1. INTRODUCTION

1.1 Estuary

Most brooks and creeks find their way to major rivers, and these in turn wind their way to sea. At and near the mouth of the lower stream course where sea and river meet, a special and distinctive environment prevails. This ecotone, called the estuary is a buffer zone between freshwater of the stream and salt water of the sea (Reid, 1961). While the physical conditions in estuaries are often stressful, and the species diversity correspondingly low, the food conditions are so favourable that the region is packed with life. Typically, estuarine communities are composed of a mixture of endemic species and those which come in from the sea, plus a very few species with the osmoregulatory capabilities for penetrating to or from the freshwater environment. Most commercial species of oysters and crabs are primarily estuarine, while several kinds of commercially important shrimp live and spawn as adults offshore and come into the estuaries as larvae. It is quite common, in fact, for coastal nekton to use estuaries as nursery grounds, where young growth stages can take advantage of the protection and abundant food. Since man often harvests such species offshore, the vital life history and energetic connections with the nearby estuary have not always been appreciated.

Estuaries as a class of habitats rank along with tropical rain forests and coral reefs as naturally productive ecosystems. Characteristically, estuaries tend to be more productive than either the sea on one side or the freshwater drainage on the other. An estuary is a nutrient trap that is partly physical and partly biological. Estuaries benefit from a diversity of producer types "programmed" for virtually year around
photosynthesis. The back and forth movement of water does a great deal of work, removing wastes and transporting food and nutrients. The potential high productivity of estuaries has often not been appreciated by man, who has frequently classed them as "worthless" areas suitable only for the dumping of waste materials or useful only if drained or filled and converted to terrestrial use (Odum, 1971).

Ecological studies, faunistic surveys and physiological investigations pertaining to brackish waters is not a new field in biological sciences. In India, studies began as early as 1915 by Annandale and Kemp, when they made one of their best-known surveys of the fauna of Chilka Lake. The results of the study of the brackish water fauna of Madras by Panikkar and Aiyar were published in 1937. This was in the nature of an intensive study of a small area at Adyar on the composition of the brackish water fauna, the dominant elements of that fauna and the possible adaptational mechanisms at work. In 1959, Rao and George worked on the hydrology of Korapuzha estuary of Kerala. Chacko and Rajagopal (1962) and Evangeline and Subbiah (1969) studied the hydrobiology and fishery of Ennore estuary near Madras. The physico-chemical features of the outer channel of the Chilka Lake were studied by Mohanty (1975) and that of Pulicat Lake in the east coast of India by Rao and Rao (1975). In the same year, the hydrobiological survey of the estuaries in Ramanathapuram was done by Evangeline. In 1983, Raghunathan and Srinivasan made a detailed study of the hydrographic features of the Ennore estuary.
1.2 Plankton

In the aquatic food chain, plankton are an essential link. The term plankton is applied to those animals and plants which live freely in the water and which because of their limited powers of locomotion are more or less passively drifted by water currents (Newell and Newell, 1963). It is well known that phytoplankton includes the free floating and drifting plants, the more abundant and important microscopic diatoms, dinoflagellates, some bluegreen algae, many groups of smaller photosynthetic flagellates, coccolithophores and photosynthetic bacteria. Zooplankton includes all animals which unable to swim effectively against the horizontal currents. The most abundant members of the zooplankton are the herbivorous crustacean copepods, the omnivorous crustacean euphausiids, and the carnivorous chaetognaths. Other animal groups such as the Foraminifera, Tunicata, Amphipoda, Mollusca, Coelenterata, Ctenophora, Pteropoda, and Radiolaria may sporadically become locally dominant. Meroplankton or temporary plankton composed of the eggs and larval stages of benthic and nektonic organisms usually forms large part of the zooplankton (Bieri, 1969).

In India, contributions to the study of estuarine plankton came from many workers. In 1954, Dutta et al. studied the plankton of Hooghly estuary and worked on the seasonal fluctuations. In 1958, George made observations to study the composition of zooplankton of Cochin backwaters for the first time. In 1962, Chacko and Rajagopal made the pioneering attempt on the qualitative study of the plankton of Ennore estuary. Chandramohan (1963) made studies on the zooplankton of Godavari estuary. In 1969, Evangeline and Subbiah published a few reports depicting the
amplitude of seasonal changes of zooplankton of Ennore estuary. Menon et al. (1971) studied the total biomass and composition of zooplankton of Cochin backwaters. Goswami and Singhal (1974) studied the plankton communities of Mandovi and Zuari estuaries during monsoon and related the hydrographic conditions. Rao et al. (1975) studied the annual variations in zooplankton abundance and distribution in the backwaters from Cochin to Alleppey. Madhupratap (1976) studied the ecology of the zooplankton of Cochin backwaters. In 1977, Srinivasan and Raghunathan quantitatively studied the zooplankton of Ennore estuary. In 1978, they studied the seasonal periodicity and the impact of dredging on the zooplankton of that estuary. In 1981, they reported their observations on the zooplankton at Adyar estuary during solar eclipse. In 1983, Raghunathan and Srinivasan published a detailed study on the zooplankton dynamics of Ennore estuary.

1.3 Copepods

One of the most important constituents of plankton is the group Copepoda and it would be difficult to find a sample taken with a net in any aquatic habitat anywhere, which would not contain some representative of this group (Rajendran, 1973). The class Copepoda in the subphylum Crustacea, is the largest of the entomostracan classes. Most authors recognize seven orders of copepods, four of which contain primarily parasitic species (Caligoida, Larvaeodida, Monstrilloida, and Notodelphyoida). The other three orders namely Calanoidea, Cyclopoidea and Harpacticoida are free-living copepods, of which there are over five thousand five hundred species. The calanoids include about 2300 species, the cyclopoids include
about 450 species and harpacticoids include approximately 2800 species (Bowman and Abele, 1982).

Knowledge of estuarine copepods of India has accumulated over a period of 80 years with significant contributions from Sewell (1924) who reported the copepods of Chilka Lake. In 1950, Krishnaswamy studied the copepod larval stages and their fluctuation in the plankton samples of Madras coast. Wallershaus (1969) worked on the taxonomy of planktonic copepods, and Tranter and Abraham (1971) studied the coexistence of copepod species in Cochin backwaters. Contribution of Pillai (1972) on the estuarine copepods is noteworthy. Raghunathan (1981) studied the copepod populations of Ennore estuary and their relationship with the environment.

Copepods frequently comprise a major portion of the consumer biomass in aquatic habitats and play a pivotal role in food webs both as primary and secondary consumers, and as a major source of food for many larger invertebrates and vertebrates (Williamson, 1991). Copepods are used as biological indicators for certain ecosystems (Dussart and Defaye, 1995). They can be used as agents of biological control (Riviere et al., 1987). They are also a source of chitin and chitosan (Jeuniaux and Thome, 1990).

1.3.1 Copepods as live food

Copepods are an excellent food for zooplanktivorous fish (Bulkowski et al., 1985). They are cultivated in marine aquaculture (Kahan et al., 1982) and are offered as live food to fish and shrimp larvae. Live food is superior to compounded feed,
because it is readily ingested (Kinne, 1977), more easily digested (Jirasek et al., 1977), does not affect the water quality (Watanabe et al., 1978) and have essential growth factors. Fish larvae generally grow better on living food than on non-living diets (Uhlig, 1981). Higher rate of survival is obtained in fish larvae with live food than the refrigerated plankton food (Sharma and Chakrabarti, 2000).

It is well known that the availability of live food organisms of appropriate size and in adequate densities is indispensable for rapid growth and high survival for the early larval stages of most fish and crustacean cultures (Nellen, 1985; Katavic, 1986; Khadka and Rao 1986). Apart from this the live food should be of high nutritional value for supporting the growth. Administration of diets having a suitable fatty acid composition is extremely important in order to support growth of early larval stages (New, 1976; Bottino et al., 1980; Martin, 1980; Teshima et al., 1983).

Among the livefood organisms the rotifer (Brachionus plicatilis), brine shrimp (Artemia sp.) and various copepod species are the most commonly used in aquaculture (Gatesoupe and Luquet, 1981; Watanabe et al., 1983; James et al., 1986; Watanabe and Kiron, 1994). Though Brachionus plicatilis and Artemia have been commonly used as prey during the early but critical periods in the life history of fishes and crustaceans, they do not always promote optimal growth. Problems associated with rotifers and brine shrimp include nutritional deficiencies and inappropriate prey size (Howell, 1979; Scott and Middleton, 1979; Kahan, 1981; Leger et al., 1986). Alternative food sources that overcome these inadequacies and promote adequate growth are needed. Specifically, copepods tend to be rich in essential fatty acids, most
notably 22:6ω-3 and 20:5ω-3, that are deficient in some strains of *Artemia* (Leger et al., 1986; Norsker and StØttrup, 1994). As copepods form an important component in the food chain of fish larvae, culture trials aimed at establishing a reliable mass production system were attempted by several workers (Fukusho et al., 1977; Arnott et al., 1986; StØttrup, 2001).

The choice of a copepod species for mass culture depends on the users’ needs. Growth rate, body size, rearing temperature and fecundity of the species as well as the facilities to be used are important considerations for selecting the suitable copepod species for culture (Abu-Rezq et al., 1997). According to Kinne (1977) live food has to satisfy some basic aquaculture demands such as mass production of living food, controlled reproducible nutritional quality and simple low cost management. According to Hagiwara et al. (1995) and Sun and Fleeger (1995), the copepod species for mass culture should possess the following demographic characteristics viz., higher reproductive potential, larger brood size, longer reproductive period, larger population of females, shorter generation time, shorter turnover time (from egg to egg), faster growth rate and higher survival rate. Other important properties include a diet flexible enough to allow growth on a variety of food sources and tolerance of a wide range of physical environmental factors such as temperature and salinity.

For the aquaculture industry, mass rearing of copepods in intensive systems had little appeal in the light of the ready availability of *Artemia* cysts. However, economic appraisal of hatchery performance, using the two different feeding strategies (copepods Vs. rotifers and *Artemia*) would be beneficial to this issue
(Støttrup and Norsker, 1997). For the development of an intensive copepod cultivation system, harpacticoid species are preferred because according to Støttrup and Norsker (1997), calanoids can be cultivated at very low densities. Harpacticoids, on the other hand, may be produced in volumetrically much denser cultures, but being benthic their proliferation depends on the area of a solid substratum. Many calanoids, do not comply with maricultural demands, due to the relative low and instable biomass densities obtained so far. For this reason, increasing attention has been focused on various species of highly reproductive harpacticoid copepods (Uhlig, 1984). Small neritic or estuarine copepods especially harpacticoids are easier to rear than the larger, open sea species (Uhlig, 1984; James et al., 1986).

Mariculturists have been increasingly interested in harpacticoid copepods (Morris, 1956; Bishai, 1961; Blaxter, 1962; Fahey, 1963; Ikeda 1973; Kitajima, 1973; Fukusho et al., 1977; Gaudy and Guerin, 1977; Hirata, 1977; Fujita, 1973; Spectorova, 1979). Some species have been thoroughly studied and also successfully mass cultivated, producing relatively high yields of living food (Katayama, 1973; Gillet and Guerin, 1975; Uhlig, 1975; Rothbard, 1976; Fukusho et al., 1977; Hirata et al., 1979).

Evidences suggests that harpacticoid copepods may serve as exceptional live prey for hatchery reared fishes and crustaceans (Kahan, 1980; Watanabe et al., 1983). In many respects harpacticoids appear to be suitable food organisms for mariculture. Of particular importance are their tolerance to a wide range of environmental conditions, their ability to utilize different food sources, their high reproductive
capacity, their relatively short life cycle, and their ability to produce high population densities in appropriate culture systems (Uhlig, 1984). Harpacticoids are less prone to infestations (Michajlow, 1969). Harpacticoids have a relatively high caloric content per unit weight and superior nutritional value compared to many traditional food sources (Kahan 1981; Kahan et al., 1982; Volk et al., 1984; Chandler, 1986; Gee, 1989).

Harpacticoids from first nauplius to adult provide a broad spectrum of prey sizes (80 to >900 μm in length and up to 3-5 μg dry weight) suitable for ingestion by an equally broad size range of developing fish with small gapes (Gee, 1989). Artemia may be too large to be suitable prey for many fish larvae or post-larvae with especially small gapes (Kahan, 1981). Several harpacticoids are considered to be promising copepods for laboratory cultivation (Ikeda, 1973; Omori, 1973). Among benthic copepods, Tigriopus sp. and Tisbe sp. have been mass cultured. The Tigriopus japonicus is considered as the most promising food organism (Kitajima, 1973; Iwasaki, 1973). It has been widely mass cultured by aquaculturists in Japan to provide an intermediate size class of live food for larval fish (Fukuhara, 1978) and it has been part of commercial rearing practices (Fukusho, 1980).

Nutritional analysis by Watanabe et al. (1983) showed that T. japonicus is high in polyunsaturated fatty acids, 20:5n3 and 22:6n3, that are essential to marine fish larvae (Fujii et al., 1976). Fish larvae fed on T. japonicus generally show higher viability than those fed on rotifers or brine shrimp (Kitajima, 1978). Uhlig (1984) found that mass cultivation of the harpacticoid Tisbe holothuriae, could satisfy the
requirements of mariculture. It can be easily cultured and it eats almost any kind of food. It has proved very useful as culture partner in cultures of benthic ciliates as well as invertebrates to clean the culture dishes from overgrowing microorganisms and various deposits (Uhlig, 1981).

In comparison with Artemia and Brachionus, the nauplii stages of the harpacticoid T. holothuriae are of particular interest on account of their size range of 50 to 120 µm. Furthermore the nauplii of Tisbe swim around in the water and thus are attractive to early fish larvae (Uhlig, 1984). StØttrup and Norsker (1997) demonstrated the potential for Tisbe nauplii as a first feed organism in terms of availability in the water column, fish larval survival and growth. In India also, attempts were made to mass culture harpacticoid copepods, to be used as live food. In 1977, Gopalan carried out the experimental mass culture of the harpacticoid, Nitocra spinipes. Goswami (1977) cultured Laophonte setosa on natural detritus, to offer as food to shrimp larvae.

1.4 Harpacticoid Taxonomy

The literature on Harpacticoida, prior to 1940 has been reviewed by Lang (1948) in his “Monographie der Harpacticiden”. According to Dussart and Defaye (1995) the superorder Harpacticoida includes two orders namely Longipediformes, and Harpacticiformes. The former contains almost exclusively marine species. The latter comprise families, which have representatives in fresh- as well as brackish continental and coastal waters. According to Willen (1999) the Harpacticoida contains over 3000 species and sub-species belonging to 463 genera and 54 families. However,
the great majority of species is assumed to be still unknown, mainly because large regions of the earth have not yet been extensively sampled. Huys et al. (1996) who published a family key pointed out that the familial classification of the Harpacticoida is in a state flux and many changes are likely to occur in the near future.

1.5 Ecology and Distribution

Each species has a life cycle conditioned by abiotic factors (seasonal variations in physical and chemical characteristics of the environment) and biotic factors (interactions within communities). Light controls the rate of development and also governs the vertical and horizontal migrations. Adults show negative phototaxis during the day and positive phototaxis at night. Temperature influences the number and size of the eggs, the number of clutches and the interval between successive clutches. It also controls the embryonic development and longevity of the adult stage. Benthic harpacticoids develop more slowly than planktonic ones (Dussart and Defaye, 1995).

Harpacticoids are primarily benthic organisms. They are adapted to several kinds of freshwater and marine environments. A few are planktonic or live in association with other organisms. In marine sediments, after the nematodes, they represent the most abundant meiofaunal group. Harpacticoids may be found also in semi-terrestrial habitats, such as damp moss and leaf-litter. Harpacticoids are widespread across the world. Some genera have a distribution restricted to one continent, but most of them are cosmopolitan. Many have distributions more related to environmental factors than to a geographic situation. The temperature and pH seem
to influence their distribution and abundance (Williamson, 1991; Dussart and Defaye, 1995). Population densities of harpacticoids are highest in shallow areas, and the high-density areas are usually represented by a limited number of species (Coull, 1977).

1.6 Morphology

The generalized harpacticoid is linear in shape with the prosome slightly wider than the urosome and the entire body gradually tapering posteriorly. Following Gooding’s (1957) terminology the harpacticoid body is divided into two major regions by a major articulation. The anterior prosome is in front of the constriction and the posterior urosome is behind the constriction. The prosome is further divided into a ‘cephalosome’ with all the head appendages (one pair each of antennules A₁, antennae A₂, mandibles Md, Maxillules Mxl and maxillae Mx) and the first thoracic appendages (Maxillipeds Mxp), and the ‘metasome’, including somites with legs P₁-P₄. The urosome is then the remaining posterior somites and the animal terminates with the caudal rami bearing caudal setae. The major articulation lies between the somites of legs 4 and 5. The antennules are very short with less than 10 segments. The antennae are biramous. The harpacticoid body surface is often ornamented with minute sensilla, fine hair-like filaments projecting outward through the cuticle, and these structures are often found banding the animal and have important taxonomic significance in intrageneric systematics.

The males are always smaller than the females. The number of body somites in males is 10 and in females 9, due to the fusion of first two urosomal somites to
form the genital somite. Males have geniculate antennules with swollen segment about mid length. In most cases fifth leg ($P_5$) is also sexually dimorphic. $P_6$ in harpacticoids is difficult to observe and generally comprises two setae near the genital aperture (Coull, 1977; Dussart and Defaye, 1995).

1.7 Locomotion

Swimming mode of copepods varies with the species and habitat. Benthic harpacticoids swim and crawl over the substrates in the littoral, benthic, and interstitial habitats. Though the swimming behaviour of the planktonic calanoids and cyclopoids has been investigated in detail, studies on the planktonic harpactocoids are wanting (Williamson, 1991).

1.8 Food and feeding

Harpacticoids consume microalgae, fungi, protozoans, bacteria and detritus. The algae may include phytoflagellates, cyanobacteria, and both epipelagic and epiphytic diatoms. Harpacticoids also use dissolved organic matter as a food source. The microbial communities associated with dead food may be more important than the foods themselves (Hicks and Coull, 1983). For feeding, harpacticoids use their mouthparts for scraping food from a diversity of substrata. The antennae and maxillae grasp the prey while the maxillipeds aid in anchoring to the substratum. The maxillules shred and stuff the food into the vibrating mandibles. Suspension feeding harpacticoids feed by lying on their dorsal or lateral sides and vibrating their maxillules, maxillae and mandibles. These vibrations create feeding currents that bring water and food towards the mouth (Williamson, 1991).
1.9 Anatomy

1.9.1 Muscular system

The muscular system is adapted to the types of movement (Boxshall, 1992) such as swimming, creeping or ‘walking’. Most muscles used for locomotion are striated. The muscular cells are bounded by a simple membrane, and the nuclei are generally beneath this membrane at the periphery of the cell. The striated muscles are either transversal or longitudinal (Fahrenbach, 1962). The longitudinal dorsal trunk muscles are paired and run from the cephalosome backwards to the anal somite. They are attached by tendons to each somite. The alimentary tract has circular smooth muscles their contractions ensure the peristaltic movements (Dussart and Defaye, 1995).

1.9.2 Digestive system

Harpacticoid digestive system has been studied in detail by Fahrenbach (1962). The digestive tract opens antero-ventrally at the oral aperture and ends postero-dorsally at the anus, on the anal somite. The oral aperture is protected by labrum and labium. The labrum contains the labral glands which are often lobed. They are organized in syncytia and contain mucopolysaccharides and glycoproteins. The digestive tract consists of an ectodermal foregut, an endodermal midgut and an ectodermal hindgut. The two ectodermal parts have chitinized wall. At the beginning of the midgut anterodorsal diverticulum is present functioning as hepatopancreas. Digestion takes place in the anterior part of the midgut, the posterior part being
involved in absorption and formation of faecal pellets (Yoshikoshi, 1975; Dussart and Defaye, 1995).

1.9.3 Reproductive system

Harpacticoids are sexually reproducing organisms with the exception of a few species (Sarvala, 1979). The genital system occupies the dorso-median part of the prosome, lying above and along the digestive canal, and opening ventrally on the genital somite. The male possesses one testis and a vas deferens. The vas deferens is composed of the seminal vesicle, spermatophoric sac, and ejaculatory duct. Spermatogonia form in the posterior zone of the testis where they begin to differentiate. The spermatids and their nurse cells are in the anterior part. They complete their maturation in vas deferens and are packed into spermatophores. The spermatophore varies in shape depending upon the taxon. The female possesses one ovary and a pair of oviducts. The oviducts extend anteriorly and then posteriorly to the gonopore on the genital somite. Each oviduct gives off diverticula. The posterior part of the ovary is the germinal part, where the oogonia multiply and then they undergo differentiation more anteriorly (Fahrenbach, 1962; Dussart and Defaye, 1995).

1.10 Mating behaviour

Male harpacticoids are more active swimmers than females. The male ceases the female with both its geniculate antennules at the level of furcal setae and brings its genital aperture near to that of the female. The spermatophore is fixed close to this aperture with the help of its legs (Fahrenbach, 1962; Dussart and Defaye, 1995). The
duration of mating varies from a few hours to several days. A male may take up to 10 days to inseminate a female and till then the couple can be seen swimming together. There are reports on the presence of a female chemical signal in some harpacticoids (Lazzaretto et al., 1990).

1.11 Development and life cycle

Female harpacticoids can store sperm and thus produce fertile clutches of eggs for extended period of time in the absence of males (Hicks and Coull, 1983). Copepods develop from fertilized eggs that hatch into a nauplius. There are six naupliar stages (N₁-N₆), followed by six copepodite stages (C₁-C₆), the last of which is the adult, the development being anamorphic. It is noteworthy that not all species of harpacticoids have the same number of development stages. The development time from extrusion to hatching (for subitaneous eggs) is usually from 1-5 days. Development time from egg to adult is normally on the order of 1-3 weeks, while the adult lifespan is generally from one to several months. Development times and life spans are much longer at lower temperatures and may vary considerably with species (Williamson 1991; Dussart and Defaye, 1995).

1.12 Culture

Harpacticoids have been cultured on a wide range of artificial and natural foods, including baker’s yeast, fish food, algae, bacteria, and dried, mashed, or rotting animals, eggs and plants (Hicks and Coull, 1983). Nitocra spinipes was cultured on a diet of detritus supplemented with phytoplankton by Abraham and Gopalan (1975). While culturing the species Gopalan (1977) studied the effect of various food items
such as detritus, *Chlorella* sp., shrimp head meal and a compounded diet. *Tisbe holothuriae* was mass cultured successfully by Uhlig (1981) in flat containers using dried mantle meat of *Mytilus edulis* as food. In 1984, he compared the mass culture of this species in an enclosed flat plexiglass system and a semi-open floating system. StØttrup and Norsker (1997) cultured *T. holothuriae* in shallow trays and in continuous bioreactors with large area substratum and compared these two systems in terms of area productivity. Abu-Rezq *et al.* (1997) cultured *T. furcata* with different algal species and studied the ingestion, fecundity and growth rates. *Tigriopus japonicus* was reared on living microalgae, artificial fish food and various vegetables by Vilela (1984) while conducting production experiments, and obtained best results with mixed food. In 1992, she mass cultured *T. brevicornis* using different kinds of food, and obtained highest density with the microalga *Platymonas suecica* and artificial fish food. She also evaluated the nutritional quality of the harpacticoid cultured on different diets. Carli *et al.* (1995) cultured *T. fulvus* with alga *Monochrosis lutheri* and yeast *Saccharomyces cerevisiae* as food and studied the influence of nutrition on fecundity and survival. Hagiwara *et al.* (1995) cultured *T. japonicus* in different salinities and studied the reproductive characteristics. For the mass culture of *Amphiascoides atopus*, Sun and Fleeger (1995) successfully designed and implemented a sustainable recirculating system, capable of producing in excess of one million individuals and over 5g. dry weight biomass per day.

1.13 Objectives of present study

Recently there have been many anthropogenic activities around the Adyar estuary such as dumping of debris, erection of multistoried buildings closer to the
estuary and release of domestic and industrial sewage at higher quantum. Further the bar mouth of the estuary has remained closed for most part of the year except during monsoon period. As a consequence characteristics of water and soil sediments have changed to a great extent. This necessitates studies on zooplankton of the estuary to assess their current biodiversity. The first objective of the thesis is to study the biodiversity of zooplankton of the estuary by collecting fortnightly samples for a period of one year.

Copepods constitute the dominant group of marine zooplankton and are preferred prey for larvae of economically important finfish and shellfish. They have greater ecological importance and hence the second objective of the thesis is to identify the different copepods of the Adyar estuary up to species level.

Recent literature on the mass culture of copepods for use in marine hatcheries indicates that the harpacticoid copepods are more amenable than cyclopoids and calanoids. Harpacticoids show variations pertaining to many biological aspects such as feeding, mating and reproduction compared to cyclopoids and calanoids. Further, there is no detailed investigation pertaining to any of the harpacticoid species of India except the taxonomic descriptions. Hence the third objective of the thesis is to make a detailed study on the morphology, food and feeding habits, reproduction and development of selected species of harpacticoids.