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DECLARATION

"The work described in this thesis was carried out by me under supervision of Prof. J. Jinadasa, Department of Zoology, University of Sri Jayewardenepura, Nugegoda, Sri Lanka. A report on this has not been submitted in whole or in part to any University for another degree/Diploma".

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W.A.C.Manorie

"I certify that the above statement made by the candidate is true and that this thesis is suitable for submission to the University for the purpose of evaluation"

15.07.05
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Date.

Srinivasa
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Coordinator.

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Supervisor.
7/15/05

MATURITY CONDITION OF FRINGE SCALE SARDINE - *Sardinella fimbriata*, CAUGHT IN THE GILL-NET FISHERY AT A COASTAL STRETCH EXTENDING FROM MIRISSA TO GANDARA IN THE MATARA DISTRICT.

By

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ABSTRACT

This is a preliminary analysis of the small mesh gill net fishery in the southern cost extending from Ganara to Mirissa in the Matara district during the period June- September 2003, and June- September 2004. The main objectives of the present study was to find out whether fish caught in the gill nets operated are mature and what percentage of fish is mature, find out the damage caused by immature fish caught, and optimum period at which the fishery should be operated and the optimum mesh size of the gill nets to be used in the fishery in the southern coast extending from Gandara to Mirissa. .

In this study eight gill-net were considered. Ten samples were collected from one known gill net, and each sample consisted of nearly fifty fish. In the laboratory, standard length, weight of ovary, and egg diameter were measured. The length frequency analysis of *S. fimbriata* showed that the fish less than 10 cm entered the fishery during the beginning of the fishing season. The sex ratio of *S. fimbriata* is determined by the present study has shown that the females are dominant in all the net samples. The overall sex ratio of male to female, in the population according to the current study was 1:1.5 showing dominance condition.

It was found that there was no statistical difference among the different mesh sizes used by the fisherman.

When consider the management of Sardinella sp., the mesh size of the gill net play a prominent role. The selectivity of the gill net is such that the proportion of fish retained in a maximum at some optimum size, and falls off for fish bigger or smaller than this optimum. According to the present results.

The result indicated that the size of fish caught in the net varied from 10 cm to13.5 cm. Gonosomatic index of the fish varies from 1.236 to 4.63. Egg diameter varies 0.68 mm to 1.02 mm. The GSI of the mature fish is 9.00. The standard length of mature fish is 11.4 cm. The optimum mesh size is range from 3.26 cm to 3.40 cm.

CHAPTER ONE

INTRODUCTION

Small pelagic fish species provided an important source of animal protein in many developing countries. In Sri Lanka around 45% of the total marine fish production consists of small pelagic varieties (Anon, 1984) Prior to mechanization of the fishing industry in early 1960's the production of small pelagic fish was mainly by beach seines (Canagaratnam and Medcof, 1956; Canagaratnam, 1965; Weerakoon, 1965) During that period the small meshed gill-nets were operated by traditional non mechanized wooden crafts and the contribution to the total marine fish production by this gear was significant. Since the mechanization of the fishing industry, there was a steady increase in the production of small pelagic fish species by gill-nets. The percentage contributed by beach seines could have declined over the years mainly due to the low efficiency of the beach seines compared to the small meshed gill-nets.

A study by Karunasinghe and Fonseka (1985) indicated that mechanized crafts have produced a catch rate two times greater than that of the non-mechanized crafts using the small meshed gill-nets in the south west and far south regions of Sri Lanka during 1983/84 periods.

Small pelagic fish species form an important part of animal protein requirement of Sri Lankans, with a per capita consumption of 18.0 Kg per year. They constitute over 40% of the marine fish production of the country. Around 90% of these fish are caught by small meshed gill nets, while beach seines contributing around 8%. (Karunasinghe, 1990)

Fringe scale sardine is a fast growing species and therefore a high level of natural mortality could be expected. A study on the stock status of the sardine, *Amblygaster sirm* which is the main species caught in these gill-nets have also had indicated signs of over- fishing. (Karunasinghe, 1990).

The acoustic studies carried out around the coastal waters of Sri Lanka, estimated a total pelagic biomass of about 200000 ton (Anon ,1981). The small pelagic fish biomass as given by the R/V Fridtiot Nansen survey for the area from Negombo to Galle was 25000 MT. (Blindheim and Foyn 1980). The production from the beach seine in this area estimated using the observations made during 1984 was 2500 MT. The maximum potential yield estimated from biomass figures for the area from Negombo to Galle was 20130 MT as against the present annual production of 15260 MT in this area (12760 MT from gill-nets, 2500 MT from beach seines). If the biomass estimate is correct, then there is a surplus small pelagic yield of about 4870 MT. (Around 23% from the potential yield) in this area. The catch of small pelagic species (mostly in gill-nets and beach seines) in Sri Lanka during the year 1979 was around 70000 MT (Anon, 1980). The small mesh gill-nets contributed to the bulk of this production and latest available production data from the beach seine fishery indicated that it is around 10000 MT per year (Karunasinghe & Fonseka, 1995)

According to the fisheries yearbook of 1998, the coastal fish production in Sri Lanka reached the highest level in 1994, but it declined in 1995 and 1996. In the year of 1997 and 1998 it increased by 2.3% and 9.1% respectively. (NARA1999) At present Negombo, Puttalam & Chilaw are the most important coastal fish production areas.

In Negombo 25700 tons (coastal sector) were produced in 1998 (Statistical unit, plan & Moni. Div. Ministry of Fish & Aqa. Res. Dev. 1999). Specified data regarding with *Sardinella fimbriata* has not mentioned here.

According to Karunasinghe & Fonseka, in 1985, the catch per unit effort (CPUE) for west and northwest coastal areas were higher than that of any other area, due to the relatively high productivity in the shelf region that extends over larger areas.

In Sri Lanka, sardine and anchovies represent the clupeids, which contribute to a major part of the marine fish production. There are nine species of sardines in the Indian waters. *S. longiceps* (cuv & val) *S. fimbriata* (Valenciennes,) *S. gibbosa* (Bleeker) and *S. albella* (cuv & val) are some of them (Nair, 1959.). This study was focused on the S. *fimbriata* (Valenciennes, 1847).

Table 1.1, Vernacular names used for S*ardinella fimbriata* (Valenciennes, 1847)

Vernacular names	Country	Language
Fringe scale sardine	USA	English
Gal salaya	Sri Lanka	Sinhalese
Umma	Qatar	Arabic
Choodai	Sri Lanka	Tamil
Choodai	India	Tamil
Charree addee	India	Hindi

S. fimbriata belongs to family Clupeidae. First fossil record is in lower Eocene. (Gaudant, 1991). Maximum sizes of *Sardinella fimbriata* vary from place to place, according to Whitehead, (1985) maximum size (the standard length) of *S. fimbriata* is 13.0 cm.

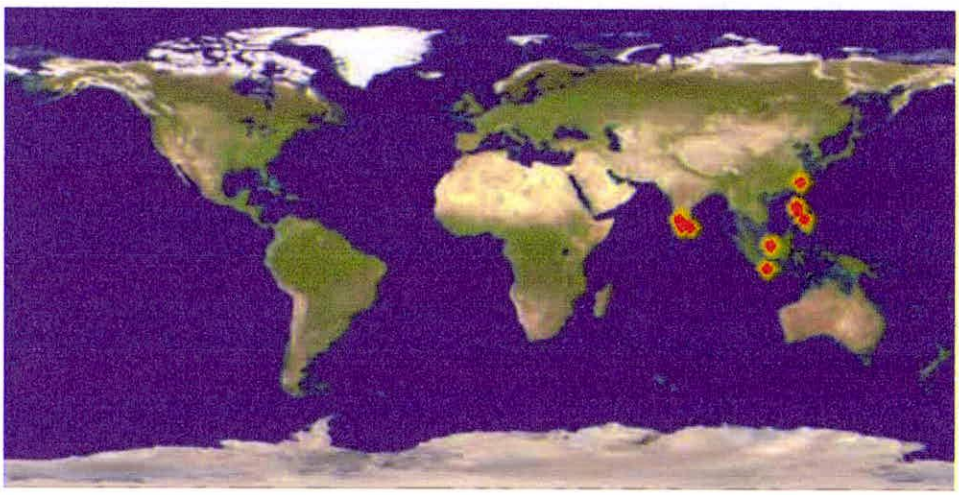

Fig.1.1.Distribution of *Sardinella fimbriata* (Valenciennes, 1847)

Their living environment is pelagic; brackish; marine water. Depth is less than 5 m. Tropical climate; 23°N-12°S. Resilience is high. Minimum population doubling time is less than 15 months (K=0.7-1.6; t_{max}=3). Distribution of *S. fimbriata* is limited only to narrow area, i.e., Indo-West Pacific: southern India and Bay of Bengal to the Philippines, also eastern tip of Papua New Guinea. Often it is confused with *S. gibbosa* in Indian waters. *S. fimbriata* form schools in coastal waters. Misidentifications (especially with *S. gibbosa* in Indian waters and *S. albella* in the western Indian Ocean) make published biological data potentially unreliable. *S. fimbriata* is important as a commercial fish and is marketed fresh, dried-salted, boiled or as fish balls. (Whitehead, 1985)

Morphology, Dorsal spines (total): 0; Dorsal soft rays (total): 13-21; Anal spines: 0; Anal soft rays: 12-23. Body somewhat compressed but variable; total number of scutes 29 to 33. Vertical striae on scales not meeting at center, hind part of scales with a few perforations and (in Indian Ocean specimens) somewhat produced posterior. A dark spot is at dorsal fin origin.

S. fimbriata is not in International Union for the Conservation of Nature (IUCN) Red List. According to Jeyaseelan, (1998) food items of both of juveniles and adults *S. fimbriata* are plants and phytoplankton. Adults also predate on zooplanktons. (Whitehead, 1985). The food items of *Sadinella* sp. are available along the west coast of India. Jone (1939), Chacko (1956), and Chacko &Mathew (1956), have also analyzed the food items of *Sadinella sp.*, According to them, Sardine is a pure plankton feeder and *Concinodiscus* and *Fragillaria* are constant items in their stomach contents. Among the zooplanktonic organisms, copepods like *Paracalanus, Acartia, Oithona, Corycaeus* and *Euterpina* are seen in good quantities. Fish eggs and S*agitta* formed frequent items of the diet of the fish. Blue green alga, *Trichodesmium* is also found in fair quantities in the diet during the summer months. Devanesan& Chidambaram (1948) observed that the sardines feed mainly on *Lucifer, Sagitta*, crab larvae and *Trichodesmium.* The food and feeding habits of sardine on Madras coast have been studied by Vijayaraghavan (1953). According to him sardines feed on small crustaceans (copepods) belonging to the genera *Euterpina, Oithona, Pseudodiaptomus* and *Acartia.* According to Rao (1976) percentage composition of dominant food components differ with the size of *S. fimbriata* (Valenciennes). Fish measuring less than 50 mm fed mainly on diatoms such as *Coscinodiscus sp.* Fish of 51-100 mm group also fed on diatoms particularly during the period November-December. During the other months

diatoms particularly during the period November-December. During the other months they feed on copepods, larvae of bivalves and gastropods. *S. fimbriata of* the size class 101-150 mm, preferred copepods as food; the other items were larval forms of bivalves and gastropods, mysids, megalopa and alima larvae. Similar components could also be seen in the stomach of fish of 151-200 mm size group.

Copepods were also very common, in the diet forming more than 50% almost in all the samples. *Eucalanus, Calanus Paracalunus, Macrosetella, Acartia, Microsetella, Temora, Oithona, Centropages, Oncaea, Pseudodiaptomus* and *Corycaeus* were the important copepods genera encountered. Larval forms of bivalves and gastropods were also commonly found in the majority of stomachs. Other items like mysids, megalopa lavae, alima larvae, amphipods and prawn larvae contributed to lesser extent.

Classification of *S. fimbriata* is as follows.

Class- Teleostomi

Sub class- Actinopterygii

Order- Clupeoidei

Family- Clupeidae

Species- *Sadinella fimbriata,*

Fringe scale sardine