PREFACE

Molluscs comprise of a heterogeneous group of animals of great diversity. The group includes less familiar coat-of-mail shell, Amphineura; familiar forms like spirally twisted, single shelled, gastropods; two valved, bivalves; curious cephalopods (squids, cuttle fishes, octopuses) and the elephant tusk shells, scaphopods. Molluscs inhabit different ecosystems such as land, fresh water bodies, backwater and estuarine areas, mangroves, intertidal regions, littoral down to deep waters in the marine region. According to Subba Rao (1991), the number of molluscan species recorded from different regions of the world is between 80,000 and 100,000. From India, a total of 3271 species, formed of 1900 gastropods, 1110 bivalves, 210 cephalopods, 41 polyplacophores and 20 scaphopods have so far been recorded (Appukkuttan, 1996).

Imprinted in the Indian mythology and legend, in folklore, in social customs and traditions, in trade and handicrafts, as currency and medicine, the molluscan resources of India have been traditionally exploited along the coastal belt for food, export, shell-industry, shell-crafts and ornamental purposes from ancient times. However, organized fishery has been limited to only a few resources of chanks, pearl oysters and cephalopods, the exploitation of other gastropods and bivalves being remaining, by and large,
at sustenance level. At present, exploited molluscan resources contribute to only 4-5% of the total fish landings of India as against about 8-9 million tonnes (13%) of world molluscan production.

The bivalves belonging to Class Lamellibranchiata or Pelecypoda or Bivalvia of the Phylum Mollusca, are the widely distributed and better known among the various classes of shelled mollusces and comprise of a large group of specialised and laterally compressed forms. The Class includes oysters, mussels, clams, cockles and certain less familiar species groups. India has extensive bivalve resources in the coastal and estuarine waters and are utilised as food or a source of lime or for cement or for decorative shell-craft articles. In recent years, they form a delicacy and luxury food item in Japan, USA and Western Europe.

Among the exploited bivalve resource of India, clams occupy top position with an annual production of 50,000 tonnes. Kerala ranks foremost accounting for about 72% of clam landings (Narasimham, 1993), the Vembanad and Ashtamudi lake regions contributing to the bulk of the landings.

Several species of clams belonging to the families Arcidae, Venuridae, Corbiculidae, Tridacnidae, Solenidae, Mesodesmatidae, Tellinidae and Donacidae are exploited along the Indian coast. While the species such as
Meretrix casta, M. meretrix, Katelysia opima and Villorita cyprinoides are the major ones exploited from India, Anadara granosa, Paphia malabarica. P. laterisulca, Gafriarium tumidum, Mesodesma glabratum, Tellina sp., Donax faba, D. cuneatus, D. incarnatus, Mactra voilacea, Tridacna maxima, T. crocea and T. squamosa are the other important clams supporting the fishery. Among these, the wedge clam, D. incarnatus is fished in significant quantities in the Malippuram region in Vypeen Island, near Kochi, central Kerala.

With the increasing demand for animal protein food to meet the food requirement of burgeoning human population, and in the context of decline in the land area for agriculture, the urgent need of appropriate strategies to enhance the exploitation, production and utilization of fish and shellfish resources through capture and culture means from different water bodies is emphasized. In this scenario, organized exploitation of molluscan resources is receiving greater attention. Although, the exploited molluscan resources of India, in general, are able to withstand the fishing pressure because of their high fecundity, reproductive capacities and greater larval production, the natural fluctuation in abundance, pollution and environmental hazards and indiscriminate fishing would adversely affect the stocks. A comprehensive knowledge on the biology, population characteristics, and the biotic and
abiotic factors influencing the resource has, therefore, become essential not only for sustained exploitation but also for formulating rational managerial measures to maintain a healthy stock position. Although several aspects of the biology and ecology of commercially important species of *Donax* supporting the fishery along certain regions of the Indian coast have been studied, a perusal of the literature reveals that no detailed information on the biology of *D. incarnatus* exploited from the Central Kerala coast is available. As this species contributes at present to a significant seasonal fishery along the Malippuram coast, and has great potential to improve the fishery through culture and sea ranching, it was selected for investigation on certain aspects of its biology and ecology. The results of these investigations are embodied in this thesis complex.

The thesis is presented in five Chapters following a Preface and General Introduction.

The first chapter describes the characteristics of the species and its environment. The distribution of the species in the study area is presented in relation to the environmental factors.

The second chapter deals with the age and growth of *D. incarnatus*. The growth rate of the species is compared with that recorded for the species in other areas and the variation discussed.
The third chapter presents the results of the studies on the reproductive cycle of the species on the basis of detailed microscopic and histological observations of gonads. The different maturity stages are described. The spawning season and the peak breeding period of the species are determined.

The biochemical composition of *D. incarnatus* is given in the fourth chapter. Variations in different organic constituents such as protein, glycogen and lipid are correlated with the reproductive cycle of the species.

The results of observations on salinity tolerance of the species and filtration rate in different test salinities are presented in the fifth chapter.

The salient findings of the present study are discussed in the light of the earlier works and gaps in the knowledge pointed out in the general discussion.

It may be mentioned that the results of these investigations have considerably enhanced the existing knowledge on the biology and distribution/availability pattern of *D. incarnatus* in the Malippuram region. The species occurs in good concentration during October - March/April, and disappears from the area during late premonsoon and monsoon months. Recolonising the area in September, it grows fast in the subsequent months. The life span of the species is estimated to be about an year. Studies on the reproductive biology
of the species have revealed that there are two spawning peaks, the major peak in February - March and minor peak, in December. The salinity regime of the area influences the reproductive activity. These observations form the original contribution in the thesis. The information on variation in water content, protein, glycogen and lipid levels in relation to reproductive cycle has helped to a better understanding of the gametogenic activity and spawning of the species. Similarly, the findings on salinity tolerance and filtration rate have shown that small sized clams exhibit greater tolerance range than larger clams, and grow at a faster rate with active metabolism. It is hoped that these information would considerably add to the present knowledge of the basic facts which are relevant to the improvement and management of the clam fishery of this region.