

Present status of the fishery in Rekawa lagoon, Sri Lanka

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Abstract

Rekawa lagoon (240ha) is one of the important brackish water bodies in the Southern coast of Sri Lanka, the fishery of which has been exploited under artisanal basis for years by small-scale fishers using different types of traditional fishing gears. This study aimed to assess the present status of the fishery of Rekawa lagoon. The study was carried out from May to October 2004 to collect fish catch and effort data. Drift gillnets, cast nets and fish kraals are the permissible fishing gears in the lagoon. Fishing activities are managed by the Rekawa Lagoon Management Committee. The drift gillnet is the prominent gear and 11 feet non-mechanized fibreglass vessel is the common fishing craft. Kraal operations are seasonally conducted with onset of shrimp. Of the fish sampled, 22 finfish and 5 shellfish species were identified. *Nematalosa nasus*, *Pseudarius jella*, *Oreochromis niloticus* and *Liza dussumieri* were the main fin fish species caught. Although, *Penaeus indicus* has been the common species in the lagoon, because of the stocking practises conducted by NARA, *P. monodon* dominated the shellfish catches during the study period. The present study shows that the present fish production in the lagoon is very low so that fishers are in need of alternative livelihood options.

Key words: Rekawa lagoon, artisanal fishery, fish kraal, Co-management.

Introduction

Sri Lanka has a coastal line of approximately 1760km dotted with a large number of estuaries and lagoons. The total brackish water area covers 120,000ha consisting of lagoons, estuaries, swamps, tidal pools etc. Puttalam, Chilaw, Bolgoda, Negambo, Batticaloe and Jaffna lagoon are the main brackish water bodies in Sri Lanka. These water bodies are rich in both fin fish and shellfish resources. These ecosystems are important not only for fisheries but also as nursery grounds for a number of species of fin fish and shellfish. Since there is a large energy inputs in the form of detritus, lagoons and estuaries are the highly productive ecosystems, which are second only to the coral reefs (De Silva and De Silva, 1984).

Rekawa lagoon (240ha/ 6° 05'N and 80° 50'E) is a small basin estuary situated in the southern coast in Hambantota district, Sri Lanka (Figure 1). It is situated in the

intermediate climatic zone of the country with an annual rainfall of about 2000mm. The two monsoons dictate the weather and the rainfall in and around Rekawa area. From May to October the Southwest monsoon predominant and from November to April the Northeast monsoon influences the weather pattern. Rekawa lagoon receives freshwater from watersheds draining through the Kirama Oya, Rekawa Oya and Urubokka Oya (Figure 1). The Kirama Oya (32km) is the principal freshwater source for the lagoon. The lagoon has approximately 225km² catchment area.

The lagoon is bounded by a sand bar at seaward end and the landward end is bounded by paddy fields. Most of the paddy fields are abundant due to high saline conditions. On the basis of morphology, the lagoon can be divided into three major areas viz. deep sea channel (a), Kraal region (b) and lagoon proper (c) (Figure 1) (Jayatissa, 1987). The channel region is the deepest part having mean depth around 2m and the bottom is more or less even.

A. Fisheries in Rekawa Lagoon

A considerable portion of the community in Rekawa area depends on lagoon fishery for their livelihood. There are around 400 families having about 1600 members. They depend on either lagoon fishing or sea fishing and few are engaged in both of these activities. Fishers conduct their fishing activities mainly at the shallowest part of the lagoon, which has a mean depth around 0.75m at high water level. Fishing activities and welfare activities of fishers in the lagoon are managed by the Rekawa Lagoon Fisheries Management Committee (RLMC) consisting of government official, resource users and some non-governmental personals. RLMC meets once a month and discusses problems and the fishery related activities so that all responsible parties are actively involving in decision making. Therefore, it is a type of co-management system (Sen and Nielsen 1996). Fishers must be registered under RLMC for fishing in the lagoon. Presently there are around 162 registered members and around 72 registered crafts. During shrimp fishing season, some part-time fishers are also engaged in fishing.

A.1 Fish species in the lagoon; Of about 125 species of fish that have been recorded in Sri Lankan lagoons (Joseph, 1993), fifteen species of finfish and 6 species of shrimp were recorded from Rekawa lagoon (Jayakody and Jayasinghe, 1992). According to them *Oreochromis mossambicus*, *O. niloticus* and *Ambassis commersoni* dominate the finfish catch while *Penaeus indicus* dominates shrimp catch.

A.2 Fishing gears and vessels; In 1940s, the dominating fishing gear types were traditional methods such as castnet, fish kraals, brush piles and “Hiraweta/Iriweta” (Personal Communication). However, presently permissible fishing gears are cast nets, gillnets and fish kraals. Fishing activities in the lagoon are conducted with the help of non-mechanized craft with out trigger. Many of them are fibreglass boats while few are wooden canoes. Operation of mechanized boats is prohibited in the lagoon.

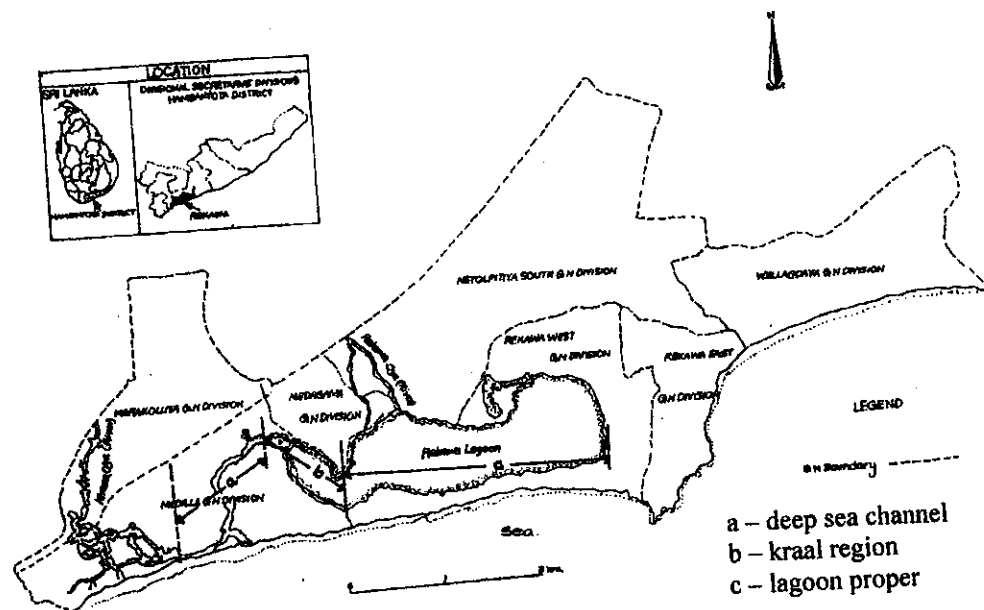


Figure 1 - Map of the Rekawa lagoon representing the location, main water sources and Grama Niladari Divisions. (Modified after Ganewatta *et al.*, 1995).

A.2.1 Cast net; Fishers operate cast nets almost in all parts of the lagoon. Small meshed (19mm) cast nets are used for catching shrimps whereas large meshed (76mm) cast nets are used for catching finfish.

A.2.2 Gillnet; Gillnet is the major fishing gear in Rekawa lagoon. This method has been introduced to the lagoon by fishers who were migrated and settled from Koggala area during 1940s (Personal Communication). Two ply nylon nets with two mesh sizes (19mm and 76mm) are used to catch shrimp and finfish.

A.2.3 Fish Kraal (Ja-kotu); Kraal is a kind of trap, made by Palmirah strips and is mainly used for catching shrimp. About 15000 strips are needed to erect a kraal. Only skilled fishers can construct kraals. Rekawa Lagoon Fisheries Regulations (RLFR) issued only 25 permits to regulate the number of kraals in the lagoon.

Materials and Methods

A frame survey was conducted before commencement of actual sampling program to identify basic characteristics of the fishery in Rekawa lagoon. Data on the fishing effort (craft and gear) and details about fishing gear (mesh sizes, time of operation, number of net pieces operated) were collected from the fishery once a week during the study period from May to October 2004. Fish landings were observed during weekly visits to collect data on species composition and bulk weight of each species in different fishing methods separately. Landing sites were visited in the early morning (5.30-7.00am) to collect catch and effort data before catches were sold.

Results

A.1 Fishing gears; Drift gillnet is the chief gear used in the Rekawa lagoon. Different fishing gear types used by fishers in various Grama Niladari (GN) divisions around Rekawa Lagoon are shown in Table 1.

A.1.1 Gillnet; Fishers use nets with two mesh sizes for shrimp and finfish. They set their nets in the lagoon at about 9.30pm and fishes caught are landed before 8.00am on the following morning. However, some fishers fish during daytime and they do not have a particular time for fishing operations. There are 58 fishers registered for gillnetting under RLMC. According to the RLFR, mesh sizes have been regulated as follows;

	for fin fish	for shellfish
Minimum permissible mesh size	76mm	19mm
Number of net pieces per fisher	4	6
Maximum length of gillnets	145m	145m

A.1.2 Cast net; Normally fishers use nets with two different mesh sizes as in gillnets. But minimum permissible mesh sizes are not decided. However, followings have been decided by RLFR.

- Radius of the net is 4-6m
- Diameter of the net is around 800-1000 meshes

A.1.3 Kraals; Normally kraals are used to catch shrimp. Although 25 permits have been issued to erect kraals only 4 kraals were operated during the study period due to low shrimp catch.

Table 1 - Different-fishing gear types used by fishers in Rekawa Lagoon fishery according to GN divisions

	Medilla	Medagama	Marakolliya	Netolpitiya	south	Rekawa west	Rekawa east	Wellodaya	Not mentioned	Total
Kraal	8	2	7	-	-	-	2	-	-	19
Kraal & cast net	-	-	1	-	-	-	-	-	-	1
Drift gillnet	11	9	1	11	3	23	-	-	-	58
Drift gillnet & cast nets	1	11	-	-	3	1	-	-	-	16
Cast nets	-	1	1	-	12	8	1	-	-	23
*other methods	2	1	1	3	-	22	3	13	-	45
Total	22	24	11	14	18	56	4	-	-	162

• Not mentioned above and no permission for cast net

B. Fishing effort; Fibreglass and wooden non-mechanized out trigger canoes (3.5m) are used in the fishery. Most of the fishers have their own vessels (about 88%). Canoes are made up of fibreglass (50%) or wooden (41%) and remain are constructed by using both fibreglass and wood. Fishers used to fish in different times of the day (Table 2).

Table 2 - The percentage involvement of fishers in fishing activities with respect to fishing time.

Fishing Time	Percentage
Night	44
Afternoon and night	32
Noon and afternoon	12
Morning	8
No particular time	4

C. Fish production; In terms of total weight of fish caught in the Rekawa lagoon, catch is based largely on few lagoon species mainly *Nematalosa nasus*, *Pseudarius jella*, *Liza dussumieri* and *Oreochromis niloticus* (Figure 2). Total finfish production varied with landing sites (Figure 3) and the highest production was reported at Godigamuwa landing site during June. During the present study, 22 finfish species are recorded (Table 3). There is no significant relationship between fish production and rainfall (Figure 4).

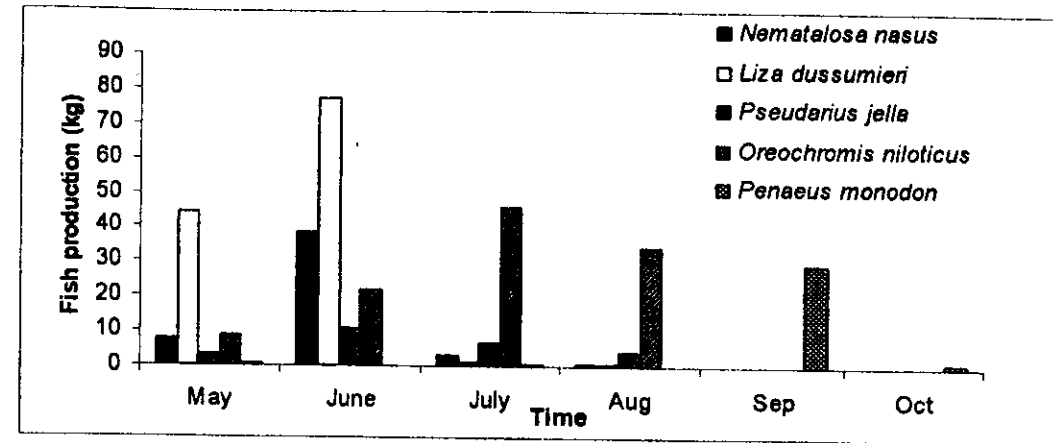


Figure 2 - Variation of major species in commercial catches in the Lagoon during the study period.

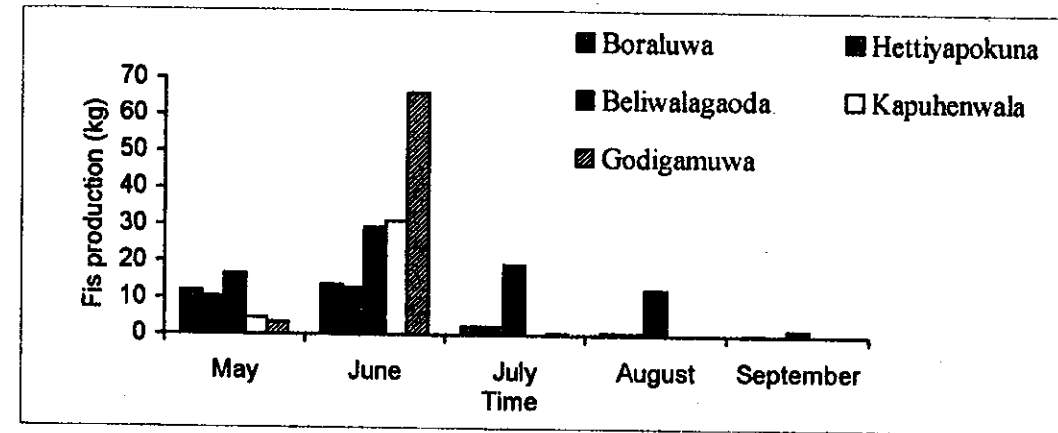


Figure 3 - Mean fish production in each landing site during the study period.

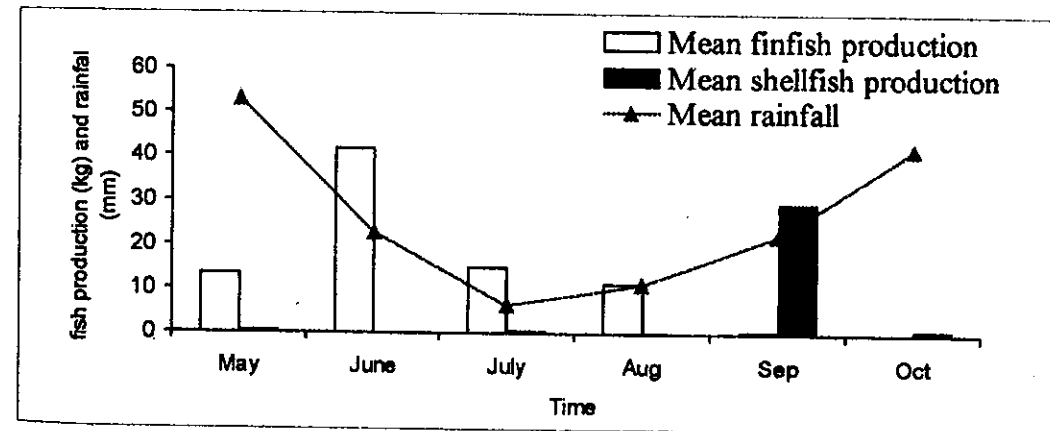


Figure 4 - Mean finfish and shellfish production and rainfall variation with time at Rekawa lagoon

Table 3 - Common fin fish and shell fish species found in Rekawa lagoon during different periods (1986, 1994, 2004)

Family	Scientific name	English name	Sinhala name	A	B	C
Ambasidae	<i>Ambassis commersoni</i> Cuvier 1828	Glassy perchlet	Katilla	-	-	+
	<i>Ambassis gymnocephalus</i> (Lacepede) 1802	Glassy perchlet	Katilla	-	-	+
Anguilidae	<i>Anguilla bicolor</i> McClelland 1845	Level-finned eel	Aanda	-	+	+
Bagridae	<i>Macrones vittatus</i> (Bloch) 1794	Cat fish	Ankutta	+	-	-
Carangidae	<i>Caranx sanson</i> (Forsk.) 1775	Travelly	Paraw	-	-	+
	<i>Carangoides malabaricus</i> (Bloch) 1801	Malabar travelly	Paraw	+	+	-
Chanoideae	<i>Chanos chanos</i> (Forsk.) 1775	Milk fish	Vekkaya	-	+	-
Cichlidae	<i>Etroplus suratensis</i> (Bloch) 1785	Green chromide	Mal korali	-	-	+
	<i>Etroplus maculatus</i> (Bloch) 1785	Spotted etroplus	Mal Korali	+	+	-
Clupeidae	<i>Oreochromis mossambicus</i> (Peters) 1852	Mossambique Tilapiya	Korali	+	+	+
	<i>Oreochromis niloticus</i> (Linnaeus) 1758	Nile tilapiya	Korali	-	+	+
	<i>Anchoviella indica</i> (Van Hasselt) 1823	Indian anchovy	Hal messa	-	+	+
	<i>Sardinella</i> sp.	Sardine	Salaya	+	+	+
Dorsomidae	<i>Nematalosa nasus</i> (Bloch) 1795	Gizard shade	Koia	+	+	+
Gerridae	<i>Gerres abbreviatus</i> Bleeker, 1850	Silver biddies	Kalanda	-	-	+
Gobidae	<i>Glossogobius</i> sp	Goby	Weligowwa	-	+	-
Hemiramphidae	<i>Hemirhamphus</i> sp	Half beak	Maranda	-	-	+
Leiognathidae	<i>Leiognathus dussumieri</i> (Valenciennes) 1835	Pony fish	Panna / Karalla	+	+	+
	<i>Leiognathus equulus</i> (Forsk.) 1775	Greater pony fish	Panna/ Mas Karalla	+	+	+
Lutjanidae	<i>Lutianus argentimaculatus</i> (Forsk.) 1775	Mangrove red snapper	Thambalaya	-	-	+
Mugilidae	<i>Liza dussumieri</i> (Valenciennes) 1836	Dussumier's mullet	Godaya	-	-	+
Muraenesocidae	<i>Muraenesox cinereus</i> (Forsskal) 1775	Pike conger	Wel urulewa	+	-	+
Serranidae	<i>Epinephelus malabaricus</i> (Schneider) 1801	Malabar grouper	Gal Kossa	-	-	+
	<i>Epinephelus tauvina</i> (Forska) 1775	Greasy grouper	Kossa	+	+	-
Sillaginidae	<i>Sillago sihama</i> (Forsk.) 1775	Silver silago	Kalanda	-	+	+

Family	Scientific name	English name	Sinhala name	A	B	C
Theraponidae	<i>Therapon jarbua</i> (Forsk.) 1775	Perch	Iri Bataya	-	+	-
Trachysuridae	<i>Pseudarius jella</i> (Day) 1875	Grey mullet	Godaya	-	-	+
	<i>Tachysurus</i> sp	Cat fish	Anguluwa	-	+	-
Triacanthidae	<i>Triacanthus biaculeatus</i> (Bloch) 1786	Tripod fish	Thun Katuwa	-	-	+
	<i>Triacanthus brevis</i> Schlegel, 1815	Tripod fish	Thun Katuwa	+	+	+
Portunidae	<i>Scylla serrata</i> (Forsskal) 1755	Mud crab	Kalapu kakuluwa	-	-	+
Penaeidae	<i>Penaeus latisulcatus</i> Kishinouye, 1896	Milk shrimp	Kiri Issa	+	-	-
	<i>Penaeus monodon</i> Fabricius, 1798	Tiger shrimp	Karandu issa	+	+	+
	<i>Penaeus indicus</i> H. Mine-Edwards, 1837	Indian white shrimp	Kiri Issa	+	+	+
	<i>Penaeus semisulcatus</i> De Haan, 1844	Green tiger shrimp	Kurutu Issa	+	+	+
	<i>Metapenaeus dobsoni</i> Miers, 1878	Kadal Shrimp	Gal Issa	+	-	+

[A - 1986, B - 1994 (Ganewatte *et al.*, 1995) C - Present study, "+" Species present, "-" Species absent]

Discussion

The fishery in the Rekawa lagoon is similar in many ways to other traditional, lagoon fisheries in Sri Lanka. i.e. fishing activities are conducted under traditional basis, low technology fishing gears and methods are used, fishing is a secondary livelihood option for many fishers and it is practised as a supplementary basis. Instead of them there are some special methods of operations of some common fishing methods practised in other lagoons in the country. i.e. harvesting of brush pile. In Negambo lagoon, brush piles are encircled using encircling nets and 3-5 men are needed in its operation (Wijayarathne and Costa, 1987) and finally fish catch is taken with the net. In the harvesting of brush pile in Rekawa lagoon, the pile is encircled by a mat like structures, which are used to erect kraals. The mat is moved towards gradually covering the full water depth of the brush pile restricting fish into a smaller water volume. Then trapped fish are taken away using scoop nets and manually.

Within the study period, National Aquatic Resources, Research and Development Agency (NARA) has practiced stocking program of shrimp Post Larvae (PLs) in the Rekawa lagoon and therefore some management measures were implemented such

as gear restrictions. According to that management measures, gillnetting and cast netting were prohibited for two-month period from August to September. Since there are lack of other alternative job opportunities, these restrictions have significantly affected on fishers livelihood, specially people who are entirely depend on lagoon fishing. However, they have gained large shrimp catch and more income after the recruitment of stocked shrimp. Even though there are regulations, fishers use restricted fishing gears and gillnets having small mesh sizes. Further, fishing intensity has also been increased compared to the past because of increasing the human population in the area. Although there are regulations for maximum number of net pieces per fisher, they have used more than recommended. Therefore, the amount of gear available would seem to be far higher than needed for a sustainable fishery in the lagoon. Though there are nearly 162 fishers have been registered under RLMC, only about 20% are involving in the lagoon fishery regularly. Nevertheless during shrimp catching season from Sep/Oct to April/May (Nissanka, 1997) fishers who have not registered were also fishing in the lagoon. This is lead to form conflicts among fishers.

From the recorded 22 fin fish species, very few commercially important species represent the daily catches. Especially during the period of closed season, considerable eel catch which was not common in the past was recorded due to the fishing gears used such as long lines. Species such as *Epinephelus tauvina*, *Carangoides malabaricus*, *Etroplus maculatus* and *Penaeus latisulcatus* have been recorded in the early studies (Ganewatte *et al.*, 1995) were not present in this study. On the other hand species such as *Liza dussumieri*, *Triacanthus brevirostris*, *Hemirhamphus* sp. have not been recorded in previous studies are recorded in the present study. According to the experiences of elderly fishers in Rekawa lagoon, large size individuals (*Chanos chanos*, *Caranx* sp.) were common in the catch in 1970s. However presently it is difficult to see such type of large size individuals in the catch and this may due to growth over fishing. According to the present study it is clearly shows that majority of the fish catch is represented by smaller size individuals (juvenile fish) comprising less than half of the market biomass.

As there are no particular times for fishing (Table 2), catch rates were difficult to measure. However minimum and maximum recorded catch rates were 0.2-66kg per night respectively. But the average catch is probably at the lower end of this range and many fishers said that their catch is about 1.0-2.3kg per night. Further to that lagoon fish do not have high demand and good market price. On the other hand there is no competitive fish marketing system for lagoon fish in Rekawa area. Because of the above reasons, lagoon fisher's income is very low. Since shrimp has good market

price and makes more money to the community, the intensity of fishing remarkably increases during the shrimp catching season. Therefore most fishers are involving in shrimp fishery. During the study period the highest mean finfish production was recorded in June 2004. This was due to large number of fisher involvement. Because number of fishers involving in fishing activities depends on weather condition and water level of the lagoon. Less fishing activities have been recorded specially during rainy days and high water levels in the lagoon. With the implementation of gear restrictions, number of fishers fishing in the lagoon has reduced. On the other hand during the period of August to September many fishers were involving in shrimp fishery and hence the finfish production has declined.

Shrimp fishery in Rekawa lagoon is highly seasonal and extends from September/October to April/May (Nissanka, 1997). The post larvae, which migrate from sea to lagoon during July, are caught in the lagoon by cast nets, set gillnets and kraals during November to January period (Jayakody and Jayawardane, 1997). But present study was not conducted in the main shrimp fishing season and it may be the cause for the low shrimp production. During the initial stages of the study period, shellfish does not show considerable catch. But in latter part of the study period they have shown peak production nearly 30kg per day. This was due to the shrimp PL restocking program conducted by NARA and RLMC. Present study shows that shellfish production is dominated by *Penaeus monodon*. In addition *P. indicus*, *P. semisulcatus* and *Metapenaeus dobsoni*, also contribute in small proportions. According to the previous studies, *P. indicus* dominates the shrimp catch (Jayakody and Jayawardane, 1997; Nissanka, 1997). Because of the artificial enhancement of recruitment, *P. monodon*, dominated the present shrimp catch.

Conclusions

The people in the Rekawa area have no sufficient income for their livings. Therefore management practices which are conducted by RLMC would be unsuccessful and the people might practice some destructive income generating methods such as coral mining, mangrove cutting, catching of small individuals of fish and shell fish species, use of destructive and prohibited or banned fishing gears and methods etc. Since it seems that the stocking of PLs of *P. monodon* was successful for some extent and the fishers gained more money in the shrimp catching season, frequent stockings can be practiced as a short term alternative to address their immediate income for the livelihood.

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