

Assessment on the present status of coastal fisheries at Gurunagar, Jaffna

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Abstract

Fishery is a major income source of the Sri Lankan people resides in the coastal region. Among those, Jaffna contributes a considerable proportion to the total fishery production of the island which was 4.5% of the total fish production in Sri Lanka in 2013. This study aimed to collect recent updated fisheries information as the government already identified Gurunagar as a potential site in Jaffna to develop to the status of a harbor. Fishery related data was collected during the period April to June 2015 from commercial fishing vessels and sirakuvalai fishing operations landed at Gurunagar. Primary data was collected through direct observations during the field visits and secondary information was collected from the records of the Fisheries office at Jaffna. Catch, effort species composition, fishing craft and gear information were collected from randomly selected fishing crafts on randomly selected days. Fishers at Gurunagar engage in different fishing practices. Fishing activities of this area are regulated by the Fisher's societies with the assistance of Department of Fisheries and Aquatic Resources. A total number of 28 species, representing 22 families were identified in commercial landings during the study period and also the species diversity and size of the fish (2.4 cm – 69 cm) varied with gear types. The types of gears used varied with the craft types. The catch rates of Outboard Fiber Reinforced Plastic Boats (OFRP - one day boats) recorded as higher than in-board day boats. Total fish production was recorded as around 128 tons during the study period. Production of sirakuvalai was accounted for 7.4 % of the total production in the study area. Commercial production per day is recorded around 3972.5 kg/Day and the average number of boats actively operated is 150. The existing facilities in the Gurunagar landing site for anchoring boats, sorting the catches, auctioning, storing and distribution are not up to the level required for an export oriented fish landings. Results of the present study suggest the need of further monitoring of this landing site to gather reliable information at least one year of time to cover seasonal variations of fish landings.

Key words: Commercial fishery, fishing crafts, fish production, Gurunagar, sirakuvalai fishery

Introduction

Fishery resources are a vital source of food and make a valuable economic contribution to the local communities in most of coastline countries (Narriman *et al.*, 1998). Small Tropical

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Island like Sri Lanka is mainly depends on fish as a food source that policies and management ensure its sustainable use and sufficient access for dependent communities (Anonymous, 2015).

Sri Lanka is situated in south of the Indian subcontinent. The total length of coastline is approximately 1,739.3 km and the area of continental shelf is 30,000 km² (CCD, 2013). In 2014, coastal fisheries accounted for 62 % of the total marine production, amounted to 209,500 Mt (Munro, 1955). The contribution from the coastal fisheries of Jaffna was estimated at about 4.5 % of the total marine fish landings in Sri Lanka in 2009 (Anonymous, 2011). Gurunagar landing site belongs to Jaffna west Fishery Inspector (FI) division within 14 FI divisions (Ministry of Fisheries, 2013). Fishing is an ancient occupation for the people in Gurunagar which is one of the major populated areas, contains 9159 people who directly depend on the fishery (Anonymous, 2011). Those who are engaged in coastal fishing and fishery related activities.

Assessment of the current trends in capture fisheries at Gurunagar including biological and socio-economic aspects is the key for policy development, better decision making and fisheries management. It supports to manage fisheries and aquatic resources that results in a better public image and sustainable fisheries in the future through data gathering, analysis and research (Anonymous, 2015). Gurunagar fishery is a complex system of interacting factors incorporating the state of the biological, social and institutional constraints, economic and cultural beliefs (De Graaf *et al.*, 2015). It is necessary for predictive assessment of future outcomes of alternative management measures,

detail on fishing operations, fishers and the environment required to manage the fisheries. The aim of this study is to monitor and assess the status of stocks that are being fished. It is interpreted in relation to catch quotes, falling total landings and changes in the fish population and species composition.

The yield is an important indicator of fisheries performance, which forecast of sustainable landings that good management should be able to achieve (Bapat and Kurian, 1981). Further the fishermen engage in fishing activities using various kinds of fishing methods basically different gears, different fishing vessels and different methods of fishing (NARA, 2008). Apart from this, their fishing activities in this area have been regulated with fishing communities and fishermen societies (Raguparan, 2013).

In this study, the components of fish, fishermen, fishing craft and fishing gear exist in this particular fishery were analyzed to determine the present status of coastal fisheries in Gurunagar. These findings give a brief idea to the stakeholders of this fishery in this region for sustainable fishery management and ecosystem and economic stability for local community. And also, this study can support the Ministry of Fisheries and Aquatic Resource Development by providing required information to develop the harbor in future.

Materials and Methods

Geological coordinates of Gurunagar are the latitudes of 9°38'57"N and the Longitude 80°1'8"E which was selected as the study area (Figure 1) for this research during the period from April to June, 2015.



Figure 1: Gurunagar fish landing site selected for the study area.

Primary data were collected in fish landing site, over a three month study period. Catches from any type of 70 fishing crafts per day were randomly selected. Weights of the catches were recorded based on species and gear. The number of operating crafts per day, fishing craft types used in a selected day, types of fishing gear differed with the variety of fishing crafts and number of fishing days for each type of fishing crafts were collected to analyze the fish production at Gurunagar fish landing site.

Secondary data such as fishing population, fishermen societies, facilities of the landing site were collected from the Department of Fisheries and through the direct observation and discussion with fishermen.

Results and Discussion

Socio-economic status of Gurunagar fishing community

In this study all illustrations described that the strength of the Gurunagar landing site in consistence production of fishery products is its relatively huge number of individuals (9159) in the fishing community and active fishermen (3100). Sirakuvalai fishery, trawl fishery, auctioneer and fishermen co-operative societies regulate the fishing activities in Gurunagar fish landing site. A number of 30 auctioneers and 20 retailers have been involved in the marketing of the fishery products.

Women role in fishing activities at Gurunagar was significant. They are involved in the activities of net repairing, net mending, sorting of catches,

selling fishery products, dry fish production and collection of seashells. Their working hours per day vary with seasons.

The economic status of a fishing family living in Gurunagar may not be a constant. It fluctuates with season, climatic condition, fishing effort and investment in fishing gear. The people who involved in fishing activities can broadly be categorized as fishing craft owners, labors, auctioneers, retailers and dry fish producers. The monthly income of a person may differ from LKR 20,000 to 75,000 according to the occupation.

Fishing Techniques

The fishermen in Gurunagar have been adapted to several fishing gear and fishing methods for decades (Table 1 and 2). Even though they were not highly modernized, the operated depth ranged from 6 to 40 feet and also a numerous number of species such as small and large pelagic species, demersal fishes and prawns were being exploited by these different forms of fishing gear (Chitravadivelu, 1990a) using different fishing methods (Chitravadivelu, 1990b).

Table 1: Types of fishing gear used in Gurunagar area for catching the targeted species.

Type of gears	Associated gears	Target species	Comment
Gill nets	Drift gill net	<i>Caranx</i> sp. Black tipped leather skin <i>Hemirhamphus</i> sp.	Made up of nylon. Mesh size - 1.5, 2.25, 3.5, 4.5. Thread size is 6-9 ply. Used in OFRP and IDAY Operate depth – 6 ft to 30 ft
	Bottom gill net	<i>Siganus</i> sp. mugil, <i>Gerreomorpha</i> sp.	Used to catch bottom dwelling (demersal) species. Mesh size - 2.25, 3.5, 4.5. Thread size is 21-45 ply. Used in OFRP and IDAY Operate depth – 6 ft to 30 ft
	Crab net	<i>Portunus</i> sp.	Mesh size, 2.25, 3.5, 4.5 Used in OFRP, MTRB crafts. Operate depth – 6 ft to 30 ft
Casting net		<i>Siganus</i> sp. <i>Gerreomorpha</i> sp.	Operated by one man Used in shallow water Targeted species - schooling species

Type of gears	Associated gears	Target species	Comment
Trammel net or Disco net		<i>Penaeus</i> sp. Lobster <i>Lethrinus</i> sp. <i>Portunus</i> sp.	Usually used in bottom. Perpendicular height is 9'. It contains 3 nets. Internal (pouch like net) mesh size (1''-1.5'') External net (14''-36''). Targeted species - Shrimp and lobsters
Trawling net	Bottom trawler	<i>Penaeus</i> sp. Sea cucumber <i>Portunus</i> sp. Rays Shark Vaaval Buffer fish	Consists of funnel shaped belly, cod end wings and long ropes. It is fixed on vessels and pulled along the ocean area. Mesh size 1.25 inches Used in IDAY crafts. Operate depth – 18ft to 42ft
Sirakuvalai		<i>Penaeus</i> sp. <i>Siganus</i> sp. Squids	Installed in a shallow water body against the lagoon mouth. The mesh size - 1.25in. Used in the MTRB vessels
Brush Park	Leaves	Cuttle fish	Leaves are installed in sea floor during the spawning season of cuttlefish. Cuttlefish lay their eggs on the leaves and stay there. Then they can be caught by using the hooks and nets.

Type of gears	Associated gears	Target species	Comment
Hook and line	Hand Line	<i>Hemirhamphus</i> sp. <i>Arius</i> sp. <i>Gerreomorpha</i> sp. <i>Siganus</i> sp.	Used in offshore. Hooks are fixed in lines. Earthworm, small shrimp, cuttlefish and small fish are used as bait.
		<i>Lutjanus</i> sp.	Used in the inshore while they are doing the net fishing
Manual picking	Hand picking	Sea shells	In offshore - 1 to 3 feet depth. Women manually pick the sea shells in the shallow water areas.
		Sea cucumber	Sea cucumbers are collected by divers in shallow areas.
	Long hooks	Lobster Skates and Rays <i>Lutjanus</i> sp.	Hooks are used to catch burrow dwelling species. It is done by the divers

Note: IDAY – Inboard Day boat; OFRP – Out board fiber Reinforced Plastic Boat;

MTRB – Mechanized Traditional Boat; NTRB – Non Mechanized Traditional Boat

Type of crafts	Number of operating crafts	Dimensions			Minimum fisher per craft	Comments
		Length (Feet)	Width (Feet)	Weight (Ton)		
IDAY	150	28- 32	8	3.5	5	Landed only on Tuesday, Thursday and Sunday. Operated depth - 18-42 feet. Operating hours > 12 hours.
OFRP	396	17-20	4.5	1.5	3	Operated only on Monday, Wednesday, Friday and Saturday. Operated depth - 12-30 ft Operating hours - 8 hours.
MTRB	80	25.3	5.09	--	2	Operated daily. Accompanied with sirakuvalai and casting nets.
NTRB	69	25.3	5.09	--	1	Operated daily. Accompanied with sirakuvalai and hooks and line.

Fish production trend

Table 3: Mean per day craft and monthly fish production for different craft category on Gurunagar landing site for three months study period (April to June 2015)

Craft category	Per day production (kg)	Fishing Days	Number of operating crafts	Average monthly production (kg)
IDAY	3389.73	13	150	44066.49
OFRP	5777.64	13	250	75109.32
Sirakuvalai	635.71	15	100	9535.65
Total				128711.46

The average fish production was 128 tons for three months study period (Table 3). Most of the fish are caught from IDAY and OFRP. Around 10 ton species caught from Sirakuvalai fishery. Most of the days of a month fishermen used the Sirakuvalai for fishing. But the average production was less compared to OFRP and IDAY. Other crafts such as OFRP and IDAY have less number of vessels and operate in few days in a month. Therefore the average fish production was less compared to Sirakuvalai.

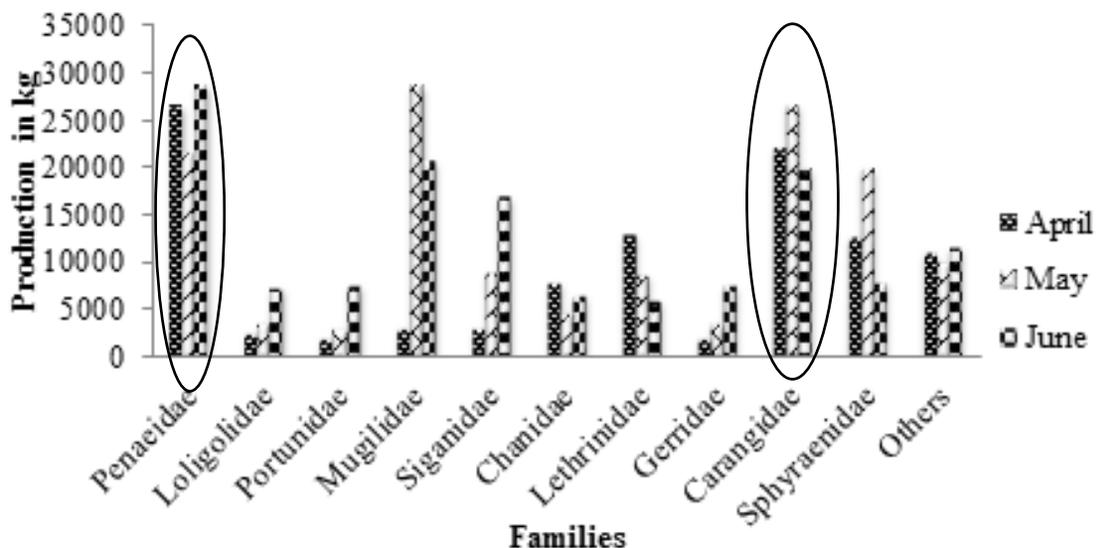


Figure 2: Production of different fish families from fishing crafts

As shown in this bar chart (Figure 2), families Penaeidae and Carangidae were caught in large amount throughout the study period. Family Mugilidae species were caught in high amount

in the month of May. Types of fish species caught vary in all three months from the catch of both crafts such as OFRP and IDAY.

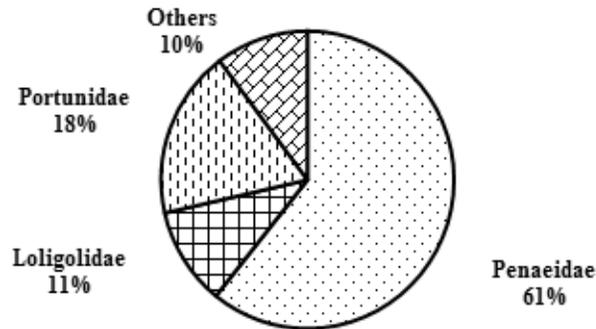


Figure 3: Composition of fish families from Sirakuvalai fishery

The fish species composition from Sirakuvalai fishery

Sirakuvalai fishery was the significant method in Gurunagar fishery. According to that this graph showed the percentage distribution of fish families caught from Sirakuvalai fishery (Figure 3). Sixty one percentages of Penaeidae species caught and it was accounted the highest percentage compared to other species in this fishery. Family Portunidae and family Loligolidae were caught less than 15%. While estimating total production of Sirakuvalai fishery, family Penaeidae had contributed large amount of nearly 7 tons and the month of highest catch, was April. Other species caught less amount and they showed the highest catch in June.

Species

The target fish species in Gurunagar include small pelagic and large pelagic species, demersal fishes and prawns. The smallest pelagic species of sardine, herring and the demersal species of shark, catfish, jack, trevally, rays, emperors and shrimps were caught. Species composition and

size vary with the type of gear, techniques and location. A total number of 28 fish species (Table 4) from 22 families were recorded at Gurunagar landing site (De Bruin *et al.*, 1994). The most common families were Penaeidae, Siganidae, Gerreidae, Chanidae, Trygonidae, Carangidae and Portunidae (Figure 4). Shrimp fishery is important in this site. The common prawn species are *Penaeus semisulcatus*, *Penaeus monodon* and *Penaeus indicus*. Families carangidae, Mugilidae and Penaeidae species were caught in large amount than other species from families Chanidae, Portunidae, Lethrinidae and Gerreidae (Munro, 1955).

Problems by short facilities

The findings indicated in terms of production, Gurunagar is one of the highly productive landing sites in Jaffna. But this region has no harbor facilities which includes for landing and distributing fish and accessing land and navigable water, for commercial demand, and for shelter from wind and waves.

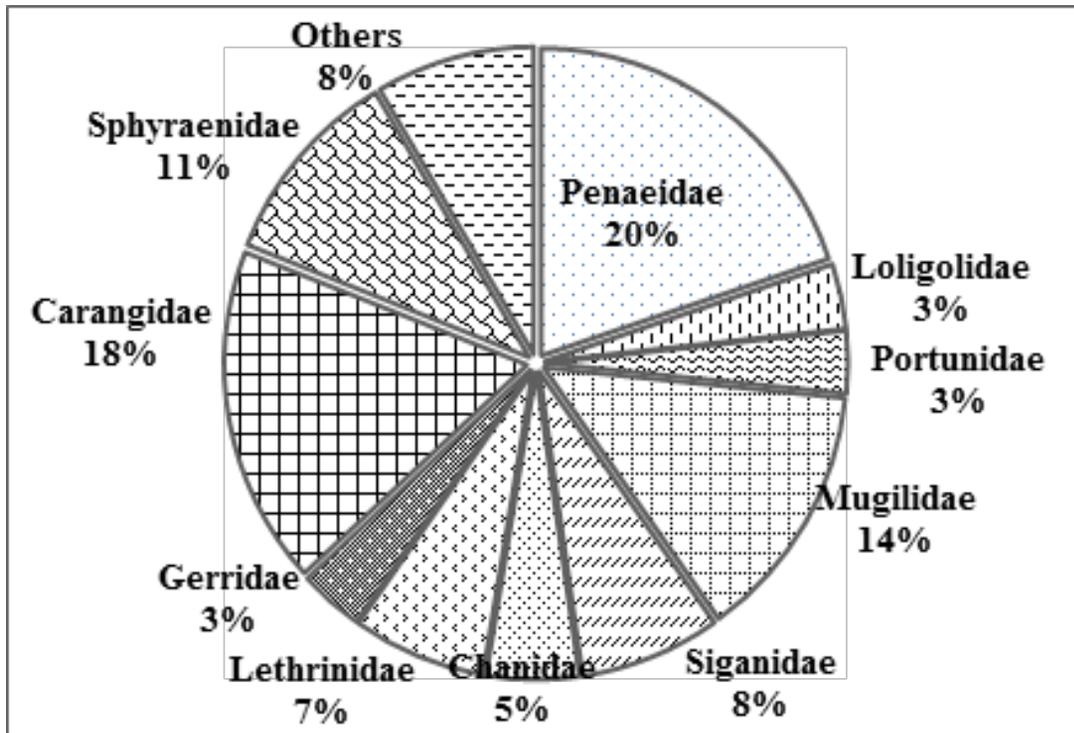


Figure 4: Composition of targeted fish families from Gurunagar fishery

Even though huge amount of fish was brought into the landing sites, there is no proper way for landing and sorting fish. Usually fish were sorted out on the boat. Entering another boat into the landing site was problematic which leads damaging fish. And also unwanted or by-catch organisms were discarded at sea. Boat repairing was done in the coast. Remaining oil, paint, other materials such as wood shavings, screw were thrown into the sea. Pollution happens

due to waste disposal in the sea which leads fish killing and their habitat. So the future stock will be declined.

Nets were put in the seaside in bulk. Nets were mixed together and the separation of them is also difficult. There was no place for mending nets. Fishermen face such difficulties as spreading nets in all places.

Table 4: The recorded fish species during the study period at Gurnagar

No	Family	Species name	FAO	Sinhala name	Tamil name
1	Carangidae	<i>Caranx sansun</i>	Yellow-fin travelly	Parawa	Manchal Paarai
2	Carangidae	<i>Chorinemus tolooparah</i>	Black-tipped leatherskin	Pothu kattava	Katta/Thol parah
3	Carcharinidae	<i>Scoliodon palasorrah</i>	Grey dog shark	Kiri mora	Pal schura
4	Channidae	<i>Chanos chanos</i>	Milk fish/ Salmon herring	Vaikka	Paal meen
5	Chirocentridae	<i>Chirocentrus nudus</i>	Smooth wolf herring	Gal katuvalla	Kat Karuvallai
6	Clupeidae	<i>Kowala coval</i>	White sardine	Sudu sudaya	Vellai schudai
7	Dorosomidae	<i>Anodontostoma chacunda</i>	Short nose gizzard shad	Goiya	Koi meen
8	Gerreidae	<i>Gerreomorpha setifer</i>	Black striped silver biddy	Oleya/ udassa	Thirali/ Udakan
9	Hemirhamphidae	<i>Hemirhamphus marginatus</i>	Barred half beak	Thani hote mor- alla	Mural
10	Lethrinidae	<i>Lethrinus rhodopterus</i>	Rose finned pigface bream	-	Vella meen
11	Mugilidae	<i>Valamugil buchanani</i>	Buchanan's blue tail mullet	-	Siraiya meen
12	Mullidae	<i>Upeneus vittatus</i>	Yellow striped goatfish	Kaha iri nagareya	Manjal kithu nakharai
13	Penaeidae	<i>Penaeus indicus</i>	Indian white shrimp	Kiri issa	Vella iral
14	Penaeidae	<i>Penaeus monodon</i>	Giant tiger prawn	Karawandu issa	Karu ral
15	Penaeidae	<i>Penaeus semisulcatus</i>	Cocktail shrimp	-	Paaddu ral

No	Family	Species name	FAO	Sinhala name	Tamil name
16	Penaeidae	<i>Metapenaeus monoceros</i>	Speckled shrimp	Kooni	Kooni ral
17	Platycephalidae	<i>Platycephalus turberculatus</i>	Halfspined flathead	-	Eriyaal meen
18	Portunidae	<i>Portunus pelagicus</i>	Blue swimming crab	-	Nandu
19	Sciaenidae	<i>Johnius sina</i>	Drab jew fish	-	-
20	Serranidae	<i>Epinephelus undulosus</i>	Brown lined reef cod	Thambelaya	Panchi keleva
21	Siganidae	<i>Siganus javus</i>	Streaked spinefoot	Nava	Oora
22	Siganidae	<i>Siganus oramin</i>	White spotted spine foot	-	Oddi
23	Tachysuridae/ Aridae	<i>Arius caelatus</i>	Cat fish	Anguluva	Keleru
24	Theraponidae	<i>Therapon puta</i> / <i>Autistes puta</i>	Small scaled banded Grunter	Viran kili	Keeli/ Kove kitchen
25	Triacanthidae	<i>Triacanthus brevirostris</i>	Short-nosed tripod fish	Thunkkadduwa	Mullu kilaththi
26	Trygonidae	<i>Himantura uarnak</i>	Banded whip-tail stingray	Vali maduwa	Manal thirukkai/ Puliyar thirukkai
27	Trygonidae	<i>Amphoistius kuhlii</i>	Spotted stingray	-	Thirukkai meen
28	Holothuridae	<i>Holothuria scabra</i>	Sand cucumber	-	Karuppu addai

The ice factory located near to shore of Gurunagar landing site does not provide sufficient amount of ice to cater the demand of fishers. When the fishermen go to catch fish for long distance they need to have them for long time. It damages fish quickly. Fuel filling is done using oil filled cans due to no filling station in the coast. It consumes their working hours. And also fishermen have to store oil at home while they go for fishing at dawn or midnight.

Auctioning was done at Gurunagar landing sites for selling fish in small hut. Fish were sold for retail sellers and dry fish processing. Market trend is differed by the type and amount of fish caught in a particular day. Retail sellers purchase fish from fishermen and sell in markets or in small junctions. Usually small sizes, large amount, less marketable price fish are used for dry fish processing. Auctioning was done by president of fishing society or the leader of a boat. It is beneficial for selling fish in less time with less damage.

Some destructive fishing activities are also done in this area. In OFRP boat, trawling nets were used for catching shrimp. It leads to damage the bottom feeding organisms and the habitats. Untargeted population declines due to catching unwanted organisms in the bottom. Usually cuttle fish spawns in man-made or natural brush park area. While they come to spawn, fishermen catch them. If it continues the future stock will be rare.

Conclusion

The fisheries activities in this region are mainly conducted by two types of crafts and Sirakuvalai fishery. Sea cucumber, Lobster and Grouper fish species are dived and they were collected by those crafts of OFRP and IDAY. Diving-caught fish are also collected by those crafts.

A total number of 28 species, representing 22 families were identified in commercial landings during the study period and also the species diversity and size of the fish varied with gear types and operated crafts as the different gears are operated in different fishing grounds, during various fishing seasons and target different species. The catch rates per boat from Outboard Fiber Reinforced Plastic Boat were higher than In board Day boat. Total fish production was recorded as around 128 tons in these months. Production from Sirakuvalai was accounted for 7.4 % of the total production in the study area.

Commonly fish species belongs to the families of Peneaidae and Carangidae were the dominant species in the commercial catch during the study period. This shows the seasonal variation of fishing of species.

Commercial production and operating boats per day is relatively high. But the facilities in the Gurunagar landing site for anchoring boats, sorting the catches, auctioning, storing and distribution are not in the satisfied level.

Therefore, this study provides the information to enhance fisheries as the Government has a plan to develop Gurunagar anchorage to the level of a fully-fledged harbor.

Suggestions

It was difficult to find the CPUE from the catch information gathered from the commercial landing in the Gurunagar fishery. Because they use multiple gears at once and they switched to one from another based on the catch at that time. They sort the catch on boat at the sea mostly and rest at landing site. So it was difficult to separate the catches from the specific gear. However it can be sorted out with a controlled study.

Limitations

Fishing can vary seasonally, using fishing crafts and gears in this area. The study period is limited. Therefore, the fishing trend cannot be predicted for whole year.

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