

**Maturity status and some reproductive aspects of**  
***Chirocentrus nudus* (Swainson:1839)**  
**caught in Negombo and Chilaw**

**By**


**Dewathage Gayani Thanuja Thilakarathne.**

Thesis submitted to the University of Sri Jayewardenepura for the partial fulfillment of the degree of Master of Science in Fisheries and Aquatic Resource Management.

## Memorandum

The work described in this thesis was carried out by me at the Department of Zoology, University of Sri Jayewardenepura, Nugegoda, Sri Lanka, under the supervision of Prof. J.Jinadasa, and the report on this has not been submitted to any University for another degree.

Date: 30 - 09 - 2009

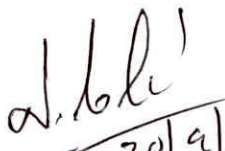
  
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D.G.T. Thilakarathne.

## Certification

We certify that the work of D.G.T. Thilakarathne on ' Maturity status and some reproductive aspects of *Chirocentrus nudus* (Swainson) caught in Negombo and Chilaw' for the degree of M.Sc. in the Faculty of Science at University of Sri Jayewardenepura.

We feel that the candidate's work is complete and suitable for submitting to the University for the purpose of evaluation.

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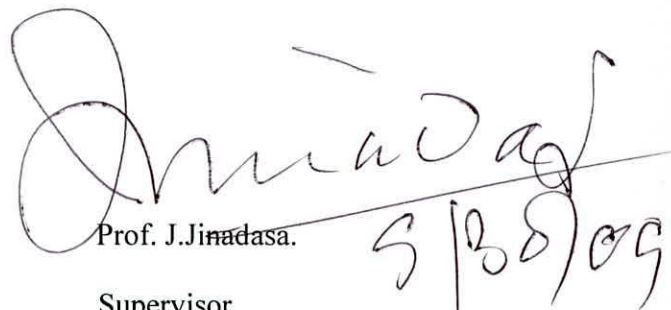
  
30/9/09

Dr. Nissanka De Silva.

Course Co-ordinator

Department of Zoology

University of Sri Jayewardenepura

  
5/10/09

Prof. J. Jinadasa.

Supervisor

Department of Zoology

University of Sri Jayewardenepura

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## **List of Abbreviations**

FAO	Food and Agriculture Organization
FRP	Fiber Reinforced Plastic
GSI	Gonado Somatic Index
ICES	International Council for the Exploration of the Sea

## **Acknowledgements**

I wish to express my sincere gratitude to the supervisor of my project Prof. J.Jinadasa, Department of Zoology, University of Sri Jayewardenepura, for his valuable guidance, in completing the project. Also, I specially thank to Dr. Nissanka De Silva, Head, Senior lecturer, Department of Zoology and course co-ordinator, for his encouragement and help during the course of study and the project.

Also, I would like to express my gratitude to Dr. K. Ranathunga, lecturer, Department of Zoology, for his helpful attention and Mr. P. Dias, lecturer, Department of Computer and Statistics, for his valuable help in analyzing data.

Specially I would like to thank my brother, for his valuable help in analyzing and creation of computer graphs.

I also would like to thank Mr. K. S. Wijenayake and Ms. W.D. Lakmali, Technical Officers of the Department of Zoology for their co-operation in this task.

Also my gratitude should go to all the members of my family, for their encouragement to do graduate studies, which makes this a success.

I also would like to thank all the staff members of my work place, District Fisheries Office, Mahawewa, for their valuable help in field works.

I also wish to express my heartiest thanks and gratitude to all the staff members of the Department of Zoology, University of Sri Jayewardenepura, who helped me endeavor in various manners.



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**ABSTRACT**

The present study is a preliminary study of reproductive biology of white fin wolf herring (*Chirocentrus nudus*). Wolf herrings were collected from commercial fish catches at Negombo and Chilaw landing sites from March 2008 to February 2009. Reproductive and maturity details were obtained from samples taken from commercial catches at the study areas.

Size of the fish in the commercial catch varies from 22.5cm to 55.5cm. The minimum size at first maturity is 45.2 cm standard length, according to the gonado somatic indices and ova diameter measurements. The sex ratio of this species is 1:1.26 (males: females) showing that the females dominate the population. They are multiple spawners and spawning season is April to August, and July is the peak spawning period. It was found that 26% females were mature and 74% females were immature in the commercial catch in Negombo and Chilaw showing that the wolf herring fishery is unsustainable.

# CHAPTER I

## INTRODUCTION

Both in numbers and economic value the fishes belonging to the family Clupeidae rank first among the food fishes of the world. They are represented in all temperate and tropical seas and often form large shoals swimming on the surface and performing long migratory journeys. Among the commercial food fishes of the world the clupeoid fishes (Class: Actinopterygii, Order: Clupeiformes) are very important and form the mainstay of the economy of most of the maritime nations (Chan, 1965). The wolf herring fishery along the west coasts of the India is constituted chiefly of *C. dorab*, probably the only clupeid fish growing to a size of nearly 100cm. In spite of its importance as a marine fishery resource, very little attention seems to have been paid towards a detailed study of this fish except of preliminary accounts (Prabhu, 1953). In Sri Lanka, the clupeoids, which contribute to a major part of the marine fish production, are chiefly represented by herrings, sardines and anchovies. However, wolf herrings also form an important part of commercial fishery.

*Chirocentrus nudus* (Swainson: 1839) has several vernacular names (FAO). In English it is known as White fin wolf herring, in Sinhala; Gal katuwalla and in Sri Lankan Tamil it is Kat karuvallai.

The wolf herrings belong to family (Chirocentridae) with two marine species of ray finned fish related to herrings. Both species have very elongate, highly compressed bodies,

resembling the Clupeidae, but without scutes along the belly. Both jaws have long, large and sharp canine teeth that facilitate their ravenous appetites, mostly for other fish. Both species reach a length of 100cm. They have silvery sides and bluish green back. No spiny rays in fins. A single dorsal fin set well behind mid point of body, pectoral fins set low on body, pelvic fins about equidistant between pectoral base and anal origin, anal fin origins below anterior dorsal fin base, caudal fin deeply forked (Ficher, 1984). The above two species appear to be diurnal carnivorous, voracious predators, preying mostly on fishes, depending for predation perhaps on vision. They seem to ingest the prey as a whole, swallowing its head first. When young, they feed mainly on the post larvae and juveniles of *Sardinella*, but as adults they change over to adult sardines and other Clupeoids (Luther, 1985). Though, both species belong to the same trophic level, *Chirocentrus nudus* seems to avoid competition by feeding on relatively larger sized prey, which they are able to do with the help of their larger mouth and strong teeth (Luther, 1985). This species is also known to eat crabs (Ficher, 1984).



Figure 1: An image of *Chirocentrus nudus*



The Dorab wolf herring is found in warm coastal waters from the Red sea to the largest of these islands are, from north to south, Hokkaido, Honshu and Australia. The white fin wolf herring is found in a similar range, and is difficult to distinguish from *Chirocentrus dorab*.

Distinctive characters of *C. dorab* are body very elongate and laterally compressed, belly sharp, but without scutes. Head strongly compressed. Two fangs like canines pointing forward in upper jaw, a series of canine teeth in lower jaw. Dorsal fin set far back on body and has a black mark on it (Ficher, 1984). Pectoral fin shorter than distance between eye centre and hind boader of gill cover (George, 1995). Anal fin is origins before the dorsal fin origin (Ficher, 1984). Colour is back bright blue, flanks silver and upper part of dorsal fin black. Inner face of pectoral fin is black at base, and some black on anterior part of anal fin (George, 1995). Habitat is pelagic and neritic in coastal waters from the shore to about 120m depth (Ficher, 1984). Live shallow inshore over mud and substratum (George, 1995). Maximum size is 100m and common 40-60cm.

Distinctive characters of *C. nudus* are body very elongate, strongly compressed, belly sharp but without scutes. Head strongly compressed. Two fangs like canines pointing forward in upper jaw, a series of canine teeth in lower jaw. Dorsal fin set far back on body and fins are hyaline and caudal fin is yellowish (Ficher, 1984). Pectoral fin longer than distance between eye centre and hind border of gill cover (George, 1995). Anal fin origin usually a little behind dorsal fin origin. Colour is back bright blue, flanks silver and dorsal fin clear but frequently damaged. Inner face of pectoral fin is black and no black on anterior part of anal fin. Habitat is pelagic and neritic in coastal waters from the shore to

about 150m depth. Live shallow, inshore over mud and common 60cm in standard length (Ficher, 1984). These two species used as bait for large scombroides in trolling, trolling line, and hand line (George, 1995). This species is widely caught by gill net, beach seine, drift net, and trawling (Ficher, 1984). Individuals in the larger size groups are caught in gill nets where as smaller as well as bigger ones are caught in shore seines. All most all the individuals caught from gill nets are either in mature or post mature gonads (Prabhu, 1953).

Studies on size frequency distribution made for wolf herrings have shown that, the white fin wolf herring fishery is constituted of individuals from 1-4 year classes. The average sizes attained by the first to fourth year class fishes were calculated to be 28, 44, 62, 78cm respectively. That observations indicated the first year class individuals ranging in size up to 22cm remain in offshore waters until the end of first year or the beginning of the second year of their life and that they do not make a significant contribution to the wolf herring fishery (Prabhu, 1953).

Regular examinations of gonads of *C. dorab* from different size groups indicates that this species attains sexual maturity when about 50cm long, during the third year of life or at the completion of two years and that the mature individuals spawn during July – August. A statistical study of the measurements of the intra ovarian eggs shows that spawning is restricted to a short and definite period, as the mature stock of ova are sharply differentiated from the immature. They migrate away from inshore areas to spawn (Prabhu, 1953). According to the Roy (1972), they migrate from offshore waters to the coastal areas in search of foods in the immature stage. Also he stated that, prior to the development of intra

ovarian eggs and spawning, this species migrates back to the offshore waters. However, biology, specially reproduction and maturity of *C. nudus* are almost unknown.

Therefore, objective of this project is to study the size of fish caught commercially, maturity stages, spawning season, mature size, and percentage of mature fish in the commercial catch using standard techniques. Results obtained on size, maturity and reproduction are essential for the assessment and management of fish stocks, and hope the information given by this study on *C. nudus* on the above aspects may help in that direction.

Fish production associated with coastal fishery plays an important role in developing countries in many ways. It provides animal protein source for less income groups while fishing industry provides direct or indirect employments. Marine coastal fish species form an important part of animal protein requirements of Sri Lankans. They constitute over 40% of the marine fish production of the country (Karunasinghe, 1998).

There had been a gradual decline in the landing of almost all the important commercial fisheries, including the herring fishery, indicating the likelihood of over fishing and this is attributing to the intensive fishing at present, without proper management strategies and under the open access nature of the countries fishery. According to Dayaratne (1985), the seasonal variation in catch rates of these herrings could probably be due to some reproductive behavior. Therefore, it is important to study the reproductive biology of this

species in detail. Age at maturity and spawning period is to be most useful from fisheries point of view.

It was assumed that data collected from these landing sites is representative of the population of *Chirocentrus nudus* in Negombo and Chilaw coastal area.