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Species composition of Batoids in a coastal gillnet fishery operated in the northern coastal waters of Sri Lanka

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Original Article

Abstract

Over the past decades the numbers of Elasmobranchs have declined drastically worldwide, jeopardising the food security of some of the world's less developed countries. The present study provides information about current status and diversity of batoids in gillnet fishery in northern coastal waters of Sri Lanka. The batoid landings were monitored monthly during the period from January to December, 2016. These fishes were mainly caught with bottom set gillnets operated frequently by Outboard Fibre Reinforced Plastic (OFRP) boats. The mesh size of the gillnet and net panels used varied from 2'-22' and 6-15 pieces respectively. 26 batoid species belonging to two orders (Myliobatiformes and Torpediniformes) and five families *viz*., Dasyatidae, Myliobatidae, Mobulidae, Rhinobatidae and Narcinidae were recorded in commercial landings. Of the recorded families, higher number of species belonged to the family Dasyatidae and of that 55% were *Himantura* species. Females with pups were observed for the species of *Gymnura micrura* and *Aetobatus narinari* with disc width ranging from 40-55 cm and 75-110 cm respectively. The disc width for *Gymnura micrura* and *Aetobatus narinari* pups were 10-12 cm and 20-35cm respectively. The observation of high proportion of juveniles and sub adults of *Rhinoptera javanica* (Javanese cownose ray) indicates the presence of a nursery ground adjacent to Jaffna peninsula.

Keywords*: Batoidea, disc width, fishery, OFRP, rays*

Introduction

Rays, skates, guitarfishes and sawfishes are collectively called as Batoids (De Bruin *et al*., 1994). Batoids are found in all the oceans and have adapted to a wide array of habitats (McEachran and Aschliman, 2004). They show different life history patterns with slow-growing, late maturity, low fecundity and longevity (Frisk, 2010). Many species of batoids are increasingly important in targeted or by-catch fisheries, contributing to the fisheries catch worldwide (White *et al*., 2013). Elasmobranchs contribute to the by-catch fisheries worldwide (Tamini *et al*., 2006). Elasmobranchs are slow growing and these species produce smaller number of pups in their lifetime and recruitment to the fishery is very slow. Therefore, batoids have been susceptible to high fishing pressure around the world (Devadoss, 1978). Research on the life history studies of batoids has not been given much importance as compared to other teleost or elasmobranch species (Frisk, 2010). Very little is known about their diversity and life history patterns of batoids, leading to even taxonomic uncertainties which limits their management. From northern coastal waters in Sri Lanka only very little information is available on batoid fishery. Therefore, present study was planned to understand the occurrence and availability of batoids and current fisheries aspects in northern coastal waters in Sri Lanka.

Material and methods

The survey consisted of two major parts, a frame survey and a comprehensive survey. The frame survey was carried out along the coast of the Jaffna peninsula to identify the main landing sites for batoid fishery in Jaffna District (Fig. 1). A total of 11 fish and landing sites along the Jaffna peninsula were identified and field visits were conducted to collect the basic information. Moreover, randomly selected fishers and coastal villagers were interviewed from each landing site and the data were collected over a period of one year from January to December, 2016. Each species was identified using identification guides (De Bruin *et al.*, 1994; Froese and Pauly, 2017) and the numbers of each species, disc length (DL) and disc width (DW) were recorded. Disc length (from tip of the head to the tip of the pectoral fins) in cm and Disc width (the distance between two edges of the pectoral fins) in cm, were taken using a measuring tape. In addition to such biological features, fisheries data such as type of craft, type of gear, depth, number of fishing days, number of crew involved were also recorded.

Results and discussion

Batoids are mainly caught with bottom set gillnets, mostly used by Outboard Fiber Reinforced Plastic boats (OFRP) of 5m to 5.5m Overall Lengths (OAL). On an average, 18 number of boats were operated in the studied sites. The mean depth of operation was 13 m (10-20 m depth range) which will be within 10-15 kilometers from the shore. Each boat carries two crew members and duration of fishing time was around 12- 20 hours per trip. The gillnets have 6-15 net panels and 1 piece is about 40-50 m length and 3-4 m depth, and the mesh size varied from 2'- 22'. This particular fishery is locally called as 'Thirukkai fishery' in the region. Fishermen who live along the coastal belt are actively engaging in this fishery. The fishing activity is at its peak during April to August but may depend on the prevailing weather condition.

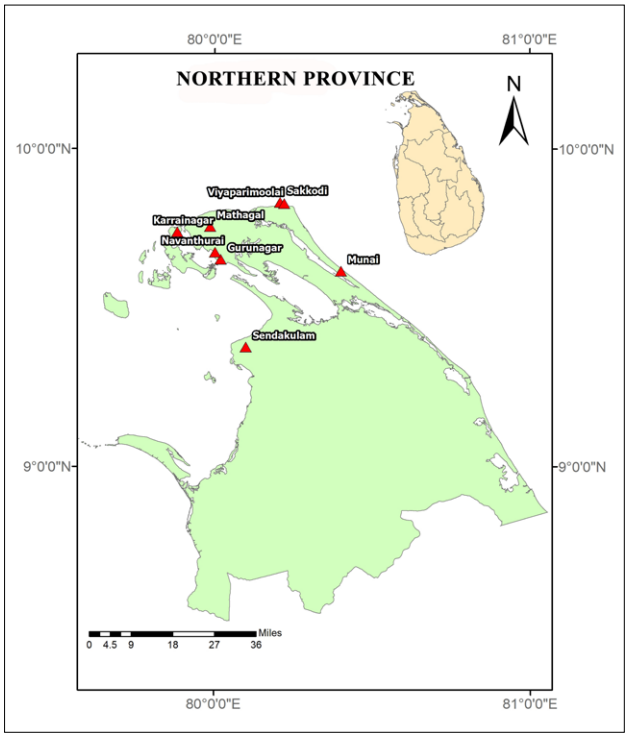

Fig. 1. Map showing the sampling sites

A total number of 26 batoid species belonging to two orders (Myliobatiformes and Torpediniformes) and five families *viz.,* Dasyatidae, Myliobatidae, Mobulidae, Rhinobatidae and Narcinidae were recorded from commercial landings in the northern coastal waters (Table 1). Of the recorded families, higher number of species belonged to the family Dasyatidae 42% and of this 55% were *Himantura* species (Fig. 2 and 3). Juveniles of *Rhinoptera javanica* (28-45 cm) were observed in high proportion (45%) in the total landings of this species, Females with three pups were observed for the species of *Gymnura micrura* and *Aetobatus narinari* with disc width ranged from 40-55 cm and 75-110 cm respectively. The disc width range for *G. micrura* and *A. narinari* pups were 10-12 cm and 20-35 cm respectively. During the study period the number of pups observed for eagle rays were three.

The meat of the batoid species was used for local consumption and if the quality has gone down with bad weather condition, it will be used for dried curing or for the preparation of animal feed. There is a good consumer demand for fresh fish in this area and also drying and salting has traditionally been practiced when quality goes down. Interviewed fishermen emphasized that if they have good freezing facilities, they could maintain good quality meat. The price of dried fish per kg varied from Sri Lankan rupees 800.00 to 1500.00. Drying may take place on a large scale or on a dealer's backyard as small scale one. Gill rakers collected from *Mobula* species were processed for export market. And its price of the dried rakers usually ranges from 8000.00 to 15,000.00 Sri Lankan rupees per kg at the source. Further, it was gathered by interviewing the coastal people that the skin of batoids are converted into fancy leather which can be used for shoes and other value-added products such as wallets, dress belts, handbags and purses (Fig. 4).

Though the batoid fishes are a little known group, many species are increasingly important in targetted or by-catch fisheries worldwide and also their correct taxonomic identification gives way for sustainable utilization of the resources (Akhilesh *et al.*, 2014; Fernando *et al.,* 2019; Joshi *et al.*, 2016). Fernando *et al.*, 2019 studied on elasmobranch fauna in the North western, Northern, Eastern province and Western province in Sri Lanka

Table 1. Species composition of batoids caught in northern coastal waters of Sri Lanka

No	Scientific Name	Common Name	Disc Width range (cm)
Order Myliobatiformes (Sting rays)			
Family: Dasyatidae			
1.	*Dasyatis kuhlii*	Blue spotted sting ray	21-29
2.	*Dasyatis marginatus*	Blackedge stingray	25-64
3.	*Dasyatis zugei*	Pale-edged sting ray	15-25
4.	*Himantura bleekeri*	Whiptail stingray	45-67
5.	*Himantura gerrardi*	Sharpnose stingray	45-65
6	*Himantura imbricatus*	Scaly stingray	15-20
7.	*Himantura uarnak*	Honeycomb stingray	79-120
8	*Himantura undulata*	Leopard whipray	55-85
9	*Himantura jenkinsii*	Jenkins whipray	50-90
10	*Pastinachus sephen*	Cowtail stingray	79-130
11	*Taeniura meyeni*	Blotched fantail ray	65-120
Family: Myliobatidae (Eagle rays, Cownose rays)			
12	*Aetobatus narinari*	Spotted eagle ray	75-110
13	*Aetomylaeus maculatus*	Mottled eagle ray	45-114
14	*Aetomylaeus nichofii*	Banded eagle ray	40-55
15	*Rhinoptera adspersa*	Rough cownose ray	50-120
16	*Rhinoptera javanica*	Javanese cownose ray	55-140
17	*Gymnura poecilura*	Long-tailed Butterfly ray	35-54
18	*Gymnura micrura*	Smooth Butterfly ray	40-55
Family: Mobulidae (Manta rays, Devil rays)			
19	*Mobula japanica*	Spinetail mobula	55-110
20	*Mobula tarapacana*	Chilean devil ray	40-112
21	*Mobula thurstoni*	Bent fin devil ray	62-105
22	*Mobula kuhlii*	Shortfin pygmy devil ray	42-106
Family: Rhinobatidae(Guitarfishes)			
23	*Rhina ancylostoma*	Shark ray	110-190
24	*Rhinobatos annandalei*	Annandale's guitarfish	35-75
25	*Rhinobatos granulatus*	Granulated guitarfish	79-120
Order: Torpediniformes (electric rays)			
Family: Narcinidae			
26	*Narcine lingula*	Chinese numbfish	15-22

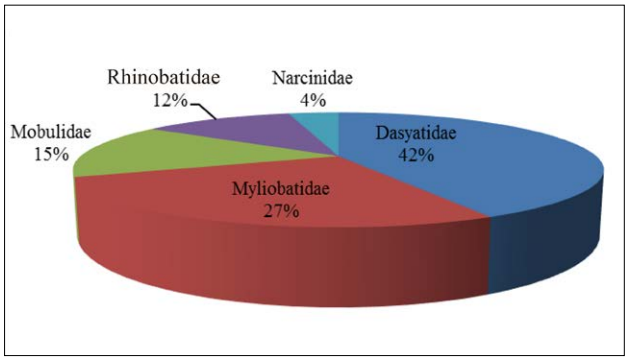

Fig. 2. Percentage occurrence of batoid species

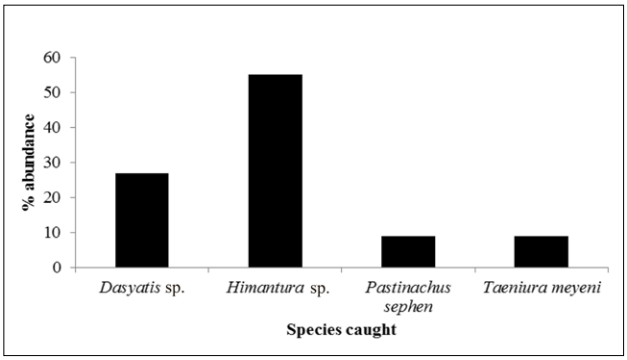

Fig. 3. Abundance (%) of species caught from family Dasyatidae

Fig. 4. Sun drying of batoid skin and meat

and some of the similar species were recorded. Previously, Kizhakudan *et al.* (2010) have also shown that ray species collected by trawlers off Chennai dominated by *Himantura* species which is in agreement with the present study. Further, it has shown that range of litter size for eagle rays as 2-12 (Martin and Cailliet, 1988). Yokota *et al.* (2012) have observed size at birth ranged from 13.5- 17.5 cm for *Gymnura micrura* in Brazilian waters. Muktha *et al.* (2020) have observed 19-22 cm disc width range at birth for the *Gymnura poecilura* in the Bay of Bengal region. Present study observed it as 10-12 cm in the Sri Lankan territorial waters for *G. micrura*. Order Torpediniformes consist of electric rays having larger body size to smaller body size rays (Frisk, 2010). Of that smaller body size *Narcine lingula* was recorded during the study period. Fins collected from shark like batoids ('white-fin') have a high demand as well as provide profitable products (Clarke *et al*., 2006 b; White *et al*., 2013). Data collection was not possible in the Northern part of the Sri Lanka due to the civil war. Therefore, present study provides recent information on diversity of batoids collected in Northern Sri Lankan territorial waters.

Present study presents information about diversity and utilization of the batoid fishes caught by gillnets operated in the northern coastal waters of Sri Lanka. The observation of high proportion of juveniles and sub adults of *Rhinoptera javanica* (Javanese cownose ray) indicates the presence of a nursery ground adjacent to Jaffna peninsula. Batoids are considered as elasmobranches fishes having slow growth, late maturity and producing less number of pups. As they produce less number of pups within their life time, recruitment to the fishing grounds is very slow. As a result, the batoids are susceptible to over fishing and are slow to recover if over-fished. Hence, the study of maturity, spawning season, spawning ground and, age and growth, mortality parameters of the key species is recommended.

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