Adaptive management and welfare enhancement of *Kattudel* fishery in Negombo Lagoon

Shimpei Iwasaki[1]

Abstract

This paper presents a case study of Kattudel (stake-seine) fishery for catching fishery resources in Negombo Lagoon, Sri Lanka. The research aims to address fishery adaptation to tackle with the commons dilemma by introducing a *padu system* which is a gear-specific with rules to define fishing grounds and right holders. Among the right holders belonging to particular families, an effective mechanism has been evolved for resource sharing in the fishery over the hundreds of years dating back to the 18th century.

Evidence from the case study showed that a nested structure of the fishery at the vertical level among stakeholders has been developed. For equity sharing of the resource, different fishing dates are assigned among four *Kattudel* fishery societies, and fishing grounds are then allocated to the right holders in each society using a lottery. Complicated challenges and issues related to demarcation of territories and conflicting situations among the societies have been settled through active involvement of the Roman Catholic Church. The findings revealed that the role of the Roman Catholic Church served as a basis for coordinating the societies over fishery resources and introducing a welfare scheme for fishing communities. In the latter, a funding for the welfare scheme has been incorporated in the income generation process including auction for specific fishing grounds devised by each society. It enables to respond to livelihood security, in terms of death, loss of physical strength and unforeseeable accident, and to promote cultural development at the base of the Roman Catholic Church. Religious enhancement is expected to strengthen the fishery operation among the societies and among the right holders in each society. Based on these findings, this paper provides a significance of the linkages of adaptive management and welfare enhancement beyond the commons dilemma.

Keywords: *Kattudel* fishery, *Padu system*, Welfare, Risk sharing, Negombo Lagoon

[1] Department of Environmental Scinece, Fukuoka Women's University. E-mail: iwasaki@fwu.ac.jp

1. Introduction

Most fishery resources entail an element of mobility that requires cooperation of the stakeholders. Even though a fisher manages his or her fishing ground in an appropriate manner, the fishing activity may fail to achieve good fish production because of its overexploitation by others. As a result, a tragedy will occur in the absence of management. On this account, a given form of social control among resource users is extremely important for fisheries management to implement a set of rules that help to govern access to fishing grounds or the behaviors of the users.

Given the inherent uncertainties in the management of fishery systems, the adoption of command-and-control measures makes it difficult to achieve effective fishery management from a scientific viewpoint. Particularly, the method can not be easily applied to many developing countries where multi-species and multi-gear fisheries prevail. Instead, many scholars increasingly put high emphasis on the significance of the adaptive management approach (Armitage, Berkes, & Doubleday, 2007; Berkes, 2004, 2005; Carlsson & Berkes, 2005; Iwasaki and Shaw, 2010). Adaptive management as an approach takes into account uncertainty and assumes that management knowledge is inadequate, thus requiring experimentation and learning in an iterative process (Berkes, 2007). Related to this, fishery systems throughout the world have traditionally sought to reduce uncertainty and a broad range of risks through the use of a set of norms, institutions and networks of various types (Acheson, 1981). They developed community-based resource use systems, which tend to be dynamic, going through cycles of crisis and recovery and cycles of institutional renewal (Berkes, 2005).

One of the representative examples is *padu systems* that are based on rotational fishing grounds allocated by lottery. *Padu systems* are devised in lagoon and estuary areas of Sri Lanka and southern Indian states of Kerala and Tamil Nadu (Atapattu, 1987; Berkes, 2005, 2006; Jayakody, 1996; Jayawardane & Perera, 2003; Lobe & Berkes, 2004). In the Negombo estuary of Sri Lanka which is targeted in this paper, this fishery, so-called "*Kattudel* (stake-seine) fishery", has been evolved for resource sharing over the hundreds of years dating back to the 18th century. This paper presents a case study of *Kattudel* fishery for catching fishery resources in Negombo Lagoon. The research aims to address fishery adaptation to tackle with the commons dilemma and explore factors for contributing to institutional robustness in common-pool resource settings by introducing a *padu system*. Following the next section, this paper describes a profile of the study site and methodology. Secondly, the research seeks to feature the function of institutional settings of *Kattudel* fishery. Then, it explores identifying driving forces of long-enduring institutions in the fishery. Lastly, this paper draws some implications on sustaining fishery resources in the management.

2. Profile of Study Area and Methodology

Negombo Lagoon is a shallow coastal lagoon in the western part of Sri Lanka, situated at latitude 7°10' north and longitude 79°50' east (Figure 1). The lagoon covers an area of 3,164 ha and is connected to the sea by a single narrow opening (Goonethilake et al., 2005). The pear-shaped lagoon is around 12.5 km in length and its width varies from 0.6 to 3.6 km (ibid). The greatest recorded water depth is 2.6 m, but 10% of the lagoon has a water depth of less than 0.5 m (Jayakody, 1996). Freshwater from catchments drains into the system via Dandugam Oya and Ja-Ela, influencing the hydrological regimes in the lagoon environment. This mixed combination has endowed it with valuable biodiversity and highly productive ecosystem in which fishery resources present attractive benefits.

The substantial environment enables a large number of fishers and local people who are engaged in allied fishery business activities to support their livelihoods. According to the government data, in the years 2007-2008, the total numbers of fishery households and fishing population are 8,465 and 35,140, respectively in the covered 13 fishery inspection areas. Out of these, the number of those who are engaged in the lagoon and other fisheries is 3,392, accounting for around 31% of the total fishing population. In the study area, the fishing population is predominantly composed of Roman Catholics by religion. Multi-species and multi-gear fisheries which are based on small-scale operations can be commonly observed in Negombo Lagoon. Such diverse fisheries take place all year round using a total of 22 methods, of which 13 are entirely traditional including *Kattudel* (ibid).

In the northern part of Negombo Lagoon, *Kattudel* (stake net) fishery consisting of a bag and two wings has been taken place all the year round. Nets using nine stakes are fixed in the muddy grounds, so-called "*Kattudel Padus*". The fishery starts in the evening until the tidal flow from the lagoon to the sea ceases. It is important to note that specific fishers from villages of Grand street, Sea street, Duwa Pitipana street and Pitipana are engaged in the fishery. They organized four *Kattudel* fishery societies (KFSs) for managing fishery resources and sharing the benefits among them in the limited boundary.

With this recognition, fieldwork was carried out in Negombo Lagoon in March 2010 and September 2012. The research used both qualitative and quantitative tools including structural questionnaires, semi-structured interviews with key informants and secondary data. The questionnaire survey related to the fishery was conducted in certain group of KFS (N=19). Furthermore, semi-structured interviews were conducted on representative members from four KFS with a view to understanding the institutional mechanism of the *padu system*. In the following, the paper starts by identifying their institutional settings for resource sharing in the fishery.

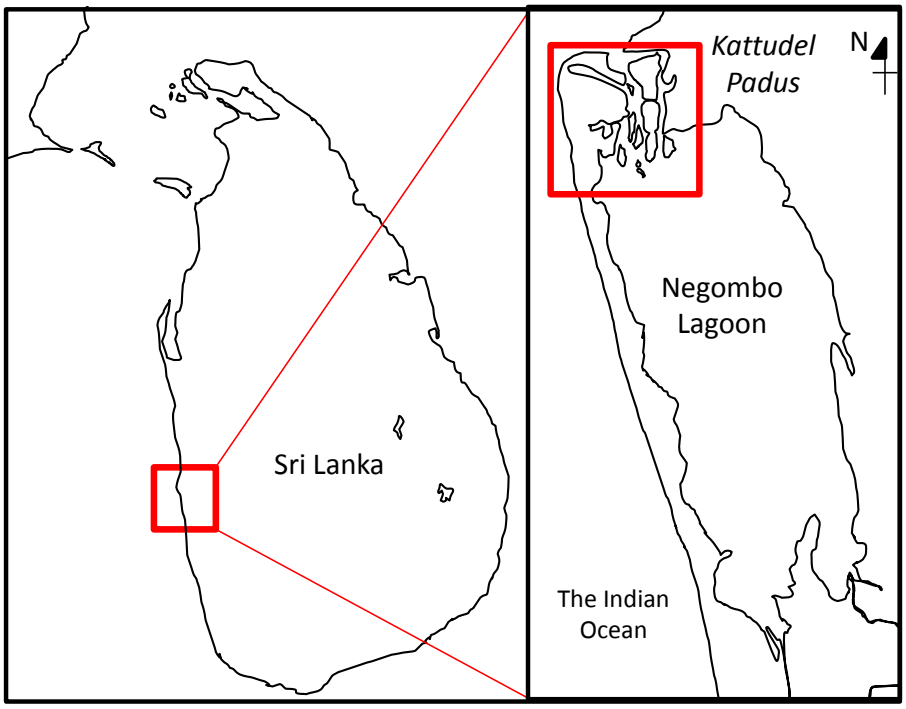

Figure 1 Map of Negombo Lagoon

3. Institutional Settings of *Kattudel* Fishery in Negombo Lagoon

This section sets out to provide a better understanding of identifying a range of institutional settings of four *Kattudel* fishery societies (KFSs).

3-1. Organization of *Kattudel* Fishery Societies

According to interviews with representative members of KFSs, total numbers of the members were 84 in Duwa-Pitipana KFS, 102 in Grand street KFS, 68 in Sea street KFS and 40 in Pitipana KFS. Hence, the fishery comprises 294 fishers in September 2012. The members in three KFSs except Pitipana KFS are further divided into two groups depending on their residential areas, in order to handle the society in an appropriate manner. The rights for operating *Kattudel Padus* are exclusively vested upon the members so that limited entry in the fishery has been maintained so far. The use right is handed down from father to son for generation. Successors are neither son in-law nor unmarried son. The members are required to be a fisher by profession, a resident of given limits, and have their own boat and equipment for *Kattudel* fishery. To become the member of KFS, furthermore, the candidate requires meeting several criteria which are regulated by each society. For example, the criteria in Grand street KFS includes (i) limited entry of membership that at each annual general meeting two new members are granted the opportunity to join the society, the candidates

should (ii) join the society within five years of marriage and (iii) submit an application form to the society with a statement stating that he is willing to agree to all the rules and regulations of the society. In addition, the candidates in each society require demonstrating the presence of his eligibility regarding netting in place.

3-2. Operation of *Padu System* in Negombo Lagoon

Four KFSs manage and share fishery resources in the limited fishing grounds by applying a *padu system* that is based on rotational fishing grounds allocated by lottery. The term *Padu* is used to mean "site" or "location" in Sri Lanka and can be referred to the system of rotational access in stake net fishery (Lobe and Berkes 2004). At present, there are 22 *padus* where around 40-50 stake nets can be installed. These *padus* are divided into eastern (*Saayen*) and western (*Maththen*) parts of sea mouth channels as shown in Figure 2.

In Negombo Lagoon, collective actions for operating the fishery in *Kattudel Padus* have been put into practice among four KFSs. Limited fishing spaces can not allow all the members to engage in the fishery at the same time. Instead, the societies coordinate the use of *padus* on a daily basis and rotate access to the site among them. The procedure for operation of *Kattudel* fishery is as follows.

Three KFSs (Duwa-Pitipana, Grand street and Sea street) use 16-19 *padus* every three days while Pitipana KFS use four *padus* every day and three *padus* every three days. On the first day, for example, the members from Grand street KFS can have an access to the *padus* except three *padus*[2] in which Pitipana KFS enjoys the exclusive rights. On the second day, Sea street KFS is able to join the fishery where Grand street KFS engaged yesterday. At the same time, Pitipana KFS use the same *padus* consecutively. On the third day, Pitipana KFS is able to use additional three *padus* where Grand street KFS and Sea street KFS occupied on the first and second days. In the meantime, Duwa-Pitipana KFS use the other *padus*, accounting for 16 *padus* in total. On the following day, the rights for *Kattudel* fishery are granted to Grand street KFS again while Pitipana KFS use their exclusive four *padus*. Such rotating procedure enables each society to ensure equal opportunity to limited fishing grounds in a peaceful manner.

[2] Pitipana KFS uses 3 to 4 nets in a padu called "Orappadu" while Grand street and Sea street use 2 nets in the same site.

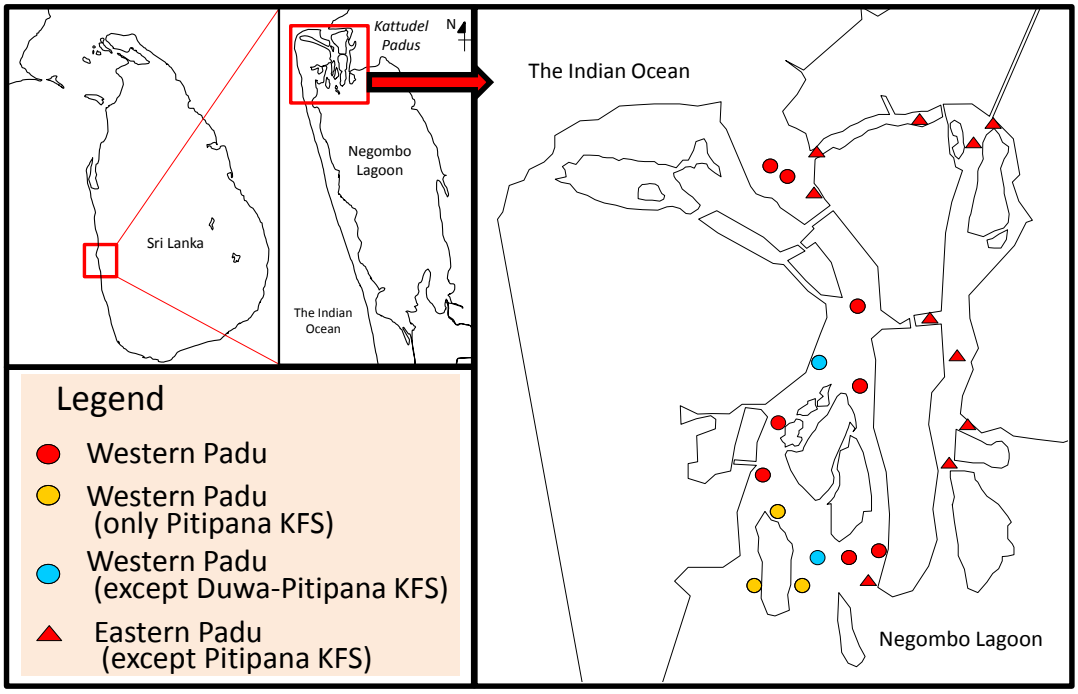

Figure 2 Map of *Kattudel Padus*

3-3. Management of *Kattudel* Fishery Societies

At their parish, each KFS holds two types of meetings (annual general meeting and regular meeting) to make sure that all the activities of the society are well-organized. At annual general meeting, all the members are required to attend unless justified. During the meeting, they conduct important deliberations including the way to allocate the rights for use in *Kattudel Padus* among the members. Even though four KFSs coordinate use of fishing grounds on a daily basis, all the society members who get them a turn can not enjoy the fishery due to overpopulation. To ensure transparency and maintain peace among the members, two types of lottery systems are created. Before or in annual general meeting, the society is required to choose grand number allocation (*Maha nommaraya*) either small number allocation (*Heen Nommaraya*). In case of grand number allocation, all the members draw lots and then serial numbers from 1 to n (n = number of the members or group members) are assigned to them during annual general meeting. Fisher A assigned serial number 1 in group A, for example, is able to choose a specific site in the eastern part by his personal preference while fisher B assigned serial number 1 in group B is able to do the same way in the western part. The right of choice is given in numerical order. On the next fishing day (after 3 days), fisher C who has the last grand number (n) in group A is firstly eligible to choose any *padus* in the western part while fisher D who has the last grand number (n) in group B can do the same way. In this way, fishers in group A and B interchange *Kattudel Padus* every three days and the chance of choice is rotated (n-1), (n-2), (n-3),…4, 3, 2. In so

doing, all the members have an opportunity to choose preferred *padus* in an equitable manner. As for Pitipana KFS, the society organizes two annual general meetings on Hallelujah Saturday (around March) and November 1st (feast for all saints), both of which are strongly linked to religious ceremony. On those days, 40 members draw lots and then the rights of choice are given in numerical order. About a half of those, who have not a chance to choose any *padus* on the *pelle* day due to limited nets to be fixed, might have an access to their exclusive *padus* on the next two consecutive days when Grand street KFS and Sea street KFS go fishing.

On the fishing day (so-called "*pelle*"), regular meetings are always organized within each society or each group. These meetings including annual general meeting are well-organized by the initiatives of president, secretary, treasurer, advisors and other officials including external stakeholders such as the Roman Catholic priests and the government officers. During the meetings, the members have various discussions to share information and experience, coordinate different interests and settle conflicts. In addition, the rights for use in specific *padus* are assigned among them on that day. In case of small number allocation, the members draw lots every *pelle* day in the same manner, enabling them to choose their preferred *padus* more flexibly. Irrespective of grand number or small number allocation, however, there are many fishers who want to join the fishery on the day or are willing to choose more preferred *padus*. To offer opportunity for those who have more incentive to engage in the fishery, the rights of choice can be auctioned to the members present by bidding for specific serial numbers. Before starting annual general meeting and/ or regular meetings, specific serial numbers are removed in the box by the board members in advance and then the lottery is hold among the members. In addition to the removal numbers, Pitipana street group of Duwa-Pitipana KFS and Sea street KFS use special numbers which the sick and/or the old drew for auction. In this case, given amount of money from bid price of special numbers can be distributed to the sick and/or the old as well as to the society. Whether or not to introduce removal numbers and special numbers and how to share the bid price depends on each society by mutual consent. Such considerations are expected to maintain equitable access to *Kattudel Padus* and benefit active fishers by bidding for the numbers to enjoy productive fishing grounds such as "*Kawatiya* (*sayen*)", "*Kongaha*" and "*Keerikattuwa*".

4. Driving Forces of Long-Enduring Institutions

4-1. Role of Roman Catholic Church

As the above mentioned, *Kattudel* fishery in Negombo Lagoon has been practiced over the hundreds of years dating back to the 18th century. Regarding this, it needs to be mentioned that the *padu system* has been evolved with strong leadership of the Roman Catholic Church

(Atapattu, 1987; Wimalasena, 2005).

Before the late 1950s, complicated challenges and issues related to demarcation of territories and conflicting situations among different clans leading to formation of KFSs have been occurred especially in 1940s. In response to this, the Roman Catholic Church, which had assisted the fishers in organizing KFSs, played a very important role in settling disputes among the society members and among KFSs. In the settlement process, comprehensive structure of the *padu system* that rotates access to fishing grounds to ensure equal opportunity for the entry was proposed by the Archbishop (Atapattu, 1987). Based on the rules laid down by the Roman Catholic Church, an official regulation called "the Negombo (*Kattudel*) Fishing Regulations of 1958" was published in the Gazette.

Up till now, Roman Catholic Church plays very important roles in the fishery management. In case each society faces with difficulty in settling any disputes, the priests who have educated and respectable personality are eligible to settle conflicts and maintain peace among the resource users who are all Roman Catholics. According to community regulations, for example, it is written that the parish priest serves as a chief advisor for supervising the operation of Grand street KFS. Because of a religious belief, some of the profits derived from each society are given to the Church as needed.

4-2. Nested Structure of Fishery Governance

Operation of *Kattudel* fishery is done all the year round. KFSs consecutively share the *padus*, leading in regularly monitoring their territories and illegal fishery practices. The nested use in the *padus* is expected to play a vital role in reducing and mitigating external impacts from others and in providing a significant rational behind their appropriation of the fishing grounds. Under the circumstances, three KFSs (Duwa-Pitipana, Grand street and Sea street) organize an integrated society meeting annually with an aim to governing the fishery operation against illegal and destructive fisheries. Representative members from three KFSs gather to share information and experience, coordinate different interests, and respond to the changes in its ecological-social-economic system in the institutional settings. The integrated society meeting is organized by executive members (president, secretary and treasurer) who are selected from each KFS on the annual rotational basis.

In this context, the representatives from each society discuss about coordination of the fishery including reallocation of *Kattudel Padus*. For example, Pitipana KFS has secured a space of three to four nets in *Orappadu* when Grand street and Sea street KFSs engage in the fishery, respectively. After a series of negotiation, the two societies agreed to the request from Pitipana KFS and transferred the rights for fishing to it. The location itself seems to be less productive, but the enlarged accessibility enables all the members of Pitipana KFS to have a more opportunity to join the fishery.

It is expected that the two societies accepted the request without any complications.

Because many fishers tend to engage in the fishery provided they are able to have an access to preferred *padus* which are more productive. Perhaps behind the trend is the situation that *Kattudel* fishers have a limited chance to join the fishery for ten days per month at maximum, requiring alternative sources of income to make a living. Owing to this, most of them engage in secondary occupation which includes ocean fishing, construction business, transportation service, government job and so on. Recent changes in the working environment that their secondary occupation becomes diverse and meets sufficient income source seem to decrease the number of active fishers who are strongly relying on *Kattudel* fishery all the year round. Consequently, their choice for *padus* tends to be greatly concentrated in productive *padus* such as "*Kawatiya* (*sayen*)", "*Kongaha*", "*Keerikattuwa*". Meanwhile, the ratio of their choice on the *pelle* keeps less productive *padus* such as "*Thiladiya*", "*Maththenharasode*" and "*Kimbul Ode*" low. The trend might lead to reallocation of the *padus* among the societies which are involved in integrated institutional settings. Such flexible decision-making is expected to build adaptive capacity to respond to changes in the fishery.

4-3. Welfare Scheme

According to the questionnaire in certain group of KFS (N=19), the sense of social cohesion among the members was very strong (all respondents chose the same answer). All the members are bonded to honor their own rules and regulations which were made by each society. These community customary laws have been documented and revised on the basis of local conditions. According to the documents, every society defines membership including eligibility and withdrawal-readmission process, operational rules for the fishery, penalty for violators, meeting information, auction system, accident response and so on. Those who break their own rules are subject to punishment in terms of fine, suspension of fishing and expulsion.

Each society takes into account equal rights and betterment of welfare among the members. In the latter, elaborations have been made on redistributing profits of the societies to not only the members but also relevant stakeholders. The profits from bid price and fine from the violators are shared for developing a spirit of mutual support. Redistribution of their profits include bonus to the members, loan of money, provision of share for ill-health and physical weakness persons, pension for the old, death grant, facility development, church feast, donation to the Roman Catholic Church and so on. These services depend on each society by mutual consent, enabling to respond to livelihood security, in terms of death, loss of physical strength and unforeseeable accident and to promote cultural development at the base of the Roman Catholic Church. Religious enhancement is expected to strengthen the fishery operation among the societies and among the right holders in each society as well. According

to the questionnaire, the findings revealed that all respondents perceived that the society was able to enhance their welfare in case of emergency such as disease, disaster and other tragedy. Among the welfare services, death grant was highly appreciated by the respondents, following by bonus to the members, loan of money, church feast and provision of share for ill-health and physical weakness persons and so on. These elaborations are expected to strengthen their unity as a member in each society. The information for enhancement of well-being can be shared in integrated society meetings among the societies as well.

5. Conclusions

Putting them all together, this paper highlighted *Kattudel* fishery (stake net fishery) which is a community-based fishery management system so-called "*padu system*". The system is a gear-specific with rules to define fishing grounds and right holders. Among the right holders belonging to particular clans, an effective mechanism has been evolved for resource sharing in the fishery over the hundreds of years dating back to the 18th century. On the whole, it is not too much to say that the case study satisfies the eight design principles[3] presented by Ostrom (1990) which can be as a benchmark for pursuit of institutional robustness in common-pool resource settings. The long-enduring institutions have been developed under the supervision of the Roman Catholic Church. In compliance with community regulations, nested structure of *padu system* among four KFSs plays important roles in managing the fishery and ensuring a legitimacy of their territories from others. Creation of integrated society meetings enables the societies to coordinate different interests and settle conflicts among KFSs, securing robust fishery institutions in Negombo Lagoon. At the society level, each society tightens restrictions on eligibility for the membership and operational rules while taking a due care of welfare enhancement by redistributing the profits of the society to the members and their communities. The latter is expected to promote a sense of unity among the members, thereby leading to effective fishery management in Negombo Lagoon.

Acknowledge

[3] These principles include (i) clearly defined boundaries, (ii) congruence between appropriation and provision rules and local conditions, (iii) collective choice arrangements, (iv) monitoring, (v) graduated sanctions, (vi) conflict resolution mechanisms, (vii) minimal recognition of rights to organize, and (viii) nested enterprises. It needs to be mentioned that the design principle approach has been criticized as not necessarily applicable to a wide range of real-life situations or specific only to certain types of common-pool resources (Campbell et al. 2001). But the approach has been applied actively to assess the enabling environment for use in common-pool resource management in many parts of the world.

The author acknowledges the support of JSPS grant. I am extremely grateful to Dr. Deepthi Wickramasinghe, Mr. Chandana Senevirathna, Ms. Crystal Koelmeyer, Dr. Rajib Shaw for their wholehearted support offered. I am also thankful to *Kattudel* fishers in Negombo Lagoon for taking the time for interviews and field observations.

References

Acheson MJ (1981) Anthropology of fishing. Ann. Rev. Anthropol. 10:275-316

Armitage D, Marschke M, Plummer R (2008) Adaptive co-management and the paradox of learning. Global Environmental Change 18:86-98

Atapattu RA (1987) Territorial use rights (TURFs) in Sri Lanka: case studies on Jakottu fisheries in the Madu Ganga estuary and Kattudel fishery in the Negombo lagoon. In: Indo-Pacific Fisheries Commission (ed) Paper presented at the Symposium on the Exploitation and Management of Marine Fishery Resources in South-East Asia 16-19 February 1987, FAO, Bangkok, p.379-401

Berkes F (2007) Adaptive co-management and complexity: exploring the many faces of co-management. In: Armitage D, Berkes F, Doubleday N (eds) Adaptive co-management: collaboration, learning, and multi-level governance. UBC Press, Vancouver, Toronto

Berkes F (2005) Common theory for marine resource management in a complex world. Senri Ethnological Studies 67:13-31

Berkes F (2006) From community-based resource management to complex systems: the scale issue and marine commons. Ecology and Society11 (1). http://www.ecologyandsociety.org/vol11/iss1/art45/ on accessed 26 April 2013

Berkes F (2004) Rethinking community-based conservation. Conservation Biology 18(3):621-630

Carlsson L, Berkes F (2005) Co-management: concepts and methodological implications. Journal of Environmental Management 75:65-76

Goonethilake D, Ranasinghe I, Wickremeratne HJM, Broker K (eds) (2005) Special area management plan for Negombo Lagoon, Coast Conservation Department, Ministry of Fisheries and Aquatic Resources, Colombo, Sri Lanka

Iwasaki S, Shaw R (2010) Integrated lagoon fisheries management: Resource dynamics and adaptation. Emerald Group Publishing, Bradford, UK

Jayakody SD (1996) Traditional lagoon fisheries in Negombo. In: Morris JM, Hotta M and Atapattu RA (eds) Report and Proceedings of the Sri Lanka/FAO National Workshop on Development of Community-Based Fishery Management, Colombo, 3-5 October 1994, Bay of Bengal Programme, Madras, India, pp.98-103

Jayawardane AATP, Perera AREH (2003) Observations on the artisanal stake net fishery for shrimps in the Negombo lagoon, Sri Lanka. Fisheries Management and Ecology 10:41-50

Lobe K, Berkes F (2004) The padu system of community-based fisheries management: change and local institutional innovation in south India. Marine Policy 28:271-281

Wimalasena DH (2005) Social and economic aspects of collective action in the stake seine fishery of the Negombo estuary. Journal of the National Aquatic Resources Research & Development Agency of Sri Lanka 37: 8-26