Mapping of fishery resources in trawling grounds along the Malabar-Konkan coast

A. P. Dineshbabu, Sujitha Thomas, E. V. Radhakrishnan, B. Sridhara, Y. Muniyappa, S. Kemparaju and G. D. Nataraja
Research Centre of CMFRI, Mangalore

Two categories of bottom trawl units are in operation along the Malabar-Konkan coast. The first category comprises of small boats (<9.75 m OAL) conducting daily trips operating trawl nets with codend mesh size of 10-20 mm and catch generally prawns, flatfishes and other finfishes. The second category comprises medium sized boats (9.75- 15 m OAL) which conduct multiday fishing cruises and carry various types of nets such as the relatively large mesh sized 'fish-nets' targeting finfishes, and the 'shrimp-nets' having 15-18 mm mesh size for shrimps. The crafts are still undergoing several structural as well as mechanical changes to the advantage of the fishermen. The size has been increased suitably for the operation of larger gears, with provision of winches and other operational machines, the size and shape of otterboards too have undergone several changes in design and shape, fish holds have been modified to store more fish in better condition. The large crafts (<45') are so designed for good stability with endurance of 10-15 days out at sea and fish hold capacity of 20-30 t. The multiday trawlers have evolved into highly sophisticated vessels with endurance of 15- 20 days with the latest electronic equipments like fish finders, sonars, GPS and radio telephony. The fish hold capacity too has increased from 5 to 40 t per vessel. The introduction of high speed engines has further empowered the fishermen to sweep larger water bodies by active mechanical powered fishing, allowing very little scope for the fishes to escape the fishing nets. From resource exploitation point of view, as a result of the intensive sweeping by multiday trawlers, the catch represents the total species distribution in the fishing ground. The major lacuna felt is the lack of information on the fishes discarded. In the present study, this aspect of the fishery was also incorporated to get an idea of the resource distribution in the trawling grounds along the Malabar-Konkan coast.

Fish landing data were collected from trawlers landed at Mangalore Fisheries Harbour during 2008-2009. Collection schedule was twice a week with eight observations per month. The catch was recorded as those landed for "edible uses" and the rest landed as low valued bycatch, "trash". Monthly estimates of catch, effort and species composition of commercial catch and trash were prepared based on these data. Data on onboard catch, bycatch and discards were collected from a commercial trawler operated from Mangalore during 2008-2009 on daily basis for 483 trawling days. The trawler selected was 52'' wooden with 160 hp engine capacity, engaged in multiday trawling for a cruise period of 8 to 13 days per trip. Usually the trawl unit took one day break for unloading and ice filling between the cruises. The trawler generally carried three types of trawl nets of about 10 different codend pieces to change the codend according to the resource availability at space and time. Except during the trawl ban period (June-July), data collection was continuous. Onboard information collected and recorded were cruise no., date, depth of shooting, time of shooting, shooting longitude, shooting latitude, hauling depth, hauling time, hauling latitude, hauling longitude, net type, mesh size, total catch (kg), total discard (kg) and number of hauls per day. Along with fishing information, an unsorted portion of discarded catch was collected as sample with token number representing the haul. The spatial data thus collected were used as input for the GIS study. The samples were preserved in ice and stored in fish hold. Qualitative and quantitative analyses of the samples were carried out in the laboratory. Weight of sample was taken and the species present in the discard sample were sorted out. Number, length and weight of individual fishes in each group were recorded. The number was raised to number of fishes in each haul and to the day's catch. Similar raising was also done in the case of commercial fishes also. These data were fed to MS Access files. Number, size and individual weight of the species in the sample were recorded to get a picture of life stages of the species, especially, juveniles, sub-adults and adults. For spatio-temporal distribution mapping and smooth handling of data, two softwares were used, the ArcGIS and Visual Basic 6. Visual Basic is populated with

data of commercial catch and discards, which comprises geographic coordinates, water depths, net types, commercial fish, discard species *etc*. Thematic shape files/feature classes were prepared by sending queries into these tables.

Mangalore is the most important trawl landing centre in Karnataka and one of the most progressive fisheries harbours in the country. Investigations on the extent of trawling operations from Mangalore Fisheries Harbour during 2008-2009 showed that trawlers from Mangalore operated in seas off Calicut in the south (75° E,11°N) to off Ratnagiri in the north (73.5° E to 17° N). The depth of operation was between 5 and 167 m and the most intensive trawling operations were observed in fishing grounds at 30 m depth off Mangalore to Panaji, followed by fishing grounds at 100 m depth off Malpe to Karwar. Fishing grounds at 30 m depth off Ratnagiri was found to be fished with moderate intensity. Results of the present study reveals that most of the fishing operations are concentrated within the 150 m depth zone and extension was mainly parallel to the shore, towards south or north.

Monthwise, resource maps were prepared from the data collected (Fig. 1a-k and Table 1a-k). The total number of species caught per month varied from 106 to 154. Maximum number was caught in May and minimum in February (Fig. 2). Major resources caught were *Nemipterus* spp. and other major contributors were cuttlefish, *Lagaocephalus* sp., *Trichiurus lepturus*, *Saurida* spp., *Priacanthus hamrur* and squilla. Maximum catch of *Nemipterus* spp. was in August. Cuttlefish formed the major catch during postmonsoon period (Fig. 3). To make the data more informative for resource conservation studies, the tables were made in such a way that instead of listing out the species, the abundance of all the commercially important species were split into commercial size and its juvenile size. These size-wise categorisation (Table 1 a-k) will give more information for evolving policies to conserve and manage commercially important species of the coast.

For illustration, pooled data for both years were used to have a better coverage. Catch per hour (CPH) iis taken as criteria for resource abundance. Present study, eventhough not comprehensive, provides a fairly good picture of the distribution and abundance of fishery resources in commercial fishing grounds. The study is based on the sampling data from a single boat and in future by incorporating more trawlers in the experiment, a comprehensive picture of resource distribution along Malabar- Konkan coast can be obtained.

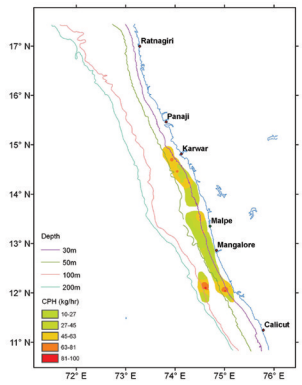

Fig. 1 a. January

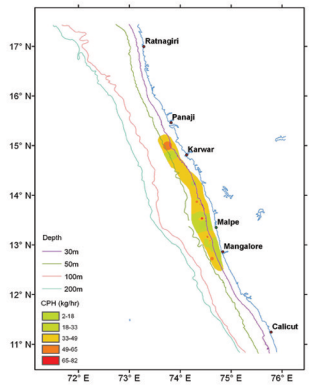

Fig. 1 b. February

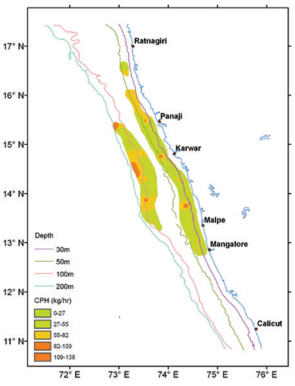

Fig. 1 C. March

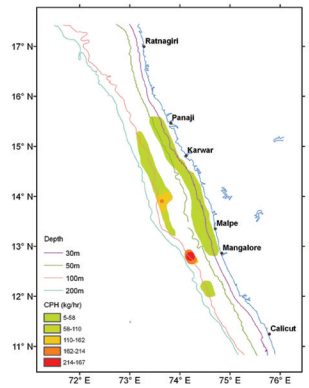

Fig. 1 d. April

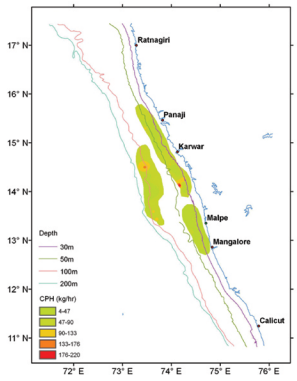

Fig. 1 e. May

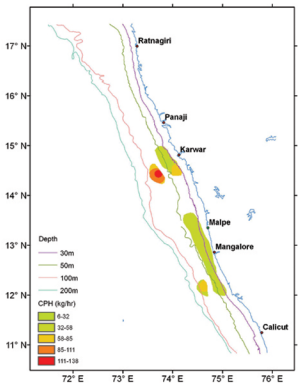

Fig. 1 f. June

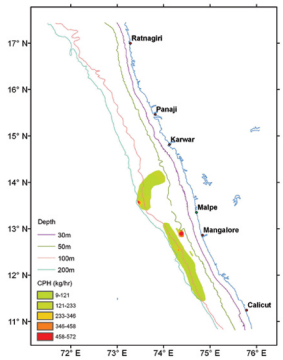

Fig. 1 g. August

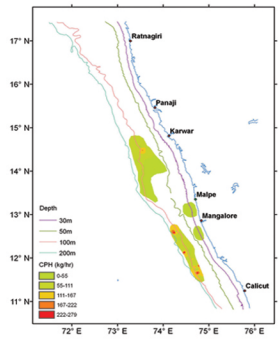

Fig. 1 h. September

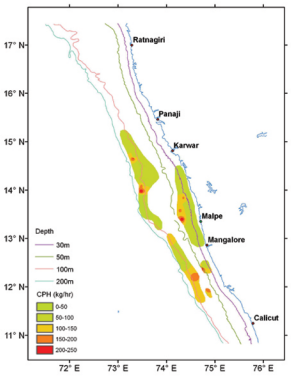

Fig. 1 i. October

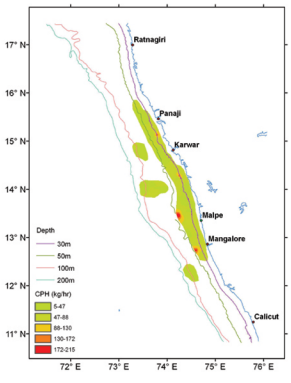

Fig. 1 j. November

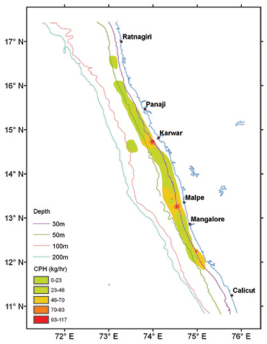

Fig. 1 k. December

Fig. 1. Fishery resource mapping along Malabar-Konkan coast for the year 2008-2009

Table 1. Monthly abundance (CPH) of different species /groups of marine resources in the trawling grounds off Malabar- Konkan coast

(a) January

Group/Species	(kg)	Group/Species	(kg)	Group/Species	(kg)	Group/Species	(kg)
Nemipterus randalli	10.27	*Lactarius lactarius*	0.30	*Rastrelliger kanagurta* (juvenile)	0.05	*Cryptopodia angulata*	0.01
Lagocephalus inermis	9.59	*Epinephelus diacanthus* (juvenile)	0.29	*Rachycentron canadum*	0.04	*Dactyloptena* sp.	0.01
Trichiurus lepturus	7.76	*Megalaspis cordyla*	0.28	*Pterois volitans*	0.04	*Opisthopterus tardoore* (juvenile)	0.01
Saurida tumbil	6.19	*Charybdis feriatus*	0.27	*Gobius* sp.	0.04	*Acanthurus* sp.	0.01
Oratosquilla nepa	4.91	*Saurida* sp. (juvenile)	0.27	*Sepia elliptica*	0.04	*Alectis indicus*	0.01
Priacanthus hamrur	3.42	*Opisthopterus tardoore*	0.23	Lesser sardine	0.04	*Balistes* sp.	0.01
Metapenaeus monoceros	3.33	*Metapenaeus dobsoni*	0.23	*Stolephorus waitei*	0.04	*Bregmaceros mcclellandi*	0.01
Muraenesox sp.	2.74	*Encrasicholina devisi*	0.22	*Metapenaeopsis stridulans*	0.03	*Caranx* sp.	0.01
Sardinella longiceps	2.30	Shark	0.22	*Charybdis riversandersoni*	0.03	*Chaetodon* sp.	0.01
Loligo duvaucelli	2.26	*Ambassis* spp.	0.21	*Cynoglossus* sp.	0.03	*Coloconger* sp.	0.01
Charybdis hoplites	2.23	Scorpion fish	0.21	*Sphyraena* sp. (juvenile)	0.03	*Cynoglossus puncticeps*	0.01
Solenocera sp.	1.79	*Monocanthus* sp.	0.20	*Metapenaeus affinis* (juvenile)	0.03	*Decapterus russelli*	0.01
Platycephalus sp	1.71	*Chirocentrus dorab*	0.20	*Metapenaeus dobsoni* (juvenile)	0.03	*Decapterus* sp. (juvenile)	0.01
Sepia pharaonis	1.29	Eels	0.19	*Etisus levimanus*	0.03	*Doclea ovis*	0.01
Decapterus sp.	1.27	*Scomberomorus commerson*	0.19	*Lysiosquilla* sp.	0.03	*Ficus gracillis*	0.01
Epinephelus diacanthus	1.18	*Portunus pelagicus*	0.18	*Johnius* sp. (juvenile)	0.03	*Fusinus nicobaricus*	0.01
Cynoglossus sp. (juvenile)	1.11	*Otolithes* sp. (juvenile)	0.18	*Sepia trigonina*	0.02	*Glyphocrangon* sp.	0.01
Muraenesox cinereus	1.11	*Trichiurus lepturus* (juvenile)	0.17	*Platax orbicularis*	0.02	*Hilsa* spp.	0.01
Sphyraena sp.	1.08	*Odonus niger*	0.15	*Leiognathus bindus*	0.02	*Leiognathus* sp. (juvenile)	0.01
Platycephalus spp. (juvenile)	1.04	*Mene maculata*	0.15	*Apogon* sp.	0.02	*Lutjanus* sp.	0.01
Thryssa spp.	0.94	*Dussumieria acuta* (juvenile)	0.13	Sciaenid	0.01	*Metapenaeus andamanensis*	0.01
Anchovies	0.76	*Loligo duvaucelli* (juvenile)	0.13	*Arius* sp.	0.01	*Murex* sp.	0.01
Saurida undosquamis	0.75	*Anodontostoma chacunda*	0.12	*Terapon* sp. (juvenile)	0.01	*Murex trapa*	0.01
Fenneropenaeus indicus	0.75	*Alepes* spp. (juvenile)	0.12	*Otolithes* sp.	0.01	*Myra fugax*	0.01
Nemipterus randalli (juveniles)	0.74	*Charybdis smithii*	0.11	*Zebrias* sp.	0.01	*Natica* sp.	0.01
Leiognathus spp.	0.72	*Parapercis* sp.	0.11	*Penaeus canaliculatus*	0.01	*Parapenaeopsis stylifera* (juvenile)	0.01
Parastromateus niger	0.67	*Thenus orientalis*	0.10	*Nemipterus japonicus*	0.01	*Parapenaeus fissuroides*	0.01
Lagocephalus inermis (juvenile)	0.66	*Psettodes* sp.	0.10	*Calappa granulata*	0.01	*Parastromateus niger* (juvenile)	0.01
Parapenaeopsis stylifera	0.60	Ray	0.10	*Antennarius* sp.	0.01	*Polynemus* sp.	0.01
Acanthocepola indica	0.56	*Pterois* sp.	0.10	*Lophiomus* sp.	0.01	*Priacanthus hamrur* (juvenile)	0.01
Uranoscopus sp.	0.50	*Arius* spp. (juvenile)	0.09	*Pomadasys* sp.	0.01	*Pristipomoides* sp.	0.01
Trachypenaeus sp.	0.48	*Dussumieria acuta*	0.09	*Pellona* sp.	0.01	*Pseudorhombus* sp.	0.01
Rastrelliger kanagurta	0.43	*Scorpaenodes* sp.	0.09	*Parascolopsis aspinosa*	0.01	*Rachycentron canadum* (juvenile)	0.01
Portunus sanguinolentus	0.42	*Tibia* sp.	0.08	*Bursa* sp.	0.01	*Sardinella longiceps* (juvenile)	0.01
Octopus	0.42	*Terapon* sp. (juvenile)	0.08	*Lactarius lactarius* (juvenile)	0.01	*Solenocera choprai*	0.01
Pampus spp.	0.39	*Penaeus monodon*	0.08	*Metapenaeus affinis*	0.01	*Stolephorus baganensis*	0.01
Johnius spp.	0.38	*Psettodes erumei*	0.08	*Cynoglossus macrostomus*	0.01	*Turris* sp.	0.01
Secutor insidiator	0.38	*Sepiella inermis*	0.06	*Calappa lophos*	0.01	*Upeneus* sp.	0.01
Sea snake	0.36	*Callionymus* sp.	0.06	*Alepes* sp.	0.01	*Xenophora solaris*	0.01
Diodon sp.	0.30	*Fistularia petimba*	0.05	*Cynoglossus bilineatus*	0.01	Total	81.28

(b) February

Group/Species	(kg)	Group/Species	(kg)	Group/Species	(kg)	Group/Species	(kg)
Lagocephalus inermis	10.20	*Saurida tumbil*	1.54	*Antennarius* sp.	0.49	*Platycephalus* sp.	0.26
Muraenesox sp.	5.36	*Loligo duvauceli*	1.41	*Sardinella longiceps*	0.48	*Lagocephalus inermis* (juvenile)	0.26
Oratosquilla nepa	4.18	*Trichiurus lepturus*	1.14	Shark	0.34	*Rastrelliger kanagurta*	0.25
Nemipterus spp.	2.95	*Metapenaeus monoceros*	0.86	Octopus	0.33	Eels	0.24
Charybdis hoplites	2.60	*Cynoglossus* spp. (juvenile)	0.54	*Leiognathus* spp.	0.33	Anchovies	0.20
Priacanthus hamrur	2.27	*Thryssa* spp. (juvenile)	0.51	*Fenneropenaeus indicus*	0.32	*Sepia pharaonis*	0.19

Group/Species	(kg)
Decapterus sp.	0.18
Parapenaeopsis stylifera	0.18
Johnius spp.	0.16
Charybdis riversandersoni	0.14
Odonus niger	0.14
Calappa lophos	0.14
Chirocentrus dorab	0.14
Parastromateus niger	0.12
Epinephelus diacanthus	0.12
Portunus sanguinolentus	0.12
Sphyraena sp.	0.11
Trachypenaeus sp.	0.10
Trachinocephalus myops	0.10
Metapenaeus dobsoni	0.10
Saurida sp. (juvenile)	0.10
Etisus levimanus	0.10
Megalaspis cordyla	0.09
Seer fish (juvenile)	0.07
Lactarius lactarius	0.06
Dussumieria acuta	0.06
Thalamita crenata	0.06
Apogon sp.	0.06
Bregmaceros mcclellandi	0.06

Group/Species	(kg)
Ray	0.05
Mene maculata	0.05
Pterois volitans	0.05
Scorpaenodes sp.	0.04
Solenocera sp.	0.04
Arius spp. (juvenile)	0.03
Portunus pelagicus	0.03
Nemipterus randalli	0.03
Leiognathus bindus	0.02
Fistularia petimba	0.02
Pampus spp.	0.02
Sepia elliptica	0.02
Penaeus canaliculatus	0.02
Encrasicholina devisi	0.02
Saurida undosquamis	0.02
Callionymus sp.	0.01
Charybdis cruciata	0.01
Metapenaeus affinis	0.01
Acanthocepola indica	0.01
Uranoscopus sp.	0.01
Rastrelliger kanagurta (juvenile)	0.01
Pterois sp.	0.01
Arius sp.	0.01

Group/Species	(kg)
Psettodes sp.	0.01
Priacanthus hamrur (juvenile)	0.01
Dactyloptena sp.	0.01
Cynoglossus sp.	0.01
Pterois russelii	0.01
Solenocera choprai	0.01
Terapon sp. (juvenile)	0.01
Zebrias sp.	0.01
Abalistes stellaris	0.01
Cynoglossus bilineatus	0.01
Parapercis sp.	0.01
Secutor insidiator	0.01
Sepiella inermis	0.01
Alectis indicus	0.01
Alepes sp.	0.01
Metapenaeopsis stridulans	0.01
Stolephorus waitei	0.01
Stolephorus baganensis	0.01
Upeneus sp.	0.01
Penaeus monodon	0.01
Thenus orientalis	0.01
Pomadasys sp.	0.01
Pseudorhombus sp.	0.01

Group/Species	(kg)
Tibia curta	0.01
Decapterus russelli	0.01
Sea snake	0.01
Scomberomorus commerson	0.01
Gymnothorax sp.	0.01
Hippocampus sp.	0.01
Leiognathus splendens	0.01
Thryssa sp.	0.01
Murex sp.	0.01
Octopus membraneous	0.01
Psettodes erumei	0.01
Trichiurus lepturus (juvenile)	0.01
Decapterus sp. (juvenile)	0.01
Parastromateus niger (juvenile)	0.01
Lophiomus sp.	0.01
Parapenaeus fissuroides	0.01
Alepes spp. (juvenile)	0.01
Anodontostoma chacunda	0.01
Opisthopterus tardoore	0.01
Otolithes spp.	0.01
Platycephalus sp. (juvenile)	0.01
Rachycentron canadum	0.01
Terapon sp.	0.01
Total	39.89

(c) March

Group/Species	(kg)
Nemipterus randalli	17.07
Saurida tumbili	11.00
Lagocephalus inermis	6.50
Loligo duvaucell	4.97
Oratosquilla nepa	3.53
Metapenaeus monoceros	3.42
Trichiurus lepturus	3.16
Priacanthus hamrur	2.31
Epinephelus diacanthus	1.73
Anchovies	1.66
Charybdis hoplites	1.64
Saurida sp. (juvenile)	1.46
Octopus	1.26
Cuttle fish	1.18
Sphyraena sp.	1.17
Fenneropenaeus indicus	1.08
Decapterus sp.	1.08
Murex trapa	0.92
Cynoglossus spp.	0.91
Leiognathus bindus	0.87
Rastrelliger kanagurta	0.81
Platycephalus spp.	0.65
Thryssa spp.	0.64
Epinephelus chlorostigma	0.63
Shark	0.62

Group/Species	(kg)
Metapenaeus dobsoni	0.61
Leiognathus spp.	0.52
Odonus niger	0.51
Bathygobius sp.	0.51
Apogon sp.	0.48
Megalaspis cordyla	0.47
Parastromateus niger	0.43
Podophthalmus vigil	0.43
Lagocephalus inermis (juvenile)	0.42
Solenocera sp.	0.39
Metapenaeus affinis (juvenile)	0.37
Parapenaeopsis stylifera	0.36
Alepes spp.	0.32
Cyclichthys sp.	0.31
Orectolobus sp.	0.29
Ficus gracillis	0.27
Trichiurus lepturus (juvenile)	0.26
Scolopsis vosmeri	0.26
Lactarius lactarius	0.23
Echeneis naucrates	0.23
Johnius spp.	0.21
Parapenaeus fissuroides	0.21
Tibia delicatula	0.21
Eels	0.20
Leiognathus splendens	0.19

Group/Species	(kg)
Ray	0.19
Portunus pelagicus	0.17
Portunus sanguinolentus	0.16
Charybdis feriatus	0.16
Pampus spp.	0.15
Secutor insidiator	0.15
Seer fish	0.15
Pristipomoides multidens	0.14
Sardinella longiceps	0.14
Lesser sardine	0.13
Mene maculata	0.13
Pomacentrus sp.	0.12
Trachypenaeus sp	0.11
Bursa sp.	0.10
Turris sp.	0.10
Strombus listeri	0.09
Octopus membraneous	0.08
Sepia elliptica	0.08
Chirocentrus dorab	0.08
Metapenaeus monoceros (juvenile)	0.07
Pterois volitans	0.07
Xenophora solaris	0.07
Encrasicholina devisi	0.07
Stolephorus waitei	0.07
Solenocera choprai	0.05

Group/Species	(kg)
Nemipterus randalli (juvenile)	0.05
Penaeus monodon	0.05
Dussumieria acuta	0.05
Parapercis sp.	0.05
Alectis indicus	0.05
Cirolana fluviatilis	0.05
Platycephalus sp. (juvenile)	0.05
Pellona sp.	0.04
Lophiomus sp.	0.04
Muraenesox sp.	0.04
Dasyatis sp.	0.04
Arius spp.	0.04
Metapenaeus affinis	0.04
Opisthopterus tardoore	0.03
Trypauchen vagina	0.03
Thryssa (juvenile)	0.03
Psettodes sp.	0.03
Cynoglossus bilineatus	0.03
Scorpaenodes sp.	0.03
Etisus levimanus	0.02
Terapon sp.	0.02
Pterois sp.	0.02
Upeneus sp.	0.02
Scomberomorus commerson	0.02
Saurida undosquamis	0.01

Group/Species	(kg)
Terapon sp. (juvenile)	0.01
Charybdis riversandersoni	0.01
Abalistes stellaris	0.01
Loligo duvaucelli (Juvenile)	0.01
Callionymus sp.	0.01
Bursa spinosa	0.01
Alepes sp. (juvenile)	0.01
Sepia sp.	0.01
Otolithes spp.	0.01
Penaeus indicus (juvenile)	0.01
Star fish	0.01
Panulirus homarus	0.01
Fistularia petimba	0.01
Natica sp.	0.01
Megalaspis cordyla (juvenile)	0.01
Diodon sp.	0.01

Group/Species	(kg)
Nemipterus japonicus	0.01
Penaeus canaliculatus	0.01
Cynoglossus macrostomus	0.01
Trachinocephalus myops	0.01
Priacanthus hamrur (juvenile)	0.01
Metapenaeus andamanensis	0.01
Drupa sp.	0.01
Lactarius lactarius (juvenile)	0.01
Pseudorhombus sp.	0.01
Cryptopodia angulata	0.01
Rachycentron canadum	0.01
Sphyraena sp. (juvenile)	0.01
Scomberoides spp.	0.01
Anodontostoma chacunda	0.01
Hilsa spp.	0.01
Bregmaceros mcclellandi	0.01

Group/Species	(kg)
Tibia curta	0.01
Uranoscopus sp.	0.01
Dactyloptena sp.	0.01
Penaeus canaliculatus (juvenile)	0.01
Acanthocepola indica	0.01
Hippocampus sp.	0.01
Sepiella inermis	0.01
Psettodes erumei	0.01
Calappa lophos	0.01
Caesio sp.	0.01
Arius sp. (juvenile)	0.01
Gastropod	0.01
Antennarius sp.	0.01
Gymnothorax sp.	0.01
Glyphocrangon sp.	0.01

Group/Species	(kg)
Charybdis lucifera	0.01
Conus sp.	0.01
Fusinus nicobaricus	0.01
Strombus sp.	0.01
Stolephorus baganensis	0.01
Balistes sp.	0.01
Synodus indicus	0.01
Decapterus russelli	0.01
Dussumieria acuta (juvenile)	0.01
Lutjanus sp.	0.01
Parastromateus niger	0.01
Pomadasys sp.	0.01
Pterois russelii	0.01
Total	79.76

(d) April

Group/Species	(kg)
Nemipterus randalli	26.13
Lagocephalus inermis	14.17
Saurida tumbil	12.79
Trichiurus lepturus	6.36
Rastrelliger kanagurta	5.59
Platycephalus sp. (juvenile)	5.55
Loligo duvaucelli	5.26
Decapterus sp.	5.15
Priacanthus hamrur	4.99
Cynoglossus spp.	3.49
Metapenaeus monoceros	3.29
Saurida undosquamis	3.06
Sardinella longiceps	2.59
Megalaspis cordyla	2.38
Epinephelus diacanthus	2.33
Sphyraena sp.	2.31
Anchovies	2.14
Cuttle fish	2.05
Oratosquilla nepa	1.42
Muraenesox sp.	1.28
Scorpaenodes sp.	1.24
Scomberoides spp.	1.09
Thryssa spp.	1.04
Acanthocepola indica	0.93
Johnius spp.	0.92
Lactarius lactarius	0.90
Seer fish (juvenile)	0.83
Octopus	0.80
Penaeus semisulcatus	0.75
Saurida sp. (juvenile)	0.54
Pseudorhombus sp.	0.50
Parastromateus niger	0.45
Solenocera sp.	0.43

Group/Species	(kg)
Alepes spp.	0.43
Pampus spp.	0.42
Cynoglossus sp. (juvenile)	0.37
Leiognathus spp.	0.34
Terapon sp.	0.32
Lophiomus sp.	0.29
Shark	0.28
Parapenaeus fissuroides	0.26
Lutjanus sp.	0.24
Platycephalus spp.	0.23
Myra fugax	0.22
Ray	0.21
Trachypenaeus sp.	0.19
Rachycentron canadum	0.19
Portunus sanguinolentus	0.19
Otolithes spp.	0.19
Chirocentrus dorab	0.18
Opisthopterus tardoore	0.16
Fenneropenaeus indicus	0.16
Psettodes sp.	0.14
Portunus pelagicus	0.14
Calappa lophos	0.13
Apogon sp.	0.12
Metapenaeus dobsoni	0.11
Synodus indicus	0.10
Parapercis sp.	0.10
Heterocarpus spp.	0.10
Parapenaeopsis stylifera	0.09
Glyphocrangon sp.	0.09
Antennarius sp.	0.09
Charybdis feriatus	0.08
Eels	0.07
Anodontostoma chacunda	0.06

Group/Species	(kg)
Pterois sp.	0.06
Priacanthus hamrur (juvenile)	0.05
Star fish	0.04
Hilsa spp.	0.04
Lesser sardine	0.04
Cynoglossus macrostomus	0.04
Cryptopodia angulata	0.04
Epinephelus radiatus	0.03
Nemipterus japonicus	0.03
Lagocephalus inermis (juvenile)	0.03
Solenocera choprai	0.03
Charybdis hoplites	0.03
Arius spp.	0.02
Leiognathus bindus	0.02
Cynoglossus bilineatus	0.02
Gobius sp.	0.02
Penaeus monodon	0.02
Ambassis sp.	0.02
Sea snake	0.02
Mene maculata	0.02
Loligo duvaucelli (juvenile)	0.01
Dussumieria acuta	0.01
Rastrelliger kanagurta (juvenile)	0.01
Penaeus canaliculatus	0.01
Balistes sp.	0.01
Podophthalmus vigil	0.01
Fistularia petimba	0.01
Uranoscopus sp.	0.01
Psettodes erumei	0.01
Nemipterus japonicus (juvenile)	0.01
Tibia curta	0.01
Ray (juvenile)	0.01
Decapterus russelli	0.01

Group/Species	(kg)
Epinephelus diacanthus (juvenile)	0.01
Doclea ovis	0.01
Murex sp.	0.01
Sphyraena sp. (juvenile)	0.01
Metapenaeus andamanensis	0.01
Sardinella longiceps (juvenile)	0.01
Encrasicholina devisi	0.01
Ficus gracillis	0.01
Strombus listeri	0.01
Penaeus canaliculatus (juvenile)	0.01
Pomadasys sp.	0.01
Odonus niger	0.01
Sea urchin	0.01
Gymnothorax sp.	0.01
Conus sp.	0.01
Upeneus sp.	0.01
Turritella sp.	0.01
Stolephorus waitei	0.01
Carangid	0.01
Sargocentron rubrum	0.01
Secutor insidiator	0.01
Bursa sp.	0.01
Turris sp.	0.01
Monocanthus sp.	0.01
Heniochus sp.	0.01
Trachinocephalus myops	0.01
Natica sp.	0.01
Alectis indicus	0.01
Lactarius lactarius (juvenile)	0.01
Dactyloptena sp.	0.01
Callionymus sp.	0.01
Octopus membraneous	0.01
Drupa sp.	0.01

Group/Species	(kg)
Megalaspis cordyla (juvenile)	0.01
Terebra sp.	0.01
Sponge	0.01
Thryssa sp. (juvenile)	0.01
Leiognathus splendens	0.01
Johnius sp. (juvenile)	0.01
Pitar sp.	0.01
Strombus sp.	0.01
Xenophora solaris	0.01
Crepidula sp.	0.01
Pholas sp.	0.01
Nassarius sp.	0.01
Panulirus homarus	0.01
Nephropsis sp.	0.01
Total	127.34

(e) May

Group/Species	(kg)
Nemipterus randalli	23.69
Saurida tumbil	23.39
Decapterus sp.	9.98
Lagocephalus inermis	6.27
Priacanthus hamrur	5.14
Trichiurus lepturus	4.93
Rastrelliger kanagurta	4.87
Cuttle fish	3.28
Parapenaeus fissuroides	3.08
Sphyraena sp.	2.72
Apogon sp.	2.63
Muraenesox cinereus	2.44
Muraenesox sp.	2.17
Metapenaeus monoceros	1.85
Encrasicholina devisi	1.75
Rastrelliger kanagurta (juvenile)	1.67
Epinephelus diacanthus	1.54
Anchovies	1.49
Diodon sp.	1.32
Solenocera choprai	1.18
Oratosquilla nepa	1.18
Charybdis hoplites	1.15
Scorpaenodes sp.	1.09
Secutor insidiator	0.87
Johnius spp.	0.81
Megalaspis cordyla	0.79
Lagocephalus inermis (juvenile)	0.76
Leiognathus spp.	0.71
Seer fish	0.67
Nemipterus japonicus	0.66
Acanthocepola indica	0.59
Fistularia petimba	0.57
Turris sp.	0.56
Thryssa spp.	0.50
Platycephalus sp. (juvenile)	0.46
Podophthalmus vigil	0.41
Dussumieria acuta	0.39
Lactarius lactarius	0.38
Saurida sp (juvenile)	0.37
Solenocera choprai	0.36
Eels	0.33
Trachypenaeus sp.	0.30
Ambassis sp.	0.30
Fenneropenaeus indicus	0.29
Sardinella longiceps	0.29
Lophiomus sp.	0.28
Murex sp.	0.24
Parastromateus niger	0.24
Saurida undosquamis	0.23
Conus sp.	0.22
Bursa sp.	0.22
Parapenaeopsis stylifera	0.22
Octopus sp.	0.22
Platycephalus spp.	0.21
Charybdis feriatus	0.21
Ray	0.20
Trachinocephalus myops	0.20
Trichiurus lepturus (juvenile)	0.20
Uranoscopus sp.	0.19
Natica sp.	0.18
Harpiosquilla harpax	0.18
Portunus sanguinolentus	0.18
Otolithes spp.	0.18
Strombus sp.	0.17
Pterois sp.	0.17
Metapenaeus dobsoni	0.16
Lutjanus sp.	0.16
Shark	0.16
Loligo duvaucelli	5.10
Opisthopterus tardoore	0.15
Cynoglossus spp.	0.14
Antennarius sp.	0.14
Megalaspis cordyla (juvenile)	0.13
Dussumieria acuta (juvenile)	0.13
Leiognathus bindus	0.12
Carangid	0.12
Portunus pelagicus	0.11
Charybdis smithii	0.11
Pterois volitans	0.11
Ficus gracillis	0.10
Mene maculata	0.10
Sepia elliptica	0.10
Rachycentron canadum	0.10
Pterois russelii	0.10
Cynoglossus macrostomus	0.10
Pampus spp.	0.09
Doclea ovis	0.07
Psettodes erumei	0.07
Harpa major	0.07
Hilsa spp.	0.07
Decapterus russelli	0.06
Alepes spp.	0.06
Telescopium sp.	0.06
Arius spp.	0.06
Gymnothorax sp.	0.05
Thenus orientalis	0.05
Upeneus sp.	0.05
Chirocentrus dorab	0.05
Drupa sp.	0.04
Lesser sardine	0.04
Glossogobius sp.	0.04
Cynoglossus bilineatus	0.04
Sepiella inermis	0.04
Scomberomorus commerson	0.03
Rachycentron canadum (juvenile)	0.03
Epinephelus radiatus	0.03
Zebrias sp.	0.03
Synodus indicus	0.02
Calappa lophos	0.02
Podophthalmus nacreus	0.02
Penaeus monodon	0.02
Scomberoides spp.	0.02
Thalamita crenata	0.02
Gobius sp.	0.02
Siganus canaliculatus	0.02
Star fish	0.01
Glyphocrangon sp.	0.01
Parrot fish	0.01
Myra fugax	0.01
Octopus membraneous	0.01
Cryptopodia angulata	0.01
Triacanthus sp.	0.01
Dactyloptena sp.	0.01
Pseudorhombus sp.	0.01
Parascolopsis aspinosa	0.01
Heterocarpus gibbosa	0.01
Sardinella albella	0.01
Terapon sp.	0.01
Pellona sp.	0.01
Oliva sp.	0.01
Etisus levimanus	0.01
Pugilina pugilina	0.01
Parascolopsis vosmeri	0.01
Terapon sp. (juvenile)	0.01
Sea snake	0.01
Bregmaceros mcclellandi	0.01
Chaetodon sp.	0.01
Pomadasys sp.	0.01
Thias tissoti	0.01
Xenophora solaris	0.01
Panulirus homarus	0.01
Phalium canaliculatus	0.01
Epinephelus chlorostigma	0.01
Aristius sp.	0.01
Heterocarpus spp.	0.01
Nephropsis sp.	0.01
Penaeus canaliculatus	0.01
Penaeus semisulcatus	0.01
Psettodes sp.	0.01
Puerulus sewellii	0.01
Abalistes stellaris	0.01
Charybdis lucifera	0.01
Ray (juvenile)	0.01
Priacanthus hamrur (juvenile)	0.01
Metapenaeus monoceros (juvenile)	0.01
Anodontostoma chacunda	0.01
Parapercis sp.	0.01
Stolephorus waitei	0.01
Metapenaeus affinis	0.01
Leiognathus sp. (juvenile)	0.01
Tibia curta	0.01
Total	122.27

(f) June

Group/Species	(kg)
Saurida tumbil	20.92
Nemipterus randalli	15.50
Rastrelliger kanagurta	12.10
Diodon sp.	10.38
Odonus niger	9.09
Saurida undosquamis	5.21
Loligo duvaucelli	4.20
Lagocephalus inermis	3.65
Decapterus sp.	3.12
Trichiurus lepturus	2.86
Trachypenaeus sp.	2.09
Encrasicholina devisi	2.08
Metapenaeus monoceros	1.62
Priacanthus hamrur	1.55
Trachinocephalus myops	1.50
Oratosquilla nepa	1.39
Sepiella inermis	1.37
Leiognathus bindus	1.31
Mene maculata	1.26
Epinephelus diacanthus	1.25
Lagocephalus inermis (juvenile)	0.91
Nemipterus (juveniles)	0.85
Sepia pharaonis	0.83
Sphyraena sp.	0.75
Fistularia petimba	0.70
Lactarius lactarius	0.69
Podophthalmus vigil	0.68
Thryssa spp.	0.65
Trichiurus lepturus (juvenile)	0.62
Pterois volitans	0.58
Scorpaenodes sp.	0.54
Solenocera choprai	0.54
Charybdis hoplites	0.53
Seer fish	0.52
Dussumieria acuta (juvenile)	0.52
Fenneropenaeus indicus	0.52
Gymnothorax sp.	0.51
Johnius spp.	0.47
Parapenaeus fissuroides	0.46
Apogon sp.	0.45
Charybdis feriatus	0.44
Dactyloptena sp.	0.41
Antennarius sp.	0.39
Charybdis riversandersoni	0.38
Anchovies	0.37
Decapterus russelli	0.31
Platycephalus sp. (juvenile)	0.30
Octopus	0.29
Lophiomus sp.	0.27
Parrot fish	0.26
Saurida sp. (juvenile)	0.25
Megalaspis cordyla	0.24
Uranoscopus sp.	0.22
Platycephalus spp.	0.22
Muraenesox sp.	0.21
Opisthopterus tardoore	0.21
Psettodes erumei	0.18
Sepia elliptica	0.17
Upeneus sp.	0.17
Zebrias sp.	0.17
Portunus sanguinolentus	0.17
Parastromateus niger	0.16
Chirocentrus dorab	0.16
Pterois russelii	0.14
Terapon sp.	0.81
Synodus indicus	0.13
Portunus pelagicus	0.12
Lactarius lactarius (juvenile)	0.11
Leiognathus spp.	0.10
Parapercis sp.	0.10
Ray	0.09
Eels	0.09
Cynoglossus macrostomus	0.08
Rachycentron canadum	0.08
Thenus orientalis	0.08
Priacanthus hamrur (juvenile)	0.08
Doclea ovis	0.07
Shark	0.07
Cynoglossus sp. (juvenile)	0.07
Rastrelliger kanagurta (juvenile)	0.06
Secutor insidiator	0.06
Pomacentrus sp	0.05
Otolithes spp.	0.04
Stolephorus waitei	0.04
Scomberoides spp.	0.04
Calappa lophos	0.03
Arius spp.	0.02
Portunus sanguinolentus (juvenile)	0.02
Pseudorhombus sp	0.01
Penaeus monodon	0.01
Alectis indicus	0.01
Pampus spp	0.01
Megalaspis cordyla (juvenile)	0.01
Otolithes sp.	0.01
Alepes spp.	0.01
Anodontostoma chacunda	0.01
Aristius sp.	0.01
Cynoglossus spp.	0.01
Dactyloptena sp. (juvenile)	0.01
Dussumieria acuta	0.01
Heterocarpus spp.	0.01
Hilsa spp.	0.01
Lesser sardine	0.01
Metapenaeus affinis	0.01
Metapenaeus dobsoni	0.01
Nephropsis sp.	0.01
Parapenaeopsis stylifera	0.01
Pellona sp.	0.01
Penaeus canaliculatus	0.01
Penaeus semisulcatus	0.01
Psettodes sp.	0.01
Puerulus sewellii	0.01
Sardinella longiceps	0.01
Total	117.93

(g) August

Group/Species	(kg)
Nemipterus randalli	61.11
Sepia pharoanis	23.03
Ambassis sp.	13.20
Epinephelus diacanthus	7.86
Saurida tumbil	7.56
Charybdis smithii	7.11
Priacanthus hamrur	6.38
Trichiurus lepturus	4.27
Muraenesox sp.	3.94
Lophiomus sp.	3.42
Uranoscopus sp.	3.04
Loligo duvaucelli	2.79
Sphyraena sp.	2.51
Saurida sp. (juvenile)	2.29
Nemipterus sp. (juvenile)	2.24
Parapercis sp.	2.23
Calappa gallus	1.83
Shark (juvenile)	1.77
Platycephalus sp. (juvenile)	1.60
Metapenaeus andamanensis	1.43
Tonna dolium	1.40
Apogon sp.	1.30
Sepiella inermis	1.29
Dactyloptena sp.	1.26
Pomacentrus sp.	1.22
Pterois russelii	1.16
Parapenaeus fissuroides	0.96
Saurida undosquamis	1.03
Zebrias sp.	0.89
Abalistes stellaris	0.88
Epinephelus diacanthus (juvenile)	0.85
Gymnothorax sp.	0.84
Scolopsis vosmeri	0.81
Polynemus sp.	0.78
Diodon sp.	0.72
Psenopsis intermedia	0.72
Scorpaenodes sp.	0.65
Sepia trigonina	0.64
Trachypenaeus sp.	0.64
Lutjanus sp.	0.61
Charybdis riversandersoni	0.53
Doclea hybrida	0.52
Balistes sp.	0.51
Antennarius sp.	0.48
Decapterus sp.	0.46
Osteogeneiosus militaris	0.44
Acanthocepola indica	0.44
Octopus membraneous	0.41
Bothus sp.	0.41
Sargocentron rubrum	0.39
Drupa sp.	0.38
Sea snake	0.33
Parascolopsis aspinosa	0.31
Charybdis hoplites	0.30
Metapenaeus monoceros	0.29
Eels	0.28
Platycephalus spp.	0.27
Scarus sp.	0.24
Priacanthus hamrur (juvenile)	0.24
Solenocera choprai	0.24
Psettodes erumei	0.22
Doclea ovis	0.20
Trachinocephalus myops	0.19
Cynoglossus macrostomus	0.18
Platax sp.	0.17
Calappa granulata	0.17
Charybdis lucifera	0.16
Cynoglossus bilineatus	0.16
Pterois volitans	0.14
Charybdis feriatus	0.14
Fistularia petimba	0.14
Octopus	0.13
Lactarius lactarius	0.11
Pampus spp.	0.11
Strombus listeri	0.11
Pristipomoides sp.	0.10

Group/Species	(kg)
Etisus levimanus	0.10
Ficus gracillis	0.09
Tibia curta	0.09
Cynoglossus sp. (juvenile)	0.09
Dussumieria acuta	0.08
Pseudorhombus sp.	0.08
Aploactinidae	0.07
Metapenaeus monoceros (juvenile)	0.06
Thryssa spp.	0.06
Epinephelus chlorostigma	0.06
Muraenesox cinereus	0.05
Oratosquilla nepa	0.05
Gobius sp.	0.05
Iago omanensis	0.04
Ray	0.04
Trichiurus lepturus (juvenile)	0.04
Conus sp.	0.04

Group/Species	(kg)
Shark	0.03
Murex sp.	0.03
Decapterus russelli	0.03
Rachycentron canadum	0.03
Parascolopsis vosmeri	0.03
Parascolopsis sp.	0.03
Sepia elliptica	0.02
Johnius sp. (juvenile)	0.02
Parastromateus niger	0.01
Bursa sp.	0.01
Cynoglossus spp.	0.01
Bregmaceros mcclellandi	0.01
Xenophora solaris	0.01
Metapenaeus affinis	0.01
Squid (juvenile)	0.01
Glyphocrangon sp.	0.01
Rastrelliger kanagurta (juvenile)	0.01

Group/Species	(kg)
Harpiosquilla harpax	0.01
Fenneropenaeus indicus	0.01
Psettodes sp.	0.01
Alepes spp.	0.01
Anchovies	0.01
Anodontostoma chacunda	0.01
Aristius sp.	0.01
Arius spp.	0.01
Chirocentrus dorab	0.01
Heterocarpus spp.	0.01
Hilsa spp.	0.01
Johnius spp.	0.01
Lagocephalus inermis	0.01
Leiognathus spp.	0.01
Lesser sardine	0.01
Megalaspis cordyla	0.01
Metapenaeus dobsoni	0.01

Group/Species	(kg)
Nephropsis sp.	0.01
Opisthopterus tardoore	0.01
Otolithes spp.	0.01
Parapenaeopsis stylifera	0.01
Pellona sp.	0.01
Penaeus canaliculatus	0.01
Penaeus monodon	0.01
Penaeus semisulcatus	0.01
Portunus pelagicus	0.01
Portunus sanguinolentus	0.01
Puerulus sewellii	0.01
Rastrelliger kanagurta	0.01
Sardinella longiceps	0.01
Scomberoides spp.	0.01
Seer fish	0.01
Squilla	0.01
Terapon sp.	0.01
Total	182.85

(h) September

Group/Species	(kg)
Nemipterus randalli	37.47
Trichiurus lepturus	16.62
Sepia pharoanis	14.10
Saurida tumbil	13.77
Epinephelus diacanthus	10.09
Priacanthus hamrur	8.47
Loligo duvaucelli	6.40
Platycephalus sp. (juvenile)	6.35
Muraenesox sp.	5.68
Psenopsis intermedia	4.09
Ambassis sp.	4.03
Saurida undosquamis	3.92
Nemipterus spp. (juveniles)	3.80
Uranoscopus sp.	3.72
Charybdis smithii	3.68
Scorpaenodes sp.	3.64
Metapenaeus andamanensis	3.40
Decapterus sp.	3.06
Sphyraena sp.	1.67
Parapercis sp.	1.22
Lophiomus sp.	1.17
Charybdis feriatus	1.00
Fistularia petimba	0.98
Zebrias sp.	0.83
Sepiella inermis	0.81
Cynoglossus bilineatus	0.77
Priacanthus hamrur (juvenile)	0.75
Psettodes erumei	0.73
Gymnothorax sp.	0.73
Pomacentrus sp.	0.64
Lagocephalus inermis	0.63
Sepia elliptica	0.62

Group/Species	(kg)
Charybdis riversandersoni	0.57
Aploactinidae	0.55
Epinephelus diacanthus (juvenile)	0.54
Apogon sp.	0.50
Lutjanus sp.	0.49
Trachinocephalus myops	0.47
Charybdis hoplites	0.42
Acanthocepola indica	0.42
Leiognathus spp.	0.41
Solenocera choprai	0.41
Saurida sp. (juvenile)	0.40
Tibia curta	0.40
Octopus	0.39
Odonus niger	0.39
Eels	0.36
Balistes sp.	0.36
Cephalopholis sp.	0.36
Lactarius lactarius	0.30
Calappa gallus	0.29
Octopus membraneous	0.28
Antennarius sp.	0.26
Pterois russelii	0.25
Platycephalus spp.	0.24
Rastrelliger kanagurta	0.21
Drupa sp.	0.20
Cynoglossus sp. (juvenile)	0.20
Lagocephalus inermis (juvenile)	0.17
Cynoglossus macrostomus	0.15
Siganus vermiculatus	0.14
Chaetodon sp.	0.13
Dussumieria acuta	0.13
Pampus spp.	0.13

Group/Species	(kg)
Dactyloptena sp.	0.13
Sea snake	0.12
Sepia sp.	0.10
Anodontostoma chacunda	0.10
Pristipomoides sp.	0.10
Metapenaeus monoceros	0.10
Thryssa spp.	0.09
Alepes sp. (juvenile)	0.09
Parrot fish	0.09
Cynoglossus spp.	0.09
Johnius spp.	0.08
Alepes spp.	0.07
Tonna dolium	0.07
Shark	0.06
Sargocentron rubrum	0.06
Upeneus sp.	0.06
Leucosia anatum	0.06
Bregmaceros mcclellandi	0.05
Epinephelus chlorostigma	0.05
Murex sp.	0.05
Pterois sp.	0.04
Trachypenaeus sp.	0.04
Pterois volitans	0.04
Sardinella longiceps	0.04
Ficus gracillis	0.04
Leiognathus bindus	0.04
Decapterus sp.	0.03
Doclea hybrida	0.03
Bursa sp.	0.02
Metapenaeus affinis	0.02
Conus sp.	0.02
Etisus levimanus	0.02

Group/Species	(kg)
Otolithes spp.	0.02
Parastromateus niger	0.02
Arius spp.	0.02
Rachycentron canadum	0.02
Sepia trigonina	0.01
Parascolopsis aspinosa	0.70
Seer fish	0.01
Ray	0.01
Doclea ovis	0.01
Natica sp.	0.01
Scomberoides spp.	0.01
Metapenaeus monoceros (juvenile)	0.01
Sea urchin	0.01
Trichiurus lepturus (juvenile)	0.01
Turris sp.	0.01
Telescopium sp.	0.01
Parapenaeus fissuroides	0.01
Sphyraena sp. (juvenile)	0.01
Calappa lophos	0.01
Terapon sp.	0.01
Glyphocrangon sp.	0.01
Lactarius lactarius (juvenile)	0.01
Anchovies	0.01
Aristius sp.	0.01
Chirocentrus dorab	0.01
Heterocarpus spp.	0.01
Hilsa spp.	0.01
Lesser sardine	0.01
Megalaspis cordyla	0.01
Metapenaeus dobsoni	0.01
Nephropsis sp.	0.01
Opisthopterus tardoore	0.01

Group/Species	(kg)
Parapenaeopsis stylifera	0.01
Pellona sp.	0.01
Penaeus canaliculatus	0.01
Fenneropenaeus indicus	0.01
Penaeus monodon	0.01
Penaeus semisulcatus	0.01
Portunus pelagicus	0.01
Portunus sanguinolentus	0.01
Psettodes sp.	0.02
Puerulus sewellii	0.01
Squilla	0.01
Total	172.25

(i) October

Group/Species	(kg)
Sepia pharoanis	23.24
Trichiurus lepturus	21.03
Lagocephalus inermis	8.99
Nemipterus spp.	8.16
Saurida tumbil	7.87
Epinephelus diacanthus	7.66
Decapterus sp.	7.64
Priacanthus hamrur	7.48
Charybdis smithii	5.73
Solenocera choprai	4.23
Rastrelliger kanagurta	3.93
Platycephalus sp. (juvenile)	3.55
Antennarius sp.	3.20
Loligo duvaucelli	8.86
Decapterus sp. (juvenile)	2.85
Diodon sp.	2.74
Cynoglossus spp.	2.70
Muraenesox sp.	2.68
Nemipterus randalli	2.08
Uranoscopus sp.	2.02
Saurida undosquamis	1.70
Sardinella longiceps	1.40
Priacanthus hamrur (juvenile)	1.29
Octopus	1.27
Octopus membraneous	1.21
Sphyraena sp.	1.09
Pampus spp.	1.05
Seer fish	1.03
Epinephelus diacanthus (juvenile)	0.98
Parastromateus niger	0.94
Dactyloptena sp.	0.83
Arius sp. (juvenile)	0.81
Leiognathus spp.	0.77
Acanthocepola indica	0.74
Lactarius lactarius	0.71
Megalaspis cordyla	0.70
Lagocephalus inermis (juvenile)	0.70
Lophiomus sp.	0.67
Scorpaenodes sp.	0.66
Mene maculata	0.65
Psettodes erumei	0.64
Coloconger sp.	0.64
Alepes spp.	0.61
Bregmaceros mcclellandi	0.59
Odonus niger	0.58
Psenopsis intermedia	0.58
Sepia elliptica	0.53
Doclea hybrida	0.52
Ambassis sp.	0.52
Shark (juvenile)	0.48
Apogon sp.	0.44
Alectis indicus	0.44
Thryssa spp.	0.41
Pterois russelii	0.37
Parapercis sp.	0.35
Trachinocephalus myops	0.34
Metapenaeus andamanensis	0.32
Gymnothorax sp.	0.30
Dussumieria acuta (juvenile)	0.29
Lutjanus sp.	0.29
Sea snake	0.27
Eels	0.26
Platycephalus spp.	0.26
Chirocentrus dorab	0.26
Ray	0.25
Pomacentrus sp.	0.24
Lesser sardine	0.24
Strombus listeri	0.22
Saurida sp. (juvenile)	0.21
Shark	0.19
Arius spp.	0.19
Charybdis feriatus	0.19
Scolopsis vosmeri	0.17
Hilsa spp.	0.17
Calappa lophos	0.17
Abalistes stellaris	0.14
Sphyraena sp. (juvenile)	0.12
Sepia sp.	0.12
Sardinella sp.	0.10
Johnius spp.	0.09
Rachycentron canadum	0.08
Pterois volitans	0.08
Alepes sp. (juvenile)	0.08
Decapterus russelli	0.08
Sepia trigonina	0.08
Anodontostoma chacunda	0.08
Leiognathus bindus	0.07
Trachypenaeus sp.	0.07
Opisthopterus tardoore	0.07
Pellona sp.	0.06
Aristius sp.	0.06
Terapon sp.	0.06
Parascolopsis aspinosa	0.39
Parastromateus niger (juvenile)	0.05
Cynoglossus macrostomus	0.05
Fistularia petimba	0.05
Terapon sp. (juvenile)	0.05
Otolithes spp.	0.05
Doclea ovis	0.04
Fenneropenaeus indicus	0.03
Cynoglossus bilineatus	0.03
Parapenaeus fissuroides	0.03
Sepiella inermis	0.03
Dussumieria acuta	0.03
Tibia sp.	0.03
Charybdis hoplites	0.02
Scomberoides spp.	0.02
Penaeus monodon	0.02
Metapenaeus monoceros	0.01
Stolephorus waitei	0.01
Anchovies	0.01
Encrasicholina devisi	0.01
Pristipomoides multidens	0.01
Stolephorus baganensis	0.01
Murex sp.	0.01
Leiognathus splendens	0.01
Tonna dolium	0.01
Lethrinus sp.	0.01
Trichiurus lepturus (juvenile)	0.01
Sardinella longiceps (juvenile)	0.01
Balistes sp.	0.01
Megalaspis cordyla (juvenile)	0.01
Pomadasys sp.	0.01
Sargocentron rubrum	0.01
Thryssa sp. (juvenile)	0.01
Glyphocrangon sp.	0.01
Rastrelliger kanagurta (juvenile)	0.01
Zebrias sp.	0.01
Metapenaeus monoceros (juvenile)	0.01
Heterocarpus spp.	0.01
Metapenaeus affinis	0.01
Metapenaeus dobsoni	0.01
Nephropsis sp.	0.01
Parapenaeopsis stylifera	0.01
Penaeus canaliculatus	0.01
Penaeus semisulcatus	0.01
Portunus pelagicus	0.01
Portunus sanguinolentus	0.01
Psettodes sp.	0.01
Puerulus sewellii	0.01
Squilla	0.01
Total	161.07

(j) November

Group/Species	(kg)
Sepia pharoanis	11.51
Trichiurus lepturus	11.50
Rastrelliger kanagurta	8.31
Decapterus sp.	8.05
Cynoglossus spp.	6.65
Lagocephalus inermis	5.71
Loligo duvaucelli	5.19
Oratosquilla nepa	4.48
Dussumieria acuta (juvenile)	3.39
Epinephelus diacanthus	3.01
Decapterus sp. (juvenile)	3.00
Nemipterus randalli	2.85
Sphyraena sp.	2.84
Priacanthus hamrur	2.16
Alepes spp.	1.80
Megalaspis cordyla	1.61
Odonus niger	1.60
Saurida sp.	1.35
Anchovies	1.26
Mene maculata	0.97
Lactarius lactarius	0.96
Leiognathus spp.	0.90
Lesser sardine	0.88
Thryssa spp.	0.68

Group/Species	(kg)
Solenocera choprai	0.67
Lagocephalus inermis (juvenile)	0.65
Parastromateus niger	0.63
Lactarius lactarius (juvenile)	0.53
Sardinella longiceps	0.53
Nemipterus japonicus	0.45
Opisthopterus tardoore	0.45
Pterois russelii	0.41
Lutjanus sp.	0.38
Metapenaeus monoceros	0.33
Saurida sp. (juvenile)	0.32
Epinephelus diacanthus (juvenile)	0.25
Johnius spp.	0.25
Arius spp.	0.24
Parapenaeopsis stylifera	0.23
Platycephalus spp.	0.19
Charybdis feriatus	0.19
Chirocentrus dorab	0.17
Charybdis smithii	0.16
Charybdis hoplites	0.14
Octopus	0.14
Pampus spp.	0.14
Eels	0.14
Shark	0.13
Trichiurus lepturus (juvenile)	0.13

Group/Species	(kg)
Parastromateus niger (juvenile)	0.13
Rachycentron canadum	0.12
Ray	0.10
Pellona sp.	0.10
Dussumieria acuta	0.09
Anodontostoma chacunda	0.09
Metapenaeus dobsoni	0.09
Terapon sp.	0.07
Seer fish	0.06
Rastrelliger kanagurta (juvenile)	0.06
Decapterus russelli	0.06
Fenneropenaeus indicus	0.05
Bregmaceros mcclellandi	0.05
Octopus membraneous	0.04
Portunus sanguinolentus	0.04
Platycephalus sp. (juvenile)	0.04
Scomberoides spp.	0.04
Metapenaeopsis stridulans	0.04
Sphyraena sp. (juvenile)	0.03
Scorpaenodes sp.	0.03
Alectis indicus	0.02
Alepes sp. (juvenile)	0.02
Trachinocephalus myops	0.02
Hilsa spp.	0.02
Sardinella longiceps (juvenile)	0.01

Group/Species	(kg)
Cynoglossus macrostomus	0.01
Stolephorus waitei	0.01
Fistularia petimba	0.01
Metapenaeus monoceros (juvenile)	0.01
Encrasicholina devisi	0.01
Terapon sp. (juvenile)	0.01
Metapenaeus affinis	0.01
Muraenesox sp.	0.01
Leiognathus bindus	0.01
Thryssa sp. (juvenile)	0.01
Solea sp.	0.01
Johnius sp. (juvenile)	0.01
Pellona sp. (juvenile)	0.01
Pomadasys sp.	0.01
Jelly fish	0.01
Diodon sp.	0.01
Other carangids	0.01
Protonibea diacanthus	0.01
Doclea ovis	0.01
Upeneus sp.	0.01
Pterois volitans	0.01
Portunus sanguinolentus (juvenile)	0.01
Atropus atropus	0.01
Star fish	0.01
Rachycentron canadum (juvenile)	0.01

Group/Species	(kg)
Sardinella fimbriata	0.01
Gerres limbatus	0.01
Parapenaeopsis stylifera (juvenile)	0.01
Leiognathus splendens	0.01
Murex sp.	0.01
Portunus pelagicus (juvenile)	0.01
Tonna dolium	0.01
Echeneis naucrates	0.01
Bullia melanoides	0.01
Heterocarpus gibbosa	0.01
Ambassis sp.	0.01
Matuta planipes	0.01
Myra fugax	0.01
Aristius sp.	0.01
Heterocarpus spp.	0.01
Nephropsis sp.	0.01
Otolithes spp.	0.01
Penaeus canaliculatus	0.01
Penaeus monodon	0.01
Penaeus semisulcatus	0.01
Portunus pelagicus	0.01
Psettodes sp	0.01
Puerulus sewellii	0.01
Total	98.66

(i) December

Group/Species	(kg)
Trichiurus lepturus	9.20
Rastrelliger kanagurta	7.74
Decapterus sp.	5.89
Priacanthus hamrur	5.01
Lagocephalus inermis	4.48
Nemipterus randalli	3.72
Anchovies	3.54
Oratosquilla nepa	3.24
Loligo duvaucelli	3.21
Saurida tumbil	3.20
Sepia pharonis	3.16
Cynoglossus spp.	2.97
Muraenesox sp.	2.85
Epinephelus diacanthus	2.06
Sphyraena sp.	1.94
Tibia curta	1.74

Group/Species	(kg)
Rastrelliger kanagurta (juvenile)	1.69
Platycephalus sp. (juvenile)	1.52
Leiognathus spp.	1.33
Nemipterus spp. (juveniles)	1.22
Alepes spp.	1.15
Lagocephalus inermis (juvenile)	0.94
Metapenaeus monoceros	0.90
Parapenaeopsis stylifera	0.87
Thryssa spp.	0.86
Solenocera sp.	0.79
Sardinella longiceps	0.79
Saurida sp. (juvenile)	0.79
Metapenaeus dobsoni	0.72
Charybdis hoplites	0.67
Octopus	0.63
Trichiurus lepturus (juvenile)	0.59

Group/Species	(kg)
Fistularia petimba	0.57
Johnius spp.	0.55
Lactarius lactarius	0.55
Megalaspis cordyla	0.44
Parastromateus niger	0.43
Dussumieria acuta	0.43
Chirocentrus dorab	0.38
Uranoscopus sp.	0.37
Thenus orientalis	0.35
Encrasicholina devisi	0.35
Trachypenaeus sp.	0.34
Charybdis feriatus	0.31
Fenneropenaeus indicus	0.31
Etisus levimanus	0.29
Opisthopterus tardoore	0.28
Lesser sardine	0.20

Group/Species	(kg)
Eels	0.20
Cardita sp.	0.19
Pellona sp.	0.19
Murex trapa	0.18
Dussumieria acuta (juvenile)	0.18
Saurida undosquamis	0.16
Nemipterus japonicus	0.16
Ray	0.16
Zebrias sp.	0.16
Shark	0.15
Mene maculata	0.15
Pterois sp.	0.15
Platycephalus spp.	0.14
Scomberomorus commerson	0.12
Portunus sanguinolentus	0.12
Epinephelus diacanthus (juvenile)	0.11

Group/Species	(kg)
Pterois volitans	0.11
Rachycentron canadum	0.11
Calappa lophos	0.10
Sphyraena sp. (juvenile)	0.10
Scorpaenodes sp.	0.10
Pampus spp.	0.10
Bursa sp.	0.10
Decapterus russelli	0.09
Metapenaeus monoceros (juvenile)	0.08
Arius spp.	0.08
Terapon sp.	0.07
Turris sp.	0.07
Portunus pelagicus	0.07
Otolithes spp.	0.07
Diodon sp.	0.07
Odonus niger	0.06
Anodontostoma chacunda	0.06
Terapon sp. (juvenile)	0.06

Group/Species	(kg)
Acanthocepola indica	0.06
Parapercis sp.	0.06
Callionymus sp.	0.05
Monocanthus sp.	0.05
Octopus egina	0.04
Scomberoides spp.	0.04
Trachinocephalus myops	0.04
Bathygobius sp.	0.04
Octopus membraneous	0.04
Apogon sp.	0.03
Stolephorus waitei	0.03
Psettodes erumei	0.02
Ambassis sp.	0.02
Sepiella inermis	0.02
Hilsa spp.	0.02
Charybdis riversandersoni	0.02
Thalamita crenata	0.02
Penaeus canaliculatus (juvenile)	0.02

Group/Species	(kg)
Leiognathus bindus	0.02
Platax orbicularis	0.02
Natica sp.	0.02
Turritella sp.	0.02
Metapenaeus affinis	0.02
Rachycentron canadum (juvenile)	0.01
Leiognathus splendens	0.01
Secutor insidiator	0.01
Parascolopsis aspinosa	0.01
Lactarius lactarius (juvenile)	0.01
Megalaspis cordyla (juvenile)	0.01
Carangid sp.	0.01
Lophiomus sp.	0.01
Pterois russelii	0.01
Priacanthus hamrur (juvenile)	0.01
Alectis indicus	0.01
Penaeus monodon	0.01
Sea snake	0.01

Group/Species	(kg)
Metapenaeus affinis (juvenile)	0.01
Sepia elliptica	0.01
Sardinella longiceps (juvenile)	0.01
Atropus atropus	0.01
Scomberoides spp. (juvenile)	0.01
Alepes sp. (juvenile)	0.01
Metapenaeus andamanensis	0.01
Cynoglossus sp. (juvenile)	0.01
Aristius sp.	0.01
Heterocarpus spp.	0.01
Nephropsis sp.	0.01
Penaeus canaliculatus	0.01
Penaeus semisulcatus	0.01
Psettodes sp.	0.01
Puerulus sewellii	0.01
Total	85.95

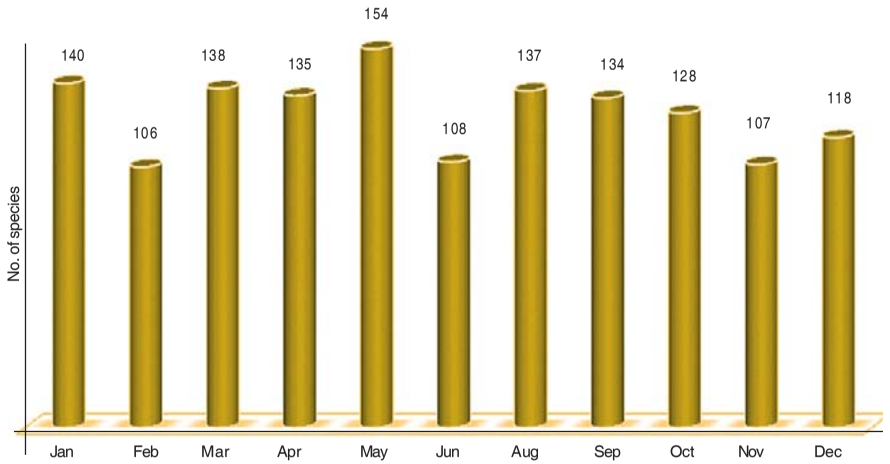

Fig. 2. Total number of species caught in trawling grounds along Malabar-Konkan

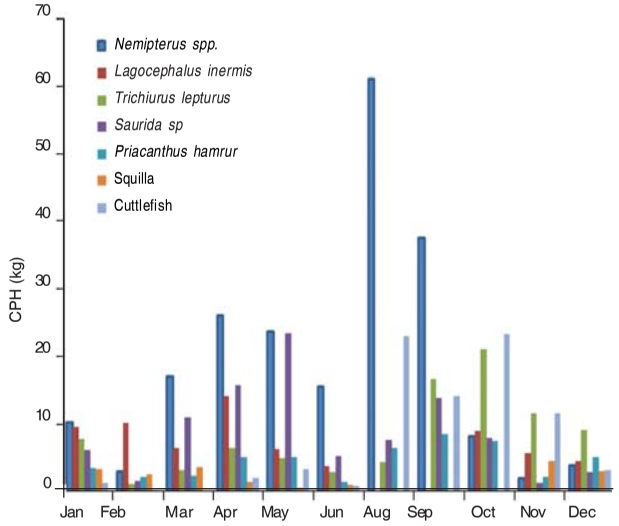

Fig. 3. Major species contributing to the trawl fishing off Malabar-Konkan coast

First record of the Oman cuttlefish, *Sepia omani* Adam and Rees, 1966 from Maharashtra waters

Sujit Sundaram
Research Centre of CMFRI, Mumbai

Many new records of cephalopods are reported from Maharashtra waters over the years. A new entrant of cuttlefish, *Sepia omani* Adam and Rees, 1966 (Fig. 1) was observed in trawl catches at New Ferry Wharf, Mumbai. The depth of operation was about 30-40 m at 70-80 km north of Mumbai coast.The species was observed in the catch in April 2009. The dorsal mantle length of the species landed ranged from 40 to 75 mm with corresponding weight ranging from 17.66 to 59.73 g. According to Jereb *et al.* (2005) the maximum mantle length of this species is100 mm.The occurrence of *S. omani* is reported for the first time from Maharashtra waters.

S. omani is distributed in the Northern Indian Ocean, Gulf of Oman, off Pakistan and western India (Jereb *et al.,* 2005). Some of the important distinguishing characters of S. *omani* are: the mantle is oval with the dorsal anterior margin triangular. Club sucker-bearing surface flattened with 3 or 4 suckers in transverse rows and 3 to 5 suckers in middle of the longitudinal row extremely enlarged (Fig. 2). The cuttlebone is acuminate and has a long spine (Fig.3, 4). The dorsal surface of the mantle has dark brown transverse stripes.

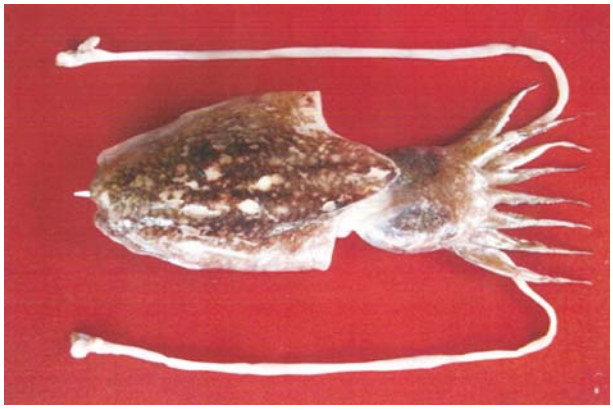

Fig. 1. *Sepia omani* Adam and Rees, 1966

Twelve specimens of *S. omani* were analysed for further biological characteristics. The stomach condition was ascertained as per Kore and Joshi (1975). The Index of preponderance was estimated as suggested by Natarajan and Jhingran (1961). Majority of the guts were empty and the food was in finely macerated condition. The species seems to mainly feed on fish (80%) followed by prawn (20%). Majority of the specimens were immature. The species was not observed in the catch thereafter and the present observation appears to be a rare occurrence.

Fig. 2. Enlarged suckers on the arms of *S. omani*

Fig. 3. Cuttle bone of *S. omani* (dorsal surface)

Fig. 4. Cuttlebone of *S. omani* (ventral surface)