GENERAL INTRODUCTION
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The whitebait anchovies of the genera *Stolephorus* Lacepede, 1803 and *Encrasicholina* Fowler, 1938 belonging to the family Engraulidae are small sized clupeoid fishes widely distributed in the tropical and sub-tropical regions of the Indo-Pacific. An analysis of the marine fin fish landings in Kerala during the period 1985 - 1993 (C.M.F.R.I., 1995) showed that whitebait anchovies formed more than 90% of the total anchovy catch and therefore the present investigation is confined exclusively to the whitebait anchovy resources of the state. In India whitebaits with a mean annual landings of about 72,000 tonnes for 1991-95 support a lucrative fishery, with the southern maritime states of Kerala, Karnataka, Tamilnadu and Andhra Pradesh contributing the major share of the catch. Kerala with a coastline of 650 km contributes to an average of about 50% of the all India anchovies catch. The Pelagic Fishery Project surveys have pointed out the existence of a large resource of whitebaits in the sea fairly close to the shore between Ratnagiri and Tuticorin (Menon and George, 1975). The seasonal whitebait resource which has been estimated as ranging from 0.23 to 0.52 million tonnes is only marginally exploited at present.

Till recently most of the publications on the whitebaits of the Indo-Pacific area have been mainly on systematic studies. Various species of the family Engraulididae have been described by earlier workers from different localities with remarks on their commercial importance and general characteristics. To mention some of the works from India - Venkataraman (1960) dealt with the food and feeding habits of *Anchoviella tri* and *A. heterolobus*; Rao (1967) studied
the diurnal variations in the nature of the feed of *A. heterolobus* and *A. insularis* and Rabindranath (1966) studied the food of *A. commersoni*. Later Luther (1979) studied the food of *Encrasicholina devisi* and *S. waitei*. Rao (1988 a and 1988 b) gave an account of the food of *E. devisi* and *Stolephorus waitei*. Thangavelu et al. (1987) and Gopakumar et al. (1995) also made some brief studies on the food and feeding of some species of whitebaits.

Prabhu (1956) and Dharmambha (1959) also gave details of the spawning habits of *A. commersoni* and *A. heterolobus* based on ova diameter measurements. Intraovarian eggs of whitebaits have been described by George (1958). Luther (1979), Rao (1988a, 1988b), Puthran (1990) and Luther et al. (1992a) gave brief accounts of the breeding habits of some species of whitebaits such as *Encrasicholina devisi*, *Stolephorus waitei* and *S. insularis*. Pelagic *Stolephorus* egg collected from the plankton of the inshore waters have been described by Gopinath (1946), Devanesan and Varadarajan (1942), John (1951), Varadarajan (1953), Nair (1952) and Vijayaraghavan (1957). Bensam (1971) has given a provisional key for the identification of the eggs and early larval stages of some species of whitebait anchovies. Some aspects on the age and growth of whitebait anchovies have been given by Rao (1988 a, 1988 b), Puthran (1990) and Luther et al. (1992 b).

Among the important studies on the resource characteristics of the whitebait anchovies resources from outside India mention may be made of the works of Delsman (1931) on the eggs and larvae of the genus *Stolephorus* sp. from Java sea, Hardenberg (1934) on some aspects of the breeding of the genus

However most of the investigations mentioned above on whitebait anchovies from the Indian Exclusive Economic Zone are limited mainly to one or other aspects of biology such as food and feeding habits, spawning season or description of eggs, larvae and early development. More over doubts have been cast on the true identity of many of the species of whitebaits from the Indo-Pacific on which biological and other details have been collected. Hence it was felt desirable to undertake a detailed investigation on the systematics, fishery, biology and population dynamics of the anchovies of the Kerala coast which is grossly underexploited at present. The data collected on these lines will help in making a total assessment of the stocks and related aspects of the whitebait anchovies of Kerala State and the results and interpretation facilitate the Government to evolve suitable strategies for effective and rational management of this resource.

The study is based mainly on samples of fish collected from small mechanised trawlers, purse seiners and artisanal gears such as ring seine (thangu vala) at Fish Landing Centres at Cochin and nearby areas. The main
centres at which samples have been collected are Cochin Fisheries Harbour and Fort Cochin. The work deals in detail with the biology and fishery of *Encrasicholina devisi* (Whitley) and *Stolephorus waitei* Jordan and Seale, which together contribute to the major share of the whitebait anchovy landings in Kerala. Investigations were also carried out on *E. punctifer* Fowler which has been found to constitute a significant portion of the whitebait production during certain seasons. In addition to the observations on the fishery and biology of these fishes it was also felt necessary to study the systematics of this group mainly with reference to the major species occurring in the study area. The present account is dealt under four major chapters, viz., Systematics, Biology, Fishery and Population Dynamics.

**Chapter I** deals with the observations on the major species contributing to the whitebait anchovy production along the Kerala coast with details of generic diagnoses, synonymies and distribution. A key for the identification is included. Details of the range of variation of selected morphometric and meristic characters are given.

**Chapter II** incorporates all the biological information collected during this period which include observations on the food and feeding habits, length-weight relationship and condition factor, spawning, fecundity, size at first maturity, sex ratio and age and growth.

**Chapter III** presents the observations made by the author on the effort, catch and species composition of the whitebait anchovies by the small commercial trawlers and the artisanal fishing gears at Cochin and nearby fish landing centres.
It also includes details of the total marine fish production in India and Kerala along with the total catch of whitebaits and their percentage in total catch from 1976 to 1995 (published by CMFRI).

*Chapter IV* on population dynamics incorporates the studies on vital parameters like natural mortality, fishing mortality, standing stock, maximum sustainable yield etc. of the major component species. This will facilitate in evolving suitable regulatory measures for the rational and sustainable management of the resource and help the industry to suitably deploy effort inputs for better exploitation.

Relevant references pertaining to the systematics, biology, fishery and *population dynamics* have been given at the end.