Indigenous knowledge in the beach seine fisheries in Sri Lanka: An indispensable factor in community-based fisheries management

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ABSTRACT

Small-scale fishing over the globe is based primarily on fisher indigenous knowledge (IK), accumulated through many generations of close interactions between people and the natural world. Community-based beach seine fisher communities of southern Sri Lanka were studied through standard ethnographic methods to ascertain the traditional method in using fishers' IK, and explore empirically the accuracy in using those methods distilled from the traditional fishers. Study revealed that, inter alia, traditional fishers use IK to predict the commencement of fishing season, and identify and quantify the species composition occurring at their fishing territory. Ten traditional methods those which are important for identifying and quantifying the fish school were distilled. Explored methods frequently used by traditional fishers were based on the changes of seawater color (folk oceanography) and the behaviour of sea terns (*Sterna* sp.). Traditional fishers' responses on frequency of utility of explored methods in day-to-day fishing activities were in accordance with the findings of the empirical study. Moreover, principal component analysis (PCA) revealed that PC score loading in fishers' expectation and fishers' realization had a positive significant relationship ($r=0.814$, $p<0.001$). This indicated that traditional fishers' expectation on composition and quantity of fish school arriving at fishing territory (*ex-ante*) is accurate and reliable at the realization (*ex-post*). As such, there exist opportunities to fisheries co-management for the coastal fisheries in Sri Lanka, incorporating fishers' indigenous knowledge in resource exploitation.

1. Introduction

With the intensification of fisheries in many parts of the world, commercial fishers compete with artisanal or small scale fishers for the same resources [1], mainly due to open access nature of the fisheries commons and subsidy driven overcapitalization. Fisheries management and development assistance programmes in tropical countries are usually science-based, bureaucratic, centralized top-down approach [2] and based exclusively on formal biological science [3]. Decline of the annual production of jointly used coastal fisheries suggests that government-based fisheries management strategy is not particularly effective, as this form of management mostly disregards

the experiences and knowledge of fishers [4]. Active management of local fisheries by resource users, through self-governing institutions or sharing of management responsibility between resource users and governments is widely seen as a key to improve fisheries management and reduce overexploitation [5,6]. There are several fisher communities that have now realized the long-term hazards of the new fishing practices and, consequently, have started managing their resources for sustainable utilization [7]. This approach appears to be an important means of managing fisheries successfully, since it increases the commitment of fishers to the system and allows the resource to flourish. Being traditional fisheries with a long history, such traditional management practices exist in beach seine fisheries in Sri Lanka [8]. Nevertheless, such practices as in the case of many community-based natural resource management systems in the world are not clearly visible [9], unless the mode of fishery is closely investigated.

Indigenous knowledge (IK), which is also termed as local knowledge, traditional knowledge and traditional ecological knowledge is a way of acquiring knowledge and is similar to western science, as it is based on accumulation of observations [10]. It is inseparable from

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cultural values, spiritual beliefs and customary legal systems of local communities and is viewed as the intellectual property of the entire community [11]. IK does not belong to any single individual within the community. Study [12], following pioneering ethno-ichthyological survey, emphasized that artisanal fishers in coastal and inland waters throughout the world are always talking about fish, constantly discussing fish ecology and behaviour. Therefore, some scholars have claimed that fishery biologists would be greatly benefitted by including IK of fishers in their research and management initiatives [13], in view of the fact that existing IK is recorded, analysed and integrated in proper ways [14].

Sri Lanka's rich IK in natural resource management has passed down verbally from generation to generation and has also been documented in ancient classical literature [15]. Nevertheless, studies are scarce to show the utility of IK in community managed coastal fisheries of Sri Lanka. A reconnaissance survey to ascertain traditional community managed coastal fisheries of southern Sri Lanka and anecdotal evidence lead authors to postulate the hypothesis that traditional fishers use IK for their fishing activities. We thought that, in addition to documentation, practice-oriented empirical study approach provides more sympathetic and informative understanding of the IK used by these traditional fishers. In light of this, the specific objectives of the present study were to: (1) ascertain the uses of IK and explore the methods of applying IK by beach seine fisher communities in Sri Lanka; and (2) examine empirically the accuracy of the application of explored methods by traditional fishers to elucidate their importance scientifically to the interested stakeholders. It is thought that such an ethno-ichthyological study would bring potential benefit to the fishers themselves by giving them a greater political voice and recognition, and improving dialogue between fishers and management agencies.

2. Methodology

2.1. Study area and communities

The study area is located in coastal belt of southern Sri Lanka which comprises three fisheries districts, viz., Galle, Matara and Tangalle. Eight rural coastal villages having beach seine fisher communities were selected as the specific sites for the detailed study (Fig. 1). Selection of these sites was based on the accessibility to key persons who assured the willingness to actively support the data collection process voluntarily.

2.2. Data collection strategy

Data collections were carried out in two phases which was run over two year period from July 2011 to June 2013. Primary data were collected through: (1) semi-structured interviews; (2) participant observation; (3) focus group discussions; and (4) key informant interviews. The prime instrument used for the purpose of data collection was semi-structured interviews, recognized as a standard ethnographic method for gathering information in an open ended format [16]. Initially, a fulltime reconnaissance survey was conducted to identify the community leaders, active traditional fishers and other individuals who had strong influence with fishers including buyers, middlemen such as sellers. In this phase, 162 individuals were interviewed together with district fisheries' officers and fisheries' inspectors. Further, the process of data collection is characterized by interviews with 8 community leaders and 48 active traditional fishers identified using a snowballing sampling method [17], by taking into the consideration of their long-term knowledge and skills in fisheries. Moreover, a total of 33 active fishers who were community members but were not 'right holders' and 10 middlemen were interviewed in order to explore the methods of applying IK by
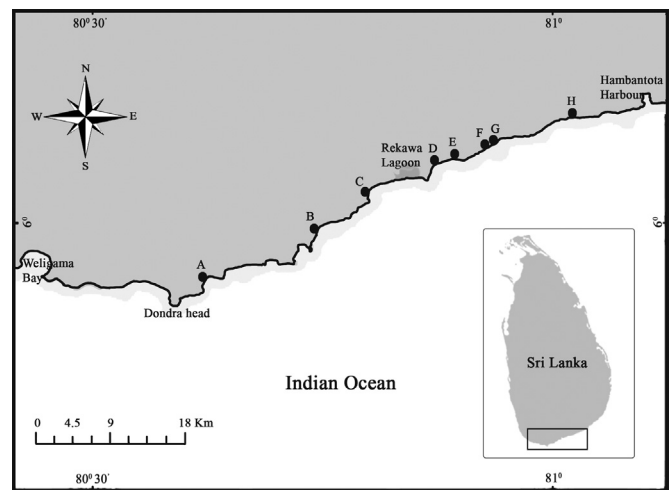

Fig. 1. Map of coastal belt of southern Sri Lanka showing the study area with the locations of the eight coastal villages studied: Thalalla (A), Mawella (B), Madekatiya (C), Wallodaya (D), Kahandamodara (E), Gurupokuna (F), Kalametiya (G) and Waaduruppa (H) (Inset: Map of Sri Lanka showing study area).

traditional fishers. This phase identified fisher community leaders and old traditional fishers with know-how, having long term knowledge, experience and skills in fisheries, ecosystem and community, hereinafter termed as traditional fishers. Data gathered through participant observation and semi-structured interviews were documented immediately in the field, and recorded with digital voice recorder wherever possible. Semi-structured interviews, key informant interviews and focus group discussions were carried out using the fishers' own language, Sinhalese. The uses of IK and methods used in applying IK by traditional fishers to identify the fish species occurring their fishing territory was the main focus in this phase. The collected information were triangulated and noted.

In the second phase, data collection was focused on exploring empirically the utility of each traditional method extracted from traditional fishers in the first phase of data collection. First, traditional fishers were questioned on the frequency of utility of each method for their day to day fishing activities, and noted as fishers' response. Being a fisheries scientists and academic helping with fishing activities in the area, one of the authors made personal observations on frequency of utility of explored methods by traditional fishers in the sea front at 87 beach seine operations to compute the frequency of utility of each method, as authors' observation. Second, traditional fishers' prediction on species composition in the harvest before operating beach seine, hereinafter termed as fishers' expectation and, actual species composition in harvest measured in bulk weight (kg) after fishing operation, hereinafter termed as realization were recorded as follows. Traditional fishers identified in phase 1 data collection were questioned on the species composition arriving at their fishing territory just before operating the beach seine. Then, after conclusion of the fishing operation, species composition in the harvest and total weight of the each species (kg) were recorded in situ. The same procedures were repeated for 87 occasions (fishing operations) in beach seine fishing territory traditionally termed, *madel padu*.

Fish species and sea terns were initially identified at the shore by vernacular names used by fishers. Then, the species were identified up to lowest taxonomic level using photographs, diagrams and dichotomous keys [18–20]. Furthermore, selected traditional fishers were questioned to identify species, e.g., torpedo scad (*Megalapsis cordyla*), as well as sea terns (*Sterna* sp.), and identification was confirmed with local names in the presence of traditional fishers.