Socio-economic and marketing aspects of Laila and Bottom Long Line fisheries in the Kalpitiya Peninsula of Sri Lanka

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Abstract

Surrounding Net Fishery (laila) and Bottom Long Line Fishery which operate in the coastal waters of Kalpitiya Peninsula, compete for the same fish resources, resulting in a fishery dispute between the respective fishermen. Both fisheries target demersal as well as mid pelagic fishes, such as travellys (*parava*), mullets (*galmalu*) and barracudas (*ulava*). As the dispute had an adverse impact on the social harmony in the fishing community of the area, a socio-economic survey was conducted to study the underlying factors and to suggest policy measures to resolve the issue.

The laila fishermen were resident fishermen in the Kalpitiya Peninsula while bottom long line fishermen were migratory fishermen from Negombo and Chilaw areas in the west coast of Sri Lanka. The Kalpitiya Peninsula is located in the North West coast, some 50 km away from the west coast. Although the educational level and literacy rate of the laila community was below that of the bottom long line community, the laila community was economically better off. The net economic returns from laila fishery were superior to that from bottom long line fishery. The boat owner's and crew's share per operation of laila fishery were Rs.3,736 and Rs.947 respectively. The same figures for bottom long line fishery were Rs.588 and Rs.327 respectively. The resource rent from laila fishery was Rs.5,860, however, and much higher than that for bottom long line fishery (Rs.275), showing that the laila fishery exploits the targeted fish resource at a much higher rate compared to bottom long line fishery. This situation badly affects the equitable distribution of resources between the two fishing communities and results in unequal economic gains. Based on the findings of this study, certain input/output controls are proposed to address this problem, among which is the need to increase license fee for laila fishery units to offset the higher exploitation rate of fish resources.

Keywords: interactive fisheries, fishery dispute, laila fishery, Bottom Long Line fishery, resource rent

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Introduction

The development of marine capture fisheries and the increase in fisher population in Sri Lanka over the last fifty years has had a great impact on livelihood patterns of fishing communities of the island. The technical improvements have led to diversified fishing practices and a resultant increase in fishing pressure on the fish resources has resulted in frequent fishery disputes among fishermen. Such conflicts have been reported especially among those who target the same resource using different fishing techniques. Examples of such conflicts are the dispute between purse-seine and small-scale fishermen in the south western coast in the 1980's and that between ring-net and small-scale fishermen (Sanders *et al*., 1997). These disputes have had negative impacts on both the social and economic status of fishing communities and have led to the imposition of regulations, such as the purse-seine fishing regulations in 1986, by the Ministry of Fisheries and Aquatic Resources (Ariyadasa, 1998). Though regulations have been imposed, they were not based on thorough investigations of the resource base or of the impact of respective fisheries on the social and economic aspects of the fishing community.

Several types of surrounding-net fisheries are practiced in the coastal waters of Sri Lanka. In the Kalpitiya Peninsula, a surrounding net, known as *"laila*", is used from November to April. This fishery technique targets fish varieties such as travellys (*parava*), mullets (*galmalu*) and barracudas (*ulava*). The technique of laila fishery is said to have been introduced by migrant fishermen from Mannar, who are regarded as internally displaced persons (IDPs) due to the ethnic conflict in the North-East of Sri Lanka. The fishermen in the islets of Baththalangunduwa and Palliyawatte off Kalpitiya - who are migratory fishermen from the Negombo and Chilaw areas have been engaged in fishing activity for the last 25 years - use bottom long line fishery for the same fish resources. The introduction of laila fishery to the Kalpitiya area occurred around 1998 and is a minor modification of laila valai nets used in the Mannar area. This technique results in higher catch rates and the fishery became a lucrative source of livelihood for the laila operators.

With the increase in laila fishery, the catch and income of the bottom long line operators were badly affected and they organized to protest against laila fishery. As a measure to resolve this conflict and to control the fishing effort, the Ministry of Fisheries and Aquatic Resources introduced a licensing system to laila operators in the Kalpitiya Peninsula. The license fee was Rs.20,000 per annum per laila fishing unit and around 115 licenses have been issued. Despite these measures, however, frequent conflicts, often of a violent nature, continued to occur between the two parties. Although the re-licensing has been discontinued to control this situation, the laila operators continue to fish without proper permission.

A study was conducted, therefore, with the objectives of examining the social, economic and marketing dimensions of the conflict, in order to provide the information needed as a policy guideline to the Ministry of Fisheries and Aquatic Resources.

Materials and Methods

A survey was conducted in 2005 on fishermen at the Kalpitiya and Baththalangunduwa fish landing centers. A total of twenty two laila operators and eighteen bottom long line operators were selected using a simple random sampling method. Data were collected by administering a questionnaire and were analysed using Statistical software (Minitab version 14).

Model

(1) $\mathbf{OS = a(TR-VC)}$

Where; OS = Owner's share
TR = Total revenue
VC = Variable costs
a = Share basis

(2) $\mathbf{RR = Opp + CSpp}$

Where; RR = Resource rent of fishing operation
Opp = Owner's pure profit
CSpp = Crews pure profit

Results and Discussion

Characteristics of the fishing operations

Laila Fishing Operation

A laila fishing operation is a collective action of a number of fishermen and needs substantial human and physical resources compared to other coastal fishery methods. One fishing unit comprises 3 to 4 crafts powered by 25-30 hp out-board motors and 10 to 15 personnel including skippers, fishing crew and divers needed for the operation. The length of a laila net is about 120-150 fathoms with a height of about 9-16 fathoms. In addition to possessing all the features of a typical purse-seine net, it also has hanging sand bags to submerge the net towards the seabed.

The laila fishing operation is conducted during the daytime. The fishermen depart from the landing center early in the morning and arrive in the late evening. They use global positioning system (GPS) equipment to find suitable places to shoot the net, usually on or around rocky areas in the sea using previous data stored in their GPS. After reaching the suitable area for operation divers observe whether fish shoals are available on or around rocky places. If fish shoals are available, fishing crew start the shooting of the net according to signals given by divers. To prevent the escape of fish, boats are run fast around the net. If the shoal of fish is completely surrounded by the net, divers drag the bottom ropes of the net to make a purse to trap the fish. One of the criticisms raised by

fishermen opposed to this fishery was that at times laila fishermen use explosives such as dynamite during the operation.

As the success of laila fishing is affected greatly by the conditions in the sea, the technique requires specialized skills and experience. Calm seas and clear water is essential in order to observe and locate fish schools, while wind speed and water currents tend to adversely affect the fishing operation. The period of the year when conditions are most suitable for laila fishing are, therefore, from November to April.

Bottom Long Line (BLL) Fishing operation

Bottom long line fishing operations in the area are similar to long line operations elsewhere except for the operating depth. Tuna long lines are used to catch mid-water and deepwater swimming tunas while bottom long lines are used to catch demersal fish close to the seabed. In the BLL fishery, 2- 3 fishermen are engaged in each fishing operation. A fishing unit comprises one 25-30 hp out-board motor craft and on an average, 20 long line baskets, each with five hooks. Spotted sardinella *(hurulla*) or squid *(della*) are used as the bait. The fishermen depart for fishing around 16:00 in the evening and arrive at 08.00 the following morning. Bottom long line operators shoot their lines at depths of around l5-20 fathoms and catch travellys (*parava*), queen fishes, mullet (*gal malu*) and barracuda (*ulava*).

Social attributes of the fishing communities

Demographic Aspects

The two communities in question basically differ by their location; the laila community resides in the Kalpitiya land stretch and bottom long line fishers reside at Palliyawatte and Baththalangunduwa islands located about 30 km north of Kalpitiya and about 8 km west of Kudiramale point. The laila fishermen are permanent residents in Kalpitiya and bottom long line operators are migratory fishermen from Negombo and Chilaw areas. Some of the demographic attributes of the two communities are given in Table 1. The BLL operators were all Sinhala Roman Catholics whereas the laila community comprises all three major Sri Lankan ethnic groups, namely, Sinhala, Tamil and Muslim. The respective communities show considerable disparity in educational levels; the majority in the laila community had only studied upto primary school level but the majority of the bottom long line community had a secondary education. This situation was also reflected in the literacy rate of two communities.

Table 1. Demographic attributes of laila bottom long line operators

Demographic attributes	Laila			Bottom long line	
Ethnicity (%)	Sinhala	Tamil	Muslim	Sinhala	
	61	26	13	100	
Mean age of fishermen	32 years			30 years	
	82.6			72.2	
Civil status (%)	Married			Married	
	82.6			72.2	
Education level (%)	Primary		Secondary	Primary	Secondary
	62.2		34.8	27.8	72.2
Literacy (%)	56.5			88.9	
Average family size	5.8			3.8	
Dependency ratio	4.9			2.8	
Children < 18 years per household	2.1			1.1	
Children schooling per household	2.0			0.7	

The literacy rate of the BLL operators at about 88.9% was comparable to the national level figure of about 92%. The average family size of laila operators was 5.8 with most of them being extended families. In contrast, due to the migratory nature, many BLL operators had nuclear families. The dependency ratio of families of laila fishermen was higher than that of BLL operators. Housing conditions of the two communities showed improved levels compared to national level figures. Sanitary conditions such as drinking water, safe toilet facilities were available in both communities and many of them were better off than the national average levels (CBSL, 2005). Sixty seven per cent of laila families had telephone facilities, either mobile or fixed lines compared to the national level of 23.9%. With regard to the availability of motorized transport, BLL families showed a status similar to national level statistics while laila families showed greater ownership of motorized transport.

Table 2. Housing conditions and other amenities of laila and bottom long line operators

Category	Laila (%)	Bottom long line (%)	National level (%)
Brick or cement block walls	91.3	83.3	75.3
Tiled or asbestos roofing	82.6	88.9	78.8
Cement tiled or better flooring	95.6	100	68.2
Own well or pipe borne water	78.3	77.8	62.2
Water sealed latrine	82.6	77.8	78.4
Electricity	78.3	94.4	73.9
TV	82.6	72.2	68.2
Telephone (land/cellular)	69.7	22.2	23.9
Motorized transport	34.8	22.2	25.4

Economic aspects

Capital Investment

The mean capital investment of the laila operators studied was Rs. 544,809 while that of a bottom long line operator was Rs. 284,650 (Table 3). The capital investment for an owner of a laila fishing unit was nearly twice than that of a bottom long line operator due to the higher cost of inputs.

Table 3. Mean value of the fishing implements of laila operators and bottom long line operators

Asset/boat owner	Laila (Rs.)	Bottom long line (Rs.)
Craft & engine	400,545	249,094
Gear	143,864	35,556
Total	544,809	284,650

An economic analysis of the respective fishing operations, shown in Table 4, is based on comparing economic indicators such as revenue, owner's share, crew share and resource rent of fishing. A laila fishing unit comprised four crafts with out-board motors (OBM), one laila net and 10-15 crew members including the skipper and divers, while that of a bottom long line fishery unit comprised of one craft with OBM, 20 bundles of bottom long lines (l00 hooks) and 2-3 crew members including the skipper.

It can be seen that the economics of laila and BLL operations show a wide disparity; the income from a unit of laila is Rs. 44,805 whereas that from a BLL is Rs. 4,171 An owner's share from a laila fishery was six times that of a BLL unit. The share of a crew member of laila and BLL fishing unit was around Rs. 947 and Rs. 327 per operation, respectively. The number of days engaged in fishing operations, however, varied greatly between the two types of fisheries since, laila cannot operate in rough, windy sea conditions and when the water is not clear. As a result, the number of days of laila operations was half of that of BLL fishery. Therefore, during the season from November to April, the income of an owner of a laila unit was Rs. 319,082 and for a BLL operator, Rs. 112,502. The respective seasonal income of crew members of laila and BLL were about Rs. 80,882 and Rs. 62,499.

Table 4. Average estimates of the cost and revenue (in Rs.) of laila or BLL operation

Economic indicator	Laila (Rs.)	Bottom long line (BLL) (Rs.)
Revenue / day	44,805	4,171
Operation expenditure / day	14,918	2,700
Divisible income / day	29,887	1,471
Owner's share	14,944	588
Mean boats / operation	4	1
One boat owner's share	3,736	588
Crew share	14,944	883
Mean crew / operation	15.78	2.7
Crew share / crew member	947	327
No. of days per season	85.41	191.2
One boat owner's share/ season	319,081	112,502
Crew share / crew member/ season	80,882	62,499

Resource (economic) Rent

The resource or economic rent, defined as the surplus value over and above the opportunity cost of all factors of production employed in a competitive fishery, arise from ownership or access to valuable resources in limited supply (Panayatou, 1985). This is calculated by adding the pure profits of the boat owner and the crew members. When estimating pure economic profit from the fishery resource, the opportunity costs are deducted from the income earned by the owner and the crew. For this study, the owner's and the crew's pure profit indicate return to capital and labour, respectively. The opportunity cost of capital indicates income forgone by craft owners who invest in fishing compared to other activities in the financial market. The opportunity cost of owner's labour is the income forgone by managing his craft and gear instead of working in another job (Vidanage *et al.*, 2000). The opportunity cost of labour is based on the average daily income of a crew member in the small scale fishery sector (Wimalasena, 2005). Accordingly, the resource rent of a laila fishing unit per operation was Rs. 5,860 and the same in BLL fishing unit was Rs. 275 showing that a laila fishery earns an exorbitant resource rent compared to bottom long line fishery. As the resource rent of BLL was positive despite the magnitude of the difference, it indicates the economic viability of its existence. In terms of the equitable distribution of fish resources among the two kinds of fishermen, however, it was not satisfactory. The regulation of the laila fishing operations is needed, therefore, to prevent discrimination against the bottom long line operators. On the other hand, however, laila fishery recorded a greater efficiency in contrast to its negative consequences on the equitable distribution of resources.

Table 5. Resource rent of laila and bottom long line fishery per craft per operation

Item	Laila (Rs.)	Bottom long line (Rs.)
Owners' share	3,736	588
Owner's pure profit	3,272	202
Crew share	3,788	883
Crew's pure profit	2,588	73
Resource rent	5,860	275

Market Structure

One of the criticisms against the laila fishery was the dominant role it played in the determination of fish prices in the Kalpitiya Peninsula. The bottom long line operators charge that the higher catch rates of laila operations tend to drastically reduce the price of fish.

Table 6. Mean fish prices (per kg) of laila and bottom long line fishery

Variety	Price variation			
	Laila (Rs.)		Bottom long line (Rs.)	
	High	Low	High	Low
Travellys (*parava*)	121	79	114	74
Mullets (*meeweti*)	101	68	108	65
Barracuda (*ulava*)	111	79	112	69

The above table which shows the major varieties and their price variation during the fishing season did not indicate a significant difference. It should be noted, however, that the market places and fish assemblers of the two fisheries were different from one another. Assemblers who bought fish from Baththalangunduwa supplied fish to the Colombo wholesale fish market and their buying price, therefore, depended on the daily fish price at the Colombo wholesale market. The assemblers from regional places such as Kurunegala and Anuradhapura come to Kalpitiya to purchase fish from laila operators. Due to the assured fish supply of laila fisheries, more regional fish traders participate in the Kalpitiya fish auctions. This situation promotes competitive fish marketing and provides opportunity to other kinds of small scale fishermen to dispose their catch at competitive prices. In the off season of laila fishery, the influx of fish traders from the interior places to Kalpitiya was minimal compared to the fishing season.

Livelihood Opportunities

As a productive process, fishing operations generate employment opportunities to people living in a particular area. As there is a fishery dispute between the two groups of fishermen, it is important to consider not only the economic benefit directly accrued to the society, but also the overall social benefits. The following table shows the livelihood opportunities provided by each type of fishery.

Table 7. Livelihood opportunities of laila and bottom long line fisheries

Manpower utilization (number employed)	**Laila**	**Bottom long Line**
Direct livelihood per operation	15.8	2.7
Indirect livelihood per operation	6.4	2.0
Total livelihood per operation	22.2	5.3
Total population benefited	2712	742

Direct livelihood depicts the fishing crew including skippers/owners of crafts whereas the indirect beneficiaries include net menders, fish loaders and other labourers on the beach.

Legal Aspects

When laila fishery was first introduced into the Kalpitiyaa Peninsula, it was not considered a threat by bottom long line operators. Following applications from laila operators, around 115 operating licenses were issued by the Ministry of Fisheries and Aquatic Resources. These licenses were issued to laila operators under the purse seine fishing regulations. According to the purse seine fishing regulations imposed in 1987, purse seine is defined as "a ring of net built like a long shallow curtain, which is shot to surround a shoal of fish in mid water both from the sides and from underneath, and then closed underneath with a purse ring" (Ariyadasa, 1998). Purse seine is allowed to operate up to 10 miles (16 km) from the shore in Puttalam district as the continental shelf is wider there compared to the Southern shores of Sri Lanka. But laila net is used to catch demersal fishes in the sea bed of shallow areas. Regulations must, therefore, take into account both the resource type and the location. The issue of permits should also be done after a comprehensive investigation of the resource base as well as the socio-economic consequences to other fisheries.

Interactive Dynamics

The interactions between laila and bottom long line fishermen covers economic, social, legal and marketing aspects (Fig.1) with economic and social interactions playing a key role in the dispute. As the laila fishery provides more incentives to the operators and their living standards have been improved, they are unwilling to give up the technique. As permits had earlier been issued to them, they do not accept that it can now be made illegal. In addition, the other resident fishermen in Kalpitiya, do not protest against the laila fishery. Although bottom long line fishermen are not residents of the area, they have been engaged in this activity for more than 25 years, and believe that their right to the fish resources should not be compromised. With the increase in the number of craft and populations of migratory fishermen, similar conflict situations arise in many parts of Sri Lanka. Conflicts occur when users are no longer prepared to cooperate or abide by established rules of conduct with respect to the use of a particular resource (Oakerson, 1992). Therefore, three kinds of conflicts in the use and management of coastal resources could be identified; conflict between users of the same resource, between users of different resources, and conflicts between governmental agencies administering programs or projects related to the coast. Conflict over natural resources can occur at many levels and have class and political dimensions (Buckles and Rusnak, 1999). In the present study, intense and often violent reactions were reported between bottom long line and laila operators and it appeared, as predicted by Buckles and Rusnak above, that certain politically powerful groups were behind the conflicts. The Police and Navy often had to be called in to release the craft under the custody of BLL operators.

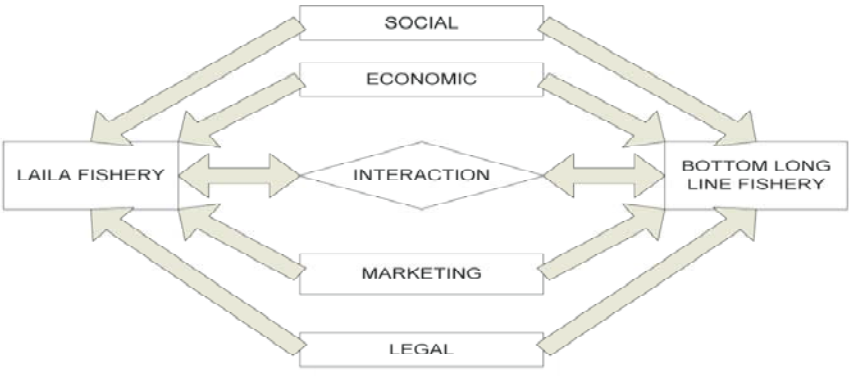

Fig. 1. Interactive forces of the fishery dispute

Since the dispute affects the social harmony in the area, it is necessary in everyone's interests to find a long-lasting solution which takes into account the views of the respective fishermen. The fishermen expressed following views to us in relation to the problem.

- Laila operators were willing to give up their fishing technique provided the government was prepared to replace the fishing gear enabling them to engage in an alternative fishing method.
- Bottom long line operators had no objections to the former laila operators fishing in the same area.
- Both parties respected the opinion of scientists at NARA about the resource potential of the targeted varieties and the impact of laila fishery on such resources and were prepared to abide by any modifications that could be made to fishing gear to minimize harmful effects.

Ludicello *et al*., (1999) have pointed out that the policy measures for conflict resolution, from an economic perspective, should be based on input and output controls, such as those listed below:

Input controls

- Restricting the number of fishermen working in a fishery
- Restricting the volume of gear or the size of crafts
- Limiting the period of time over which fishermen are allowed to catch fish, in order to spread reductions equally among them but not reduce the number of participants
- Restricting the technology that fishermen are allowed to use

Output controls

- Imposing landing quotas to limit the total quantity of fish that can be caught
- Imposing catch limits per craft
- Imposing some restrictions on the type of fish landed
- Imposing technical restrictions such as time periods and areas in which fish can be caught
- Imposing taxes or entry permits

These input and output controls used should be based not only on socio-economic criteria but also the resource potential of the targeted fish varieties of the two fisheries. It should be remembered, however, that the use of input and output controls as a management tool in preventing conflicts is futile in the absence of effective and efficient monitoring and surveillance mechanisms. When employing input output controls for laila fishery, therefore, setting up of a monitoring and surveillance mechanism is essential for conflict-free fishing operations.

Conclusions

Over the last 50 years, fishermen were encouraged to improve their fishing methods in order to increase the total fish production in Sri Lanka. In recent years, however, this has changed with current policy makers paying more attention to resource depletion and sustainability, since sustainable production considers not only efficiency but also inter-community and inter-generational equity. Although laila fishery is clearly more efficient than BLL fishery, it is not acceptable with respect to equitable distribution resource among fishermen. While BLL fishery remains economically viable and laila fishery more profitable, the resource rent of laila fishery was 20 times that of BLL fishery, showing that the laila fishery exploits the resource at a very high rate. If the laila fishery was allowed to continue, the fishing effort should be strictly restricted using input and output controls. Moreover, since the present license fee (Rs. 20,000) is not adequate with respect to its resource rent, it should be increased to offset the exploitation rate.

Acknowledgements

The authors wish to thank NARA for providing financial assistance to carry out this study.

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