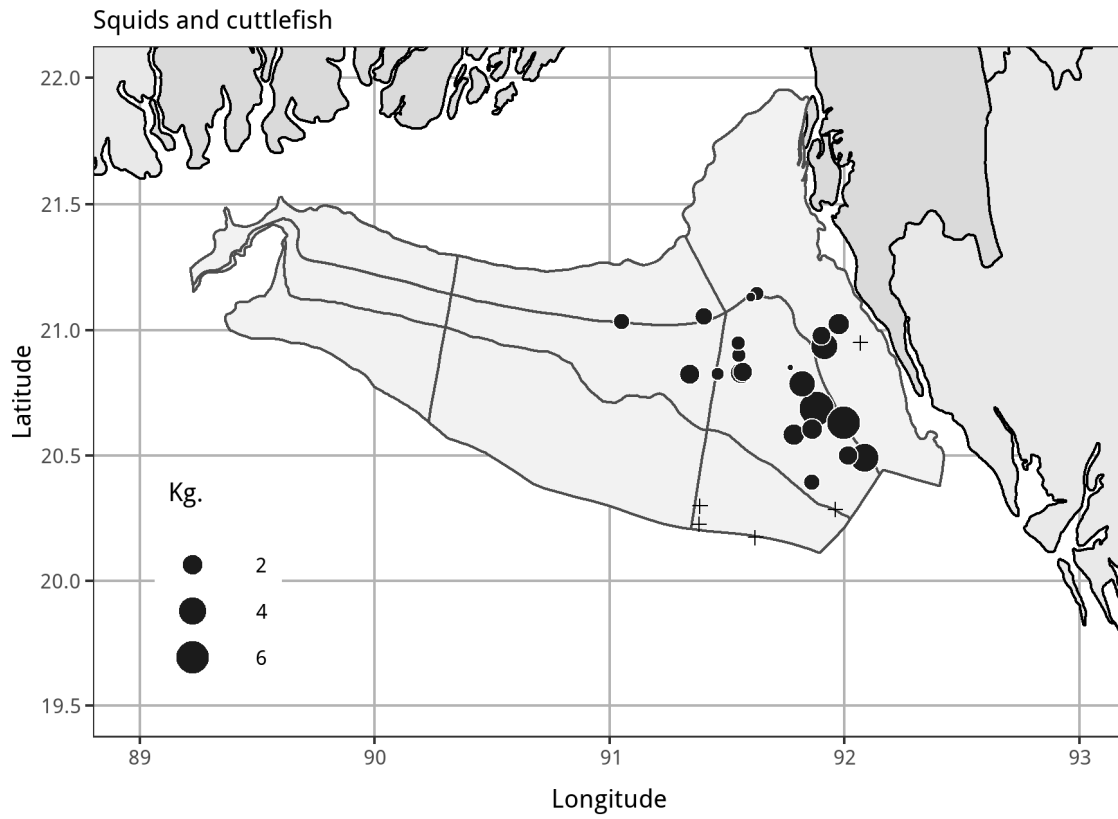


Stratum mean catch per tow (kg)

Stratum	Mean catch (kg)
10202	1.240
10203	2.364
10205	1.320
10206	1.982
10209	0.000

Overall mean catch per tow, stratum weighted.

Overall	1.942
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Species group: Trichiuridae - ribbonfish

Elongate and compressed ribbon-like trichiurid are benthopelagic inhabitants of coastal and often come near the surface at night. Ribbonfish export as dry, salted and fresh form in different countries. This carnivorous fish feeds on small fish and shrimp. Harvested by bottom trawl, set net and beach seines.

Species in group and number of catches

Scientific name	Occurrences
Lepturacanthus savala	15
Trichiurus lepturus	2

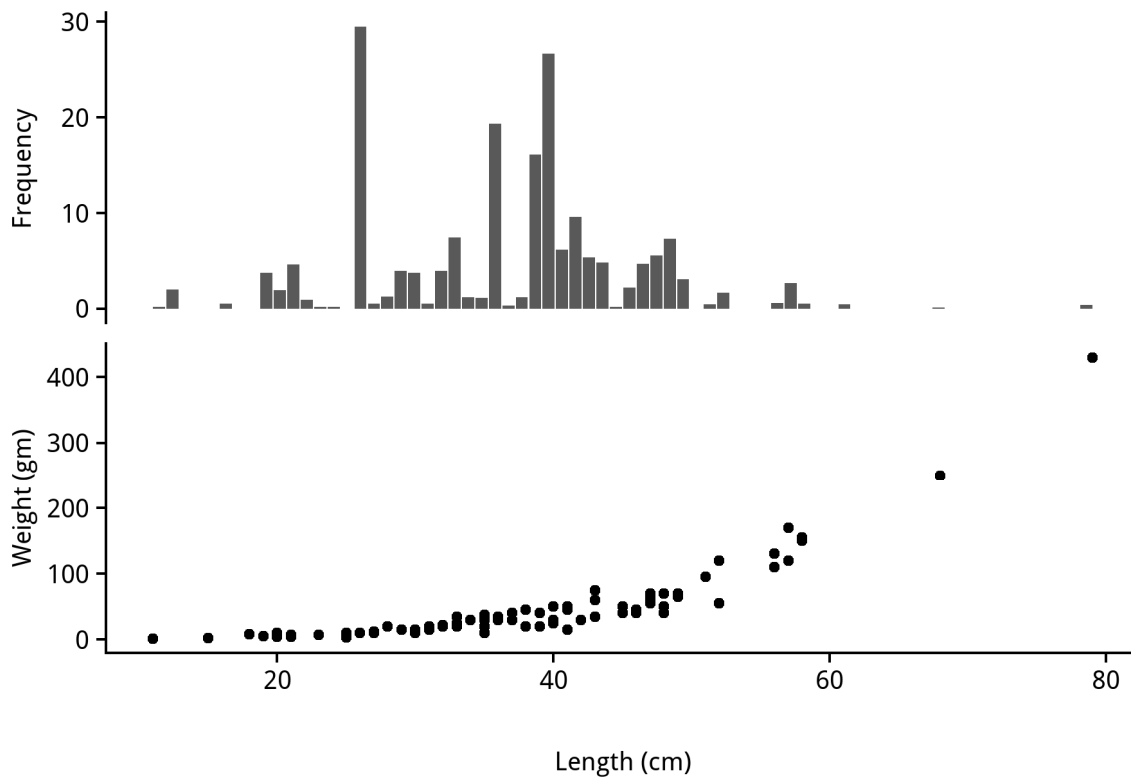
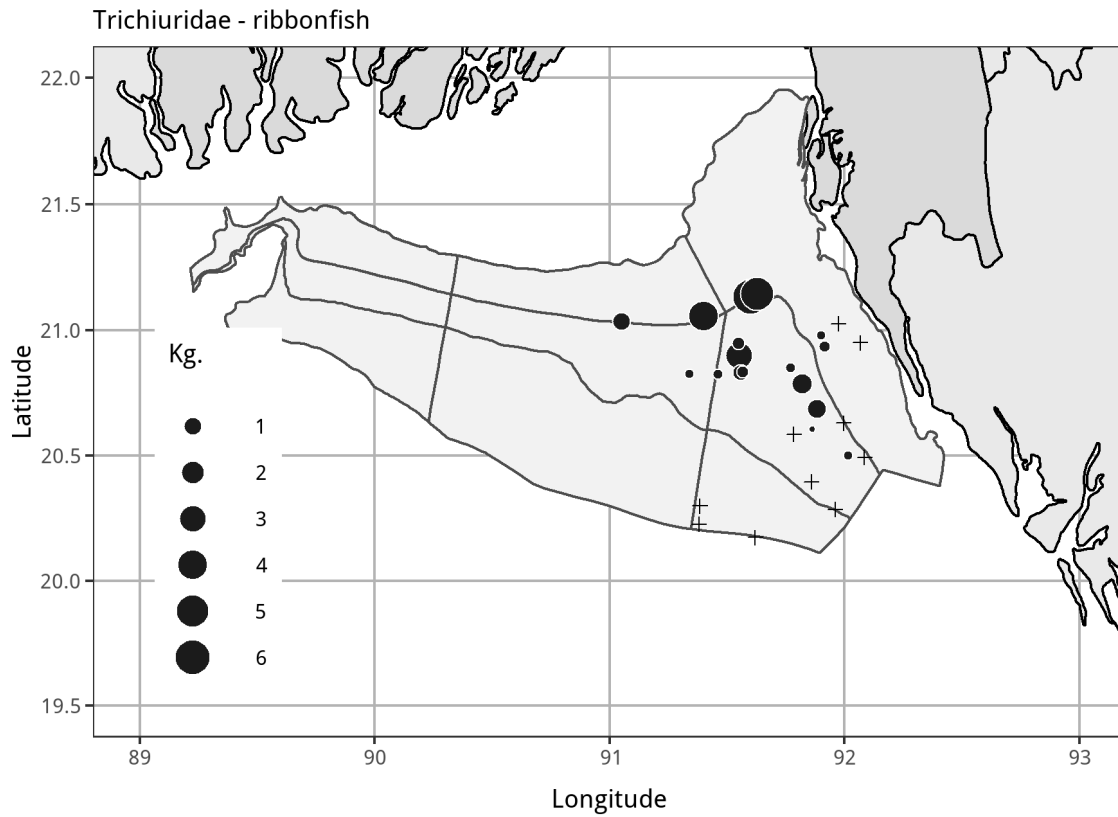


Stratum mean catch per tow (kg)

Stratum	Mean catch (kg)
10202	2.500
10203	0.945
10205	0.210
10206	0.984
10209	0.000

Overall mean catch per tow, stratum weighted.

Overall	0.946
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Species group: Other families - Synodontidae, Tetradontidae, Platycephalidae

These groups are used mainly as fish meal and poultry feed. Important as commercial fisheries sold fresh, dried and salted in the markets. Lizard fishes are exploited in sandy and muddy bottom areas in demersal fishing. Fisheries have no commercial importance of Puffer fish. The puffer fish must not be eaten because its skin and internal organs contain neurotoxin. Flathead fishes are minor commercial importance and caught by trawl over sandy and muddy bottom.

Species in group and number of catches

Scientific name	Occurences	Scientific name	Occurences
Grammoplites scaber	1	Saurida longimanus	3
Lagocephalus lunaris	13	Saurida tumbil	23
Onigocia pedinacula	2	Saurida undosquamis	1
Onigocia sp.	2	Tetraodon sp.	1
Platycephalus indicus	20	TETRAODONTIDAE	1

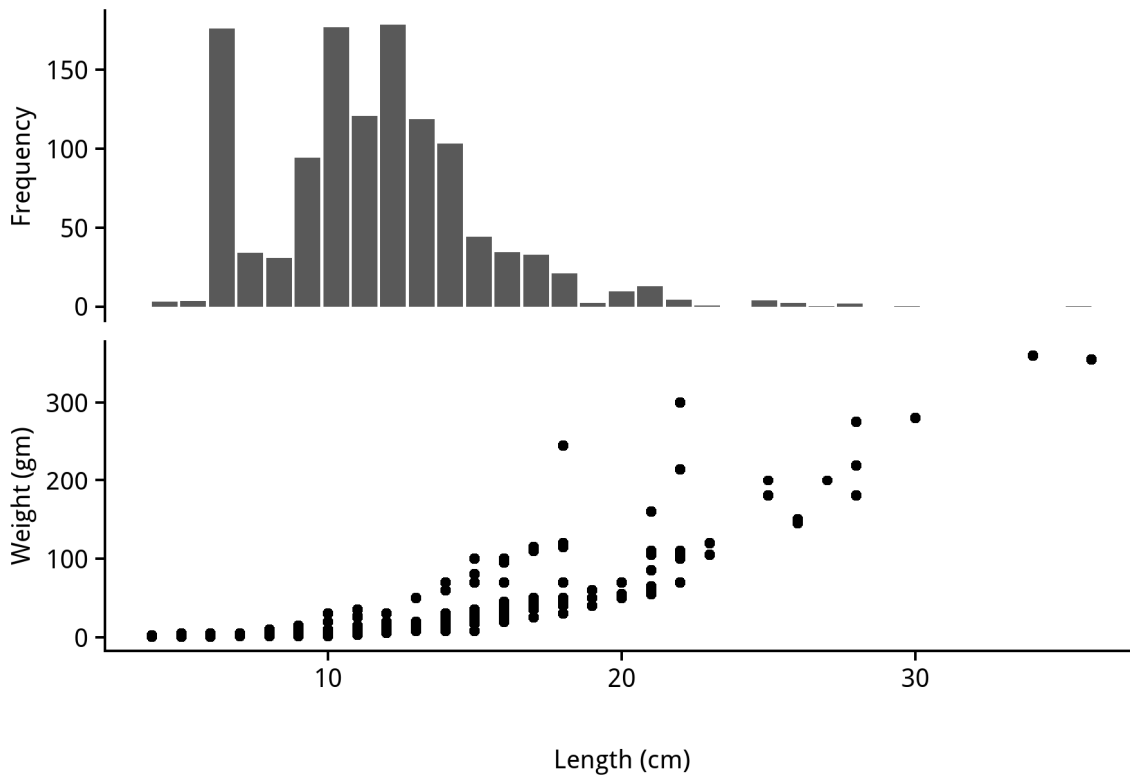
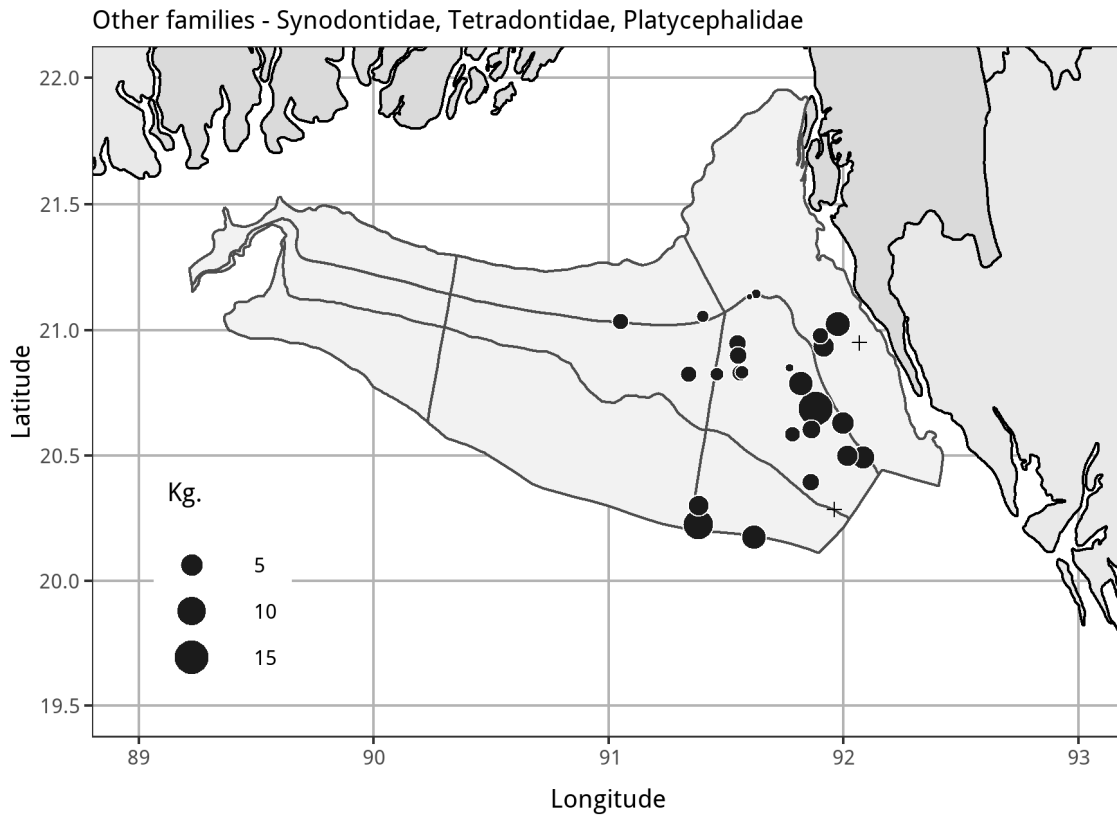


Stratum mean catch per tow (kg)

Stratum	Mean catch (kg)
10202	1.300
10203	3.029
10205	1.440
10206	3.295
10209	6.915

Overall mean catch per tow, stratum weighted.

Overall	
3.196	



ANNEX I: Sampling stations, Shrimp Survey #2016202

Stn	Stratum	Zone	Ground	Location (DD)		Location (DM)		Depth (m)	
				Long (E)	Lat (N)	Long (E)	Lat (N)	Min	Max
75	10201	Inshore	Swatch	89.416	21.391	89°25'	21°23'	10	40
76	10201	Inshore	Swatch	90.226	21.175	90°14'	21°11'	10	40
77	10201	Inshore	Swatch	89.763	21.392	89°46'	21°24'	10	40
78	10201	Inshore	Swatch	90.284	21.175	90°17'	21°11'	10	40
79	10201	Inshore	Swatch	89.301	21.283	89°18'	21°17'	10	40
80	10201	Inshore	Swatch	90.111	21.338	90°07'	21°20'	10	40
107	10201	Inshore	Swatch	90.168	21.230	90°10'	21°14'	10	40
116	10201	Inshore	Swatch	89.879	21.338	89°53'	21°20'	10	40
121	10201	Inshore	Swatch	90.168	21.338	90°10'	21°20'	10	40
128	10201	Inshore	Swatch	89.821	21.284	89°49'	21°17'	10	40
1	10202	Inshore	Middle	91.267	21.225	91°16'	21°14'	10	40
2	10202	Inshore	Middle	91.325	21.225	91°19'	21°13'	10	40
3	10202	Inshore	Middle	91.208	21.117	91°12'	21°07'	10	40
4	10202	Inshore	Middle	91.267	21.279	91°16'	21°17'	10	40
5	10202	Inshore	Middle	90.399	21.175	90°24'	21°11'	10	40
6	10202	Inshore	Middle	91.034	21.064	91°02'	21°04'	10	40
7	10202	Inshore	Middle	90.515	21.175	90°31'	21°10'	10	40
8	10202	Inshore	Middle	91.209	21.226	91°13'	21°14'	10	40
9	10202	Inshore	Middle	91.381	21.062	91°23'	21°04'	10	40
105	10202	Inshore	Middle	91.266	21.171	91°16'	21°10'	10	40
114	10202	Inshore	Middle	90.804	21.228	90°48'	21°14'	10	40
117	10202	Inshore	Middle	91.036	21.227	91°02'	21°14'	10	40
135	10202	Inshore	Middle	90.342	21.175	90°20'	21°11'	10	40
10	10203	Inshore	South	91.902	21.165	91°54'	21°10'	10	40
11	10203	Inshore	South	92.072	20.946	92°04'	20°57'	10	40
12	10203	Inshore	South	92.130	20.945	92°08'	20°57'	10	40
13	10203	Inshore	South	92.010	20.622	92°01'	20°37'	10	40
14	10203	Inshore	South	91.794	21.816	91°48'	21°49'	10	40
15	10203	Inshore	South	92.240	20.565	92°14'	20°34'	10	40
16	10203	Inshore	South	91.959	21.110	91°58'	21°07'	10	40
17	10203	Inshore	South	91.558	21.385	91°33'	21°23'	10	40
18	10203	Inshore	South	91.615	21.385	91°37'	21°23'	10	40
19	10203	Inshore	South	91.673	21.384	91°40'	21°23'	10	40
20	10203	Inshore	South	91.789	21.383	91°47'	21°23'	10	40
21	10203	Inshore	South	91.672	21.276	91°40'	21°17'	10	40
22	10203	Inshore	South	91.498	21.223	91°30'	21°13'	10	40
23	10203	Inshore	South	91.676	21.655	91°41'	21°39'	10	40
24	10203	Inshore	South	91.900	21.002	91°54'	21°00'	10	40
25	10203	Inshore	South	91.558	21.439	91°33'	21°26'	10	40
26	10203	Inshore	South	91.903	21.273	91°54'	21°16'	10	40
27	10203	Inshore	South	91.957	21.002	91°57'	21°00'	10	40
28	10203	Inshore	South	91.729	21.221	91°44'	21°13'	10	40
29	10203	Inshore	South	91.499	21.332	91°30'	21°20'	10	40
30	10203	Inshore	South	91.613	21.168	91°37'	21°10'	10	40

ANNEX I: Sampling stations, Shrimp Survey #2016202

Stn	Stratum	Zone	Ground	Location (DD)		Location (DM)		Depth (m)	
				Long (E)	Lat (N)	Long (E)	Lat (N)	Min	Max
31	10203	Inshore	South	91.676	21.601	91°41'	21°36'	10	40
32	10203	Inshore	South	91.899	20.948	91°54'	20°57'	10	40
102	10203	Inshore	South	91.737	21.871	91°44'	21°52'	10	40
127	10203	Inshore	South	91.443	21.495	91°27'	21°30'	10	40
134	10203	Inshore	South	91.555	21.114	91°33'	21°07'	10	40
141	10203	Inshore	South	92.182	20.566	92°11'	20°34'	10	40
142	10203	Inshore	South	92.014	20.893	92°01'	20°54'	10	40
33	10204	Midshore	Swatch	90.168	21.176	90°10'	21°11'	40	80
34	10204	Midshore	Swatch	89.937	21.230	89°56'	21°14'	40	80
35	10204	Midshore	Swatch	90.110	21.067	90°07'	21°04'	40	80
36	10204	Midshore	Swatch	89.764	21.175	89°46'	21°11'	40	80
120	10204	Midshore	Swatch	89.995	21.121	89°60'	21°07'	40	80
126	10204	Midshore	Swatch	89.648	21.284	89°39'	21°17'	40	80
130	10204	Midshore	Swatch	89.821	21.176	89°49'	21°11'	40	80
131	10204	Midshore	Swatch	89.995	21.176	89°60'	21°11'	40	80
53	10205	Midshore	Middle	90.688	21.012	90°41'	21°01'	40	80
54	10205	Midshore	Middle	91.321	20.845	91°19'	20°51'	40	80
55	10205	Midshore	Middle	91.090	20.793	91°05'	20°48'	40	80
56	10205	Midshore	Middle	90.803	21.011	90°48'	21°01'	40	80
57	10205	Midshore	Middle	91.437	20.844	91°26'	20°51'	40	80
58	10205	Midshore	Middle	90.342	21.121	90°20'	21°07'	40	80
59	10205	Midshore	Middle	91.206	20.792	91°12'	20°48'	40	80
60	10205	Midshore	Middle	91.147	20.738	91°09'	20°44'	40	80
61	10205	Midshore	Middle	91.206	20.900	91°12'	20°54'	40	80
62	10205	Midshore	Middle	91.378	20.736	91°23'	20°44'	40	80
63	10205	Midshore	Middle	90.861	20.957	90°52'	20°57'	40	80
106	10205	Midshore	Middle	91.207	21.009	91°12'	21°01'	40	80
112	10205	Midshore	Middle	91.377	20.628	91°23'	20°38'	40	80
118	10205	Midshore	Middle	91.264	20.900	91°16'	20°54'	40	80
139	10205	Midshore	Middle	90.341	21.013	90°20'	21°07'	40	80
37	10206	Midshore	South	91.669	21.005	91°40'	21°00'	40	80
38	10206	Midshore	South	91.552	20.843	91°33'	20°51'	40	80
39	10206	Midshore	South	91.779	20.570	91°47'	20°34'	40	80
40	10206	Midshore	South	91.837	20.624	91°50'	20°37'	40	80
41	10206	Midshore	South	91.612	21.114	91°37'	21°07'	40	80
42	10206	Midshore	South	91.553	20.952	91°33'	20°57'	40	80
43	10206	Midshore	South	91.782	20.841	91°47'	20°50'	40	80
44	10206	Midshore	South	92.009	20.513	92°01'	20°31'	40	80
45	10206	Midshore	South	92.066	20.513	92°04'	20°31'	40	80
46	10206	Midshore	South	91.948	20.297	91°57'	20°18'	40	80
47	10206	Midshore	South	91.839	20.786	91°50'	20°47'	40	80
48	10206	Midshore	South	91.552	20.898	91°33'	20°54'	40	80
49	10206	Midshore	South	91.835	20.407	91°50'	20°24'	40	80

ANNEX I: Sampling stations, Shrimp Survey #2016202

Stn	Stratum	Zone	Ground	Location (DD)		Location (DM)		Depth (m)	
				Long (E)	Lat (N)	Long (E)	Lat (N)	Min	Max
101	10206	Midshore	South	92.123	20.458	92°07'	20°27'	40	80
113	10206	Midshore	South	91.550	20.627	91°33'	20°38'	40	80
123	10206	Midshore	South	91.610	20.897	91°37'	20°54'	40	80
132	10206	Midshore	South	91.897	20.786	91°54'	20°47'	40	80
138	10206	Midshore	South	91.896	20.677	91°54'	20°41'	40	80
72	10207	Offshore	Swatch	89.591	21.067	89°35'	21°04'	80	100
73	10207	Offshore	Swatch	89.475	21.012	89°29'	21°01'	80	100
74	10207	Offshore	Swatch	89.879	21.013	89°53'	21°01'	80	100
75	10207	Offshore	Swatch	90.226	20.850	90°14'	20°51'	80	100
150	10207	Offshore	Swatch	90.225	20.796	90°14'	20°48'	80	100
151	10207	Offshore	Swatch	89.706	21.067	89°42'	21°04'	80	100
152	10207	Offshore	Swatch	89.648	21.013	89°39'	21°01'	80	100
64	10208	Offshore	Middle	90.801	20.523	90°48'	20°31'	80	100
65	10208	Offshore	Middle	90.858	20.523	90°51'	20°31'	80	100
66	10208	Offshore	Middle	90.456	20.796	90°27'	20°48'	80	100
67	10208	Offshore	Middle	90.972	20.360	90°58'	20°22'	80	100
68	10208	Offshore	Middle	91.205	20.684	91°12'	20°41'	80	100
69	10208	Offshore	Middle	91.202	20.304	91°12'	20°18'	80	100
70	10208	Offshore	Middle	90.744	20.740	90°45'	20°44'	80	100
71	10208	Offshore	Middle	90.513	20.524	90°31'	20°31'	80	100
103	10208	Offshore	Middle	90.859	20.740	90°52'	20°44'	80	100
104	10208	Offshore	Middle	90.628	20.632	90°38'	20°38'	80	100
108	10208	Offshore	Middle	91.318	20.412	91°19'	20°25'	80	100
109	10208	Offshore	Middle	91.146	20.521	91°09'	20°31'	80	100
50	10209	Offshore	South	91.374	20.303	91°22'	20°18'	80	100
51	10209	Offshore	South	91.603	20.192	91°36'	20°12'	80	100
52	10209	Offshore	South	91.374	20.249	91°22'	20°15'	80	100
110	10209	Offshore	South	91.833	20.244	91°50'	20°15'	80	100
115	10209	Offshore	South	91.775	20.191	91°46'	20°11'	80	100
137	10209	Offshore	South	91.663	20.463	91°40'	20°28'	80	100
140	10209	Offshore	South	91.489	20.302	91°29'	20°18'	80	100

Abbreviations:

DD = Decimal degree notation

DM = Degree Minute notation

E = East

N = North

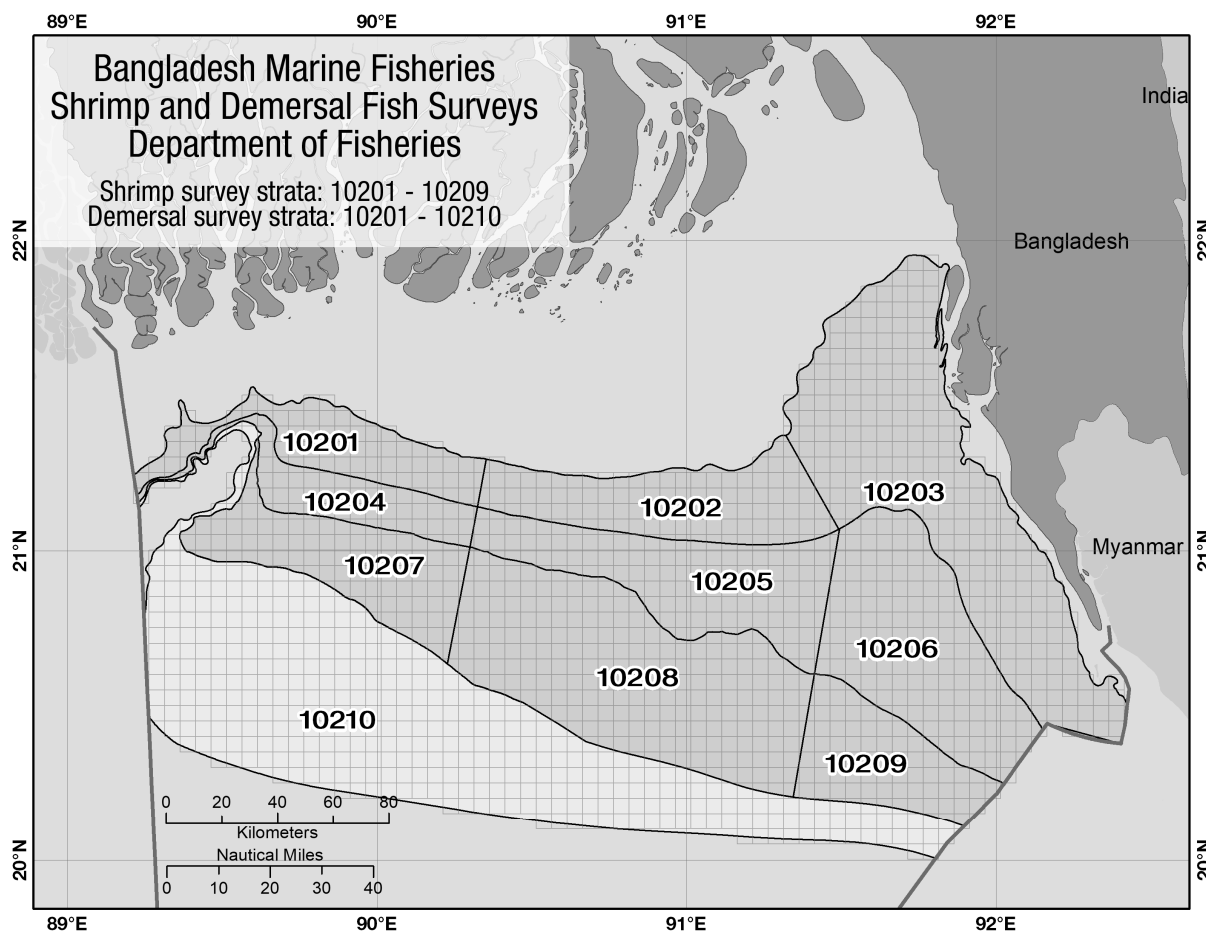
m = meter



Survey Annual Report
DoF Survey Working Group
12 December, 2018

Survey Operations

The R/V Meen Shandhani conducts annual shrimp and demersal trawl surveys. Each survey required approximately one month at-sea and samples approximately 80 pre-selected stations on the Bangladesh continental shelf. Survey stations are allocated according to a depth and area stratification plan. Shrimp surveys have 9 strata within 10 and 100 m depth range. The demersal fish surveys include the same 9 strata as the shrimp plus 1 more stratum for the 100 to 200 m range.



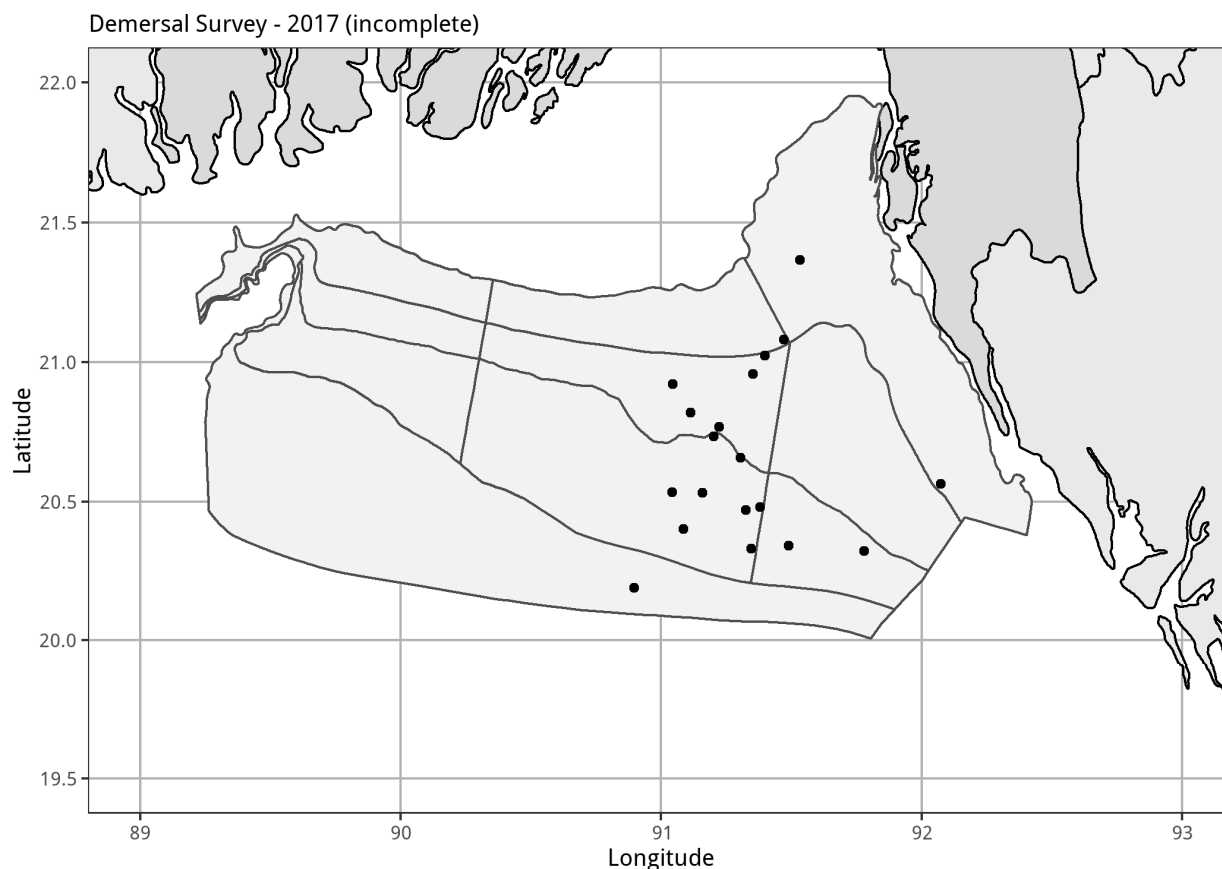
Trawl survey strata

The number of stations allocated to each stratum is dependent on the area (km²), which is used to calculate the stratum weight as the proportion of the total area in a given stratum.

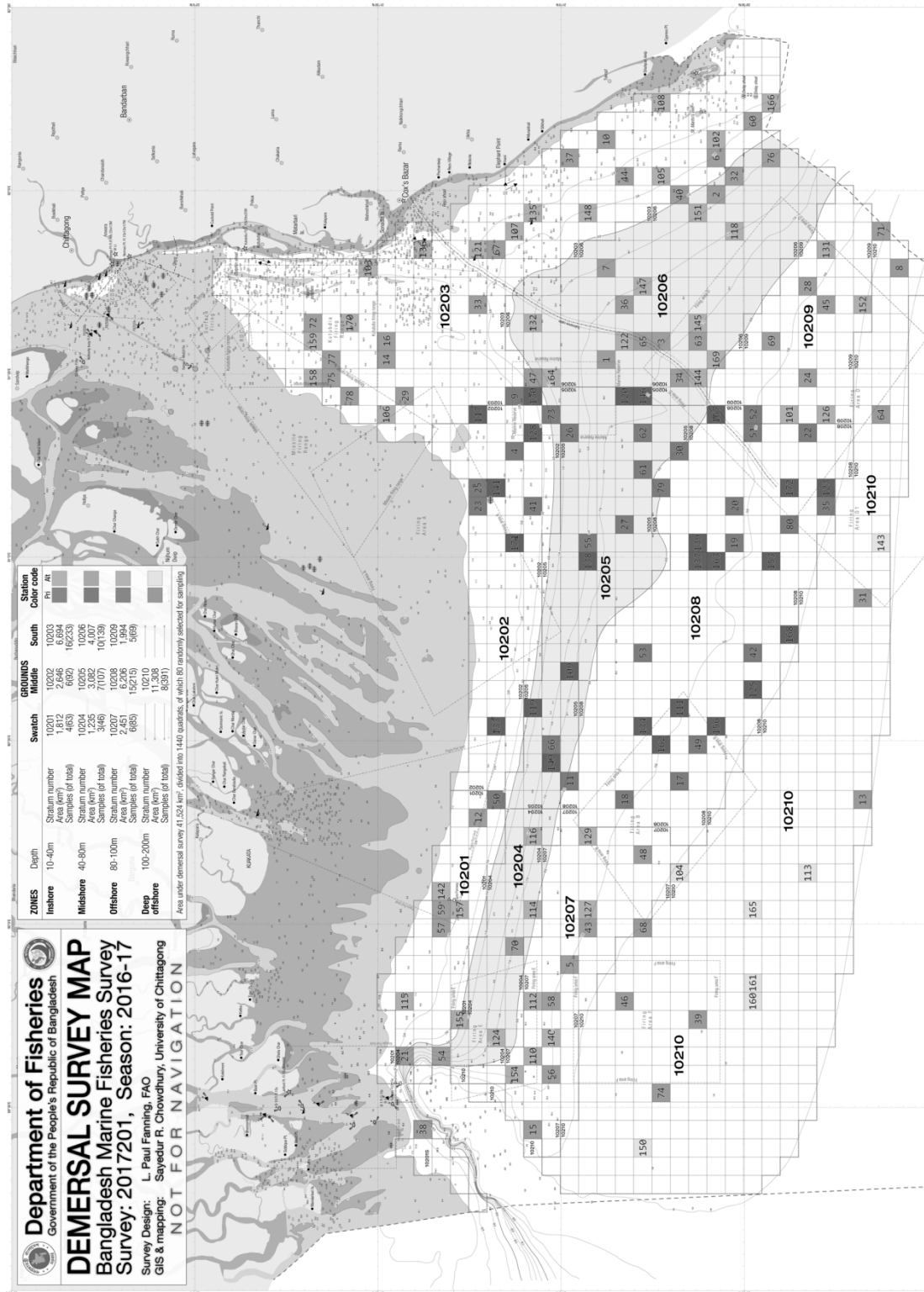
Stratum	Name	Depth (m)	Area (km ²)	Weight	Sets completed*
10201	Swatch Inshore	10 - 40	1814	0.043	0
10202	Middle Inshore	10 - 40	2681	0.064	0
10203	South Inshore	10 - 40	6833	0.163	2
10204	Swatch Midshore	40 - 80	1350	0.032	0
10205	Middle Midshore	40 - 80	3180	0.076	6
10206	South Midshore	40 - 80	3978	0.095	1
10207	Swatch Offshore	80 - 100	2522	0.060	0
10208	Middle Offshore	80 - 100	6083	0.145	8
10209	South Offshore	80 - 100	2025	0.048	1
10210	Deep Offshore	100-200	11376	0.272	1

*The sets completed column is the actual number of trawl samples taken in the survey.

This was the second survey of the 2016-17 survey season. This survey could not be completed as planned due to delay in starting the survey caused by various disruptions in the earlier shrimp survey 2016202. Soon after the starting weather became unfavorable for the continuing survey operations, and the survey season was called off.



The survey locations plotted are the starting locations of valid fishing stations.



Demersal Survey Map 2017201

Species group: Penaeid shrimps

Majority of penaeid shrimp species that are presently exploited are common to both in Artisanal and Industrial fisheries. The artisanal fishery harvest pre-adult, post juveniles, juveniles and even the post larvae (PL) but the industrial fishery harvest mostly the adult phase of penaeid shrimp. Most of the species are commercially important. The highest contribution in the total production is made by *Metapenaeus monoceros* the brown shrimp.

Species in group and number of catches

Scientific name	Occurences
Metapenaeus affinis	1
Metapenaeus monoceros	1

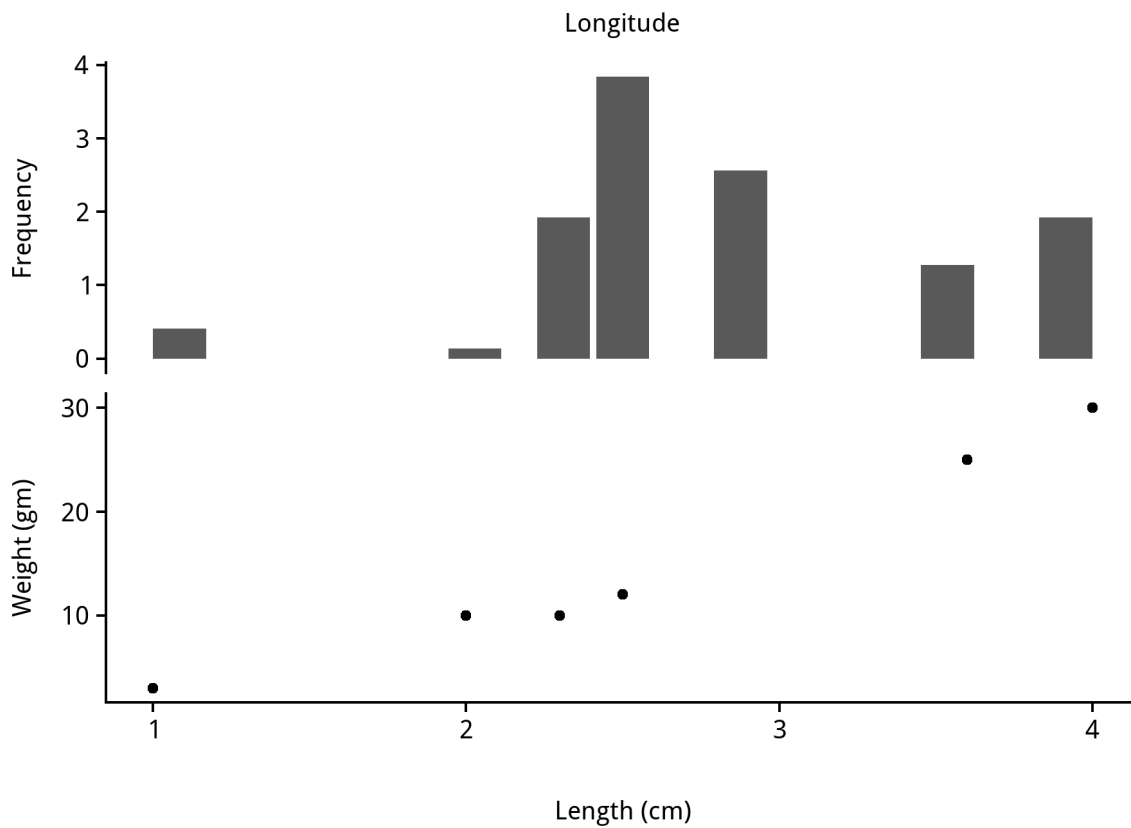
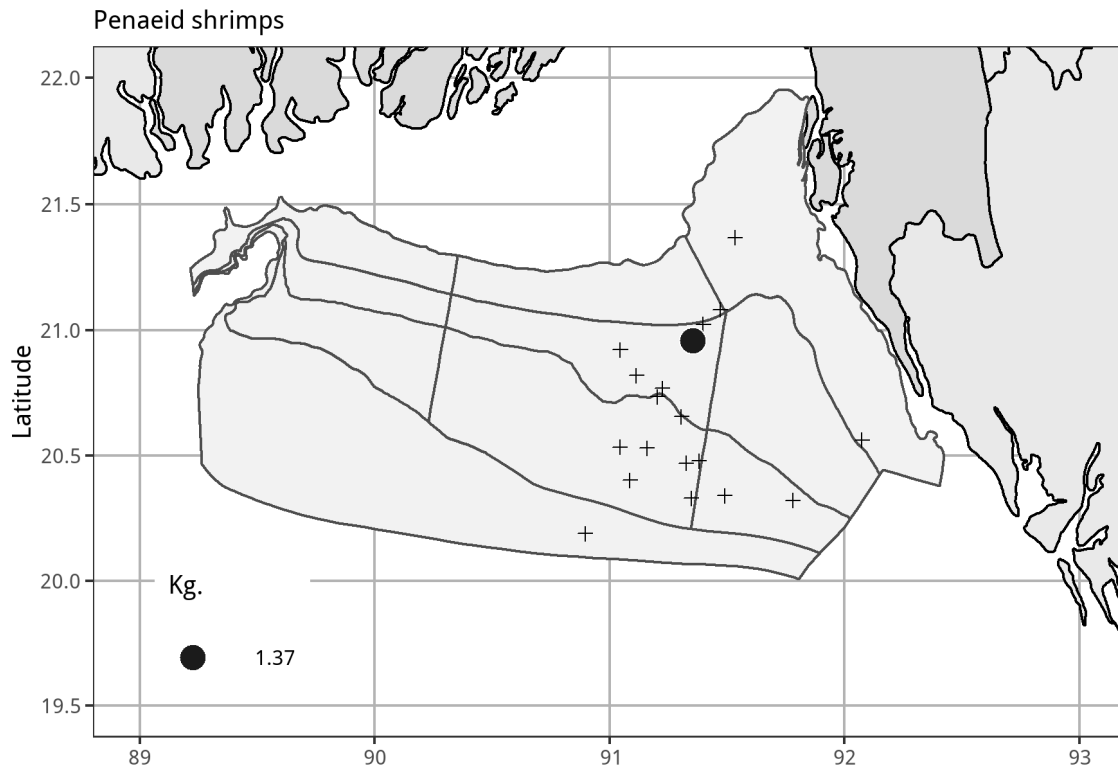


Stratum mean catch per tow (kg)

Stratum	Mean catch (kg)
10203	0.000
10205	0.228
10206	0.000
10208	0.000
10209	0.000
10210	0.000

Overall mean catch per tow, stratum weighted.

Overall	0.044
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Species group: Non-penaeid shrimps

Non-penaeid shrimp are found mainly coastal areas, brackish water and estuaries and caught in artisanal gears (ESBN and MSBN) in different stages of their life cycle. Most of them are economically important in our local market. Some of non-penaeid found in dipper water and harvest by shrimp trawlers. Some non-penaeid shrimp *Squilla mantis* the mantis shrimp are used as poultry feed and fish meal.

Species in group and number of catches

Scientific name	Occurences
Solenocera crassicornis	1

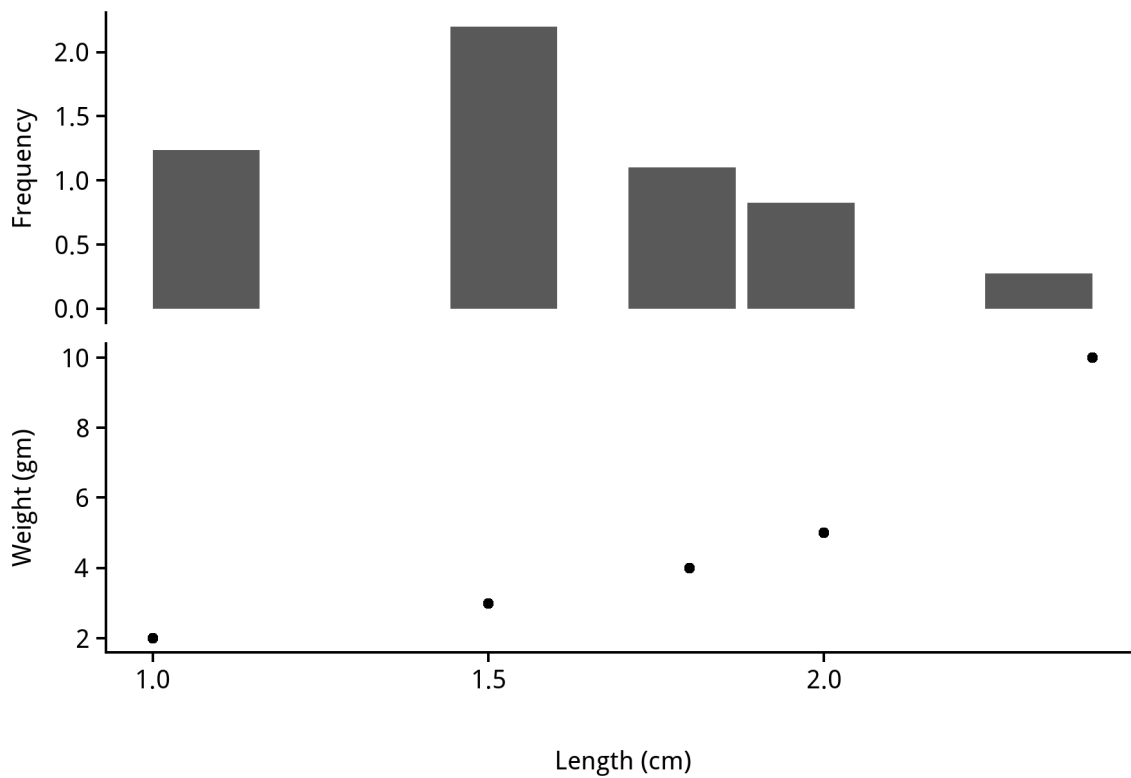
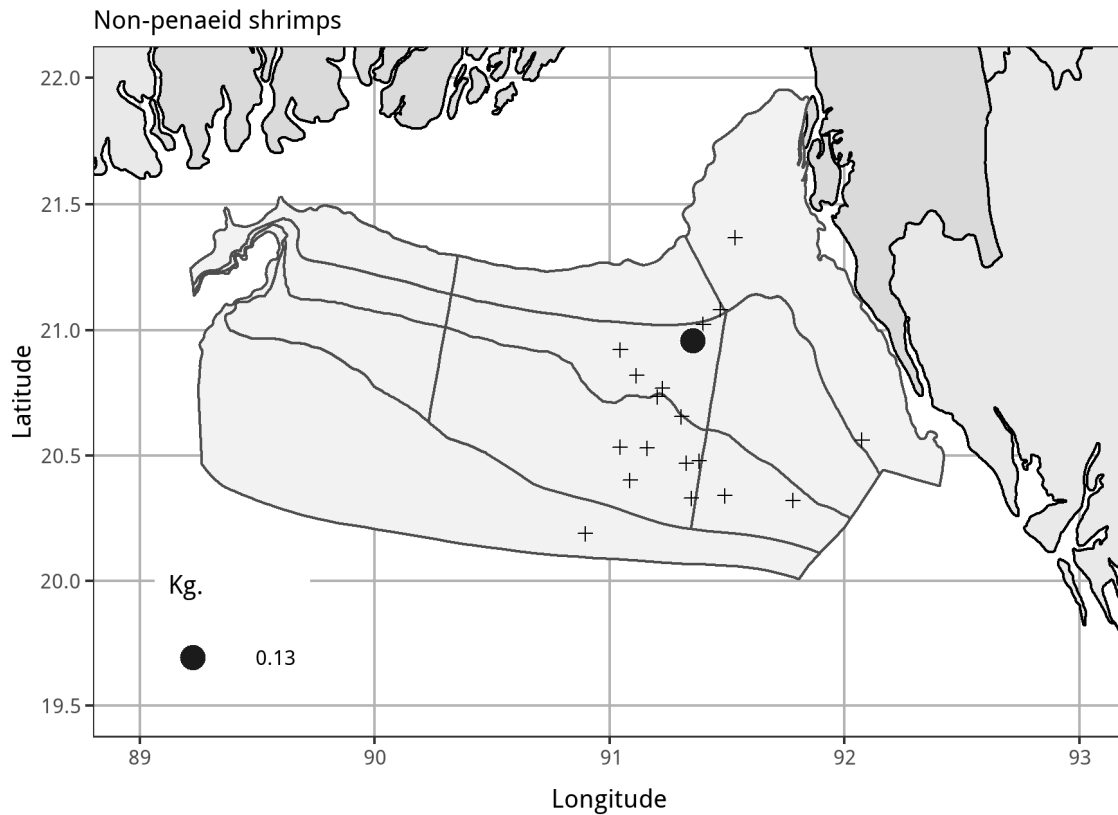


Stratum mean catch per tow (kg)

Stratum	Mean catch (kg)
10203	0.000
10205	0.022
10206	0.000
10208	0.000
10209	0.000
10210	0.000

Overall mean catch per tow, stratum weighted.

Overall	0.004
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Species group: Small pelagics - Clupeidae and Pristigasteridae

Shads, Anchovies, Sardines and Herring which lie under the family of Clupeidae and Pristigasteridae are the most significant fish group of seawater of Bangladesh. They are commercially important and abundantly available but exploited as by catch of Small Mesh Drift gill Net, Set Bag Net and commercial trawl fishery. Among these groups *Hilsa ilisha* the National fish (Hilsa) is the dominant species both inland and marine catch.

Species in group and number of catches

Scientific name	Occurences	Scientific name	Occurences
Anodontostoma chacunda	1	Sardinella fimbriata	3
Dussumieria acuta	3	Tenualosa ilisha	2
Ilisha filigera	4	Tenualosa toli	2

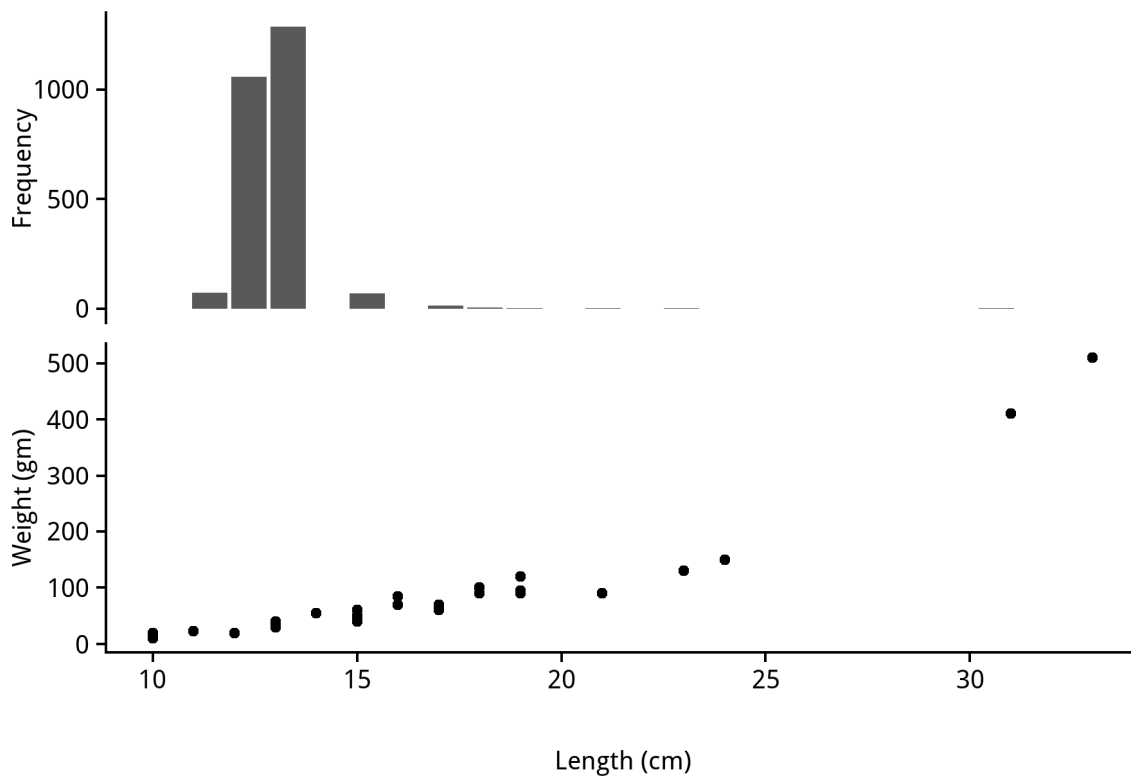
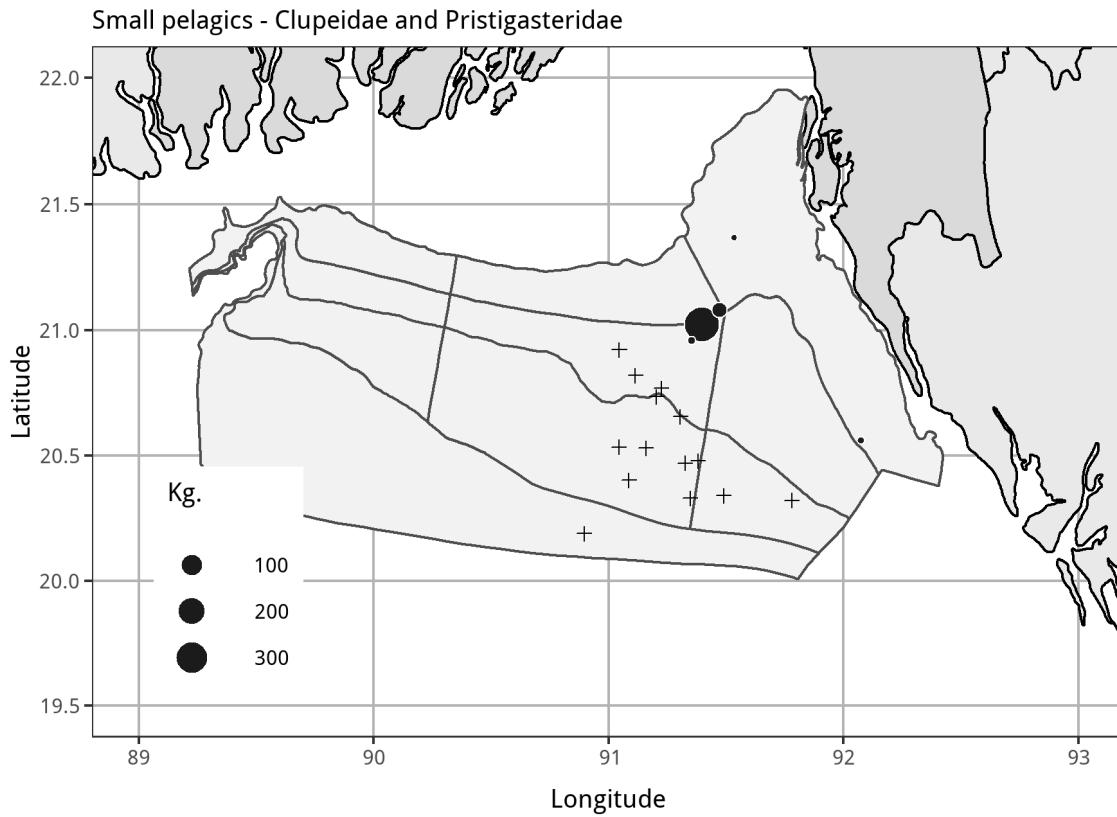


Stratum mean catch per tow (kg)

Stratum	Mean catch (kg)
10203	17.445
10205	63.908
10206	0.630
10208	0.000
10209	0.000
10210	0.000

Overall mean catch per tow, stratum weighted.

Overall
14.782



Species group: Carangidae - Jacks and scads

Carangids are commercially important but exploited as by-catch or incidental catch of gill net, mid water trawl, demersal trawl and shrimp trawl though these groups are mostly pelagic. Within this group *Megalaspis cordyla* the Hard tail Scad and *Parastromateus niger* the Black pomfret are abundantly available in our territory.

Species in group and number of catches

Scientific name	Occurences	Scientific name	Occurences
CARANGIDAE	1	Decapterus russelli	2
Carangoides sp.	4	Megalaspis cordyla	3
Decapterus kurroides	3	Parastromateus niger	1
Decapterus macrosoma	1	Selar crumenophthalmus	1
Decapterus maruadsi	1		

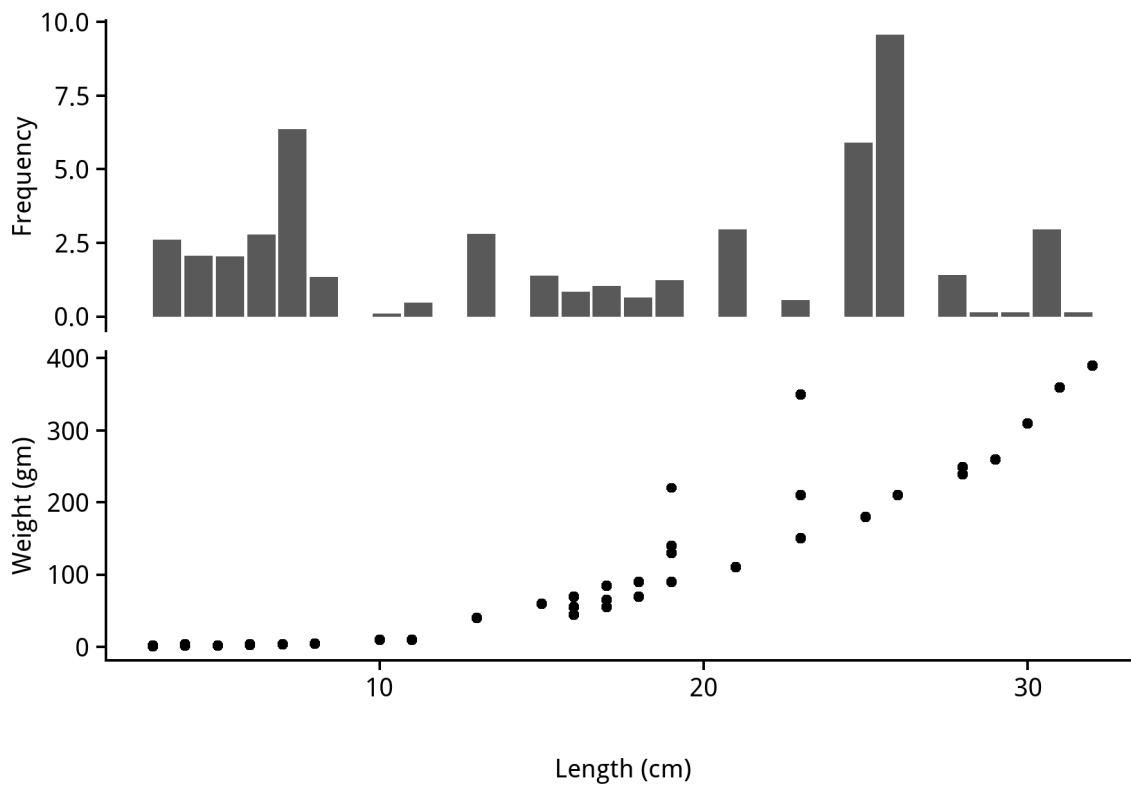
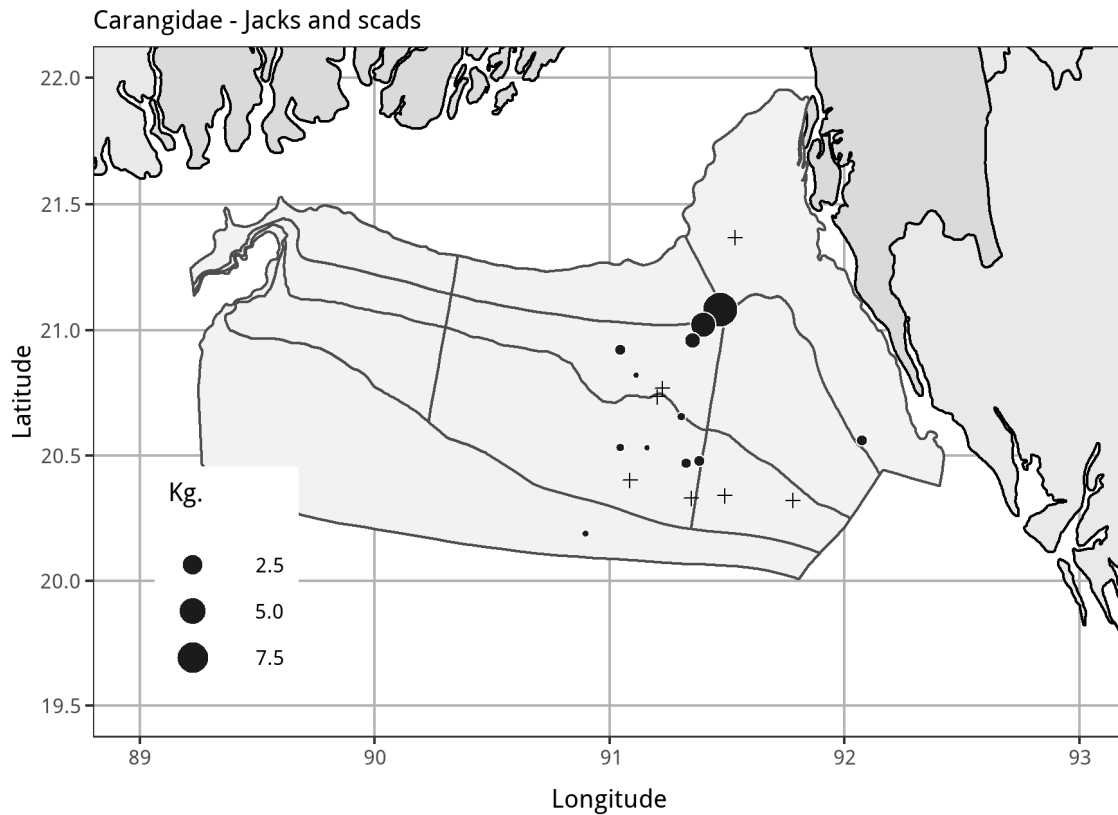


Stratum mean catch per tow (kg)

Stratum	Mean catch (kg)
10203	4.875
10205	0.917
10206	0.250
10208	0.069
10209	0.000
10210	0.015

Overall mean catch per tow, stratum weighted.

Overall
0.897

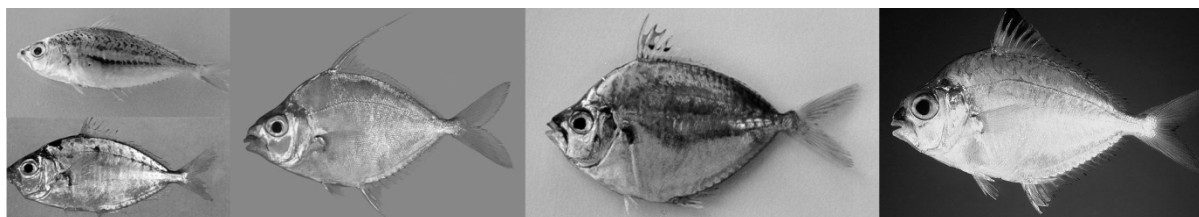


Species group: Leiognathidae - Ponyfish

Leiognathids or pony fish the small sized fishes consume locally and used as poultry feed and fish meal as cheap price. This group are abundantly caught in Artisanal fishing gear (MSBN), demersal trawl and shrimp trawl.

Species in group and number of catches

Scientific name	Occurences
Gazza minuta	3
Leiognathus bindus	1
Leiognathus brevisrostris	4
Secutor ruconius	1

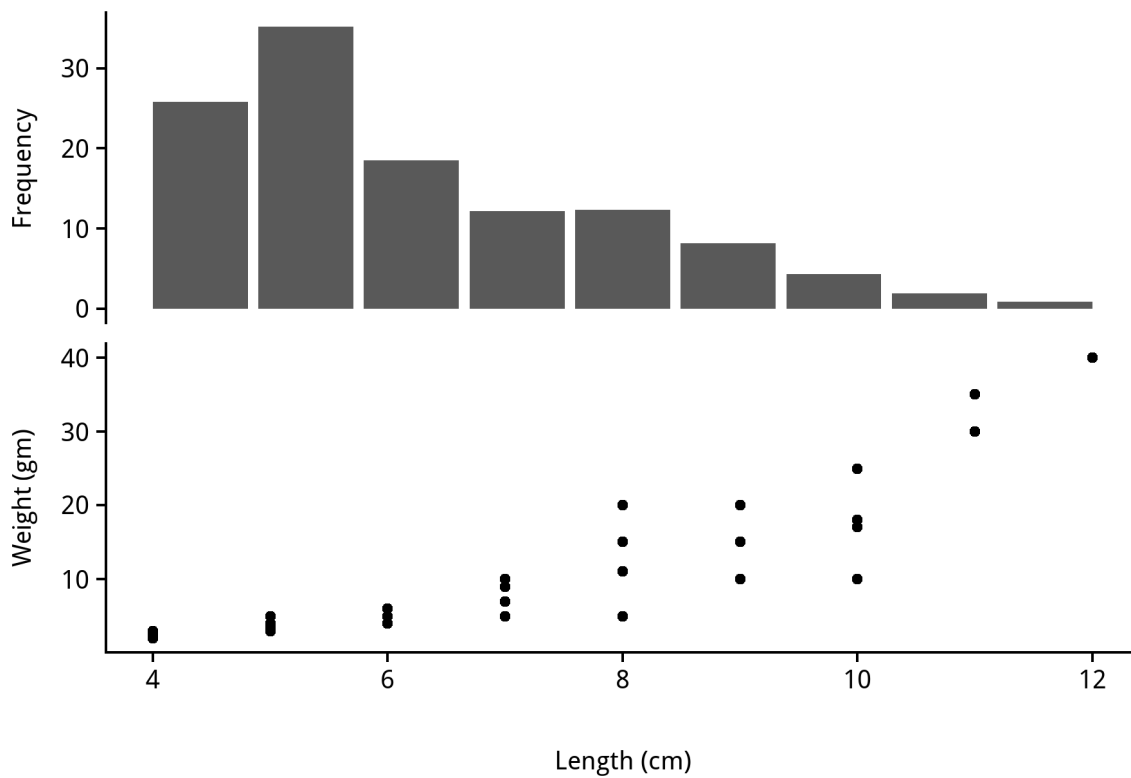
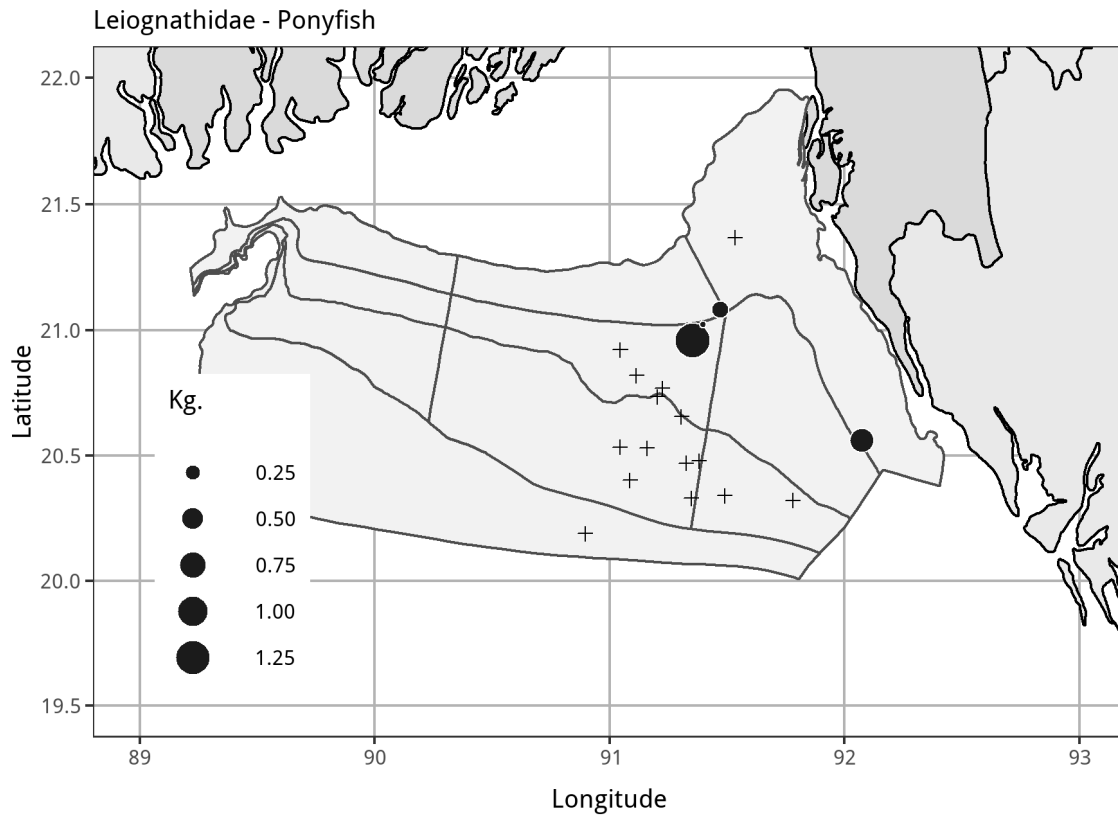


Stratum mean catch per tow (kg)

Stratum	Mean catch (kg)
10203	0.155
10205	0.248
10206	0.600
10208	0.000
10209	0.000
10210	0.000

Overall mean catch per tow, stratum weighted.

Overall	0.094
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Species group: Mullidae - Goatfish

Mullidae – Goatfish, the small sized fish is consumed locally and harvest mainly in mid water trawl and found significantly in coral reef areas.

Species in group and number of catches

Scientific name	Occurences
Upeneus sulphureus	1
Upeneus supravitatus	1

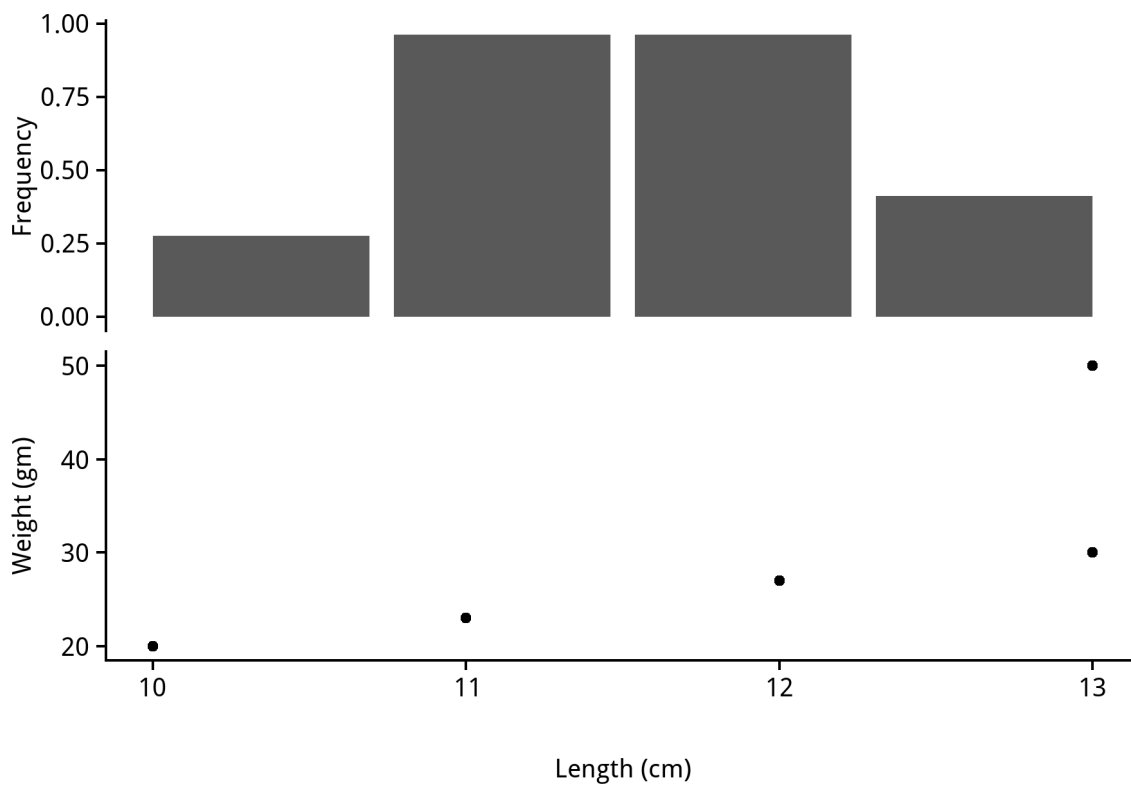
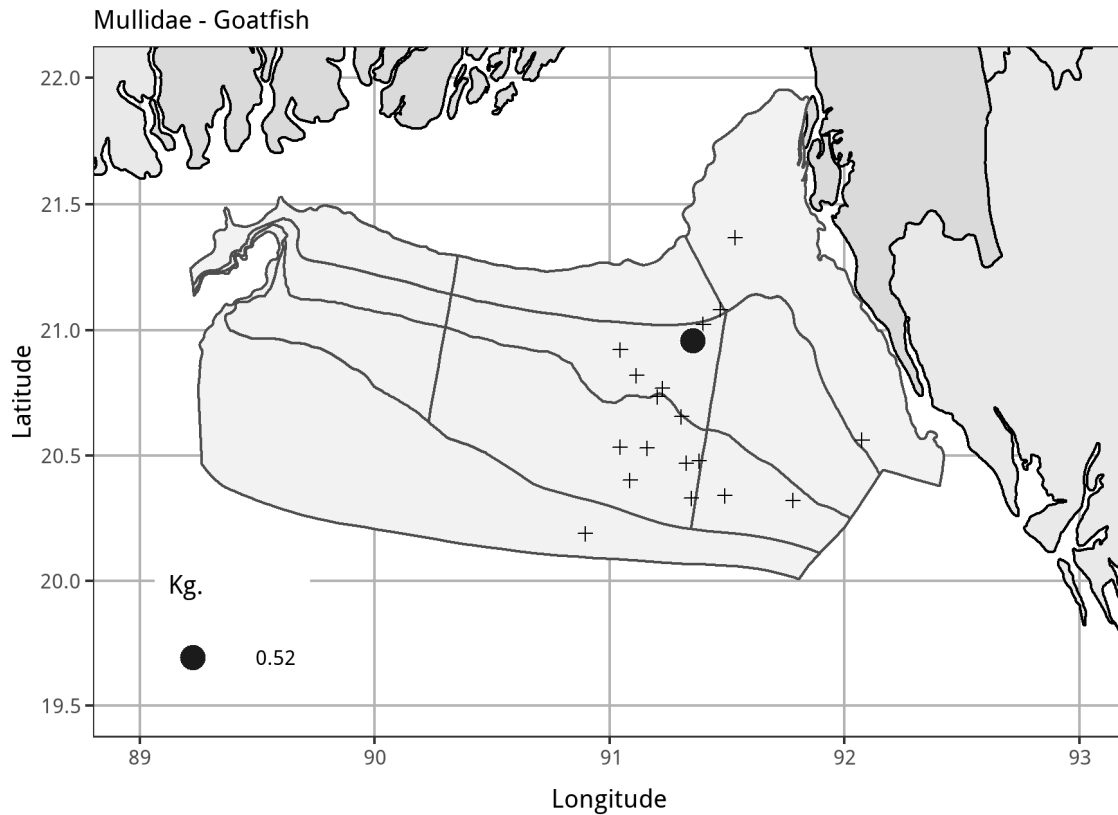


Stratum mean catch per tow (kg)

Stratum	Mean catch (kg)
10203	0.000
10205	0.087
10206	0.000
10208	0.000
10209	0.000
10210	0.000

Overall mean catch per tow, stratum weighted.

Overall	0.017
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Species group: Nemipteridae - Threadfin breams

Threadfin breams are commercially important fishes and considered as good fish. This are mainly caught bottom trawl, gill net and long lines. This fishes are occurring in muddy and sandy bottom and known to control of population of crustaceans and small fishes in the marine ecosystem.

Species in group and number of catches

Scientific name	Occurences
Nemipterus japonicus	1
Parascolopsis aspinosa	1

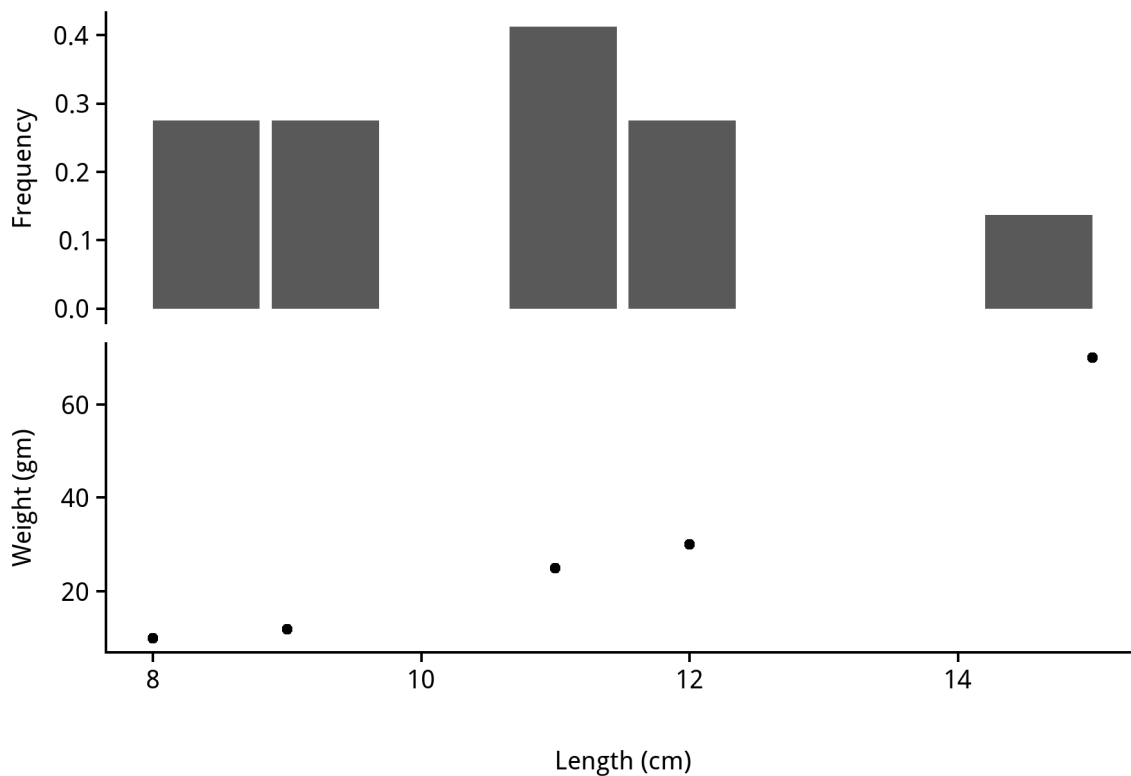
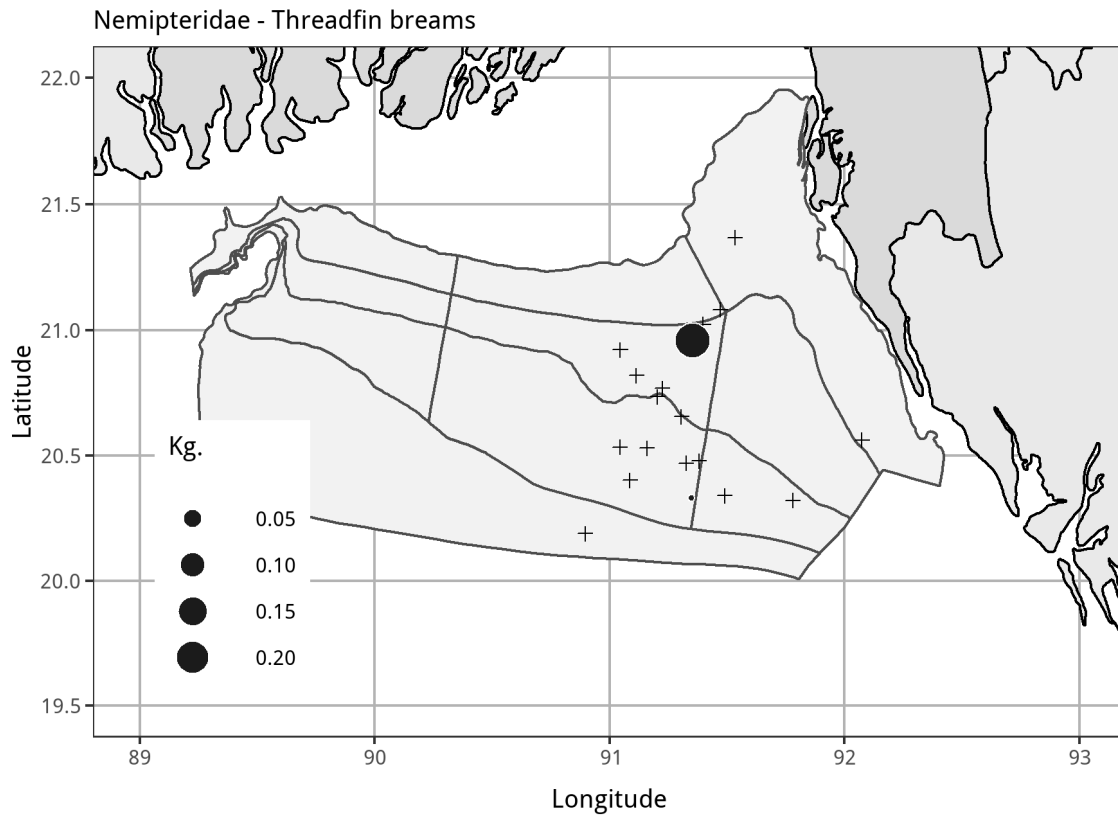


Stratum mean catch per tow (kg)

Stratum	Mean catch (kg)
10203	0.000
10205	0.040
10206	0.000
10208	0.001
10209	0.000
10210	0.000

Overall mean catch per tow, stratum weighted.

Overall	0.008
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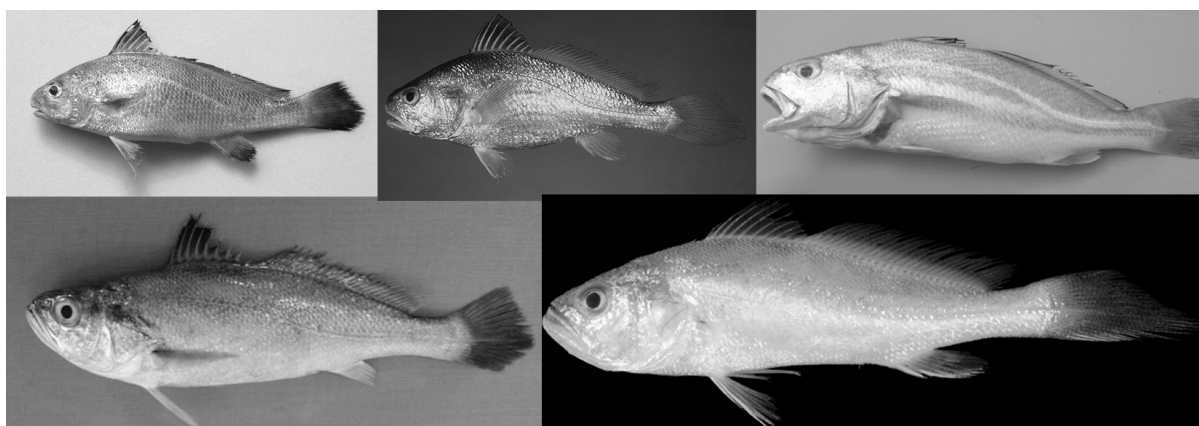


Species group: Sciaenidae - Croakers

Croakers are the largest group in the commercially important fishes in our sea water. These are bottom dwelling and carnivores' fishes known as drums feeding on benthic invertebrates and small fishes. They are caught bottom trawl, gill net and long lines. They are exported as dry and fresh form and fetch a good foreign currency and have a local demand.

Species in group and number of catches

Scientific name	Occurences
Johnius belangerii	1
Pennahia anea	2

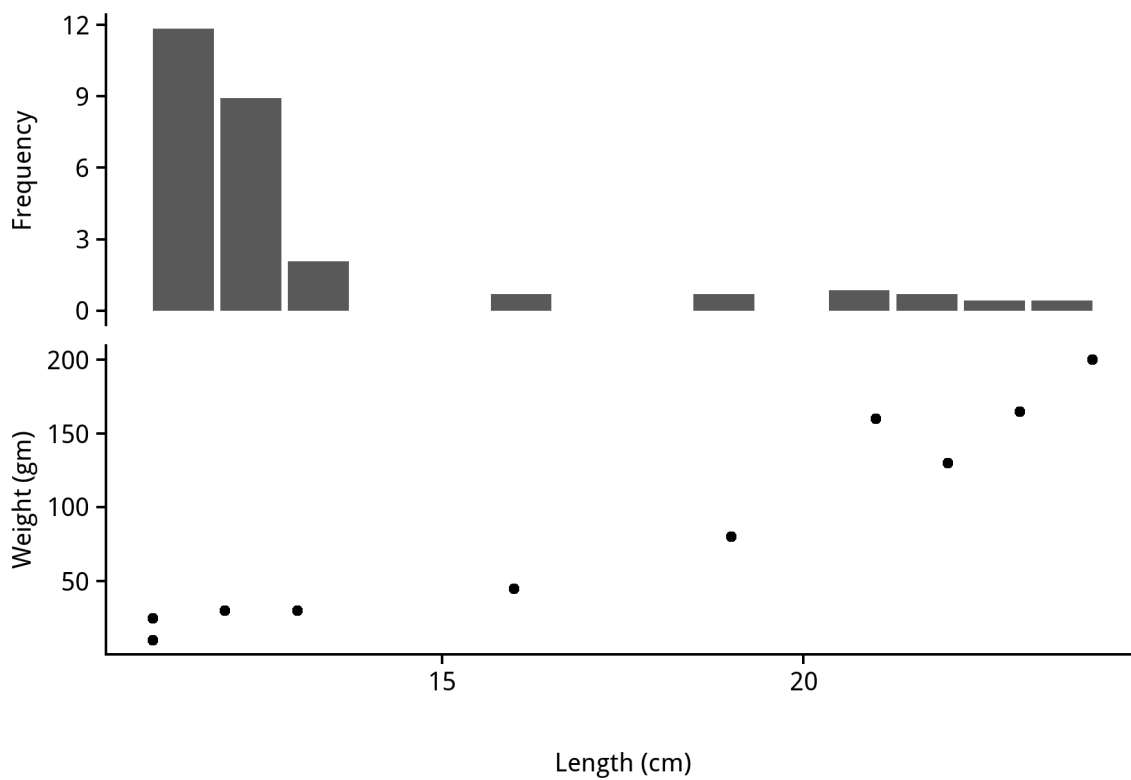
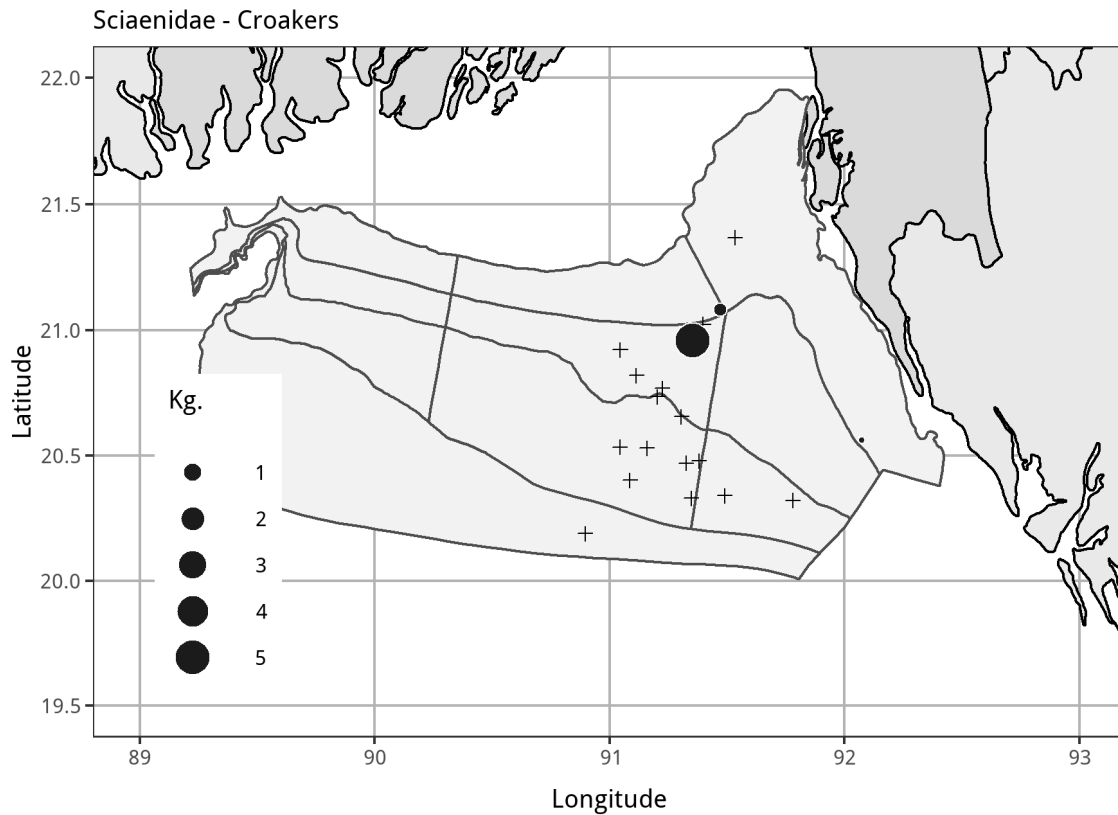


Stratum mean catch per tow (kg)

Stratum	Mean catch (kg)
10203	0.200
10205	0.833
10206	0.160
10208	0.000
10209	0.000
10210	0.000

Overall mean catch per tow, stratum weighted.

Overall	0.195
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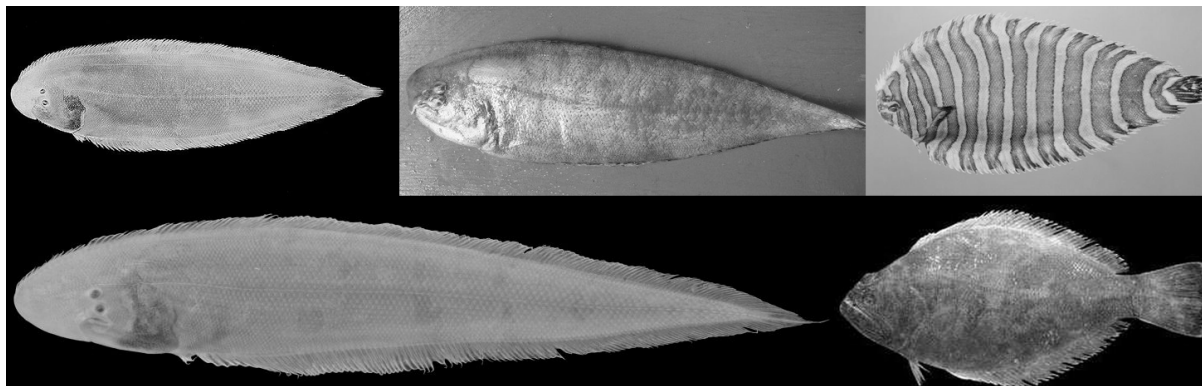


Species group: Pleuronectiformes - Flatfish

As before Flatfish are thrown as trash in shrimp trawl and demersal trawl catch. But at present flat fishes are used in fish meal and poultry feed. These groups mainly harvest in shrimp trawl but sometimes caught in MSBN. In Bangladesh only some tribal peoples having some species of flat fish, but now days these export in foreign countries mainly in China, Korea and Singapore. These groups are inhabits in sand and mud bottoms and eat only crutaceans.

Species in group and number of catches

Scientific name	Occurences
Pseudorhombus elevatus	1

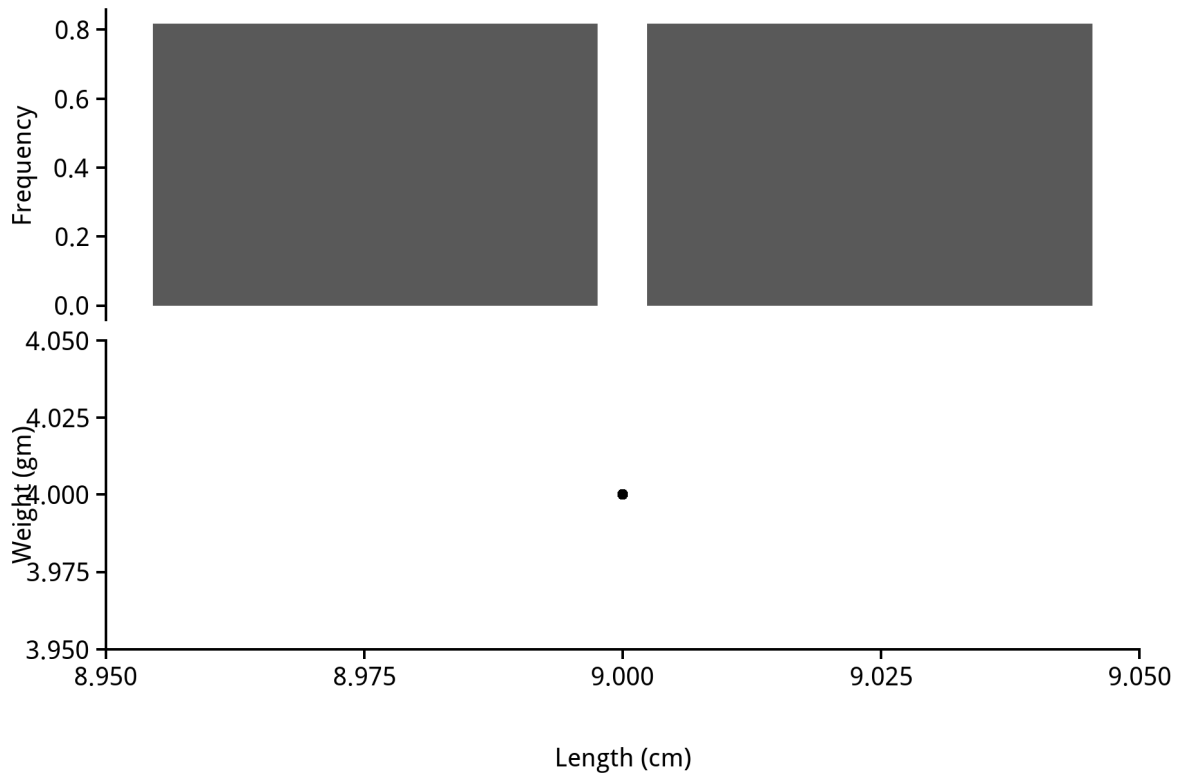
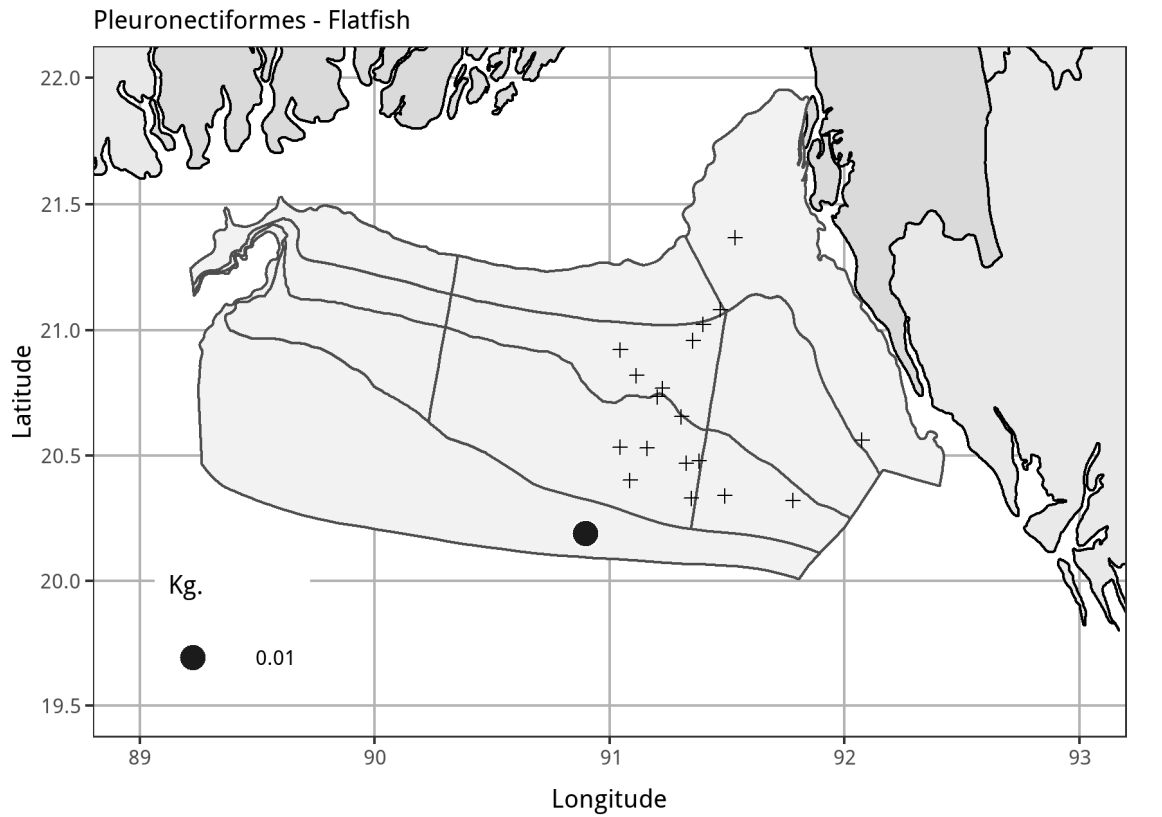


Stratum mean catch per tow (kg)

Stratum	Mean catch (kg)
10203	0.00
10205	0.00
10206	0.00
10208	0.00
10209	0.00
10210	0.01

Overall mean catch per tow, stratum weighted.

Overall	0.001
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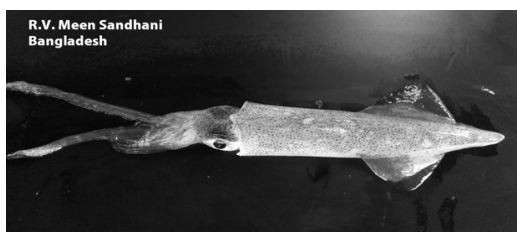


Species group: Squids and cuttlefish

Two major groups of cephalopods e.g. Squid and cuttle fish which are available in Bangladesh coast. Cephalopods are not exploited by any specialised fishing gear but a small quantity is being caught as by-catch of bottom trawl and shrimp trawl and even MSBN also. Now days it's are exportable item in different countries.

Species in group and number of catches

Scientific name	Occurences
Sepia sp.	5
Uroteuthis duvauceli	13

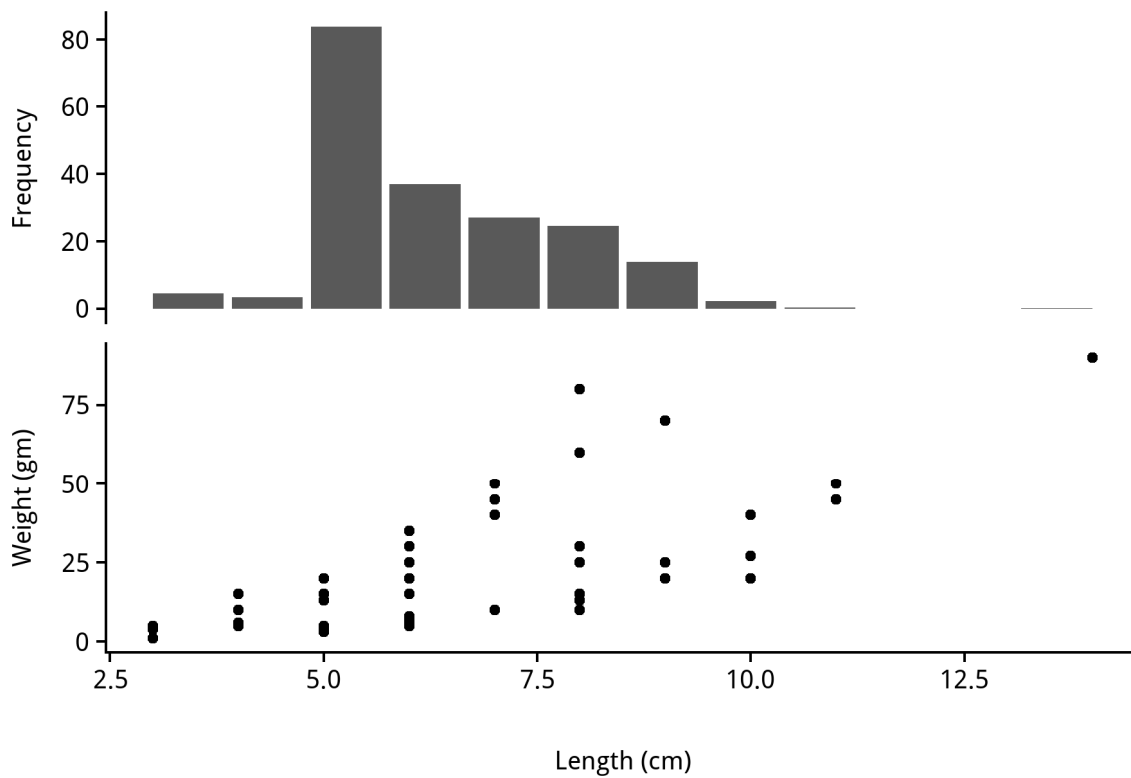
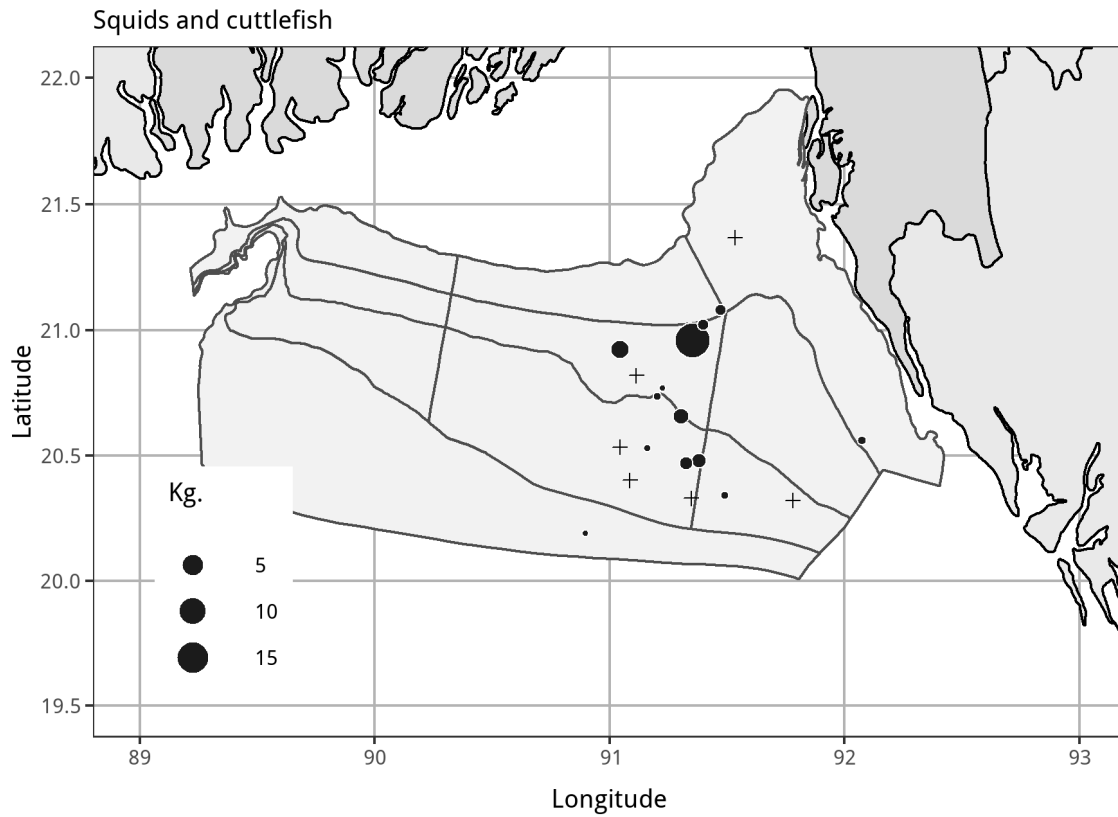


Stratum mean catch per tow (kg)

Stratum	Mean catch (kg)
10203	0.255
10205	3.834
10206	0.090
10208	0.551
10209	0.060
10210	0.005

Overall mean catch per tow, stratum weighted.

Overall
1.052



Species group: Trichiuridae - ribbonfish

Elongate and compressed ribbon-like trichiurid are benthopelagic inhabitants of coastal and often come near the surface at night. Ribbonfish are exported as dry, salted and fresh forms in different countries. These carnivorous fish feed on small fish and shrimp. Harvested by bottom trawl, set net and beach seines.

Species in group and number of catches

Scientific name	Occurrences
Lepturacanthus savala	5

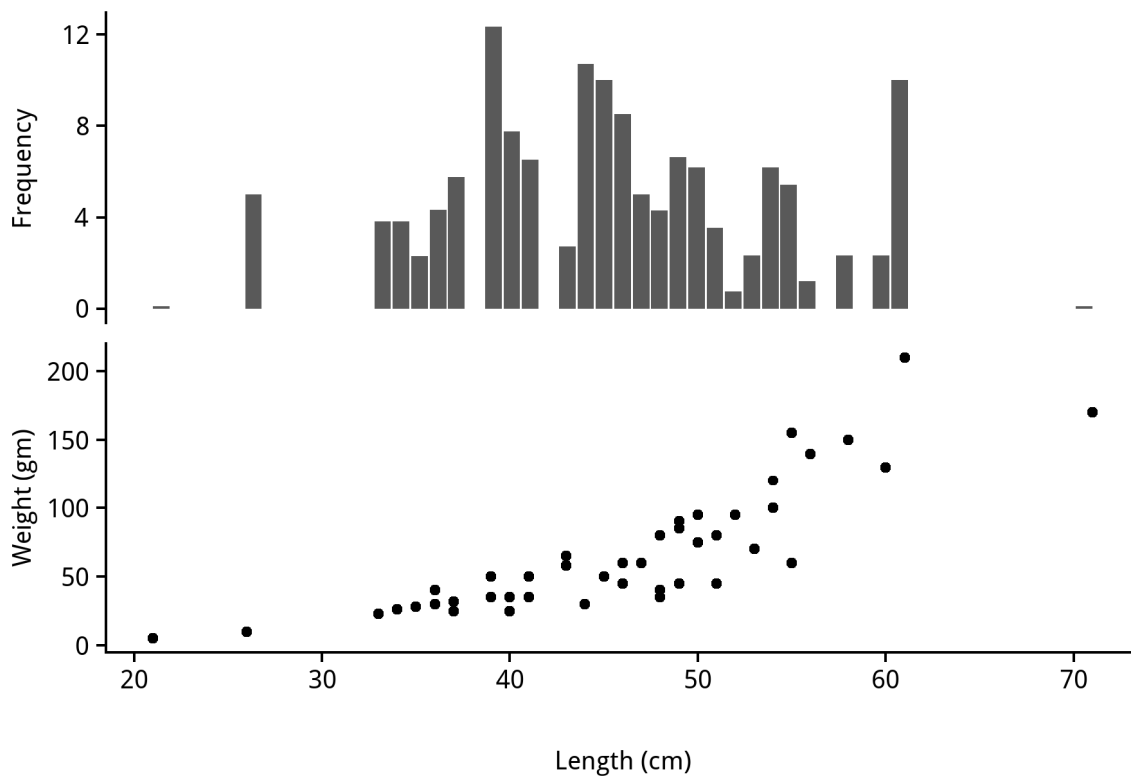
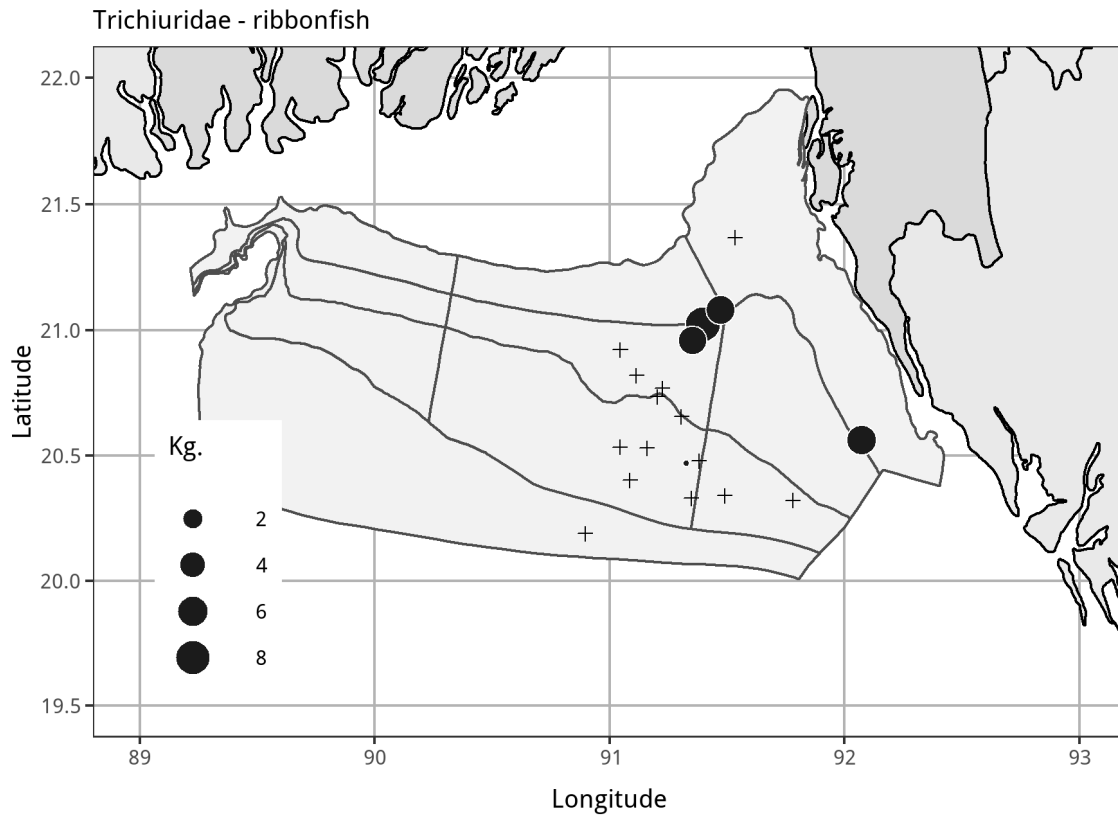


Stratum mean catch per tow (kg)

Stratum	Mean catch (kg)
10203	2.750
10205	2.250
10206	5.800
10208	0.022
10209	0.000
10210	0.000

Overall mean catch per tow, stratum weighted.

Overall	1.059
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Species group: Other families - Synodontidae, Tetradontidae, Platycephalidae

These groups are used mainly as fish meal and poultry feed. Important as commercial fisheries sold fresh, dried and salted in the markets. Lizard fishes are exploits in sandy and muddy bottom areas in demersal fishing. Fisheries have no commercial importance of Puffer fish. The puffer fish must not be eaten because its skin and internal organs contain neurotoxin. Flathead fishes are minor commercial importance and caught by trawl over sandy and muddy bottom.

Species in group and number of catches

Scientific name	Occurences
Cociella crocodilus	1
Harpadon nehereus	1
Lagocephalus lunaris	6
Rogadius asper	3
Saurida tumbil	4

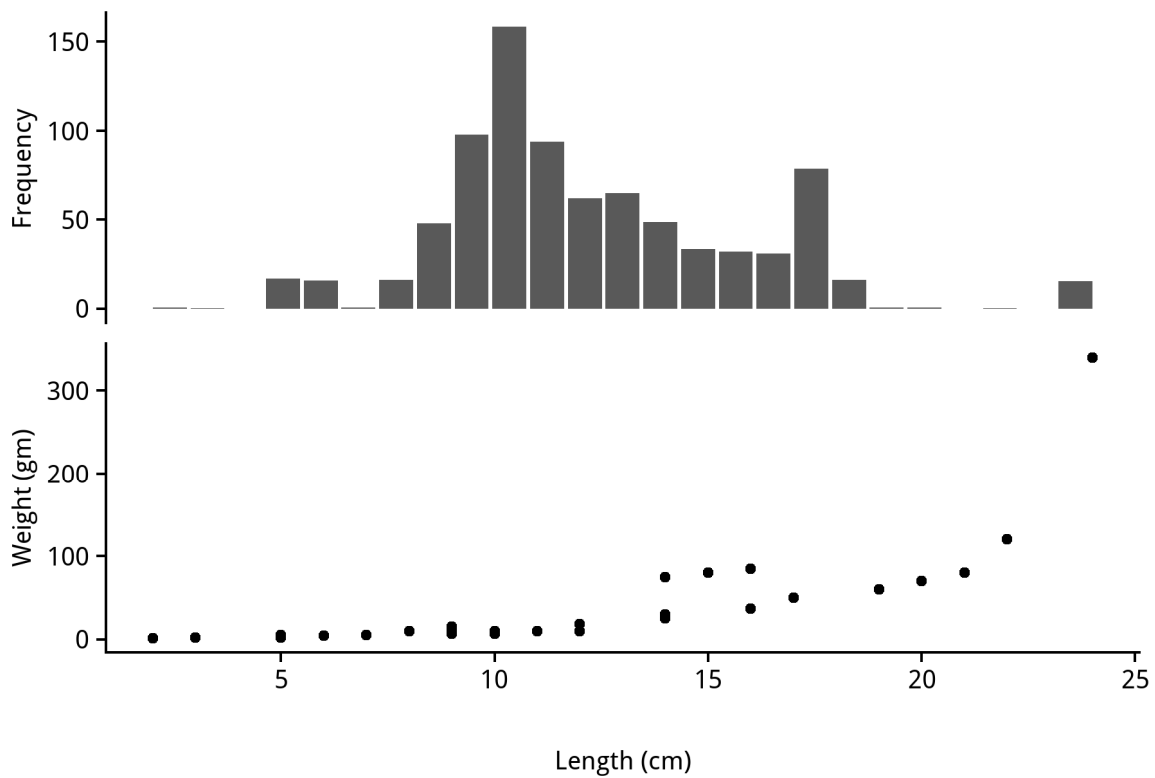
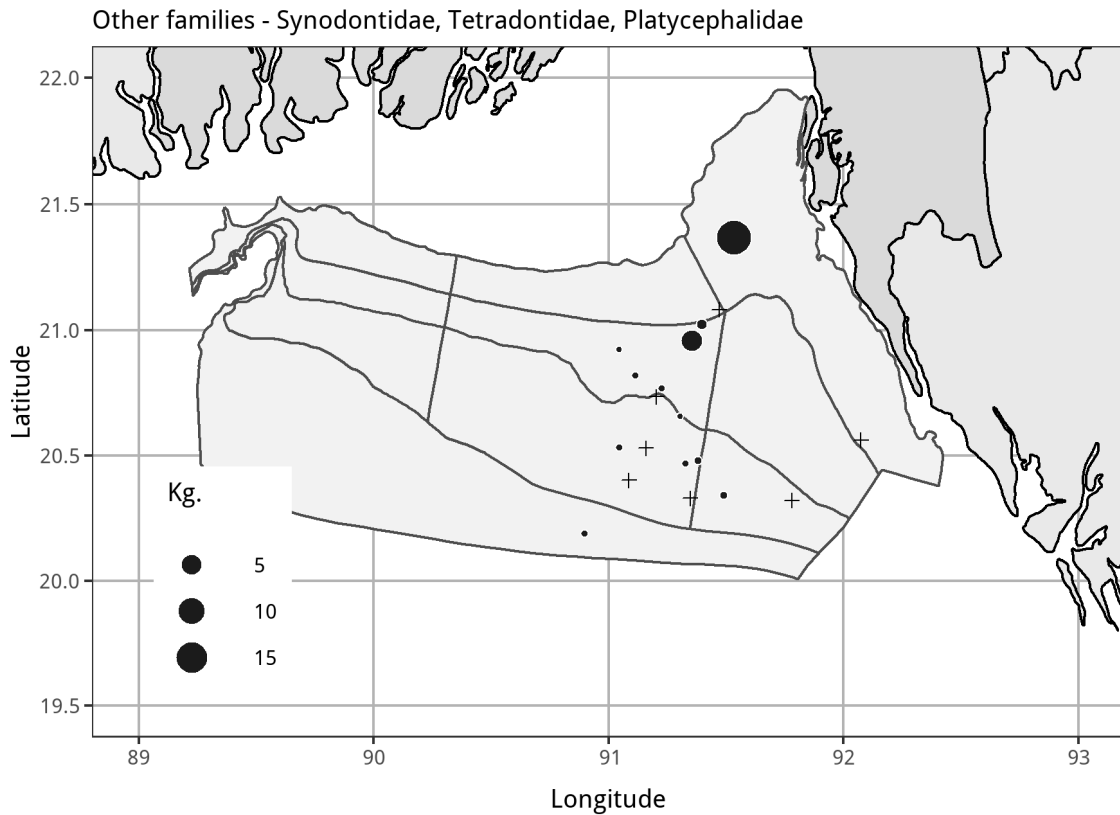


Stratum mean catch per tow (kg)

Stratum	Mean catch (kg)
10203	9.650
10205	0.912
10206	0.000
10208	0.010
10209	0.055
10210	0.010

Overall mean catch per tow, stratum weighted.

Overall	1.518
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ANNEX II: Sampling stations, Demersal Survey #2017201

Stn	Stratum	Zone	Location (DD)		Location (DDM)		Depth (m)		Max
			Ground	Lat(N)	Lon(E)	Lat(N)	Lon(E)	Min	
12	10201	Inshore	Swatch	21.2275	90.2892	21°13.65'	90°17.35'	10	40
38	10201	Inshore	Swatch	21.3775	89.4392	21°22.65'	89°26.35'	10	40
57	10201	Inshore	Swatch	21.3275	89.9892	21°19.65'	89°59.35'	10	40
59	10201	Inshore	Swatch	21.3275	90.0392	21°19.65'	90°02.35'	10	40
115	10201	Inshore	Swatch	21.4275	89.7892	21°25.65'	89°47.35'	10	40
142	10201	Inshore	Swatch	21.3275	90.0892	21°19.65'	90°05.35'	10	40
155	10201	Inshore	Swatch	21.2775	89.7392	21°16.65'	89°44.35'	10	40
157	10201	Inshore	Swatch	21.2775	90.0392	21°16.65'	90°02.35'	10	40
4	10202	Inshore	Middle	21.1275	91.2892	21°07.65'	91°17.35'	10	40
9	10202	Inshore	Middle	21.1275	91.4392	21°07.65'	91°26.35'	10	40
23	10202	Inshore	Middle	21.2275	91.1392	21°13.65'	91°08.35'	10	40
25	10202	Inshore	Middle	21.2275	91.1892	21°13.65'	91°11.35'	10	40
41	10202	Inshore	Middle	21.0775	91.1392	21°04.65'	91°08.35'	10	40
50	10202	Inshore	Middle	21.1775	90.3392	21°10.65'	90°20.35'	10	40
117	10202	Inshore	Middle	21.2275	91.3892	21°13.65'	91°23.35'	10	40
128	10202	Inshore	Middle	21.0775	91.3392	21°04.65'	91°20.35'	10	40
130	10202	Inshore	Middle	21.0775	91.4392	21°04.65'	91°26.35'	10	40
133	10202	Inshore	Middle	21.1775	90.5392	21°10.65'	90°32.35'	10	40
141	10202	Inshore	Middle	21.1775	91.1892	21°10.65'	91°11.35'	10	40
171	10202	Inshore	Middle	21.1275	91.0392	21°07.65'	91°02.35'	10	40
6	10203	Inshore	South	20.5775	92.0892	20°34.65'	92°05.35'	10	40
10	10203	Inshore	South	20.8775	92.1392	20°52.65'	92°08.35'	10	40
14	10203	Inshore	South	21.4775	91.5392	21°28.65'	91°32.35'	10	40
16	10203	Inshore	South	21.4775	91.5892	21°28.65'	91°35.35'	10	40
29	10203	Inshore	South	21.4275	91.4392	21°25.65'	91°26.35'	10	40
33	10203	Inshore	South	21.2275	91.6892	21°13.65'	91°41.35'	10	40
37	10203	Inshore	South	20.9775	92.0892	20°58.65'	92°05.35'	10	40
40	10203	Inshore	South	20.6775	91.9892	20°40.65'	91°59.35'	10	40
44	10203	Inshore	South	20.8275	92.0392	20°49.65'	92°02.35'	10	40
47	10203	Inshore	South	21.0775	91.4892	21°04.65'	91°29.35'	10	40
60	10203	Inshore	South	20.4775	92.1892	20°28.65'	92°11.35'	10	40
67	10203	Inshore	South	21.1775	91.8392	21°10.65'	91°50.35'	10	40
72	10203	Inshore	South	21.6775	91.6392	21°40.65'	91°38.35'	10	40
75	10203	Inshore	South	21.6275	91.4892	21°37.65'	91°29.35'	10	40
77	10203	Inshore	South	21.6275	91.5392	21°37.65'	91°32.35'	10	40
78	10203	Inshore	South	21.5775	91.4392	21°34.65'	91°26.35'	10	40
102	10203	Inshore	South	20.5775	92.1392	20°34.65'	92°08.35'	10	40
103	10203	Inshore	South	21.5275	91.7892	21°31.65'	91°47.35'	10	40
105	10203	Inshore	South	20.7275	92.0392	20°43.65'	92°02.35'	10	40
106	10203	Inshore	South	21.4775	91.3892	21°28.65'	91°23.35'	10	40
107	10203	Inshore	South	21.1275	91.8892	21°07.65'	91°53.35'	10	40
108	10203	Inshore	South	20.7275	92.2392	20°43.65'	92°14.35'	10	40
121	10203	Inshore	South	21.2275	91.8392	21°13.65'	91°50.35'	10	40
135	10203	Inshore	South	21.0775	91.9392	21°04.65'	91°56.35'	10	40
136	10203	Inshore	South	21.3775	91.8392	21°22.65'	91°50.35'	10	40
148	10203	Inshore	South	20.9275	91.9392	20°55.65'	91°56.35'	10	40
158	10203	Inshore	South	21.6775	91.4892	21°40.65'	91°29.35'	10	40
159	10203	Inshore	South	21.6775	91.5892	21°40.65'	91°35.35'	10	40
166	10203	Inshore	South	20.4275	92.2392	20°25.65'	92°14.35'	10	40

ANNEX II: Sampling stations, Demersal Survey #2017201

Stn	Stratum	Zone	Location (DD)		Location (DDM)		Depth (m)		Min	Max
			Ground	Lat(N)	Lon(E)	Lat(N)	Lon(E)	Min		
170	10203	Inshore	South	21.5775	91.6392	21°34.65'	91°38.35'	10	40	
21	10204	Midshore	Swatch	21.4275	89.6392	21°25.65'	89°38.35'	40	40	
54	10204	Midshore	Swatch	21.3275	89.6392	21°19.65'	89°38.35'	40	40	
70	10204	Midshore	Swatch	21.1275	89.9392	21°07.65'	89°56.35'	40	40	
114	10204	Midshore	Swatch	21.0775	90.0392	21°04.65'	90°02.35'	40	80	
116	10204	Midshore	Swatch	21.0775	90.2392	21°04.65'	90°14.35'	40	80	
124	10204	Midshore	Swatch	21.1775	89.6892	21°10.65'	89°41.35'	40	80	
26	10205	Midshore	Middle	20.9775	91.3392	20°58.65'	91°20.35'	40	40	
27	10205	Midshore	Middle	20.8275	91.0892	20°49.65'	91°05.35'	40	40	
55	10205	Midshore	Middle	20.9275	91.0392	20°55.65'	91°02.35'	40	40	
61	10205	Midshore	Middle	20.7775	91.2392	20°46.65'	91°14.35'	40	40	
62	10205	Midshore	Middle	20.7775	91.3392	20°46.65'	91°20.35'	40	40	
66	10205	Midshore	Middle	21.0275	90.4892	21°01.65'	90°29.35'	40	40	
73	10205	Midshore	Middle	21.0275	91.3892	21°01.65'	91°23.35'	40	40	
109	10205	Midshore	Middle	20.9775	90.6892	20°58.65'	90°41.35'	40	80	
119	10205	Midshore	Middle	21.0775	90.5892	21°04.65'	90°35.35'	40	80	
120	10205	Midshore	Middle	20.8275	91.4392	20°49.65'	91°26.35'	40	80	
138	10205	Midshore	Middle	20.9275	90.9892	20°55.65'	90°59.35'	40	80	
146	10205	Midshore	Middle	20.7775	91.4392	20°46.65'	91°26.35'	40	80	
149	10205	Midshore	Middle	21.0275	90.4392	21°01.65'	90°26.35'	40	80	
1	10206	Midshore	South	20.8775	91.5392	20°52.65'	91°32.35'	40	80	
2	10206	Midshore	South	20.5775	91.9892	20°34.65'	91°59.35'	40	80	
3	10206	Midshore	South	20.7275	91.5892	20°43.65'	91°35.35'	40	80	
7	10206	Midshore	South	20.8775	91.7892	20°52.65'	91°47.35'	40	80	
32	10206	Midshore	South	20.5275	92.0392	20°31.65'	92°02.35'	40	80	
34	10206	Midshore	South	20.6775	91.4892	20°40.65'	91°29.35'	40	80	
36	10206	Midshore	South	20.8275	91.6892	20°49.65'	91°41.35'	40	80	
63	10206	Midshore	South	20.6275	91.5892	20°37.65'	91°35.35'	40	80	
65	10206	Midshore	South	20.7775	91.5892	20°46.65'	91°35.35'	40	80	
76	10206	Midshore	South	20.4275	92.0892	20°25.65'	92°05.35'	40	80	
118	10206	Midshore	South	20.5275	91.8892	20°31.65'	91°53.35'	40	80	
122	10206	Midshore	South	20.8275	91.5892	20°49.65'	91°35.35'	40	80	
132	10206	Midshore	South	21.0775	91.6392	21°04.65'	91°38.35'	40	80	
144	10206	Midshore	South	20.6275	91.4892	20°37.65'	91°29.35'	40	80	
145	10206	Midshore	South	20.6275	91.6392	20°37.65'	91°38.35'	40	80	
147	10206	Midshore	South	20.7775	91.7392	20°46.65'	91°44.35'	40	80	
151	10206	Midshore	South	20.6275	91.9392	20°37.65'	91°56.35'	40	80	
164	10206	Midshore	South	21.0275	91.4892	21°01.65'	91°29.35'	40	80	
169	10206	Midshore	South	20.5775	91.5392	20°34.65'	91°32.35'	40	80	
5	10207	Offshore	Swatch	20.9775	89.8892	20°58.65'	89°53.35'	80	100	
15	10207	Offshore	Swatch	21.0775	89.4392	21°04.65'	89°26.35'	80	100	
43	10207	Offshore	Swatch	20.9275	89.9892	20°55.65'	89°59.35'	80	100	
48	10207	Offshore	Swatch	20.7775	90.1892	20°46.65'	90°11.35'	80	100	
56	10207	Offshore	Swatch	21.0275	89.5892	21°01.65'	89°35.35'	80	100	
58	10207	Offshore	Swatch	21.0275	89.7892	21°01.65'	89°47.35'	80	100	
110	10207	Offshore	Swatch	21.0775	89.6392	21°04.65'	89°38.35'	80		
112	10207	Offshore	Swatch	21.0775	89.7892	21°04.65'	89°47.35'	80		
127	10207	Offshore	Swatch	20.9275	90.0392	20°55.65'	90°02.35'	80		
129	10207	Offshore	Swatch	20.9275	90.2392	20°55.65'	90°14.35'	80		

ANNEX II: Sampling stations, Demersal Survey #2017201

Stn	Stratum	Zone	Location (DD)		Location (DDM)		Depth (m)		Max
			Ground	Lat(N)	Lon(E)	Lat(N)	Lon(E)	Min	
140	10207	Offshore	Swatch	21.0275	89.6892	21°01.65'	89°41.35'	80	
154	10207	Offshore	Swatch	21.1275	89.5892	21°07.65'	89°35.35'	80	
11	10208	Offshore	Middle	20.9775	90.3892	20°58.65'	90°23.35'	80	100
17	10208	Offshore	Middle	20.6775	90.3892	20°40.65'	90°23.35'	80	100
18	10208	Offshore	Middle	20.8275	90.3392	20°49.65'	90°20.35'	80	100
19	10208	Offshore	Middle	20.5275	91.0392	20°31.65'	91°02.35'	80	100
20	10208	Offshore	Middle	20.5275	91.1392	20°31.65'	91°08.35'	80	100
22	10208	Offshore	Middle	20.3275	91.3392	20°19.65'	91°20.35'	80	100
30	10208	Offshore	Middle	20.6775	91.2892	20°40.65'	91°17.35'	80	100
35	10208	Offshore	Middle	20.2775	91.1392	20°16.65'	91°08.35'	80	100
42	10208	Offshore	Middle	20.4775	90.7392	20°28.65'	90°44.35'	80	100
49	10208	Offshore	Middle	20.6275	90.4892	20°37.65'	90°29.35'	80	100
51	10208	Offshore	Middle	20.4775	91.3392	20°28.65'	91°20.35'	80	100
52	10208	Offshore	Middle	20.4775	91.3892	20°28.65'	91°23.35'	80	100
53	10208	Offshore	Middle	20.7775	90.7392	20°46.65'	90°44.35'	80	100
79	10208	Offshore	Middle	20.7275	91.1892	20°43.65'	91°11.35'	80	100
80	10208	Offshore	Middle	20.3775	91.0892	20°22.65'	91°05.35'	80	100
111	10208	Offshore	Middle	20.6775	90.5892	20°40.65'	90°35.35'	80	100
123	10208	Offshore	Middle	20.2775	91.1892	20°16.65'	91°11.35'	80	100
125	10208	Offshore	Middle	20.4775	90.6392	20°28.65'	90°38.35'	80	100
134	10208	Offshore	Middle	20.7775	90.5392	20°46.65'	90°32.35'	80	100
137	10208	Offshore	Middle	20.6275	90.9892	20°37.65'	90°59.35'	80	100
139	10208	Offshore	Middle	20.6275	91.0392	20°37.65'	91°02.35'	80	100
153	10208	Offshore	Middle	20.4275	90.9892	20°25.65'	90°59.35'	80	100
156	10208	Offshore	Middle	20.5775	90.5392	20°34.65'	90°32.35'	80	100
162	10208	Offshore	Middle	20.7275	90.4892	20°43.65'	90°29.35'	80	100
163	10208	Offshore	Middle	20.5775	90.9892	20°34.65'	90°59.35'	80	100
167	10208	Offshore	Middle	20.5775	91.3892	20°34.65'	91°23.35'	80	100
168	10208	Offshore	Middle	20.3775	90.7892	20°22.65'	90°47.35'	80	100
172	10208	Offshore	Middle	20.3775	91.1892	20°22.65'	91°11.35'	80	100
24	10209	Offshore	South	20.3275	91.4892	20°19.65'	91°29.35'	80	100
28	10209	Offshore	South	20.3275	91.7392	20°19.65'	91°44.35'	80	100
45	10209	Offshore	South	20.2775	91.6892	20°16.65'	91°41.35'	80	100
69	10209	Offshore	South	20.4275	91.5892	20°25.65'	91°35.35'	80	100
71	10209	Offshore	South	20.1275	91.8892	20°07.65'	91°53.35'	80	100
101	10209	Offshore	South	20.3775	91.3892	20°22.65'	91°23.35'	80	100
126	10209	Offshore	South	20.2775	91.3892	20°16.65'	91°23.35'	80	100
131	10209	Offshore	South	20.2775	91.8392	20°16.65'	91°50.35'	80	100
152	10209	Offshore	South	20.1775	91.6892	20°10.65'	91°41.35'	80	100
8	10210	Deep	All	20.0775	91.7892	20°04.65'	91°47.35'	100	200
13	10210	Deep	All	20.1775	90.3392	20°10.65'	90°20.35'	100	200
31	10210	Deep	All	20.1775	90.8892	20°10.65'	90°53.35'	100	200
39	10210	Deep	All	20.6275	89.7392	20°37.65'	89°44.35'	100	200
46	10210	Deep	All	20.8275	89.7892	20°49.65'	89°47.35'	100	200
64	10210	Deep	All	20.1275	91.3892	20°07.65'	91°23.35'	100	200
68	10210	Deep	All	20.7775	89.9892	20°46.65'	89°59.35'	100	200
74	10210	Deep	All	20.7275	89.5392	20°43.65'	89°32.35'	100	200
104	10210	Deep	All	20.6775	90.1392	20°40.65'	90°08.35'	100	200
113	10210	Deep	All	20.3275	90.1392	20°19.65'	90°08.35'	100	200

ANNEX II: Sampling stations, Demersal Survey #2017201

Stn	Stratum	Zone	Location (DD)		Location (DDM)		Depth (m)		Min	Max
			Ground	Lat(N)	Lon(E)	Lat(N)	Lon(E)			
143	10210	Deep	All	20.1275	91.0392	20°07.65'	91°02.35'	100	200	
150	10210	Deep	All	20.7775	89.3892	20°46.65'	89°23.35'	100	200	
160	10210	Deep	All	20.4775	89.7892	20°28.65'	89°47.35'	100	200	
161	10210	Deep	All	20.4775	89.8392	20°28.65'	89°50.35'	100	200	
165	10210	Deep	All	20.4775	90.0392	20°28.65'	90°02.35'	100	200	

Abbreviations:

DD = Decimal degree notation

DM = Degree Minute notation

E = East

N = North

m = meter

ANNEX II: Sampling stations, Demersal Survey #2017201

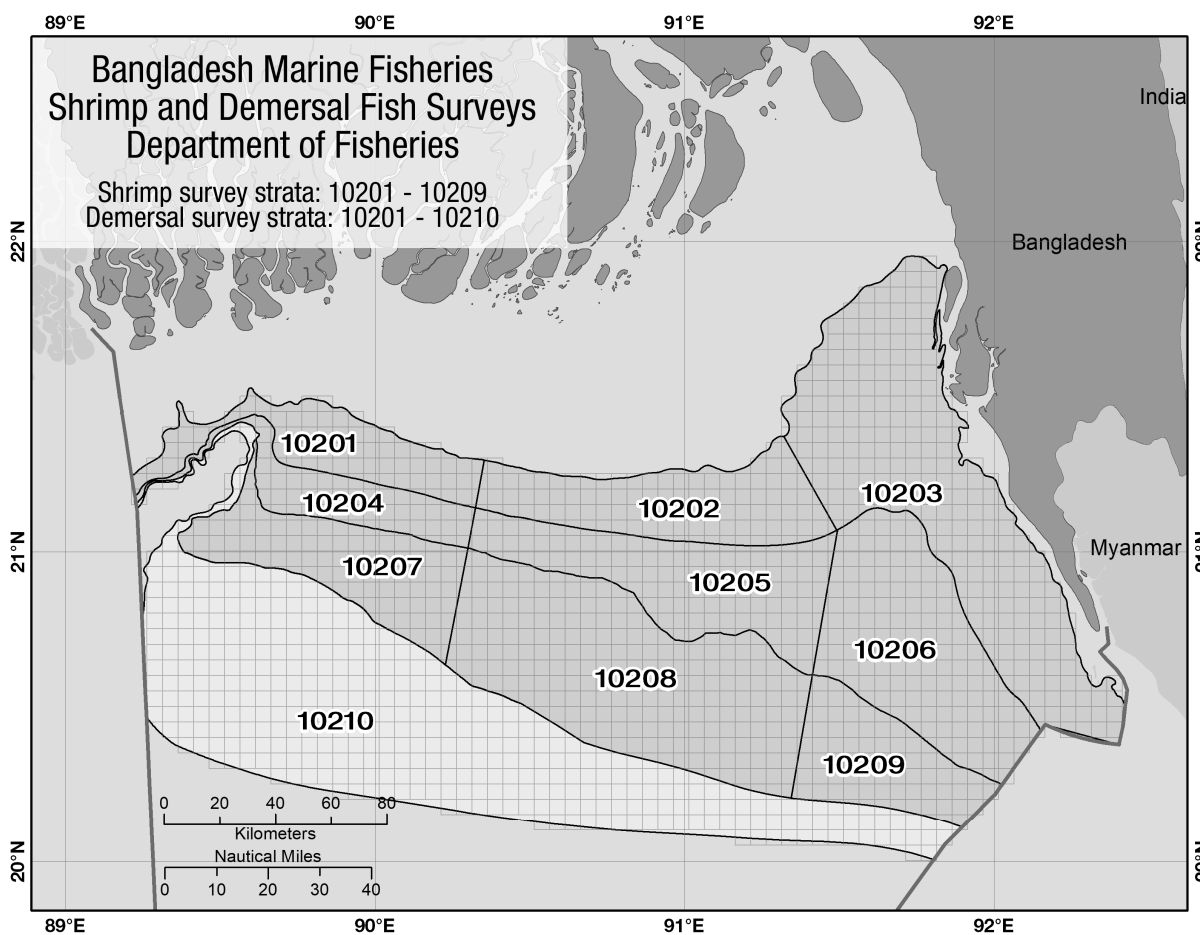
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Survey Annual Report
DoF Survey Working Group
12 December, 2018

Survey Operations

The R/V Meen Shandhani conducts annual shrimp and demersal trawl surveys. Each survey required approximately one month at-sea and samples approximately 80 pre-selected stations on the Bangladesh continental shelf. Survey stations are allocated according to a depth and area stratification plan. Shrimp surveys have 9 strata within 10 and 100 m depth range. The demersal fish surveys include the same 9 strata as the shrimp plus 1 more stratum for the 100 to 200 m range.



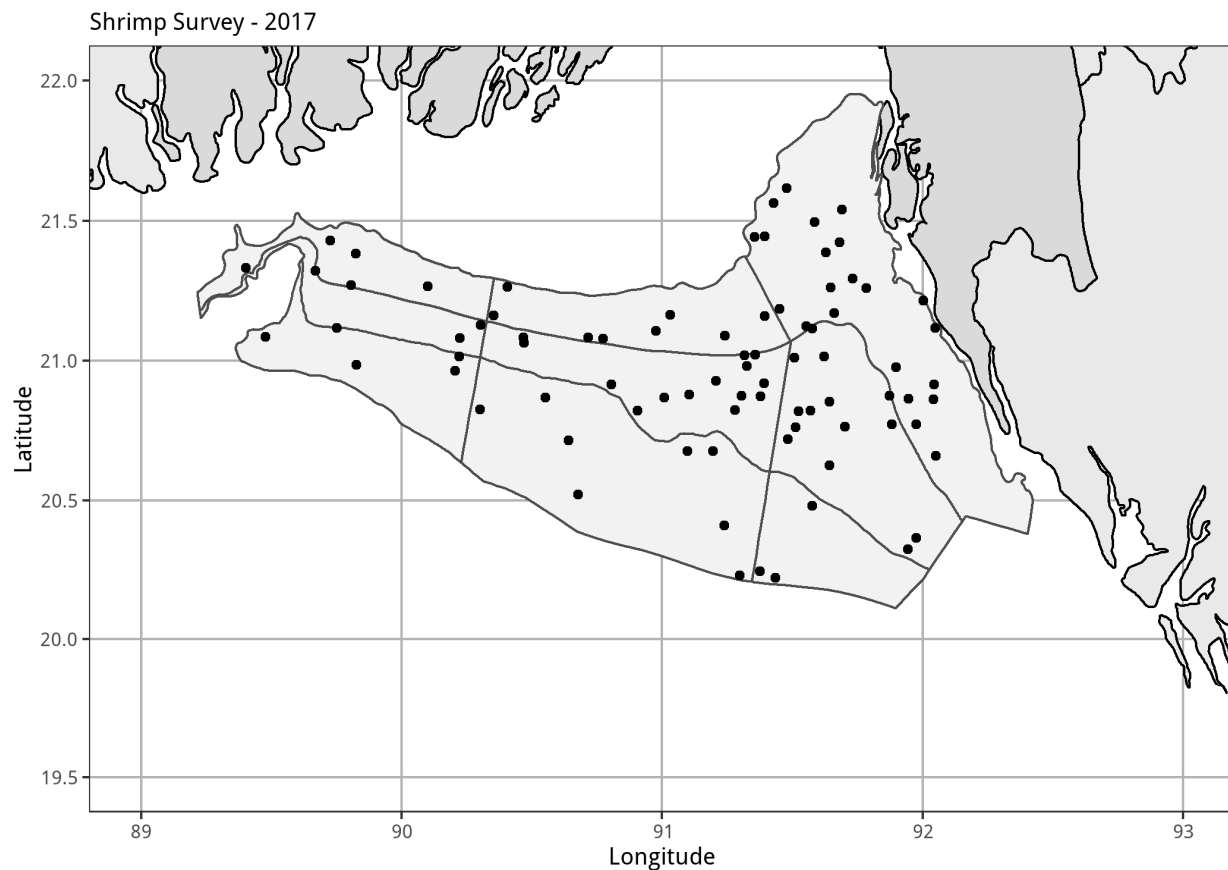
Trawl survey strata

The number of stations allocated to each stratum is dependent on the area (km²), which is used to calculate the stratum weight as the proportion of the total area in a given stratum.

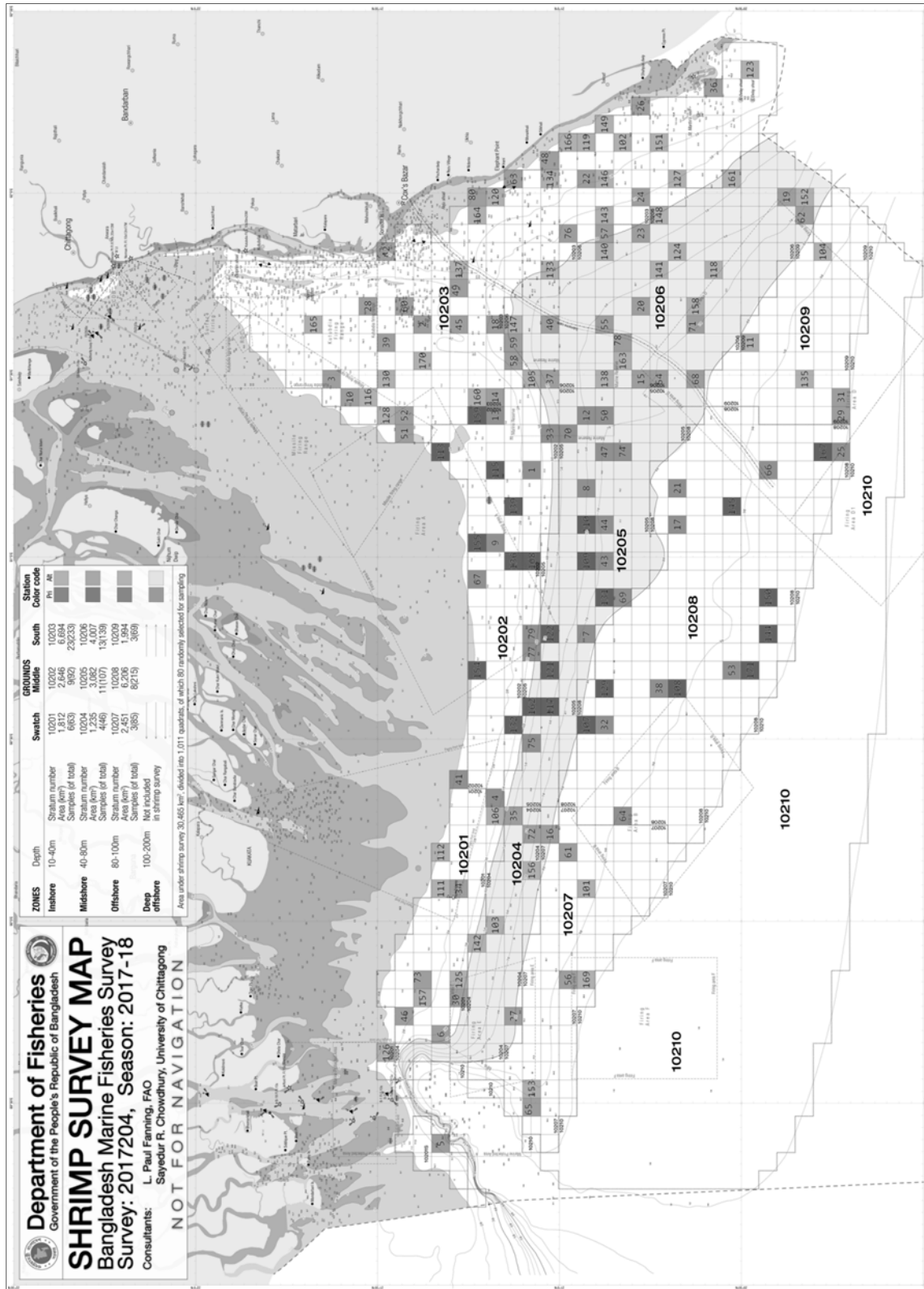
Stratum	Name	Depth (m)	Area (km ²)	Weight	Sets completed*
10201	Swatch Inshore	10 - 40	1814	0.060	6
10202	Middle Inshore	10 - 40	2681	0.088	10
10203	South Inshore	10 - 40	6833	0.224	23
10204	Swatch Midshore	40 - 80	1350	0.044	4
10205	Middle Midshore	40 - 80	3180	0.104	12
10206	South Midshore	40 - 80	3978	0.131	13
10207	Swatch Offshore	80 - 100	2522	0.083	3
10208	Middle Offshore	80 - 100	6083	0.200	8
10209	South Offshore	80 - 100	2025	0.066	3

*The sets completed column is the actual number of trawl samples taken in the survey.

This was the first completed shrimp cruise of R.V. Meen Sandhani. All 80 stations were sampled in three cruises on time and as planned.



The survey locations plotted are the starting locations of valid fishing stations.



Shrimp Survey Map 2017204

Species group: Penaeid shrimps (Excluding tiger shrimp)

Majority of penaeid shrimp species that are presently exploited are common to both in Artisanal and Industrial fisheries. The artisanal fishery harvest pre-adult, post juveniles, juveniles and even the post larvae (PL) but the industrial fishery harvest mostly the adult phase of penaeid shrimp. Most of the species are commercially important. The highest contribution in the total production is made by *Metapenaeus monoceros* the brown shrimp.

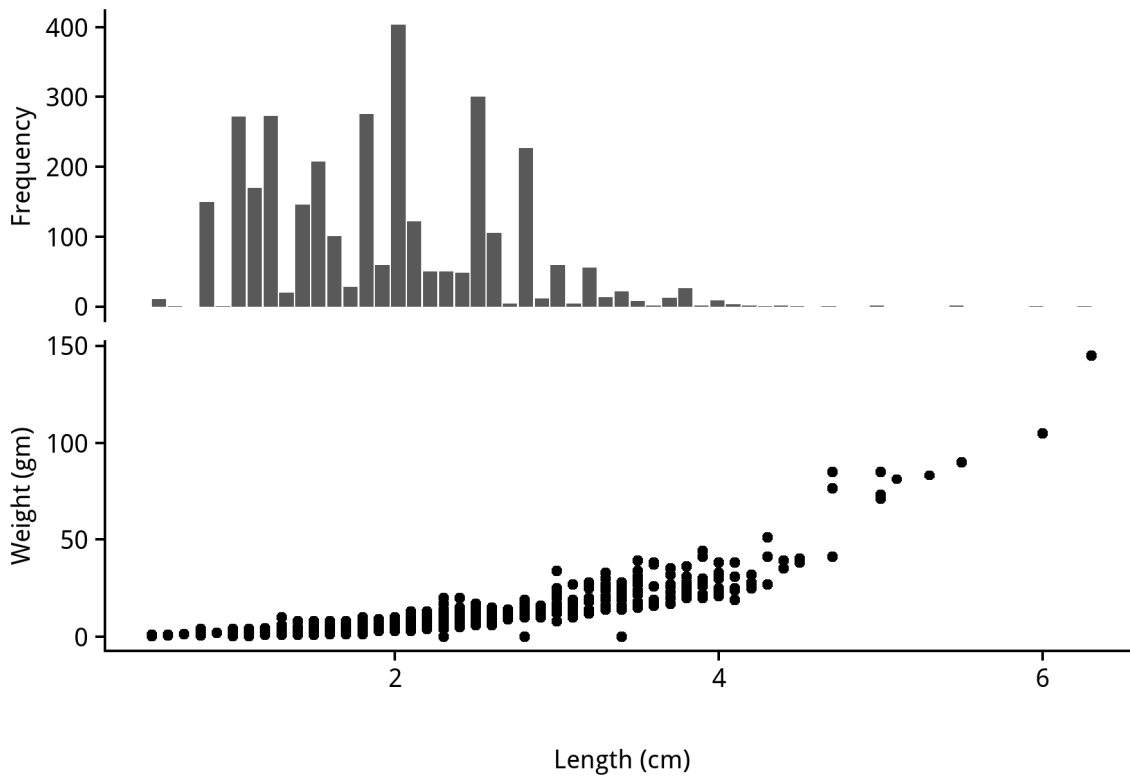
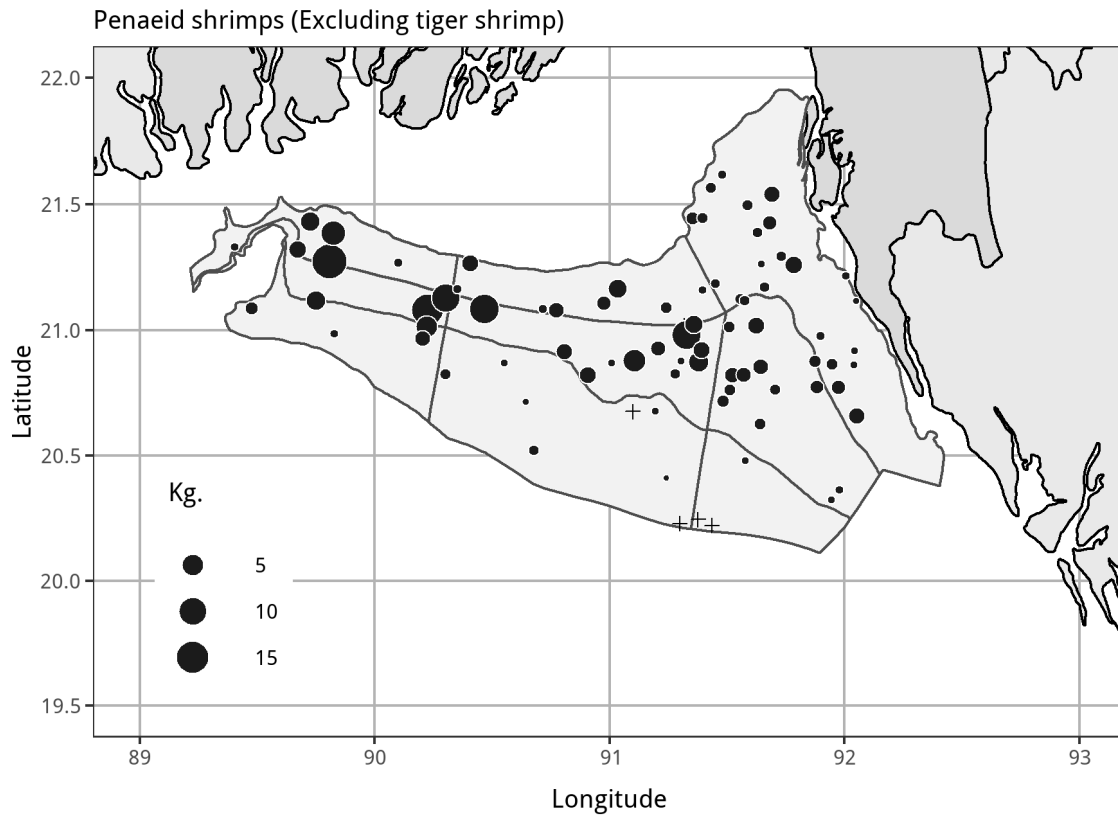
Species in group and number of catches

Scientific name	Occurences	Scientific name	Occurences
<i>Metapenaeopsis stridulans</i>	11	<i>Parapenaeopsis stylifera</i>	10
<i>Metapenaeus affinis</i>	5	<i>Parapenaeus longipes</i>	6
<i>Metapenaeus brevicornis</i>	28	<i>Penaeus canaliculatus</i>	2
<i>Metapenaeus dobsoni</i>	14	<i>Penaeus indicus</i>	6
<i>Metapenaeus lysianassa</i>	7	<i>Penaeus merguensis</i>	1
<i>Metapenaeus monoceros</i>	54	<i>Penaeus notialis</i>	4
<i>Mierspenaeopsis hardwickii</i>	10	<i>Penaeus semisulcatus</i>	3
<i>Parapenaeopsis sculptitis</i>	13		



Shrimp surveys - Penaeid shrimps (Excluding tiger shrimp)

Stratum	10201	10202	10203	10204	10205	10206	10207	10208	10209	
Weight	0.060	0.088	0.224	0.044	0.104	0.131	0.083	0.200	0.066	
Survey number										Annual mean
2016202		4.51	1.08		1.79	1.34			0.15	1.01
2017204	6.90	1.36	0.89	9.07	4.39	1.04	0.94	0.13	0.01	1.83



Species group: Tiger shrimp

Among the penaeid shrimp *Penaeus monodon* the Tiger shrimp is the most target species of commercial shrimp trawlers and some artisanal fishing gears (MSBN and Trammel net etc.). Because this shrimp fetches a very good prices both in local and international market. Principal breeding season is January-February.

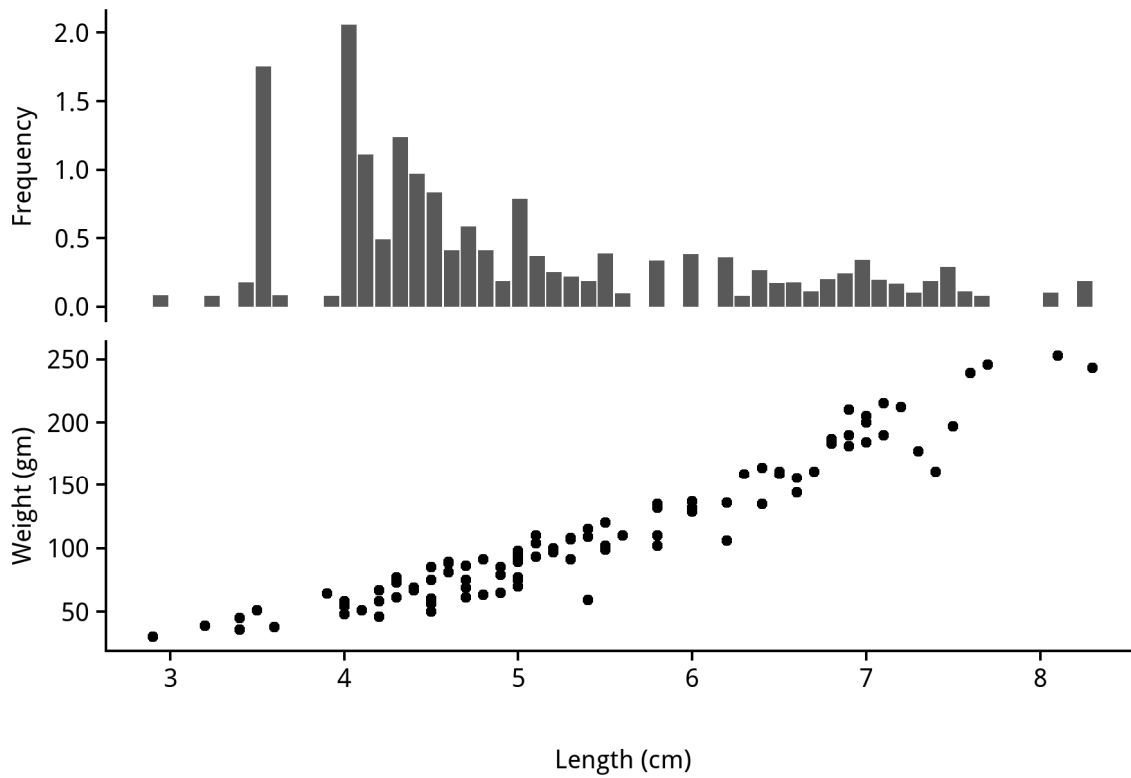
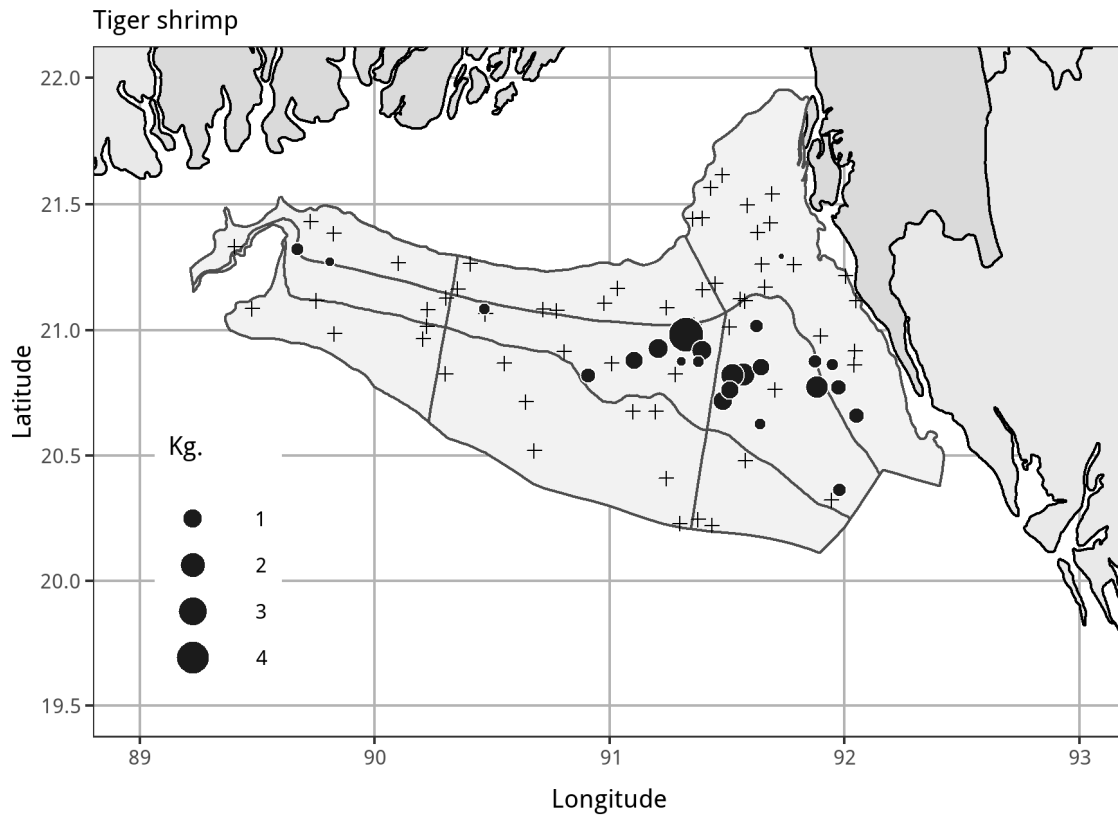
Species in group and number of catches

Scientific name	Occurences
<i>Penaeus monodon</i>	24



Shrimp surveys - Tiger shrimp

Stratum	10201	10202	10203	10204	10205	10206	10207	10208	10209	
Weight	0.060	0.088	0.224	0.044	0.104	0.131	0.083	0.200	0.066	
Survey number										Annual mean
2016202		0.48	0.02		0.33	0.58			0.00	0.16
2017204	0.08	0.00	0.08	0.00	0.88	0.70	0.00	0.00	0.00	0.21



Species group: Non-penaeid shrimps

Non-penaeid shrimp are found mainly coastal areas, brackish water and estuaries and caught in artisanal gears (ESBN and MSBN) in different stages of their life cycle. Most of them are economically important in our local market. Some of non-penaeid found in dipper water and harvest by shrimp trawlers. Some non-penaeid shrimp *Squilla mantis* the mantis shrimp are used as poultry feed and fish meal.

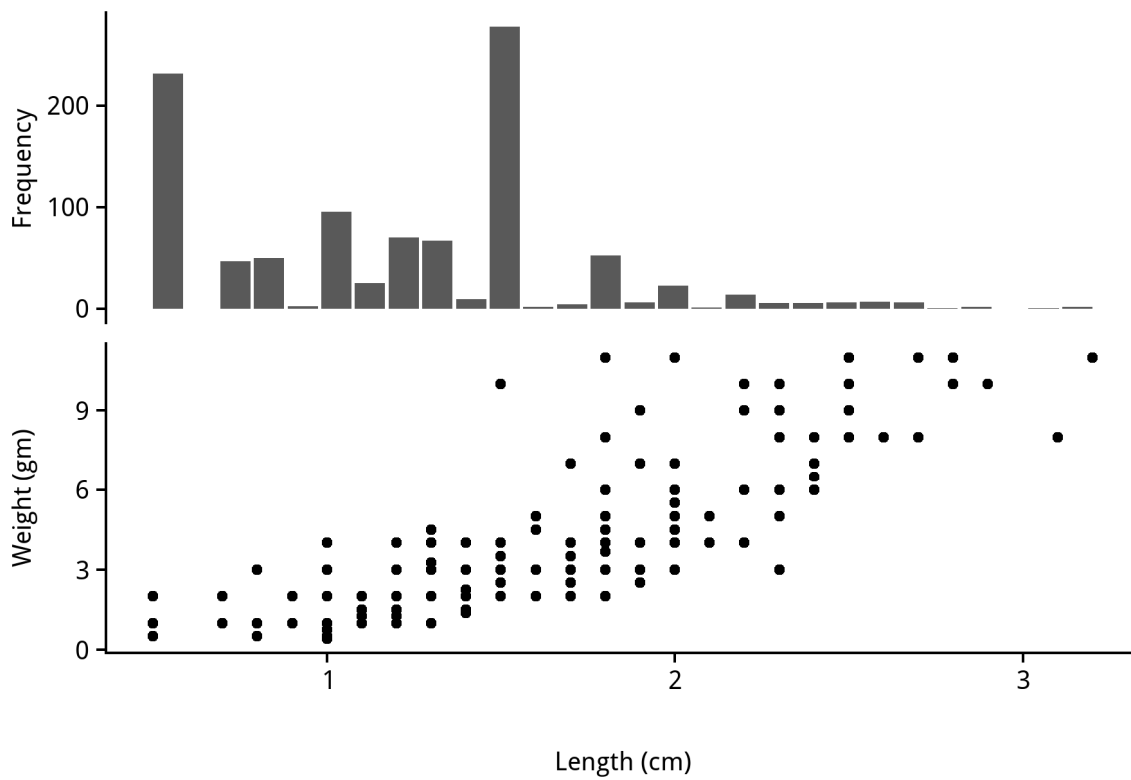
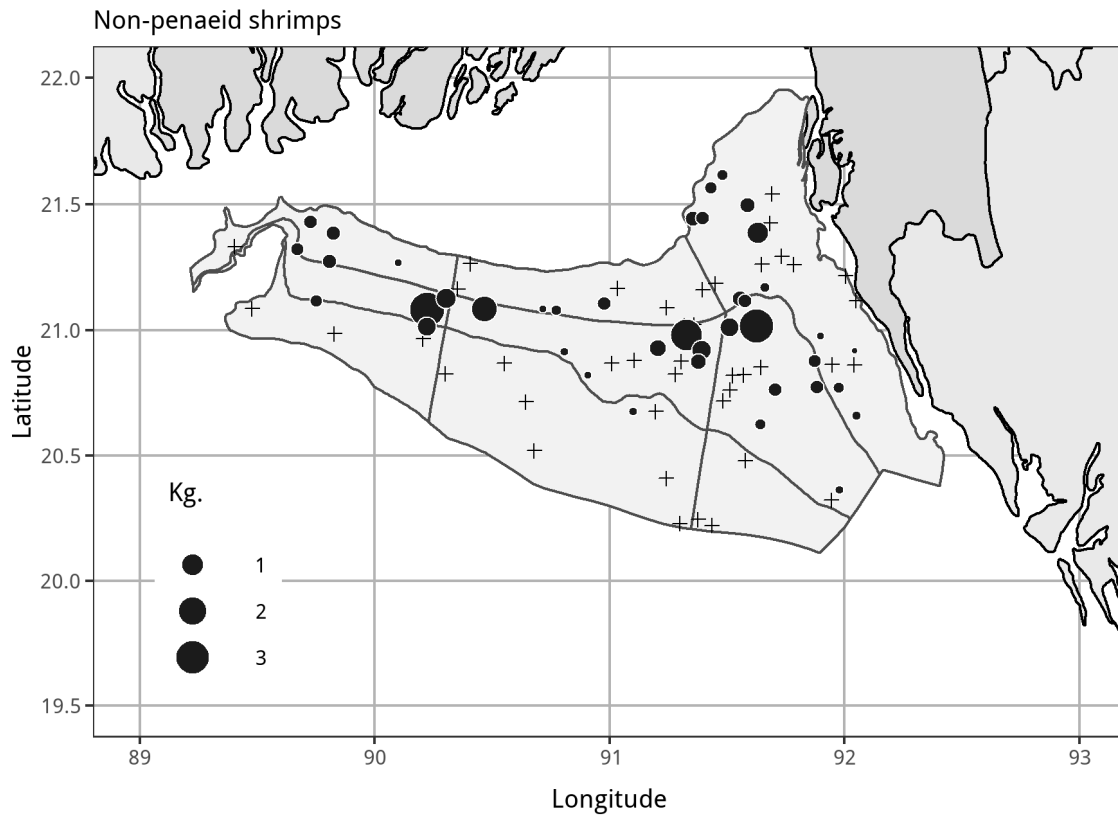
Species in group and number of catches

Scientific name	Occurences	Scientific name	Occurences
Exopalaemon styliferus	4	Solenocera hextii	18
Nematopalaemon tenuipes	5	Solenocera indica	1
Solencera indica	25	Squilla mantis	1
Solenocera crassicornis	1		



Shrimp surveys - Non-penaeid shrimps

Stratum	10201	10202	10203	10204	10205	10206	10207	10208	10209	
Weight	0.060	0.088	0.224	0.044	0.104	0.131	0.083	0.200	0.066	
Survey number										Annual mean
2016202		0.76	0.07		0.03	0.11			0.11	0.11
2017204	0.19	0.03	0.14	1.33	0.58	0.37	0.00	0.00	0.00	0.21



Species group: Small pelagics - Clupeidae and Pristigasteridae

Shads, Anchovies, Sardines and Herring which lie under the family of Clupeidae and Pristigasteridae are the most significant fish group of seawater of Bangladesh. They are commercially important and abundantly available but exploited as by catch of Small Mesh Drift gill Net, Set Bag Net and commercial trawl fishery. Among these groups *Hilsa ilisha* the National fish (Hilsa) is the dominant species both inland and marine catch.

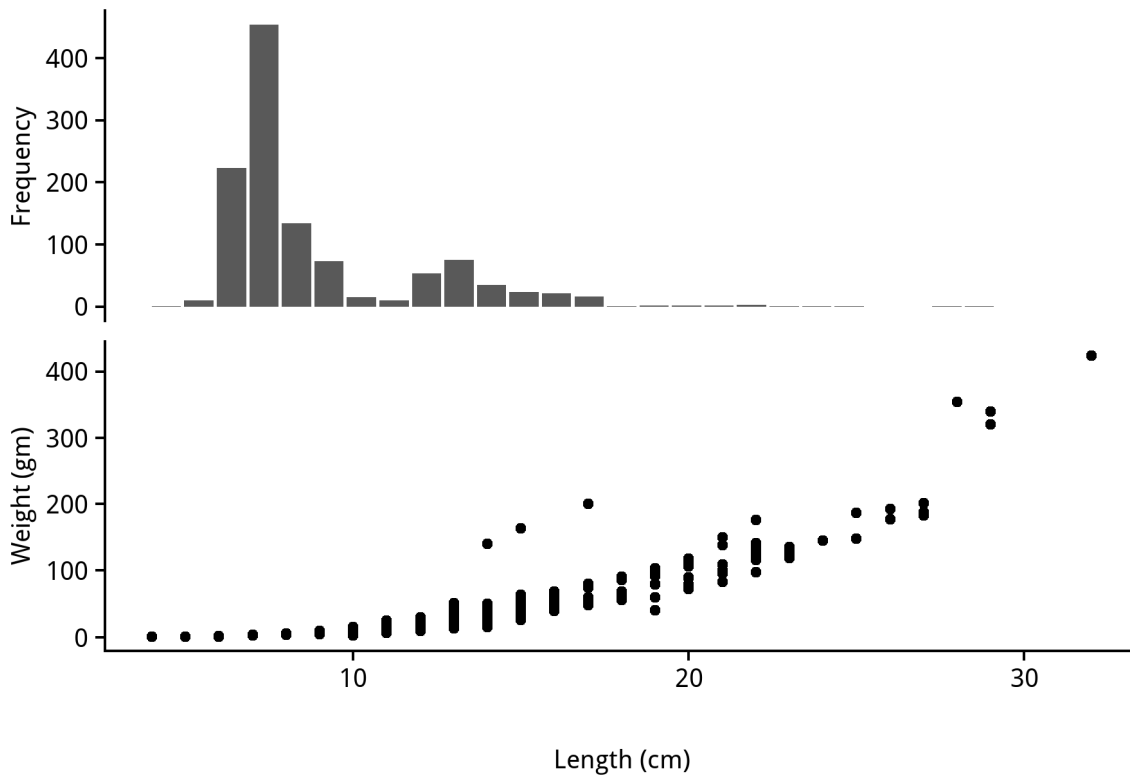
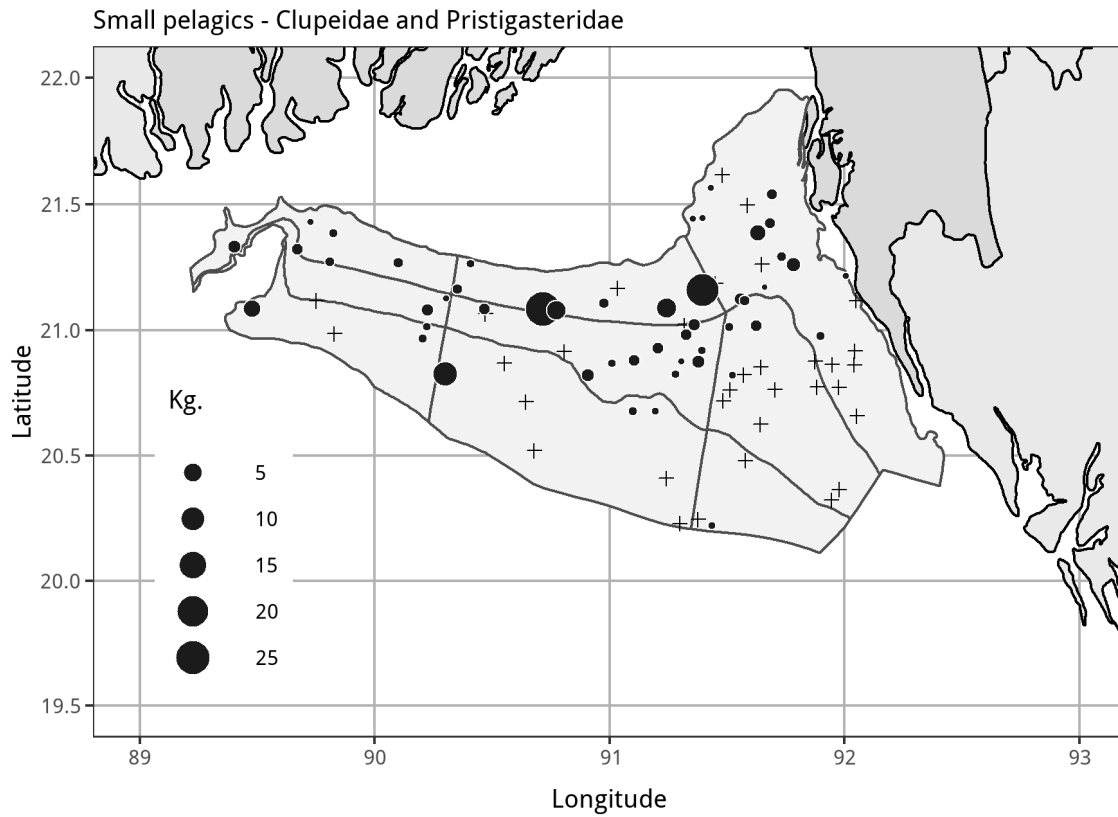
Species in group and number of catches

Scientific name	Occurences	Scientific name	Occurences
Anodontostoma chacunda	4	Ilisha melastoma	16
Dussumieria acuta	1	Pellona ditchela	1
Dussumieria elopsoides	19	Raconda russeliana	1
Hilsa kelee	1	Sardinella fimbriata	5
Ilisha elongata	9	Sardinella melanura	1
Ilisha filigera	20	Tenualosa ilisha	4
Ilisha megaloptera	1		



Shrimp surveys - Small pelagics - Clupeidae and Pristigasteridae

	10201	10202	10203	10204	10205	10206	10207	10208	10209	
Stratum	0.060	0.088	0.224	0.044	0.104	0.131	0.083	0.200	0.066	
Weight										
Survey number										Annual mean
2016202		0.63	14.11		0.00	0.18			0.00	3.25
2017204	0.59	6.20	0.44	0.40	0.70	0.14	1.47	1.45	0.02	1.20



Species group: Carangidae - Jacks and scads

Carangids are commercially important but exploited as by-catch or incidental catch of gill net, mid water trawl, demersal trawl and shrimp trawl though these groups are mostly pelagic. Within this group *Megalaspis cordyla* the Hard tail Scad and *Parastromateus niger* the Black pomfret are abundantly available in our territory.

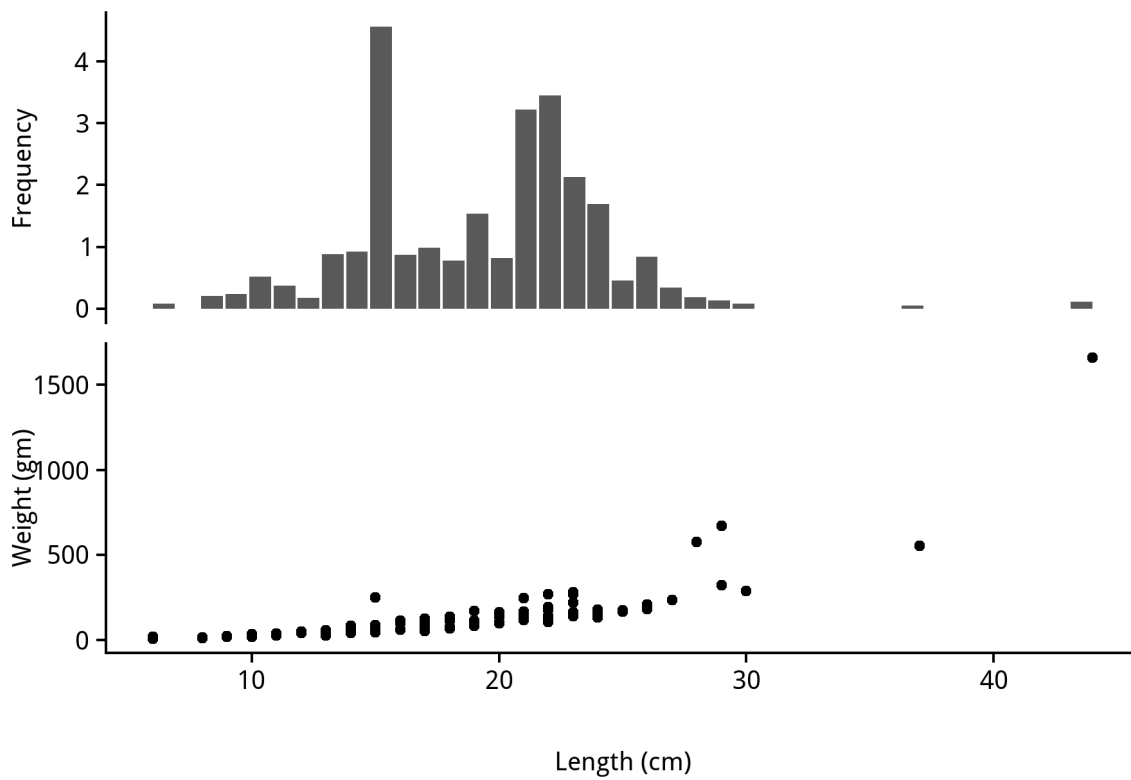
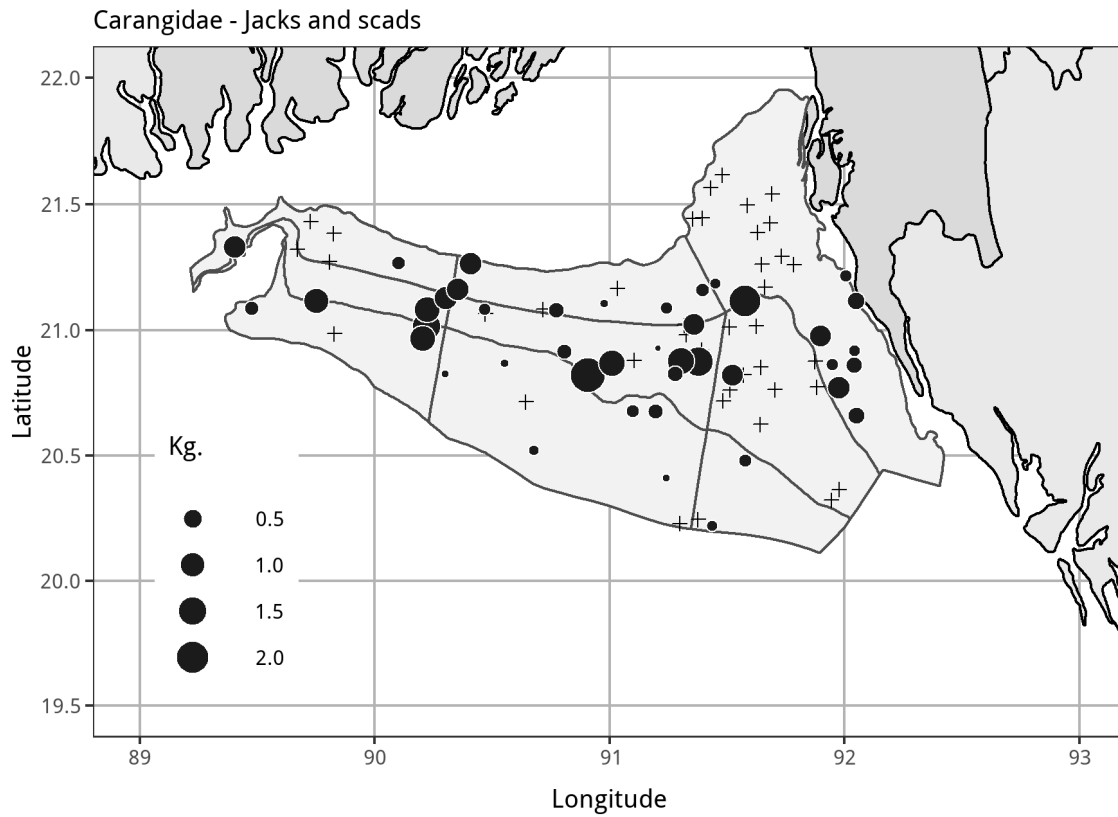
Species in group and number of catches

Scientific name	Occurences	Scientific name	Occurences
Alectis ciliaris	3	Caranx (Caranx) sexfasciatus	2
Alectis indica	5	Decapterus sp.	2
Alectis sp.	1	Megalaspis cordyla	18
Alepes melanoptera	1	Parastromateus niger	1
Atropus atropus	1	Scomberoides commersonianus	1
Carangoides armatus	2	Scomberoides tala	1
Carangoides caeruleopinnatus	1	Scomberoides tol	1
Carangoides cf. malabaricus	4	Selar crumenophthalmus	10
Carangoides chrysophrys	3	Seriola rivoliana	1
Carangoides ferdau	1	Trachurus indicus	1
Carangoides malabaricus	3	Uraspis sp.	3
Caranx (Caranx) melampygyus	2		



Shrimp surveys - Carangidae - Jacks and scads

Stratum	10201	10202	10203	10204	10205	10206	10207	10208	10209	
Weight	0.060	0.088	0.224	0.044	0.104	0.131	0.083	0.200	0.066	
Survey number										Annual mean
2016202		0.39	0.08		0.14	0.61			0.09	0.15
2017204	0.14	0.31	0.14	1.17	0.70	0.23	0.44	0.08	0.09	0.28

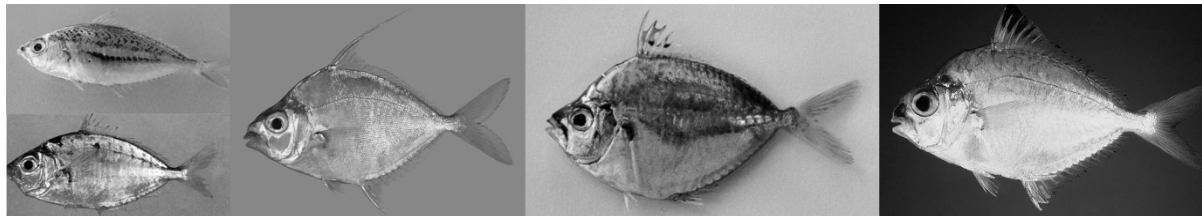


Species group: Leiognathidae - Ponyfish

Leiognathids or pony fish the small sized fishes consume locally and used as poultry feed and fish meal as cheap price. This group are abundantly caught in Artisanal fishing gear (MSBN), demersal trawl and shrimp trawl.

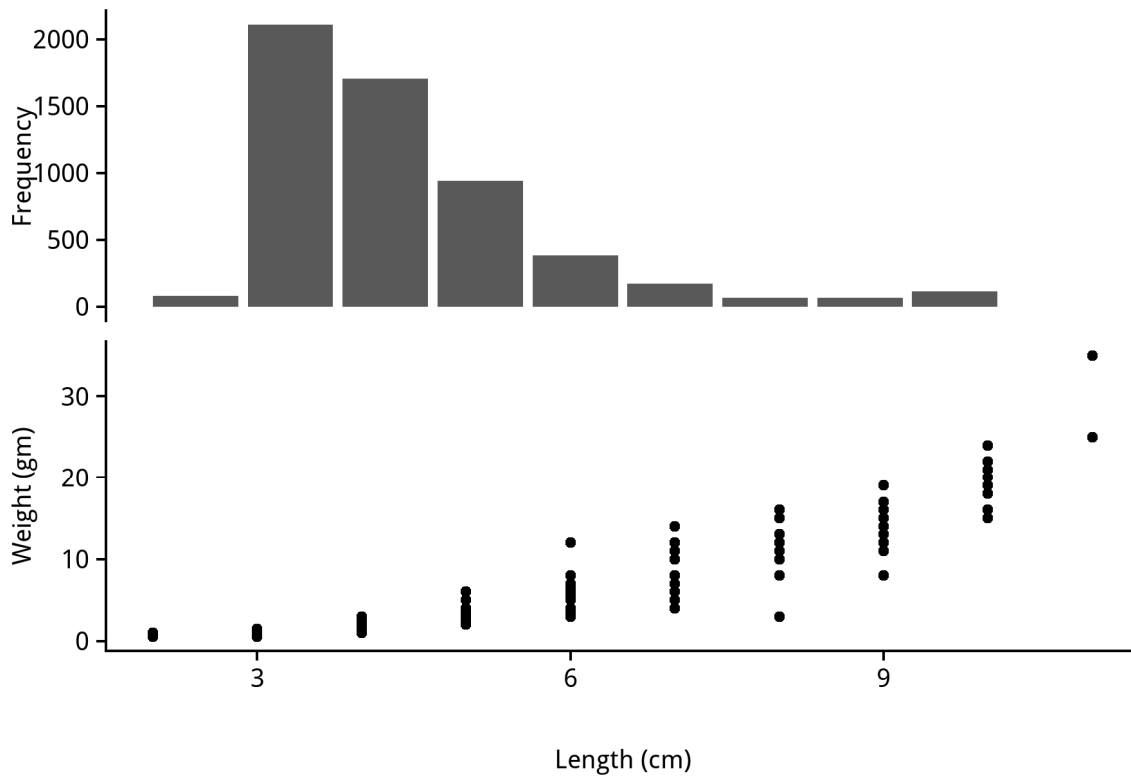
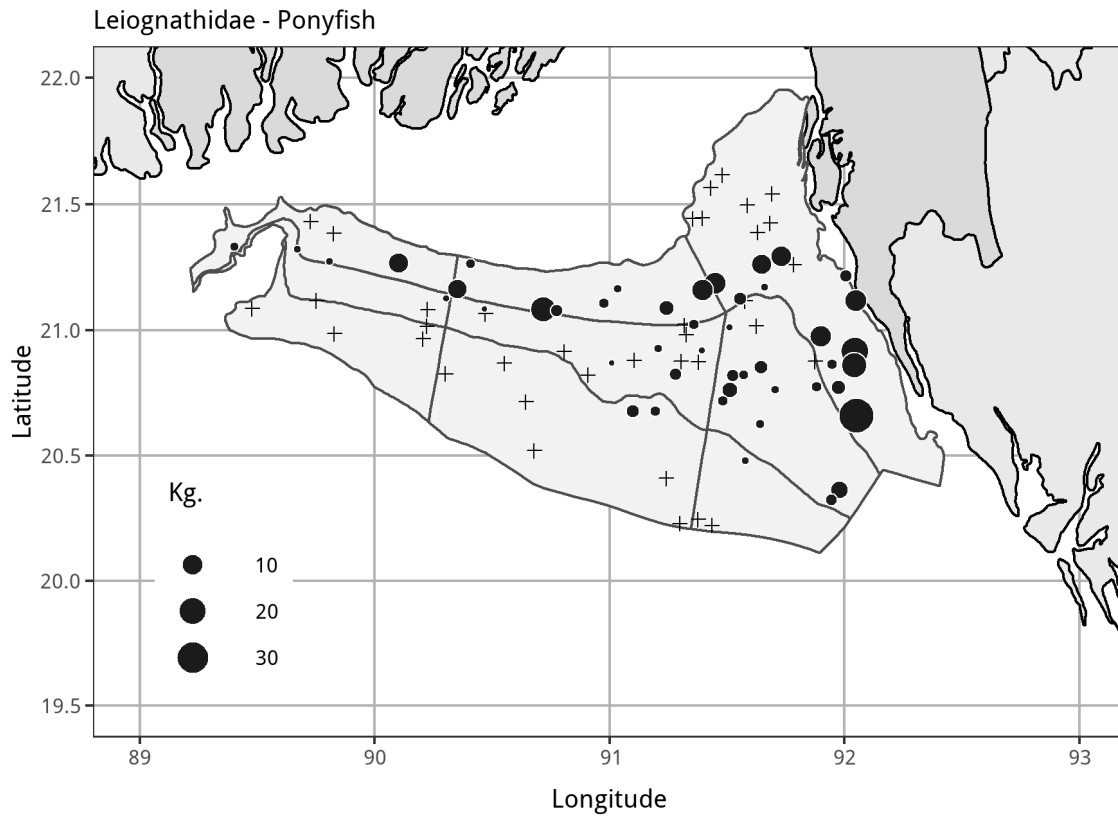
Species in group and number of catches

Scientific name	Occurences	Scientific name	Occurences
Gazza minuta	12	Leiognathus elongatus	1
Leiognathus bindus	29	Leiognathus splendens	1
Leiognathus brevisrostris	17	Secutor insidiator	6



Shrimp surveys - Leiognathidae - Ponyfish

	10201	10202	10203	10204	10205	10206	10207	10208	10209	
Stratum										
Weight	0.060	0.088	0.224	0.044	0.104	0.131	0.083	0.200	0.066	
Survey number										Annual mean
2016202		1.98	2.57		6.63	3.35			0.01	1.88
2017204	1.26	3.95	6.41	0.02	0.18	1.50	0.00	0.33	0.03	2.14



Species group: Mullidae - Goatfish

Mullidae – Goatfish, the small sized fish is consumed locally and harvest mainly in mid water trawl and found significantly in coral reef areas.

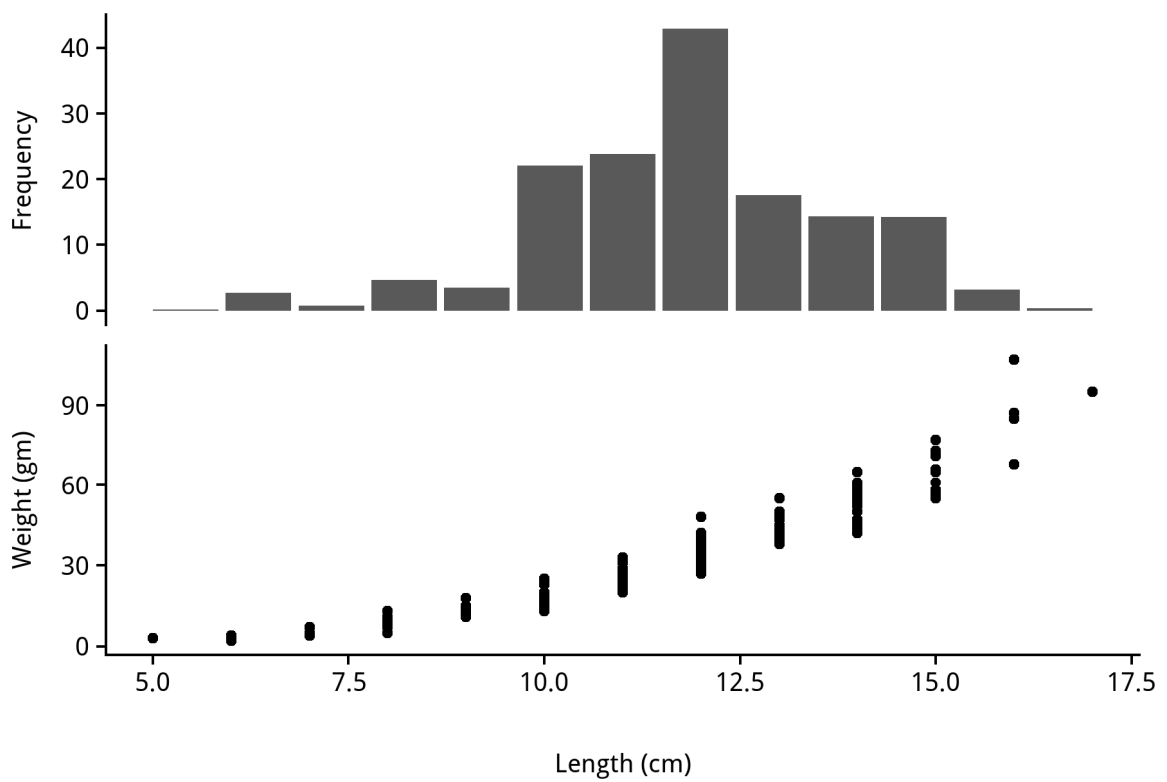
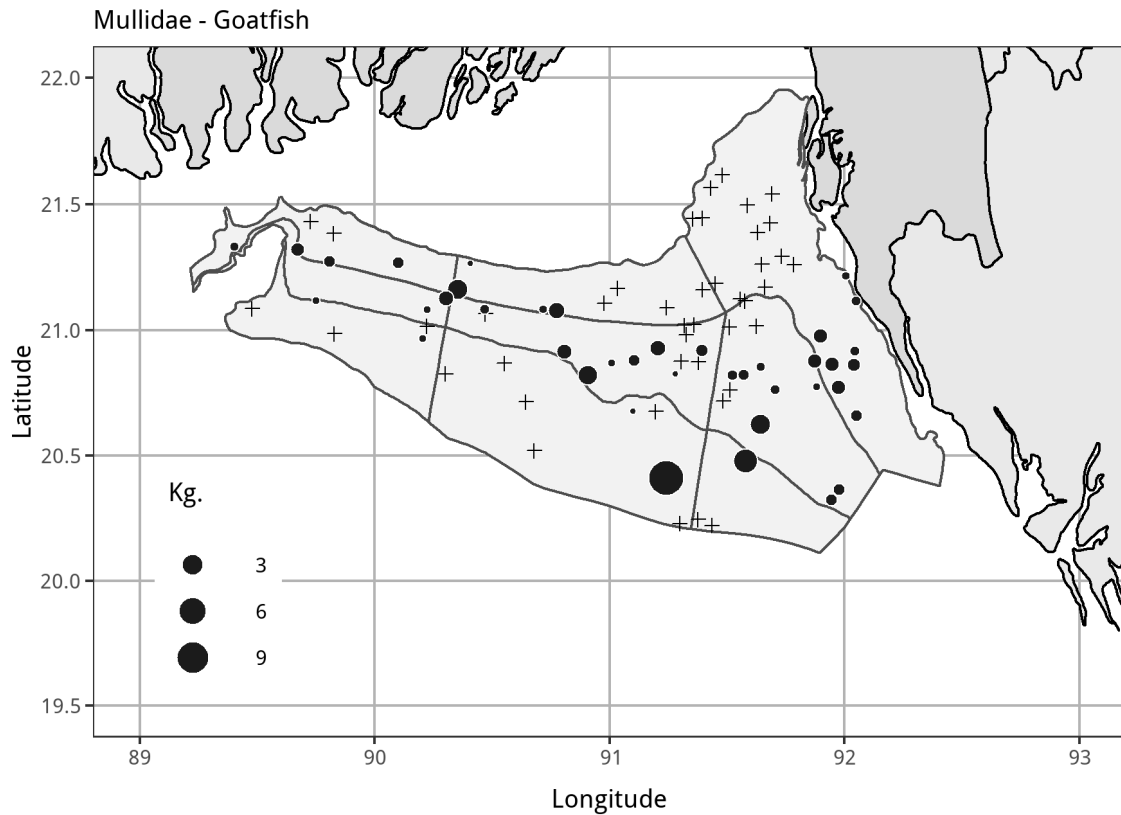
Species in group and number of catches

Scientific name	Occurences	Scientific name	Occurences
Mulloidés vanicolensis	1	Upeneus sulphureus	23
Parupeneus forsskali	1	Upeneus supravitatus	22
Upeneus bensasi	2	Upeneus tragula	1
Upeneus moluccensis	2		



Shrimp surveys - Mullidae - Goatfish

	10201	10202	10203	10204	10205	10206	10207	10208	10209	
Stratum										
Weight	0.060	0.088	0.224	0.044	0.104	0.131	0.083	0.200	0.066	
Survey number										Annual mean
2016202		0.20	1.37		0.78	2.41			0.00	0.72
2017204	0.31	0.44	0.24	0.31	0.56	0.35	0.01	1.55	1.46	0.64



Species group: Nemipteridae - Threadfin breams

Threadfin breams are commercially important fishes and considered as good fish. This are mainly caught bottom trawl, gill net and long lines. This fishes are occurring in muddy and sandy bottom and known to control of population of crustaceans and small fishes in the marine ecosystem.

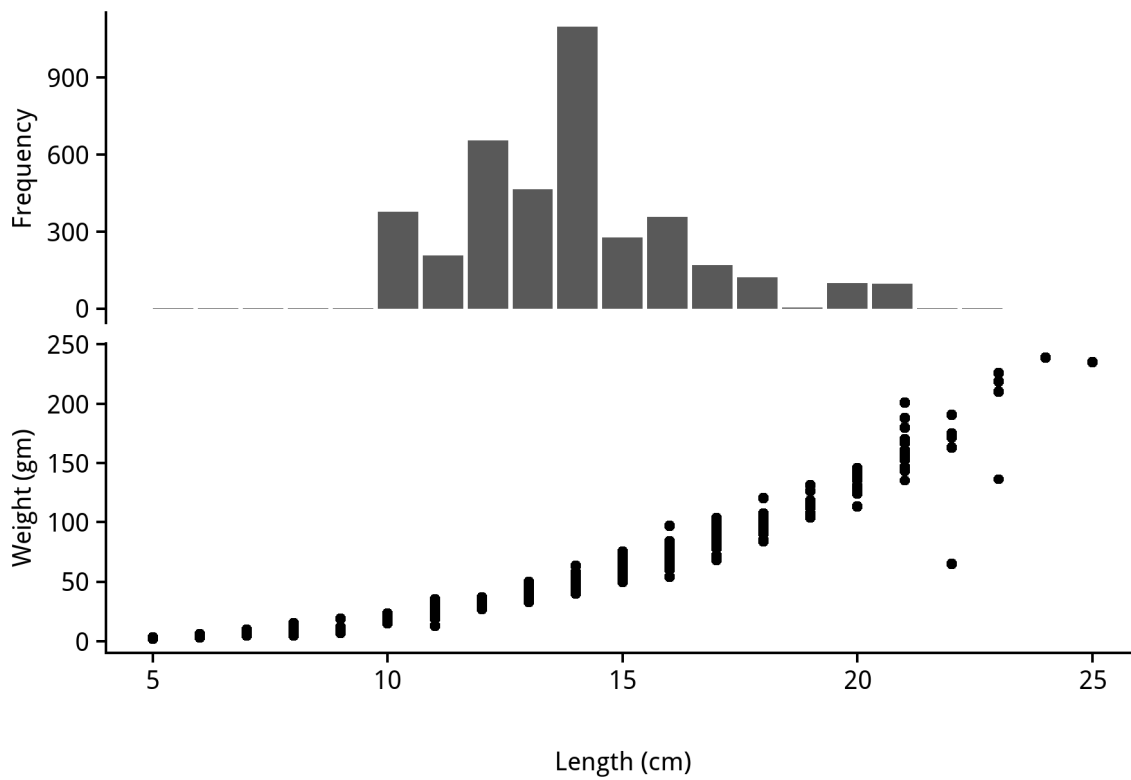
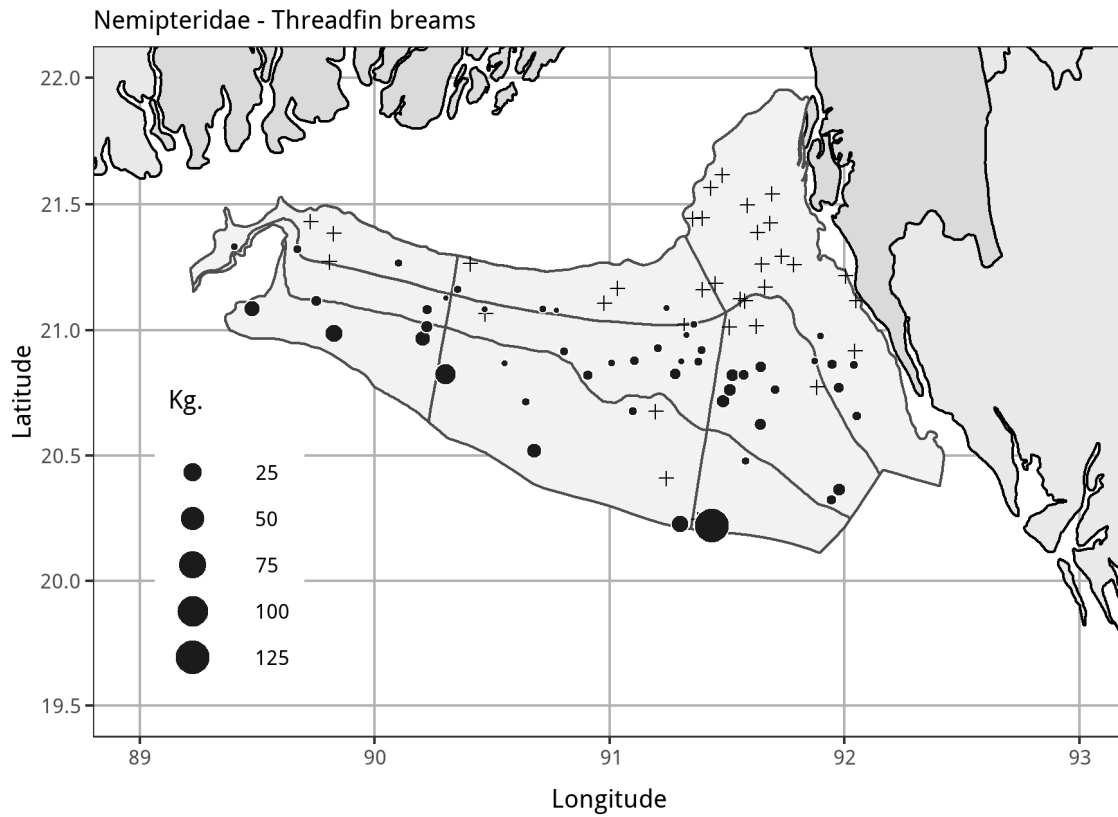
Species in group and number of catches

Scientific name	Occurences	Scientific name	Occurences
Nemipterus bipunctatus	1	Nemipterus randalli	4
Nemipterus japonicus	42	Nemipterus sp.	1
Nemipterus nematophorus	1	Parascolopsis aspinosa	3
Nemipterus peronii	3		



Shrimp surveys - Nemipteridae - Threadfin breams

Stratum	10201	10202	10203	10204	10205	10206	10207	10208	10209	
Weight	0.060	0.088	0.224	0.044	0.104	0.131	0.083	0.200	0.066	
Survey number									Annual mean	
2016202		0.01	0.09		1.06	1.54			16.69	1.44
2017204	0.38	0.16	0.49	2.93	1.39	3.61	17.81	9.78	47.25	7.46

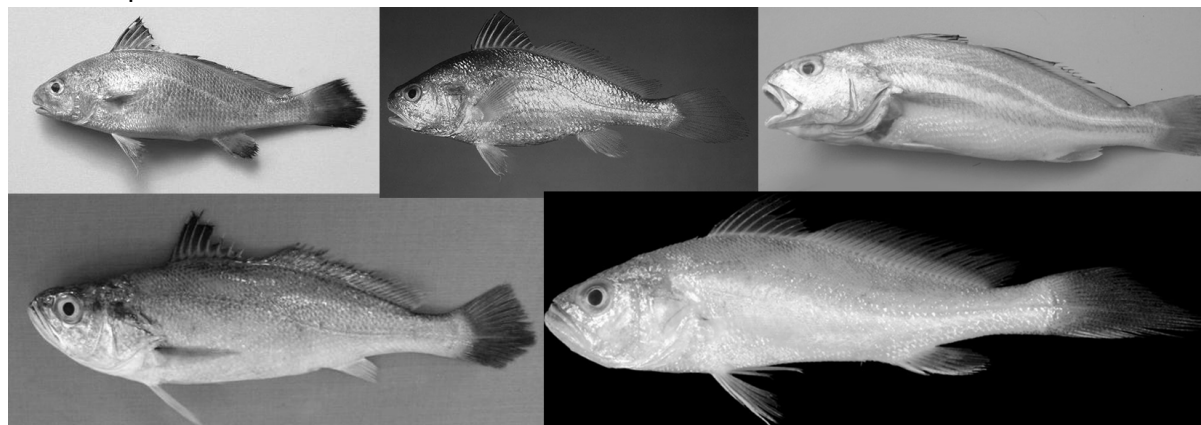


Species group: Sciaenidae - Croakers

Croakers are the largest group in the commercially important fishes in our sea water. These are bottom dwelling and carnivores' fishes known as drums feeding on benthic invertebrates and small fishes. They are caught bottom trawl, gill net and long lines. They are exported as dry and fresh form and fetch a good foreign currency and have a local demand.

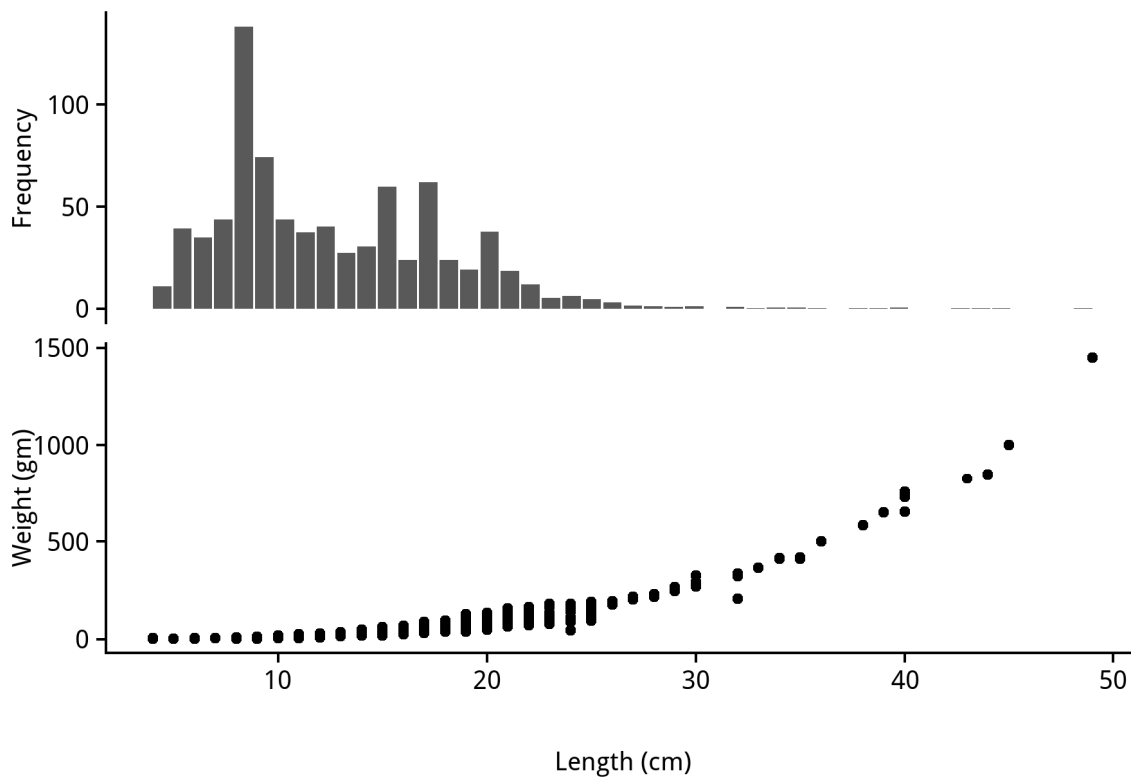
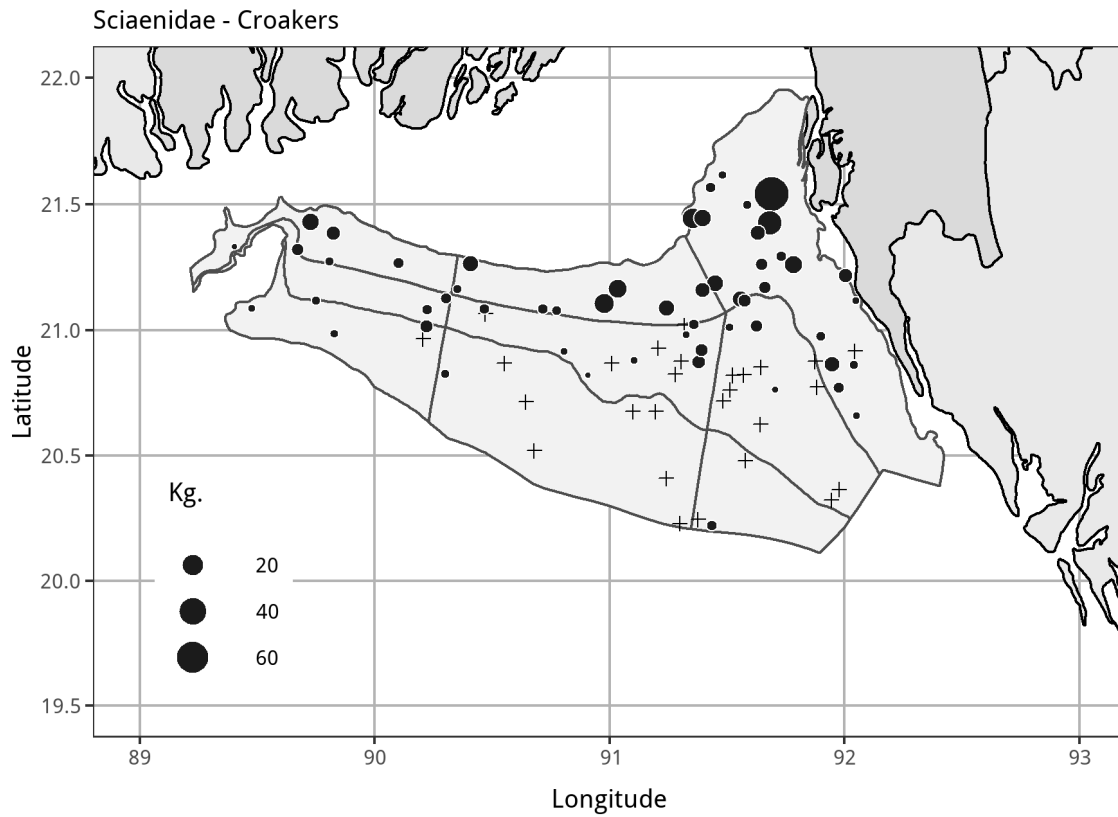
Species in group and number of catches

Scientific name	Occurences	Scientific name	Occurences
Argyrosomus japonicus	1	Otolithes cuvieri	11
Johnieops sina	1	Otolithes ruber	2
Johnieops vogleri	3	Otolithes sp.	1
Johnius argentatus	2	Otolithoides biauritus	4
Johnius belangerii	20	Otolithoides pama	8
Johnius carutta	2	Panna microdon	6
Johnius dussumieri	7	Pennahia anea	21
Johnius elongatus	14	Protonibea diacanthus	4
Johnius macropterus	2	Pterotolithus maculatus	2
Johnius sp.	4		



Shrimp surveys - Sciaenidae - Croakers

Stratum	10201	10202	10203	10204	10205	10206	10207	10208	10209	
Weight	0.060	0.088	0.224	0.044	0.104	0.131	0.083	0.200	0.066	
Survey number										Annual mean
2016202		3.45	1.83		0.00	0.65			0.10	0.81
2017204	4.50	5.80	11.11	2.08	1.19	0.63	0.28	0.08	0.50	3.64

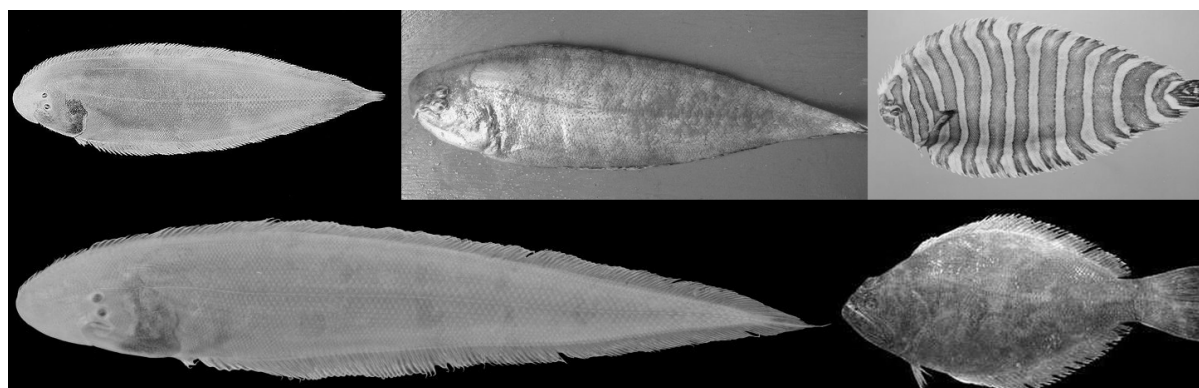


Species group: Pleuronectiformes - Flatfish

As before Flatfish are thrown as trash in shrimp trawl and demersal trawl catch. But at present flat fishes are used in fish meal and poultry feed. These groups mainly harvest in shrimp trawl but sometimes caught in MSBN. In Bangladesh only some tribal peoples having some species of flat fish, but now days these export in foreign countries mainly in China, Korea and Singapore. These groups are inhabits in sand and mud bottoms and eat only crutaceans.

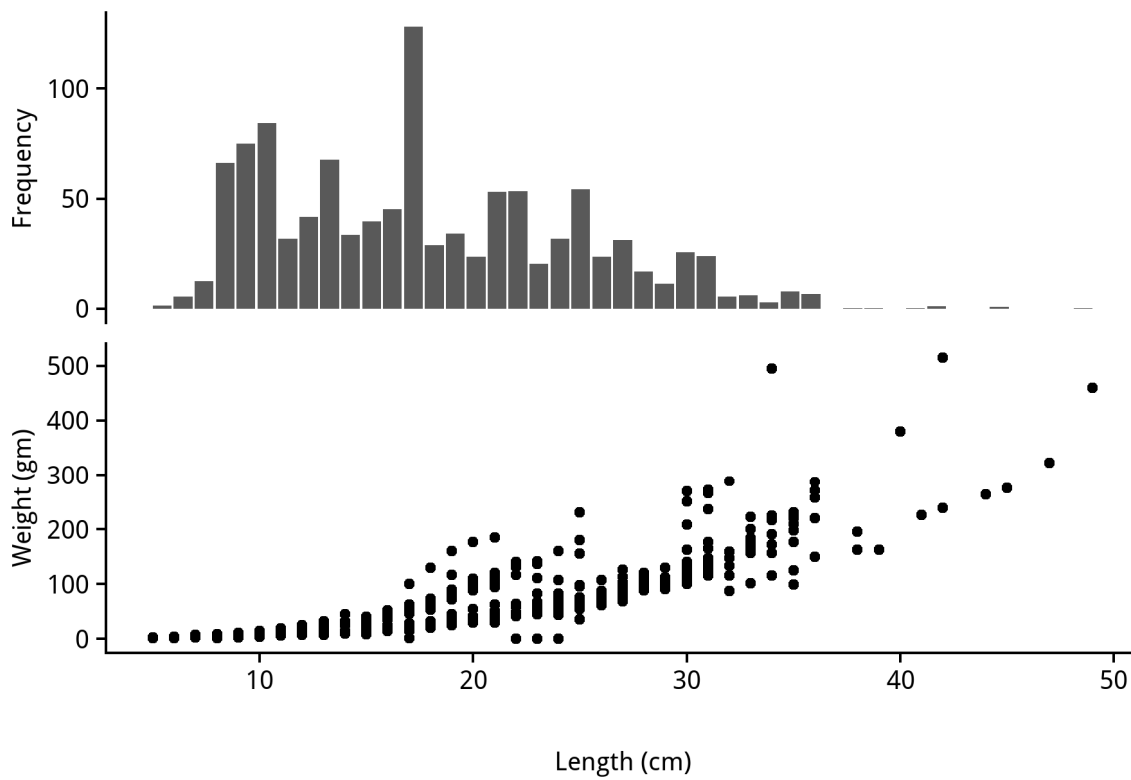
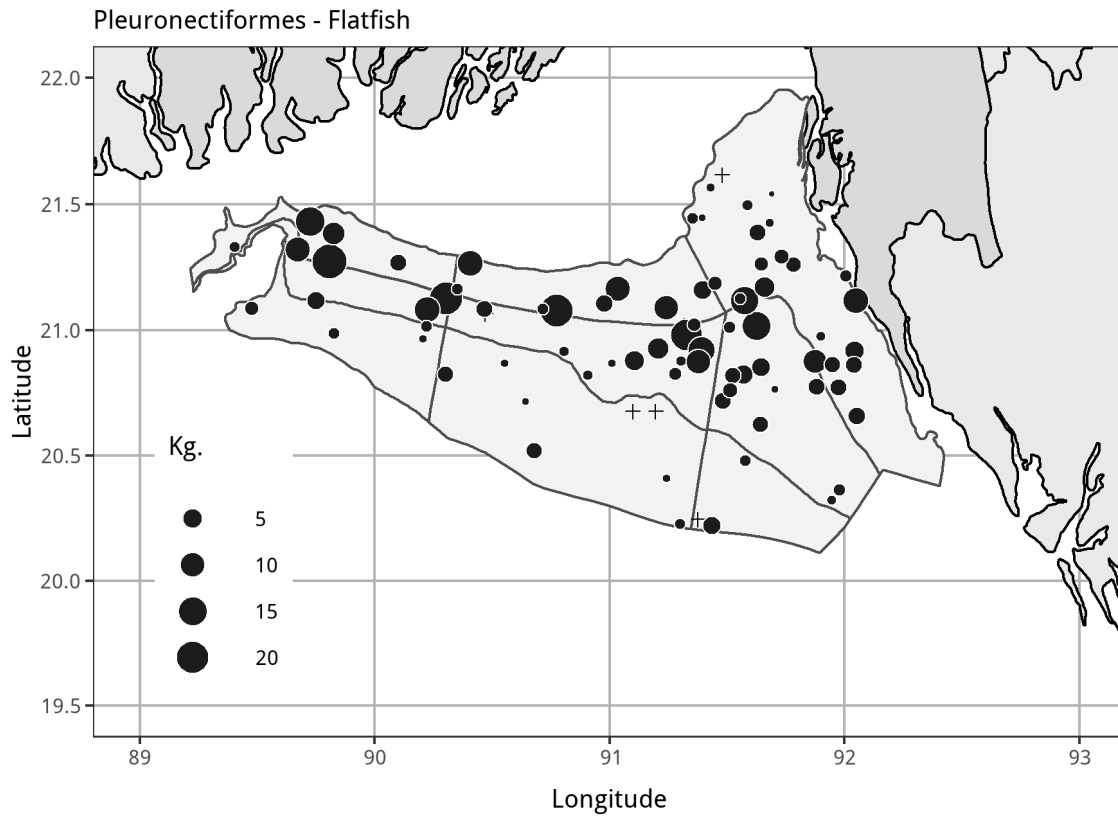
Species in group and number of catches

Scientific name	Occurences	Scientific name	Occurences
Arnoglossus sp.	1	Pseudorhombus javanicus	12
Bothus myriaster	7	Pseudorhombus malayanus	9
Brachirus orientalis	2	Pseudorhombus triocellatus	2
Cynoglossus lingua	63	Solea elongata	3
Leops nigrescens	4	Zebrias altipinnis	1
Paralichthodes algoensis	6	Zebrias synapturoides	1
Paraplagusia bilineata	5	Zebrias zebra	13
Pseudorhombus elevatus	30		



Shrimp surveys - Pleuronectiformes - Flatfish

Stratum	10201	10202	10203	10204	10205	10206	10207	10208	10209	
Weight	0.060	0.088	0.224	0.044	0.104	0.131	0.083	0.200	0.066	
Survey number										Annual mean
2016202		1.09	3.85		1.16	3.65			0.54	1.59
2017204	12.58	6.70	3.03	10.21	6.28	4.79	0.99	0.94	1.79	4.14

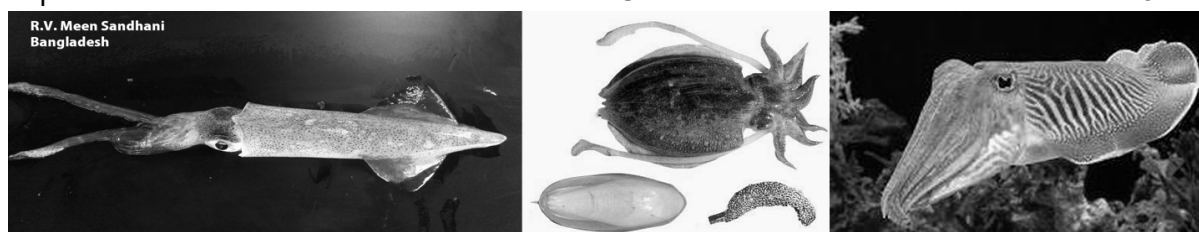


Species group: Squids and cuttlefish

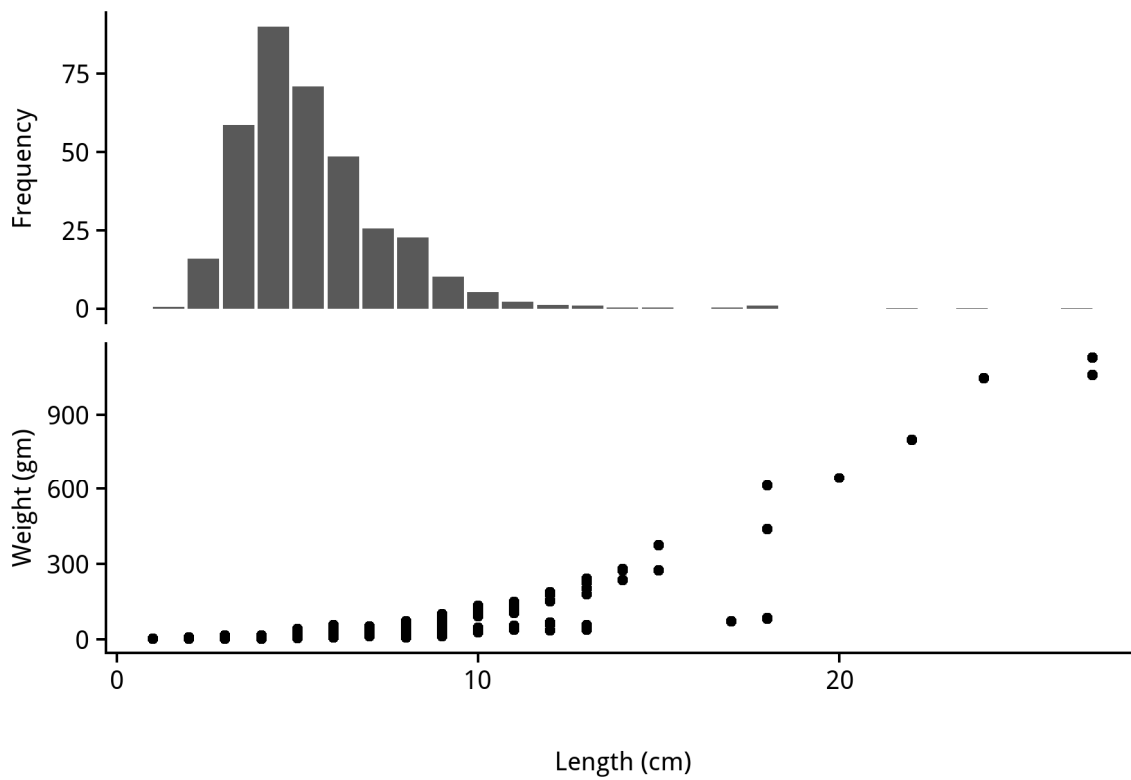
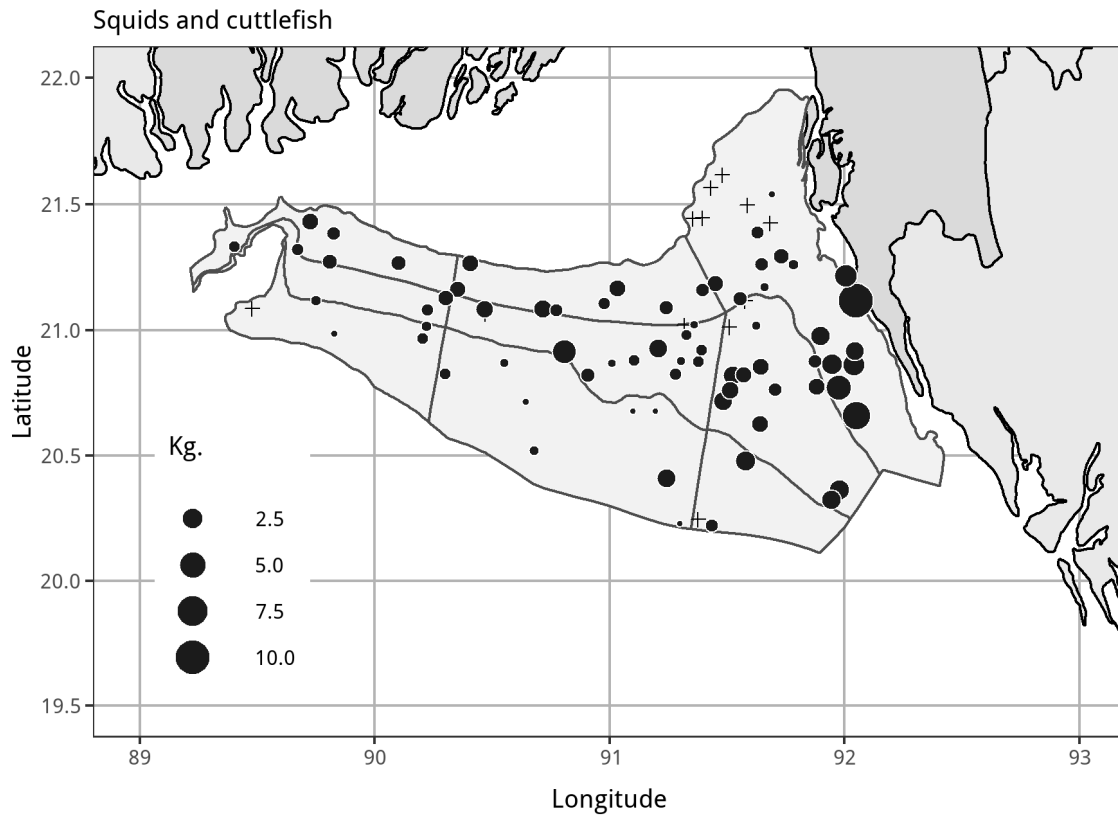
Two major groups of cephalopods e.g. Squid and cuttle fish which are available in Bangladesh coast. Cephalopods are not exploited by any specialised fishing gear but a small quantity is being caught as by-catch of bottom trawl and shrimp trawl and even MSBN also. Now days it's are exportable item in different countries.

Species in group and number of catches

Scientific name	Occurences	Scientific name	Occurences
Brachioteuthis sp.	1	Sepia officinalis	2
Sepia acuelata	8	Sepia sp.	50
Sepia esculenta	11	Uroteuthis duvauceli	49



Shrimp surveys - Squids and cuttlefish										
Stratum	10201	10202	10203	10204	10205	10206	10207	10208	10209	
Weight	0.060	0.088	0.224	0.044	0.104	0.131	0.083	0.200	0.066	
Survey number										Annual mean
2016202		1.14	3.06		1.30	2.27			0.00	1.22
2017204	0.89	0.77	1.80	0.52	0.94	1.27	0.11	0.36	0.96	0.96



Species group: Trichiuridae - ribbonfish

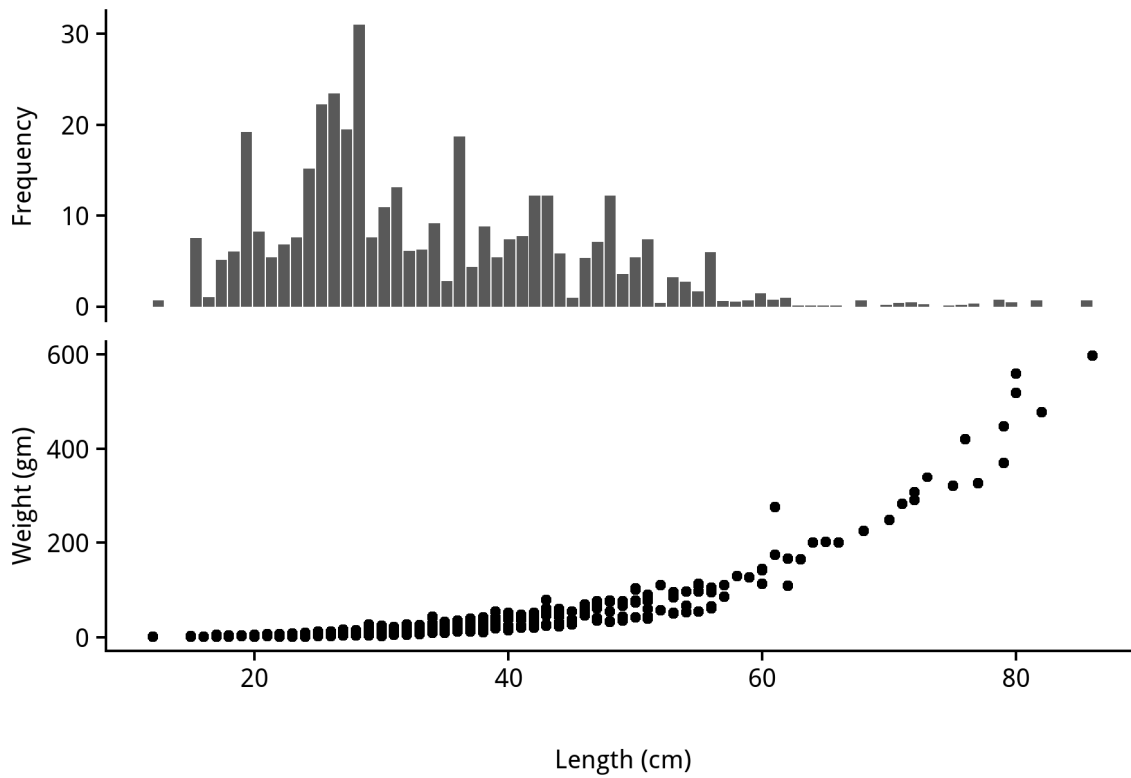
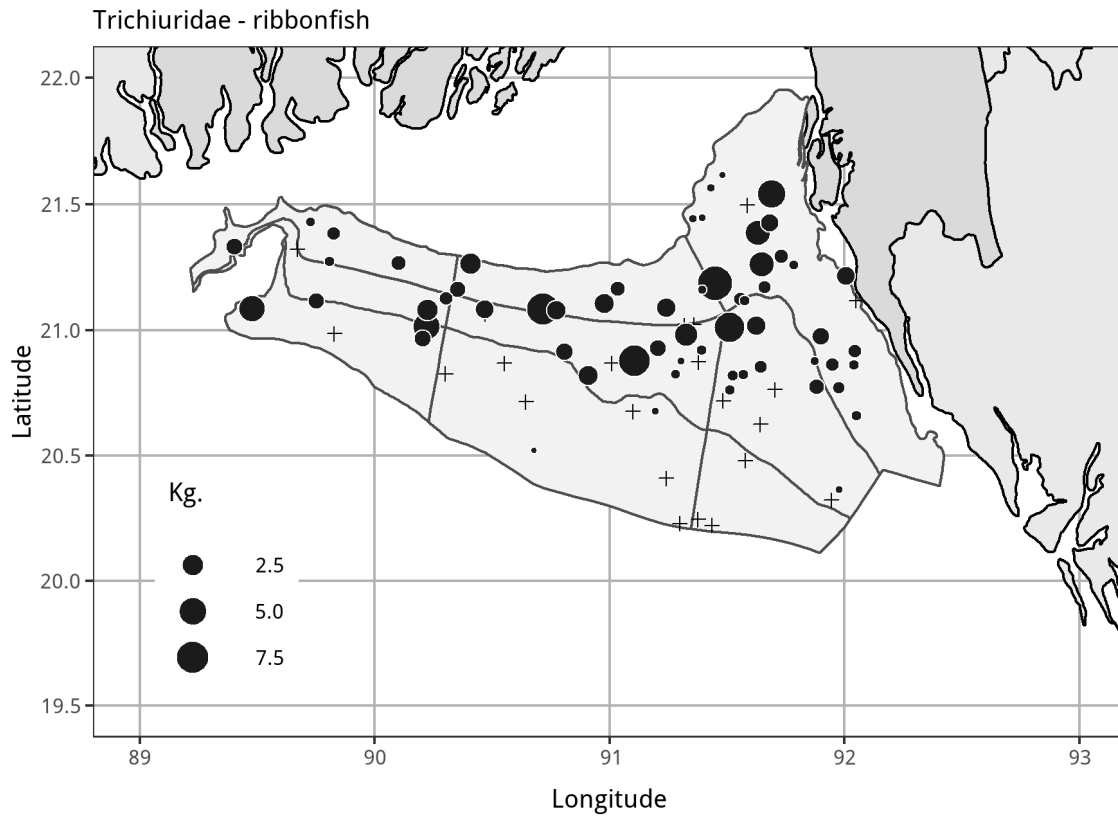
Elongate and compressed ribbon-like trichiurid are benthopelagic inhabits coastal and often comes near the surface at night. Ribbonfish export as dry, salted and fresh form in different countries. This carnivore fish feed on small fish and shrimp. Harvest bottom trawl, set bag net and beach seines.

Species in group and number of catches

Scientific name	Occurences
Lepturacanthus savala	49
Trichiurus lepturus	13



Shrimp surveys - Trichiuridae - ribbonfish										
Stratum	10201	10202	10203	10204	10205	10206	10207	10208	10209	
Weight	0.060	0.088	0.224	0.044	0.104	0.131	0.083	0.200	0.066	
Survey number										Annual mean
2016202		2.34	1.01		0.21	0.90			0.00	0.57
2017204	0.53	1.67	1.56	2.36	1.71	0.88	1.97	0.01	0.00	1.09

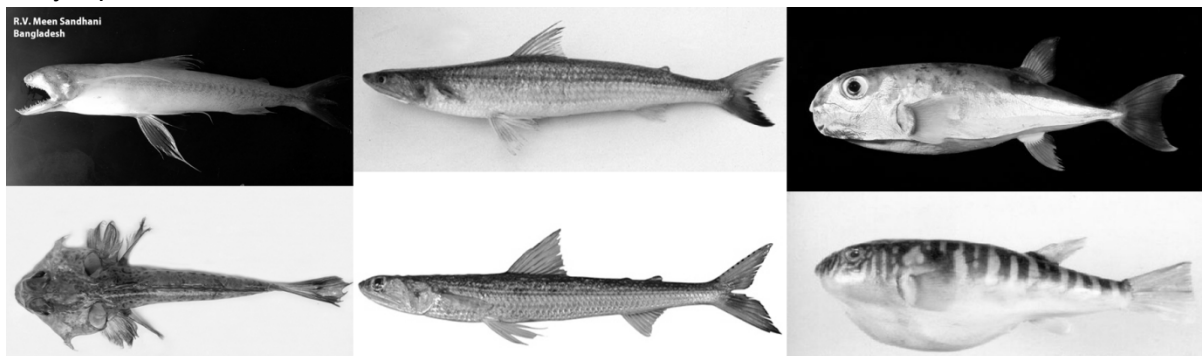


Species group: Other families - Synodontidae, Tetrodontidae, Platycephalidae

These groups are used mainly as fish meal and poultry feed. Important as commercial fisheries sold fresh, dried and salted in the markets. Lizard fishes are exploited in sandy and muddy bottom areas in demersal fishing. Fisheries have no commercial importance of Puffer fish. The puffer fish must not be eaten because its skin and internal organs contain neurotoxin. Flathead fishes are minor commercial importance and caught by trawl over sandy and muddy bottom.

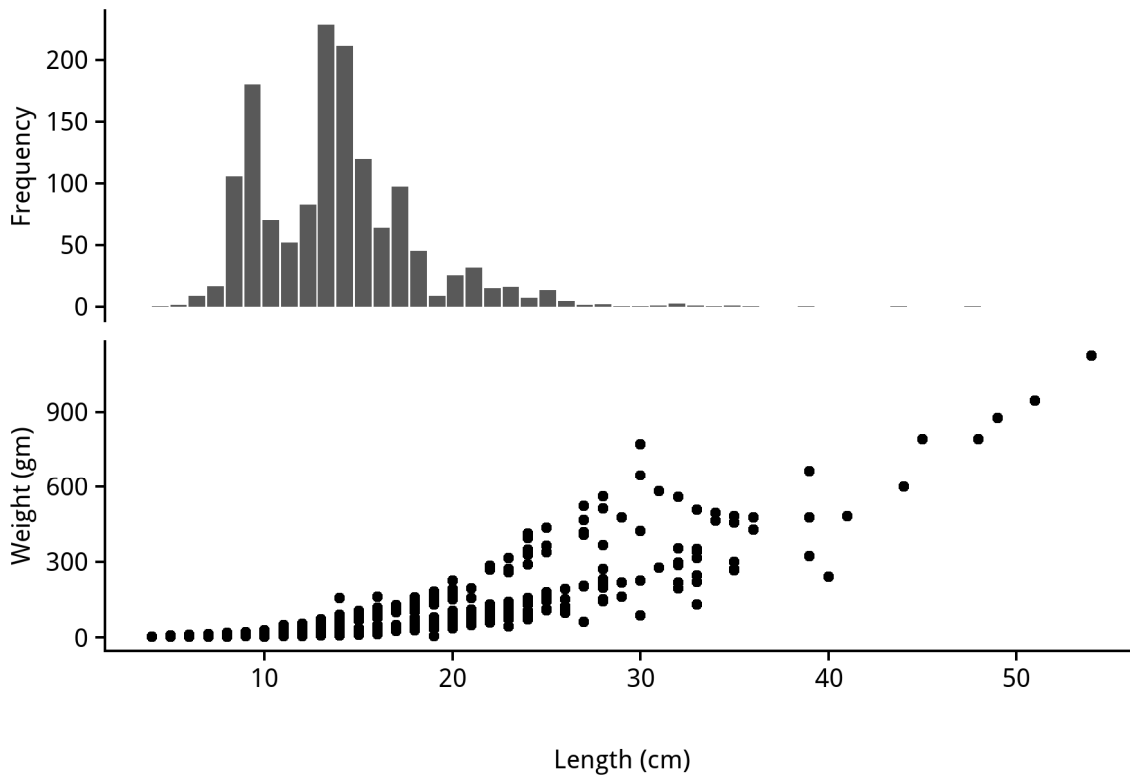
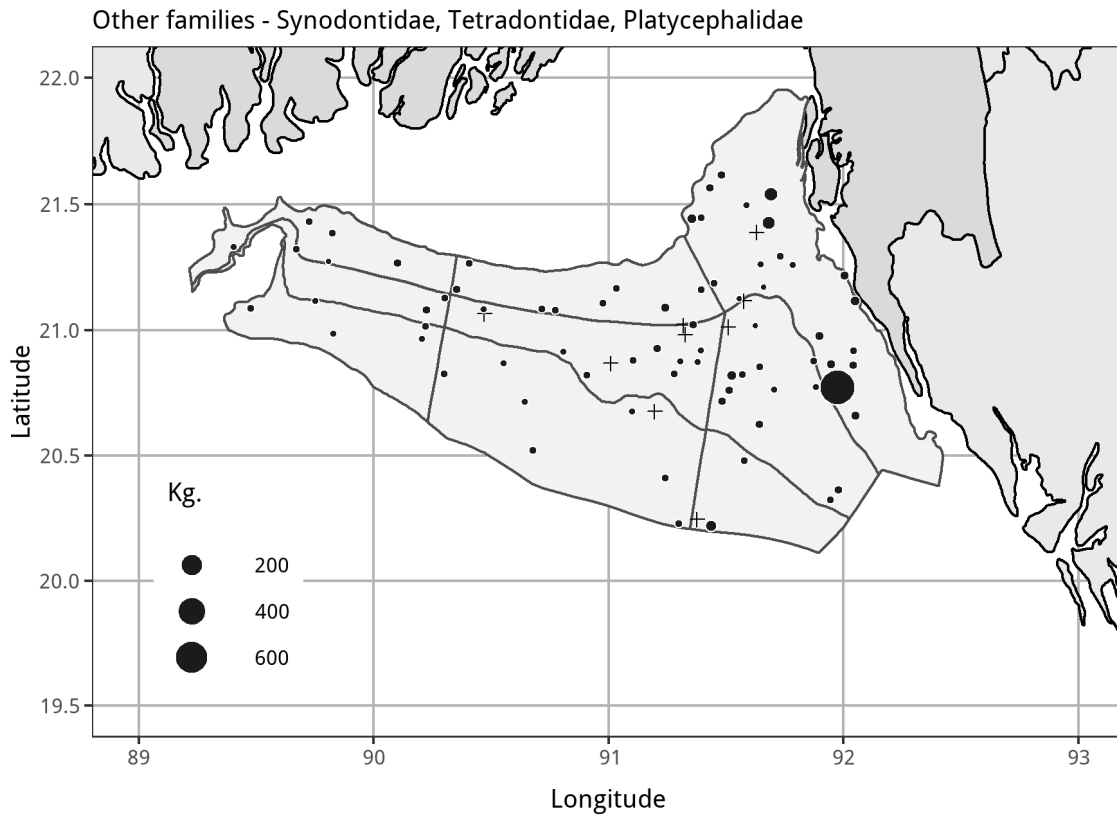
Species in group and number of catches

Scientific name	Occurrences	Scientific name	Occurrences
Arothron immaculatus	1	Platycephalus sp.	2
Arothron leopardus	1	Rogadius asper	46
Cociella crocodilus	5	Saurida longimanus	3
Grammoplites scaber	3	Saurida tumbil	40
Grammoplites suppositus	2	Saurida undosquamis	3
Harpadon nehereus	8	Sorsogna tuberculata	1
Lagocephalus lagocephalus	26	Sorsogona sp.	1
Lagocephalus lunaris	19	Synodus indicus	6
Lagocephalus spadiceus	3	Takifugu ablongus	3
Minous monodactylus	1	Trachinocephalus myops	5
Platycephalus indicus	9		



Shrimp surveys - Other families - Synodontidae, Tetrodontidae, Platycephalidae

Stratum	10201	10202	10203	10204	10205	10206	10207	10208	10209	
Weight	0.060	0.088	0.224	0.044	0.104	0.131	0.083	0.200	0.066	
Survey number										Annual mean
2016202		1.18	3.83		1.42	3.58			8.42	2.14
2017204	1.48	2.45	41.65	2.23	1.02	2.35	0.92	1.14	7.67	10.97



ANNEX III: Sampling stations, Shrimp Survey #2017204

Stn	Stratum	Zone	Ground	Location (DD)		Location (DDM)		Depth (m)	
				Lat (N)	Lon (E)	Lat (N)	Lon (E)	Min	Max
5	10201	Inshore	Swatch	21.3275	89.3892	21°19.65	89°23.35	10	40
6	10201	Inshore	Swatch	21.3275	89.6892	21°19.65	89°41.35	10	40
30	10201	Inshore	Swatch	21.2775	89.7892	21°16.65	89°47.35	10	40
34	10201	Inshore	Swatch	21.2775	90.0892	21°16.65	90°05.35	10	40
46	10201	Inshore	Swatch	21.4275	89.7392	21°25.65	89°44.35	10	40
73	10201	Inshore	Swatch	21.3775	89.8392	21°22.65	89°50.35	10	40
106	10201	Inshore	Swatch	21.1775	90.2892	21°10.65	90°17.35	10	40
111	10201	Inshore	Swatch	21.3275	90.0892	21°19.65	90°05.35	10	40
112	10201	Inshore	Swatch	21.3275	90.1892	21°19.65	90°11.35	10	40
125	10201	Inshore	Swatch	21.2775	89.8392	21°16.65	89°50.35	10	40
126	10201	Inshore	Swatch	21.4775	89.6392	21°28.65	89°38.35	10	40
157	10201	Inshore	Swatch	21.3775	89.7892	21°22.65	89°47.35	10	40
1	10202	Inshore	Middle	21.0775	91.2392	21°04.65	91°14.35	10	40
4	10202	Inshore	Middle	21.1775	90.3392	21°10.65	90°20.35	10	40
9	10202	Inshore	Middle	21.1775	91.0392	21°10.65	91°02.35	10	40
13	10202	Inshore	Middle	21.1775	91.3892	21°10.65	91°23.35	10	40
33	10202	Inshore	Middle	21.0275	91.3392	21°01.65	91°20.35	10	40
41	10202	Inshore	Middle	21.2775	90.3892	21°16.65	90°23.35	10	40
67	10202	Inshore	Middle	21.2275	90.9392	21°13.65	90°56.35	10	40
77	10202	Inshore	Middle	21.0775	90.7392	21°04.65	90°44.35	10	40
79	10202	Inshore	Middle	21.0775	90.7892	21°04.65	90°47.35	10	40
113	10202	Inshore	Middle	21.3275	91.2892	21°19.65	91°17.35	10	40
115	10202	Inshore	Middle	21.1775	91.2392	21°10.65	91°14.35	10	40
132	10202	Inshore	Middle	21.1275	90.5392	21°07.65	90°32.35	10	40
136	10202	Inshore	Middle	21.1275	90.9892	21°07.65	90°59.35	10	40
139	10202	Inshore	Middle	21.1275	91.1392	21°07.65	91°08.35	10	40
154	10202	Inshore	Middle	21.2275	90.6892	21°13.65	90°41.35	10	40
155	10202	Inshore	Middle	21.2275	91.0392	21°13.65	91°02.35	10	40
159	10202	Inshore	Middle	21.2275	91.3892	21°13.65	91°23.35	10	40
168	10202	Inshore	Middle	21.0775	90.9892	21°04.65	90°59.35	10	40
2	10203	Inshore	South	21.3775	91.6392	21°22.65	91°38.35	10	40
3	10203	Inshore	South	21.6275	91.4892	21°37.65	91°29.35	10	40
10	10203	Inshore	South	21.5775	91.4392	21°34.65	91°26.35	10	40
14	10203	Inshore	South	21.1775	91.4392	21°10.65	91°26.35	10	40
18	10203	Inshore	South	21.1775	91.6392	21°10.65	91°38.35	10	40
22	10203	Inshore	South	20.9275	92.0392	20°55.65	92°02.35	10	40
24	10203	Inshore	South	20.7775	91.9892	20°46.65	91°59.35	10	40
26	10203	Inshore	South	20.7775	92.2392	20°46.65	92°14.35	10	40
28	10203	Inshore	South	21.5275	91.6892	21°31.65	91°41.35	10	40
36	10203	Inshore	South	20.5775	92.2892	20°34.65	92°17.35	10	40
39	10203	Inshore	South	21.4775	91.5892	21°28.65	91°35.35	10	40
42	10203	Inshore	South	21.4775	91.8392	21°28.65	91°50.35	10	40
45	10203	Inshore	South	21.2775	91.6392	21°16.65	91°38.35	10	40
48	10203	Inshore	South	21.0275	92.0892	21°01.65	92°05.35	10	40
49	10203	Inshore	South	21.2775	91.7392	21°16.65	91°44.35	10	40
51	10203	Inshore	South	21.4275	91.3392	21°25.65	91°20.35	10	40
52	10203	Inshore	South	21.4275	91.3892	21°25.65	91°23.35	10	40
57	10203	Inshore	South	20.8775	91.8892	20°52.65	91°53.35	10	40
58	10203	Inshore	South	21.1275	91.5392	21°07.65	91°32.35	10	40
60	10203	Inshore	South	21.4275	91.6892	21°25.65	91°41.35	10	40

ANNEX III: Sampling stations, Shrimp Survey #2017204

Stn	Stratum	Zone	Ground	Location (DD)		Location (DDM)		Depth (m)	
				Lat (N)	Lon (E)	Lat (N)	Lon (E)	Min	Max
63	10203	Inshore	South	21.1275	92.0392	21°07.65	92°02.35	10	40
76	10203	Inshore	South	20.9775	91.8892	20°58.65	91°53.35	10	40
80	10203	Inshore	South	21.2275	91.9892	21°13.65	91°59.35	10	40
102	10203	Inshore	South	20.8275	92.1392	20°49.65	92°08.35	10	40
105	10203	Inshore	South	21.0775	91.4892	21°04.65	91°29.35	10	40
116	10203	Inshore	South	21.5275	91.4392	21°31.65	91°26.35	10	40
119	10203	Inshore	South	20.9275	92.1392	20°55.65	92°08.35	10	40
120	10203	Inshore	South	21.1775	91.9892	21°10.65	91°59.35	10	40
123	10203	Inshore	South	20.4775	92.3392	20°28.65	92°20.35	10	40
127	10203	Inshore	South	20.6775	92.0392	20°40.65	92°02.35	10	40
128	10203	Inshore	South	21.4775	91.3892	21°28.65	91°23.35	10	40
130	10203	Inshore	South	21.4775	91.4892	21°28.65	91°29.35	10	40
133	10203	Inshore	South	21.0275	91.7892	21°01.65	91°47.35	10	40
134	10203	Inshore	South	21.0275	92.0392	21°01.65	92°02.35	10	40
137	10203	Inshore	South	21.2775	91.7892	21°16.65	91°47.35	10	40
143	10203	Inshore	South	20.8775	91.9392	20°52.65	91°56.35	10	40
146	10203	Inshore	South	20.8775	92.0392	20°52.65	92°02.35	10	40
149	10203	Inshore	South	20.8775	92.1892	20°52.65	92°11.35	10	40
151	10203	Inshore	South	20.7275	92.1392	20°43.65	92°08.35	10	40
160	10203	Inshore	South	21.2275	91.4392	21°13.65	91°26.35	10	40
164	10203	Inshore	South	21.2275	91.9392	21°13.65	91°56.35	10	40
165	10203	Inshore	South	21.6775	91.6392	21°40.65	91°38.35	10	40
166	10203	Inshore	South	20.9775	92.1392	20°58.65	92°08.35	10	40
170	10203	Inshore	South	21.3775	91.5392	21°22.65	91°32.35	10	40
16	10204	Midshore	Swatch	21.0275	90.2392	21°01.65	90°14.35	40	80
27	10204	Midshore	Swatch	21.1275	89.7392	21°07.65	89°44.35	40	80
35	10204	Midshore	Swatch	21.1275	90.2892	21°07.65	90°17.35	40	80
72	10204	Midshore	Swatch	21.0775	90.2392	21°04.65	90°14.35	40	80
103	10204	Midshore	Swatch	21.1775	89.9892	21°10.65	89°59.35	40	80
142	10204	Midshore	Swatch	21.2275	89.9392	21°13.65	89°56.35	40	80
156	10204	Midshore	Swatch	21.0775	90.1392	21°04.65	90°08.35	40	80
7	10205	Midshore	Middle	20.9275	90.7892	20°55.65	90°47.35	40	80
8	10205	Midshore	Middle	20.9275	91.1892	20°55.65	91°11.35	40	80
12	10205	Midshore	Middle	20.9275	91.3892	20°55.65	91°23.35	40	80
43	10205	Midshore	Middle	20.8775	90.9892	20°52.65	90°59.35	40	80
44	10205	Midshore	Middle	20.8775	91.0892	20°52.65	91°05.35	40	80
47	10205	Midshore	Middle	20.8775	91.2892	20°52.65	91°17.35	40	80
50	10205	Midshore	Middle	20.8775	91.3892	20°52.65	91°23.35	40	80
69	10205	Midshore	Middle	20.8275	90.8892	20°49.65	90°53.35	40	80
70	10205	Midshore	Middle	20.9775	91.3392	20°58.65	91°20.35	40	80
74	10205	Midshore	Middle	20.8275	91.2892	20°49.65	91°17.35	40	80
75	10205	Midshore	Middle	21.0775	90.4892	21°04.65	90°29.35	40	80
109	10205	Midshore	Middle	20.9275	90.9892	20°55.65	90°59.35	40	80
110	10205	Midshore	Middle	20.9275	91.0892	20°55.65	91°05.35	40	80
117	10205	Midshore	Middle	21.0275	90.5892	21°01.65	90°35.35	40	80
121	10205	Midshore	Middle	21.0275	90.6892	21°01.65	90°41.35	40	80
122	10205	Midshore	Middle	21.0275	90.7892	21°01.65	90°47.35	40	80
131	10205	Midshore	Middle	20.8775	90.8892	20°52.65	90°53.35	40	80
162	10205	Midshore	Middle	21.0775	90.5892	21°04.65	90°35.35	40	80
15	10206	Midshore	South	20.7775	91.4892	20°46.65	91°29.35	40	80

ANNEX III: Sampling stations, Shrimp Survey #2017204

Stn	Stratum	Zone	Ground	Location (DD)		Location (DDM)		Depth (m)	
				Lat (N)	Lon (E)	Lat (N)	Lon (E)	Min	Max
19	10206	Midshore	South	20.3775	91.9892	20°22.65	91°59.35	40	80
20	10206	Midshore	South	20.7775	91.6892	20°46.65	91°41.35	40	80
23	10206	Midshore	South	20.7775	91.8892	20°46.65	91°53.35	40	80
37	10206	Midshore	South	21.0275	91.4892	21°01.65	91°29.35	40	80
40	10206	Midshore	South	21.0275	91.6392	21°01.65	91°38.35	40	80
54	10206	Midshore	South	20.7275	91.4892	20°43.65	91°29.35	40	80
55	10206	Midshore	South	20.8775	91.6392	20°52.65	91°38.35	40	80
59	10206	Midshore	South	21.1275	91.5892	21°07.65	91°35.35	40	80
62	10206	Midshore	South	20.3275	91.9392	20°19.65	91°56.35	40	80
68	10206	Midshore	South	20.6275	91.4892	20°37.65	91°29.35	40	80
71	10206	Midshore	South	20.6275	91.6392	20°37.65	91°38.35	40	80
78	10206	Midshore	South	20.8275	91.5892	20°49.65	91°35.35	40	80
118	10206	Midshore	South	20.5775	91.7892	20°34.65	91°47.35	40	80
124	10206	Midshore	South	20.6775	91.8392	20°40.65	91°50.35	40	80
138	10206	Midshore	South	20.8775	91.4892	20°52.65	91°29.35	40	80
140	10206	Midshore	South	20.8775	91.8392	20°52.65	91°50.35	40	80
141	10206	Midshore	South	20.7275	91.7892	20°43.65	91°47.35	40	80
147	10206	Midshore	South	21.1275	91.6392	21°07.65	91°38.35	40	80
148	10206	Midshore	South	20.7275	91.9392	20°43.65	91°56.35	40	80
152	10206	Midshore	South	20.3275	91.9892	20°19.65	91°59.35	40	80
158	10206	Midshore	South	20.6275	91.6892	20°37.65	91°41.35	40	80
161	10206	Midshore	South	20.5275	92.0392	20°31.65	92°02.35	40	80
163	10206	Midshore	South	20.8275	91.5392	20°49.65	91°32.35	40	80
56	10207	Offshore	Swatch	20.9775	89.8392	20°58.65	89°50.35	80	100
61	10207	Offshore	Swatch	20.9775	90.1892	20°58.65	90°11.35	80	100
65	10207	Offshore	Swatch	21.0775	89.4892	21°04.65	89°29.35	80	100
101	10207	Offshore	Swatch	20.9275	90.0892	20°55.65	90°05.35	80	100
153	10207	Offshore	Swatch	21.0775	89.5392	21°04.65	89°32.35	80	100
169	10207	Offshore	Swatch	20.9275	89.8392	20°55.65	89°50.35	80	100
17	10208	Offshore	Middle	20.6775	91.0892	20°40.65	91°05.35	80	100
21	10208	Offshore	Middle	20.6775	91.1892	20°40.65	91°11.35	80	100
25	10208	Offshore	Middle	20.2275	91.2892	20°13.65	91°17.35	80	100
32	10208	Offshore	Middle	20.8775	90.5392	20°52.65	90°32.35	80	100
38	10208	Offshore	Middle	20.7275	90.6392	20°43.65	90°38.35	80	100
53	10208	Offshore	Middle	20.5275	90.6892	20°31.65	90°41.35	80	100
64	10208	Offshore	Middle	20.8275	90.2892	20°49.65	90°17.35	80	100
66	10208	Offshore	Middle	20.4275	91.2392	20°25.65	91°14.35	80	100
107	10208	Offshore	Middle	20.9275	90.5392	20°55.65	90°32.35	80	100
108	10208	Offshore	Middle	20.6775	90.6392	20°40.65	90°38.35	80	100
129	10208	Offshore	Middle	20.8775	90.6392	20°52.65	90°38.35	80	100
144	10208	Offshore	Middle	20.4275	90.7892	20°25.65	90°47.35	80	100
145	10208	Offshore	Middle	20.5275	91.1392	20°31.65	91°08.35	80	100
150	10208	Offshore	Middle	20.4275	90.8892	20°25.65	90°53.35	80	100
167	10208	Offshore	Middle	20.2775	91.2892	20°16.65	91°17.35	80	100
171	10208	Offshore	Middle	20.4775	90.6892	20°28.65	90°41.35	80	100
11	10209	Offshore	South	20.4775	91.5892	20°28.65	91°35.35	80	100
29	10209	Offshore	South	20.2275	91.3892	20°13.65	91°23.35	80	100
31	10209	Offshore	South	20.2275	91.4392	20°13.65	91°26.35	80	100
104	10209	Offshore	South	20.2775	91.8392	20°16.65	91°50.35	80	100
114	10209	Offshore	South	20.4775	91.5892	20°28.65	91°35.35	80	100

ANNEX III: Sampling stations, Shrimp Survey #2017204

Stn	Stratum	Zone	Ground	Location (DD)		Location (DDM)		Depth (m)	
				Lat (N)	Lon (E)	Lat (N)	Lon (E)	Min	Max
135	10209	Offshore	South	20.3275	91.4892	20°19.65	91°29.35	80	100

Abbreviations:

DD = Decimal degree notation

DM = Degree Minute notation

E = East

N = North

m = meter

ANNEX III: Sampling stations, Shrimp Survey #2017204

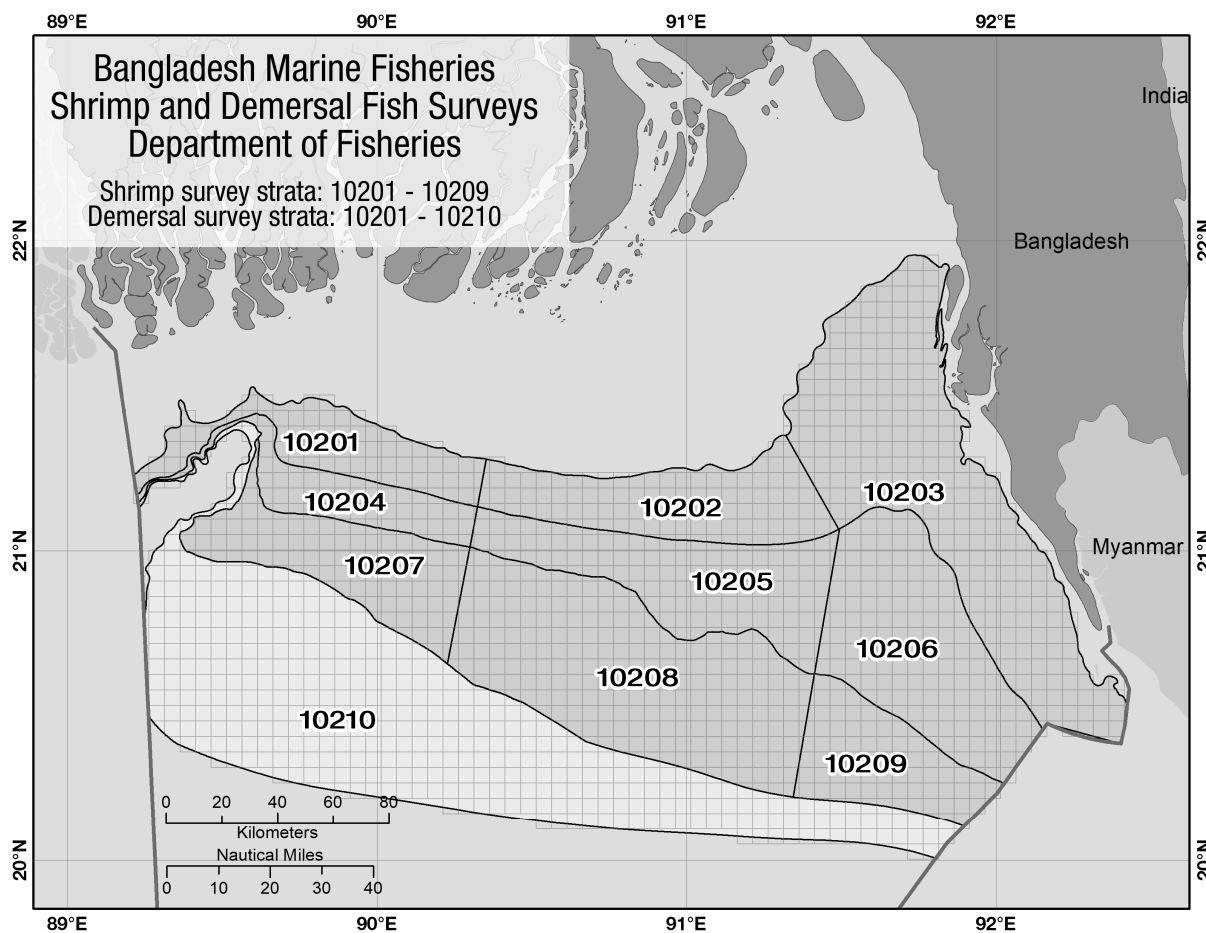
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**Survey Annual Report
DoF Survey Working Group
12 December, 2018**

Survey Operations

The R/V Meen Shandhani conducts annual shrimp and demersal trawl surveys. Each survey required approximately one month at-sea and samples approximately 80 pre-selected stations on the Bangladesh continental shelf. Survey stations are allocated according to a depth and area stratification plan. Shrimp surveys have 9 strata within 10 and 100 m depth range. The demersal fish surveys include the same 9 strata as the shrimp plus 1 more stratum for the 100 to 200 m range.



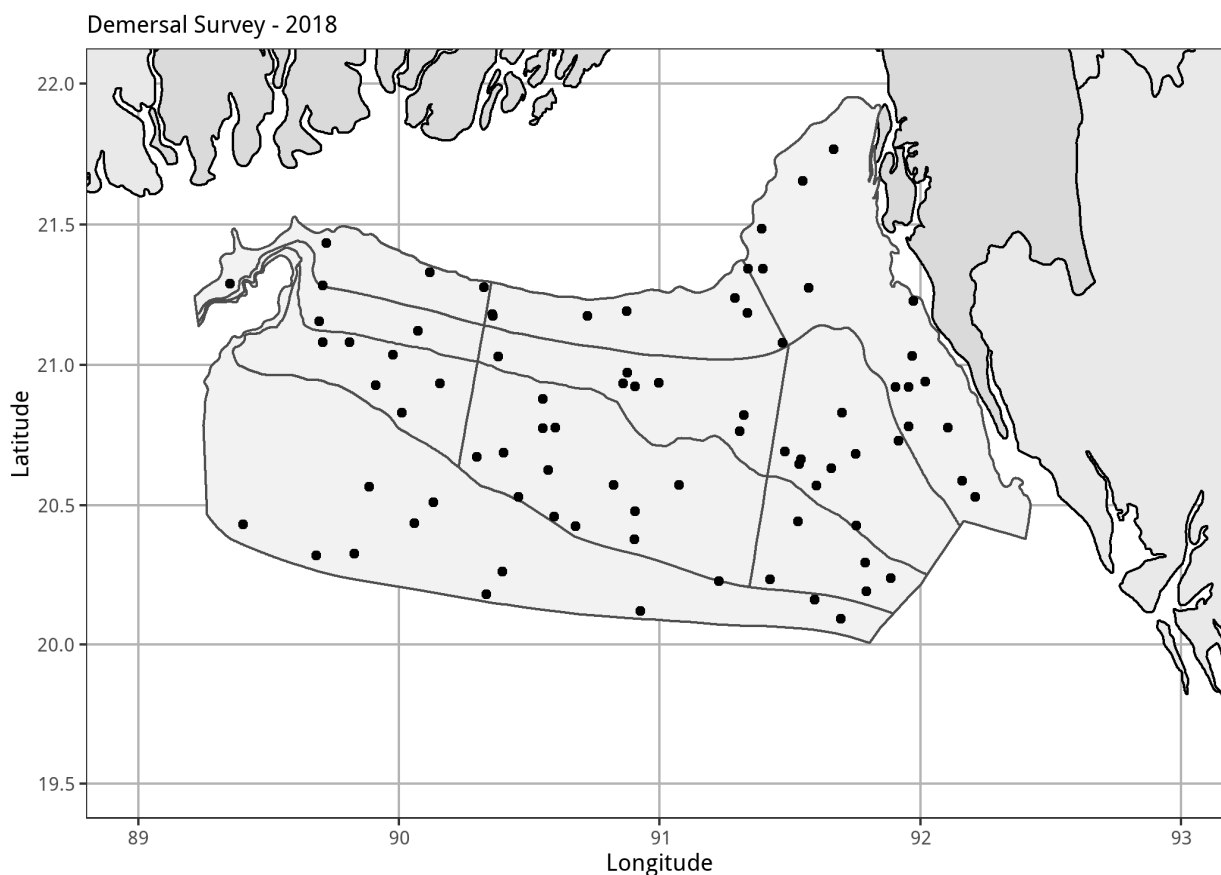
Trawl survey strata

The number of stations allocated to each stratum is dependent on the area (km²), which is used to calculate the stratum weight as the proportion of the total area in a given stratum.

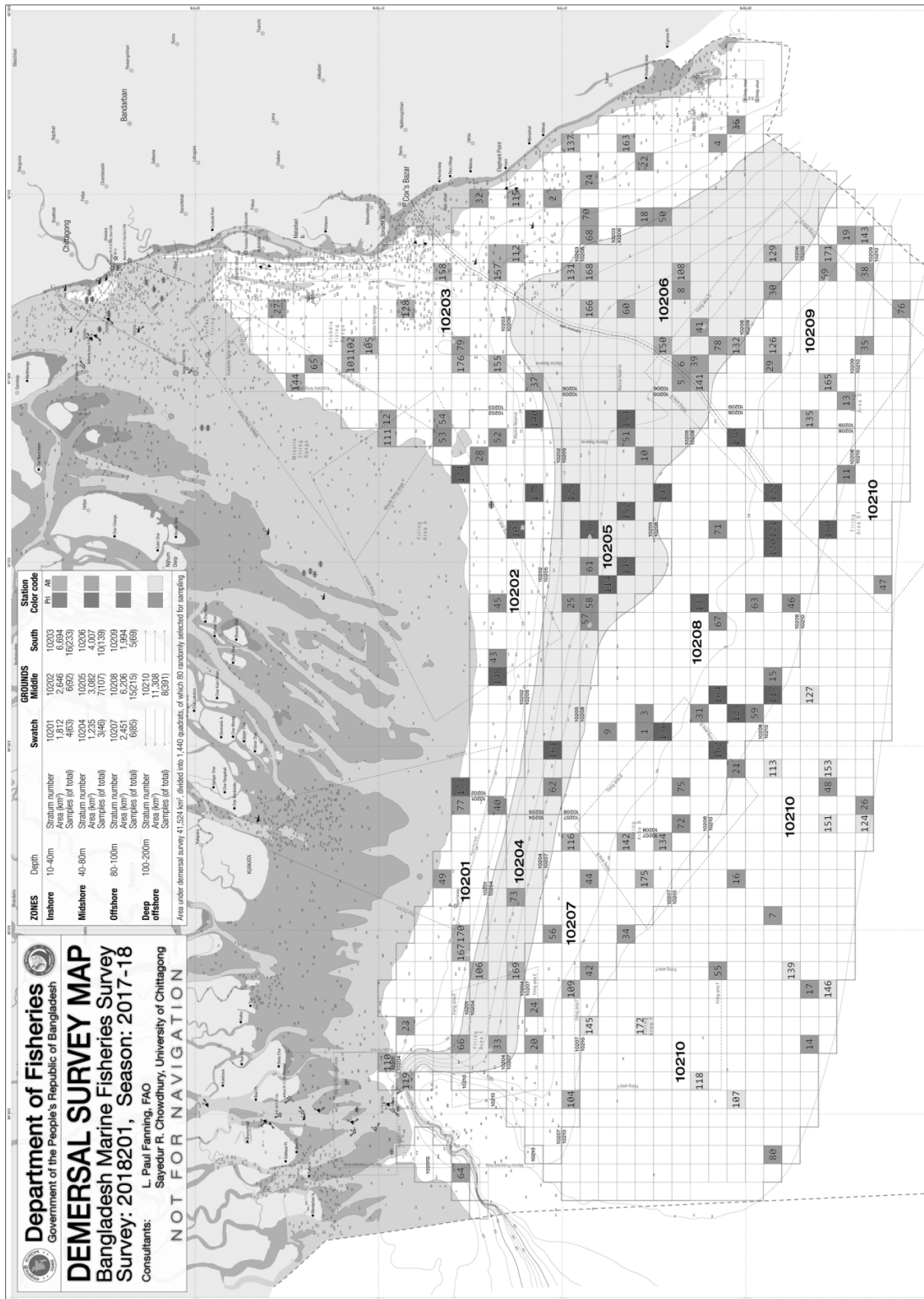
Stratum	Name	Depth (m)	Area (km ²)	Weight	Sets completed*
10201	Swatch Inshore	10 - 40	1814	0.043	4
10202	Middle Inshore	10 - 40	2681	0.064	7
10203	South Inshore	10 - 40	6833	0.163	15
10204	Swatch Midshore	40 - 80	1350	0.032	3
10205	Middle Midshore	40 - 80	3180	0.076	7
10206	South Midshore	40 - 80	3978	0.095	9
10207	Swatch Offshore	80 - 100	2522	0.060	6
10208	Middle Offshore	80 - 100	6083	0.145	14
10209	South Offshore	80 - 100	2025	0.048	5
10210	Deep Offshore	100-200	11376	0.272	11

*The sets completed column is the actual number of trawl samples taken in the survey.

This was the first completed demersal survey of R.V. Meen Sandhani, all three cruises were carried out on time and as planned, and all 80 stations were sampled.



The survey locations plotted are the starting locations of valid fishing stations.



Demersal Survey Map 2018201

Species group: Penaeid shrimps

Majority of penaeid shrimp species that are presently exploited are common to both in Artisanal and Industrial fisheries. The artisanal fishery harvest pre-adult, post juveniles, juveniles and even the post larvae (PL) but the industrial fishery harvest mostly the adult phase of penaeid shrimp. Most of the species are commercially important. The highest contribution in the total production is made by *Metapenaeus monoceros* the brown shrimp.

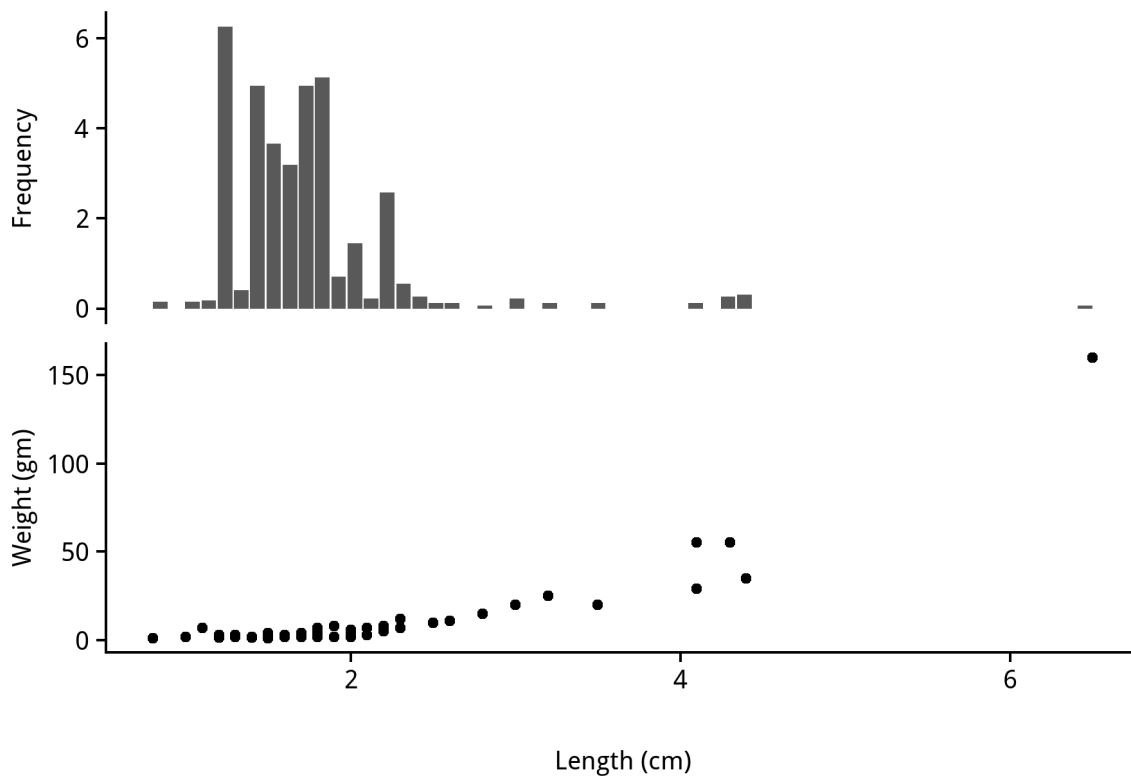
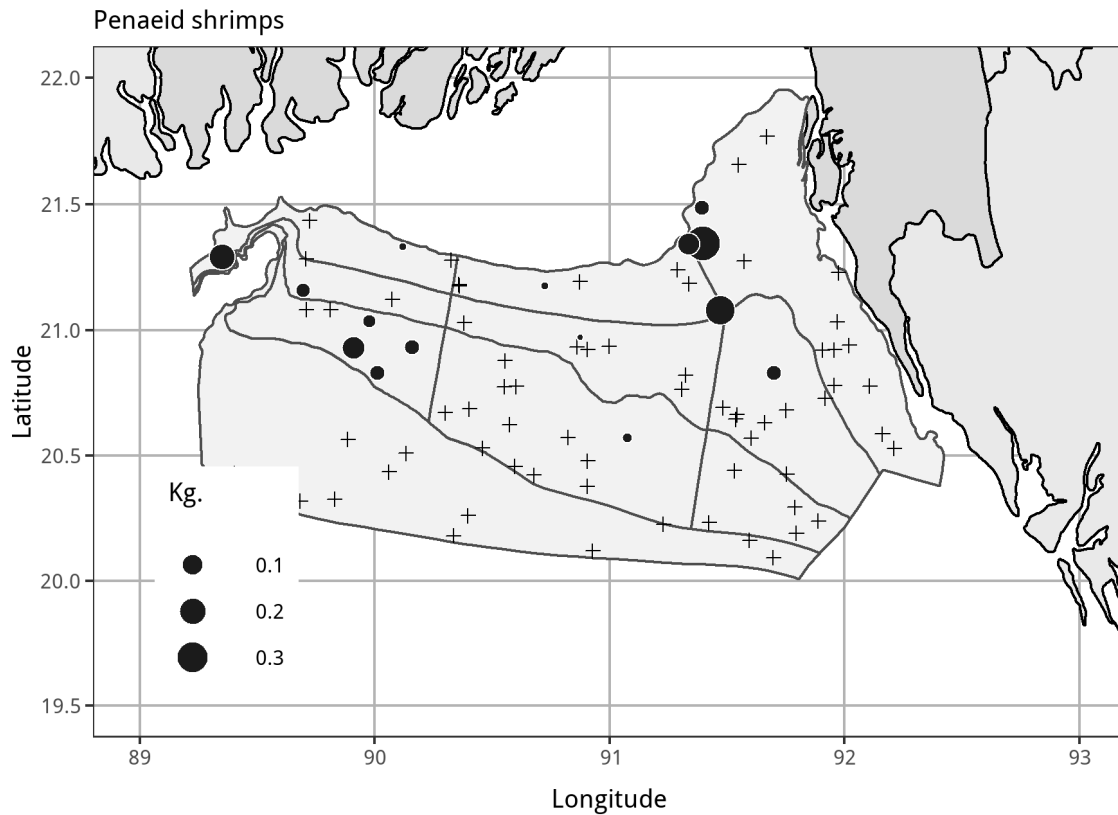
Species in group and number of catches

Scientific name	Occurences	Scientific name	Occurences
<i>Metapenaeus affinis</i>	1	<i>Metapenaeus monoceros</i>	4
<i>Metapenaeus brevicornis</i>	6	<i>Mierspenaeopsis hardwickii</i>	1
<i>Metapenaeus dobsoni</i>	5	<i>Penaeus indicus</i>	3
<i>Metapenaeus lysianassa</i>	1	<i>Penaeus monodon</i>	1



Demersal surveys - Penaeid shrimps

Stratum	10201	10202	10203	10204	10205	10206	10207	10208	10209	10210	
Weight	0.043	0.064	0.163	0.032	0.076	0.095	0.060	0.145	0.048	0.272	
Survey number											Annual mean
2017201			0.00		0.19	0.00		0.00	0.00	0.00	0.01
2018201	0.05	0.02	0.04	0.01	0.00	0.00	0.04	0.00	0.00	0.00	0.01



Species group: Non-penaeid shrimps

Non-penaeid shrimp are found mainly coastal areas, brackish water and estuaries and caught in artisanal gears (ESBN and MSBN) in different stages of their life cycle. Most of them are economically important in our local market. Some of non-penaeid found in dipper water and harvest by shrimp trawlers. Some non-penaeid shrimp *Squilla mantis* the mantis shrimp are used as poultry feed and fish meal.

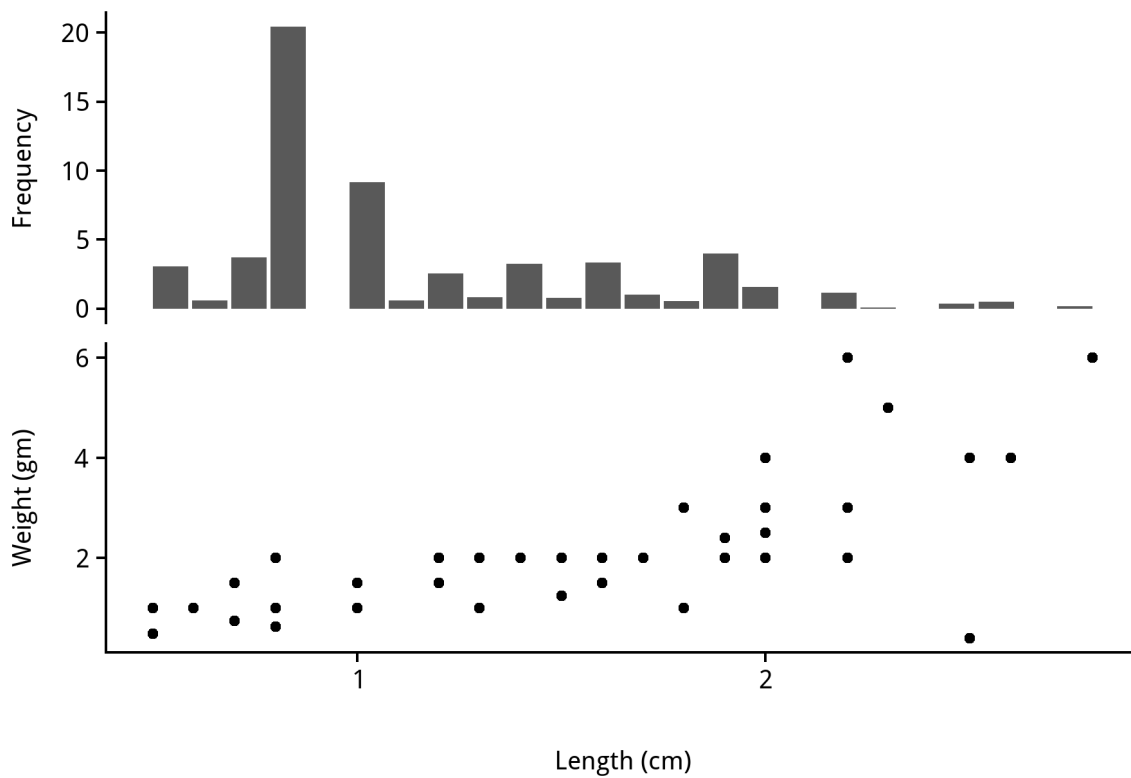
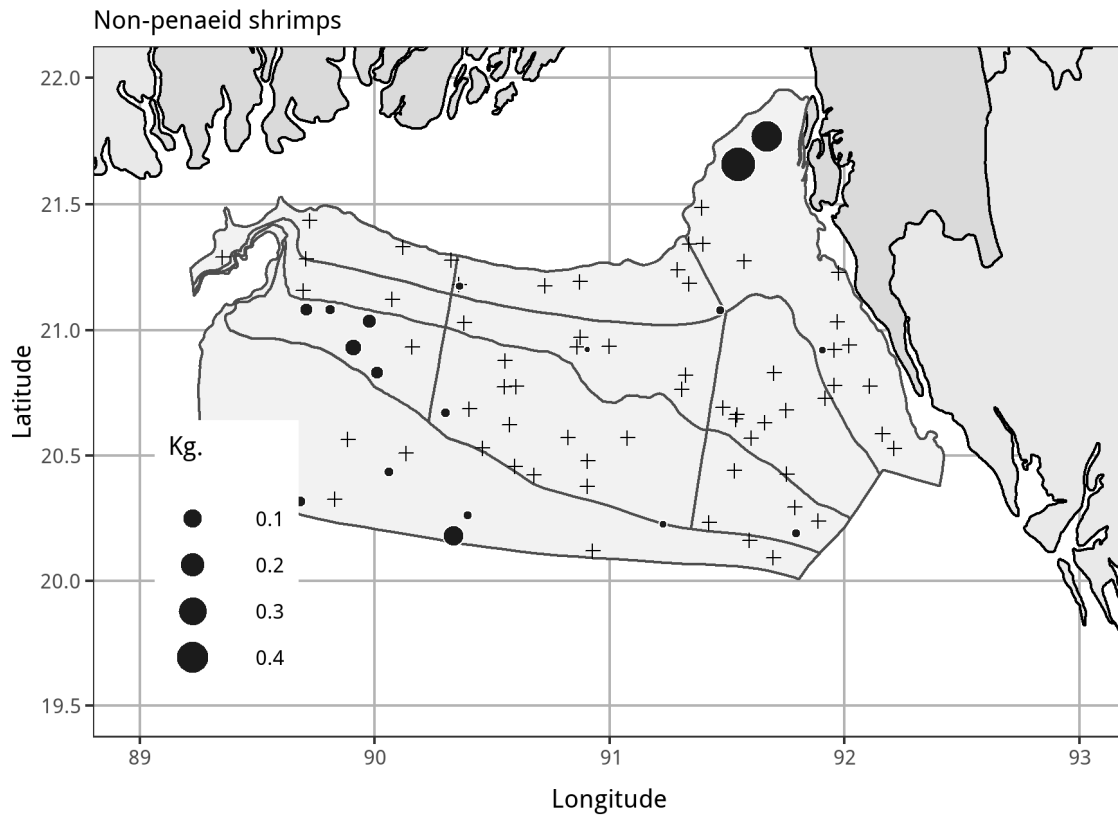
Species in group and number of catches

Scientific name	Occurences
Exopalaemon styliferus	2
Nematopalaemon tenuipes	2
S H R I M P S	1
Solencera indica	2
Solenocera hextii	15



Demersal surveys - Non-penaeid shrimps

Stratum	10201	10202	10203	10204	10205	10206	10207	10208	10209	10210	
Weight	0.043	0.064	0.163	0.032	0.076	0.095	0.060	0.145	0.048	0.272	
Survey number											Annual mean
2017201			0.00		0.02	0.00		0.00	0.00	0.00	0.00
2018201	0.00	0.00	0.04	0.00	0.00	0.00	0.03	0.00	0.00	0.02	0.01



Species group: Small pelagics - Clupeidae and Pristigasteridae

Shads, Anchovies, Sardines and Herring which lie under the family of Clupeidae and Pristigasteridae are the most significant fish group of seawater of Bangladesh. They are commercially important and abundantly available but exploited as by catch of Small Mesh Drift gill Net, Set Bag Net and commercial trawl fishery. Among these groups *Hilsa ilisha* the National fish (Hilsa) is the dominant species both inland and marine catch.

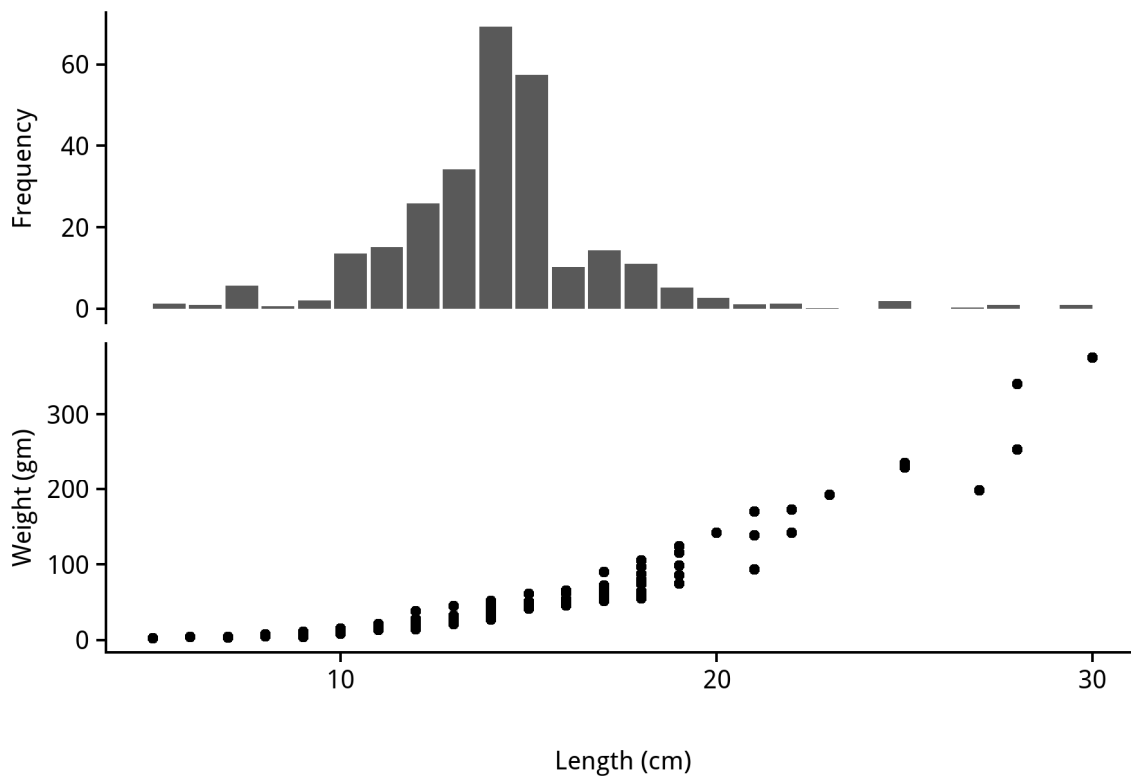
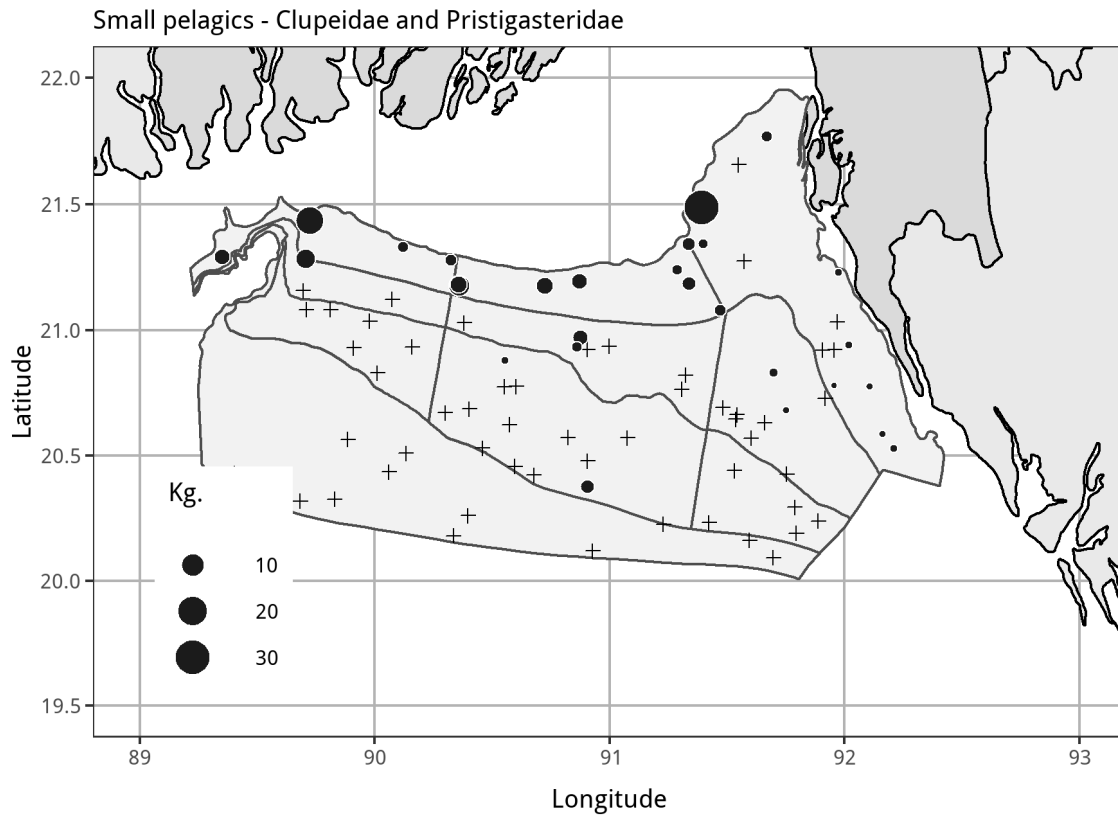
Species in group and number of catches

Scientific name	Occurences	Scientific name	Occurences
Anodontostoma chacunda	3	Raconda russeliana	1
Dussumieria acuta	5	Sardinella gibbosa	7
Dussumieria elopsoides	15	Sardinella melanura	1
Ilisha elongata	4	Stolephorus indicus	1
Ilisha filigera	5	Tenualosa ilisha	3
Ilisha megaloptera	1	Tenualosa toli	1
Ilisha melastoma	1		



Demersal surveys - Small pelagics - Clupeidae and Pristigasteridae

	10201	10202	10203	10204	10205	10206	10207	10208	10209	10210	
Stratum	10201	10202	10203	10204	10205	10206	10207	10208	10209	10210	
Weight	0.043	0.064	0.163	0.032	0.076	0.095	0.060	0.145	0.048	0.272	
Survey number											Annual mean
2017201			14.85		53.61	0.54		0.00	0.00	0.00	6.55
2018201	5.09	3.52	1.96	2.02	0.51	0.03	0.00	0.14	0.00	0.00	0.89



Species group: Carangidae - Jacks and scads

Carangids are commercially important but exploited as by-catch or incidental catch of gill net, mid water trawl, demersal trawl and shrimp trawl though these groups are mostly pelagic. Within this group *Megalaspis cordyla* the Hard tail Scad and *Parastromateus niger* the Black pomfret are abundantly available in our territory.

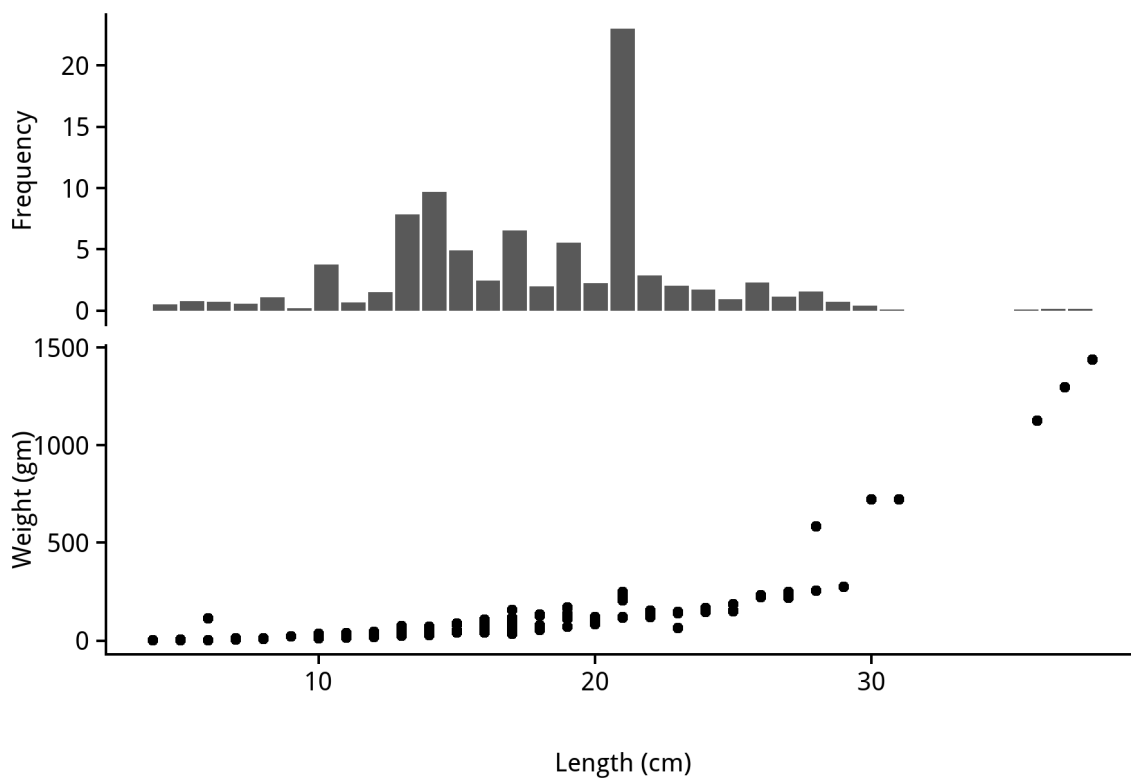
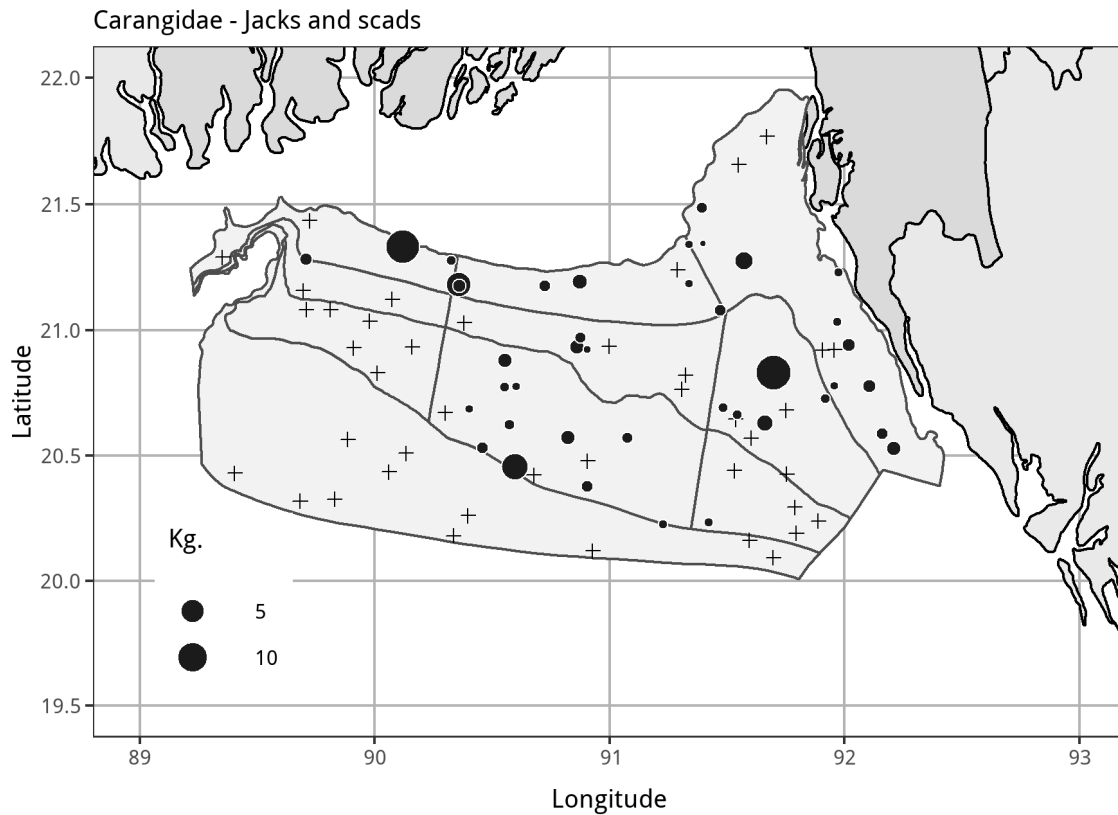
Species in group and number of catches

Scientific name	Occurences	Scientific name	Occurences
<i>Alectis ciliaris</i>	3	<i>Decapterus russelli</i>	16
<i>Alepes djedaba</i>	2	<i>Gnathanodon speciosus</i>	1
<i>Alepes melanoptera</i>	2	<i>Megalaspis cordyla</i>	15
<i>Atropus atropus</i>	8	<i>Parastromateus niger</i>	3
<i>Carangoides armatus</i>	2	<i>Scomberoides tala</i>	2
<i>Carangoides chrysophrys</i>	5	<i>Scomberoides tol</i>	2
<i>Carangoides ferdau</i>	7	<i>Selar crumenophthalmus</i>	3
<i>Caranx sp.</i>	1		



Demersal surveys - Carangidae - Jacks and scads

	10201	10202	10203	10204	10205	10206	10207	10208	10209	10210	
Stratum											
Weight	0.043	0.064	0.163	0.032	0.076	0.095	0.060	0.145	0.048	0.272	
Survey number											Annual mean
2017201			4.14		0.77	0.22		0.06	0.00	0.01	0.77
2018201	2.96	1.23	0.50	0.23	0.25	1.87	0.00	0.88	0.03	0.00	0.62

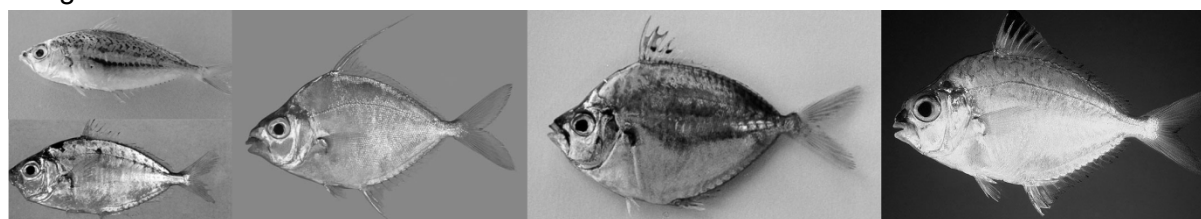


Species group: Leiognathidae - Ponyfish

Leiognathids or pony fish the small sized fishes consume locally and used as poultry feed and fish meal as cheap price. This group are abundantly caught in Artisanal fishing gear (MSBN), demersal trawl and shrimp trawl.

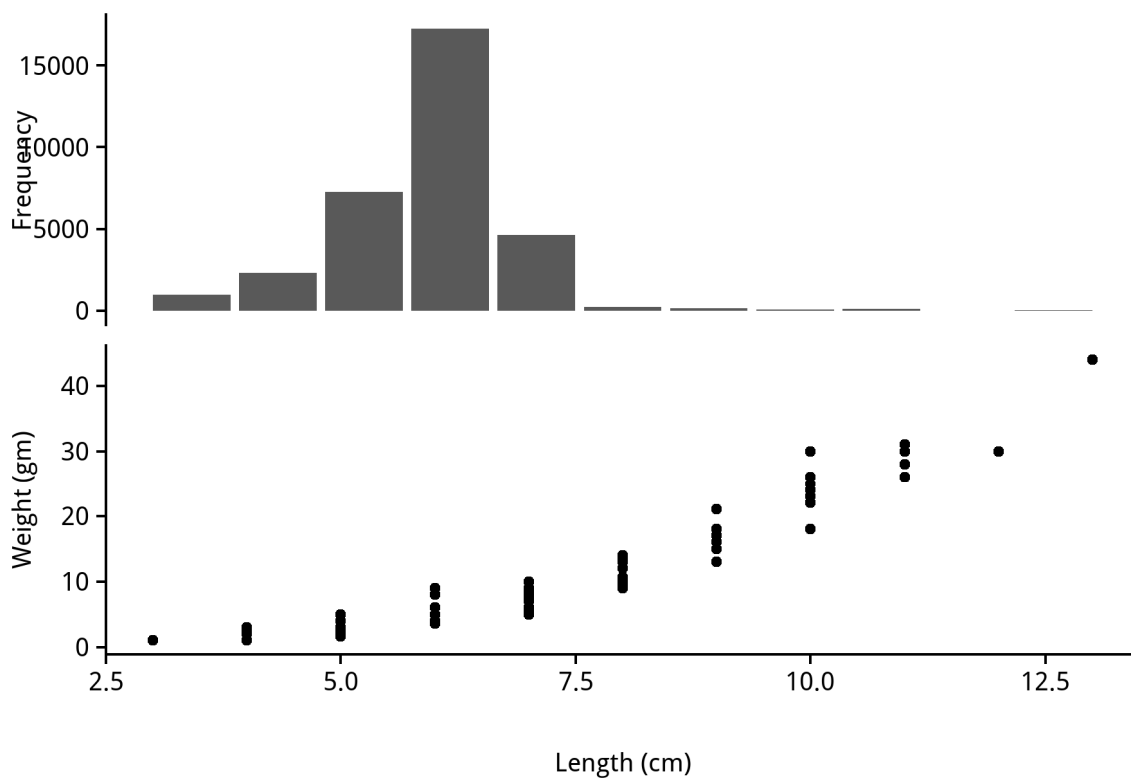
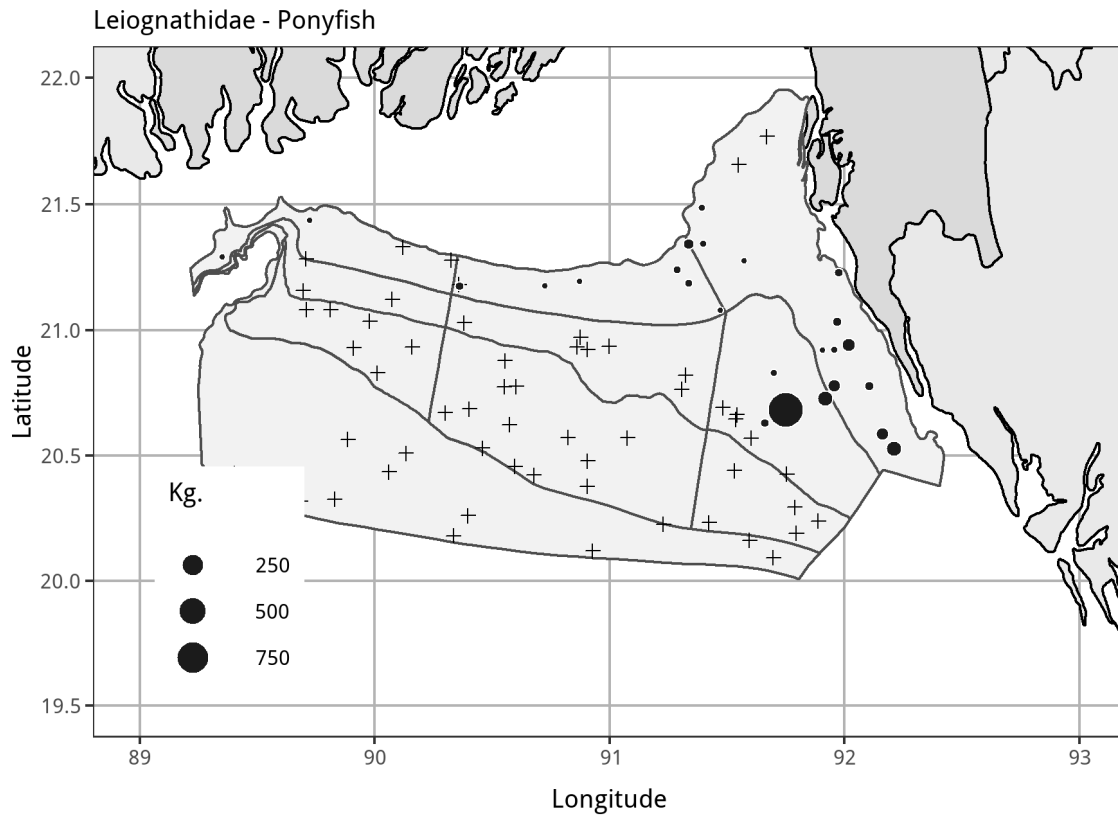
Species in group and number of catches

Scientific name	Occurences	Scientific name	Occurences
Gazza minuta	2	Leiognathus splendens	3
Leiognathus bindus	12	Secutor insidiator	3
Leiognathus brevisrostris	7	Secutor ruconius	5
Leiognathus fasciatus	1		



Demersal surveys - Leiognathidae - Ponyfish

	10201	10202	10203	10204	10205	10206	10207	10208	10209	10210	
Stratum											
Weight	0.043	0.064	0.163	0.032	0.076	0.095	0.060	0.145	0.048	0.272	
Survey number											Annual mean
2017201			0.13		0.21	0.52		0.00	0.00	0.00	0.09
2018201	0.01	3.40	17.16	0.00	0.00	114.25	0.00	0.00	0.00	0.00	13.88



Species group: Mullidae - Goatfish

Mullidae – Goatfish, the small sized fish is consumed locally and harvest mainly in mid water trawl and found significantly in coral reef areas.

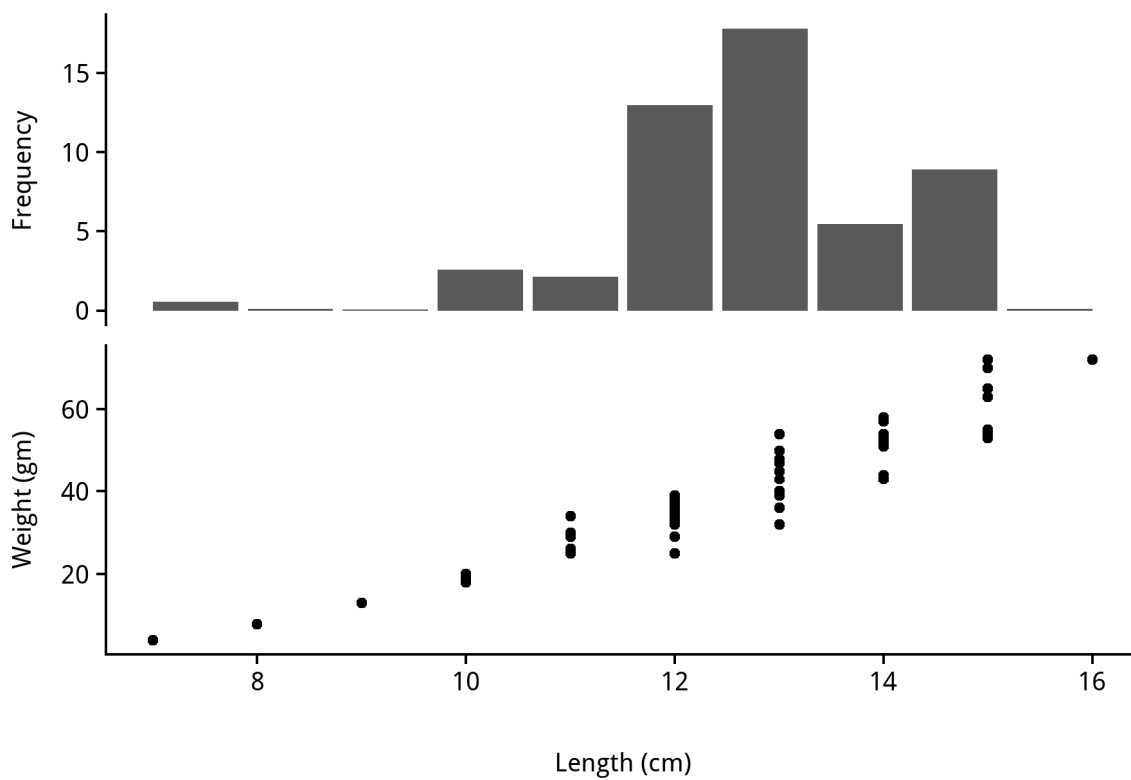
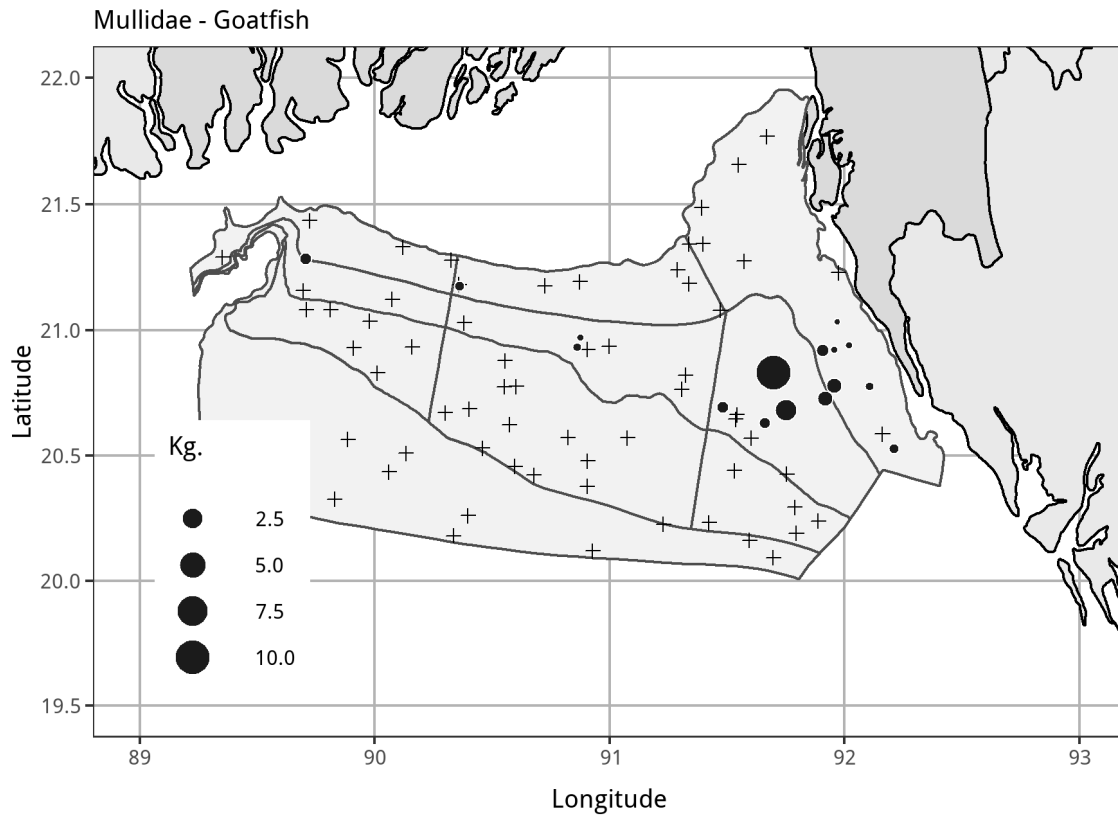
Species in group and number of catches

Scientific name	Occurences
Mulloides vanicolensis	2
Upeneus guttatus	1
Upeneus moluccensis	4
Upeneus sulphureus	2
Upeneus supravitatus	9



Demersal surveys - Mullidae - Goatfish

Stratum	10201	10202	10203	10204	10205	10206	10207	10208	10209	10210	
Weight	0.043	0.064	0.163	0.032	0.076	0.095	0.060	0.145	0.048	0.272	
Survey number											Annual mean
2017201			0.00		0.07	0.00		0.00	0.00	0.00	0.01
2018201	0.00	0.02	0.11	0.13	0.02	1.64	0.00	0.00	0.00	0.00	0.18



Species group: Nemipteridae - Threadfin breams

Threadfin breams are commercially important fishes and considered as good fish. This are mainly caught bottom trawl, gill net and long lines. This fishes are occurring in muddy and sandy bottom and known to control of population of crustaceans and small fishes in the marine ecosystem.

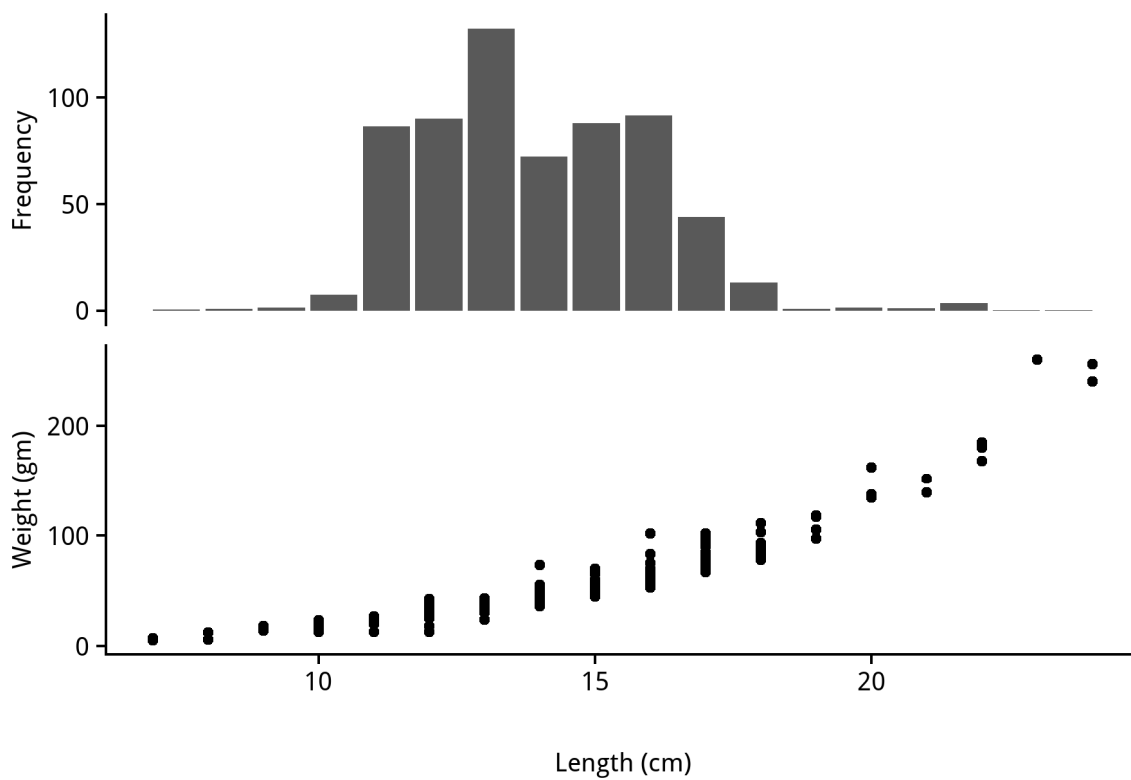
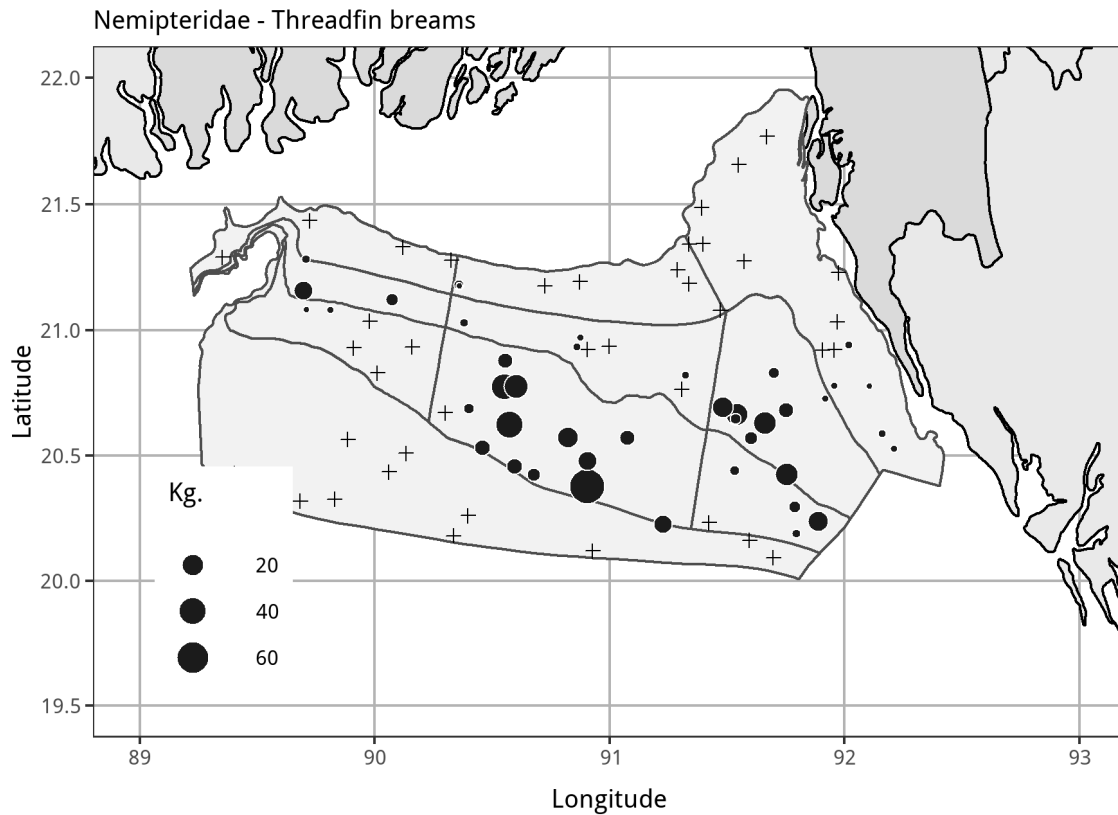
Species in group and number of catches

Scientific name	Occurences
Nemipterus bipunctatus	3
Nemipterus japonicus	16
Nemipterus randalli	28
Parascolopsis aspinosa	12



Demersal surveys - Nemipteridae - Threadfin breams

	10201	10202	10203	10204	10205	10206	10207	10208	10209	10210	
Stratum Weight	0.043	0.064	0.163	0.032	0.076	0.095	0.060	0.145	0.048	0.272	
Survey number											Annual mean
2017201			0.00		0.03	0.00		0.00	0.00	0.00	0.00
2018201	0.00	0.15	0.04	5.42	0.13	10.71	0.02	19.31	4.15	0.00	4.23

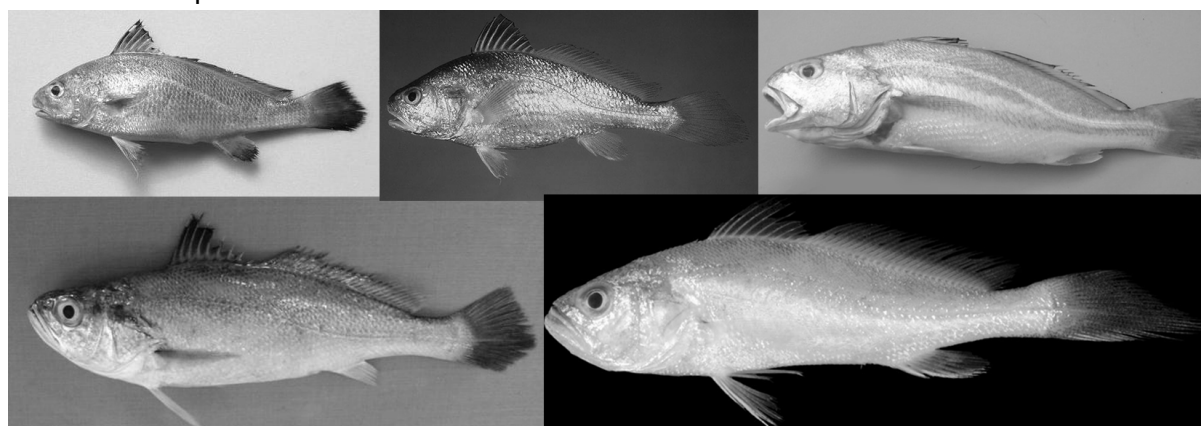


Species group: Sciaenidae - Croakers

Croakers are the largest group in the commercially important fishes in our sea water. These are bottom dwelling and carnivores' fishes known as drums feeding on benthic invertebrates and small fishes. They are caught bottom trawl, gill net and long lines. They are exported as dry and fresh form and fetch a good foreign currency and have a local demand.

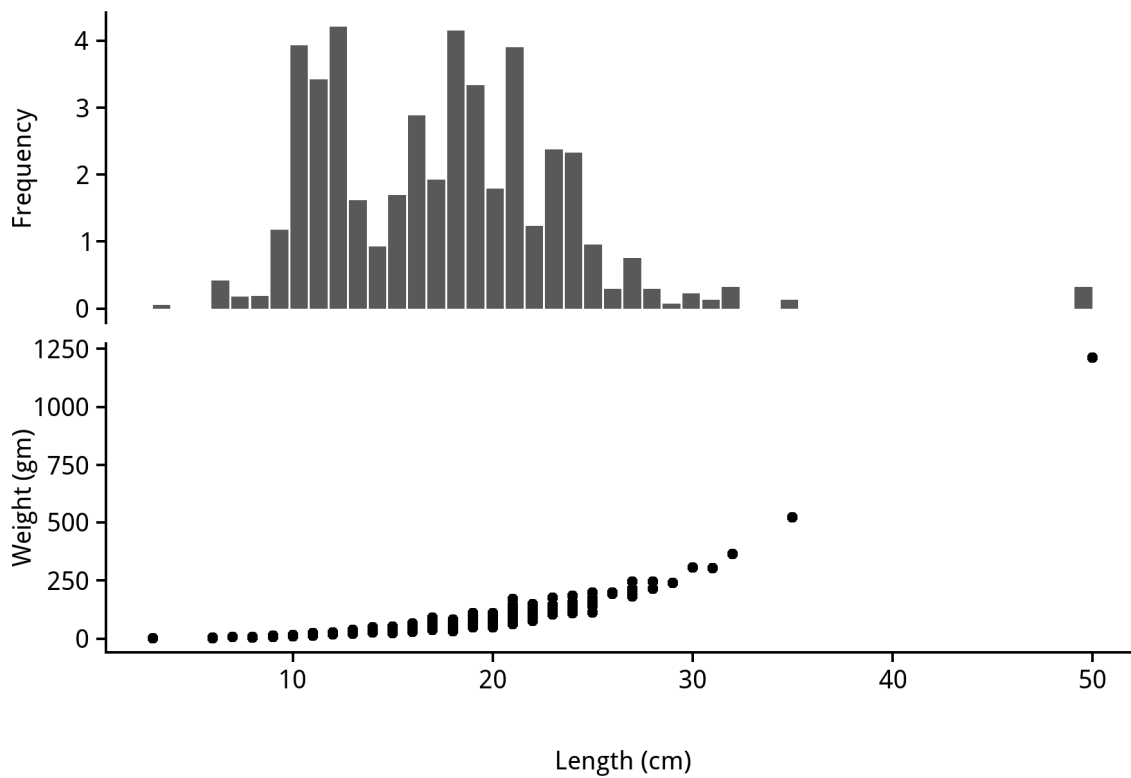
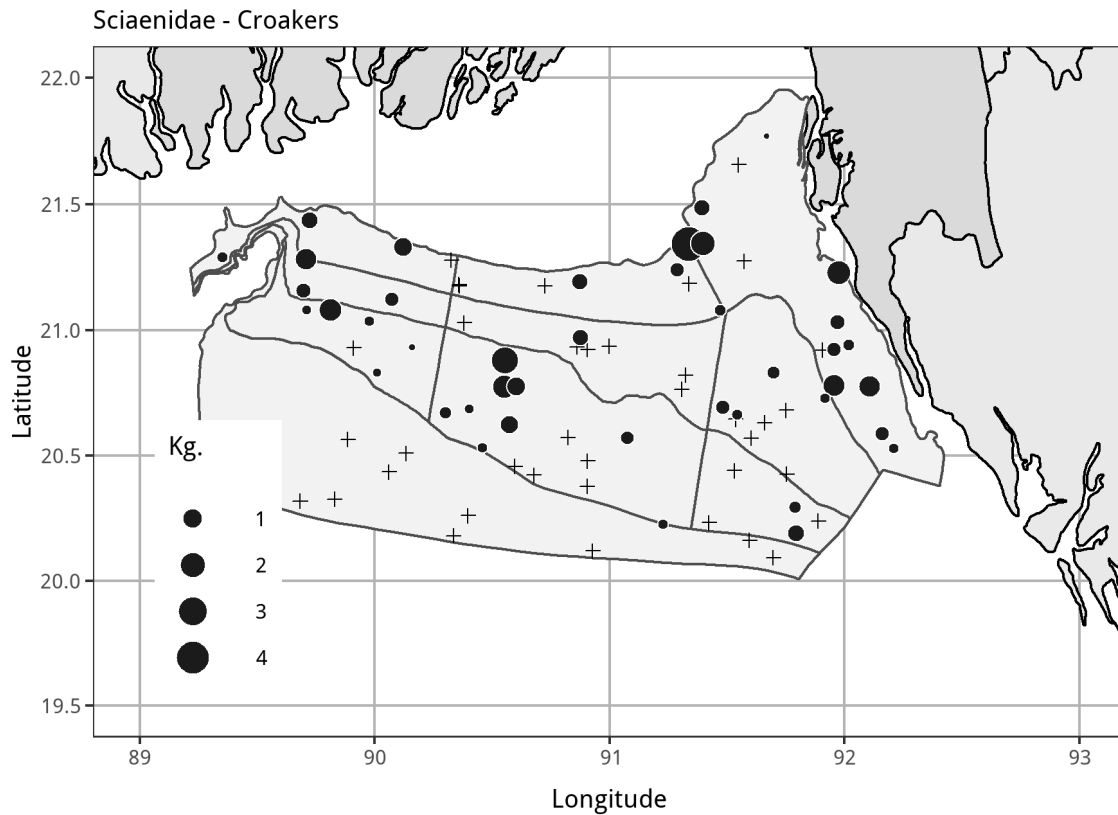
Species in group and number of catches

Scientific name	Occurences	Scientific name	Occurences
Johnieops sina	11	Nibea maculata	1
Johnius belangerii	5	Otolithes cuvieri	3
Johnius carutta	2	Panna microdon	4
Johnius dussumieri	7	Pennahia anea	5
Johnius elongatus	3	Protonibea diacanthus	12
Johnius macropterus	1	Pterotolithus maculatus	2



Demersal surveys - Sciaenidae - Croakers

Stratum	10201	10202	10203	10204	10205	10206	10207	10208	10209	10210	
Weight	0.043	0.064	0.163	0.032	0.076	0.095	0.060	0.145	0.048	0.272	
Survey number											Annual mean
2017201			0.17		0.69	0.14		0.00	0.00	0.00	0.09
2018201	0.40	0.77	0.59	0.69	0.09	0.11	0.30	0.53	0.18	0.00	0.31

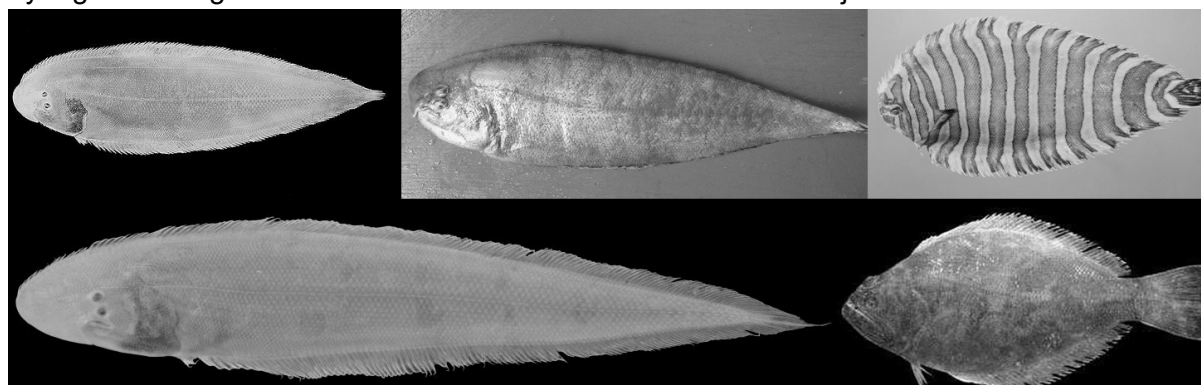


Species group: Pleuronectiformes - Flatfish

As before Flatfish are thrown as trash in shrimp trawl and demersal trawl catch. But at present flat fishes are used in fish meal and poultry feed. These groups mainly harvest in shrimp trawl but sometimes caught in MSBN. In Bangladesh only some tribal peoples having some species of flat fish, but now days these export in foreign countries mainly in China, Korea and Singapore. These groups are inhabits in sand and mud bottoms and eat only crutaceans.

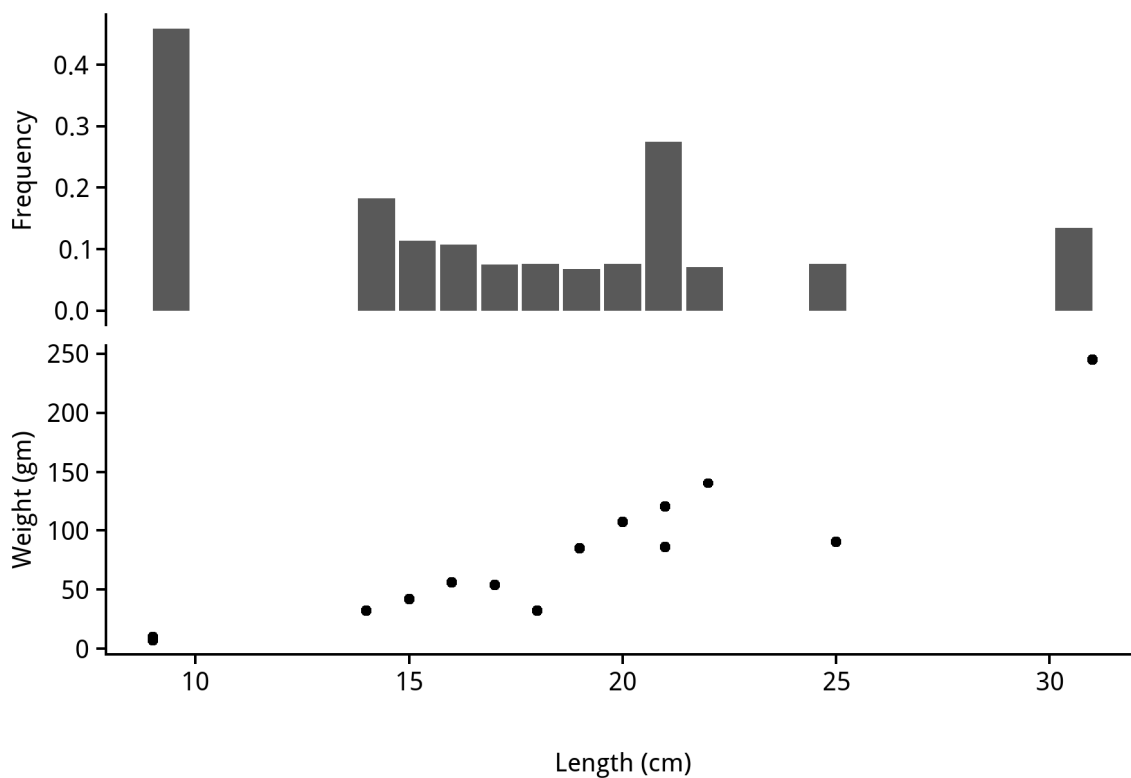
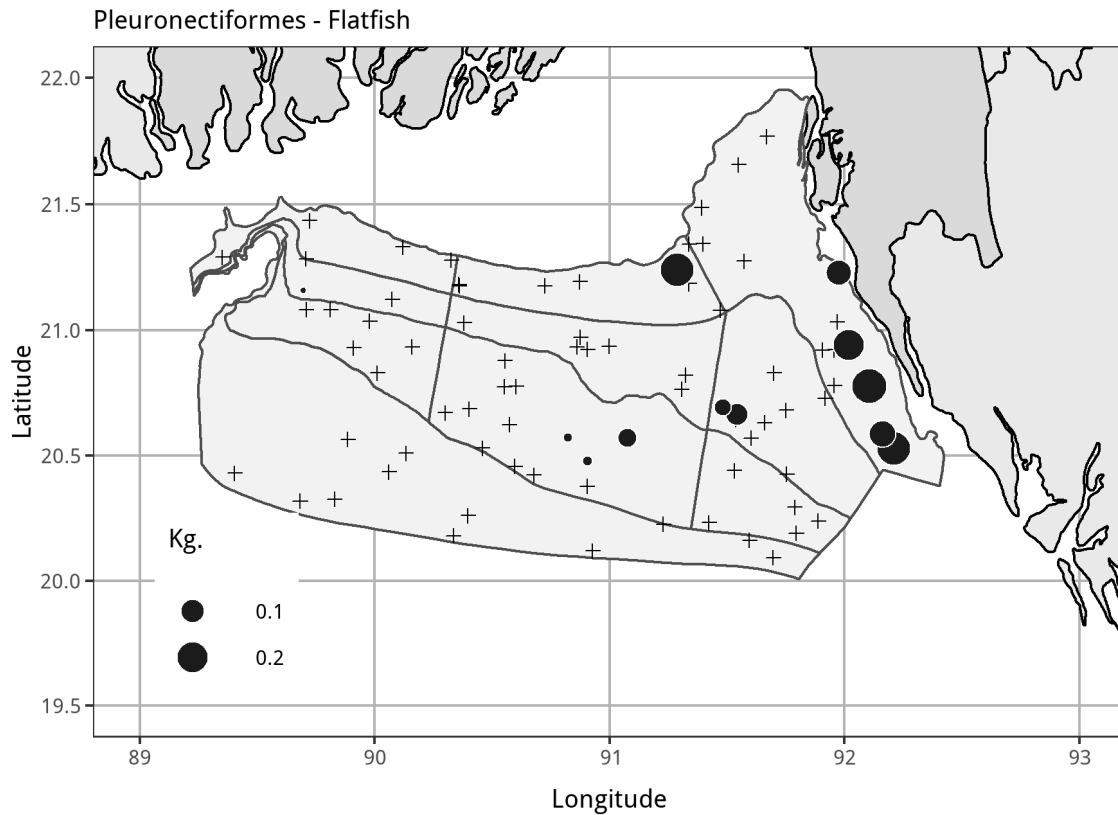
Species in group and number of catches

Scientific name	Occurences	Scientific name	Occurences
Bothus myriaster	2	Leops nigrescens	1
Cynoglossus bilineata *	1	Paralichthodes algoensis	3
Cynoglossus lingua	1	Pseudorhombus javanicus	6



Demersal surveys - Pleuronectiformes - Flatfish

	10201	10202	10203	10204	10205	10206	10207	10208	10209	10210	
Stratum Weight	0.043	0.064	0.163	0.032	0.076	0.095	0.060	0.145	0.048	0.272	
Survey number											Annual mean
2017201			0.00		0.00	0.00		0.00	0.00	0.01	0.00
2018201	0.00	0.03	0.07	0.00	0.00	0.01	0.00	0.01	0.00	0.00	0.02



Species group: Squids and cuttlefish

Two major groups of cephalopods e.g. Squid and cuttle fish which are available in Bangladesh coast. Cephalopods are not exploited by any specialised fishing gear but a small quantity is being caught as by-catch of bottom trawl and shrimp trawl and even MSBN also. Now days it's are exportable item in different countries.

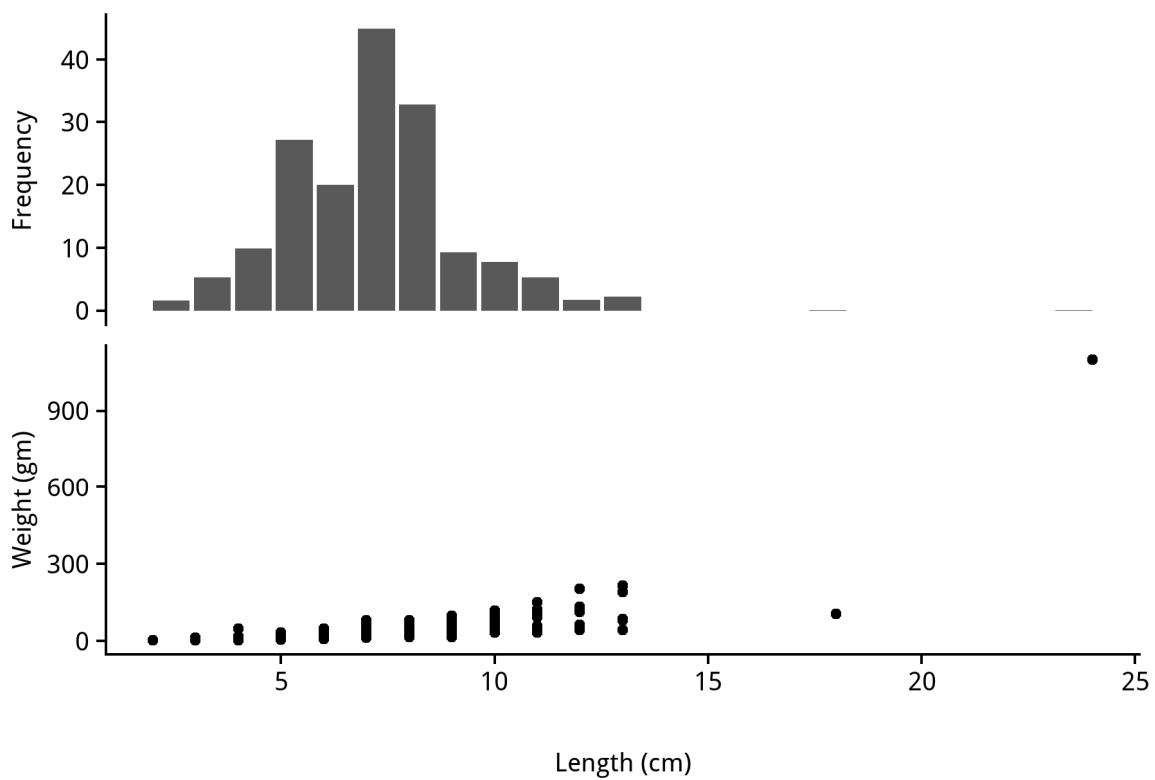
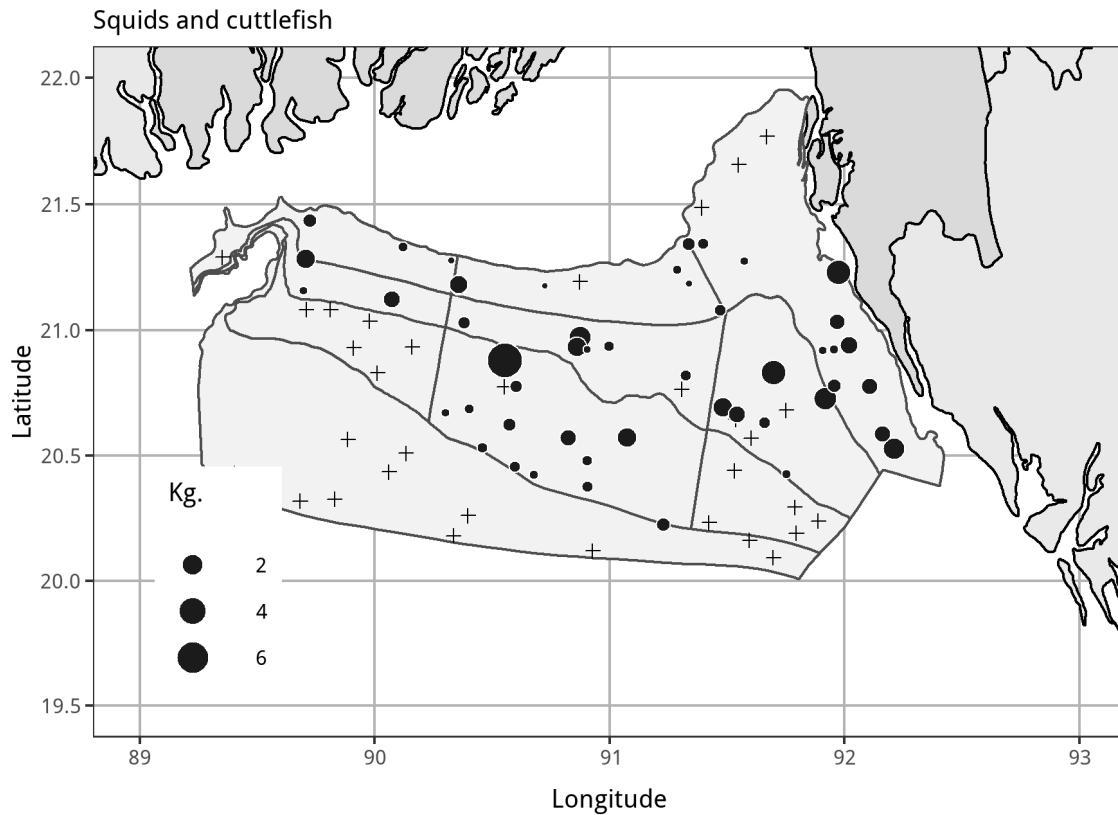
Species in group and number of catches

Scientific name	Occurences	Scientific name	Occurences
Brachioteuthis sp.	2	Sepia pharaonis	11
Sepia acuelata	6	Sepioteuthis lessoniana	4
Sepia esculenta	33	Uroteuthis duvauceli	20
Sepia officinalis	2		



Demersal surveys - Squids and cuttlefish

Stratum	10201	10202	10203	10204	10205	10206	10207	10208	10209	10210	
Weight	0.043	0.064	0.163	0.032	0.076	0.095	0.060	0.145	0.048	0.272	
Survey number											Annual mean
2017201			0.22		3.22	0.08		0.48	0.07	0.00	0.36
2018201	0.13	0.43	0.72	0.85	0.68	0.95	0.00	0.95	0.00	0.00	0.46



Species group: Trichiuridae - ribbonfish

Elongate and compressed ribbon- like trichiurid are benthopelagic inhabits coastal and often comes near the surface at night. Ribbonfish export as dry, salted and fresh form in different countries. This carnivore fish feed on small fish and shrimp. Harvest bottom trawl, set bag net and beach seines.

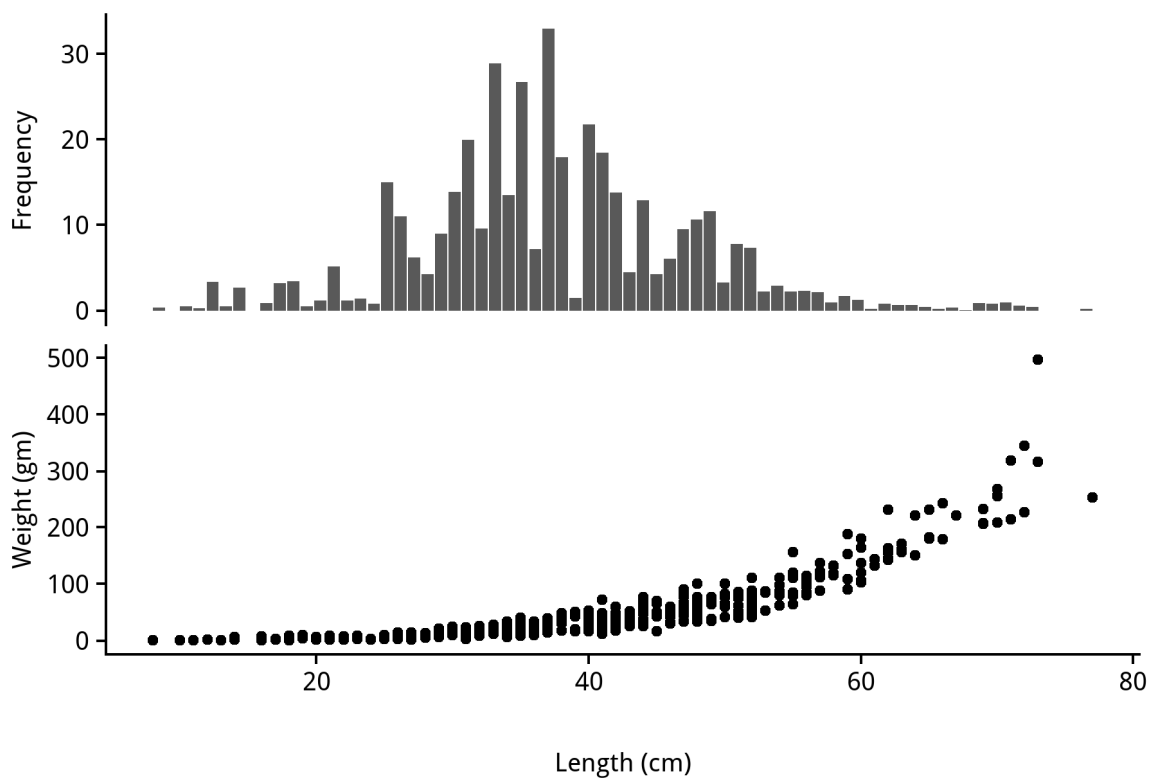
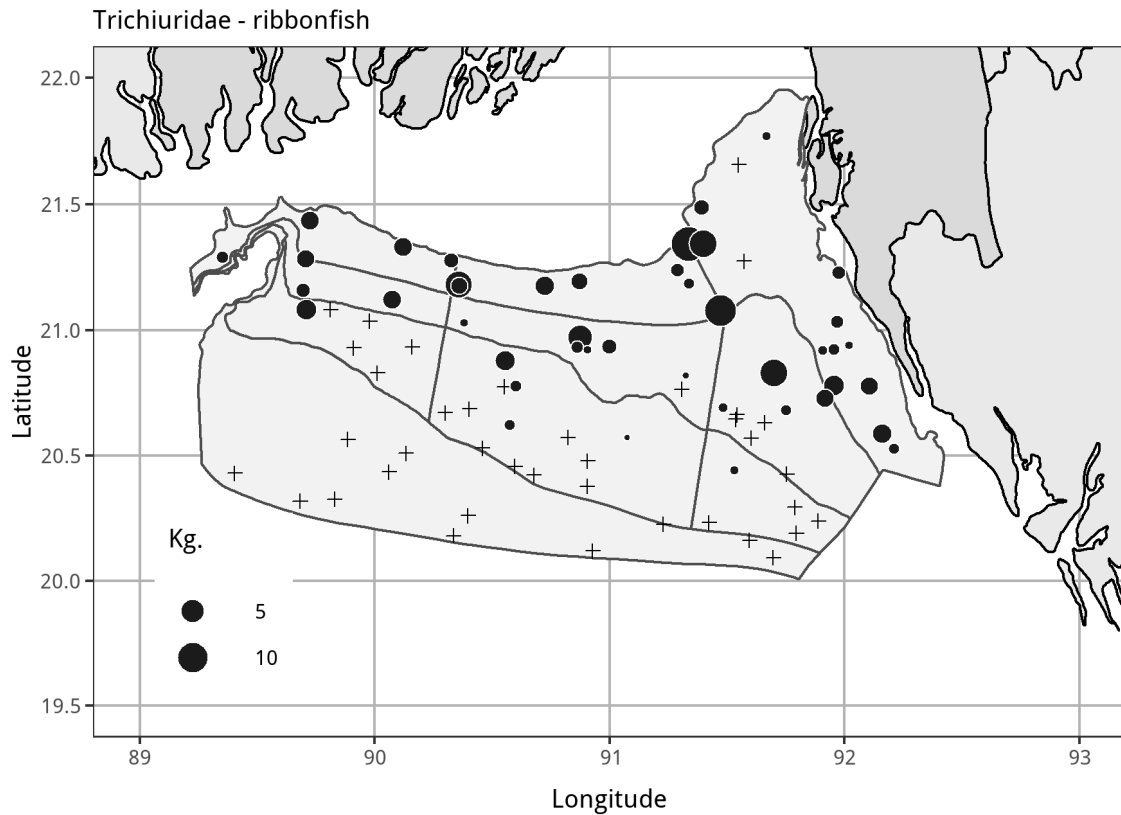
Species in group and number of catches

Scientific name	Occurrences
Eupleurogrammus muticus	3
Lepturacanthus savala	43
Trichiurus lepturus	2



Demersal surveys - Trichiuridae - ribbonfish

Stratum	10201	10202	10203	10204	10205	10206	10207	10208	10209	10210	Annual mean
Weight	0.043	0.064	0.163	0.032	0.076	0.095	0.060	0.145	0.048	0.272	
Survey number											
2017201			2.33		1.88	5.00		0.02	0.00	0.00	1.00
2018201	1.70	4.25	2.08	1.91	1.16	1.23	0.61	0.32	0.02	0.00	1.04



Species group: Other families - Synodontidae, Tetradontidae, Platycephalidae

These groups are used mainly as fish meal and poultry feed. Important as commercial fisheries sold fresh, dried and salted in the markets. Lizard fishes are exploits in sandy and muddy bottom areas in demersal fishing. Fisheries have no commercial importance of Puffer fish. The puffer fish must not be eaten because its skin and internal organs contain neurotoxin. Flathead fishes are minor commercial importance and caught by trawl over sandy and muddy bottom.

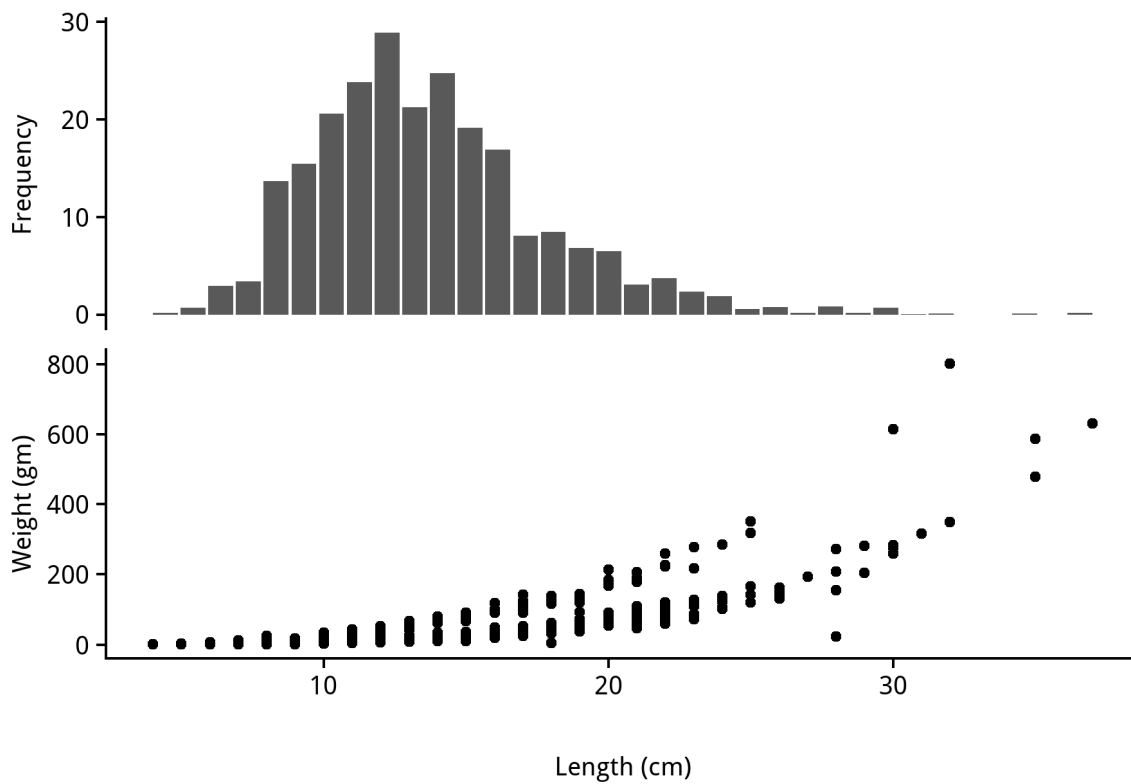
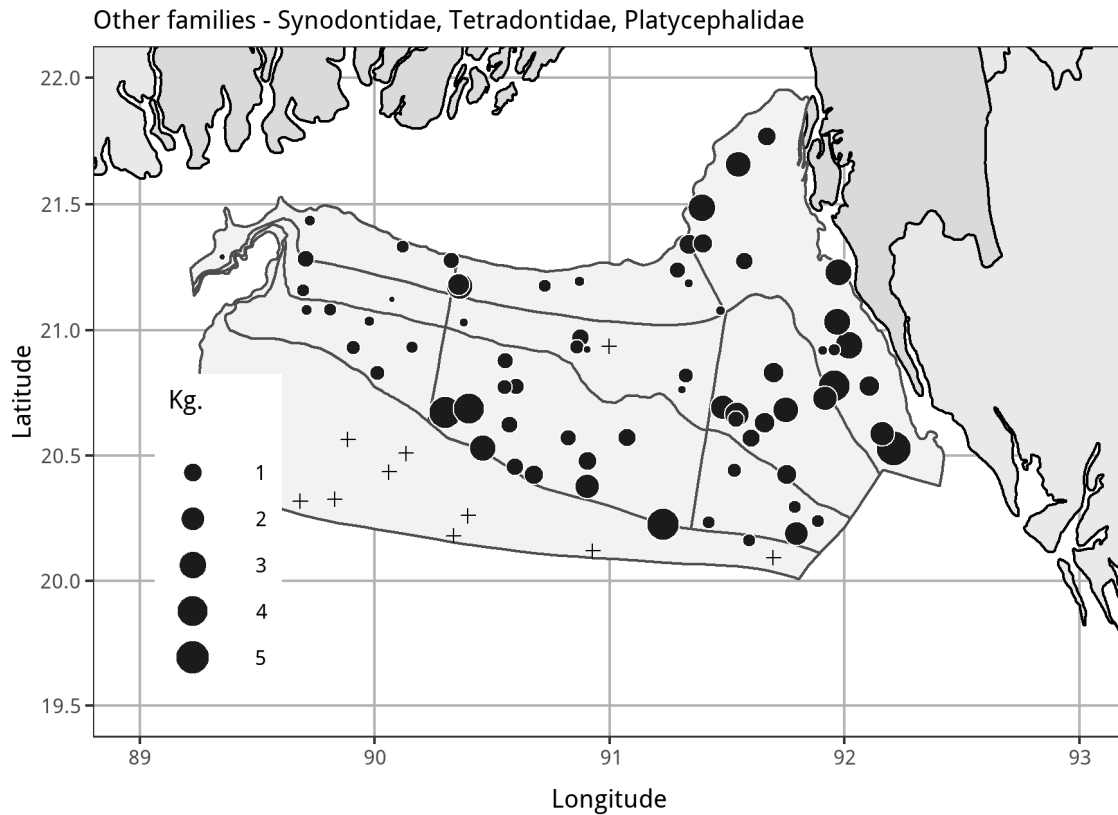
Species in group and number of catches

Scientific name	Occurences	Scientific name	Occurences
Harpadon nehereus	5	Rogadius asper	6
Lagocephalus lagocephalus	16	Saurida longimanus	23
Lagocephalus lunaris	6	Saurida tumbil	30
Lagocephalus spadiceus	7	Saurida undosquamis	3
Minous monodactylus	4	Sorsogna tuberculata	4
Platycephalus indicus	29	Trachinocephalus myops	3



Demersal surveys - Other families - Synodontidae, Tetradontidae, Platycephalidae

	10201	10202	10203	10204	10205	10206	10207	10208	10209	10210	
Stratum											
Weight	0.043	0.064	0.163	0.032	0.076	0.095	0.060	0.145	0.048	0.272	
Survey number											Annual mean
2017201			15.52		0.75	0.00		0.01	0.06	0.01	2.60
2018201	0.25	0.94	2.08	0.32	0.27	1.61	0.27	1.86	0.69	0.03	0.92



ANNEX IV: Sampling stations, Demersal Survey #2018201

Stn	Stratum	Zone	Ground	Location (DD)		Location (DDM)		Depth (m)	
				Lat (N)	Lon (E)	Lat (N)	Lon (E)	Min	Max
23	10201	Inshore	Swatch	21.4275	89.7392	21°25.65	89°44.35	10	40
49	10201	Inshore	Swatch	21.3275	90.1392	21°19.65	90°08.35	10	40
64	10201	Inshore	Swatch	21.2775	89.3392	21°16.65	89°20.35	10	40
77	10201	Inshore	Swatch	21.2775	90.3392	21°16.65	90°20.35	10	40
110	10201	Inshore	Swatch	21.4775	89.6392	21°28.65	89°38.35	10	40
167	10201	Inshore	Swatch	21.2775	89.9392	21°16.65	89°56.35	10	40
170	10201	Inshore	Swatch	21.2775	89.9892	21°16.65	89°59.35	10	40
28	10202	Inshore	Middle	21.2275	91.2892	21°13.65	91°17.35	10	40
40	10202	Inshore	Middle	21.1775	90.3392	21°10.65	90°20.35	10	40
43	10202	Inshore	Middle	21.1775	90.7392	21°10.65	90°44.35	10	40
45	10202	Inshore	Middle	21.1775	90.8892	21°10.65	90°53.35	10	40
52	10202	Inshore	Middle	21.1775	91.3392	21°10.65	91°20.35	10	40
53	10202	Inshore	Middle	21.3275	91.3392	21°19.65	91°20.35	10	40
103	10202	Inshore	Middle	21.1275	91.0892	21°07.65	91°05.35	10	40
138	10202	Inshore	Middle	21.0775	91.1892	21°04.65	91°11.35	10	40
140	10202	Inshore	Middle	21.0775	91.3892	21°04.65	91°23.35	10	40
148	10202	Inshore	Middle	21.1775	90.6892	21°10.65	90°41.35	10	40
173	10202	Inshore	Middle	21.2775	90.3892	21°16.65	90°23.35	10	40
174	10202	Inshore	Middle	21.2775	91.2392	21°16.65	91°14.35	10	40
2	10203	Inshore	South	21.0275	91.9892	21°01.65	91°59.35	10	40
4	10203	Inshore	South	20.5775	92.1392	20°34.65	92°08.35	10	40
12	10203	Inshore	South	21.4775	91.3892	21°28.65	91°23.35	10	40
18	10203	Inshore	South	20.7775	91.9392	20°46.65	91°56.35	10	40
22	10203	Inshore	South	20.7775	92.0892	20°46.65	92°05.35	10	40
27	10203	Inshore	South	21.7775	91.6892	21°46.65	91°41.35	10	40
32	10203	Inshore	South	21.2275	91.9892	21°13.65	91°59.35	10	40
36	10203	Inshore	South	20.5275	92.1892	20°31.65	92°11.35	10	40
37	10203	Inshore	South	21.0775	91.4892	21°04.65	91°29.35	10	40
54	10203	Inshore	South	21.3275	91.3892	21°19.65	91°23.35	10	40
65	10203	Inshore	South	21.6775	91.5392	21°40.65	91°32.35	10	40
68	10203	Inshore	South	20.9275	91.8892	20°55.65	91°53.35	10	40
70	10203	Inshore	South	20.9275	91.9392	20°55.65	91°56.35	10	40
74	10203	Inshore	South	20.9275	92.0392	20°55.65	92°02.35	10	40
79	10203	Inshore	South	21.2775	91.5892	21°16.65	91°35.35	10	40
101	10203	Inshore	South	21.5775	91.5392	21°34.65	91°32.35	10	40
102	10203	Inshore	South	21.5775	91.5892	21°34.65	91°35.35	10	40
105	10203	Inshore	South	21.5275	91.5892	21°31.65	91°35.35	10	40
111	10203	Inshore	South	21.4775	91.3392	21°28.65	91°20.35	10	40
112	10203	Inshore	South	21.1275	91.8392	21°07.65	91°50.35	10	40
115	10203	Inshore	South	21.1275	91.9892	21°07.65	91°59.35	10	40
128	10203	Inshore	South	21.4275	91.6892	21°25.65	91°41.35	10	40
137	10203	Inshore	South	20.9775	92.1392	20°58.65	92°08.35	10	40
144	10203	Inshore	South	21.7275	91.4892	21°43.65	91°29.35	10	40
155	10203	Inshore	South	21.1775	91.5392	21°10.65	91°32.35	10	40
157	10203	Inshore	South	21.1775	91.7892	21°10.65	91°47.35	10	40
158	10203	Inshore	South	21.3275	91.7892	21°19.65	91°47.35	10	40
159	10203	Inshore	South	21.1775	91.8392	21°10.65	91°50.35	10	40
163	10203	Inshore	South	20.8275	92.1392	20°49.65	92°08.35	10	40
176	10203	Inshore	South	21.2775	91.5392	21°16.65	91°32.35	10	40
33	10204	Midshore	Swatch	21.1775	89.6892	21°10.65	89°41.35	40	80
66	10204	Midshore	Swatch	21.2775	89.6892	21°16.65	89°41.35	40	80
73	10204	Midshore	Swatch	21.1275	90.0892	21°07.65	90°05.35	40	80
106	10204	Midshore	Swatch	21.2275	89.8892	21°13.65	89°53.35	40	80
119	10204	Midshore	Swatch	21.4275	89.5892	21°25.65	89°35.35	40	80
169	10204	Midshore	Swatch	21.1275	89.8892	21°07.65	89°53.35	40	80
10	10205	Midshore	Middle	20.7775	91.2892	20°46.65	91°17.35	40	80
25	10205	Midshore	Middle	20.9775	90.8892	20°58.65	90°53.35	40	80
51	10205	Midshore	Middle	20.8275	91.3392	20°49.65	91°20.35	40	80

ANNEX IV: Sampling stations, Demersal Survey #2018201

Stn	Stratum	Zone	Ground	Location (DD)		Location (DDM)		Depth (m)	
				Lat (N)	Lon (E)	Lat (N)	Lon (E)	Min	Max
57	10205	Midshore	Middle	20.9275	90.8392	20°55.65	90°50.35	40	80
58	10205	Midshore	Middle	20.9275	90.8892	20°55.65	90°53.35	40	80
61	10205	Midshore	Middle	20.9275	90.9892	20°55.65	90°59.35	40	80
62	10205	Midshore	Middle	21.0275	90.3892	21°01.65	90°23.35	40	80
114	10205	Midshore	Middle	20.8775	90.9392	20°52.65	90°56.35	40	80
125	10205	Midshore	Middle	20.9775	91.1892	20°58.65	91°11.35	40	80
149	10205	Midshore	Middle	20.8275	90.9892	20°49.65	90°59.35	40	80
152	10205	Midshore	Middle	20.8275	91.1392	20°49.65	91°08.35	40	80
154	10205	Midshore	Middle	20.8275	91.3892	20°49.65	91°23.35	40	80
156	10205	Midshore	Middle	20.9275	91.0892	20°55.65	91°05.35	40	80
161	10205	Midshore	Middle	21.0275	90.4892	21°01.65	90°29.35	40	80
5	10206	Midshore	South	20.6775	91.4892	20°40.65	91°29.35	40	80
6	10206	Midshore	South	20.6775	91.5392	20°40.65	91°32.35	40	80
8	10206	Midshore	South	20.6775	91.7392	20°40.65	91°44.35	40	80
30	10206	Midshore	South	20.4275	91.7392	20°25.65	91°44.35	40	80
39	10206	Midshore	South	20.6275	91.5392	20°37.65	91°32.35	40	80
41	10206	Midshore	South	20.6275	91.6392	20°37.65	91°38.35	40	80
50	10206	Midshore	South	20.7275	91.9392	20°43.65	91°56.35	40	80
60	10206	Midshore	South	20.8275	91.6892	20°49.65	91°41.35	40	80
78	10206	Midshore	South	20.5775	91.5892	20°34.65	91°35.35	40	80
108	10206	Midshore	South	20.6775	91.7892	20°40.65	91°47.35	40	80
129	10206	Midshore	South	20.4275	91.8392	20°25.65	91°50.35	40	80
131	10206	Midshore	South	20.9775	91.7892	20°58.65	91°47.35	40	80
132	10206	Midshore	South	20.5275	91.5892	20°31.65	91°35.35	40	80
141	10206	Midshore	South	20.6275	91.4892	20°37.65	91°29.35	40	80
150	10206	Midshore	South	20.7275	91.5892	20°43.65	91°35.35	40	80
166	10206	Midshore	South	20.9275	91.6892	20°55.65	91°41.35	40	80
168	10206	Midshore	South	20.9275	91.7892	20°55.65	91°47.35	40	80
20	10207	Offshore	Swatch	21.0775	89.6892	21°04.65	89°41.35	80	100
24	10207	Offshore	Swatch	21.0775	89.7892	21°04.65	89°47.35	80	100
34	10207	Offshore	Swatch	20.8275	89.9892	20°49.65	89°59.35	80	100
42	10207	Offshore	Swatch	20.9275	89.8892	20°55.65	89°53.35	80	100
44	10207	Offshore	Swatch	20.9275	90.1392	20°55.65	90°08.35	80	100
56	10207	Offshore	Swatch	21.0275	89.9892	21°01.65	89°59.35	80	100
104	10207	Offshore	Swatch	20.9775	89.5392	20°58.65	89°32.35	80	100
109	10207	Offshore	Swatch	20.9775	89.8392	20°58.65	89°50.35	80	100
116	10207	Offshore	Swatch	20.9775	90.2392	20°58.65	90°14.35	80	100
134	10207	Offshore	Swatch	20.7275	90.2392	20°43.65	90°14.35	80	100
142	10207	Offshore	Swatch	20.8275	90.2392	20°49.65	90°14.35	80	100
175	10207	Offshore	Swatch	20.7775	90.1392	20°46.65	90°08.35	80	100
1	10208	Offshore	Middle	20.7775	90.5392	20°46.65	90°32.35	80	100
3	10208	Offshore	Middle	20.7775	90.5892	20°46.65	90°35.35	80	100
9	10208	Offshore	Middle	20.8775	90.5392	20°52.65	90°32.35	80	100
11	10208	Offshore	Middle	20.2275	91.2392	20°13.65	91°14.35	80	100
15	10208	Offshore	Middle	20.4275	90.6892	20°25.65	90°41.35	80	100
21	10208	Offshore	Middle	20.5275	90.4392	20°31.65	90°26.35	80	100
31	10208	Offshore	Middle	20.6275	90.5892	20°37.65	90°35.35	80	100
46	10208	Offshore	Middle	20.3775	90.8892	20°22.65	90°53.35	80	100
59	10208	Offshore	Middle	20.4775	90.5892	20°28.65	90°35.35	80	100
63	10208	Offshore	Middle	20.4775	90.8892	20°28.65	90°53.35	80	100
67	10208	Offshore	Middle	20.5775	90.8392	20°34.65	90°50.35	80	100
71	10208	Offshore	Middle	20.5775	91.0892	20°34.65	91°05.35	80	100
72	10208	Offshore	Middle	20.6775	90.2892	20°40.65	90°17.35	80	100
75	10208	Offshore	Middle	20.6775	90.3892	20°40.65	90°23.35	80	100
117	10208	Offshore	Middle	20.4275	90.6392	20°25.65	90°38.35	80	100
120	10208	Offshore	Middle	20.4275	91.0392	20°25.65	91°02.35	80	100
121	10208	Offshore	Middle	20.4275	91.0892	20°25.65	91°05.35	80	100
122	10208	Offshore	Middle	20.4275	91.1892	20°25.65	91°11.35	80	100

ANNEX IV: Sampling stations, Demersal Survey #2018201

Stn	Stratum	Zone	Ground	Location (DD)		Location (DDM)		Depth (m)	
				Lat (N)	Lon (E)	Lat (N)	Lon (E)	Min	Max
123	10208	Offshore	Middle	20.5275	90.5892	20°31.65	90°35.35	80	100
130	10208	Offshore	Middle	20.5275	91.3392	20°31.65	91°20.35	80	100
133	10208	Offshore	Middle	20.6275	90.8892	20°37.65	90°53.35	80	100
136	10208	Offshore	Middle	20.7275	90.5392	20°43.65	90°32.35	80	100
147	10208	Offshore	Middle	20.7275	91.1892	20°43.65	91°11.35	80	100
160	10208	Offshore	Middle	20.2775	91.0892	20°16.65	91°05.35	80	100
162	10208	Offshore	Middle	20.5775	90.4892	20°34.65	90°29.35	80	100
164	10208	Offshore	Middle	20.5775	90.6392	20°34.65	90°38.35	80	100
13	10209	Offshore	South	20.2275	91.4392	20°13.65	91°26.35	80	100
19	10209	Offshore	South	20.2275	91.8892	20°13.65	91°53.35	80	100
29	10209	Offshore	South	20.4275	91.5392	20°25.65	91°32.35	80	100
38	10209	Offshore	South	20.1775	91.7892	20°10.65	91°47.35	80	100
69	10209	Offshore	South	20.2775	91.7892	20°16.65	91°47.35	80	100
126	10209	Offshore	South	20.4275	91.5892	20°25.65	91°35.35	80	100
135	10209	Offshore	South	20.3275	91.3892	20°19.65	91°23.35	80	100
143	10209	Offshore	South	20.1775	91.8892	20°10.65	91°53.35	80	100
165	10209	Offshore	South	20.2775	91.4892	20°16.65	91°29.35	80	100
171	10209	Offshore	South	20.2775	91.8392	20°16.65	91°50.35	80	100
7	10210	Deep off	All	20.4275	90.0392	20°25.65	90°02.35	100	200
14	10210	Deep off	All	20.3275	89.6892	20°19.65	89°41.35	100	200
16	10210	Deep off	All	20.5275	90.1392	20°31.65	90°08.35	100	200
17	10210	Deep off	All	20.3275	89.8392	20°19.65	89°50.35	100	200
26	10210	Deep off	All	20.1775	90.3392	20°10.65	90°20.35	100	200
35	10210	Deep off	All	20.1775	91.5892	20°10.65	91°35.35	100	200
47	10210	Deep off	All	20.1275	90.9392	20°07.65	90°56.35	100	200
48	10210	Deep off	All	20.2775	90.3892	20°16.65	90°23.35	100	200
55	10210	Deep off	All	20.5775	89.8892	20°34.65	89°53.35	100	200
76	10210	Deep off	All	20.0775	91.6892	20°04.65	91°41.35	100	200
80	10210	Deep off	All	20.4275	89.3892	20°25.65	89°23.35	100	200
107	10210	Deep off	All	20.5275	89.5392	20°31.65	89°32.35	100	200
113	10210	Deep off	All	20.4275	90.4392	20°25.65	90°26.35	100	200
118	10210	Deep off	All	20.6275	89.5892	20°37.65	89°35.35	100	200
124	10210	Deep off	All	20.1775	90.2892	20°10.65	90°17.35	100	200
127	10210	Deep off	All	20.3275	90.6392	20°19.65	90°38.35	100	200
139	10210	Deep off	All	20.3775	89.8892	20°22.65	89°53.35	100	200
145	10210	Deep off	All	20.9275	89.7392	20°55.65	89°44.35	100	200
146	10210	Deep off	All	20.2775	89.8392	20°16.65	89°50.35	100	200
151	10210	Deep off	All	20.2775	90.2892	20°16.65	90°17.35	100	200
153	10210	Deep off	All	20.2775	90.4392	20°16.65	90°26.35	100	200
172	10210	Deep off	All	20.7775	89.7392	20°46.65	89°44.35	100	200

Abbreviations:

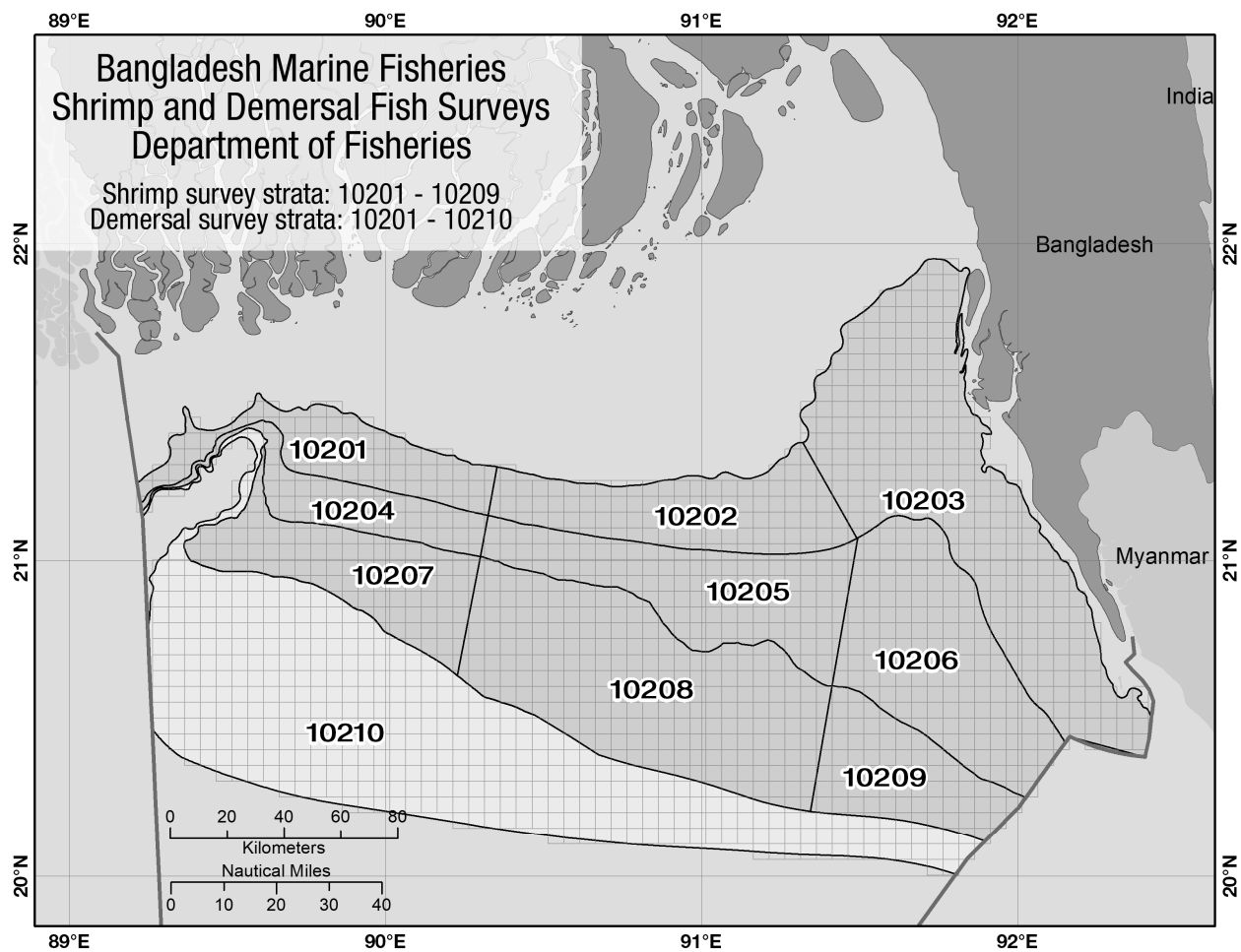
DD = Decimal degree notation
 DM = Degree Minute notation
 E = East
 N = North
 m = meter



Survey Annual Report
DoF Survey Working Group
12 December, 2018

Survey Operations

The R/V Meen Shandhani conducts annual shrimp and demersal trawl surveys. Each survey required approximately one month at-sea and samples approximately 80 pre-selected stations on the Bangladesh continental shelf. Survey stations are allocated according to a depth and area stratification plan. Shrimp surveys have 9 strata within 10 and 100 m depth range. The demersal fish surveys include the same 9 strata as the shrimp plus 1 more stratum for the 100 to 200 m range.

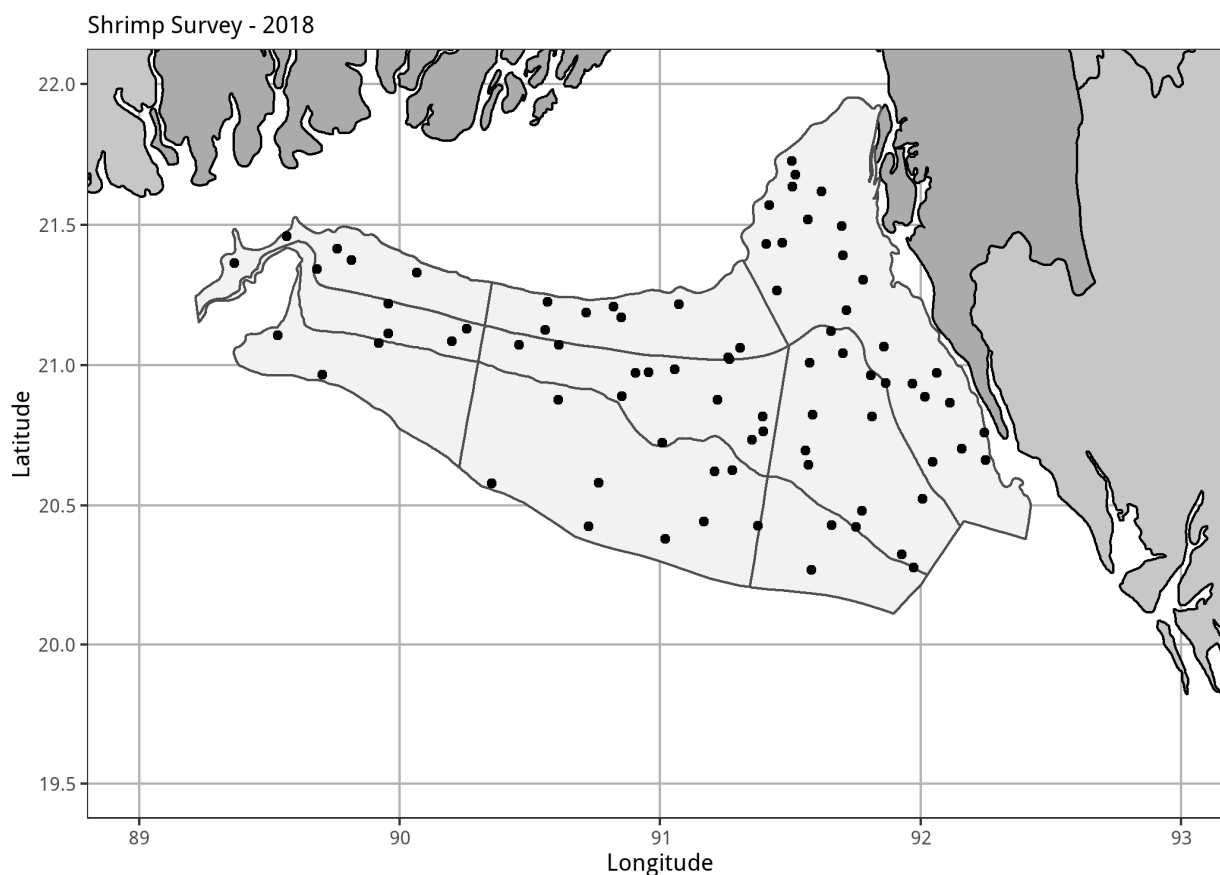


Trawl survey strata

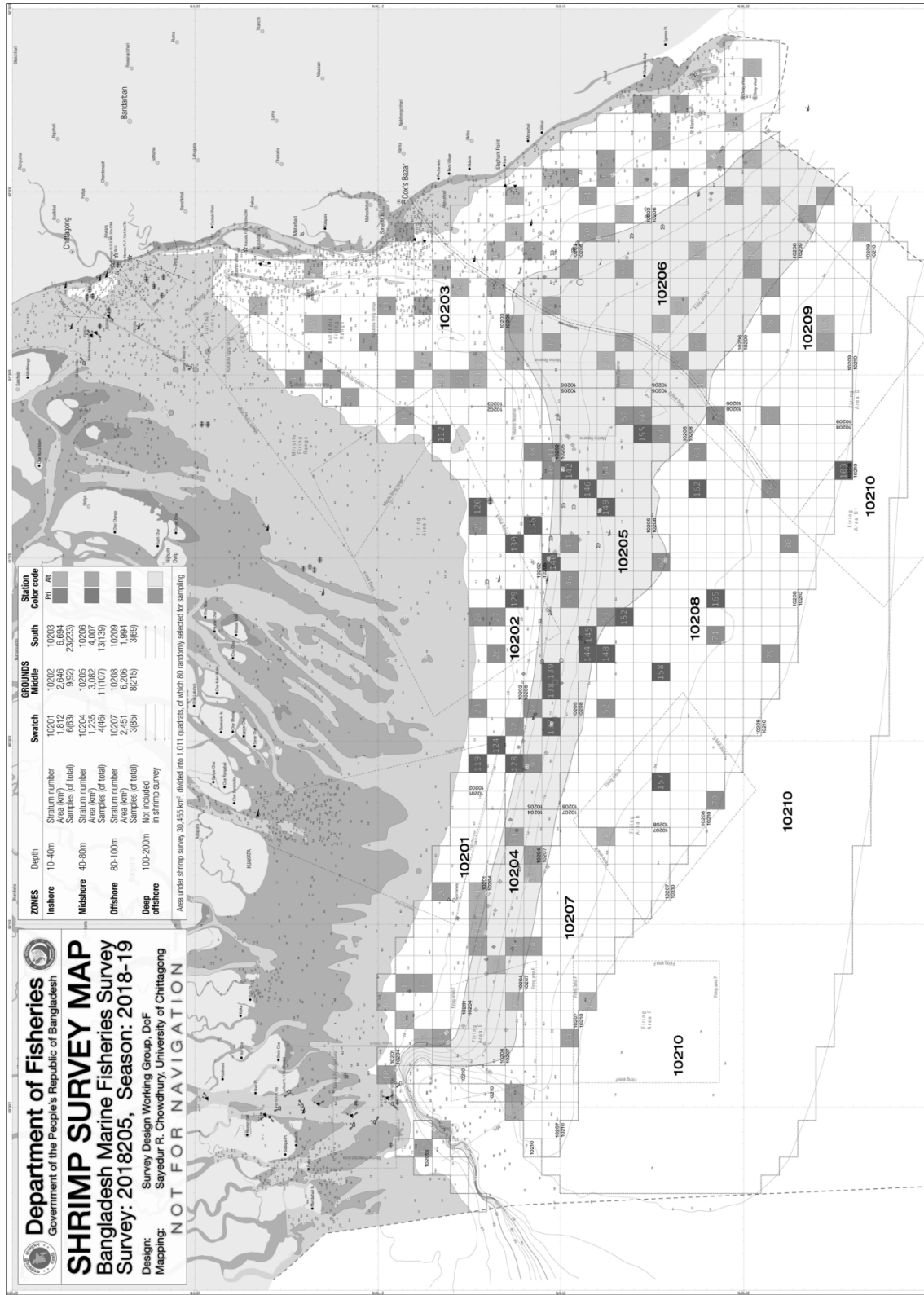
The number of stations allocated to each stratum is dependent on the area (km²), which is used to calculate the stratum weight as the proportion of the total area in a given stratum.

Stratum	Name	Depth (m)	Area (km ²)	Weight	Sets completed*
10201	Swatch Inshore	10 - 40	1814	0.060	6
10202	Middle Inshore	10 - 40	2681	0.088	9
10203	South Inshore	10 - 40	6833	0.224	22
10204	Swatch Midshore	40 - 80	1350	0.044	4
10205	Middle Midshore	40 - 80	3180	0.104	9
10206	South Midshore	40 - 80	3978	0.131	13
10207	Swatch Offshore	80 - 100	2522	0.083	3
10208	Middle Offshore	80 - 100	6083	0.200	8
10209	South Offshore	80 - 100	2025	0.066	6

*The sets completed column is the actual number of trawl samples taken in the survey.



The survey locations plotted are the starting locations of valid fishing stations



Shrimp Survey Map 2018205

Species group: Penaeid shrimps (Excluding tiger shrimp)

Majority of penaeid shrimp species that are presently exploited are common to both in Artisanal and Industrial fisheries. The artisanal fishery harvest pre-adult, post juveniles, juveniles and even the post larvae (PL) but the industrial fishery harvest mostly the adult phase of penaeid shrimp. Most of the species are commercially important. The highest contribution in the total production is made by *Metapenaeus monoceros* the brown shrimp.

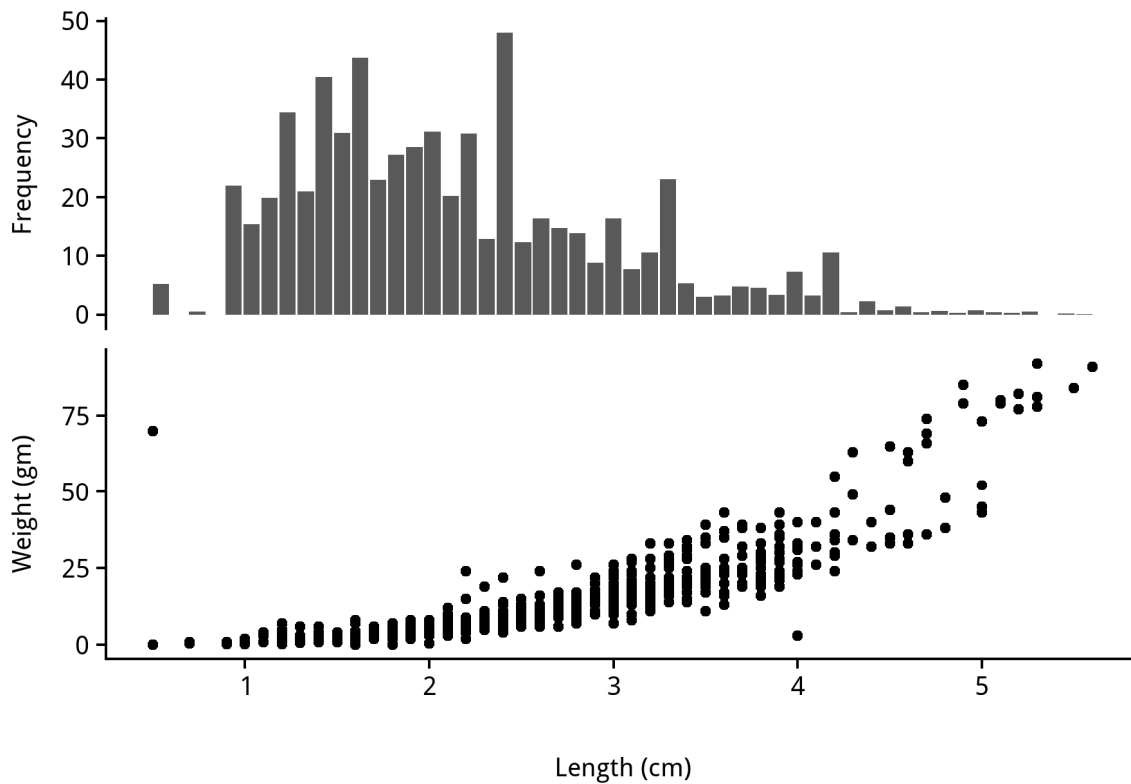
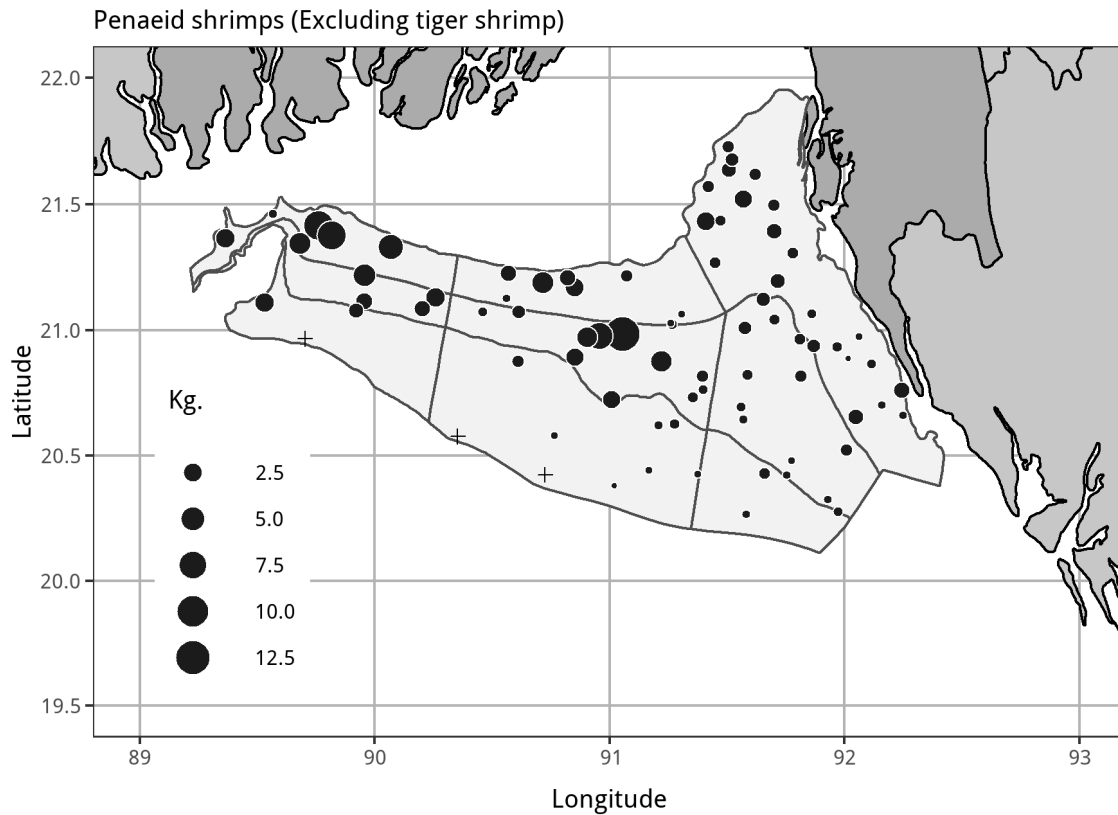
Species in group and number of catches

Scientific name	Occurences	Scientific name	Occurences
<i>Metapenaeus affinis</i>	24	<i>Parapenaeopsis</i> sp.	8
<i>Metapenaeus brevicornis</i>	12	<i>Parapenaeopsis stylifera</i>	22
<i>Metapenaeus dobsoni</i>	3	<i>Parapenaeopsis uncta</i>	2
<i>Metapenaeus lysianassa</i>	26	<i>Parapenaeus longipes</i>	25
<i>Metapenaeus monoceros</i>	47	PENAEIDAE	2
<i>Metapenaeus</i> sp.	2	<i>Penaeus indicus</i>	13
<i>Parapenaeopsis hardwickii</i>	5	<i>Penaeus semisulcatus</i>	4
<i>Parapenaeopsis sculptitis</i>	10		



Shrimp surveys - Penaeid shrimps (Excluding tiger shrimp)

Stratum	10201	10202	10203	10204	10205	10206	10207	10208	10209	
Weight	0.060	0.088	0.224	0.044	0.104	0.131	0.083	0.200	0.066	
Survey number										Annual mean
2016202		4.51	1.08		1.79	1.34			0.15	1.01
2017204	6.90	1.36	0.89	9.07	4.39	1.04	0.94	0.13	0.01	1.83
2018205	5.32	1.20	0.82	2.64	3.48	0.52	1.29	0.13	0.54	1.33



Species group: Tiger shrimp

Among the penaeid shrimp *Penaeus monodon* the Tiger shrimp is the most target species of commercial shrimp trawlers and some artisanal fishing gears (MSBN and Trammel net etc.). Because this shrimp fetches a very good prices both in local and international market. Principal breeding season is January-February.

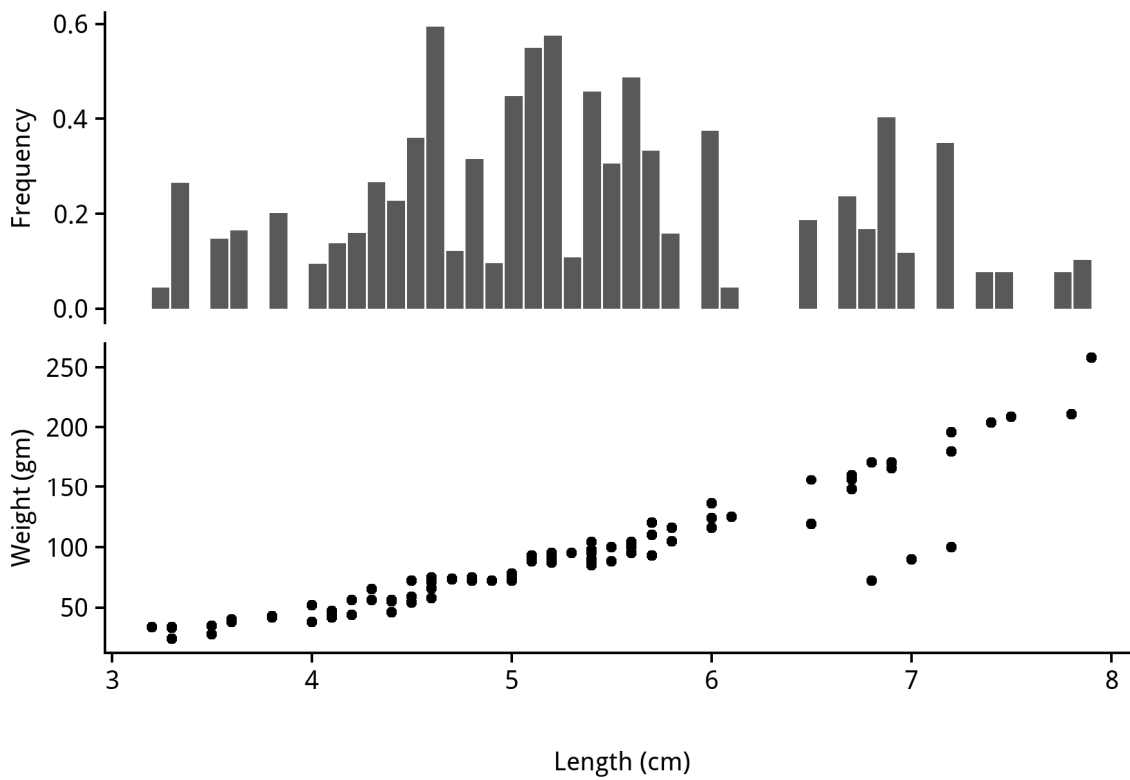
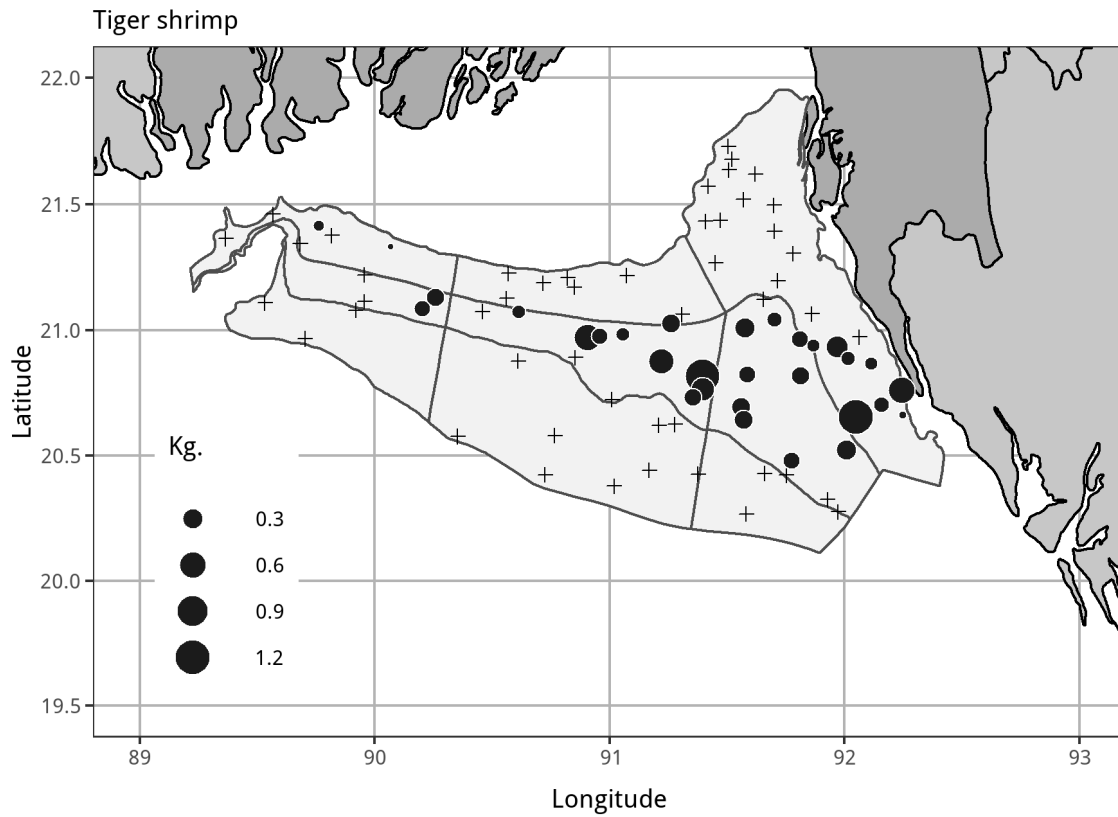
Species in group and number of catches

Scientific name	Occurences
<i>Penaeus monodon</i>	30



Shrimp surveys - Tiger shrimp

Stratum	10201	10202	10203	10204	10205	10206	10207	10208	10209	
Weight	0.060	0.088	0.224	0.044	0.104	0.131	0.083	0.200	0.066	
Survey number										Annual mean
2016202		0.48	0.02		0.33	0.58			0.00	0.16
2017204	0.08	0.00	0.08	0.00	0.88	0.70	0.00	0.00	0.00	0.21
2018205	0.01	0.03	0.12	0.10	0.28	0.29	0.00	0.00	0.00	0.10



Species group: Non-penaeid shrimps

Non-penaeid shrimp are found mainly coastal areas, brackish water and estuaries and caught in artisanal gears (ESBN and MSBN) in different stages of their life cycle. Most of them are economically important in our local market. Some of non-penaeid found in dipper water and harvest by shrimp trawlers. Some non-penaeid shrimp *Squilla mantis* the mantis shrimp are used as poultry feed and fish meal.

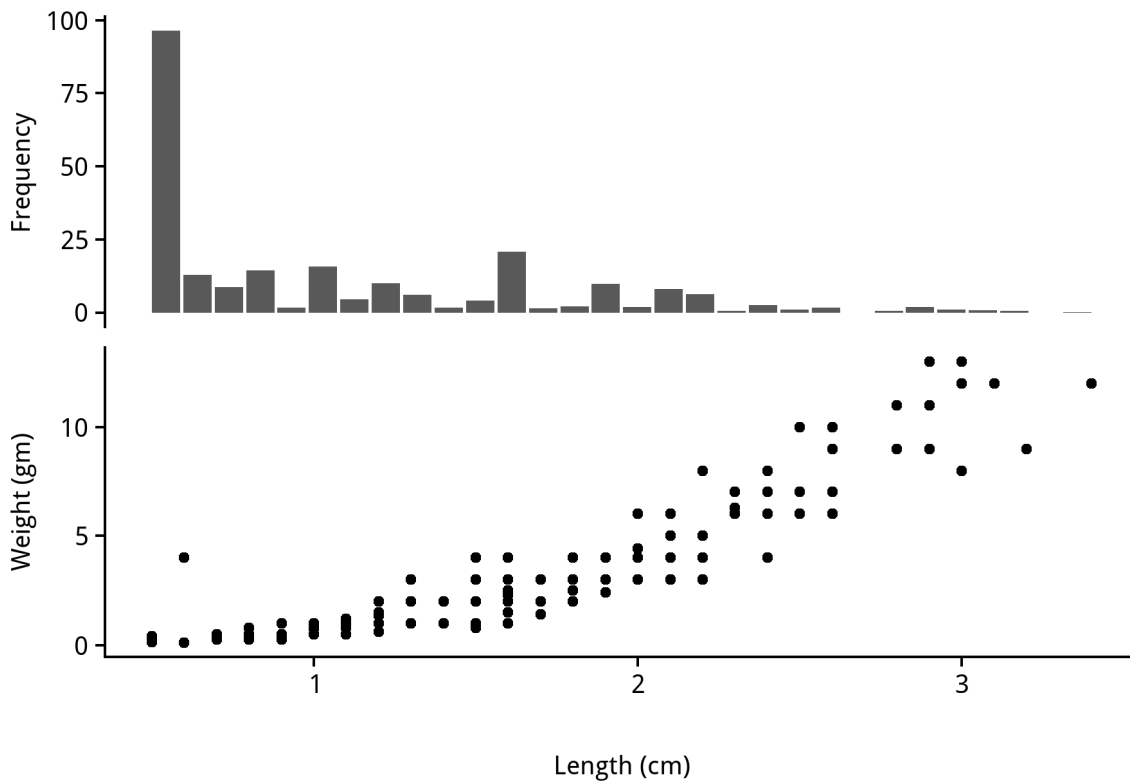
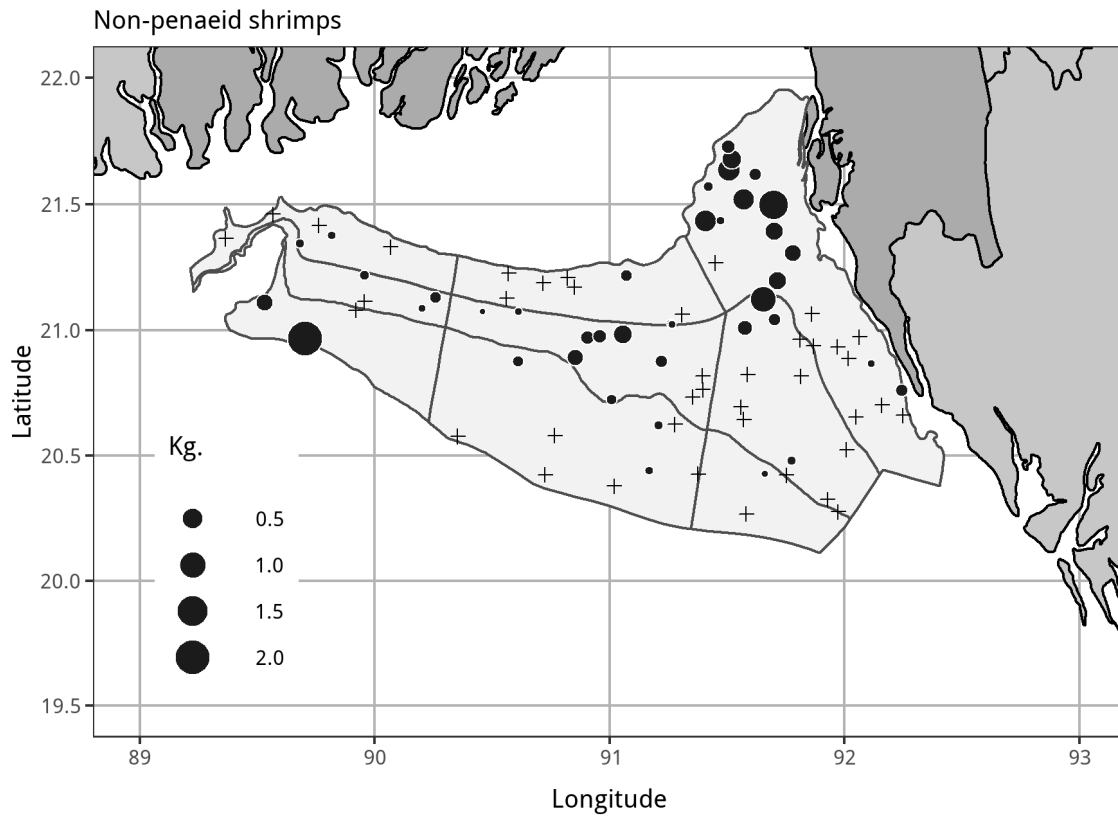
Species in group and number of catches

Scientific name	Occurences	Scientific name	Occurences
Acetes sp.	3	Palaemon sp.	2
Exopalaemon styliferus	2	Solenocera crassicornis	30
Macrobrachium malcolmsonii	2	Solenocera hextii	3
Nematopalaemon tenuipes	13	Solenocera sp.	1



Shrimp surveys - Non-penaeid shrimps

Stratum	10201	10202	10203	10204	10205	10206	10207	10208	10209	
Weight	0.060	0.088	0.224	0.044	0.104	0.131	0.083	0.200	0.066	
Survey number										Annual mean
2016202		0.76	0.07		0.03	0.11			0.11	0.11
2017204	0.19	0.03	0.14	1.33	0.58	0.37	0.00	0.00	0.00	0.21
2018205	0.01	0.01	0.22	0.03	0.12	0.11	0.81	0.01	0.01	0.15



Species group: Small pelagics – Clupeidae, Pristigasteridae, Dussumieriidae and Chirocentridae

Shads, Anchovies, Sardines and Herring which lie under the family of Clupeidae and Pristigasteridae are the most significant fish group of seawater of Bangladesh. They are commercially important and abundantly available but exploited as by catch of Small Mesh Drift gill Net, Set Bag Net and commercial trawl fishery. Among these groups *Hilsa ilisha* the National fish (Hilsa) is the dominant species both inland and marine catch.

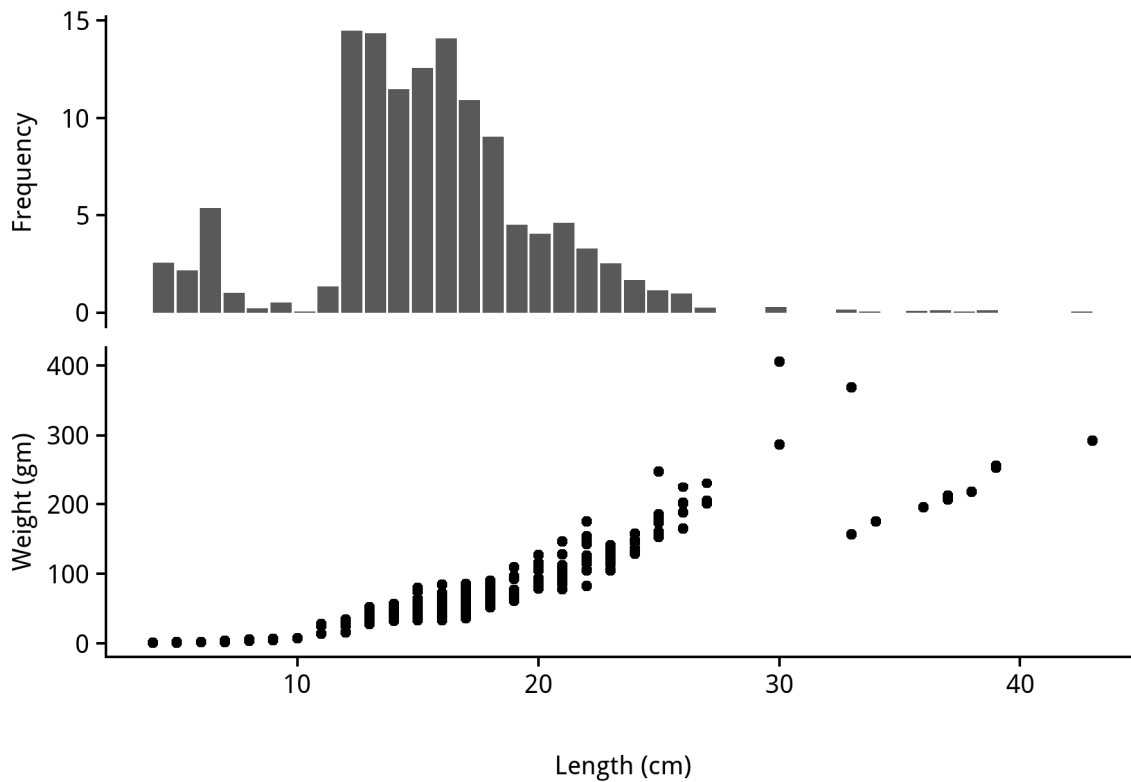
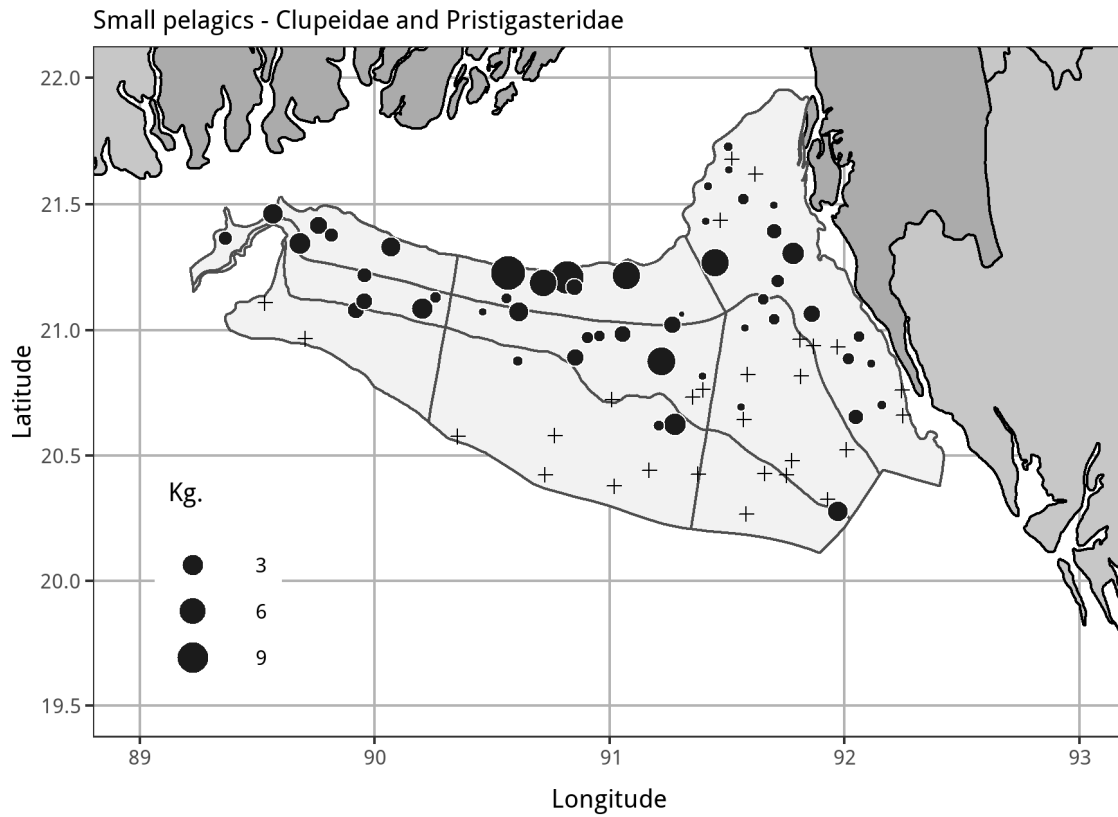
Species in group and number of catches

Scientific name	Occurences	Scientific name	Occurences
Anodontostoma chacunda	7	Ilisha filigera	26
Chirocentrus dorab	3	Ilisha megaloptera	12
CLUPEIDAE	1	Ilisha melastoma	7
Dussumieria acuta	1	Raconda russeliana	1
Dussumieria elopsoides	14	Sardinella fimbriata	8
Escualosa thoracata	2	Sardinella melanura	5
Ilisha elongata	4	Tenualosa ilisha	4



Shrimp surveys - Small pelagics - Clupeidae and Pristigasteridae

Stratum	10201	10202	10203	10204	10205	10206	10207	10208	10209	
Weight	0.060	0.088	0.224	0.044	0.104	0.131	0.083	0.200	0.066	
Survey number										Annual mean
2016202		0.63	14.11		0.00	0.18			0.00	3.25
2017204	0.59	6.20	0.44	0.40	0.70	0.14	1.47	1.45	0.02	1.20
2018205	2.29	4.70	0.34	1.47	1.55	0.29	0.49	0.49	0.71	1.08



Species group: Carangidae - Jacks and scads

Carangids are commercially important but exploited as by-catch or incidental catch of gill net, mid water trawl, demersal trawl and shrimp trawl though these groups are mostly pelagic. Within this group *Megalaspis cordyla* the Hard tail Scad and *Parastromateus niger* the Black pomfret are abundantly available in our territory.

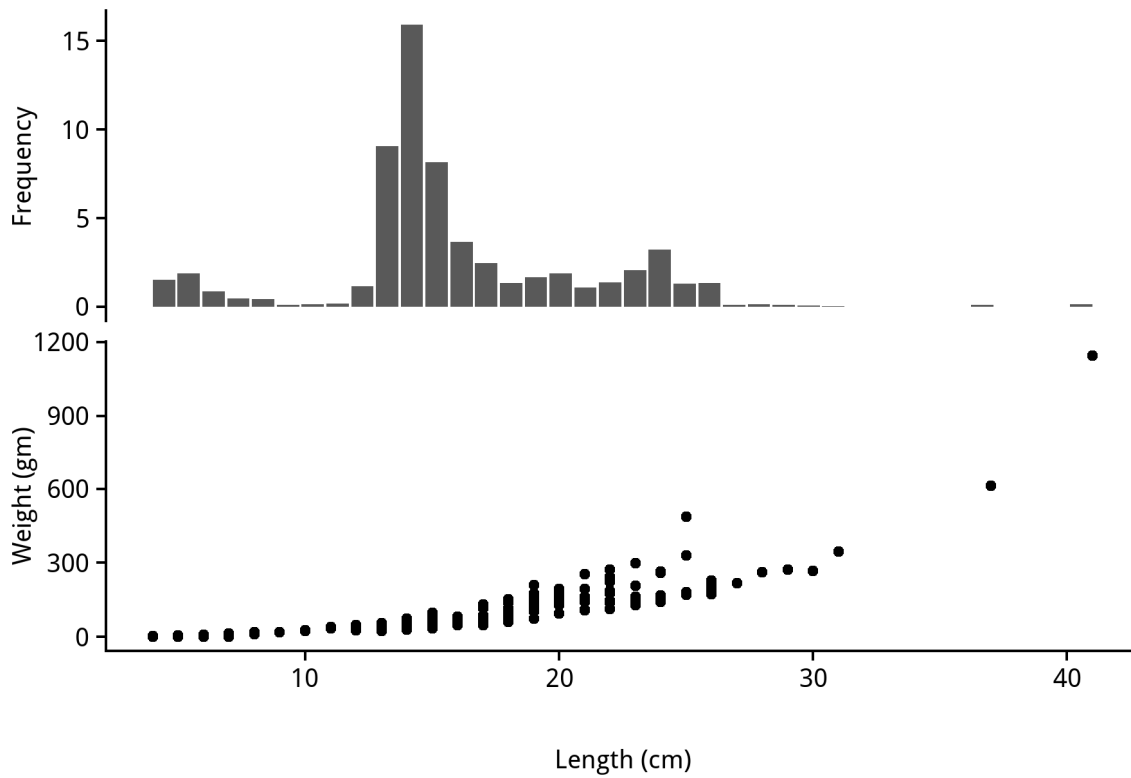
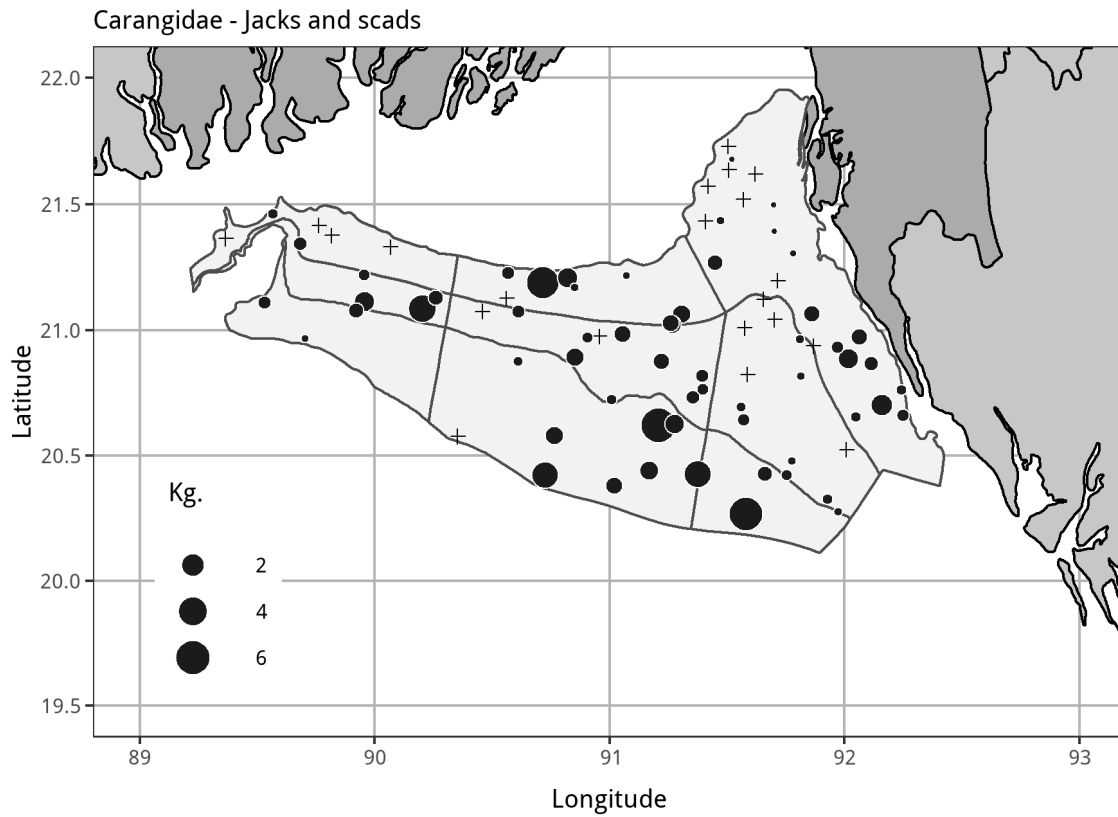
Species in group and number of catches

Scientific name	Occurences	Scientific name	Occurences
Alectis ciliaris	13	Carangoides chrysophrys	2
Alectis indica	3	Carangoides ferdau	1
Alepes djedaba	11	Decapterus russelli	18
Alepes melanoptera	3	Megalaspis cordyla	22
Alepes vari	1	Parastromateus niger	3
Atropus atropus	12	Scomberoides tol	7
CARANGIDAE	1	Selar crumenophthalmus	16
Carangoides armatus	7	Seriolina nigrofasciata	1



Shrimp surveys - Carangidae - Jacks and scads

Stratum	10201	10202	10203	10204	10205	10206	10207	10208	10209	
Weight	0.060	0.088	0.224	0.044	0.104	0.131	0.083	0.200	0.066	
Survey number										Annual mean
2016202		0.39	0.08		0.14	0.61			0.09	0.15
2017204	0.14	0.31	0.14	1.17	0.70	0.23	0.44	0.08	0.09	0.28
2018205	0.11	1.10	0.28	1.49	0.45	0.10	0.29	1.76	1.67	0.78

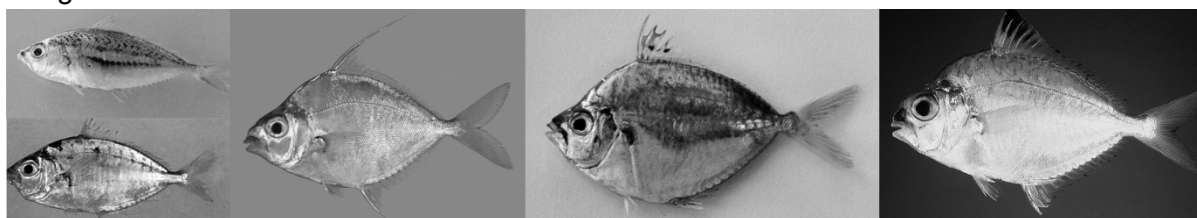


Species group: Leiognathidae - Ponyfish

Leiognathids or pony fish the small sized fishes consume locally and used as poultry feed and fish meal as cheap price. This group are abundantly caught in Artisanal fishing gear (MSBN), demersal trawl and shrimp trawl.

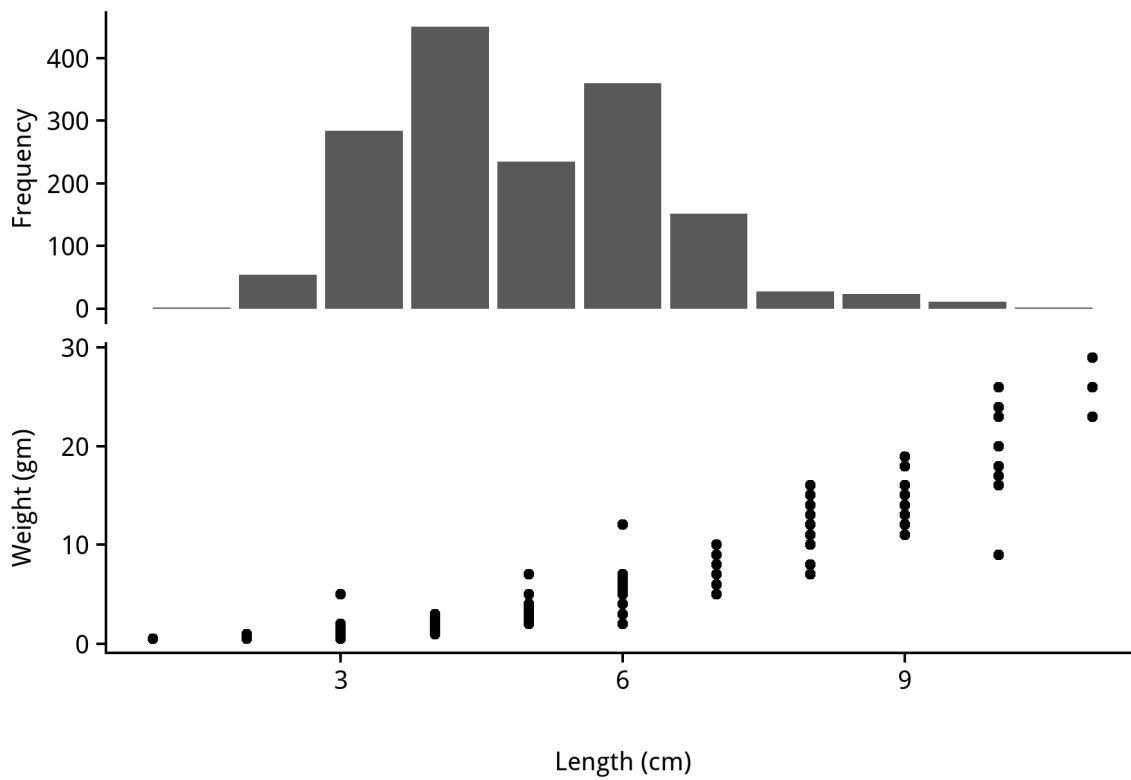
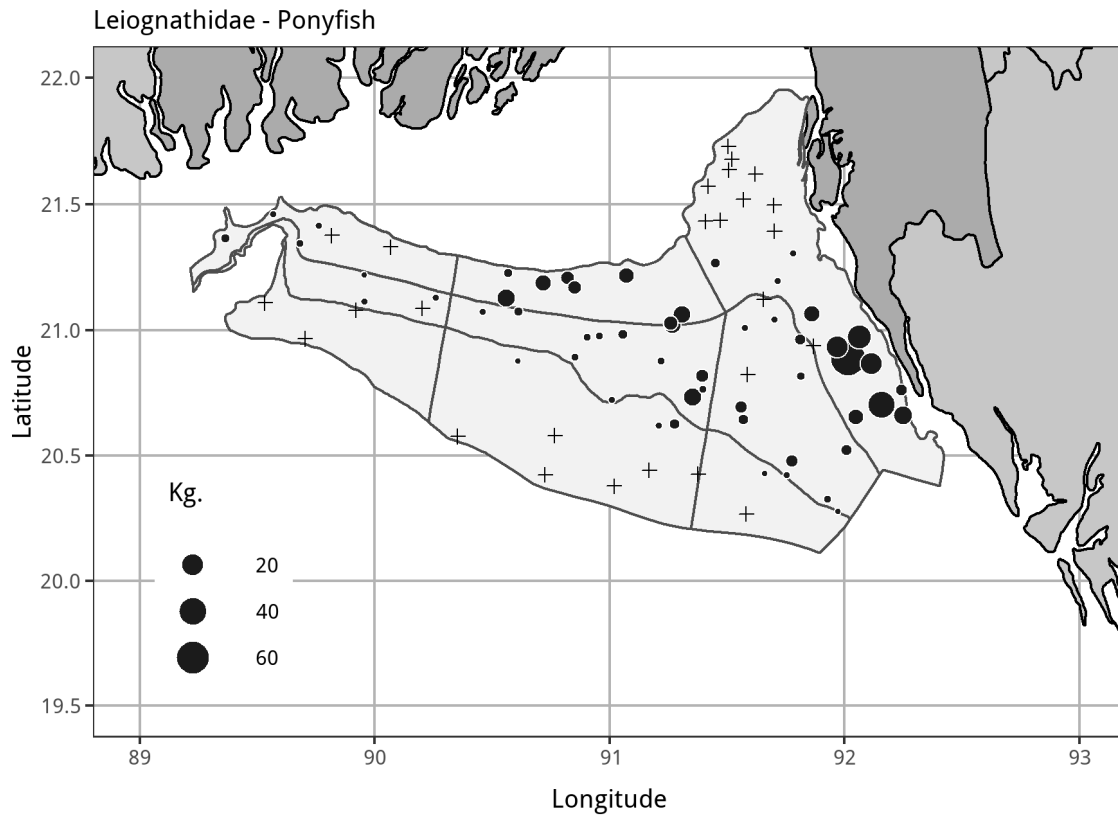
Species in group and number of catches

Scientific name	Occurences	Scientific name	Occurences
Gazza minuta	10	Leiognathus splendens	2
Leiognathus bindus	31	Secutor insidiator	6
Leiognathus brevirostris	16	Secutor ruconius	4
Leiognathus fasciatus	1		



Shrimp surveys - Leiognathidae - Ponyfish

Stratum	10201	10202	10203	10204	10205	10206	10207	10208	10209	
Weight	0.060	0.088	0.224	0.044	0.104	0.131	0.083	0.200	0.066	
Survey number										Annual mean
2016202		1.98	2.57		6.63	3.35			0.01	1.88
2017204	1.26	3.95	6.41	0.02	0.18	1.50	0.00	0.33	0.03	2.14
2018205	0.15	7.61	9.35	0.05	1.54	1.26	0.00	0.14	0.15	3.14



Species group: Mullidae - Goatfish

Mullidae – Goatfish, the small sized fish is consumed locally and harvest mainly in mid water trawl and found significantly in coral reef areas.

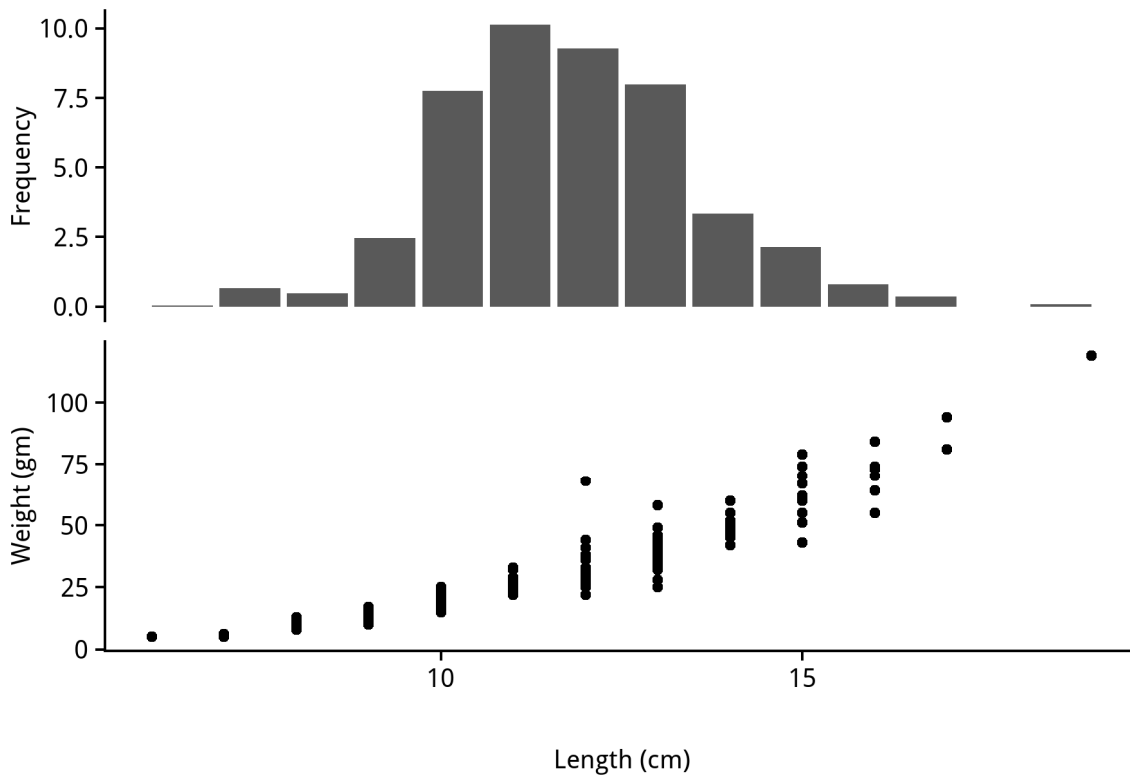
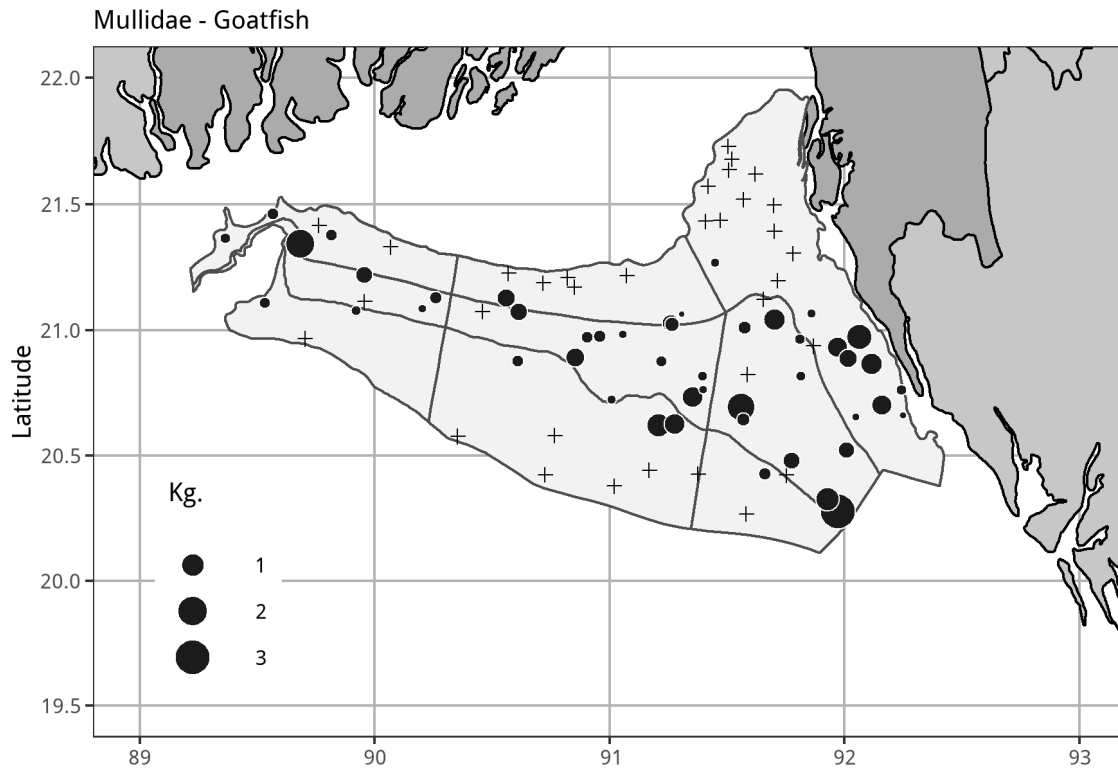
Species in group and number of catches

Scientific name	Occurences	Scientific name	Occurences
Mulloides vanicolensis	1	Upeneus moluccensis	13
Upeneus bensasi	1	Upeneus sulphureus	14
Upeneus guttatus	9	Upeneus supravitatus	22



Shrimp surveys - Mullidae - Goatfish

	10201	10202	10203	10204	10205	10206	10207	10208	10209	
Stratum Weight	0.060	0.088	0.224	0.044	0.104	0.131	0.083	0.200	0.066	
Survey number										Annual mean
2016202		0.20	1.37		0.78	2.41			0.00	0.72
2017204	0.31	0.44	0.24	0.31	0.56	0.35	0.01	1.55	1.46	0.64
2018205	0.47	0.14	0.20	0.15	0.25	0.53	0.05	0.24	0.20	0.25



Species group: Nemipteridae - Threadfin breams

Threadfin breams are commercially important fishes and considered as good fish. This are mainly caught bottom trawl, gill net and long lines. This fishes are occurring in muddy and sandy bottom and known to control of population of crustaceans and small fishes in the marine ecosystem.

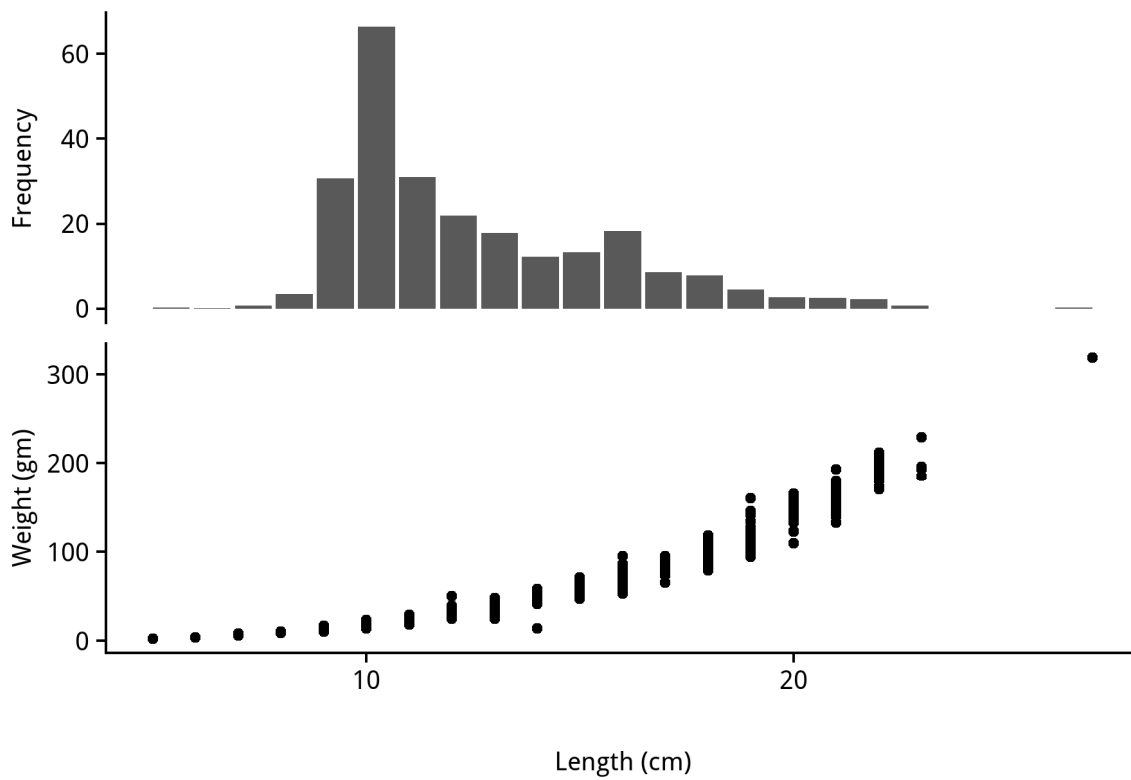
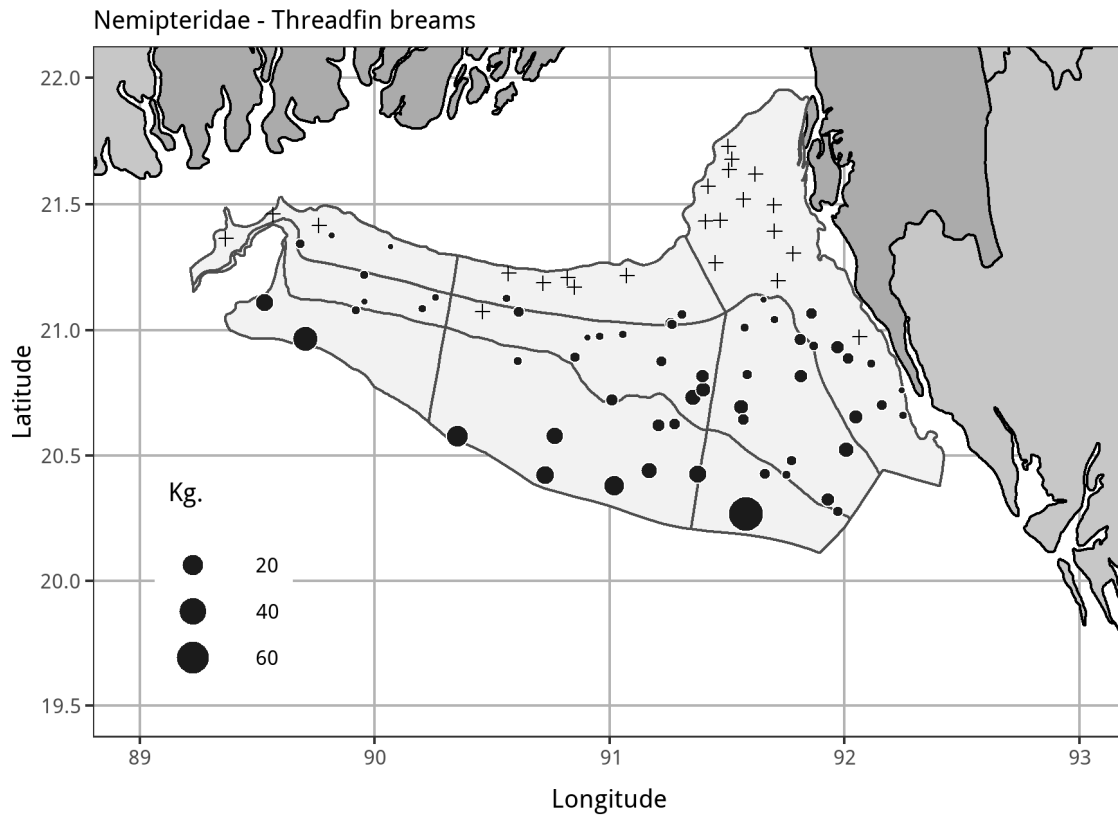
Species in group and number of catches

Scientific name	Occurences
Nemipterus japonicus	48
Nemipterus peronii	1
Nemipterus randalli	19
Parascolopsis aspinosa	11



Shrimp surveys - Nemipteridae - Threadfin breams

	10201	10202	10203	10204	10205	10206	10207	10208	10209	
Stratum Weight	0.060	0.088	0.224	0.044	0.104	0.131	0.083	0.200	0.066	
Survey number										Annual mean
2016202		0.01	0.09		1.06	1.54			16.69	1.44
2017204	0.38	0.16	0.49	2.93	1.39	3.61	17.81	9.78	47.25	7.46
2018205	0.29	0.64	0.86	0.44	2.79	2.90	14.84	9.95	15.02	5.17

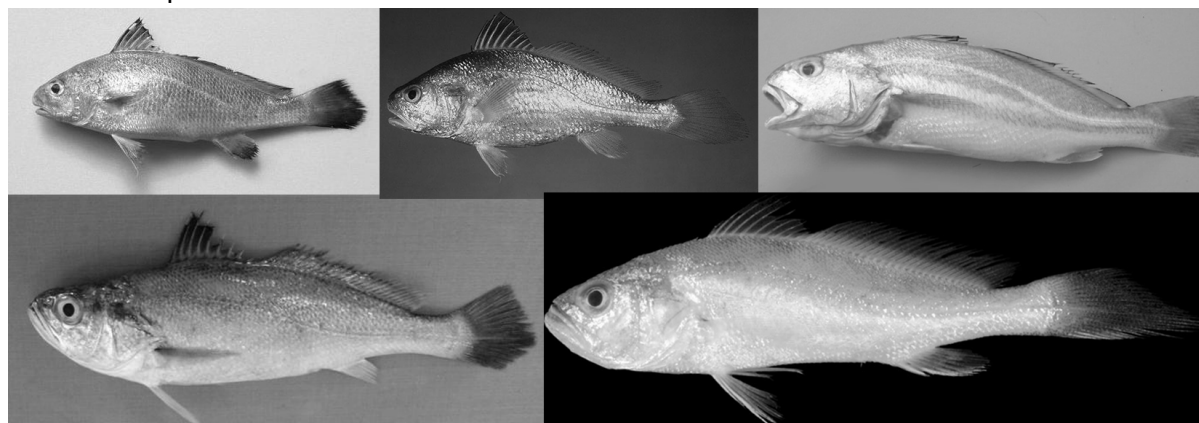


Species group: Sciaenidae - Croakers

Croakers are the largest group in the commercially important fishes in our sea water. These are bottom dwelling and carnivores' fishes known as drums feeding on benthic invertebrates and small fishes. They are caught bottom trawl, gill net and long lines. They are exported as dry and fresh form and fetch a good foreign currency and have a local demand.

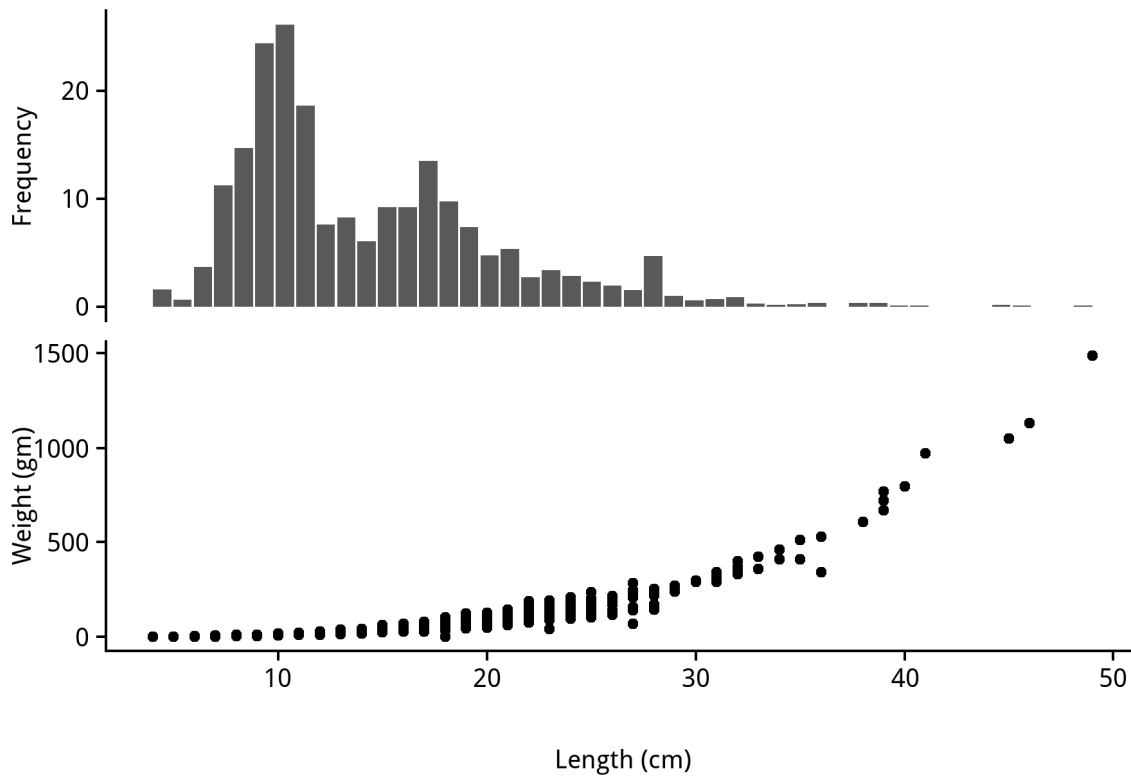
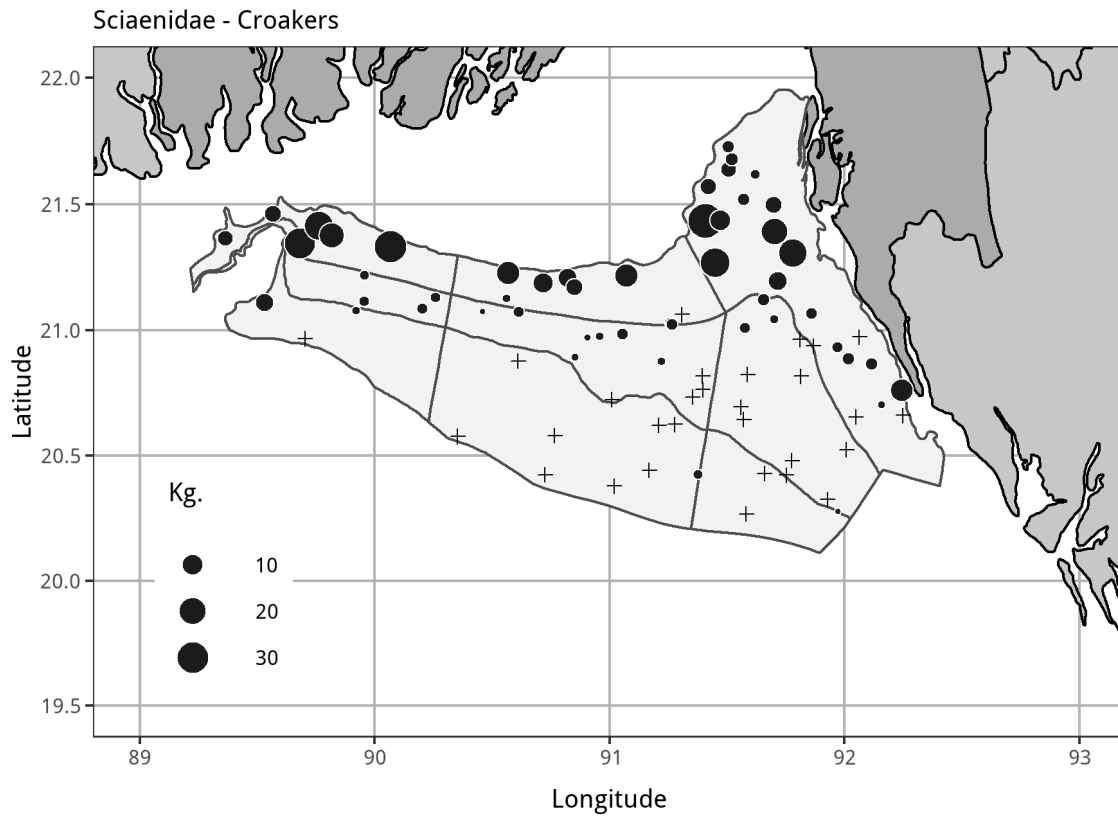
Species in group and number of catches

Scientific name	Occurences	Scientific name	Occurences
Johnieops sina	7	Panna microdon	9
Johnius belangerii	27	Pennahia anea	15
Johnius carutta	7	Protonibea diacanthus	12
Otolithes cuvieri	27	Pterotolithus maculatus	5
Otolithes ruber	1	SCIAENIDAE	5
Otolithoides pama	14		



Shrimp surveys - Sciaenidae - Croakers

	10201	10202	10203	10204	10205	10206	10207	10208	10209	
Stratum Weight	0.060	0.088	0.224	0.044	0.104	0.131	0.083	0.200	0.066	
Survey number										Annual mean
2016202		3.45	1.83		0.00	0.65			0.10	0.81
2017204	4.50	5.80	11.11	2.08	1.19	0.63	0.28	0.08	0.50	3.64
2018205	20.34	6.60	6.84	0.74	0.32	0.28	2.25	0.00	2.79	3.80

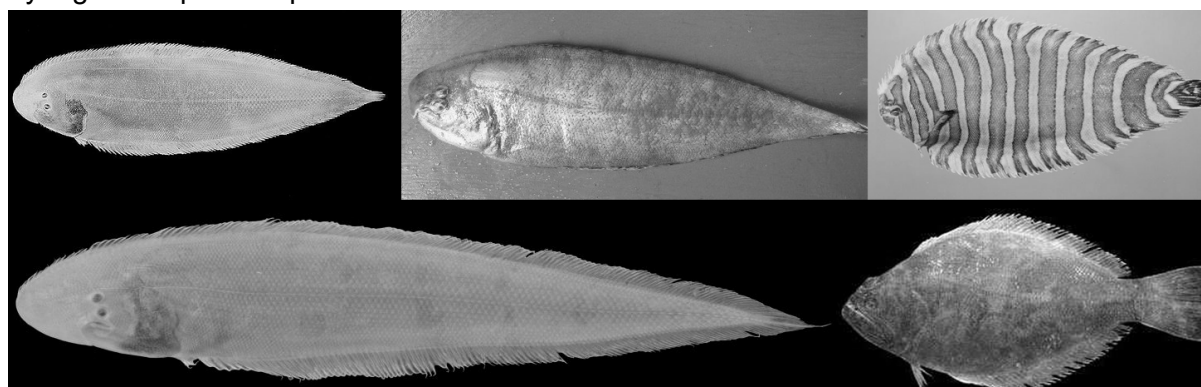


Species group: Pleuronectiformes - Flatfish

As before Flatfish are thrown as trash in shrimp trawl and demersal trawl catch. But at present flat fishes are used in fish meal and poultry feed. These groups mainly harvest in shrimp trawl but sometimes caught in MSBN. In Bangladesh only some tribal peoples having some species of flat fish, but now days these export in foreign countries mainly in China, Korea and Singapore. These groups are inhabits in sand and mud bottoms and eat only crutaceans.

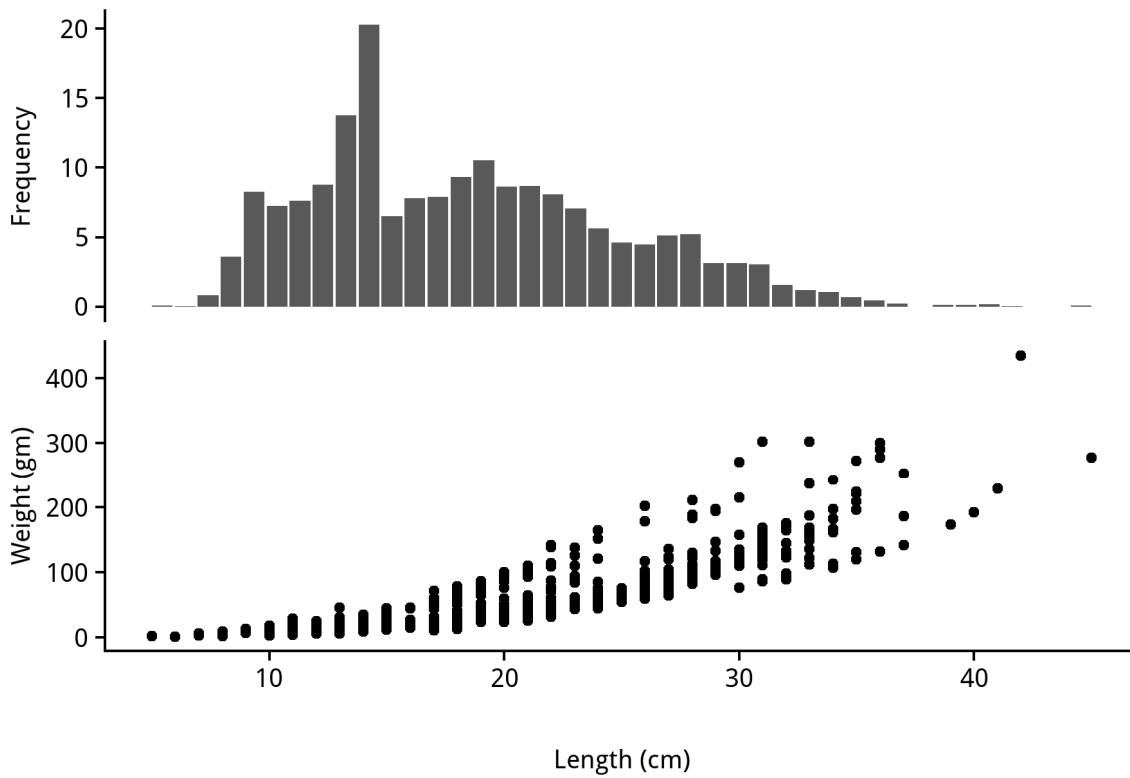
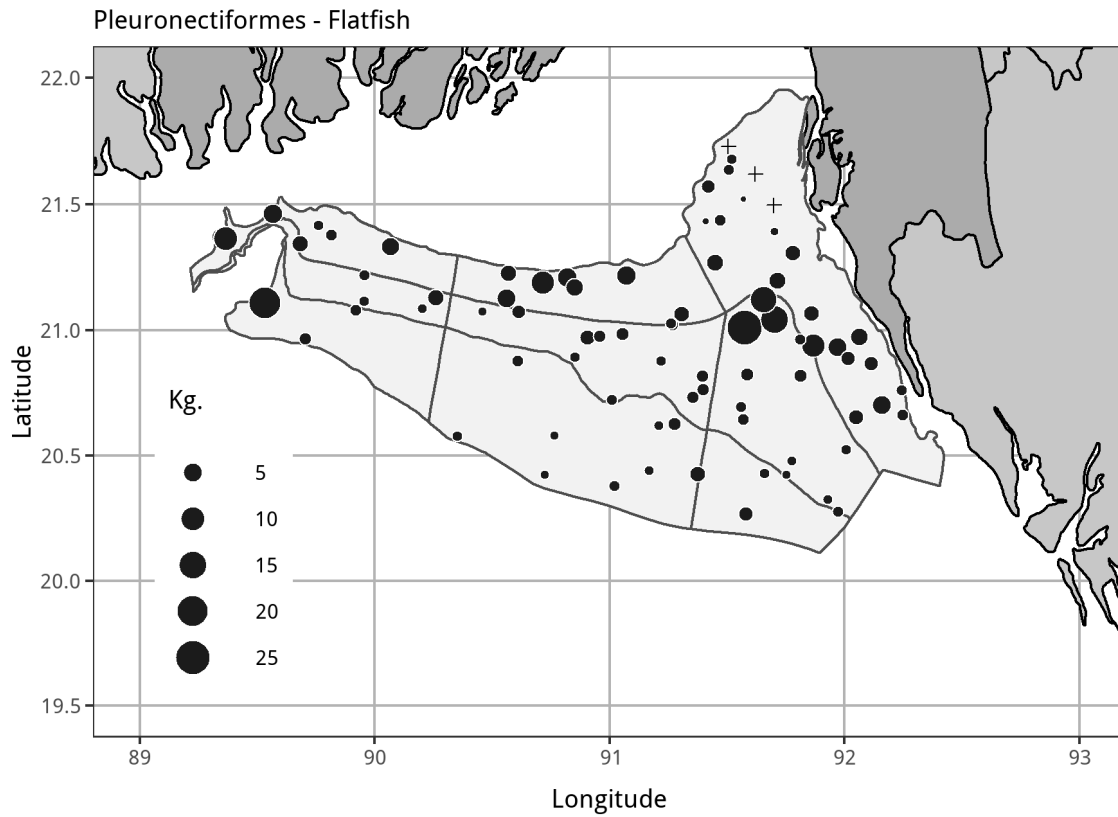
Species in group and number of catches

Scientific name	Occurences	Scientific name	Occurences
Aesopia cornuta	6	Leops nigrescens	2
Aseraggodes sp.	1	Paralichthodes algoensis	4
Bothus myriaster	4	Paraplagusia bilineata	9
Brachirus orientalis	3	Pseudorhombus elevatus	22
Cynoglossus arel	1	Pseudorhombus javanicus	10
Cynoglossus bilineata *	8	Pseudorhombus triocellatus	6
Cynoglossus cynoglossus	16	Solea elongata	9
Cynoglossus lingua	38	Solea ovata	4
Cynoglossus macrolepidotus	9	Zebrias synapturoides	1
Cynoglossus puncticeps	3	Zebrias zebra	10



Shrimp surveys - Pleuronectiformes - Flatfish

Stratum	10201	10202	10203	10204	10205	10206	10207	10208	10209	
Weight	0.060	0.088	0.224	0.044	0.104	0.131	0.083	0.200	0.066	
Survey number										Annual mean
2016202		1.09	3.85		1.16	3.65			0.54	1.59
2017204	12.58	6.70	3.03	10.21	6.28	4.79	0.99	0.94	1.79	4.14
2018205	4.48	4.50	2.13	1.28	1.23	6.18	7.71	0.58	1.41	2.98

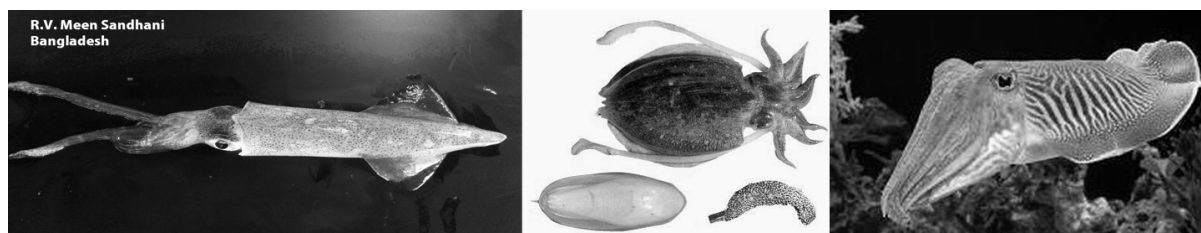


Species group: Squids and cuttlefish

Two major groups of cephalopods e.g. Squid and cuttle fish which are available in Bangladesh coast. Cephalopods are not exploited by any specialised fishing gear but a small quantity is being caught as by-catch of bottom trawl and shrimp trawl and even MSBN also. Now days it's are exportable item in different countries.

Species in group and number of catches

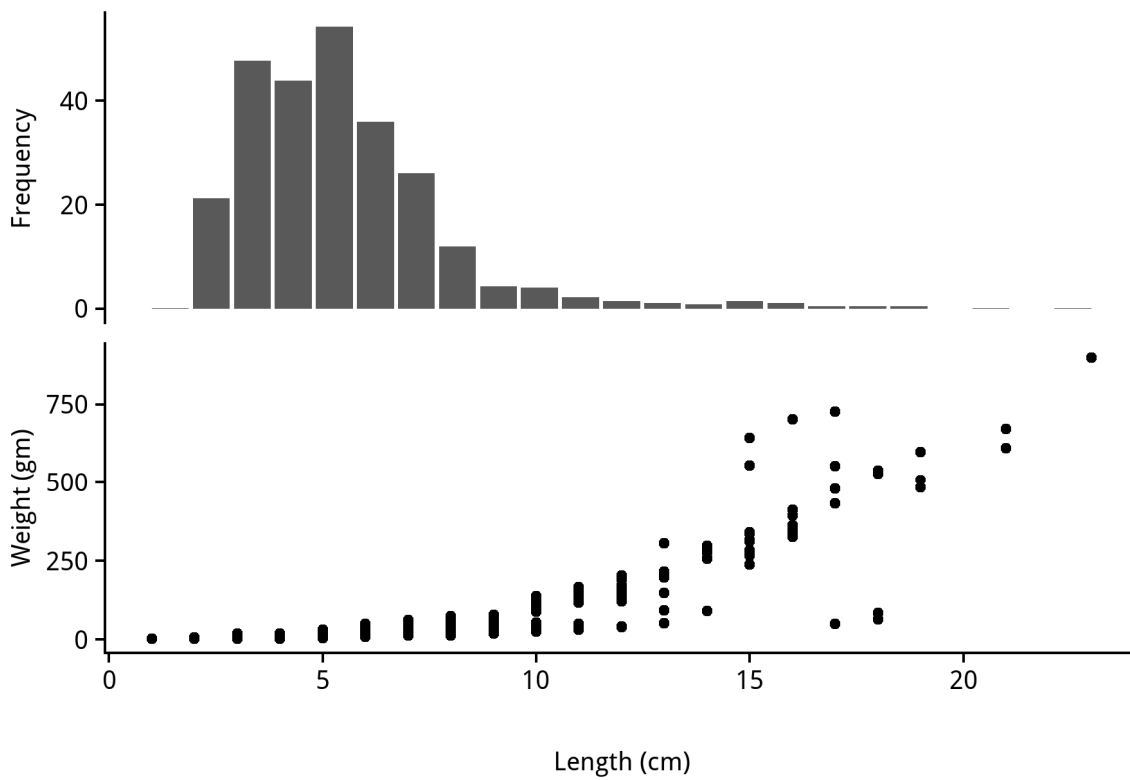
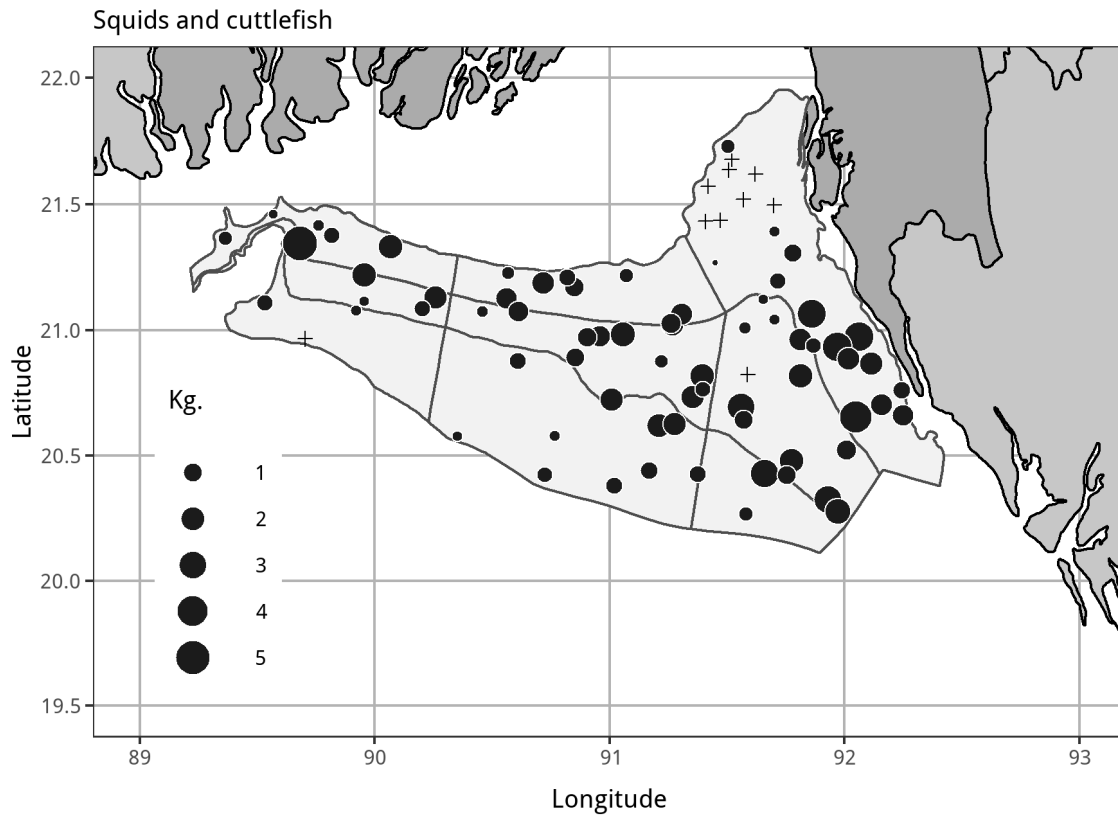
Scientific name	Occurences
Sepia acuelata	42
Sepia esculenta	35
Sepia officinalis	7
Sepia pharaonis	24
Uroteuthis duvauceli	58



R.V. Meen Sandhani
Bangladesh

Shrimp surveys - Squids and cuttlefish

Stratum	10201	10202	10203	10204	10205	10206	10207	10208	10209	
Weight	0.060	0.088	0.224	0.044	0.104	0.131	0.083	0.200	0.066	
Survey number										Annual mean
2016202		1.14	3.06		1.30	2.27			0.00	1.22
2017204	0.89	0.77	1.80	0.52	0.94	1.27	0.11	0.36	0.96	0.96
2018205	1.79	1.20	1.14	1.26	1.17	1.40	0.28	0.83	1.45	1.11



Species group: Trichiuridae - ribbonfish

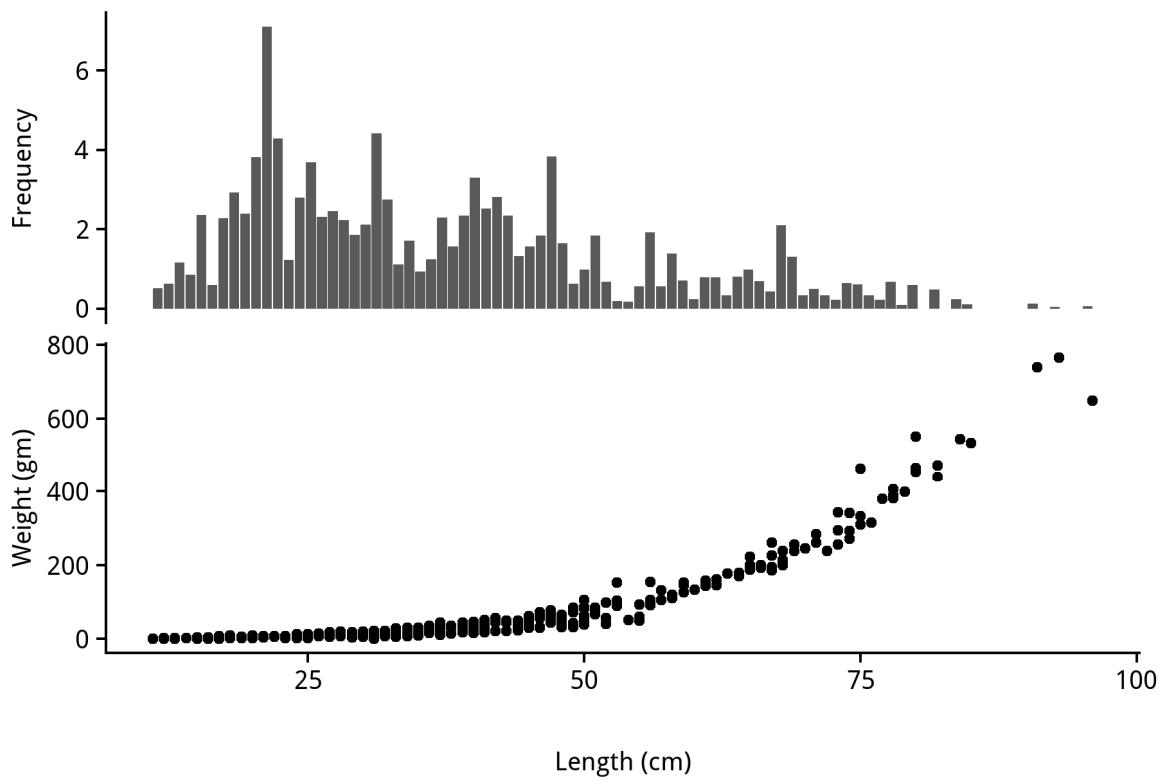
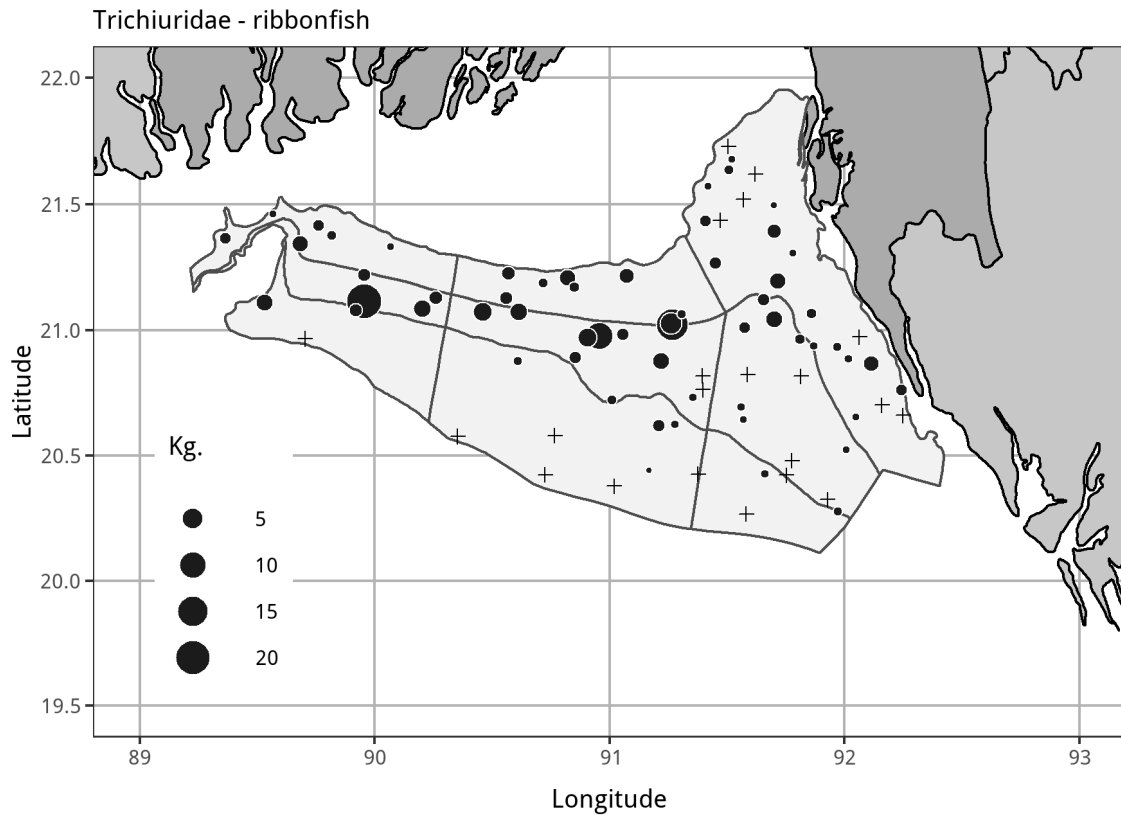
Elongate and compressed ribbon-like trichiurid are benthopelagic inhabitants of coastal and often come near the surface at night. Ribbonfish export as dry, salted and fresh form in different countries. This carnivore fish feeds on small fish and shrimp. Harvested by bottom trawl, set net and beach seines.

Species in group and number of catches

Scientific name	Occurrences
Eupleurogrammus muticus	10
Lepturacanthus savala	22
Trichiurus lepturus	34



Shrimp surveys - Trichiuridae - ribbonfish										
Stratum	10201	10202	10203	10204	10205	10206	10207	10208	10209	
Weight	0.060	0.088	0.224	0.044	0.104	0.131	0.083	0.200	0.066	
Survey number										Annual mean
2016202		2.34	1.01		0.21	0.90			0.00	0.57
2017204	0.53	1.67	1.56	2.36	1.71	0.88	1.97	0.01	0.00	1.09
2018205	0.89	3.63	0.43	6.48	2.98	0.49	1.34	0.15	0.17	1.28



Species group: Other families - Synodontidae, Tetrodontidae, Platycephalidae

These groups are used mainly as fish meal and poultry feed. Important as commercial fisheries sold fresh, dried and salted in the markets. Lizard fishes are exploits in sandy and muddy bottom areas in demersal fishing. Fisheries have no commercial importance of Puffer fish. The puffer fish must not be eaten because its skin and internal organs contain neurotoxin. Flathead fishes are minor commercial importance and caught by trawl over sandy and muddy bottom.

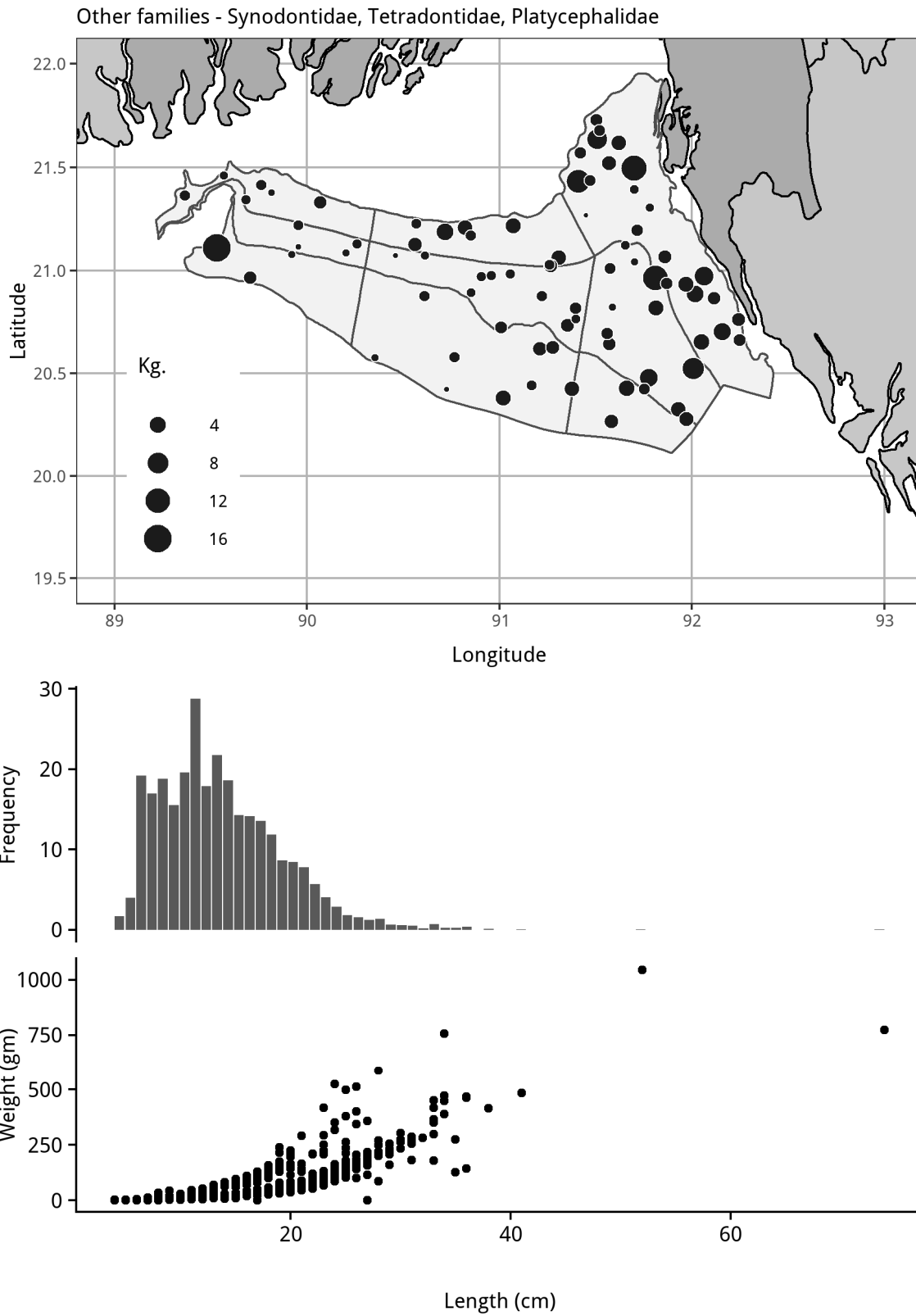
Species in group and number of catches

Scientific name	Occurences	Scientific name	Occurences
Arothron leopardus	4	Platycephalus indicus	21
Cociella crocodilus	18	Rogadius asper	4
Grammoplites scaber	12	Saurida longimanus	21
Grammoplites suppositus	23	Saurida tumbil	32
Harpadon nehereus	13	Saurida undosquamis	5
Lagocephalus guntheri	34	Sorsogna tuberculata	11
Lagocephalus lagocephalus	23	Takifugu oblongus	2
Lagocephalus lunaris	1	Trachinocephalus myops	18
Lagocephalus spadiceus	6		



Shrimp surveys - Other families - Synodontidae, Tetrodontidae, Platycephalidae

Stratum	10201	10202	10203	10204	10205	10206	10207	10208	10209	
Weight	0.060	0.088	0.224	0.044	0.104	0.131	0.083	0.200	0.066	
Survey number										Annual mean
2016202		1.18	3.83		1.42	3.58			8.42	2.14
2017204	1.48	2.45	41.65	2.23	1.02	2.35	0.92	1.14	7.67	10.97
2018205	1.01	2.62	3.53	0.52	0.84	3.28	6.43	1.41	2.31	2.59



ANNEX V: Sampling stations, Shrimp Survey #2018205

Stn	Stratum	Zone	Ground	Location (DD)		Location (DDM)		Depth (m)	
				Lat (N)	Lon (E)	Lat (N)	Lon (E)	Min	Max
10	10201	Inshore	Swatch	21.4775	89.5892	21°28.65	89°35.352	10	40
12	10201	Inshore	Swatch	21.4275	89.8392	21°25.65	89°50.352	10	40
16	10201	Inshore	Swatch	21.3775	89.3892	21°22.65	89°23.352	10	40
17	10201	Inshore	Swatch	21.3775	89.8392	21°22.65	89°50.352	10	40
19	10201	Inshore	Swatch	21.3275	89.6892	21°19.65	89°41.352	10	40
20	10201	Inshore	Swatch	21.3275	90.0892	21°19.65	90°05.352	10	40
107	10201	Inshore	Swatch	21.4775	89.7892	21°28.65	89°47.352	10	40
108	10201	Inshore	Swatch	21.4275	89.7392	21°25.65	89°44.352	10	40
109	10201	Inshore	Swatch	21.3775	89.6892	21°22.65	89°41.352	10	40
116	10201	Inshore	Swatch	21.2275	89.9892	21°13.65	89°59.352	10	40
117	10201	Inshore	Swatch	21.2275	90.0392	21°13.65	90°02.352	10	40
118	10201	Inshore	Swatch	21.2275	90.0892	21°13.65	90°05.352	10	40
23	10202	Inshore	Middle	21.2275	90.5892	21°13.65	90°35.352	10	40
24	10202	Inshore	Middle	21.2275	90.8392	21°13.65	90°50.352	10	40
25	10202	Inshore	Middle	21.2275	91.0892	21°13.65	91°05.352	10	40
26	10202	Inshore	Middle	21.1775	90.7392	21°10.65	90°44.352	10	40
27	10202	Inshore	Middle	21.1775	90.8392	21°10.65	90°50.352	10	40
32	10202	Inshore	Middle	21.1275	90.5392	21°07.65	90°32.352	10	40
38	10202	Inshore	Middle	21.0775	91.2892	21°04.65	91°17.352	10	40
40	10202	Inshore	Middle	21.0275	91.2392	21°01.65	91°14.352	10	40
41	10202	Inshore	Middle	21.0275	91.2892	21°01.65	91°17.352	10	40
112	10202	Inshore	Middle	21.3275	91.3392	21°19.65	91°20.352	10	40
119	10202	Inshore	Middle	21.2275	90.4392	21°13.65	90°26.352	10	40
120	10202	Inshore	Middle	21.2275	91.1392	21°13.65	91°08.352	10	40
124	10202	Inshore	Middle	21.1775	90.4892	21°10.65	90°29.352	10	40
128	10202	Inshore	Middle	21.1275	90.4392	21°07.65	90°26.352	10	40
129	10202	Inshore	Middle	21.1275	90.8892	21°07.65	90°53.352	10	40
130	10202	Inshore	Middle	21.1275	91.0392	21°07.65	91°02.352	10	40
136	10202	Inshore	Middle	21.0775	91.0892	21°04.65	91°05.352	10	40
4	10203	Inshore	South	21.7275	91.4892	21°43.65	91°29.352	10	40
5	10203	Inshore	South	21.6775	91.5392	21°40.65	91°32.352	10	40
6	10203	Inshore	South	21.6275	91.4892	21°37.65	91°29.352	10	40
7	10203	Inshore	South	21.6275	91.6392	21°37.65	91°38.352	10	40
8	10203	Inshore	South	21.5775	91.4392	21°34.65	91°26.352	10	40
9	10203	Inshore	South	21.5275	91.5892	21°31.65	91°35.352	10	40
11	10203	Inshore	South	21.4775	91.6892	21°28.65	91°41.352	10	40
13	10203	Inshore	South	21.4275	91.3892	21°25.65	91°23.352	10	40
14	10203	Inshore	South	21.4275	91.4892	21°25.65	91°29.352	10	40
15	10203	Inshore	South	21.4275	91.8892	21°25.65	91°53.352	10	40
18	10203	Inshore	South	21.3775	91.6892	21°22.65	91°41.352	10	40
21	10203	Inshore	South	21.2775	91.4892	21°16.65	91°29.352	10	40
28	10203	Inshore	South	21.1775	91.7392	21°10.65	91°44.352	10	40
39	10203	Inshore	South	21.0775	91.8392	21°04.65	91°50.352	10	40
49	10203	Inshore	South	20.9775	92.0392	20°58.65	92°02.352	10	40
50	10203	Inshore	South	20.9275	91.8892	20°55.65	91°53.352	10	40
51	10203	Inshore	South	20.9275	91.9892	20°55.65	91°59.352	10	40
55	10203	Inshore	South	20.8775	92.0392	20°52.65	92°02.352	10	40
56	10203	Inshore	South	20.8775	92.0892	20°52.65	92°05.352	10	40
61	10203	Inshore	South	20.7775	92.2392	20°46.65	92°14.352	10	40
64	10203	Inshore	South	20.7275	92.1392	20°43.65	92°08.352	10	40
66	10203	Inshore	South	20.6775	92.0392	20°40.65	92°02.352	10	40

ANNEX V: Sampling stations, Shrimp Survey #2018205

Stn	Stratum	Zone	Ground	Location (DD)		Location (DDM)		Depth (m)	
				Lat (N)	Lon (E)	Lat (N)	Lon (E)	Min	Max
67	10203	Inshore	South	20.6775	92.2392	20°40.65	92°14.352	10	40
102	10203	Inshore	South	21.8275	91.6892	21°49.65	91°41.352	10	40
105	10203	Inshore	South	21.6775	91.6392	21°40.65	91°38.352	10	40
106	10203	Inshore	South	21.6775	91.7892	21°40.65	91°47.352	10	40
110	10203	Inshore	South	21.3775	91.5392	21°22.65	91°32.352	10	40
113	10203	Inshore	South	21.3275	91.4892	21°19.65	91°29.352	10	40
114	10203	Inshore	South	21.3275	91.7892	21°19.65	91°47.352	10	40
115	10203	Inshore	South	21.2775	91.7392	21°16.65	91°44.352	10	40
121	10203	Inshore	South	21.2275	91.4892	21°13.65	91°29.352	10	40
122	10203	Inshore	South	21.2275	91.5392	21°13.65	91°32.352	10	40
125	10203	Inshore	South	21.1775	91.8392	21°10.65	91°50.352	10	40
131	10203	Inshore	South	21.1275	91.5392	21°07.65	91°32.352	10	40
133	10203	Inshore	South	21.1275	91.8892	21°07.65	91°53.352	10	40
134	10203	Inshore	South	21.1275	91.9892	21°07.65	91°59.352	10	40
141	10203	Inshore	South	21.0275	92.0392	21°01.65	92°02.352	10	40
151	10203	Inshore	South	20.8775	91.8892	20°52.65	91°53.352	10	40
154	10203	Inshore	South	20.8275	91.9392	20°49.65	91°56.352	10	40
156	10203	Inshore	South	20.7775	92.0392	20°46.65	92°02.352	10	40
160	10203	Inshore	South	20.7275	92.1892	20°43.65	92°11.352	10	40
166	10203	Inshore	South	20.5775	92.0892	20°34.65	92°05.352	10	40
167	10203	Inshore	South	20.5275	92.1892	20°31.65	92°11.352	10	40
170	10203	Inshore	South	20.4775	92.3392	20°28.65	92°20.352	10	40
22	10204	Midshore	Swatch	21.2275	89.9392	21°13.65	89°56.352	40	80
30	10204	Midshore	Swatch	21.1275	89.9392	21°07.65	89°56.352	40	80
31	10204	Midshore	Swatch	21.1275	90.2392	21°07.65	90°14.352	40	80
35	10204	Midshore	Swatch	21.0775	90.1892	21°04.65	90°11.352	40	80
111	10204	Midshore	Swatch	21.3275	89.4392	21°19.65	89°26.352	40	80
123	10204	Midshore	Swatch	21.1775	89.8892	21°10.65	89°53.352	40	80
127	10204	Midshore	Swatch	21.1275	89.7892	21°07.65	89°47.352	40	80
135	10204	Midshore	Swatch	21.0775	90.1392	21°04.65	90°08.352	40	80
36	10205	Midshore	Middle	21.0775	90.4392	21°04.65	90°26.352	40	80
37	10205	Midshore	Middle	21.0775	90.5892	21°04.65	90°35.352	40	80
45	10205	Midshore	Middle	20.9775	90.8892	20°58.65	90°53.352	40	80
46	10205	Midshore	Middle	20.9775	90.9392	20°58.65	90°56.352	40	80
47	10205	Midshore	Middle	20.9775	91.0392	20°58.65	91°02.352	40	80
53	10205	Midshore	Middle	20.8775	90.8392	20°52.65	90°50.352	40	80
54	10205	Midshore	Middle	20.8775	91.2392	20°52.65	91°14.352	40	80
57	10205	Midshore	Middle	20.8275	91.3892	20°49.65	91°23.352	40	80
60	10205	Midshore	Middle	20.7775	91.3892	20°46.65	91°23.352	40	80
62	10205	Midshore	Middle	20.7275	90.9892	20°43.65	90°59.352	40	80
63	10205	Midshore	Middle	20.7275	91.3392	20°43.65	91°20.352	40	80
137	10205	Midshore	Middle	21.0275	90.5392	21°01.65	90°32.352	40	80
138	10205	Midshore	Middle	21.0275	90.6392	21°01.65	90°38.352	40	80
139	10205	Midshore	Middle	21.0275	90.6892	21°01.65	90°41.352	40	80
140	10205	Midshore	Middle	21.0275	90.9892	21°01.65	90°59.352	40	80
142	10205	Midshore	Middle	20.9775	91.2392	20°58.65	91°14.352	40	80
144	10205	Midshore	Middle	20.9275	90.7392	20°55.65	90°44.352	40	80
145	10205	Midshore	Middle	20.9275	90.7892	20°55.65	90°47.352	40	80
146	10205	Midshore	Middle	20.9275	91.1892	20°55.65	91°11.352	40	80
149	10205	Midshore	Middle	20.8775	91.1392	20°52.65	91°08.352	40	80
155	10205	Midshore	Middle	20.7775	91.3392	20°46.65	91°20.352	40	80

ANNEX V: Sampling stations, Shrimp Survey #2018205

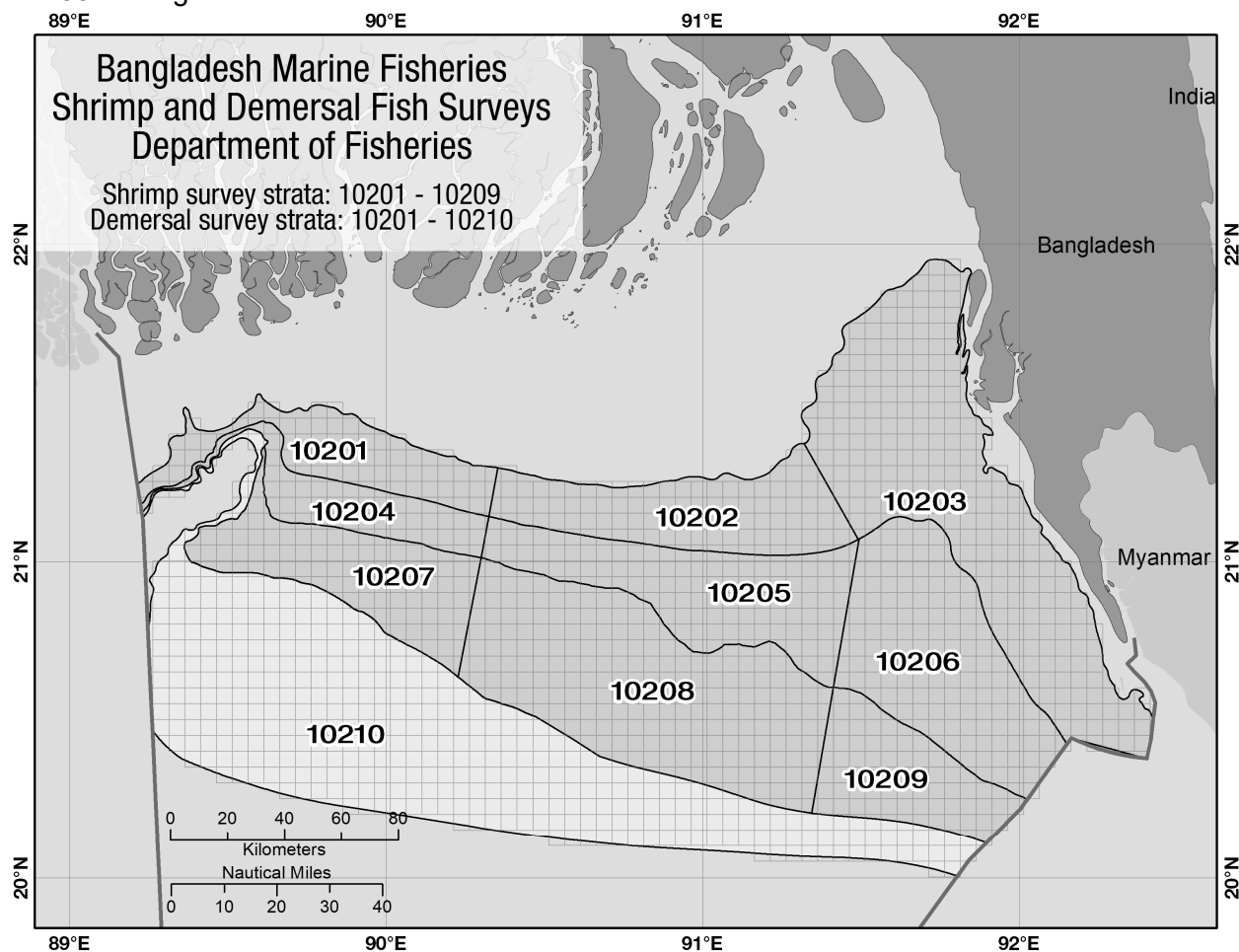
Stn	Stratum	Zone	Ground	Location (DD)		Location (DDM)		Depth (m)	
				Lat (N)	Lon (E)	Lat (N)	Lon (E)	Min	Max
1	10206	Midshore	South	20.3275	91.9392	20°19.65	91°56.352	40	80
3	10206	Midshore	South	20.2775	91.9892	20°16.65	91°59.352	40	80
33	10206	Midshore	South	21.1275	91.6392	21°07.65	91°38.352	40	80
42	10206	Midshore	South	21.0275	91.5892	21°01.65	91°35.352	40	80
43	10206	Midshore	South	21.0275	91.6892	21°01.65	91°41.352	40	80
48	10206	Midshore	South	20.9775	91.7892	20°58.65	91°47.352	40	80
58	10206	Midshore	South	20.8275	91.5892	20°49.65	91°35.352	40	80
59	10206	Midshore	South	20.8275	91.7892	20°49.65	91°47.352	40	80
65	10206	Midshore	South	20.6775	91.5392	20°40.65	91°32.352	40	80
69	10206	Midshore	South	20.6275	91.5892	20°37.65	91°35.352	40	80
73	10206	Midshore	South	20.5275	91.9892	20°31.65	91°59.352	40	80
74	10206	Midshore	South	20.4775	91.7892	20°28.65	91°47.352	40	80
79	10206	Midshore	South	20.4275	91.7392	20°25.65	91°44.352	40	80
132	10206	Midshore	South	21.1275	91.5892	21°07.65	91°35.352	40	80
150	10206	Midshore	South	20.8775	91.5392	20°52.65	91°32.352	40	80
153	10206	Midshore	South	20.8275	91.4892	20°49.65	91°29.352	40	80
159	10206	Midshore	South	20.7275	91.6392	20°43.65	91°38.352	40	80
161	10206	Midshore	South	20.6775	91.6892	20°40.65	91°41.352	40	80
163	10206	Midshore	South	20.6275	91.4892	20°37.65	91°29.352	40	80
164	10206	Midshore	South	20.6275	91.8392	20°37.65	91°50.352	40	80
168	10206	Midshore	South	20.4775	91.8392	20°28.65	91°50.352	40	80
169	10206	Midshore	South	20.4775	92.0892	20°28.65	92°05.352	40	80
171	10206	Midshore	South	20.4275	91.9892	20°25.65	91°59.352	40	80
29	10207	Offshore	Swatch	21.1275	89.5392	21°07.65	89°32.352	80	100
34	10207	Offshore	Swatch	21.0775	89.9392	21°04.65	89°56.352	80	100
44	10207	Offshore	Swatch	20.9775	89.6892	20°58.65	89°41.352	80	100
126	10207	Offshore	Swatch	21.1275	89.4892	21°07.65	89°29.352	80	100
143	10207	Offshore	Swatch	20.9275	89.7892	20°55.65	89°47.352	80	100
147	10207	Offshore	Swatch	20.8775	90.2392	20°52.65	90°14.352	80	100
52	10208	Offshore	Middle	20.8775	90.5892	20°52.65	90°35.352	80	100
68	10208	Offshore	Middle	20.6275	91.2892	20°37.65	91°17.352	80	100
70	10208	Offshore	Middle	20.5775	90.3392	20°34.65	90°20.352	80	100
71	10208	Offshore	Middle	20.5775	90.7892	20°34.65	90°47.352	80	100
72	10208	Offshore	Middle	20.5775	91.3892	20°34.65	91°23.352	80	100
75	10208	Offshore	Middle	20.4275	90.7392	20°25.65	90°44.352	80	100
76	10208	Offshore	Middle	20.4275	91.1892	20°25.65	91°11.352	80	100
80	10208	Offshore	Middle	20.3775	91.0392	20°22.65	91°02.352	80	100
103	10208	Offshore	Middle	20.2275	91.2392	20°13.65	91°14.352	80	100
148	10208	Offshore	Middle	20.8775	90.7392	20°52.65	90°44.352	80	100
152	10208	Offshore	Middle	20.8275	90.8392	20°49.65	90°50.352	80	100
157	10208	Offshore	Middle	20.7275	90.3892	20°43.65	90°23.352	80	100
158	10208	Offshore	Middle	20.7275	90.6892	20°43.65	90°41.352	80	100
162	10208	Offshore	Middle	20.6275	91.1892	20°37.65	91°11.352	80	100
165	10208	Offshore	Middle	20.5775	90.8892	20°34.65	90°53.352	80	100
2	10209	Offshore	South	20.2775	91.5892	20°16.65	91°35.352	80	100
77	10209	Offshore	South	20.4275	91.3892	20°25.65	91°23.352	80	100
78	10209	Offshore	South	20.4275	91.6392	20°25.65	91°38.352	80	100
101	10209	Offshore	South	20.2775	91.6392	20°16.65	91°38.352	80	100
104	10209	Offshore	South	20.1775	91.8892	20°10.65	91°53.352	80	100



Survey Annual Report
DoF Survey Working Group
12 December, 2018

Survey Operations

The R/V Meen Shandhani conducts annual shrimp and demersal trawl surveys. Each survey required approximately one month at-sea and samples approximately 80 pre-selected stations on the Bangladesh continental shelf. Survey stations are allocated according to a depth and area stratification plan. Shrimp surveys have 9 strata within 10 and 100 m depth range. The demersal fish surveys include the same 9 strata as the shrimp plus 1 more stratum for the 100 to 200 m range.

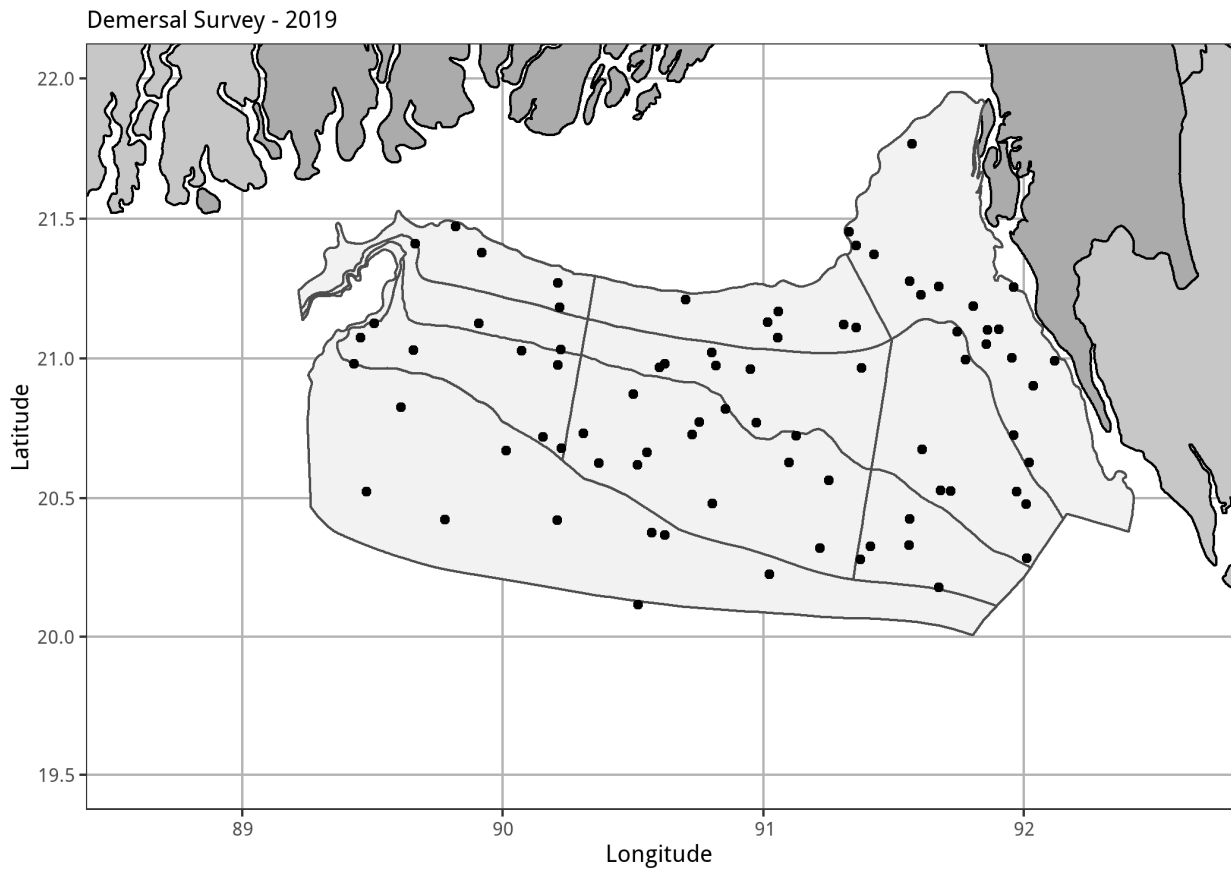


Trawl survey strata

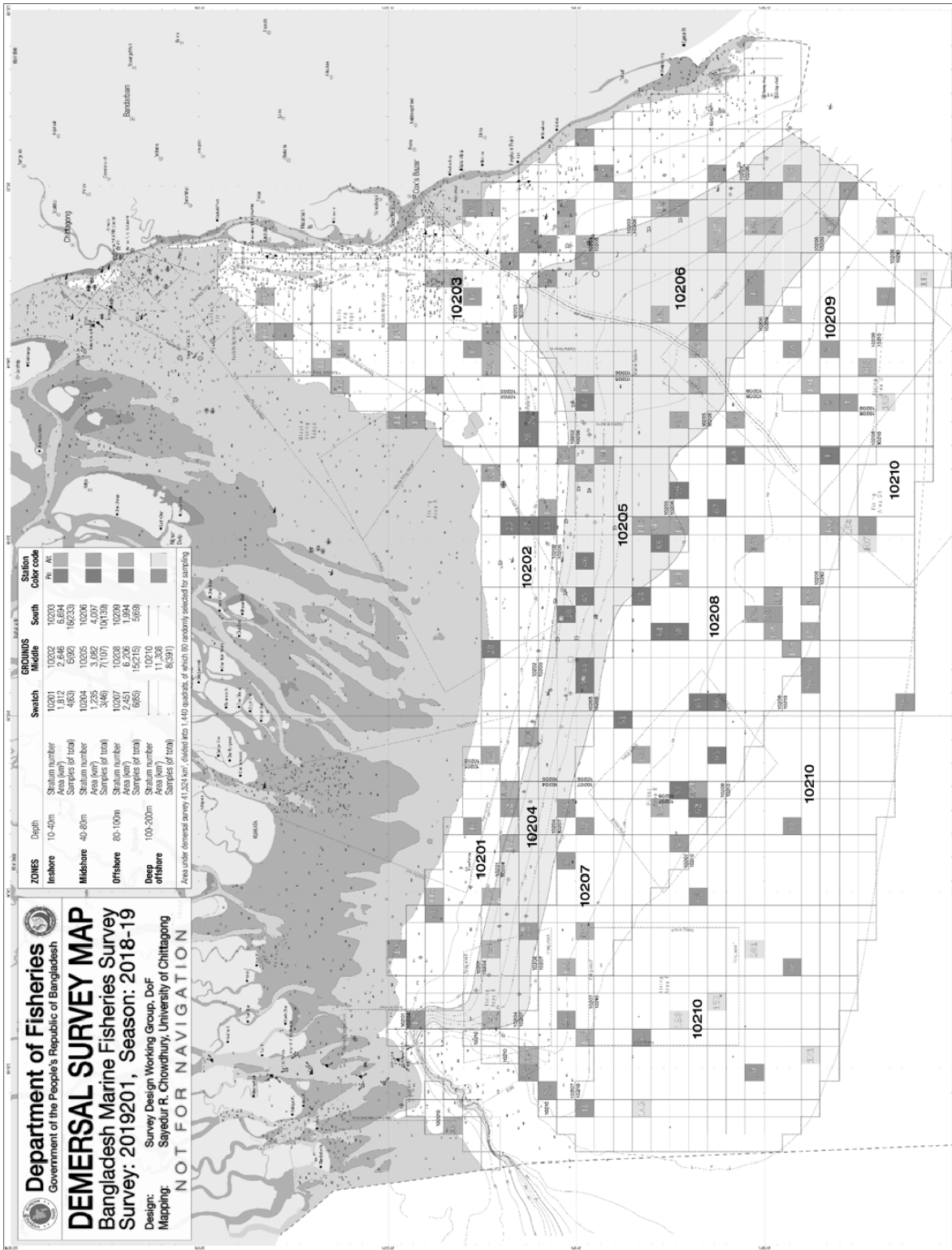
The number of stations allocated to each stratum is dependent on the area (km²), which is used to calculate the stratum weight as the proportion of the total area in a given stratum.

Stratum	Name	Depth (m)	Area (km ²)	Weight	Sets completed*
10201	Swatch Inshore	10 - 40	1814	0.043	4
10202	Middle Inshore	10 - 40	2681	0.064	5
10203	South Inshore	10 - 40	6833	0.163	16
10204	Swatch Midshore	40 - 80	1350	0.032	3
10205	Middle Midshore	40 - 80	3180	0.076	8
10206	South Midshore	40 - 80	3978	0.095	9
10207	Swatch Offshore	80 - 100	2522	0.060	6
10208	Middle Offshore	80 - 100	6083	0.145	14
10209	South Offshore	80 - 100	2025	0.048	5
10210	Deep offshore	100- 200	11376	0.272	10

*The sets completed column is the actual number of trawl samples taken in the survey.



The survey locations plotted are the starting locations of valid fishing stations



Demersal Survey Map 2019201

Species group: Penaeid shrimps

Majority of penaeid shrimp species that are presently exploited are common to both in Artisanal and Industrial fisheries. The artisanal fishery harvest pre-adult, post juveniles, juveniles and even the post larvae (PL) but the industrial fishery harvest mostly the adult phase of penaeid shrimp. Most of the species are commercially important. The highest contribution in the total production is made by *Metapenaeus monoceros* the brown shrimp.

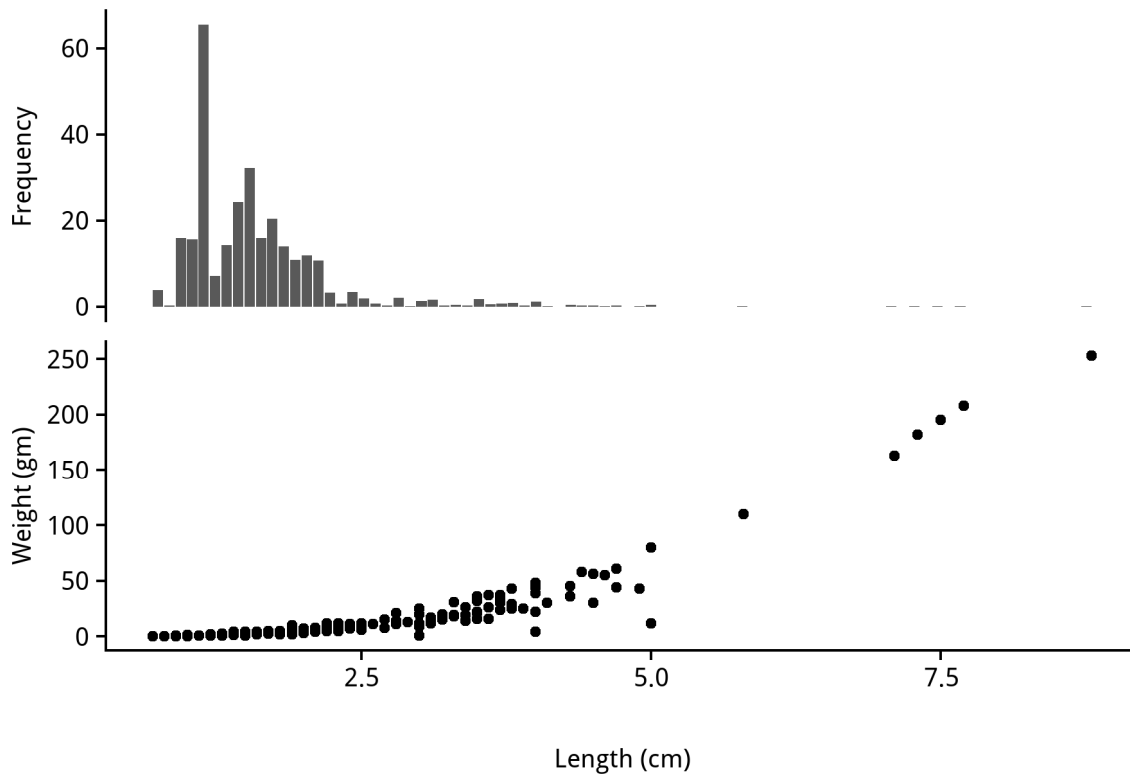
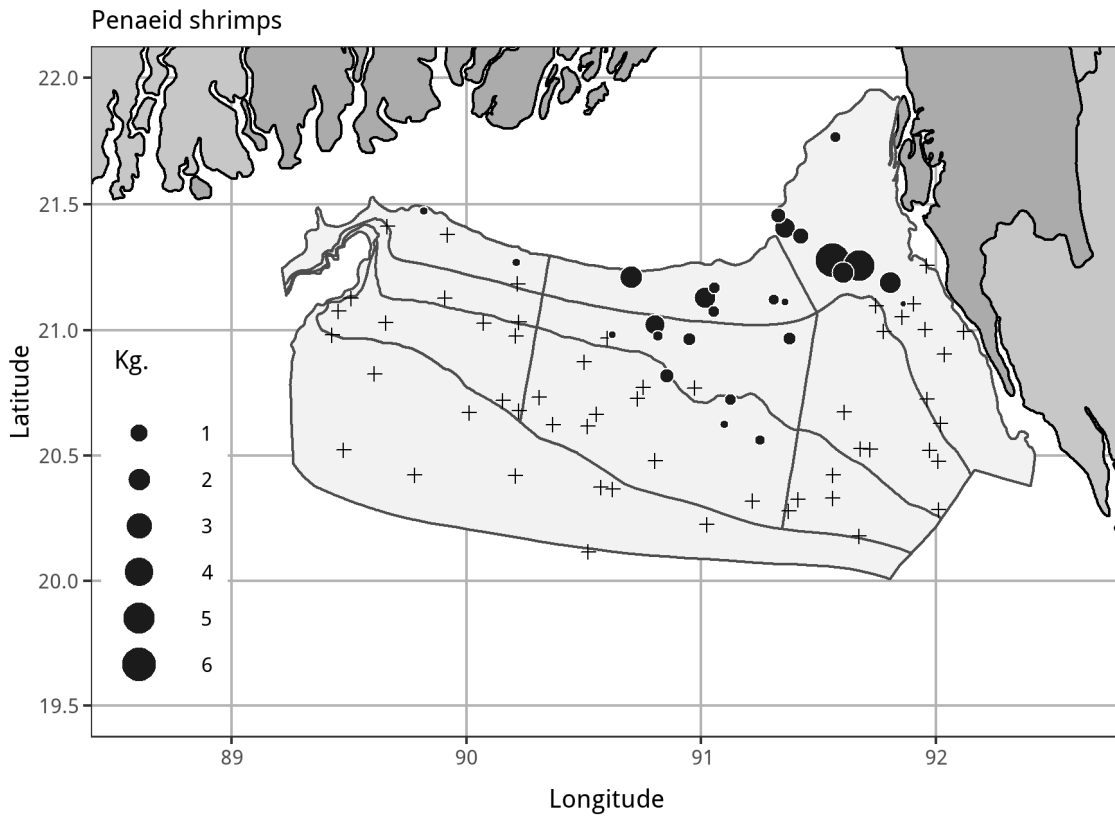
Species in group and number of catches

Scientific name	Occurences	Scientific name	Occurences
<i>Metapenaeus affinis</i>	5	<i>Parapenaeus longipes</i>	6
<i>Metapenaeus brevicornis</i>	7	PENAEIDAE	1
<i>Metapenaeus dobsoni</i>	1	<i>Penaeus canaliculatus</i>	1
<i>Metapenaeus lysianassa</i>	1	<i>Penaeus indicus</i>	5
<i>Metapenaeus monoceros</i>	9	<i>Penaeus japonicus</i>	1
<i>Parapenaeopsis sculptilis</i>	5	<i>Penaeus merguensis</i>	1
<i>Parapenaeopsis stylifera</i>	13	<i>Penaeus monodon</i>	5
<i>Parapenaeopsis uncta</i>	1		



Demersal surveys - Penaeid shrimps

	10201	10202	10203	10204	10205	10206	10207	10208	10209	10210	
Stratum											
Weight	0.043	0.064	0.163	0.032	0.076	0.095	0.060	0.145	0.048	0.272	
Survey number											Annual mean
2017201			0.00		0.19	0.00		0.00	0.00	0.00	0.01
2018201	0.05	0.02	0.04	0.01	0.00	0.00	0.04	0.00	0.00	0.00	0.01
2019201	0.02	0.69	1.12	0.00	0.26	0.00	0.00	0.05	0.00	0.00	0.26



Species group: Non-penaeid shrimps

Non-penaeid shrimp are found mainly coastal areas, brackish water and estuaries and caught in artisanal gears (ESBN and MSBN) in different stages of their life cycle. Most of them are economically important in our local market. Some of non-penaeid found in dipper water and harvest by shrimp trawlers. Some non-penaeid shrimp *Squilla mantis* the mantis shrimp are used as poultry feed and fish meal.

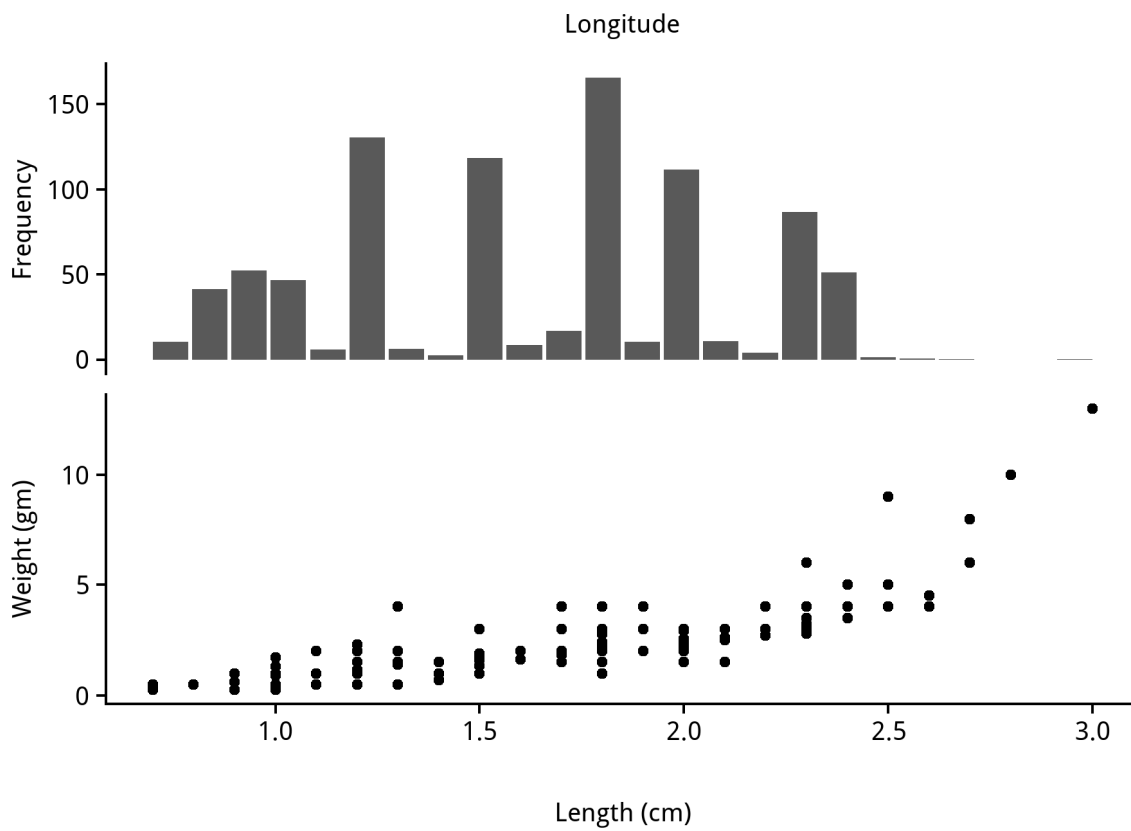
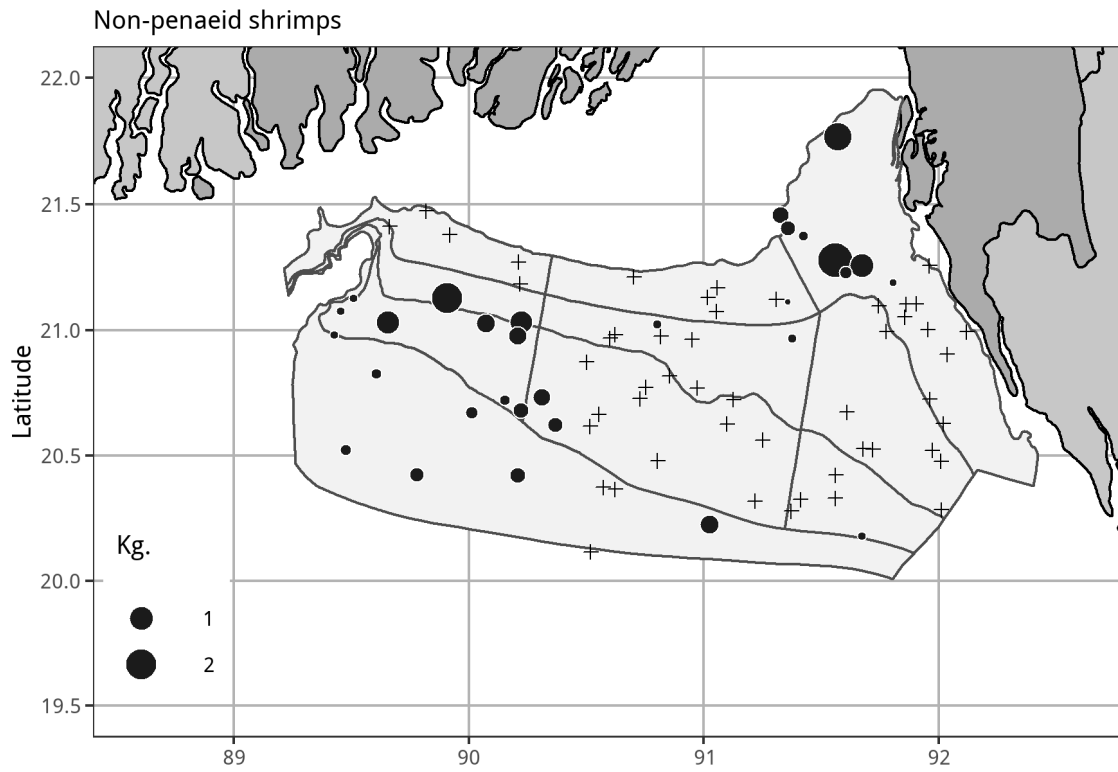
Species in group and number of catches

Scientific name	Occurences	Scientific name	Occurences
Acetes sp.	2	PALAEEMONIDAE	2
Macrobrachium malcolmsonii	1	Solenocera crassicornis	8
Nematopalaemon tenuipes	5	Solenocera hextii	19



Demersal surveys - Non-penaeid shrimps

	10201	10202	10203	10204	10205	10206	10207	10208	10209	10210	
Stratum Weight	0.043	0.064	0.163	0.032	0.076	0.095	0.060	0.145	0.048	0.272	
Survey number											Annual mean
2017201			0.00		0.02	0.00		0.00	0.00	0.00	0.00
2018201	0.00	0.00	0.04	0.00	0.00	0.00	0.03	0.00	0.00	0.02	0.01
2019201	0.00	0.00	0.40	1.16	0.01	0.00	0.30	0.06	0.00	0.12	0.16



Species group: Small pelagics - Clupeidae and Pristigasteridae

Shads, Anchovies, Sardines and Herring which lie under the family of Clupeidae and Pristigasteridae are the most significant fish group of seawater of Bangladesh. They are commercially important and abundantly available but exploited as by catch of Small Mesh Drift gill Net, Set Bag Net and commercial trawl fishery. Among these groups *Hilsa ilisha* the National fish (Hilsa) is the dominant species both inland and marine catch.

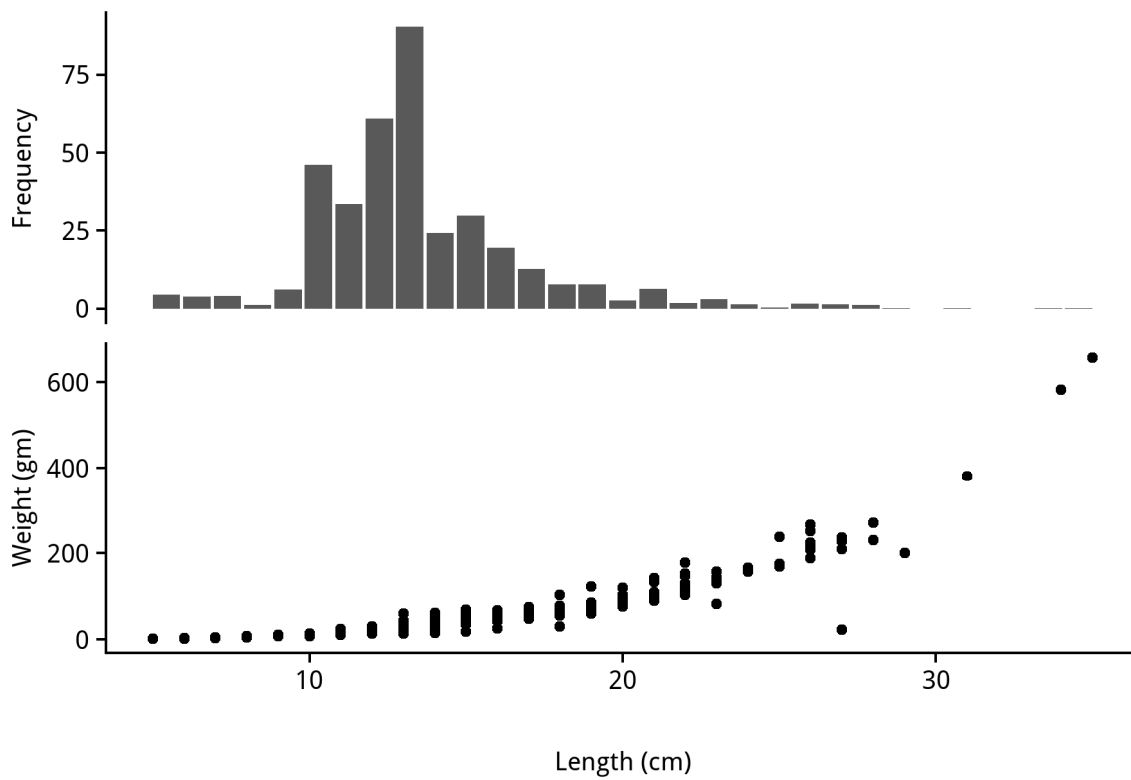
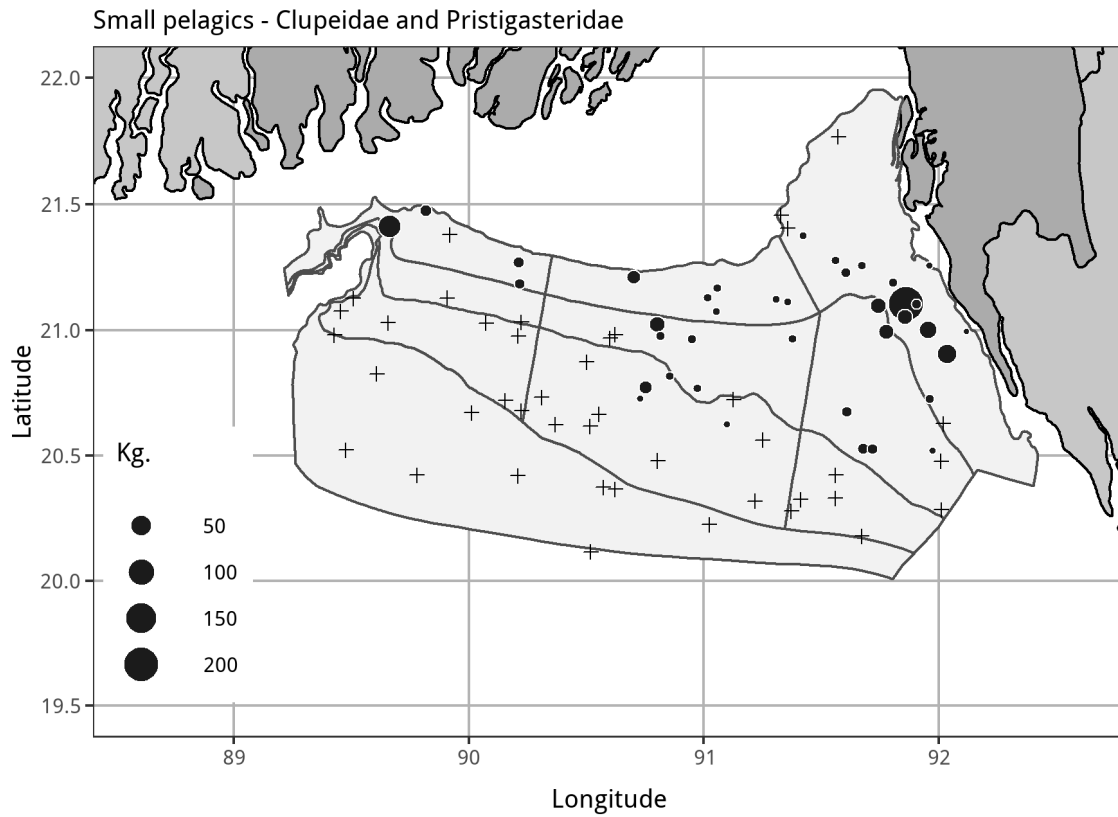
Species in group and number of catches

Scientific name	Occurences	Scientific name	Occurences
Anodontostoma chacunda	3	<i>Ilisha melastoma</i> *	1
Dussumieria acuta	4	<i>Ilisha striatula</i>	4
Dussumieria elopsoides	26	<i>Raonda russeliana</i>	2
<i>Ilisha filigera</i>	18	<i>Sardinella fimbriata</i>	6
<i>Ilisha filigera</i> *	2	<i>Sardinella melanura</i>	1
<i>Ilisha megaloptera</i> *	1	<i>Tenualosa ilisha</i>	5
<i>Ilisha melastoma</i>	4	<i>Tenualosa toli</i>	2



Demersal surveys - Small pelagics - Clupeidae and Pristigasteridae

	10201	10202	10203	10204	10205	10206	10207	10208	10209	10210	
Stratum	10201	10202	10203	10204	10205	10206	10207	10208	10209	10210	
Weight	0.043	0.064	0.163	0.032	0.076	0.095	0.060	0.145	0.048	0.272	
Survey number											Annual mean
2017201			14.85		53.61	0.54		0.00	0.00	0.00	6.55
2018201	5.09	3.52	1.96	2.02	0.51	0.03	0.00	0.14	0.00	0.00	0.89
2019201	3.98	2.53	17.67	19.19	3.04	5.38	0.00	0.81	0.00	0.00	4.70



Species group: Carangidae - Jacks and scads

Carangids are commercially important but exploited as by-catch or incidental catch of gill net, mid water trawl, demersal trawl and shrimp trawl though these groups are mostly pelagic. Within this group *Megalaspis cordyla* the Hard tail Scad and *Parastromateus niger* the Black pomfret are abundantly available in our territory.

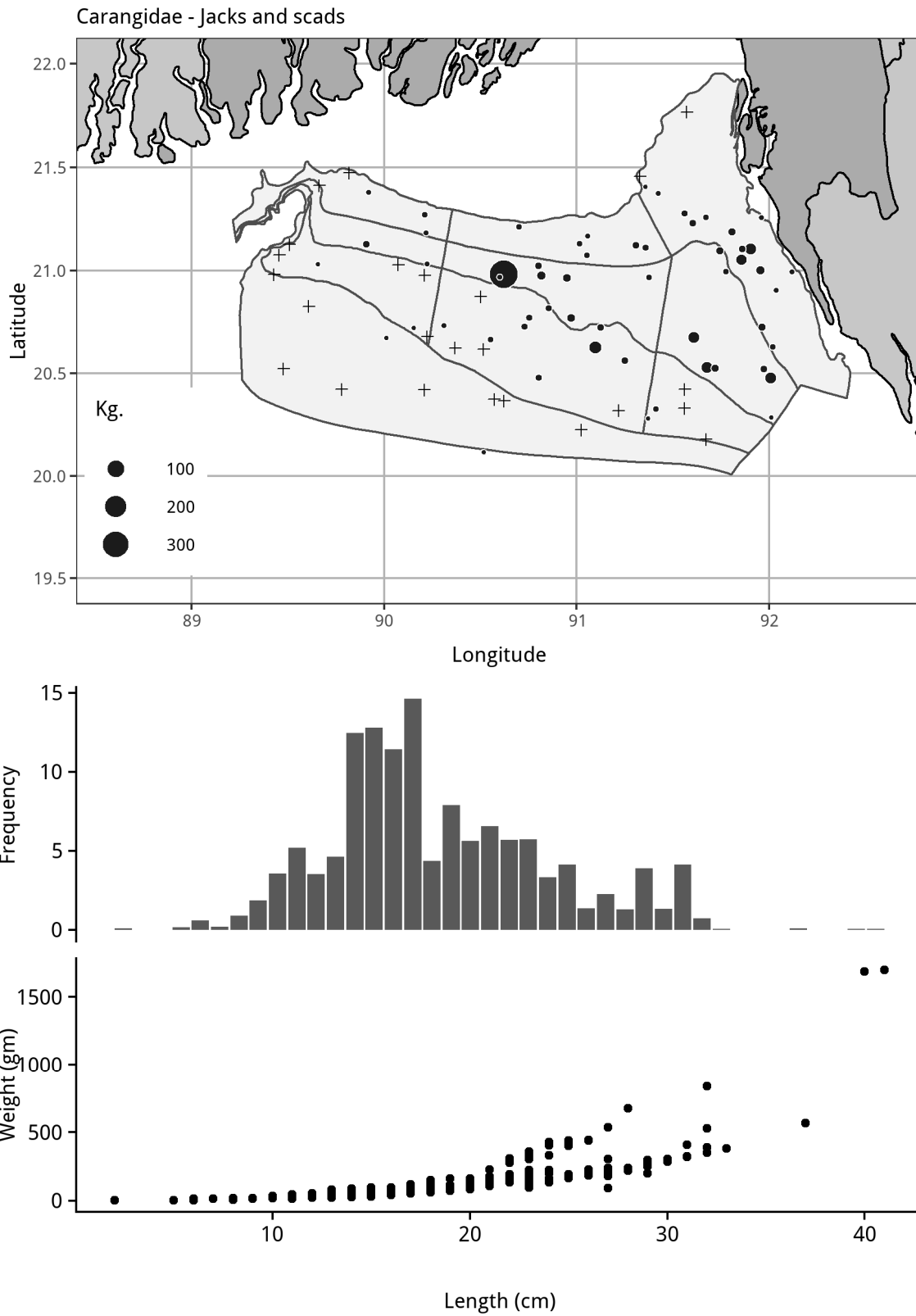
Species in group and number of catches

Scientific name	Occurences	Scientific name	Occurences
<i>Alepes djedaba</i>	8	<i>Megalaspis cordyla</i>	26
<i>Alepes melanoptera</i>	1	<i>Naucrates ductor</i>	1
<i>Alepes vari</i>	1	<i>Parastromateus niger</i>	9
<i>Atropus atropus</i>	16	<i>Scomberoides commersonianus</i>	2
<i>Atule mate</i>	1	<i>Scomberoides tol</i>	3
<i>Carangoides caeruleopinnatus</i>	1	<i>Selar boops</i>	5
<i>Carangoides chrysophrys</i>	6	<i>Selar crumenophthalmus</i>	13
<i>Carangoides ferdau</i>	2	<i>Seriolina nigrofasciata</i>	1
<i>Decapterus russelli</i>	30		



Demersal surveys - Carangidae - Jacks and scads

Stratum	10201	10202	10203	10204	10205	10206	10207	10208	10209	10210	
Weight	0.043	0.064	0.163	0.032	0.076	0.095	0.060	0.145	0.048	0.272	
Survey number											Annual mean
2017201			4.14		0.77	0.22		0.06	0.00	0.01	0.77
2018201	2.96	1.23	0.50	0.23	0.25	1.87	0.00	0.88	0.03	0.00	0.62
2019201	0.34	0.85	4.25	1.23	46.61	10.19	0.01	3.28	0.16	0.00	5.80

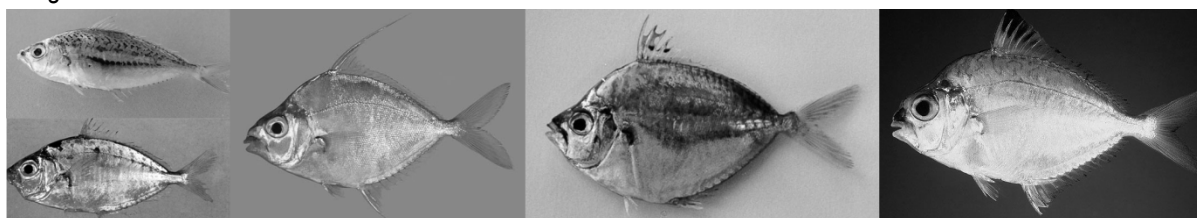


Species group: Leiognathidae - Ponyfish

Leiognathids or pony fish the small sized fishes consume locally and used as poultry feed and fish meal as cheap price. This group are abundantly caught in Artisanal fishing gear (MSBN), demersal trawl and shrimp trawl.

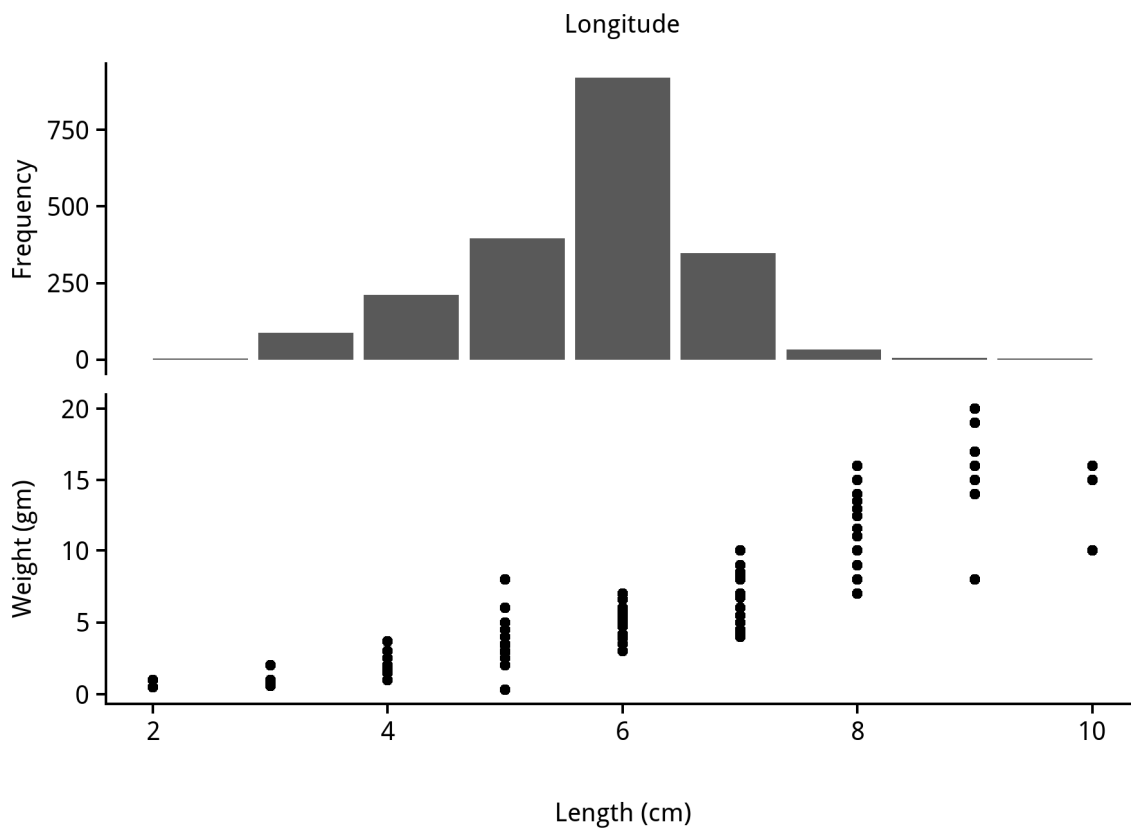
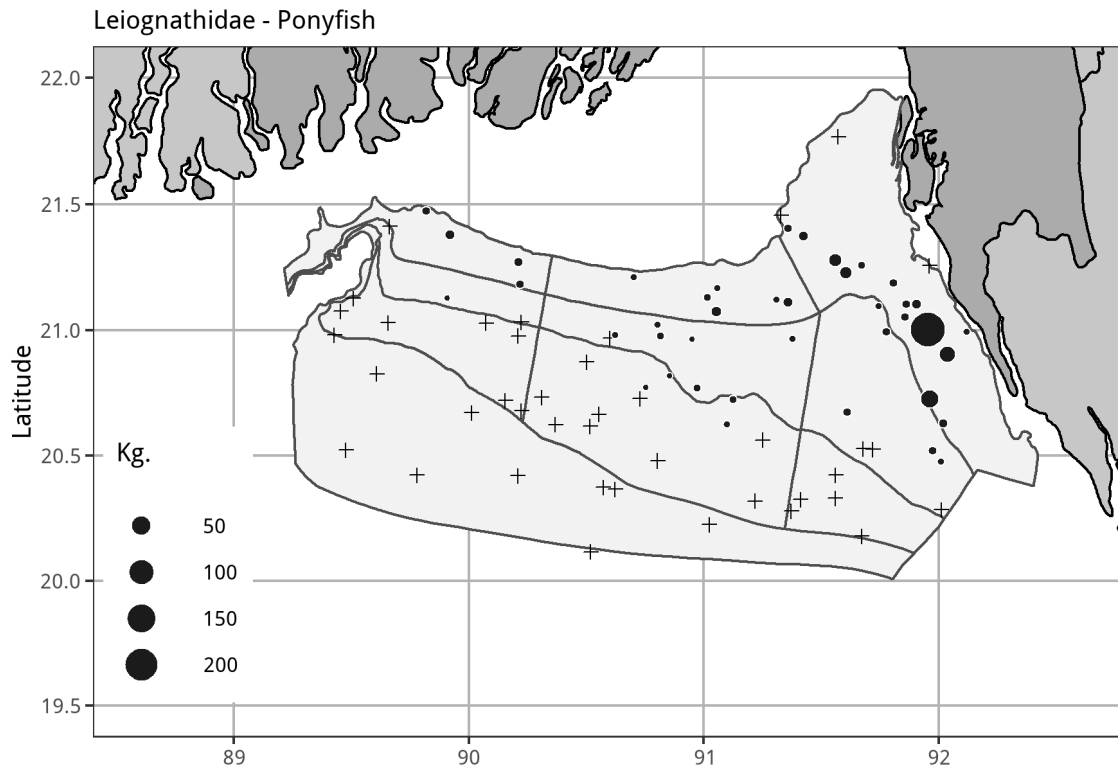
Species in group and number of catches

Scientific name	Occurences	Scientific name	Occurences
Gazza minuta	16	Leiognathus splendens	2
Leiognathus bindus	13	Secutor insidiator	2
Leiognathus brevirostris	10	Secutor ruconius	8
Leiognathus fasciatus	1		



Demersal surveys - Leiognathidae - Ponyfish

Stratum	10201	10202	10203	10204	10205	10206	10207	10208	10209	10210	
Weight	0.043	0.064	0.163	0.032	0.076	0.095	0.060	0.145	0.048	0.272	
Survey number											Annual mean
2017201			0.13		0.21	0.52		0.00	0.00	0.00	0.09
2018201	0.01	3.40	17.16	0.00	0.00	114.25	0.00	0.00	0.00	0.00	13.88
2019201	1.63	1.57	16.89	0.00	0.21	4.39	0.00	0.05	0.00	0.00	3.37



Species group: Mullidae - Goatfish

Mullidae – Goatfish, the small sized fish is consumed locally and harvest mainly in mid water trawl and found significantly in coral reef areas.

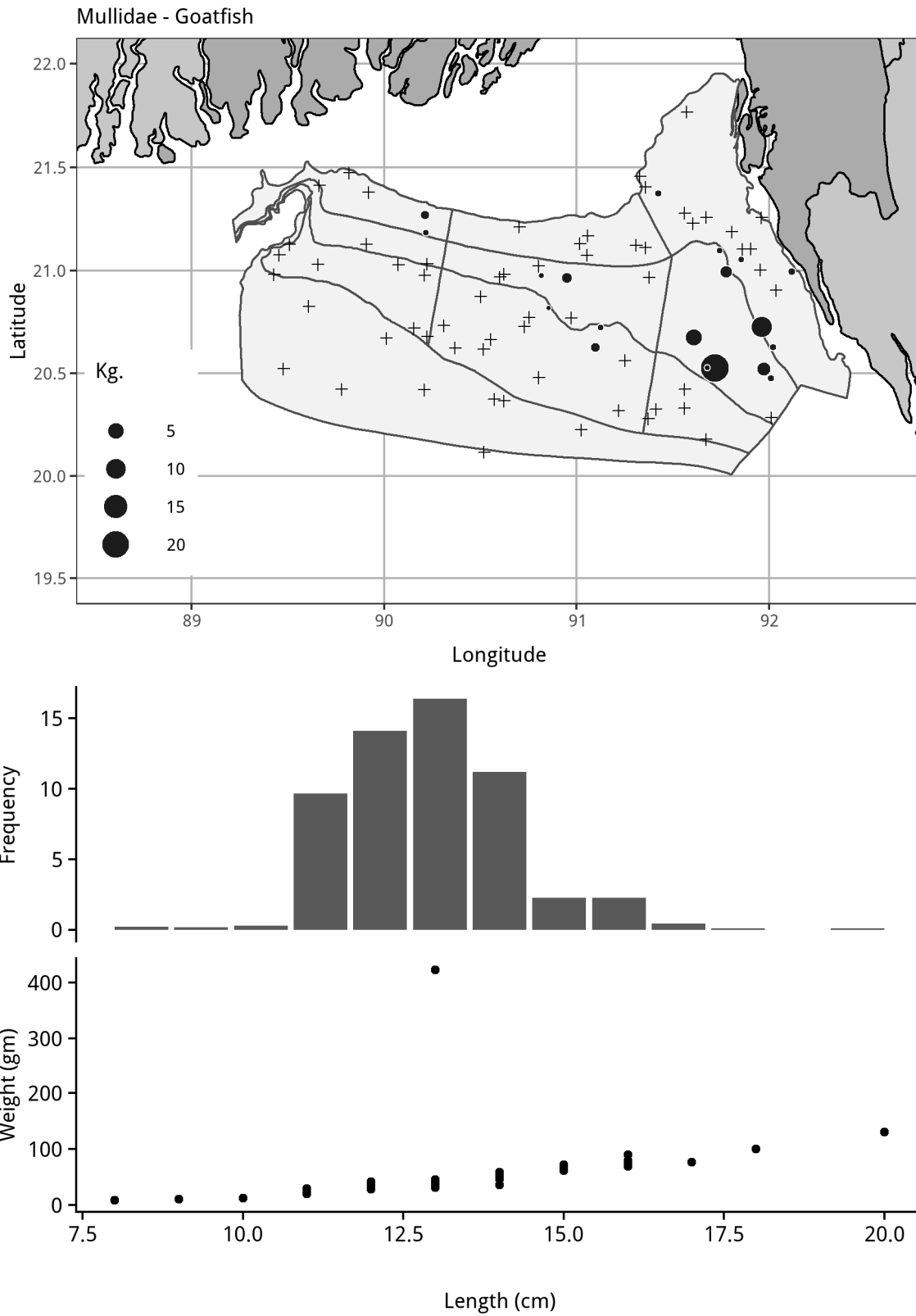
Species in group and number of catches

Scientific name	Occurences
Upeneus bensasi	1
Upeneus moluccensis	8
Upeneus sulphureus	3
Upeneus supravittatus	11
Upeneus tragula	2



Demersal surveys - Mullidae - Goatfish

Stratum	10201	10202	10203	10204	10205	10206	10207	10208	10209	10210	
Weight	0.043	0.064	0.163	0.032	0.076	0.095	0.060	0.145	0.048	0.272	
Survey number											Annual mean
2017201			0.00		0.07	0.00		0.00	0.00	0.00	0.01
2018201	0.00	0.02	0.11	0.13	0.02	1.64	0.00	0.00	0.00	0.00	0.18
2019201	0.15	0.00	0.03	0.00	0.14	4.55	0.00	0.06	0.00	0.00	0.46



Species group: Nemipteridae - Threadfin breams

Threadfin breams are commercially important fishes and considered as good fish. This are mainly caught bottom trawl, gill net and long lines. This fishes are occurring in muddy and sandy bottom and known to control of population of crustaceans and small fishes in the marine ecosystem.

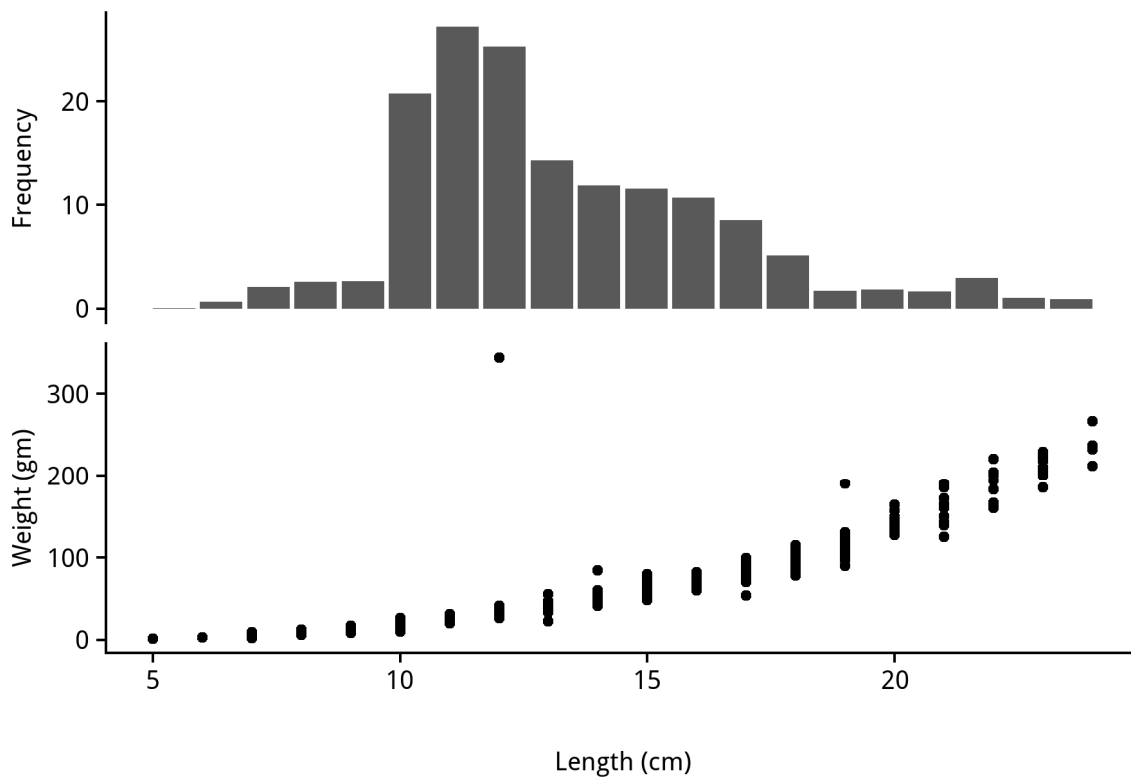
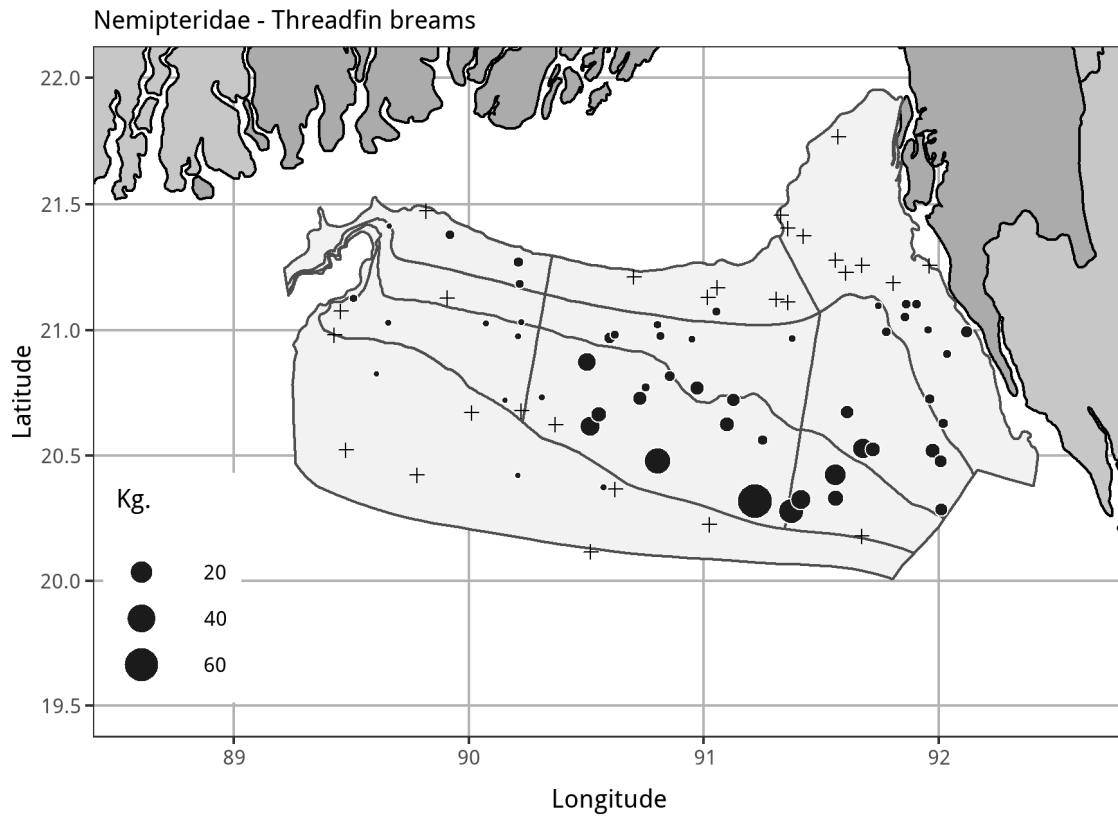
Species in group and number of catches

Scientific name	Occurences	Scientific name	Occurences
Nemipterus furcopus	1	Nemipterus peronii	9
Nemipterus hexodon	1	Nemipterus randalli	24
Nemipterus japonicus	30	Parascolopsis aspinosa	16
Nemipterus nematophorus	3		



Demersal surveys - Nemipteridae - Threadfin breams

	10201	10202	10203	10204	10205	10206	10207	10208	10209	10210	
Stratum Weight	0.043	0.064	0.163	0.032	0.076	0.095	0.060	0.145	0.048	0.272	
Survey number											Annual mean
2017201			0.00		0.03	0.00		0.00	0.00	0.00	0.00
2018201	0.00	0.15	0.04	5.42	0.13	10.71	0.02	19.31	4.15	0.00	4.23
2019201	0.60	0.10	0.40	0.02	1.01	4.14	0.06	9.52	12.16	0.00	2.55

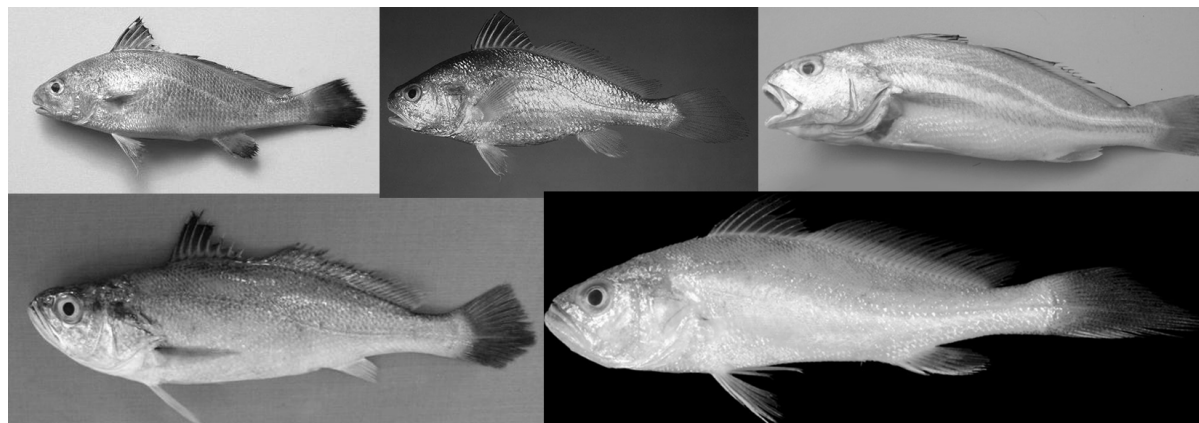


Species group: Sciaenidae - Croakers

Croakers are the largest group in the commercially important fishes in our sea water. These are bottom dwelling and carnivores' fishes known as drums feeding on benthic invertebrates and small fishes. They are caught bottom trawl, gill net and long lines. They are exported as dry and fresh form and fetch a good foreign currency and have a local demand.

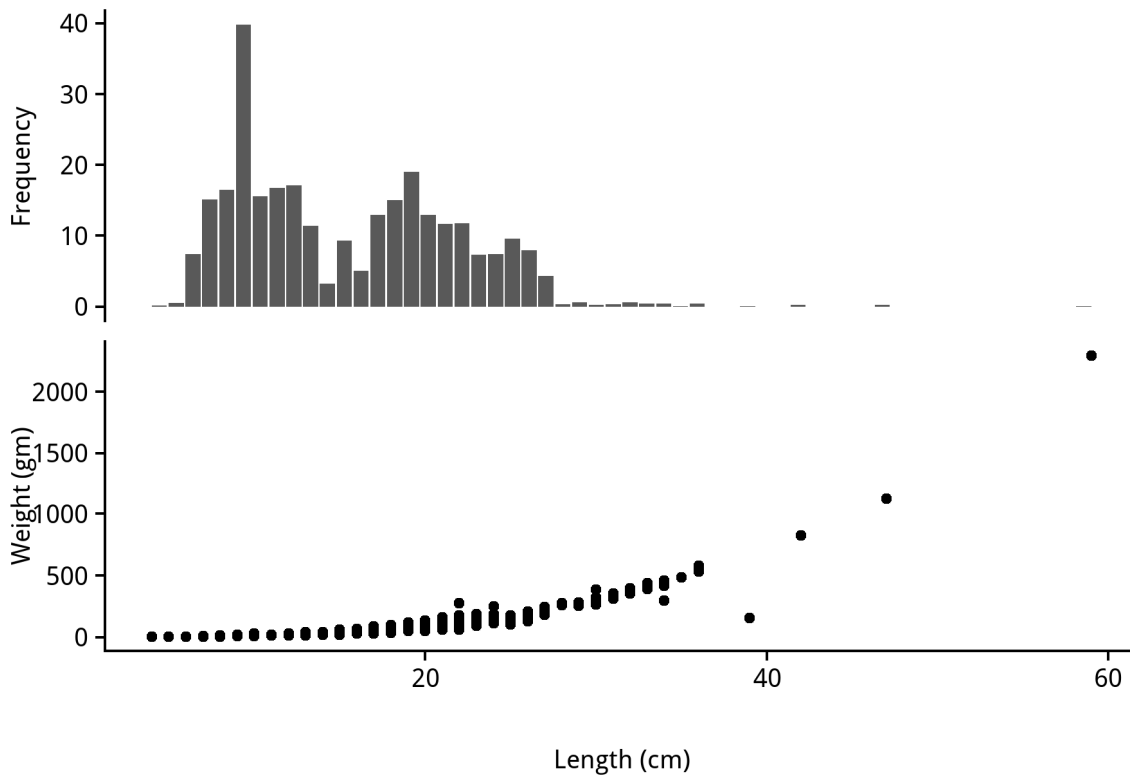
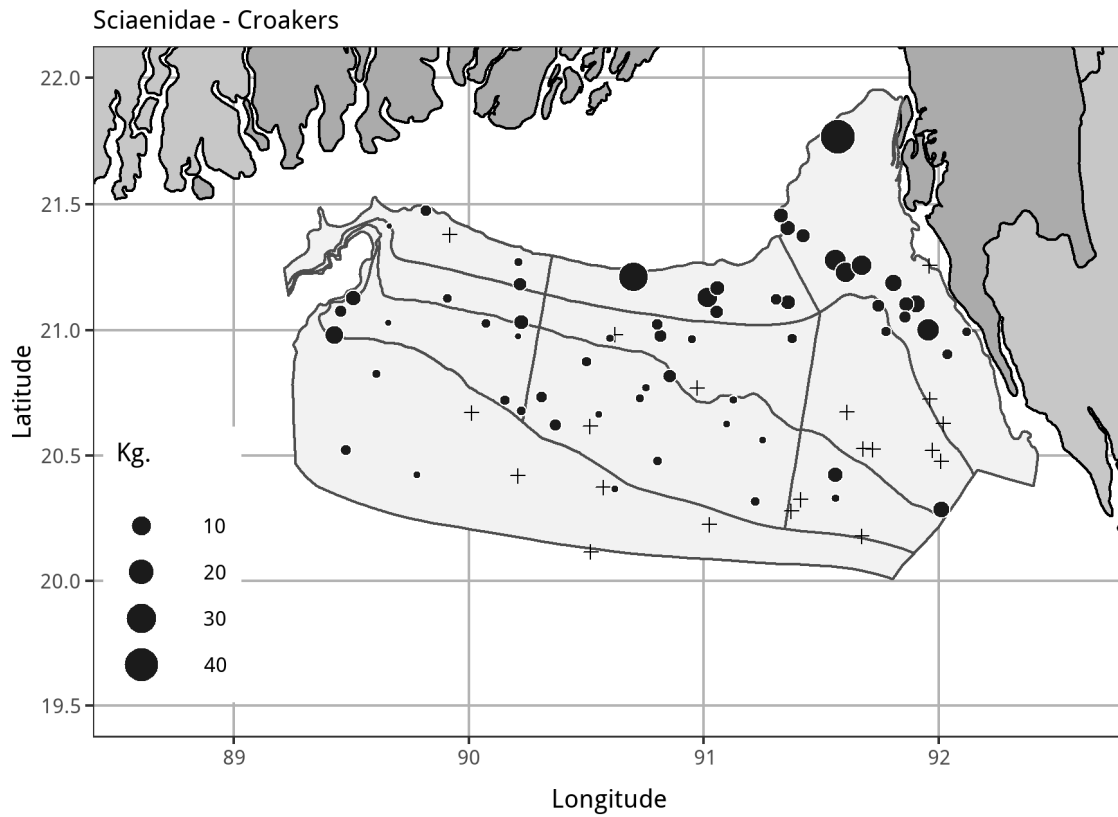
Species in group and number of catches

Scientific name	Occurences	Scientific name	Occurences
Johnieops sina	2	Otolithoides pama	13
Johnieops vogleri	1	Panna microdon	7
Johnius belangerii	10	Pennahia anea	46
Johnius carutta	6	Protonibea diacanthus	12
Johnius dussumieri	1	Pterolithus maculatus	3
Johnius elongatus	1	SCIAENIDAE	3
Otolithes cuvieri	8		



Demersal surveys - Sciaenidae - Croakers

Stratum	10201	10202	10203	10204	10205	10206	10207	10208	10209	10210	
Weight	0.043	0.064	0.163	0.032	0.076	0.095	0.060	0.145	0.048	0.272	
Survey number											Annual mean
2017201			0.17		0.69	0.14		0.00	0.00	0.00	0.09
2018201	0.40	0.77	0.59	0.69	0.09	0.11	0.30	0.53	0.18	0.00	0.31
2019201	1.06	8.24	7.11	2.44	0.75	0.90	1.17	0.63	0.80	0.65	2.33

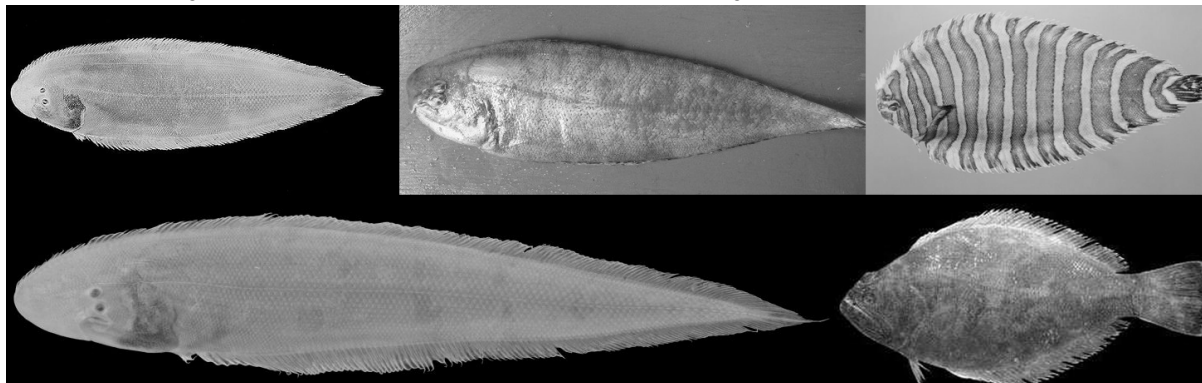


Species group: Pleuronectiformes - Flatfish

As before Flatfish are thrown as trash in shrimp trawl and demersal trawl catch. But at present flat fishes are used in fish meal and poultry feed. These groups mainly harvest in shrimp trawl but sometimes caught in MSBN. In Bangladesh only some tribal peoples having some species of flat fish, but now days these export in foreign countries mainly in China, Korea and Singapore. These groups are inhabits in sand and mud bottoms and eat only crutaceans.

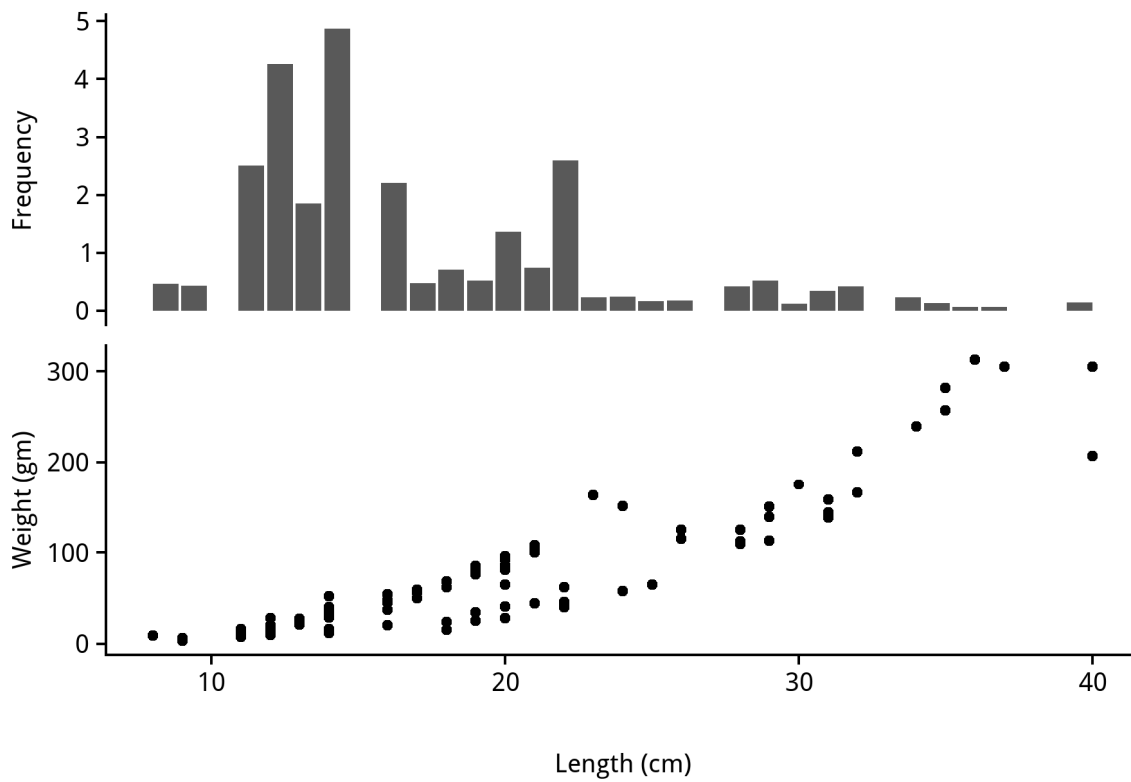
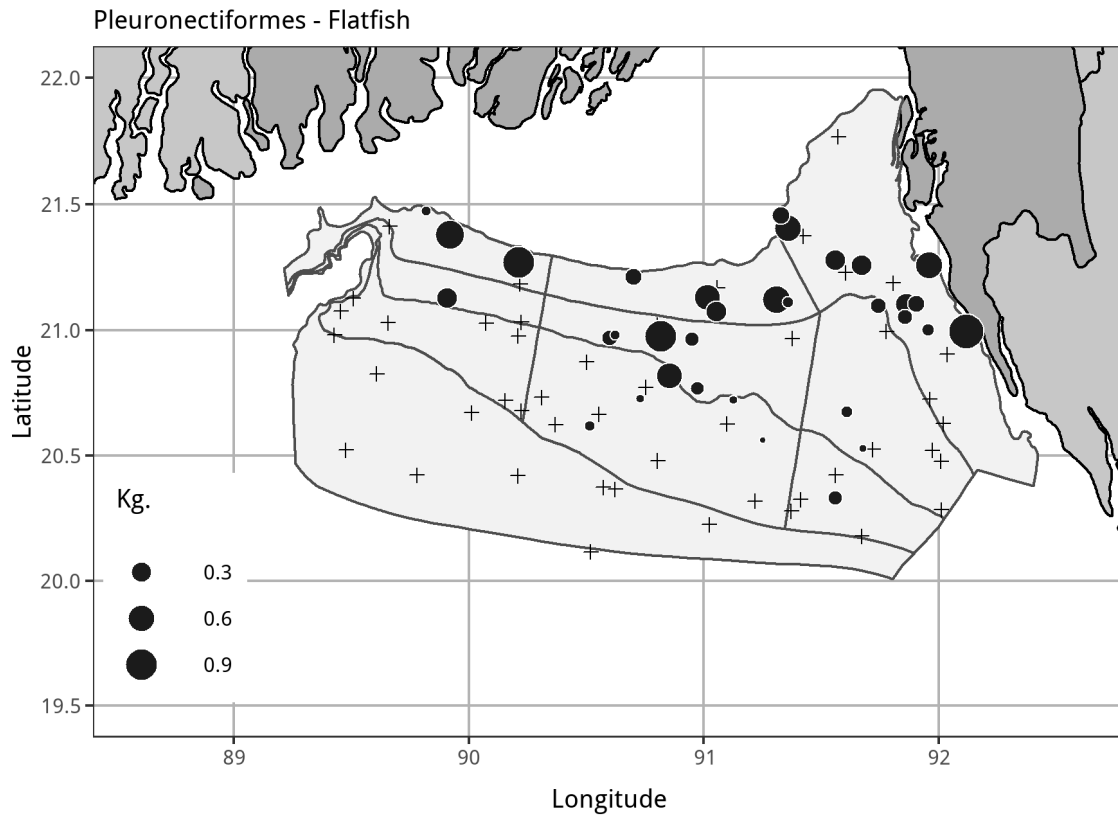
Species in group and number of catches

Scientific name	Occurences	Scientific name	Occurences
Cynoglossus bilineata *	1	Paraplagusia bilineata	8
Cynoglossus capensis	1	Pseudorhombus arsius	1
Cynoglossus lingua	10	Pseudorhombus elevatus	14
Cynoglossus puncticeps	1	Pseudorhombus javanicus	7
Laeops nigrescens	2	Pseudorhombus malayanus	1
Paralichthodes algoensis	1	Solea elongata	1



Demersal surveys - Pleuronectiformes - Flatfish

Stratum	10201	10202	10203	10204	10205	10206	10207	10208	10209	10210	
Weight	0.043	0.064	0.163	0.032	0.076	0.095	0.060	0.145	0.048	0.272	
Survey number											Annual mean
2017201			0.00		0.00	0.00		0.00	0.00	0.01	0.00
2018201	0.00	0.03	0.07	0.00	0.00	0.01	0.00	0.01	0.00	0.00	0.02
2019201	0.38	0.20	0.24	0.09	0.23	0.02	0.00	0.04	0.02	0.00	0.10



Species group: Squids and cuttlefish

Two major groups of cephalopods e.g. Squid and cuttle fish which are available in Bangladesh coast. Cephalopods are not exploited by any specialised fishing gear but a small quantity is being caught as by-catch of bottom trawl and shrimp trawl and even MSBN also. Now days it's are exportable item in different countries.

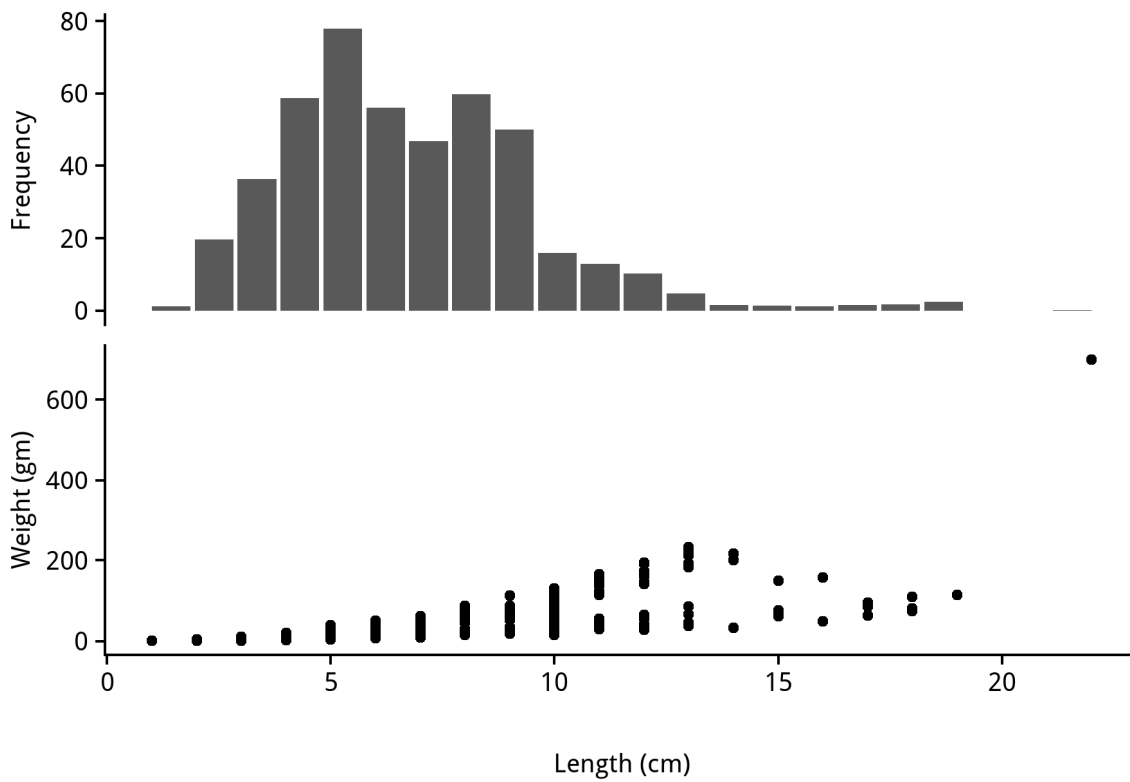
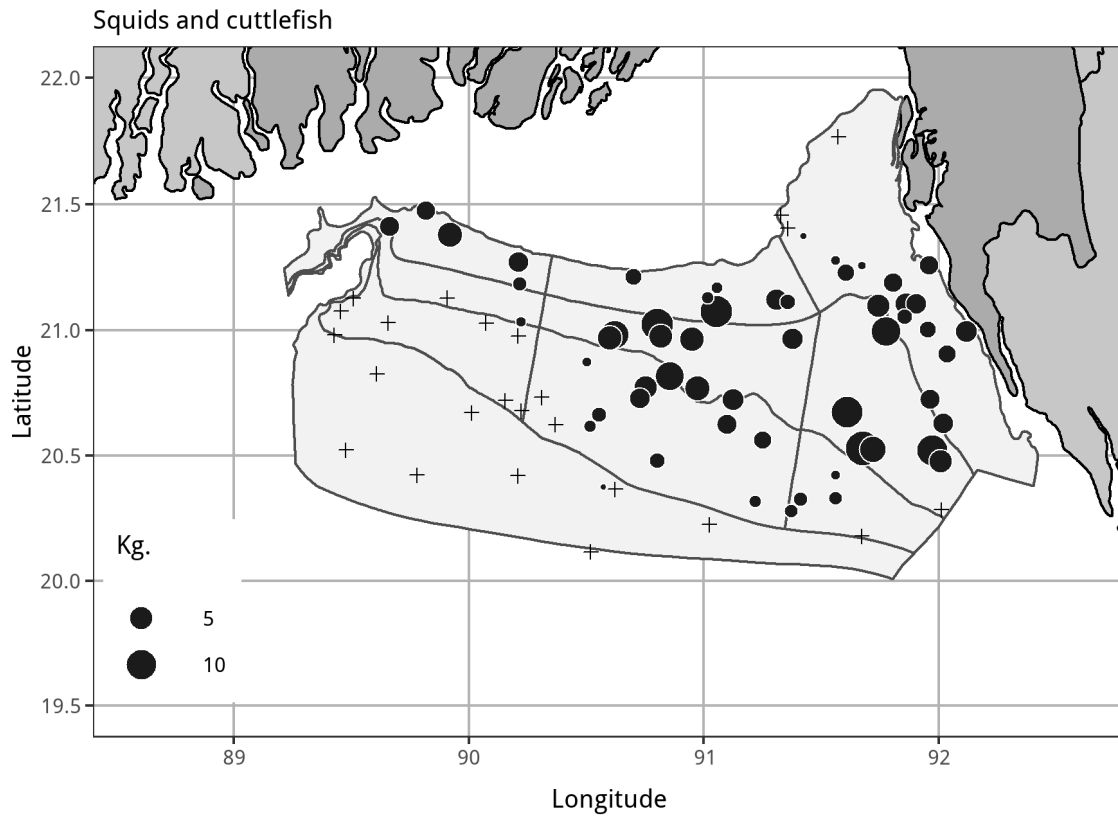
Species in group and number of catches

Scientific name	Occurences	Scientific name	Occurences
Sepia acuelata	44	Sepia sp.	1
Sepia esculenta	34	Sepiella inermis	1
Sepia officinalis	1	Sepioteuthis lessoniana	2
Sepia pharaonis	4	Uroteuthis duvauceli	48



Demersal surveys - Squids and cuttlefish

Stratum	10201	10202	10203	10204	10205	10206	10207	10208	10209	10210	Annual mean
Weight	0.043	0.064	0.163	0.032	0.076	0.095	0.060	0.145	0.048	0.272	
Survey number											
2017201			0.22		3.22	0.08		0.48	0.07	0.00	0.36
2018201	0.13	0.43	0.72	0.85	0.68	0.95	0.00	0.95	0.00	0.00	0.46
2019201	2.98	2.98	1.71	1.14	5.70	6.57	0.00	2.00	0.55	0.00	2.01



Species group: Trichiuridae - ribbonfish

Elongate and compressed ribbon-like trichiurid are benthopelagic inhabitants coastal and often comes near the surface at night. Ribbonfish export as dry, salted and fresh form in different countries. This carnivore fish feed on small fish and shrimp. Harvest bottom trawl, set beg net and beach seines.

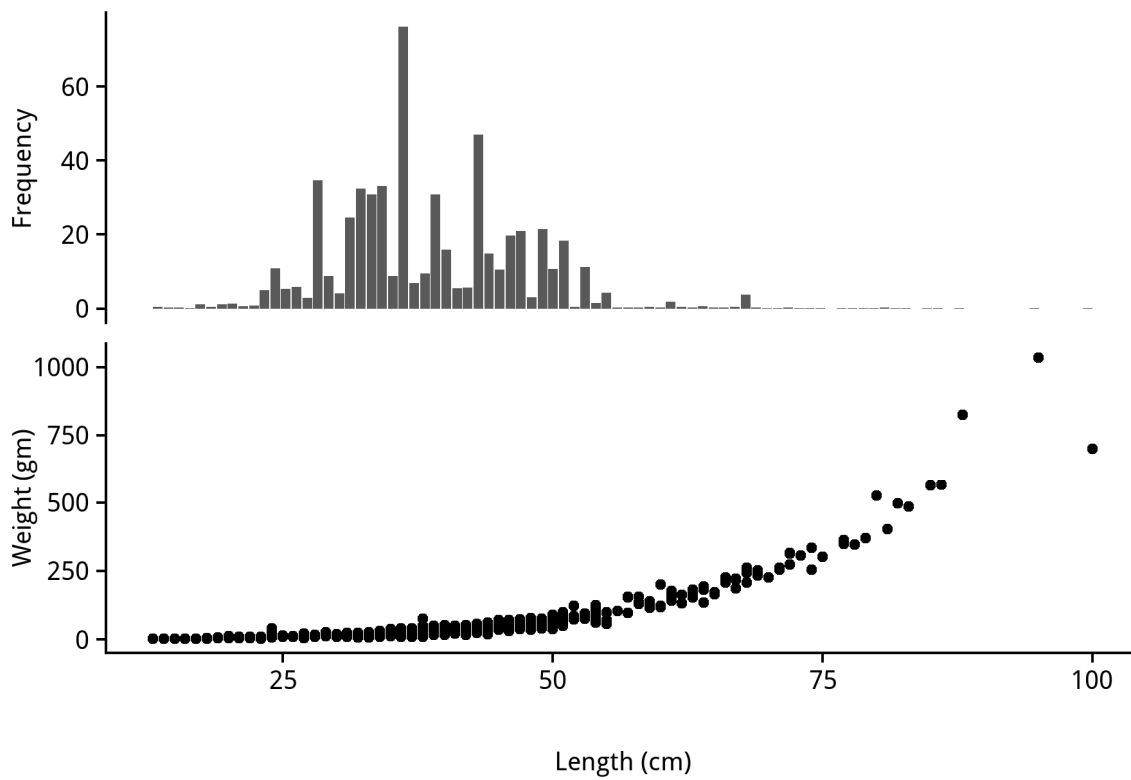
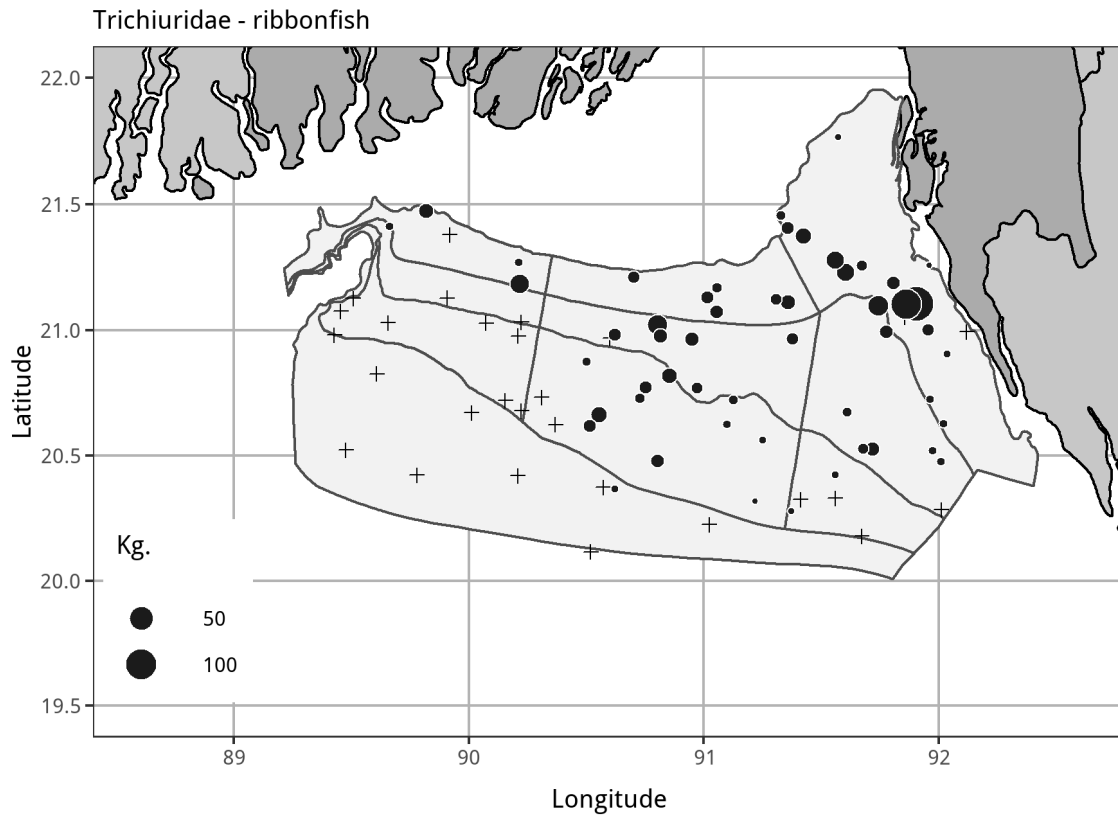
Species in group and number of catches

Scientific name	Occurences
Eupleurogrammus muticus	8
Lepturacanthus savala	28
Trichiurus lepturus	27



Demersal surveys - Trichiuridae - ribbonfish

Stratum	10201	10202	10203	10204	10205	10206	10207	10208	10209	10210	
Weight	0.043	0.064	0.163	0.032	0.076	0.095	0.060	0.145	0.048	0.272	
Survey number											Annual mean
2017201			2.33		1.88	5.00		0.02	0.00	0.00	1.00
2018201	1.70	4.25	2.08	1.91	1.16	1.23	0.61	0.32	0.02	0.00	1.04
2019201	9.06	6.63	18.21	0.27	8.04	5.90	0.00	3.90	0.11	0.05	5.56



Species group: Other families - Synodontidae, Tetrodontidae, Platycephalidae

These groups are used mainly as fish meal and poultry feed. Important as commercial fisheries sold fresh, dried and salted in the markets. Lizard fishes are exploits in sandy and muddy bottom areas in demersal fishing. Fisheries have no commercial importance of Puffer fish. The puffer fish must not be eaten because its skin and internal organs contain neurotoxin. Flathead fishes are minor commercial importance and caught by trawl over sandy and muddy bottom.

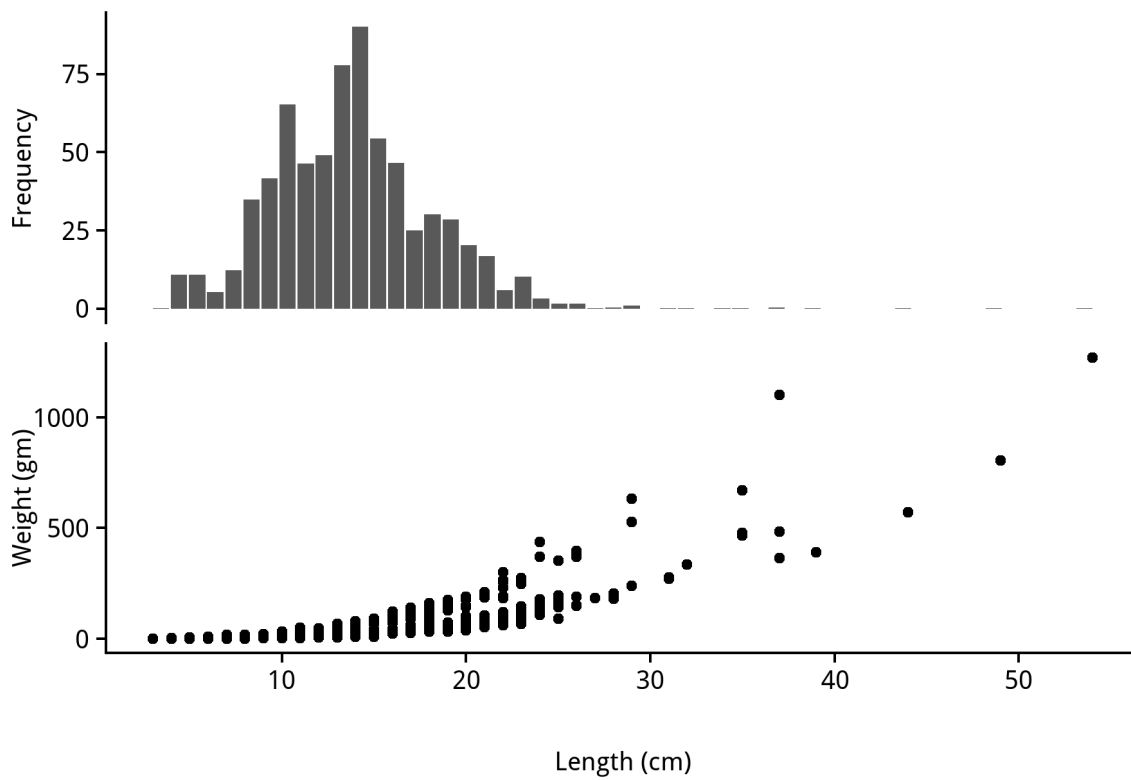
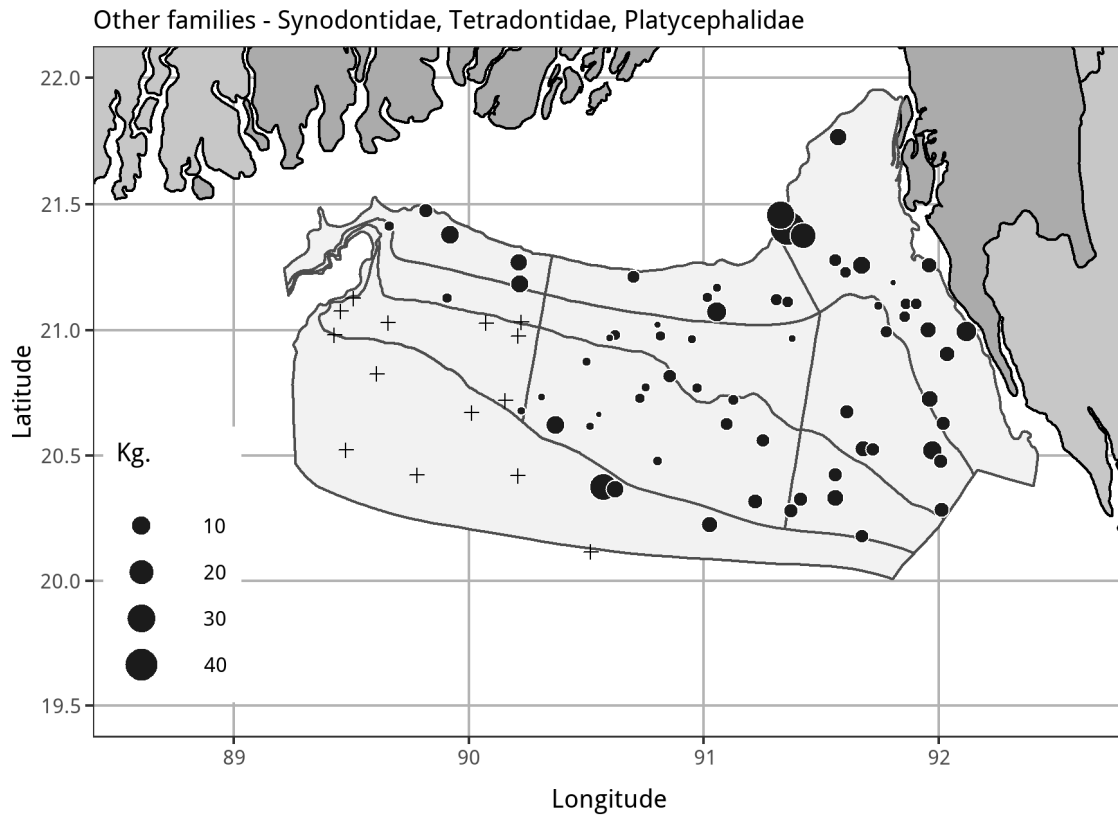
Species in group and number of catches

Scientific name	Occurences	Scientific name	Occurences
Cociella crocodilus	2	Platycephalus indicus	12
Grammoplites scaber	6	Saurida brasiliensis	1
Grammoplites suppositus	4	Saurida longimanus	35
Harpadon nehereus	9	Saurida tumbil	27
Lagocephalus cf sceleratus	5	Saurida undosquamis	11
Lagocephalus guntheri	21	Sorsogna tuberculata	7
Lagocephalus lagocephalus	9	Takifugu ablongus	1
Lagocephalus lunaris	5	Takifugu oblongus	1
Lagocephalus spadiceus	15	Trachinocephalus myops	2
Onigocia pedinacula	16		



Demersal surveys - Other families - Synodontidae, Tetrodontidae, Platycephalidae

Stratum	10201	10202	10203	10204	10205	10206	10207	10208	10209	10210	
Weight	0.043	0.064	0.163	0.032	0.076	0.095	0.060	0.145	0.048	0.272	
Survey number											Annual mean
2017201			15.52		0.75	0.00		0.01	0.06	0.01	2.60
2018201	0.25	0.94	2.08	0.32	0.27	1.61	0.27	1.86	0.69	0.03	0.92
2019201	6.09	2.98	9.27	0.62	0.72	3.81	0.00	1.64	3.49	3.29	3.71



ANNEX VI: Sampling stations, Demersal Survey #2019201

Stn	Stratum	Zone	Ground	Location (DD)		Location (DDM)		Depth (m)	
				Lat (N)	Lon (E)	Lat (N)	Lon (E)	Min	Max
10	10201	Inshore	Swatch	21.4775	89.8392	21°28.65	89°50.352	10	40
14	10201	Inshore	Swatch	21.3775	89.9392	21°22.65	89°56.352	10	40
16	10201	Inshore	Swatch	21.2775	90.1892	21°16.65	90°11.352	10	40
22	10201	Inshore	Swatch	21.1775	90.2392	21°10.65	90°14.352	10	40
116	10201	Inshore	Swatch	21.3775	89.9892	21°22.65	89°59.352	10	40
118	10201	Inshore	Swatch	21.3275	89.3392	21°19.65	89°20.352	10	40
122	10201	Inshore	Swatch	21.2275	89.9892	21°13.65	89°59.352	10	40
129	10201	Inshore	Swatch	21.1775	90.2892	21°10.65	90°17.352	10	40
20	10202	Inshore	Middle	21.2275	90.6892	21°13.65	90°41.352	10	40
23	10202	Inshore	Middle	21.1775	91.0392	21°10.65	91°02.352	10	40
27	10202	Inshore	Middle	21.1275	91.0392	21°07.65	91°02.352	10	40
28	10202	Inshore	Middle	21.1275	91.2892	21°07.65	91°17.352	10	40
29	10202	Inshore	Middle	21.1275	91.3392	21°07.65	91°20.352	10	40
33	10202	Inshore	Middle	21.0775	91.0392	21°04.65	91°02.352	10	40
123	10202	Inshore	Middle	21.2275	90.3892	21°13.65	90°23.352	10	40
124	10202	Inshore	Middle	21.2275	91.1892	21°13.65	91°11.352	10	40
131	10202	Inshore	Middle	21.1275	90.4392	21°07.65	90°26.352	10	40
132	10202	Inshore	Middle	21.0775	91.0892	21°04.65	91°05.352	10	40
134	10202	Inshore	Middle	21.0275	91.2392	21°01.65	91°14.352	10	40
7	10203	Inshore	South	21.7775	91.5892	21°46.65	91°35.352	10	40
11	10203	Inshore	South	21.4775	91.3392	21°28.65	91°20.352	10	40
13	10203	Inshore	South	21.4275	91.3392	21°25.65	91°20.352	10	40
15	10203	Inshore	South	21.3775	91.4392	21°22.65	91°26.352	10	40
17	10203	Inshore	South	21.2775	91.5392	21°16.65	91°32.352	10	40
18	10203	Inshore	South	21.2775	91.6892	21°16.65	91°41.352	10	40
19	10203	Inshore	South	21.2775	91.9392	21°16.65	91°56.352	10	40
21	10203	Inshore	South	21.2275	91.5892	21°13.65	91°35.352	10	40
24	10203	Inshore	South	21.1775	91.7892	21°10.65	91°47.352	10	40
30	10203	Inshore	South	21.1275	91.8392	21°07.65	91°50.352	10	40
31	10203	Inshore	South	21.1275	91.8892	21°07.65	91°53.352	10	40
35	10203	Inshore	South	21.0775	91.8392	21°04.65	91°50.352	10	40
40	10203	Inshore	South	21.0275	91.9392	21°01.65	91°56.352	10	40
49	10203	Inshore	South	20.9775	92.1392	20°58.65	92°08.352	10	40
50	10203	Inshore	South	20.9275	92.0392	20°55.65	92°02.352	10	40
68	10203	Inshore	South	20.6275	92.0392	20°37.65	92°02.352	10	40
105	10203	Inshore	South	21.8275	91.5892	21°49.65	91°35.352	10	40
106	10203	Inshore	South	21.8275	91.6892	21°49.65	91°41.352	10	40
111	10203	Inshore	South	21.6775	91.4892	21°40.65	91°29.352	10	40
113	10203	Inshore	South	21.6275	91.4392	21°37.65	91°26.352	10	40
114	10203	Inshore	South	21.6275	91.5392	21°37.65	91°32.352	10	40
115	10203	Inshore	South	21.4775	91.5892	21°28.65	91°35.352	10	40
117	10203	Inshore	South	21.3775	91.7392	21°22.65	91°44.352	10	40
119	10203	Inshore	South	21.3275	91.7392	21°19.65	91°44.352	10	40
125	10203	Inshore	South	21.2275	91.4892	21°13.65	91°29.352	10	40
126	10203	Inshore	South	21.2275	91.5392	21°13.65	91°32.352	10	40
127	10203	Inshore	South	21.2275	91.9392	21°13.65	91°56.352	10	40
135	10203	Inshore	South	21.0275	91.8892	21°01.65	91°53.352	10	40
140	10203	Inshore	South	20.9775	91.8392	20°58.65	91°50.352	10	40
142	10203	Inshore	South	20.8775	91.9892	20°52.65	91°59.352	10	40
149	10203	Inshore	South	20.7775	91.9392	20°46.65	91°56.352	10	40
12	10204	Midshore	Swatch	21.4275	89.6392	21°25.65	89°38.352	40	80

ANNEX VI: Sampling stations, Demersal Survey #2019201

Stn	Stratum	Zone	Ground	Location (DD)		Location (DDM)		Depth (m)	
				Lat (N)	Lon (E)	Lat (N)	Lon (E)	Min	Max
26	10204	Midshore	Swatch	21.1275	89.8892	21°07.65	89°53.352	40	80
38	10204	Midshore	Swatch	21.0275	90.2392	21°01.65	90°14.352	40	80
120	10204	Midshore	Swatch	21.2275	89.6392	21°13.65	89°38.352	40	80
121	10204	Midshore	Swatch	21.2275	89.8392	21°13.65	89°50.352	40	80
128	10204	Midshore	Swatch	21.1775	90.1392	21°10.65	90°08.352	40	80
39	10205	Midshore	Middle	21.0275	90.7892	21°01.65	90°47.352	40	80
43	10205	Midshore	Middle	20.9775	90.5892	20°58.65	90°35.352	40	80
44	10205	Midshore	Middle	20.9775	90.6392	20°58.65	90°38.352	40	80
45	10205	Midshore	Middle	20.9775	90.8392	20°58.65	90°50.352	40	80
46	10205	Midshore	Middle	20.9775	90.9392	20°58.65	90°56.352	40	80
47	10205	Midshore	Middle	20.9775	91.3892	20°58.65	91°23.352	40	80
55	10205	Midshore	Middle	20.7775	90.9892	20°46.65	90°59.352	40	80
138	10205	Midshore	Middle	20.9775	91.1892	20°58.65	91°11.352	40	80
139	10205	Midshore	Middle	20.9775	91.4392	20°58.65	91°26.352	40	80
141	10205	Midshore	Middle	20.9275	91.2392	20°55.65	91°14.352	40	80
145	10205	Midshore	Middle	20.8275	91.0392	20°49.65	91°02.352	40	80
147	10205	Midshore	Middle	20.7775	91.0392	20°46.65	91°02.352	40	80
152	10205	Midshore	Middle	20.7275	91.0392	20°43.65	91°02.352	40	80
153	10205	Midshore	Middle	20.7275	91.3392	20°43.65	91°20.352	40	80
5	10206	Midshore	South	20.2775	91.9892	20°16.65	91°59.352	40	80
34	10206	Midshore	South	21.0775	91.7392	21°04.65	91°44.352	40	80
48	10206	Midshore	South	20.9775	91.7892	20°58.65	91°47.352	40	80
60	10206	Midshore	South	20.7275	91.9392	20°43.65	91°56.352	40	80
64	10206	Midshore	South	20.6775	91.5892	20°40.65	91°35.352	40	80
71	10206	Midshore	South	20.5275	91.6892	20°31.65	91°41.352	40	80
72	10206	Midshore	South	20.5275	91.7392	20°31.65	91°44.352	40	80
73	10206	Midshore	South	20.5275	91.9892	20°31.65	91°59.352	40	80
75	10206	Midshore	South	20.4775	91.9892	20°28.65	91°59.352	40	80
103	10206	Midshore	South	20.3275	91.8892	20°19.65	91°53.352	40	80
148	10206	Midshore	South	20.7775	91.6392	20°46.65	91°38.352	40	80
155	10206	Midshore	South	20.6775	91.4392	20°40.65	91°26.352	40	80
156	10206	Midshore	South	20.6775	91.5392	20°40.65	91°32.352	40	80
158	10206	Midshore	South	20.6275	91.8392	20°37.65	91°50.352	40	80
159	10206	Midshore	South	20.6275	91.8892	20°37.65	91°53.352	40	80
164	10206	Midshore	South	20.5275	91.8892	20°31.65	91°53.352	40	80
167	10206	Midshore	South	20.4775	91.8892	20°28.65	91°53.352	40	80
170	10206	Midshore	South	20.4275	92.0392	20°25.65	92°02.352	40	80
25	10207	Offshore	Swatch	21.1275	89.4892	21°07.65	89°29.352	80	100
32	10207	Offshore	Swatch	21.0775	89.4392	21°04.65	89°26.352	80	100
36	10207	Offshore	Swatch	21.0275	89.6392	21°01.65	89°38.352	80	100
37	10207	Offshore	Swatch	21.0275	90.0892	21°01.65	90°05.352	80	100
42	10207	Offshore	Swatch	20.9775	90.1892	20°58.65	90°11.352	80	100
56	10207	Offshore	Swatch	20.7275	90.1392	20°43.65	90°08.352	80	100
130	10207	Offshore	Swatch	21.1275	89.5392	21°07.65	89°32.352	80	100
133	10207	Offshore	Swatch	21.0275	89.7892	21°01.65	89°47.352	80	100
136	10207	Offshore	Swatch	20.9775	89.5892	20°58.65	89°35.352	80	100
137	10207	Offshore	Swatch	20.9775	89.8892	20°58.65	89°53.352	80	100
146	10207	Offshore	Swatch	20.7775	90.2392	20°46.65	90°14.352	80	100
1	10208	Offshore	Middle	20.3275	91.2392	20°19.65	91°14.352	80	100
51	10208	Offshore	Middle	20.8775	90.4892	20°52.65	90°29.352	80	100
53	10208	Offshore	Middle	20.8275	90.8392	20°49.65	90°50.352	80	100

ANNEX VI: Sampling stations, Demersal Survey #2019201

Stn	Stratum	Zone	Ground	Location (DD)		Location (DDM)		Depth (m)	
				Lat (N)	Lon (E)	Lat (N)	Lon (E)	Min	Max
54	10208	Offshore	Middle	20.7775	90.7392	20°46.65	90°44.352	80	100
57	10208	Offshore	Middle	20.7275	90.2892	20°43.65	90°17.352	80	100
58	10208	Offshore	Middle	20.7275	90.7392	20°43.65	90°44.352	80	100
59	10208	Offshore	Middle	20.7275	91.1392	20°43.65	91°08.352	80	100
62	10208	Offshore	Middle	20.6775	90.2392	20°40.65	90°14.352	80	100
63	10208	Offshore	Middle	20.6775	90.5392	20°40.65	90°32.352	80	100
65	10208	Offshore	Middle	20.6275	90.3892	20°37.65	90°23.352	80	100
66	10208	Offshore	Middle	20.6275	90.5392	20°37.65	90°32.352	80	100
67	10208	Offshore	Middle	20.6275	91.0892	20°37.65	91°05.352	80	100
69	10208	Offshore	Middle	20.5775	91.2392	20°34.65	91°14.352	80	100
74	10208	Offshore	Middle	20.4775	90.7892	20°28.65	90°47.352	80	100
102	10208	Offshore	Middle	20.3275	91.0392	20°19.65	91°02.352	80	100
144	10208	Offshore	Middle	20.8275	90.3892	20°49.65	90°23.352	80	100
151	10208	Offshore	Middle	20.7275	90.8892	20°43.65	90°53.352	80	100
154	10208	Offshore	Middle	20.6775	90.2892	20°40.65	90°17.352	80	100
160	10208	Offshore	Middle	20.5775	91.3392	20°34.65	91°20.352	80	100
162	10208	Offshore	Middle	20.5275	90.7892	20°31.65	90°47.352	80	100
163	10208	Offshore	Middle	20.5275	90.9892	20°31.65	90°59.352	80	100
165	10208	Offshore	Middle	20.4775	90.7392	20°28.65	90°44.352	80	100
166	10208	Offshore	Middle	20.4775	90.8392	20°28.65	90°50.352	80	100
168	10208	Offshore	Middle	20.4275	90.6892	20°25.65	90°41.352	80	100
172	10208	Offshore	Middle	20.3775	90.7392	20°22.65	90°44.352	80	100
173	10208	Offshore	Middle	20.3775	90.8392	20°22.65	90°50.352	80	100
2	10209	Offshore	South	20.3275	91.3892	20°19.65	91°23.352	80	100
3	10209	Offshore	South	20.3275	91.5392	20°19.65	91°32.352	80	100
4	10209	Offshore	South	20.2775	91.3892	20°16.65	91°23.352	80	100
8	10209	Offshore	South	20.1775	91.6892	20°10.65	91°41.352	80	100
78	10209	Offshore	South	20.4275	91.5392	20°25.65	91°32.352	80	100
101	10209	Offshore	South	20.3775	91.4392	20°22.65	91°26.352	80	100
108	10209	Offshore	South	20.2275	91.4892	20°13.65	91°29.352	80	100
110	10209	Offshore	South	20.1775	91.8892	20°10.65	91°53.352	80	100
169	10209	Offshore	South	20.4275	91.6392	20°25.65	91°38.352	80	100
6	10210	Deep	All	20.2275	91.0392	20°13.65	91°02.352	100	200
9	10210	Deep	All	20.1275	90.5392	20°07.65	90°32.352	100	200
41	10210	Deep	All	20.9775	89.3892	20°58.65	89°23.352	100	200
52	10210	Deep	All	20.8275	89.5892	20°49.65	89°35.352	100	200
61	10210	Deep	All	20.6775	89.9892	20°40.65	89°59.352	100	200
70	10210	Deep	All	20.5275	89.4892	20°31.65	89°29.352	100	200
76	10210	Deep	All	20.4275	89.7892	20°25.65	89°47.352	100	200
77	10210	Deep	All	20.4275	90.1892	20°25.65	90°11.352	100	200
79	10210	Deep	All	20.3775	90.5892	20°22.65	90°35.352	100	200
80	10210	Deep	All	20.3775	90.6392	20°22.65	90°38.352	100	200
104	10210	Deep	All	20.2775	91.0392	20°16.65	91°02.352	100	200
107	10210	Deep	All	20.2275	90.9892	20°13.65	90°59.352	100	200
109	10210	Deep	All	20.1775	91.3892	20°10.65	91°23.352	100	200
112	10210	Deep	All	20.0775	91.7392	20°04.65	91°44.352	100	200
143	10210	Deep	All	20.8275	89.3892	20°49.65	89°23.352	100	200
150	10210	Deep	All	20.7275	89.6392	20°43.65	89°38.352	100	200
157	10210	Deep	All	20.6275	89.6892	20°37.65	89°41.352	100	200
161	10210	Deep	All	20.5275	89.8392	20°31.65	89°50.352	100	200
171	10210	Deep	All	20.3775	89.5392	20°22.65	89°32.352	100	200

LIST OF SPECIES & GENERA IN R/V MEEN SANDHANI SURVEYS

Fishes, sharks, rays and skates:

Family		Species code	Species (latin name)	Common name
Anguilliformes				
Congridae	1	CONAR01	<i>Ariosoma anago</i>	Silvery conger
	2	CONAR06	<i>Ariosoma gnanadossi</i>	
	3	CONCO04	<i>Conger cinereus</i>	Longfin African conger
	4	CONUR01	<i>Uroconger lepturus</i>	Slender conger
Muraenesocidae	5	MUXCO01	<i>Congrosox talabonoides</i>	Indian pike conger
	6	MUXMU01	<i>Muraenesox bagio</i>	Common pike conger
	7	MUXMU02	<i>Muraenesox cinereus</i>	Daggertooth pike conger
Muraenidae	8	MUREC99	<i>Echidna nubulosa</i>	Starry moray
	9	MURGY10	<i>Gymnothorax punctatus</i>	Red Sea whitespotted moray
	10	MURGY11	<i>Gymnothorax reticularis</i>	Reticulated morey, net morey
	11	MURGY14	<i>Gymnothorax undulatus</i>	Undulated moray
	12	MURGY91	<i>Gymnothorax prolatus</i>	Morray Eel
	13	MURGY99	<i>Gymnothorax pseudothyrsodeus</i>	Highfin moray
Ophichthidae	14	MARHY01	<i>Hypopleuron caninum</i>	Whiptail cusk
	15	OPHCA98	<i>Lamustoma orientalis</i>	Oriental worm-eel
	16	OPHCA99	<i>Cacula pterygera</i>	Finny snake eel
	17	OPHPI01	<i>Pisodonophis cancrivorus</i>	Longfin snake eel
	18	OPHPI03	<i>Pisodonophis boro</i>	Rice-paddy eel
Aulopiformes				
Synodontidae	19	SNAHY16	<i>Hydrophis platurus</i>	
	20	SYNHA01	<i>Harpadon nehereus</i>	Bombay duck
	21	SYNMI01	<i>Minous monodactylus</i>	Gray stingfish
	22	SYNSA02	<i>Saurida tumbil</i>	Greater lizardfish
	23	SYNSA03	<i>Saurida undosquamis</i>	Brush-tooth lizardfish
	24	SYNSA10	<i>Saurida longimanus</i>	Longfin lizardfish
	25	SYNSY03	<i>Synodus indicus</i>	Indian lizardfish
	26	SYNTR01	<i>Trachinocephalus myops</i>	Bluntnose lizardfish
Beloniformes				
Hemiramphidae	27	HEMHE03	<i>Hemiramphus marginatus</i>	
Beryciformes				
Holocentridae	28	HOLMY06	<i>Myripristis botche</i>	Blacktip soldierfish
	29	HOLMY52	<i>Myripristis murdjan</i>	Pinecone soldierfish
	30	HOLSA02	<i>Sargocentron rubrum</i>	Redcoat
	31	HOLSA05	<i>Sargocentron caudimaculatum</i>	Silverspot squirrelfish
Carcharhiniformes				
Carcharhinidae	32	SHACA12	<i>Carcharhinus sorrah</i>	Spot-tail shark
	33	SHACA15	<i>Carcharhinus dussumieri</i>	Whitecheek shark
	34	SHACA17	<i>Carcharhinus limbatus</i>	Blacktip shark
	35	SHACA21	<i>Carcharhinus falciformis</i>	Silky shark
	36	SHACA24	<i>Carcharhinus melanopterus</i>	Blacktip reef shark
	37	SHACA61	<i>Rhizoprionodon acutus</i>	Milk shark
Sphyrnidae	38	SHACA71	<i>Scoliodon laticaudus</i>	Spadenose shark

Family		Species code	Species (latin name)	Common name
	39	SHASP21	<i>Eusphyra blochii</i>	Winghead shark

Clupeiformes

Chirocentridae	40	CHRCH01	<i>Chirocentrus dorab</i>	Dorab wolf herring
	41	CHRCH02	<i>Chirocentrus nudus</i>	Whitefin wolf-herring
Clupeidae	42	CLUAN01	<i>Anodontostoma chacunda</i>	Chacunda gizzard-shad
	43	CLUES01	<i>Escualosa thoracata</i>	White Sardin
	44	CLUHI02	<i>Hilsa kelee</i>	Kelee shad
	45	CLUSL04	<i>Sardinella gibbosa</i>	Goldstripe sardinella
	46	CLUSL05	<i>Sardinella albella</i>	White sardinella
	47	CLUSL06	<i>Sardinella fimbriata</i>	Fringescale sardinella
	48	CLUSL07	<i>Sardinella longiceps</i>	Indian oil sardinella
	49	CLUSL12	<i>Sardinella melanura</i>	Blacktip sardinella
	50	CLUTE01	<i>Tenualosa toli</i>	Toli shad
	51	CLUTE03	<i>Tenualosa ilisha</i>	Hilsa shad
Dussumeriidae	52	CLUDU01	<i>Dussumeria acuta</i>	Rainbow sardine
	53	CLUDU02	<i>Dussumeria elopsoides</i>	Slender rainbow sardine
Engraulidae	54	ENGCO01	<i>Coilia dussumieri</i>	Goldspotted grenadier anchovy
	55	ENGCO02	<i>Coilia mystus</i>	Osbeck's grenadier anchovy
	56	ENGCO04	<i>Coilia macrognathos</i>	Longjaw grenadier anchovy
	57	ENGCO99	<i>Coilia reynaldi</i>	Reynald's Grenadier Anchovy
	58	ENGSE01	<i>Setipinna taty</i>	Scaly hairfin anchovy
	59	ENGSE04	<i>Setipinna brevipes</i>	Shorthead hairfin anchovy
	60	ENGST02	<i>Stolephorus commersonii</i>	Commerson's anchovy
	61	ENGST03	<i>Stolephorus indicus</i>	Indian anchovy
	62	ENGTH02	<i>Thryssa mystax</i>	Moustached thryssa
	63	ENGTH03	<i>Thryssa setirostris</i>	Longjaw thryssa
	64	ENGTH05	<i>Thryssa dussumieri</i>	Dussumier's thryssa
	65	ENGTH06	<i>Thryssa hamiltonii</i>	Hamilton's thryssa
	66	ENGTH07	<i>Thryssa malabarica</i>	Malabar thryssa
	Pristigasteridae	67	PRSIL02	<i>Ilisha elongata</i>
68		PRSIL03	<i>Ilisha melastoma</i>	
69		PRSIL04	<i>Ilisha megaloptera</i>	Bigeye ilisha
70		PRSIL05	<i>Ilisha filigera</i>	
71		PRSPE01	<i>Pellona ditchela</i>	Indian pellona
72		PRSRA01	<i>Raconda russeliana</i>	Raconda

Elopiiformes

Elopidae	73	ELOEL02	<i>Elops machnata</i>	Tenpounder
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Gadiformes

Bregmacerotidae	74	BREBR01	<i>Bregmaceros maclellandi</i>	Unicorn cod
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Lophiiformes

Antennariidae	75	ANRAN05	<i>Antennarius hispidus</i>	Zebra anglerfish
Lophiidae	76	LOPLO01	<i>Lophiodes mutilus</i>	Smooth angler
	77	LOPLO08	<i>Lophiodes naresi</i>	Goosefish
Ogcocephalidae	78	OGCHA05	<i>Haliutaea indica</i>	Indian handfish

Mugiliformes

Mugilidae	79	MUGLI09	<i>Liza subviridis</i>	Greenback mullet
	80	MUGMU02	<i>Mugil cephalus</i>	Flathead grey mullet

Family		Species code	Species (latin name)	Common name
Myliobatiformes				
Dasyatidae	81	RAYDA13	<i>Dasyatis kuhlii</i>	Blue-spotted stingray
	82	RAYDA21	<i>Pateobatis bleekeri</i>	Bleeker's whipray
	83	RAYDA23	<i>Himantura uarnak</i>	Honeycomb stingray
	84	RAYDA24	<i>Brevitrygon walga</i>	Dwarf whipray
	85	RAYDA25	<i>Pateobatis uarnacoides</i>	Whitenose whip ray
	86	RAYDA62	<i>Taeniurops meyeri</i>	Blotched fantail ray
	87	RAYDA93	<i>Brevitrygon imbricata</i>	Rays
	88	RAYGY11	<i>Gymnura poecilura</i>	Longtailed butterfly ray
	89	RAYNA02	<i>Narke dipterygia</i>	Numbray
	90	RAYNE13	<i>Narcine timplei</i>	Spotted numbfish
	91	RAYRB23	<i>Rhinobatos granulatus</i>	Sharpnose guitarfish
	92	RAYRY11	<i>Rhynchobatus djeddensis</i>	Giant guitarfish (vulnerable)
	93	RAYRY21	<i>Rhina ancylostoma</i>	Bowmouth guitarfish

Notacanthiformes				
Notacanthidae	94	ANGLE01	<i>Leptocephalus - transforming</i>	Eel larvae - transforming

Perciformes				
Acanthuridae	95	ACAAC19	<i>Acanthurus xanthopterus</i>	
Acropomatidae	96	ACRAC01	<i>Acropoma japonicum</i>	Glow-belly, lanternbelly
	97	ACRSY02	<i>Synagrops japonicus</i>	Japanese splitfin
Ambassidae	98	AMBAM02	<i>Ambassis ambassis</i>	Commerson's glassy
Apogonidae	99	APOAO03	<i>Apogonichthyoides maculipinnis</i>	
	100	APOJA03	<i>Jaydia queketti</i>	Spotfin cardinal
	101	APOJA23	<i>Jaydia ellioti</i>	
	102	APOOS01	<i>Ostorhinchus fasciatus</i>	Broadbanded cardinalfish
	103	APOOS02	<i>Ostorhinchus gularis</i>	Gular Cardinalfish
	104	APOOS99	<i>Ostorhinchus novemfasciatus</i>	Sevenstriped cardinalfish
Ariommatidae	105	ARMAR02	<i>Ariomma indicum</i>	Indian drifffish
Blenniidae	106	BLEXI01	<i>Xiphasia setifer</i>	Snakeblenny
Callionymidae	107	CALCA10	<i>Callionymus wargaretae</i>	Margaret's dragonet
	108	CALDI01	<i>Diplogrammus goramensis</i>	Goram dragonet
Carangidae	109	CARAL02	<i>Alectis indica</i>	Indian threadfish
	110	CARAL03	<i>Alectis ciliaris</i>	African pompano
	111	CARAP01	<i>Alepes djedaba</i>	Shrimp scad
	112	CARAP02	<i>Alepes vari</i>	Herring scad
	113	CARAP03	<i>Alepes melanoptera</i>	Blackfin scad
	114	CARAT01	<i>Atule mate</i>	Yellowtail scad
	115	CARAU01	<i>Atropus atropos</i>	Cleftbelly trevally
	116	CARCA04	<i>Caranx sexfasciatus</i>	Bigeye trevally
	117	CARCA05	<i>Caranx (Caranx) melampygus</i>	Bluefin trevally
	118	CARCS02	<i>Carangoides ferdau</i>	Blue trevally
	119	CARCS03	<i>Carangoides malabaricus</i>	Malabar trevally
	120	CARCS05	<i>Carangoides chrysophrys</i>	Longnose trevally
	121	CARCS06	<i>Carangoides armatus</i>	Longfin trevally
	122	CARCS07	<i>Carangoides caeruleopinnatus</i>	Coastal trevally, layang scad
	123	CARDE05	<i>Decapterus macrosoma</i>	Shortfin scad
	124	CARDE07	<i>Decapterus kurroides</i>	Redtail scad
	125	CARDE08	<i>Decapterus russelli</i>	Indian scad
	126	CARDE09	<i>Decapterus maruadsi</i>	Round scad

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	127	CARGN01	<i>Gnathanodon speciosus</i>	Golden travally
	128	CARME01	<i>Megalaspis cordyla</i>	Torpedo scad, hardtail scad
	129	CARPA01	<i>Parastromateus niger</i>	Black pomfret
	130	CARSA01	<i>Selar crumenophthalmus</i>	Bigeye scad
	131	CARSA02	<i>Selar boops</i>	Oxeye scad
	132	CARSC01	<i>Scomberoides tol</i>	Needlescaled queenfish
	133	CARSC02	<i>Scomberoides commersonianus</i>	Talang queenfish
	134	CARSC03	<i>Scomberoides tala</i>	Barred queenfish
	135	CARSE01	<i>Seriola rivoliana</i>	Almaco jack
	136	CARSI01	<i>Seriolina nigrofasciata</i>	Blackbanded trevally
	137	CARTR03	<i>Trachurus indicus</i>	Arabian scad
Cepolidae	138	CEPCE04	<i>Acanthocephala indica</i>	Bandfish
Chaetodontidae	139	CHAPA99	<i>Parachaetodon ocellatus</i>	Sixspine butterflyfish
Champsodontidae	140	CHMCH01	<i>Champsodon capensis</i>	Gaper
Drepaneidae	141	DREDR02	<i>Drepane punctata</i>	Spotted sicklefish
	142	DREDR03	<i>Drepane longimana</i>	Sicklefish
Echeneidae	143	ECNEC01	<i>Echeneis naucrates</i>	Live sharksucker
	144	ECNRE01	<i>Remora remora</i>	Shark sucker
	145	EPHEP01	<i>Ephippus orbis</i>	Spadefish
	146	EPHTR01	<i>Tripteron orbis</i>	African spadefish
Gempylidae	147	GEMNP01	<i>Neoepinnula orientalis</i>	Sackfish
Gerreidae	148	GERGE01	<i>Gerres filamentosus</i>	Whipfin silver-biddy
	149	GERGE04	<i>Gerres erythrorus</i>	Deepbody silver-b.
	150	GERGE09	<i>Gerres infasciatus</i>	Nonbanded whipfin mojarra
	151	GERPE01	<i>Pentaprion longimanus</i>	Longfin silver-biddy
Gobiidae	152	GOBBL02	<i>Boleophthalmus dussumieri</i>	Mudskipper
	153	GOBOX01	<i>Oxyurichthys papuensis</i>	Frogface goby
	154	GOBOX02	<i>Oxyurichthys petersii</i>	Frogface goby
	155	GOBPA02	<i>Aulopardia (?) ocellata</i>	
	156	GOBTA01	<i>Taenioides esquivel</i>	Bulldog Eelgoby
	157	GOBTA02	<i>Taenioides cirratus</i>	Bearded worm goby
	158	GOBTR02	<i>Trypauchen vagina</i>	Burrowing goby
	159	GOIOD01	<i>Odontamblyopus rubicondus</i>	
	160	PERGL01	<i>Glossogobius giuris</i>	Tank goby
Haemulidae	161	PODPO05	<i>Pomadasys multimaculatus</i>	Cock grunter
	162	PODPO06	<i>Pomadasys maculatus</i>	Saddle grunt, blotched grunt
	163	PODPO30	<i>Pomadasys argenteus</i>	Silver grunt
Labridae	164	LABTH01	<i>Thalassoma lunare</i>	Moon wrasse
Lactariidae	165	LACLA01	<i>Lactarius lactarius</i>	False trevally
Leiognathidae	166	LEIGA01	<i>Gazza minuta</i>	Toothpony
	167	LEILE02	<i>Leiognathus elongatus</i>	Slender ponyfish
	168	LEILE04	<i>Aurigequula fasciata</i>	Striped ponyfish
	169	LEILE07	<i>Leiognathus bindus</i>	Orangefin ponyfish
	170	LEILE08	<i>Eubleekeria splendens</i>	Splendid ponyfish
	171	LEILE09	<i>Leiognathus brevirostris</i>	Shortnose ponyfish
	172	LEISE01	<i>Secutor insidiator</i>	Pugnose ponyfish
	173	LEISE02	<i>Secutor ruconius</i>	Deep pugnose ponyfish
Lethrinidae	174	LETGY01	<i>Gymnocranius griseus</i>	Grey large-eye bream
	175	LETLE02	<i>Lethrinus lentjan</i>	Pink ear emperor
	176	LETLE21	<i>Lethrinus nebulosus</i>	Spangled emperor
	177	LETLE28	<i>Lethrinus ornatus</i>	Ornate emperor
Lobotidae	178	LOBLO01	<i>Lobotes surinamensis</i>	Atlantic tripletail
Lutjanidae	179	LUTLU06	<i>Lutjanus bohar</i>	Two-spot red snapper

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	180	LUTLU09	<i>Lutjanus argentimaculatus</i>	Mangrove red snapper
	181	LUTLU10	<i>Lutjanus johnii</i>	John's snapper
	182	LUTLU14	<i>Lutjanus lutjanus</i>	Bigeye snapper
	183	LUTLU15	<i>Lutjanus malabaricus</i>	Malabar blood snapper
	184	LUTLU17	<i>Lutjanus erythropterus</i>	Crimson snapper
	185	LUTLU51	<i>Lutjanus lunulatus</i>	Lunartail snapper
	186	LUTPI01	<i>Pinjalo pinjalo</i>	Pinjalo
	187	LUTPR02	<i>Pristipomoides filamentosus</i>	Crimson jobfish
Menidae	188	MENME01	<i>Mene maculata</i>	Moonfish
Mullidae	189	MULMO01	<i>Mulloidichthys vanicolensis</i>	Yellowfin goatfish
	190	MULPA16	<i>Parupeneus forsskali</i>	Red Sea goatfish
	191	MULUP01	<i>Upeneus japonicus</i>	Bensasi goatfish
	192	MULUP03	<i>Upeneus moluccensis</i>	Goldband goatfish
	193	MULUP04	<i>Upeneus tragula</i>	Freckled goatfish
	194	MULUP05	<i>Upeneus sulphureus</i>	Sulphur goatfish
	195	MULUP15	<i>Upeneus guttatus</i>	Two-tone goatfish
	196	MULUP16	<i>Upeneus supravittatus</i>	Long-fin goatfish
Nemipteridae	197	NEMNE01	<i>Nemipterus bipunctatus</i>	Delagoa threadfin bream
	198	NEMNE03	<i>Nemipterus japonicus</i>	Japanese threadfin bream
	199	NEMNE05	<i>Nemipterus peronii</i>	Peron's threadfin bream
	200	NEMNE07	<i>Nemipterus nematophorus</i>	Doublewhip threadfin bream
	201	NEMNE15	<i>Nemipterus randalli</i>	Randall's threadfin bream
	202	NEMPA02	<i>Parascalopsis aspinosa</i>	Smooth dwarf monocle bream
Percophidae	203	PECBE01	<i>Bembrops caudimacula</i>	
Pinguipedidae	204	PINPA04	<i>Parapercis alboguttata</i>	Whitespot sandsmelt
Polynemidae	205	PLNEL01	<i>Eleutheronema tetradactylum</i>	Fourfinger threadfin
	206	PLNLE01	<i>Leptomelanosoma indicum</i>	Indian threadfin
	207	PLNPD05	<i>Polydactylus sextarius</i>	Blackspot threadfin
	208	PLNPD07	<i>Polydactylus mullani</i>	Arabian blackspot threadfin
	209	PLNPO07	<i>Polynemus paradiseus</i>	Paradise threadfin
Pomacanthidae	210	PMOPO05	<i>Pomacanthus semicirculatus</i>	Semicircle angelfish
Priacanthidae	211	PRIPR02	<i>Heteropriacanthus cruentatus</i>	Glasseye
	212	PRIPR03	<i>Priacanthus hamrur</i>	Moontail bullseye
	213	PRIPR06	<i>Priacanthus tayenus</i>	Purple-spotted bullseye
	214	PRIPR08	<i>Priacanthus sagittarius</i>	Arrow bulleye
Rachycentridae	215	RACRA01	<i>Rachycentron canadum</i>	Cobia
Scatophagidae	216	SCTSC01	<i>Scatophagus argus</i>	Spotted scat
Sciaenidae	217	SCIAR09	<i>Argyrosomus japonicus</i>	Japanese meagre
	218	SCIAR99	<i>Pennahia argentata</i>	Silver crocker
	219	SCIJO01	<i>Johnius belangerii</i>	Belanger's croaker
	220	SCIJO02	<i>Johnius dussumieri</i>	Bearded croaker
	221	SCIJO03	<i>Johnius carutta</i>	Caroun croaker
	222	SCIJO04	<i>Johnius macropterus</i>	Largefin croaker
	223	SCIJO09	<i>Johnius elongatus</i>	Spindle croaker
	224	SCIJP02	<i>Johnius dussumieri</i>	Sin croaker
	225	SCIJP03	<i>Johnieops vogleri</i>	Sharp-toothed hammer croaker
	226	SCINI03	<i>Nibea maculata</i>	Blotched croaker
	227	SCIOS01	<i>Otolithoides biauritus</i>	Bronze croaker
	228	SCIOS02	<i>Otolithoides pama</i>	Pama croaker
	229	SCIOS99	<i>Otolithoides pama</i>	Jew fish, Pama croaker
	230	SCIOT01	<i>Otolithes ruber</i>	Tigertooth croaker
	231	SCIOT02	<i>Otolithes cuvieri</i>	Lesser tigertooth croaker
	232	SCIPB01	<i>Panna microdon</i>	Panna croaker

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	233	SCICE04	<i>Pennahia anea</i>	Greyfin croaker
	234	SCIPR01	<i>Protonibea diacanthus</i>	Spotted croaker
	235	SCIPU02	<i>Pterolithus maculatus</i>	Blotched tiger-toothed croaker
Scombridae	236	SCMAU02	<i>Auxis rochei</i>	Bullet tuna
	237	SCMRA01	<i>Rastrelliger kanagurta</i>	Indian mackerel
	238	SCMRA02	<i>Rastrelliger brachysoma</i>	Short mackerel
	239	SCMSA02	<i>Sarda orientalis</i>	Striped bonito
	240	SCMSM02	<i>Scomberomorus lineolatus</i>	Streaked seerfish
	241	SCMSM03	<i>Scomberomorus commerson</i>	Narrow-barred Spanish mackerel
	242	SCMSM04	<i>Scomberomorus guttatus</i>	Indo-Pacific king mackerel
	243	SCMSM06	<i>Scomberomorus koreanus</i>	Korean seerfish
	244	SCMTH05	<i>Thunnus tonggol</i>	Longtail tuna
Serranidae	245	SERCE05	<i>Cephalopholis boenak</i>	Chocolate hind
	246	SEREP06	<i>Epinephelus bleekeri</i>	Duskytail grouper
	247	SEREP09	<i>Epinephelus malabaricus</i>	Malabar grouper
	248	SEREP11	<i>Epinephelus morrhua</i>	Comet grouper
	249	SEREP18	<i>Epinephelus chlorostigma</i>	Brownspotted grouper
	250	SEREP20	<i>Epinephelus latifasciatus</i>	Striped grouper
	251	SEREP62	<i>Epinephelus coioides</i>	Orange-spotted grouper
	252	SEREP73	<i>Epinephelus lanceolatus</i>	Giant grouper
	253	SEREP99	<i>Epinephelus tauvina</i>	Greasy grouper
	254	SERGR01	<i>Grammistes sexlineatus</i>	Goldenstriped soapfish
Siganidae	255	SIGSI01	<i>Siganus canaliculatus</i>	White-spotted spinefoot
	256	SIGSI06	<i>Siganus javus</i>	Streaked spinefoot
Sillaginidae	257	SILSI01	<i>Sillago sihama</i>	Silver sillago
	258	SILSL01	<i>Sillaginopsis panijus</i>	Flathead sillago
Sphyrinae	259	SPHSP04	<i>Sphyrna forsteri</i>	Bigeye barracuda
	260	SPHSP05	<i>Sphyrna barracuda</i>	Great barracuda
	261	SPHSP06	<i>Sphyrna obtusata</i>	Obtuse barracuda
	262	SPHSP07	<i>Sphyrna jello</i>	Rockhandle barracuda
	263	SPHSP09	<i>Sphyrna putnamae</i>	Sawtooth barracuda
Stromateidae	264	STRPA01	<i>Pampus argenteus</i>	Silver pomfret
	265	STRPA02	<i>Pampus chinensis</i>	Chinese (silver) pomfret
Terapontidae	266	THEPE01	<i>Pelates quadrilineatus</i>	Fourlined terapon
	267	THETH01	<i>Terapon jarbua</i>	Jarbua terapon
	268	THETH02	<i>Terapon theraps</i>	Largescaled terapon
Trichiuridae	269	TRIEU01	<i>Eupleurogrammus muticus</i>	Malayan hairtail
	270	TRILT01	<i>Lepturacanthus savala</i>	Savalani hairtail
	271	TRITR01	<i>Trichiurus lepturus</i>	Largehead hairtail
	272	TRITR03	<i>Trichiurus gangeticus</i>	
Uranoscopidae	273	URAUR09	<i>Uranoscopus marmoratus</i>	
	274	URAUR10	<i>Uranoscopus dollfusi</i>	Dollfus' stargrazer
	275	URAUR98	<i>Uraoscopus fuscomaculatus</i>	
	276	URAUR99	<i>Uranoscopus guttatus</i>	Dollfus' stargrazer

Pleuronectiformes

Bothidae	277	BOTBO02	<i>Bothus myriaster</i>	Oval flounder
	278	BOTLA05	<i>Leops nigrescens</i>	
	279	BOTPS02	<i>Pseudorhombus elevatus</i>	Deep flounder
	280	BOTPS04	<i>Pseudorhombus triocellatus</i>	Three spotted flounder
	281	BOTPS06	<i>Pseudorhombus javanicus</i>	Javan flounder
	282	BOTPS09	<i>Pseudorhombus malayanus</i>	Malayan flounder
Citharidae	283	CITBR01	<i>Brachypleura novaezeelandiae</i>	Yellow-dabbled flounder

Family		Species code	Species (latin name)	Common name
Cynoglossidae	284	CYGCY03	<i>Cynoglossus bilineata</i>	
	285	CYGCY04	<i>Cynoglossus arel</i>	Largescale tonguesole
	286	CYGCY11	<i>Cynoglossus capensis</i>	Sand tonguefish
	287	CYGCY16	<i>Cynoglossus cynoglossus</i>	Bengal tongue sole
	288	CYGCY26	<i>Cynoglossus lingua</i>	Long tongue sole
	289	CYGCY27	<i>Cynoglossus puncticeps</i>	Speckled tonguesole
	290	CYGCY28	<i>Cynoglossus macrolepidotus</i>	
	291	CYGPA01	<i>Paraplagusia bilineata</i>	Doublelined tonguesole
Pleuronectidae	292	PLEPA01	<i>Paralichthodes algoensis</i>	Peppered flounder
Psettodidae	293	PSEPS02	<i>Psettodes erumei</i>	Indian spiny turbot
Soleidae	294	SOLAE01	<i>Aesopia cornuta</i>	Unicorn sole
	295	SOLBR01	<i>Brachirus orientalis</i>	Oriental sole
	296	SOLSO03	<i>Solea elongata</i>	Elongate sole
	297	SOLSO04	<i>Solea ovata</i>	Ovate sole
	298	SOLZE02	<i>Zebrias zebra</i>	Blendbanded sole
	299	SOLZE03	<i>Zebrias synapturoides</i>	Zebra sole

Scorpaeniformes

Dactylopteridae	300	DACDN01	<i>Dactyloptena orientalis</i>	Oriental flying gurnard
Platycephalidae	301	PLACO01	<i>Cociella crocodilus</i>	Crocodile flathead
	302	PLAGR02	<i>Grammoplites suppositus</i>	Spotfin flathead
	303	PLAGR04	<i>Grammoplites scaber</i>	Rough flathead
	304	PLAON01	<i>Onigocia pedinacula</i>	Broadband flathead
	305	PLAPL01	<i>Platycephalus indicus</i>	Bartail flathead
	306	PLARO01	<i>Rogadius asper</i>	Olive-tailed flathead
	307	PLASO02	<i>Sorsogona tuberculata</i>	Tuberculated flathead
Scorpaenidae	308	SCREB01	<i>Ebosia falcata</i>	
	309	SCRMI90	<i>Minous 'striped'</i>	Minous 'striped'
	310	SCRMI99	<i>Minous pictus</i>	Painted stinger
	311	SCRPT01	<i>Pterois volitans</i>	
	312	SCRPT02	<i>Pterois mombasae</i>	Frillfin turkeyfish
	313	SCRPT03	<i>Pterois russellii</i>	Plaintail turkeyfish
	314	SCRPT05	<i>Pterois miles</i>	Devil firefish
	315	SCRSP02	<i>Scorpaenodes investigaturis</i>	
Triglidae	316	TRGLE04	<i>Lepidotrigla spiloptera</i>	Spottedwing gurnard
	317	TRGLE15	<i>Lepidotrigla bispinosa</i>	Bullhorn gurnard
	318	TRGPT03	<i>Pterygotrigla arabica</i>	
Apistidae	319	SCRAP01	<i>Apistus carinatus</i>	Ocellated waspfish

Siluriformes

Ariidae	320	ARDAR06	<i>Arius maculatus</i>	Spotted catfish
	321	ARDAR26	<i>Arius venosus</i>	Veined catfish
	322	ARDPL05	<i>Plicofollis dussumieri</i>	Blacktip sea catfish
Pangasiidae	323	PANPA01	<i>Pangasius pangasius</i>	Pangas catfish
Plotosidae	324	PLOPL01	<i>Plotosus lineatus</i>	Striped eel catfish

Syngnathiformes

Fistulariidae	325	FISFI01	<i>Fistularia petimba</i>	Red cornetfish
	326	FISFI02	<i>Fistularia commersonii</i>	Bluespotted cornetfish
Syngnathidae	327	SYGHI07	<i>Hippocampus kuda</i>	Estuary seahorse

Tetraodontiformes

Diodontidae	328	DIOCY01	<i>Cylichthys orbicularis</i>	Birdbeak burrfish
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Family		Species code	Species (latin name)	Common name
	329	DIODI01	<i>Diodon hystrix</i>	Porcupine fish
Monacanthidae	330	MONAL02	<i>Aluterus monoceros</i>	Unicorn leatherjacket
Ostraciidae	331	OSTOS01	<i>Ostracion cubicus</i>	Yellow boxfish
	332	OSTRH01	<i>Rhynchostracion nasus</i>	Small-nosed boxfish
	333	OSTTE01	<i>Tetrosomus gibbosus</i>	Hunchback boxfish
Tetraodontidae	334	TETAR01	<i>Arothron immaculatus</i>	Immaculate puffer
	335	TETAR06	<i>Arothron leopardus</i>	Banded leopardblowfish
	336	TETLA03	<i>Lagocephalus lunaris</i>	Yellow toby
	337	TETLA05	<i>Lagocephalus spadiceus</i>	Yellow rough-back pufferfish
	338	TETLA06	<i>Lagocephalus lagocephalus</i>	Oceanic puffer
	339	TETLA07	<i>Lagocephalus guentheri</i>	Blackback puffer
	340	TETTA01	<i>Takifugu oblongus</i>	Lattice blaasop
	341	TETTA05	<i>Takifugu oblongus</i>	Mito fish
Triacanthidae	342	TRNTR03	<i>Triacanthus nieuhofii</i>	Silver tripodfish
	343	TRNPS01	<i>Pseudotriacanthus strigilifer</i>	Long-spined tripodfish
	344	TRNTR01	<i>Triacanthus biaculeatus</i>	Short-nosed tripodfish

Crustacea (Shrimps, crabs, lobsters & mantis):

Group		Species code	Species (Latin name)	Common name
Crabs	345	CRACA16	<i>Calappa lophos</i>	Common box crab
	346	CRACA99	<i>Carcinoscorpius rotundicanda</i>	Horseshoe crab
	347	CRAMT01	<i>Matuta planipes</i>	Moon crab
	348	CRAMT02	<i>Ashtorat lunaris</i>	Yellow moon crab
	349	CRAMT99	<i>Matuta victor</i>	
	350	CRAOC99	<i>Pramithrax aculeatus</i>	
	351	CRAPD99	<i>Podophthalmus vigil</i>	Sentinel crab
	352	CRAPO01	<i>Thalamita crenata</i>	Mangrove swimming crab
	353	CRAPO15	<i>Charybdis feriata</i>	
	354	CRAPO16	<i>Charybdis natator</i>	Red-ridged crab
	355	CRAPO20	<i>Charybdis smithii</i>	Pelagic swimming crab
	356	CRAPO34	<i>Achelous iridescens</i>	
	357	CRAPO38	<i>Portunus sanguinolentus</i>	Bloodspotted crab
	358	CRAPO39	<i>Scylla serrata</i>	Green mangrove crab
	359	CRAPO3A	<i>Portunus gladiator</i>	Swimming crab
	360	CRAPO3B	<i>Portunus pelagicus</i>	Flower crab
	361	CRAPO96	<i>Portunid (Black crab)</i>	
	362	CRAPO98	<i>Charybdis hellerii</i>	
	263	CRAPOE1	<i>Scylla olivacea</i>	
	364	CRASC01	<i>Scylla tranquebarica</i>	
365	CRAVA99	<i>Veruna litterata</i>		
Lobsters	366	LOBPA25	<i>Panulirus polyphagus</i>	Mud spiny lobster
	367	LOBPA29	<i>Panulirus penicillatus</i>	Pronghorn spiny lobster
	368	LOBSC21	<i>Thenus orientalis</i>	Flathead lobster
Mantis	369	CRUSQ11	<i>Squilla mantis</i>	Spotted mantis shrimp
Palaemonidae	370	SHRPM23	<i>Nematopalaemon tenuipes</i>	Spider prawn/shrimp
	371	SHRPM31	<i>Exopalaemon styliferus</i>	Roshna prawn
Penaeidae	372	SHRPE22	<i>Parapenaeopsis stylifera</i>	Kiddi shrimp
	373	SHRPE23	<i>Parapenaeopsis sculptilis</i>	Rainbow shrimp
	374	SHRPE25	<i>Metapenaeopsis stridulans</i>	Fiddler shrimp
	375	SHRPE26	<i>Parapenaeopsis hardwickii</i>	
	376	SHRPE27	<i>Mierspenaeopsis hardwickii</i>	
	377	SHRPE28	<i>Parapenaeopsis uncta</i>	

Group		Species code	Species (Latin name)	Common name	
	378	SHRPE32	<i>Parapenaeus longipes</i>	Flamingo shrimp	
	379	SHRPE61	<i>Penaeus notialis</i>	Southern pink shrimp	
	380	SHRPE63	<i>Penaeus monodon</i>	Giant tiger prawn	
	381	SHRPE64	<i>Penaeus indicus</i>	Indian white prawn	
	382	SHRPE66	<i>Penaeus semisulcatus</i>	Green tiger prawn	
	383	SHRPE68	<i>Penaeus canaliculatus</i>	Witch prawn	
	384	SHRPE6I	<i>Penaeus merguensis</i>	Banana prawn	
	385	SHRPE71	<i>Metapenaeus monoceros</i>	Speckled shrimp	
	386	SHRPE73	<i>Metapenaeus affinis</i>	Jinga shrimp	
	387	SHRPE77	<i>Metapenaeus lysianassa</i>	Bord shrimp	
	388	SHRPE79	<i>Metapenaeus dobsoni</i>	Kadal shrimp	
	389	SHRPE88	<i>Metapenaeus brevicornis</i>	Yellow shrimp	
		390	SHRPM42	<i>Macrobrachium malcolmsonii</i>	
		391	SHRSO63	<i>Solenocera indica</i>	
Solenoceridae	392	SHRSO16	<i>Solenocera crassicornis</i>	Coastal mud shrimp	
	393	SHRSO19	<i>Solenocera hextii</i>	Deep-sea mud shrimp	

Cephalopods:

Group		Species code	Species (Latin name)	Common name
Squid	394	SQUBR10	<i>Brachioteuthis sp.</i>	Arm squid
	395	SQULE10	<i>Pholidoteuthis sp.</i>	Scaled squid
	396	SQULO52	<i>Sepioteuthis lessoniana</i>	Bigfin reef squid
	397	SQULO71	<i>Uroteuthis duvauceli</i>	Squid
	398	SQUPS11	<i>Psychroteuthis glacialis</i>	Gracial squid
Octopus	399	SQUOC10	<i>Octopus sp.</i>	Octopus
	400	SQUOC11	<i>Octopus vulgaris</i>	Common octopus
	401	SQUOC1B	<i>Octopus aegina</i>	Marbled octopus
	402	SQUOCIB	<i>Amphioctopus aegina</i>	Sandbird octopus
Cuttle fish	403	SQUSE10	<i>Sepia sp.</i>	Cuttlefish
	404	SQUSE11	<i>Sepia officinalis</i>	Common cuttlefish
	405	SQUSE14	<i>Sepia pharaonis</i>	Pharaoh cuttlefish
	406	SQUSE18	<i>Sepia esculenta</i>	Golden cuttlefish
	407	SQUSE1G	<i>Sepia aculeata</i>	Needle cuttlefish

Up to genus level:

Order	Family		Species code	Species (latin name)	Common name
Anguilliformes	Congridae	1	CONAR00	<i>Ariosoma sp.</i>	Conger
		2	CONRH00	<i>Rhynchoconger sp.</i>	
	Muraenesocidae	3	MUXMU00	<i>Muraenesox sp.</i>	Pike conger
	Muraenidae	4	MURGY00	<i>Gymnothorax sp.</i>	Moray
Aulopiformes	Synodontidae	5	SYNSA00	<i>Saurida sp.</i>	Lizardfish
Beloniformes	Exocoetidae	6	EXOCY00	<i>Cypselurus sp.</i>	Flyingfish
Gadiformes	Bregmacerotidae	7	BREBR00	<i>Bregmaceros sp.</i>	Codlet
Lophiiformes	Lophiidae	8	LOPLO00	<i>Lophiodes sp.</i>	Angler
	Ogcocephalidae	9	OGCHA00	<i>Halieutaea sp.</i>	
Notacanthiformes	Notacanthidae	10	ANGLE00	<i>Leptocephalus sp.</i>	Eel larvae
Ophidiiformes	Ophidiidae	11	OPDMM00	<i>Monomitopus sp.</i>	
Perciformes	Ambassidae	12	AMBAM00	<i>Ambassis sp.</i>	Perchlet, glassy
	Apogonidae	13	APOAO00	<i>Apogonichthyoides sp.</i>	Cardinalfish
		14	APOJA00	<i>Jaydia sp.</i>	Cardinal
	Ariommatidae	15	ARMAR00	<i>Ariomma sp.</i>	Driftfish
	Carangidae	16	CARAL00	<i>Alectis sp.</i>	Threadfish

Order	Family		Species code	Species (latin name)	Common name
		17	CARCA00	<i>Caranx</i> sp.	Trevally
		18	CARCS00	<i>Carangoides</i> sp.	Trevally
		19	CARDE00	<i>Decapterus</i> sp.	Scad
		20	CARUR00	<i>Uraspis</i> sp.	Jack
	Drepaneidae	21	DREDR00	<i>Drepane</i> sp.	Sicklefish
	Gerreidae	22	GERPE00	<i>Pentaprion</i> sp.	Silver-biddy
	Gobiidae	23	GOBOX00	<i>Oxyurichthys</i> sp.	
	Leiognathidae	24	LEIGA00	<i>Gazza</i> sp.	Toothpony
		25	LEILE00	<i>Leiognathus</i> sp.	Ponyfish
		26	LEISE00	<i>Secutor</i> sp.	
	Nemipteridae	27	NEMNE00	<i>Nemipterus</i> sp.	Threadfin bream
	Priacanthidae	28	PRIPR00	<i>Priacanthus</i> sp.	Bigeye
	Sciaenidae	29	SCIJO00	<i>Johnius</i> sp.	Croaker
		30	SCIOT00	<i>Otolithes</i> sp.	Croaker
	Serranidae	31	SERCP00	<i>Chelidoperca</i> sp.	
Sillaginidae	32	SILSI00	<i>Sillago</i> sp.	Sillago	
Uranoscopidae	33	URAU00	<i>Uranoscopus</i> sp.	Stargazer	
Pleuronectiformes	Bothidae	34	BOTAR00	<i>Arnoglossus</i> sp.	Scaldfish
	Cynoglossidae	35	CYGCY00	<i>Cynoglossus</i> sp.	Tonguesole
	Soleidae	36	SOLAS00	<i>Aseraggodes</i> sp.	Pacific sole
		37	SOLSO00	<i>Solea</i> sp.	Sole
Scorpaeniformes	Dactylopteridae	38	DACDN00	<i>Dactyloptena</i> sp.	Flying gurnard
	Platycephalidae	39	PLAON00	<i>Onigocia</i> sp.	
		40	PLAPL00	<i>Platycephalus</i> sp.	Flathead, river gurnard
		41	PLASO00	<i>Sorsogona</i> sp.	Flathead
	Scorpaenidae	42	SCRSP00	<i>Scorpaenodes</i> sp.	Scorpionfish
Siluriformes	Ariidae	43	ARDAR00	<i>Arius</i> sp.	Sea catfish
	Pangasiidae	44	PANAA00	<i>Pangasius</i> sp.	
	Plotosidae	45	PLOPL00	<i>Plotosus</i> sp.	Eel catfish
Syngnathiformes	Fistulariidae	46	FISFI00	<i>Fistularia</i> sp.	Cornetfish
	Syngnathidae	47	SYGTR00	<i>Trachyrhamphus</i> sp.	Pipefish
Tetraodontiformes	Diodontidae	48	DIOCY00	<i>Cylichthys</i> sp.	Burrfish
	Tetraodontidae	49	TETLA00	<i>Lagocephalus</i> sp.	Puffer
		50	TETTE00	<i>Tetraodon</i> sp.	

Assessment of selected marine stocks

Stock Status Summary

Catch-Effort Data Analyses

NOTES:

- All assessments made using biomass dynamics except Tiger shrimp which is done using an annual depletion model.
- All models/analyses depend on correct historical catch data. Pomfret and catfish have problems in historical data. Bombay duck and croaker also assessed, but results too unreliable to present.

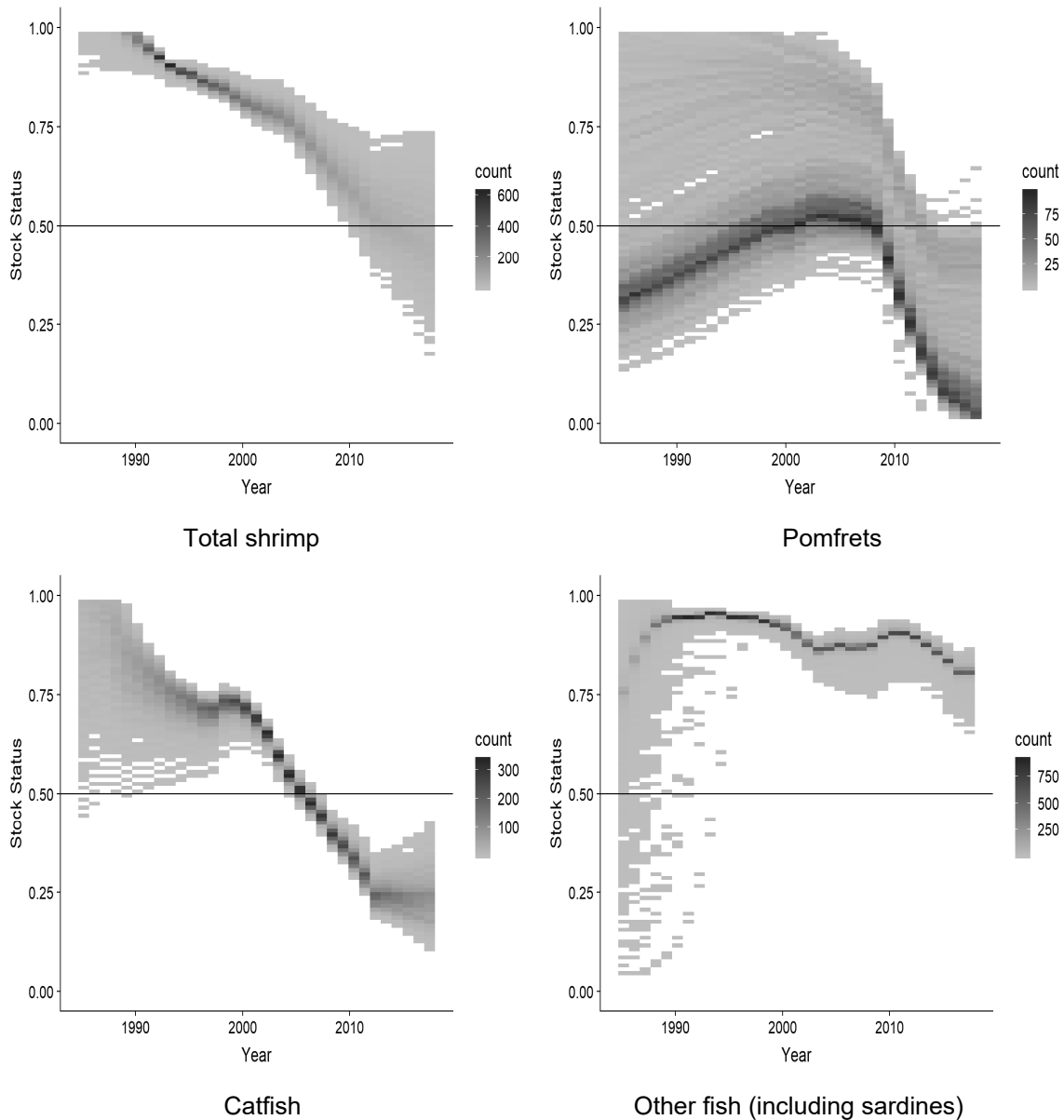


Figure: Biomass dynamics model of selected groups

Survey length-based mortality

Pomfrets

Pampus argenteus

Fishing mortality estimates and results for *P. argenteus* considered two alternatives for the growth rate coefficients found from published sources. Baseline estimate assumes $K=0.53$ and the alternate assumes $K=0.65$.

Reference Point	Baseline Growth rate (K=.53)	High Growth rate (K=.65)
Current F	1.209	1.780
SPR 20%	0.682	0.798
SPR 30%	0.504	0.587
SPR 40%	0.380	0.442
F0.1	0.943	1.214

Pampus chinensis

Fishing mortality estimates and results for *P. chinensis* considered two alternatives for the growth rate coefficients found from published sources. Baseline estimate assumes $K=0.67$ and the alternate assumes $K=0.85$.

Reference Point	Baseline growth rate (K=0.67)	Higher growth rate (K=0.85)
Current F	0.425	0.494
SPR20%	0.879	1.059
SPR30%	0.650	0.776
SPR40%	0.488	0.581
F _{0.1}	1.145	1.546

Croaker

Otolithes cuvieri

Fishing mortality estimates and results for *Otolithes cuvieri* considered two alternatives for the growth rate coefficients found from published sources. Baseline estimate assumes $K=0.30$ and the alternate assumes $K=0.61$.

Reference Point	Baseline Growth (K=0.3)	High Growth (K=0.61)
Current F	1.998	4.241
SPR 20%	0.457	0.804
SPR 30%	0.340	0.588
SPR 40%	0.258	0.440
F0.1	0.379	0.706

Pennahia anea

Fishing mortality estimates and results for *Pennahia anea* considered two alternatives for the growth rate coefficients found from published sources. Baseline estimate assumes $K=0.60$ and the alternate assumes $K=1.0$.

Reference Point	Baseline Growth (K=0.6)	High Growth (K=1.0)
Current F	0.635	1.249
SPR 20%	0.914	1.450
SPR 30%	0.676	1.053
SPR 40%	0.511	0.785
F0.1	0.994	1.816

Catfishes

Arius sp.

Fishing mortality estimates and results for *Arius* sp. considered two alternatives for the growth rate coefficients found from published sources. Baseline estimate assumes $K=0.2$ and the alternate assumes $K=0.28$.

Reference Point	Baseline Growth ($K=0.2$)	High Growth ($K=0.28$)
Current F	0.447	0.667
SPR 20%	0.431	0.508
SPR 30%	0.320	0.375
SPR 40%	0.243	0.283
F0.1	0.272	0.308

Indian Salmon

Leptomelanosoma indicum

Fishing mortality estimates and results for *L. indicum* considered one estimate for the growth rate coefficients found from published sources. The estimate assumes $K=0.189$.

Reference Point	Baseline Growth ($k=0.189$)
Current F	2.515
SPR 20%	0.385
SPR 30%	0.288
SPR 40%	0.219
F0.1	0.292

Sardines

Dussumieria spp.

Fishing mortality estimates and results for *Dussumieria* spp. considered two alternatives for the growth rate coefficients found from published sources. Baseline estimate assumes $K=0.6$ and the alternate assumes $K=1.0$.

Reference Point	Baseline Growth $k=(0.6)$	Baseline Growth $k=(1.0)$
Current F	0.623	-0.045
SPR 20%	1.078	1.868
SPR 30%	0.797	1.338
SPR 40%	0.601	0.986
F0.1	1.398	1.981

Sardinella spp.

Fishing mortality estimates and results for *Sardinella* spp. considered two alternatives for the growth rate coefficients found from published sources. Baseline estimate assumes $K=1.2$ and the alternate assumes $K=1.5$.

Reference Point	Baseline Growth $k=(1.2)$	Baseline Growth $k=(1.5)$
Current F	6.296	7.958
SPR 20%	2.859	3.600
SPR 30%	2.121	2.631
SPR 40%	1.604	1.970
F0.1	4.725	4.482

Shrimp

Fenneropenaeus indicus

Table of fishing mortality estimates and results:

Reference Point	Historical	Recent
Current F	-0.114	-1.083
SPR 20%	1.058	1.362
SPR 30%	0.782	0.996
SPR 40%	0.590	0.745
F0.1	2.699	2.654

Metapenaeus monoceros

Table of fishing mortality estimates and results:

Reference Point	Baseline	Alternate
Current F	3.134	2.820
SPR 20%	1.585	1.790
SPR 30%	1.171	1.316
SPR 40%	0.883	0.989
F0.1	2.392	2.470

Summary table of fishing mortality

Group	Species	Scenario	Current F	SPR 20%	SPR 30%	SPR 40%	F0.1
Bombay duck	<i>Harpadon nehereus</i>	Baseline	2.176	3.536	1.144	0.835	0.625
Catfish	<i>Arius</i> sp.	Baseline	0.447	0.431	0.320	0.243	0.272
		High K	0.667	0.508	0.375	0.283	0.308
Croakers	<i>Otolithes cuvieri</i>	Baseline	1.998	0.457	0.340	0.258	0.379
		High K	4.241	0.804	0.588	0.440	0.706
	<i>Pennahia anea</i>	Baseline	0.635	0.914	0.676	0.511	0.994
		High K	1.249	1.450	1.053	0.785	1.816
Indian Salmon	<i>Leptomelanosoma indicum</i>	Baseline	2.515	0.385	0.288	0.219	0.292
Pomfrets	<i>Pampus argenteus</i>	Baseline	1.209	0.682	0.504	0.380	0.943
		High K	1.780	0.798	0.587	0.442	1.214
	<i>Pampus chinensis</i>	Baseline	0.425	0.879	0.648	0.488	1.145
		High K	0.494	1.059	0.776	0.581	1.546
Sardines	<i>Dussumieria</i> sp.	Baseline	0.623	1.078	0.797	0.601	1.398
		High K	-0.045	1.868	1.338	0.986	1.981
	<i>Sardinella</i> sp.	Baseline	6.296	2.859	2.121	1.604	4.725
		High K	7.958	3.600	2.631	1.970	4.482
Shrimp	<i>Fenneropenaeus indicus</i>	Historical	-0.114	1.058	0.782	0.590	2.699
		Recent	-1.083	1.362	0.996	0.745	2.654
	<i>Metapenaeus monoceros</i>	Baseline	3.134	1.585	1.171	0.883	2.392
		Alternate	2.820	1.790	1.316	0.989	2.470