Seasonal and annual variations in fish and macro-crustacean fauna in the shore seine fishery of Karwar, Karnataka.

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Introduction

Karwar coast of Karnataka is known for sandy beaches, and these beaches apart from providing the aesthetic beauty, are supporting traditional fishermen of the coast for finding their livelihood avenues. Traditionally the beaches of Karwar is known for shore-seine operations, known as rampani fishery. Rampani nets were made of coir ropes and the nets were operated from October to March, exclusively targeting mackerel and sardines. With advent of introduction of synthetic fiber in net making, the traditional rampani fishery were replaced by a series of shore-seines made of synthetic materials locally known as yendi and the yendi operation became an year round practice targeting finfishes and macro-crustaceans especially prawns and crabs. The catch data from yendi is a good record of the biodiversity of the shoreline. Composition of the species available up to a depth of 6m from the shoreline is represented in the yendi catch. Present study is based on long term observation of the yendi fishery from Karwar coast of north Karnataka. It analyses the database on catch effort and species composition of yendi operated along Karwar beaches during 2013 to 2017 to understand seasonal variations in abundance and species composition of fish and macro-crustaceans. Stretches of Karwar beach 14.8904˚N;74.0974˚E in the north to 14.8262˚N;74.1231˚E in the south were surveyed for data collection. Since finfishes and macro-crustaceans like penaeid prawns and crabs determined the success of the commercial fishery, these two groups were focused in the present study.

Fishery trends

Catch and effort data and species composition were collected from the shore-seines operated along Karwar beach during June 2013 to March 2017. The length of the net varied from 400 to 1000 m. The height of the net in the middle is approximately 25-26 feet and decreases to 13 feet at both ends. The shore seines made nylon netting each weigh between 200 and 300 kg and is operated from shore upto 6m depths. After loading the net on to a small canoe (dhoni) (8.5-10.7 m overall length), it sails in a semicircular fashion, paying out the net, to a point at approximately 350-400 m from the starting point within 15-20 minutes. The net is hauled immediately after the dhoni reaches the end point with the hauling process completed within 2 hours. For seasonal analysis data of monsoon (June-September) Pre-monsoon (February-May) and post-monsoon (October-January) periods were used from 4,299 yendi operations carried out during June 2013 to March, 2017period.

During the period 970t of fishes and other fauna were caught. The yendi operations were found round the year with higher intensity during Monsoon months. The monthly average catch ranged from 4.4 t in April to 54.3 t in August (Figs.1 & 2). Fin fishes and macro-crustaceans, like penaeid prawns, crabs and stomatopods formed major commercial part of the shore seine fishery in Karwar. Among 147 macro fauna recorded, 116 species (78%) were finfishes belonging to 52 family while 17species (12%) were macro-crustaceans belonging to 7 families. The finfishes formed 729 t (75% in weight) followed by macro- crustaceans 171t (18%) with average Catch Per Unit Effort or CPUE for these two groups being 170 and 40 kg respectively. Season wise fishery group composition

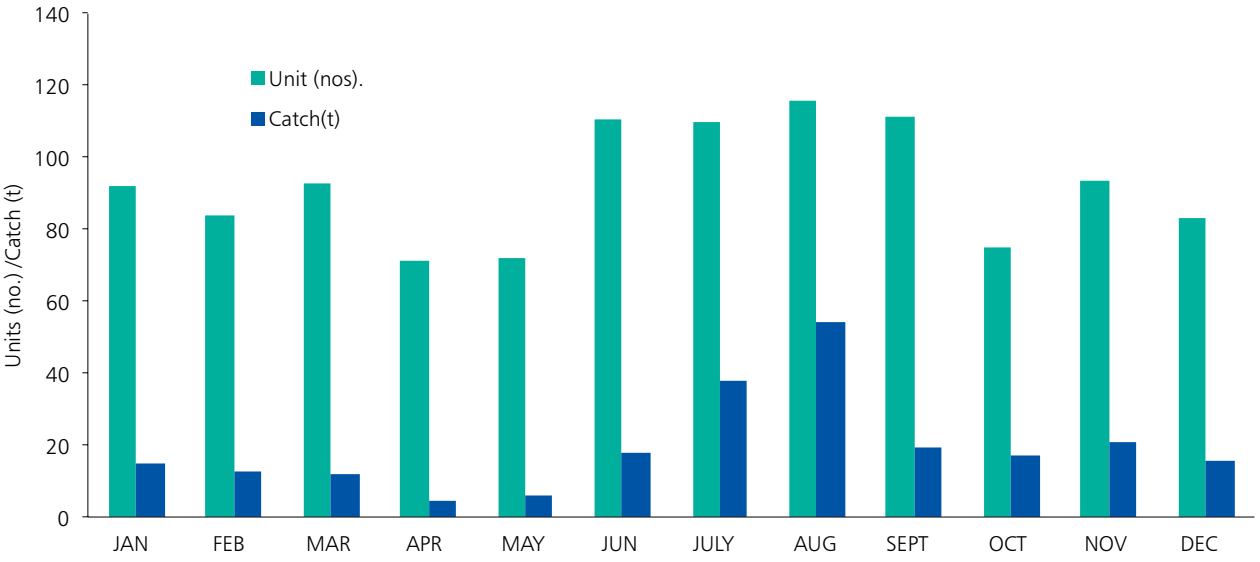

Fig.1. Average monthly effort and catch from yendi operations during 2013-2017.

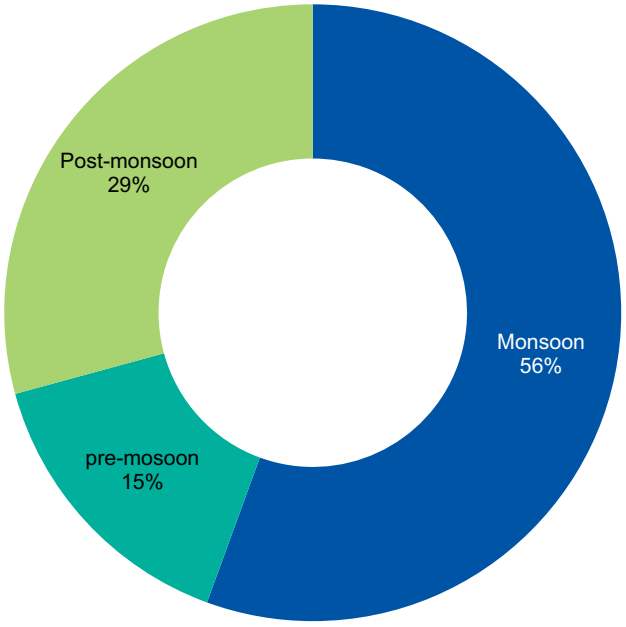

Fig.2. Seasonal catch contribution in yendi operations during 2013-2017.

indicated that during pre-monsoon months 101 species were observed in "yendi catch" of which 73 species (72%) were finfishes and 16 species (16%) were macro-crustaceans. During monsoon months of the 115 species observed in the catch, finfishes and macro-crustaceans were 91 and 13 respectively and during post- monsoon, these were 87 and 15 respectively (Fig.3).

Among 147 finfish species recorded, only 15 species contributed more than one percent to the fishery (by weight). *Trypauchen vagina, Sardinella longiceps, Rastrelliger kanagurta, S. gibbosa* and *S. fimbriata* were the major contributors in terms of quantity. The catch of *Trypauchen vagina* was mostly restricted to monsoon season during which 98% (175t) of the catch was recorded. Due to its low demand in the market, fishermen are not benefitted by the high catch of these species. This fish can however be used as a supplementary feed for culturing carnivorous fishes in marine cages. Sardines like *Sardinella gibbosa*, *S. fimbriata* and *S. longiceps* contributed to the fishery during all three seasons and *S. longiceps* dominated the fishery during pre-monsoon and post-monsoon months. Indian mackerel, *Rastrelliger kanagurta* was also available in all the seasons. Catch rates of 116 finfish species recorded during three seasons are given in the Table 1.

Penaeid prawns, *Metapenaeus dobsoni, Penaeus indicus* and *M. affinis* together contributed 68% of the crustacean fishery. Contribution of *M. dobsoni* was maximum during post monsoon-months (40t) while *P. indicus* was dominant during monsoon months (36t). Being highly valued in market, these species serves as economic backbone of the 'yendi' fishery of Karwar. Species like *Parapenaeopsis stylifera* (5%) *P. monodon* (4%), *P. merguensis*, *P. canaliculatus* and *P. semisulcatus* also formed a part of the penaeid prawn fishery while the dominant non-penaeid prawn was *Acetes* spp. Among commercial crabs, *Portunus pelagicus*, *P. sanguinolentus*

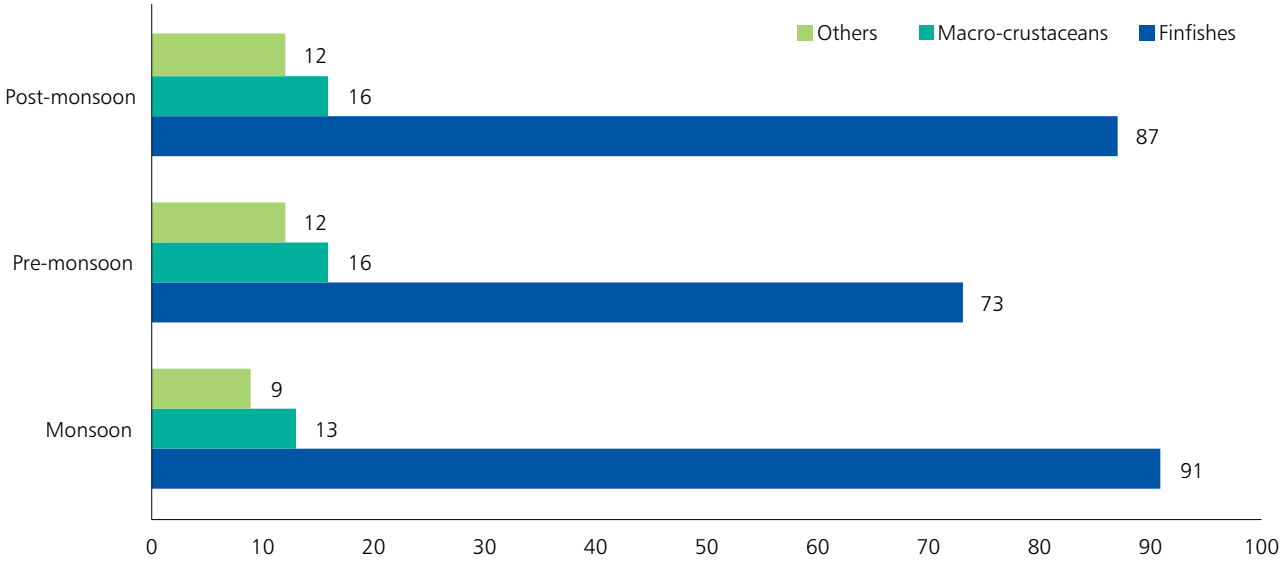

Fig.3. Average season wise fishery group composition during 2013-2017.

Table 1. Catch per unit effort of finfish species recorded in different seasons

SPECIES	PRE-MONSOON	MONSOON	POST-MONSOON
Acanthopagrus berda	0.000	0.288	0.547
Acanthopagrus latus	0.000	0.009	0.000
Alectis indicus	0.000	0.013	0.000
Alepes djeddaba	1.089	0.353	3.446
Alepes kleinii	0.738	0.370	1.517
Ambasis gymnocephalus	0.541	9.587	1.087
Ambassis urotaenia	0.856	7.466	2.681
Apogon quadrifasciatus	0.000	0.000	0.010
Anadontostoma chacunda	0.035	0.048	0.000
Arius arius	0.012	0.120	0.006
Arius jella	0.526	7.270	1.738
Atherinomorus lacunosus	0.000	0.120	0.000
Atropus atropus	0.000	0.000	0.007
Batrichthys felinus	0.035	0.035	0.022
Caranx heberi	0.252	0.000	0.018
Caranx ignobilis	1.432	1.304	0.716
Caranx sem	0.511	0.389	0.122
Congresox talabonoides	0.000	0.000	0.060
Ctenotrypauchen microcephalus	0.000	1.567	0.000
Carcharhinus melonopterus	0.060	0.000	0.000
Carcharhinus sorrah	0.056	0.000	0.000
Cynoglossus arel	0.225	0.162	0.111
Cynoglossus macrostomus	0.776	2.264	10.195
Cynoglossus puncticeps	0.419	1.534	1.625
Cypselurus poecilopterus	0.000	0.000	0.372
Decapterus russelli	0.000	0.000	5.033

SPECIES	PRE-MONSOON	MONSOON	POST-MONSOON
Diodon hystrix	0.000	0.000	0.007
Drepane punctata	0.022	0.011	0.018
Dussumieria acuta	0.063	0.016	0.025
Epinephelus diacanthus	0.046	0.000	1.284
Epinephelus malabaricus	0.000	0.002	0.000
Epinephelus tauvina	0.000	0.002	0.000
Escualosa thoracata	0.043	0.225	0.122
Fistularia petimba	0.000	0.003	0.006
Gerres filamentosus	0.226	0.947	1.293
Gerres limbatus	0.000	0.011	0.000
Gnathanodon speciosus	0.525	0.691	0.291
Gymnothorax javanicus	0.000	0.016	0.000
Gymnothorax pseudothyrsoideus	0.000	0.037	0.000
Hemiramphus lutkei	0.009	0.054	0.000
Himantura imbricata	0.009	0.004	0.000
Johnieops sina	0.000	0.027	0.000
Johnius belangeri	0.737	0.546	0.159
Johnius carutta	0.000	15.813	0.043
Johnius dussumieri	0.000	0.223	0.000
Johnius glaucus	0.041	0.845	0.006
Lactarius lactarius	0.562	3.844	0.472
Lates calcarifer	0.256	0.121	0.000
Leiognathus bindus	1.926	1.502	0.778
Leiognathus blochi	0.082	0.000	0.009
Leiognathus brevirostris	0.000	0.588	0.039
Leiognathus duara	2.327	1.371	0.545
Leiognathus splendens	0.000	0.543	0.043
Lethrinis lentjan	0.000	0.006	0.000
Liza parsia	0.000	0.031	0.009
Lutjanus johni	0.100	0.031	0.050
Lutjanus russellii	0.000	0.009	0.238
Megalaspis cordyla	0.671	0.022	0.005
Megalops cyprinoides	0.000	0.000	0.005
Monodactylus argenteus	0.027	0.013	0.030
Mugil cephalus	0.459	0.907	1.768
Muraenesox cinereus	0.000	2.064	0.225
Opistopterus tardoore	0.246	0.864	0.000
Nemipterus japonicus	0.000	0.000	0.005
Otolithes cuvieri	0.196	0.420	0.023
Otolithes ruber	0.000	0.022	0.000
Pampus argenteus	0.060	0.102	0.027
Parachaeturichthys polynema	0.049	5.125	0.000
Parastromateus niger	0.008	0.128	0.070
Pellona ditchela	0.000	0.005	0.000
Pisodonophis cancrivorus	0.000	0.583	0.041

SPECIES	PRE-MONSOON	MONSOON	POST-MONSOON
Pempheris mangula	0.020	0.000	0.000
Platycephalus crocodilus	0.116	0.666	0.025
Platycephalus indicus	0.000	0.000	0.012
Polynemus sextarius	0.000	0.004	0.005
Pomadasys maculatus	0.022	0.007	0.008
Pomadysis hasta	0.016	0.000	0.000
Psettodes erumei	0.006	0.000	0.007
Pseudorhombus javanicus	0.147	0.021	0.102
Pseudorhombus triocellatus	0.056	0.161	0.117
Pseudotriacanthus strigilifer	0.000	0.000	0.006
Rastrelliger kanagurta	28.033	8.907	55.157
Sardinella albella	0.183	0.223	0.198
Sardinella fimbriata	1.451	15.390	2.411
Sardinella gibbosa	0.000	9.889	19.403
Sardinella longiceps	64.445	1.072	55.170
Saurida tumbil	0.032	0.000	0.005
Scatophagus argus	0.018	0.054	0.082
Scomberoides lysan	0.000	0.000	0.006
Scomberoides commersonianus	0.006	0.078	0.000
Scomberoides tol	0.000	0.021	0.016
Scomberomorus commersoni	0.762	0.994	0.430
Secutor insidator	0.728	0.392	0.092
Secutor ruconius	1.183	1.098	0.287
Siganus canaliculatus	0.000	0.012	0.000
Siganus oramin	0.000	0.000	0.097
Sillago sihama	0.093	0.107	0.464
Solea elongata	0.047	0.374	0.106
Sphyreana barracuda	0.032	0.101	0.046
Stolephorus commersoni	2.297	5.654	4.116
Strogylura strongylura	0.037	0.000	0.013
Strongylura leiura	0.005	0.000	0.046
Synoptura commersonianus	0.272	0.290	0.194
Telescopium telescopium	0.005	0.000	0.000
Terapon puta	0.000	0.000	0.140
Tetraodon inermis	1.579	5.226	0.759
Terapon jarbua	0.155	0.097	0.566
Thyrsoidea macrura	0.000	0.298	0.129
Thryssa malabarica	0.491	0.816	0.013
Thryssa mystax	0.176	0.282	0.050
Thryssa setirostris	0.319	1.965	0.275
Thryssa vitirostris	0.000	0.540	0.112
Trachinotus blochi	0.033	0.000	0.020
Trichiurus lepturus	0.651	4.487	0.331
Trypauchen vagina	0.000	98.221	0.054
Upeneus moluccensis	0.000	0.019	0.000

and *Charybdis feriata* contributed 6, 5 and 4% of the crustacean fishery respectively. *Scylla serrata* also were seen during all seasons. Other crabs caught were not of commercial significance. Stomotopod, *Oratosquilla nepa* which is dried and used as fertilizer was also recorded. Season-wise catch rate of 17 species of macro-crustacean fauna is given in Table 2.

Table 2. Catch per unit effort of macro-crustaceans recorded during different seasons

SPECIES	PRE-MONSOON	MONSOON	POST-MONSOON
Acetes johni	0.490	0.000	0.000
Charybdis feriata	1.459	1.961	1.985
Charybdis lucifera	1.458	0.000	0.524
Clibanarius padavensis	0.005	0.000	0.000
Penaeus indicus	5.544	20.064	7.378
Penaeus merguiensis	0.113	0.307	0.059
Matuta lunaris	0.124	0.038	0.132
Melicertus canaliculatus	0.000	0.000	0.034
Metapenaeus affinis	0.243	4.718	3.248
Metapenaeus dobsoni	1.812	6.918	39.202
Oratosquilla nepa	2.154	0.036	4.583
Parapenaeopsis stylifera	0.638	4.065	0.404
Penaeus monodon	0.112	3.142	0.408
Penaeus semisulcatus	0.094	0.015	0.180
Portunus pelagicus	1.759	3.091	2.209
Portunus sanguinolentus	2.325	2.847	3.892
Scylla serrata	0.037	0.003	0.008

From fisheries management perspective, judicious suggestions on the fishing operations can ensure sustainability of the fishery on long term basis, thereby ensuring the livelihoods of the coastal fishermen of Karwar. In climate change perspective shore-seine fishery is highly vulnerable fishing method as extensive changes are occurring in the beach topography due to sea level rise and also by sea erosion. Hence, fishermen of the coast who are depending exclusively on shore-seine operations for their livelihood, have to be empowered with avenues of alternate vocations also.