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KV Tank
College of Fisheries Science, Junagadh Agricultural University, Veraval-Junagdh By-Pass Road, Veraval, Gujarat, India

VC Bajaniya
College of Fisheries Science, Junagadh Agricultural University, Veraval-Junagdh By-Pass Road, Veraval, Gujarat, India

JB Solanki
College of Fisheries Science, Junagadh Agricultural University, Veraval-Junagdh By-Pass Road, Veraval, Gujarat, India

Correspondence
KV Tank
College of Fisheries Science, Junagadh Agricultural University, Veraval-Junagdh By-Pass Road, Veraval, Gujarat, India

Composition and diversity of fish and shell fish catch of trawl net along the Veraval coast, Gujarat, India

KV Tank, VC Bajaniya and JB Solanki

Abstract
The present work aimed to obtain precise data on the catch of the trawl net operated along the Veraval coast, Gujarat from August 2010 to May 2013. Throughout the study period 90 marine species (70 finfish and 20 shell fish) were recorded. Ribbon fish, thread fin bream, squid, lizard fish and cuttlefish forms a major proportion of the catch. The catch of lizard fish was continuously increasing whereas catch of commercial important variety like shrimp and croaker declined. Majority of fishermen were using two seam net of less than 40 mm cod-end mesh size which contributed a sizable quantity of juveniles and by-catch. Some innovative fishermen have adopted square mesh cod-end for responsible fishing. Trawlers with average LOA 13.38 meter and average registered tonnage was 9.35 ton was recorded. CPUE were declined from 45 to 30 kg/day/boat which indicates that the number of efforts increases as overall catch was declined. Appropriate measures need to implement to overcome the effect of overexploitation of fish stock.

Keywords: Trawl net, catch composition, CPUE, Veraval

Introduction
Mechanization of indigenous artisanal fishing crafts and introduction of mechanized fishing vessels started during the first five year plan period in India. This was followed by the introduction of bigger boats and new type of gears. Experimental trawling with small mechanized boats was carried out. Fishermen made single day cruises starting from the vase early in the morning and returned in the evening after making 3-4 haul of about one hour duration each. Multiday operation of trawler and multi-gear operation are new trend in the trawl net fishery [7].

The trawl nets are cone-shaped net (made from two, four or more panels) which are towed, by one or two boats, on the bottom or in mid-water (pelagic). Trawling has contributed to increased marine fish production and has led to its widespread adoption by many countries. In India, trawlers have contributed the major part of the total marine fish production account more than 50% [9]. In this about 51% of the catch was contributed by the west coast and remaining by the east coast of India [4]. Among the nine maritime states and two union territories, Gujarat ranked first with fish landings of 7.21 lakh tones [2]. Trawl catches are composed of a highly diversified mix of fish, cephalopods, and crustaceans, since the trawls that are used are not very selective [3]. Veraval is the largest fish landing center of Gujarat. Veraval Harbour contributes to nearly one fourth of annual the landing of Gujarat. In inhabiting this paper we tried to find and identify the catch composition of finfishes and shellfish landed at Veraval. Catch composition study gives an idea of species spectrum which intern gives the idea of the age structure of the individual species available at Veraval coast.

Materials and Methods
The study was conducted at the Veraval (Latitude: 20°54'N Longitude: 70° 22' E), Gujarat. Fish samples were collected from the trawl net operators during January to May and August to December for identification. Monthly five boats were randomly selected for obtaining catch composition data [1]. Fishing was stopped before on set of monsoon or generally on 15st May to 15th August. Random sampling method was used for studying catch composition of trawl net [8]. A following observations had been recorded *viz.*, species identification (the members of group finfish were identified up to the species level using standard taxonomical keys given by

FAO fish identification catalogues [5] and estimation of proportion of FAO fish catch, gear specifications (mesh size, seam of the net), craft specifications (LOA, registered tonnage, gross tonnage, crew capacity, engine HP).

Results and Discussion

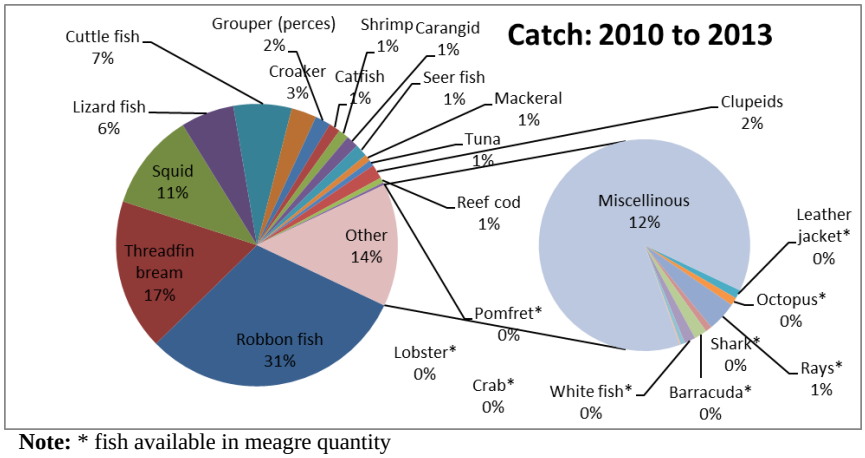
The primary goal of this study was to find out catch composition of trawl net operated along the Veraval coast. Trawl net catch was composed of a highly diversified fishes, cephalopods and crustaceans, since the trawl nets were non-selective. The data were collected from January 2010 to May 2013. Throughout the study period 90 marine species were recorded in the fishery (Table 1).

Table 1: The major species included in each group were as follows

Name of the species group	Species
Ribbon fish	*Lepturocanthus savala and Trichiurus lepturus*
Threadfin bream	*Nemipterus japonicas, Elethronema tetradactylum, Polynemus indicus and Nemipterus misoprion*
Squid	*Loligo duvauceli*
Lizard fish	*Saurida tumbil and Platycephlus indicus*
Grouper (perches)	*Epinephelus malabaricus, Epinephelus diacanthus and Epinephelus areolatus*
Croaker	*Johnius dussumieri., Otolithoides biauritus, O. ruber and Protonibea diacanthus*
Cuttlefish	*Sepia aculeata, Sepia pharaonis, Sepiella inermis and Sepia prasadi*
Carangid	*Carangoides malbaricus, Magalapsis cardyla, Decapterus russelli, Scomberoides commersonianus, Alectis indicus and Parastromateus niger*
Catfish	*Arius dussumeiri, Arius jella, Osteogeneiosus militaris*
Shrimp	*Solenocera crassicornis, Metapenaeus affinis, M. monoceras, Parapenaeopsis stylifera, Penaeus monodon, Fenneropenaues indicus and Acetus indicus*
Tuna	*Thunnus obesus, Katsuwanas pelamis, Euthynnus affinis and Thunnus tonggol*
Reef cod	*Lutjanus lutjanus*
Mackeral	*Rastrilliger kanagurta*
Pomfret	*Pampus argenteus and P. chinesis*
Octopus	*Octopus vulgaris*
Seer fish	*Scomberomorus guttatus, S. commerson and S. lineolatus*
White fish	*Lactaarius lactarius*
Rays	*Dasyatus bleekeri, Rhyncobatus djeddensis and Torpedo marmurata*
Leather jacket	*Odonus niger and Balistes fraenatus*
Crab	*Portunus sanguinolentus, Carybdis fariata and Carybdis natator*
Shark	*Scoliodon laticaudus and Sphyrna jello*
Barracuda	*Sphyraena jello and S. obtusa*
Clupeids	*Tenulosa ilisha, Ilisha melanostoma, Coilia dussumieri, Chirocentrus dorab and C. nudus*
Lobster	*Panulirus polyphagus and Thennus orientalis*
Miscellaneous	*Trachynotus spp., Psettodes erumei, Cynoglossus spp., Therapon jarbua, T. theraps, Muraenosox cinereus, Conger cinerus, Priacanthus hamrur, Lethrinus remark. Remora remora, Mene maculata, Rachycentron canadum, Coryphaena hippurus Upeneus spp. and Apogon Leptacanthus*

In 2010, major resources landed in the trawl net were Ribbon fish (19%), threadfin bream (18%), white fish (7%), shrimp (6%), grouper (5%) and squid (5%). The catch of ribbon fish was declining from February to April which September onwards the catch of ribbon fish was increased. In 2011, major resources landed in the trawl net were ribbon fish (33%), threadfin bream (11%), squid (8%) and lizard fish (7%). There was declined in the catch during November may be due to cyclone. In 2012, major resources landed in the fishing gear were Ribbon fish (21%), threadfin bream (20%), squid (11%) and cuttlefish (10%). A catch was declined from February to May and stable in August and September. In January to May 2013, major resources landed in the trawl net were Ribbon fish (43%), threadfin bream (16%), squid (14%) and lizard fish (5%).

During the study period ribbon fish dominated with 31% followed by thread fin bream (17%), squid (11%), lizard fish (6%) and cuttle fish (7%) (Figure 1). A highest total catch fluctuation was noted during 2010. A highest catch was recorded during November 2010 and lowest during February 2010. A catch was almost constant during 2011 (Figure 2).



Note: * fish available in meagre quantity

Fig 1: Percentage of composition of trawl net during January 2010 to May 2013

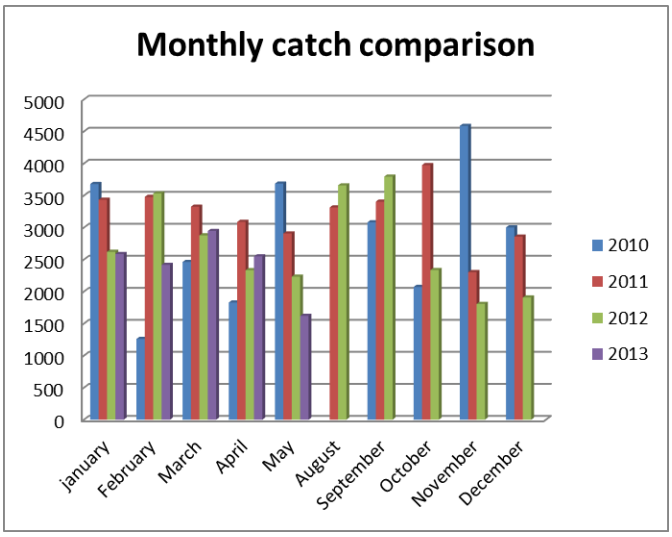


Fig 2: Catch comparison during January 2010 to May 2013

The most significant species group was represented in the catch by ribbon fish by trawl net. *Lepturocanthus savala and Trichiurus lepturus* represented the most relevant fraction of the landing. A proportion catch of Ribbon fish was highest during 2013 because highest landing in January 2013. Ribbon fish catch was continuously increased during study period except 2012. Gopalkrishnan (2013) has also reported Gujarat which has accounted for higher contributions from ribbon fishes, which have also recorded increased landings.

Thread fin bream was the second most important group. Gopalkrishnan (2013) had reported that in Gujarat, thread fin bream recorded increased the landings. There was an inverse relationship between ribbon fish and thread fin bream catch. Throughout the study period catch of the squid remain stable. It seems that the reproductive capacity and high growth rate of squid sustained its stability in the catch.

In 2010, heavy catch of leather jacket (*Odonus niger* and *Balistes fraenatus*) which is tropical migratory fish was observed at the Veraval landing centre. It may possible that the climate change effect might have caused migration of this fish into study area.

Surprising catch of White fish was reflected in the catch during 2010 because it is a migratory fish. Thread fin bream feed on shrimps and croaker. Ribbon fish also feed on crustacean. So that might be the reason for the declining catch of shrimps and croaker. The catch of carangid and tuna is remaining stable throughout the study period.

Catfish catch was 5% during 2010 and declined to 2% in 2011 onwards which shows the heavy fishing pressure on this slow growing important demersal fish. A high priced commodity shrimp catch was also continuously declined.

Lizard fish catch shows an increasing trend throughout the study period. In 2013, 5% of the total catch was recorded during first five months catch. This increasing catch trend of lizard fish showed filling the gap of declining catches of catfish, croaker and shrimp.

The mechanized trawler fleet in Veraval was having medium sized (88-110 HP) engines. Length Overall (LOA) recorded was 13.38 meter for trawler. Crew member employed for multiday trawler was in the range of 7-8 persons. The Gross tonnage of the boat ranges from 28.85 to 34.65 ton and average registered tonnage was 9.35 ton. A mesh size of a cod-end of trawl net ranges from 15 mm to 40 mm. Fishermen was using generally two seam net. For catching finfish and shellfish fishermen were using different size of mesh net. Observation on the fishing gear reveals that they were not adopting new technology for fish catching methods i.e. Turtle excluding devices and by-catch reduction Devices. Some innovative fishermen were adopting square mesh cod-end for responsible fisheries.

A Catch per Unit Effort (CPUE) or catch per hour (CPH) that is an index of abundance. A CPUE for multiday trawler was 2912.06 kg and CPH was 36.09 kg during the study period. For calculating CPUE, 3-4 haul of about 2 hours duration each was considered. A downward trend of CPUE and CPH were recorded from 2011 onwards. Compared to 2010, the CPUE was declined from 2851.64 kg to 2720.12 kg and CPH was declined from 45 kg to 30.93 kg. It indicates that the number of effort and catching hours was increased but still the catch was declined. Bottom trawling might have caused adverse impacts on the fish stock.

Ninety marine finfish and shellfish species were recorded in the trawl net fishery in which ribbon fish, thread fin bream, squid, lizard fish and cuttlefish formed a major proportion of fish catch. This study has given some fruitful result like a catch of lizard fish was continuously increasing whereas catch of commercial important variety like shrimp and croaker declined. A catch of squid remains stable. There was an inverse relationship between ribbon fish and Thread fin bream catch. It was found that the majority of fishermen were using two seam net and below 40 mm cod-end mesh size which contributed the sizable quantity of juveniles and by-catch. Some innovative fishermen have adopted square mesh cod-end for responsible fisheries. CPUE and CPH are declining 2011 onwards. So, the number of efforts increased and overall catch was declined. Gopalkrishnan (2013) has also reported that am increased deployment of high speed, high efficient engine which has increased the reach to unexplored areas but resulted in reduction in CPUE. Due to heavy pressure of fishing, catch of high valued fishes was depleted. Adequate conservation and management measures need to be implemented to prevent overexploitation of fishery resources at global scale.

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