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Fishery for Lizard Fishes off Cochin with a Note on the Biology of *Saurida undosquamis* (Richardson)

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Abstract

Among the maritime states of India, Kerala ranks first contributing to about 45% ofthe countrys lizardfish production. At Cochin Fisheries Harbour, this group contributes to an average of 3.05% of the total marine fish landings. Increased operation of shrimp trawlers is found to exert fishing pressure on the available stock. Caught mainly during monsoon months, lizard fishes are represented mainly by *Saurida undosquamis* and *S.tumbil*. A positive correlation between rainfall and abundance of these species is noticed. Fishery of *S.undosquamis* is found supported by size groups 175 to 255 mm during monsoon months and by size groups above 255 mm during postmonsoon months. Size at first maturity of *S.undosquamis* is 201-210 mm. Spawning season is prolonged with peak during October- December months. With lesser representation of ripe gonads in the catches, the species appears to breed away from the fishing grounds. Both juveniles and adults show a preference for smaller fishes such as *Stolephorus* spp. Cannibalism is noticed in the group.

Introduction

Lizard fishes of the family Scopelidae are reported to form a potential fishery along the southwest coast of India with good trawling grounds located north off Cochin (Bal and Rao, 1984). Caught mainly in smaller trawlers, (OAL 14 m and below) lizard fishes are found to form an emerging fishery at Cochin Fisheries Harbour (7° 30' N - 11° 20' N), 74° 50' E - 78° 00' E, one of three major landing centres of Kerala. Nevertheless, no comprehensive studies on the fishery of this group of fishes from this centre had been made except for the attempts made on the impact of south west monsoon on their fishery (Nair *et al.,*, 1992). Eventhough biology of lizard fishes is studied widely from East China and Yellow sea (Okada and Kyushin, 1955; Hayashi *et al.,* 1960),and in Philippine waters (Tiews *et al.,* 1972), similar attempts in India are less made (Kuthalingam,1959; Rao, 1981, 1983, 1984). This paper presents the fishery aspects of lizard fishes off Cochin with an account on the biology of *Saurida undosquamis* (Richardson).

Materials and Methods

Data collected from Fishery Resources Assessment Division of CMFRI are used in presenting the catch trends. Since *S.undosquamis* was regularly available in the catches, biology of this species is taken up. Samples of *S.undosquamis* collected twice a week from the landing centre at Cochin Fisheries Harbour during the period April 1992 to March 1994 formed the material for this study. A total of 1141 specimens of *S.undosquamis* of both the sexes ranging in length from 115 mm to 370 mm were utilized for length-frequency analysis. Maturity stages, size at first maturity, spawning season and Gonado-Somatic Index (GSI) were determined following standard methods. Food and feeding habits of the species was studied applying the "Index of Preponderance method" (Natarajan and Jhingran,1961) in juveniles and adults seperately. Rainfall data were obtained from the Indian Metereological Department.

Results and Discussion

Fishery

On an all India basis during 1985-93 period, Kerala with an average catch of 9938 t (45.06%) brought the maximum catch of lizard fishes followed by Tamil Nadu (4462 t., 20.23 %), Maharashtra (2881 t., 13.06%) Karnataka (1580 t., 7.16 %), Gujarat (1275 t., 5.78 %) and Andhra Pradesh (1147 t., 5.2 %).

Over the years, a general increase in the catch from 5695t.in 1985 to 13833t in 1993 in Kerala and from 1964t. in 1985 to 7446t. in 1992 in Tamil Nadu was noticeable. In other states, the catch is found to show a fluctuating trend during the period 1985-93.

Lizard fish fishery at Cochin Fisheries Harbour amounted to 1211t (19.054 Kg/E), which declined to 637t.(9.03 Kg/E) in 1990 (Fig.1). The catch and catch rate however, indicated an increase to a maximum of 1637t (17.76Kg/E) in 1993, through 838 t. (7.62Kg/E) of 1991 to 1125t (12.13Kg/E) of 1992. The lizardfish fishery at Cochin Fisheries Harbour with an average catch of 1039.61t (12.73 Kg/E) contributed to an average of 3.05 % of the total marine landings of the centre during 1989-93.

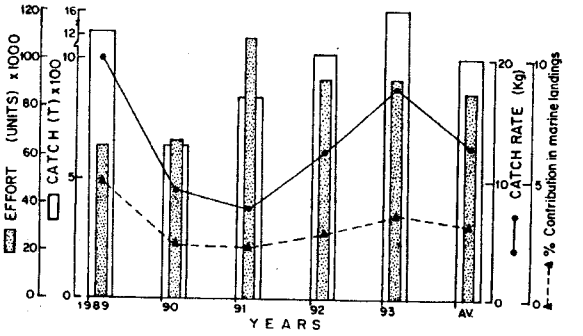

Fig. 1. Catch particulars of lizard fish fishery at Cochin fisheries harbour during 1989-93.

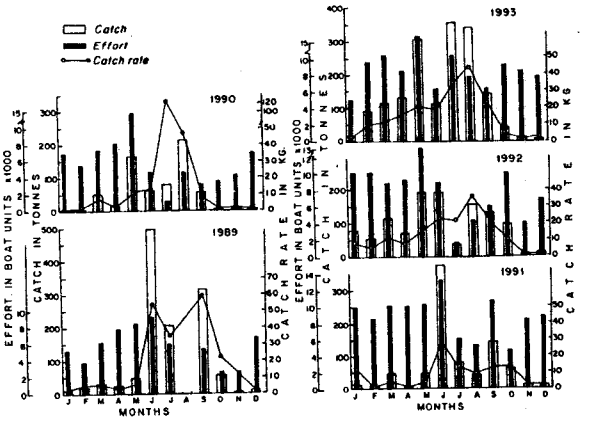

Fig. 2. Seasonal abundance of lizard fishes landed at Cochin Fisheries Harbour during 1989-93.

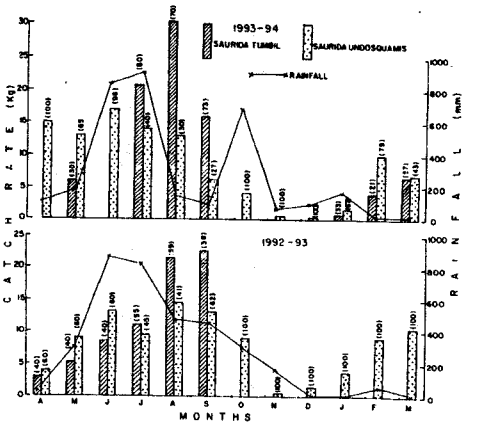

Fig. 3. Catch rate (kg) of lizard fishes alongwith monthly rainfall (mm) at Cochin Fisheries Harbour during different months during 1992-94. (Figures above bars in paranthesis indicate percentage contribution of dominant species).

It may also be seen that with a maximum of 108911 units expended during 1991 (Fig.2), a lesser catch rate of 7.621 Kg/E was obtained, while a lesser number of effort of 63553 units in 1989, brought a higher catch rate of 19.05 Kg/E. Further, during 1992 and 1993, a decrease in effort around 92000 units is found to increase the catch rate to 12.12 Kg/E and 17.76 Kg/E respectively thereby showing that a higher effort input results in reduced catch rates. And such a situation is probably caused by the increased operation of shrimp trawlers, resulting in increased fishing pressure on the available stock of groundfish leading to overfishing.

Seasonally, high catches and catch rates were obtained invariably during the monsoon months of May to September with the maximum catch of 496 t obtained during June 1989.(Fig.2). It may also be seen that an increase in effort does not have a positive effect on the catch and catch rates because during the premonsoon and postmonsoon months , there was less catch and catch rates in spite of an increase in effort input.

Specieswise, *S .undosquamis* formed upto 100% of the catch especially during the post monsoon period of October to December during both the years.(Fig.3). S.tumbil, another major species represented was obtained mainly during the monsoon months of April to September in 1992-93 and during the months of May and June to September and also during January to March 1993-94. Other species such as *Trachinocephalus myops* and *Synodus englemanni* were represented sporadically in the catches during May-June months.

A correlation of specieswise abundance in relation to rainfall (Fig.3) shows that both *S.undosquamis* and *S.tumbil* were more abundant during the monsoon months of May to September with a corresponding high rate of rainfall during these months in both the years. Concurrently, during the post monsoon months of October to December, the catch rates of both the species were low with a corresponding low in the rainfall. While the increased catch rates during the monsoon months may be attributed to the movement of these fishes to inshore waters during upwelling, the low catch rates observed during October to December period may be due to their migration back to relatively deeper waters after the upwelling (Banse,1959). It is also possible that they migrate to the inshore waters during the monsoon season probably attracted by the well aerated low saline waters, for it has been reported that favourable saline medium influences the distribution of *Harpadon nehereus*, an allied species of lizard fishes (Rao,1973). Further, substantiating the migration of lizard fishes to and from the deeper waters, Nair and Reghu (1990) state that maximum abundance of lizard fishes along the Wadge bank and southwest coast was at 41 to 80 m depth during April-September and at 101-150m during October-December months.

Size frequency studies of *S.undosquamis* showed that during 1992-93, younger size groups between 125 to 175 mm range were represented more in the fishery during April 1992 and January to March 1993, with dominant modes at 155mm and 175mm, while advanced size groups ranging between 255 to 345mm supported the fishery during August to November period with modes at 255 and 285mm. It was also noticed that size groups ranging between 175 and 245mm were represented mainly during the months of April to August with modes at 225mm and 235mm. During 1993-94 also, a similar pattern of distribution was discernible with younger size groups represented more during February to June period while advanced size groups represented mainly during July to November period. Rao (1984) studying the age and growth of lizard fishes along West Bengal states that the fishery of *S.undosquamis* is supported by one year old fish (170-190mm) and to some extent by two year old fish (250-270mm). In the present study also, the higher catches obtained during the monsoon months is contributed mainly by size groups 175-255mm. Further, during post monsoon months of September

to November, though the advanced size groups above 255mm supported the fishery, the catch was found less, probably because of their movement away from the fishing grounds for breeding or feeding purpose.

Biology

Size at first maturity

Mature ovaries of *S.undosquamis* indicated progressive increase upto 260 mm and beyond this size group, all were in mature condition. Since 52.72% of the ovaries examined were in mature condition in 201-210mm size group, it may be inferred that *S.undosquamis* off Cochin matures after attaining 200 mm in total length.

Spawning season

The ovaries were mainly in the immature stages (I and II), during the monsoon months of May to August with the maturing (stage III) and mature (stages IV and V) stages encountered during the post monsoon months of September to December period. It is also noticeable that gonads in ripe stage (VI) were seldom encountered and they formed only upto 18.2% during October 1992. Nevertheless, spent gonads in stage VII were recorded almost throughout the year with peak occurrence during post monsoon months of October to December period thus indicating a prolonged breeding season for the species.

Gonado-Somatic Index

During both the years, 1992-93 and 93-94, the GSI values in females were high during September to February months with peak values of 3.74 and 5.05 observed during October 92 and November 93 respectively. In males also, a distinct peak during August to January was noticed during both the years with peak values of 0.98 and 0.79 obtained during October 92 and November 93 respectively. The GSI values also indicated a prolonged breeding season in the species with peak season during October/November period.

The seasonal distribution of gonads in different maturity of *S.undosquamis* points to significant inferences. The availability of immature gonads during the monsoon season, the absence of ripe gonads throughout the year and the availability of spent gonads mainly during October to December period indicate that the fish breeds away from the fishing grounds mainly during October -December months. Reporting of the frequent availability of ovaries in stage I and II, and rare occurrence of stage V and VI, Rao (1983) also concludes that *S.undosquamis* breeds during October to March period with a peak in November-December months. The lesser catch and catch rates of *S.undosquamis* during the post monsoon months also points to the non-availability of this species in the fishing grounds of inshore waters.

Food preference

Indicating a clear gradation in food prference, juveniles of 111-200mm size range were found to be selective for smaller fishes such as *Stolephorus* spp and young ones of *Saurida* spp. Prawns and squids formed the next preferred food items in this group. Stomachs of most of the juveniles had semidigested food items which included crustaceans (*Acetes* spp., *cladocerans*) and echiuroides.

In the adults measuring above 200mm, comparatively large sized fish such as *Decapterus* spp., *Saurida* spp., *Nemipterus* spp., *Leiognathus* spp. and *Platycephalus* spp. were the preferred food items.

It was also noticed that prawns occupied 4th and 7th rank in the menu of juveniles and adults respectively.

Cannibalism

Cannibalism has been observed in *S.undosquamis* with both the adults and juveniles showing a preference for their youngones with smaller lizard fishes occupying 3rd rank in their menu.

According to earlier observations, *S.undosquamis* is mainly piscivorous with high feeding intensity noticed in mature fish (Kuthalingam,1959; Okado and Kyushin, 1955; Tiews *et al.*, 1972; Rao,1984). Hayashi *et al.*, (1960) have noticed higher feeding index values during the morning and evening hours in *S.undosquamis* in Japanese waters. Rao (1984) has opined that in lizard fishes in general, the size of the prey increased with the size of the predator. In the present study also, it is discernible that *S.undosquamis* preferred smaller and easily digestible food items in the juvenile stage and larger ones in the adult stage with both the groups preferring fishes followed by prawns and squids.

Cannibalism has great adaptive significance by giving improved food supply (Nikolsky, 1980). Laevaster and Larkins (1981) state that pronounced cannibalism can bring about fluctuations in the population by exerting a high predator pressure on the juveniles thus resulting in smaller year classes. In the present study, youngones of *Saurida* spp occupy 3rd rank in the food of juveniles and adults of *S.undosquamis* thereby indicating the significance of cannibalism in the species. However, in order to arrive at concrete conclusions regarding its influence on the lizard fish stock, further studies are required since the periodicity of natural fluctuations of population caused by cannibalism can vary from a few years to more than a few decades (Laevaster and Larkins, 1981).

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