



ORIGINAL ARTICLE

Distribution of Fishing Gears in India's Largest Brackish Water Lagoon, India

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ABSTRACT

An attempt was made to study about the fishing gears used in Chilika lagoon during January-December, 2009. A total of 1819 fishing boats were sampled among which 670 boats from northern sector, 535 boats from central sector, 330 boats from southern sector and 284 boats from outer channel sector. In sector wise as well as seasonal distribution of fishing gears is concern, the variation clearly visible. Northern sector and outer channel sector is highly dominated by khonda nets, while central and southern sector is dominated by gill nets. During the whole one year of assessment, gill net fishing registered highest percentage (40%) followed by khonda (set net) fishing (39.5%). Very less fishing was registered with other fishing gears like drag net (only 4%), scoop net (3.8%), sieve net (3.5%) and cast net (3%). Here both gill net and khonda together registered about 80% of total fishing in the whole lagoon. So, both the gill nets and khonda nets considered as the major fishing gears for the lagoon and rests as minors.

KEY WORDS: Fishing gear, gill net, khonda, ecological sector, Chilika lagoon.

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INTRODUCTION

Temperate and subtropical estuaries are widely recognized as productive areas that serve as habitat for many fish species [1,2]. The fish assemblages in these systems are typically dynamic, reflecting the changing suite of environmental conditions to which they are exposed on short-term or seasonal bases [3]. Low-salinity portions of estuaries, including brackish riverine systems are of particular importance as nurseries for juvenile stages of many fishes [4]. Benefits such as plentiful food resources, shelter, and limited predation pressure outweigh potential disadvantages such as fluctuating environmental conditions [5].

Fishing gears are an intrinsic part of the fishing process. Without these tools we would be very ineffective predators in the marine environment. Therefore, any assessment of the impacts of fishing on marine environments requires, at a minimum, a time series of fisheries catches related to the gear that caught them [6].

Chilika lagoon is one of the main sources of capture fisheries of Orissa and supports food and livelihood security to more than 0.2 million fisher folk living in and around the lagoon. As one of the direct use benefits of Chilika ecosystem, fisheries output shares more than 71% of its economic value. Chilika Lake also supports the state economy to a large extent by earning valuable foreign exchange to the extent of about 200 million rupees. Fish production of the lagoon significantly increased after opening of the New Mouth on the east coast of the Lagoon in September 2000. However, the amount of the production has been showing a declining trend from the peak in the year. Again, the fisheries and biodiversity of the lagoon suffered the most, both due to natural and man-induced perturbations.

Many investigations has been done about the fish diversity [7,8,9], fishery biology [10,11], fish population [12,13], fish landing [9,14,15,16], hydrology [17,18], benthic communities [19] etc. But many workers have studied about the fishing methods, fishing crafts and gears is very less except few study by Jones and Sujansingani [7], Mahapatra et al. [20], Remesan et al. [21] and Karna & Panda [22].

The present investigation is concern with the fishing gears used in different fishing areas as well as seasons in the lagoon. This paper will definitely help to the fishery researchers, planning and policy makers for the sustainability and management of fishery resource of the lagoon.

MATERIAL AND METHODS

Chilika Lagoon, the largest lagoon of India lies in the east coast of India, situated between latitudes 19°28'-19°54' North and longitude 85°05'-85°38' East. It is designated as an important Ramsar site (No.229) of India on October 1981. The water spread area of the lagoon varies between 906 km² to 1165 km² during summer and monsoon respectively. The estuarine lagoon is a unique assemblage of marine, brackish and fresh water eco-systems. The lagoon is divided into four ecological sectors namely, the southern sector, the central sector, the northern sector and the outer channel sector (figure-1). Basically, the northern sector is fresh water dominated zone, central sector is a brackish water zone and southern sector is a higher saline area. The outer channel sector is marine in nature with saline water but during monsoon, the water becomes fresh due to discharge of flood water to the sea.

For the investigation of the gears used in Chilika lagoon, a huge data was generated during January-December, 2009. All the data were collected from eight fish landing centers i.e., Kalupadaghat and Bhusandpur from northern sector; Balugaon and Nairi from central sector; Keshpur and Sabulia from Southern sector; Arakhakuda and Borokudi from outer channel sector (figure-1). In fish landing centers, fishing gears data were collected from 1819 fishing boats which were sampled randomly. All the data were collected monthly basis but analysed by seasonally like pre-monsoon season (feb-may), monsoon (june-sept) and post-monsoon (oct-jan). Because using gears are most seasonal and dependent on environmental conditions.

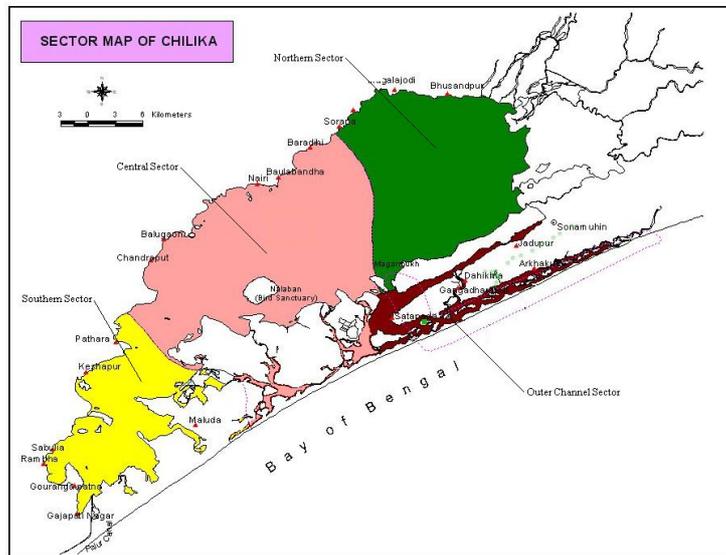


Figure-1: Map of Chilika Lagoon showing four ecological sectors and fish landing centers.

RESULTS AND DISCUSSION

A total of 1819 fishing boats were sampled among which 670 boats from northern sector, 535 boats from central sector, 330 boats from southern sector and 284 boats from outer channel sector (table-1).

Table-1: Number of boats sampled from different fish landing centers of Chilika lagoon during January-December 2009.

Ecological sectors	Fish landing centers	Number of boats sampled in different month												Total
		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Northern sector	Kalupadaghat	31	28	22	34	28	31	22	29	34	37	21	32	349
	Bhusandpur	26	22	26	31	28	33	28	21	29	33	25	19	321
Central sector	Balugaon	24	31	28	33	29	26	24	31	35	32	28	20	341
	Nairi	18	14	21	11	17	19	10	16	17	21	14	16	194
Southern sector	Keshpur	14	19	15	18	13	18	13	17	19	18	11	15	190
	Sabulia	8	14	11	18	12	9	12	15	11	9	11	10	140
Outer-channel sector	Arakhakuda	12	16	10	13	17	13	11	16	11	13	10	14	156
	Borokudi	9	10	13	16	10	12	9	8	7	12	14	8	128
Total		142	154	146	174	154	161	129	153	163	175	134	134	1819

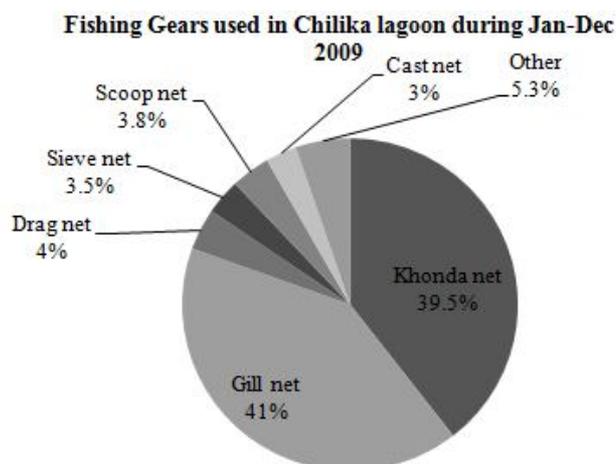


Figure-2: Distribution of fishing gears in Chilika Lagoon during January-December 2009.

Table-2: Seasonal and sector-wise variation of gears used in Chilika lagoon.

Ecological sectors	Gears used	Pre-monsoon	Monsoon	Post-monsoon	Mean
Northern sector	Khonda net	40.1	40.9	47.3	42.77
	Gill net	33.7	38.4	34.2	35.43
	Drag net	11.2	4.1	5.9	7.07
	Sieve net	3.3	3.6	0	2.30
	Scoop net	4.2	1.2	2.1	2.50
	Cast net	2.5	2	1	1.83
	Other	5	9.8	9.5	8.10
Central sector	Khonda net	42.1	32.6	35.3	36.67
	Gill net	36.4	52.7	38.6	42.57
	Drag net	11.6	5.1	8.4	8.37
	Sieve net	3.2	1.1	2.1	2.13
	Scoop net	2.4	2.1	4.2	2.90
	Cast net	1.6	0	3.1	1.57
	Other	2.7	6.4	8.3	5.80
Southern sector	Khonda net	35.4	29.6	36.6	33.87
	Gill net	46.3	55.3	47.7	49.77
	Drag net	2.2	0	0	0.73
	Sieve net	5.7	8.1	4.4	6.07
	Scoop net	6.2	5.3	5.1	5.53
	Cast net	2.1	0	0	0.70
	Other	2.1	1.7	6.2	3.33
Outer-channel sector	Khonda net	45.9	44.7	43.2	44.60
	Gill net	33.2	35.5	40.1	36.27
	Drag net	0	0	0	0.00
	Sieve net	2.1	3.1	4.7	3.30
	Scoop net	4.2	5.3	3.1	4.20
	Cast net	11.3	7.2	5.1	7.87
	Other	3.3	4.2	3.8	3.77

In sector wise as well as seasonal distribution of fishing gears is concern, the variation clearly visible (shown in table-2). Northern sector is highly dominated by khonda nets followed by gill nets. In this sector, khonda fishing is very popular among fishermen and highly used fishing gears with 42.77% followed by gill nets (35.43%). About 7% drag nets used in the sector for fishing. Gill net is the main

fishing gears all over the lagoon. Seasonal variation in gears of northern sector is concern, khonda nets dominated in all the three seasons followed by gill nets. Water depth in southern sector is lowest in comparison to all other sectors of the lagoon [22]. This could be the prime reason for the dominance of khonda nets in the sector.

In central sector, highest number of gill nets (42.57%) operations has been documented followed by khonda nets (36.67%). About 8% drag nets also used for fishing. Seasonal variation in fishing gears in the sector is concern, fishing with khonda nets registered highest percentage (42.1%) during pre-monsoon season, where as gill net fishing observed maximum during monsoon (52.7% against 32.6% of khonda fishing) and post-monsoon (38.6% against 35.3% of khonda fishing) seasons. During pre-monsoon season, the water depth in the area is quiet low as compared to other seasons for why fishermen prefer khonda net fishing. Nalabana bird sanctuary also situated in this sector which is recognized as an important breeding as well as nursery grounds of many brackish water fish species. Again, khonda net fishing is very prevalent around the Nalabana area. During monsoon and post-monsoon season, the water depth of the area increased so that khonda fishing is decreasing.

In southern sector, maximum fishing registered through gill nets. Here, 49.77% gill nets were observed followed by khonda nets of 33.87%. Southern sector is considered as the deeper area of the lagoon, for why gill net fishing is prevalent than other fishing. Generally, gill net fishing is very fruitful in high water depth area. But khonda net is also seen in this sector. Palur channel is situated in this sector which connects the lagoon to the sea. So, Palur channel is the prime migration route for a number of fish species. This is the main reason that the fishermen used khonda nets in both sides of the channel to capture migrating fishes both from lagoon to sea and sea to the lagoon. In seasonal variation in gears used is concern, gill net fishing is very dominant in all the seasons. In monsoon season, gill net fishing registered very high with 55.3% against 47.7% during post-monsoon and 46.3% during pre-monsoon seasons. During monsoon, water depth raise maximum and fixing of khonda net is very difficult, for why khonda fishing is sharply declined and gill net fishing increased. From this result, it is very clear that khonda fishing is decreased with increase in water depth and khonda fishing is increased when water depth decreases. Similarly, uses of gill net also depends upot water depth and khonda net fishing. So, khonda net fishing is clearly depends upon water depth of the operational area. As the water depth is high in southern sector, both cast net fishing and drag net fishing was noticed rare. Both type of fishing was only seen in pre-monsoon periods (which was also very less), during which water depth of this sector is in minimum level.

In outer-channel sector, khonda fishing noticed maximum (44.6%) followed by gill net fishing (36.27%). Cast net fishing is also observed in this sector. Seasonal variation in fishing gears used is concern, khonda fishing registered maximum in all the three seasons. After khonda, gill net fishing registered second dominant fishing gears used in outer-channel sector. Outer channel is the main route between the lagoon and sea in which exchange of water between sea and lagoon takes place. During monsoon the flood water (fresh water) from the catchment and rivers around the lagoon is flux out from the lagoon to the sea furnished by outer channel only. Similarly, during post monsoon and pre-monsoon period, saline water enter to the lagoon through the channel. So, along with the water exchange, various anadromous and catadromous species do their seasonal migration from the sea to the lagoon and vice-versa. Such type of movement happens for feeding and breeding purpose. To keep in mind of such movement of the fish, fishermen set their khonda along the sides of the channel where water depth is not so high. So, the sector always dominated by khonda nets. Again, where the water depth is very high and cann't fixes khonda, fishermen used gill nets for fishing. Some fishermen also used cast nets during pre-monsoon and monsoon seasons. These nets used in the sandy bank of the outer channel by small fishing only.

Drag net fishing is concern; the gear is sector specific. Drag net fishing is observed in central and northern sector, but rarely seen in southern sector. The design of operating the gear is suitable in low water depth area only [12]. Both central sector and northern sector considered as low water depth area as compared to the other two ecological sectors of the lagoon, so drag net operations is easy in the region. But, no drag net operations observed in outer-channel sector. This is due to the high water current as well as water depth in the area.

Sieve net and scoop nets are very less operating fishing gears observed all the seasons in all the sectors of the lagoon. In southern sector, few boats fishing with these nets, but in other sector, these gears are occasional. So, it could not be described as sector specific or season specific.

Similarly, cast net fishing also very rare for the lagoon. Although, few cases of cast net fishing found in outer-channel sector area, these are confined in the mouth area only. Here, fishermen cast their nets in sides of the connecting channel between sea and the lagoon and lagoon mouth area which are sandy in nature.

During the whole one year of assessment, gill net fishing registered highest percentage (41%) followed by khonda (set net) fishing (39.5%). Very less fishing was registered in other fishing nets like drag net (only 4%), scoop net (3.8%), sieve net (3.5%) and cast net (3%). Here both gill net fishing and khonda fishing together registered about 80% of total fishing in the whole lagoon throughout the complete one year of assessment. So, both the gill nets and khonda nets considered as the major fishing gears for the lagoon and rests as minors. Finally, it is concluded that seasonal as well as sectoral (sector-wise) differences clearly visible among fishing gears.

CONCLUSION

The present results shows that the sector wise as well as seasonal distribution of fishing gears is concern, a clear variation is visible. Northern sector is highly dominated by khonda nets followed by gill nets and other. But, during the whole one year of assessment, gill net fishing registered highest percentage followed by khonda (set net). Very less fishing was registered in other fishing nets like drag net, scoop net, sieve net, cast net etc. Therefore, the present study should be updated and extended with time to time data improvement and more management will be implemented for the ecosystem.

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