INTRODUCTION

It is an accepted fact that though culture fisheries cannot replace traditional capture fisheries, it is certain that the future gap between production and demand for fishery will have to be filled through aquaculture. One of the major constraints in culture fishery is the selection of suitable feed. Therefore, most of the studies during the past two decades have been concentrating on feeds ranging from naturally available to biochemically defined compounded ones (Kahan, 1982).

In the natural environment organisms are able to satisfy their nutritional requirement from a variety of sources. The natural diet of Portunus pelagicus and Scylla serrata have been studied in the field by many authors (Hill, 1976; 1979; Patel, 1979; Williams, 1982; Prasad, 1987; Prasad & Neelakantan, 1988). According to them the natural diet of these crabs encompasses a broad spectrum of both living and decaying animal materials as well as a supplementary plant diet.

Under culture conditions, crustaceans accept a wide variety of foods, but the flesh of molluscs and
crustaceans has been found to be the most acceptable producing the best growth (Deshimaru & Shigueno, 1972; Forster & Beard, 1973; Adelung & Ponat, 1977; Millikin et al., 1980; Bordner & Conklin, 1981; Vijaikumaran, 1990). Commercially the use of such food stuff is not feasible due to high cost, uncertainty in availability and storage problems (Ponat & Adelung, 1980). Therefore, the development of nutritionally balanced artificial diets capable of sustaining good growth is of practical importance.

There are two general approaches for developing nutritionally adequate diet for feeding any cultured animal. One can either employ empirically formulated diet based on the application of crude raw materials or by using purified or semipurified diets. Attempts to develop culture diets for crustaceans have largely involved the first approach (Kanazawa, 1970; Biddle et al., 1972; Balazs, 1975; Winget et al., 1976; Millikin et al., 1980). Information regarding the second approach is common in prawns (Hysmith et al., 1972; Deshimaru and Kuroki, 1974; 1975; Gopal, 1985) and is very rare in crabs (Lasser & Allen, 1976; Ponat & Adelung, 1980).

Different types of diets including dried animal
material, gels, paste, steam compressed pellets, flakes, capsules and dried spaghetti-like extrusions have been tried on other crustaceans. Dried animal material when used to supplement the fresh food was presoaked in fresh water for thirty minutes before use and were tried by Ling (1969) for the rearing of *Macrobrachium rosenbergii*. For rearing *Carcinus meanas* (Blue crab) moist diet bound in agar agar was used by Adelung & Ponat (1977) and Ponat & Adelung (1980).

According to Regnault et al., (1975), the survival and weight increment of *Crangon crangon* and *Palaemon serratus* were far superior when artificial diet was presented in the form of pastes instead of dry pellets. *Penaeus duorarum* and *P. aztecs* readily accepted 2 mm long wet compounded pellets of 1 mm circumference (Subrahmanyam and Oppenheimer, 1970). Kitabayashi et al., (1971 a) fed *P japonicus* with diet in the form of paste lumps.

Growth rate of shrimp was lowered when pelleted diet was fed as opposed to a paste diet and was reported by Kanemitsu and Asakura (1971); Kitabayashi et al., 1971 a; Forster and Beard (1973). The poor performance of pelleted diet was attributed to their being heated at 65°C for drying purposes, a more likely reason was thought to be that dry food might cause congestion of the
proventriculus and affecting the mixing of food with digestive enzymes, whereas on the other hand moist diet might facilitate easy digestion (Chaitanawisuti, 1989). So in the present study compounded diet in the form of moist pellets were offered to crabs.

The subsistence of any organism mainly depends on the nutritive value of the feed in terms of the availability of protein, lipid, carbohydrate, vitamins and minerals at appropriate levels. Lovell, (1989) and Weigel, (1989) noted that aquatic organisms have a lower dietary energy requirement than land animals because they do not have to maintain a constant body temperature. Level and source of energy significantly affect growth and are of definite economical importance in commercial feeds (Halver, 1979). When excess energy is supplied appetite may be satisfied before sufficient protein is ingested for growth (Matty, 1989). Both deficiency and excess of energy can cause reduced growth, (Coloso et al., 1988).

Among the energy nutrients, protein is the most important as it forms the major growth nutrient in the animal tissue. Protein molecules exist in different shapes and the shape directly reflects on the function of the proteins. Globular proteins are relatively
soluble and readily go into colloidal suspension, performs all the enzymatic reactions and transport nutrients and growth promoting factors. On the other hand fibrous proteins primarily form the structural units because of their non-colloidal property. Besides this function protein serves as a source of energy under acute shortage of other dietary energy components (Walton & Cowey, 1982). The optimum protein requirement for maximum growth varies from species to species. These variations can be attributed to both intrinsic & extrinsic factors which effect the organism.

Lipids are the major source of metabolizable energy and are directly related to the growth of the organism (Pandian, 1975). When compared to lipids & proteins, carbohydrates are not an essential component of the diet and the levels are of secondary importance when compared to lipids and proteins. Due to the protein sparing action of carbohydrates as reported by Andrews et al., (1972); and Andrews (1973), its level in the diet can be enhanced up to 40 % to offset higher levels of protein in feed, thereby bringing down the cost of feed preparation (Ali, 1982).

Variations in protein requirement in different species of crustaceans have also been attributed to the
biological value of protein sources which depends on the amino acids composition of the protein (Maynard & Loosly, 1971; Harper, 1981; Kies, 1981). However, some proteins are biologically unavailable for the animals due to the alteration in the amino acid composition during processing by combining with other compounds thereby become resistant to proteolytic enzymes (Cowey & Sergent, 1972).

Protein requirements are also influenced by the composition of other dietary energy components namely fats and carbohydrates. Protein lipid ratio and protein carbohydrate ratio in the diet also significantly influence the protein requirements of crustaceans (Andrews et al., 1972; Sick and Andrews, 1973; Abdul Rahman et al., 1979; Teshima and Kanazawa, 1984). Likewise, protein requirement of crustaceans has been reported to be influenced by the amount of organic salts (Sparks, 1971; Deshimaru & Kuroki, 1974; New, 1976; Maguire, 1980; Ponat & Adelung, 1980) and composition of vitamin mixtures (Adelung & Ponat, 1977).

Since all processes which take place in the animal body as feed is ingested and metabolized involve energy changes, some understanding of the principles of energetics
is basic to a study of these processes. The flow of energy through a single species population provides a quantitative basis for studying the role of that species within its community or ecosystem. Energy consumed with the food will be used for production and metabolism, while part of it is lost as excretion product & exuvia and the non digested food is egested (Crisp, 1971; Ricker, 1971). Studies in this direction in crustaceans have been carried out by various authors (Winget, 1969; Newell et al., 1972; Wallace et al., 1973; Breteler, 1975; Paul & Fuji, 1989). From their studies it was found that conversion efficiencies varied with age and also with the type of feed.

Although the above review reveals that there are many experiments in shrimp and other finfishes regarding nutritional & energetic aspects, such studies are not very common in portunid crabs (Brick, 1974; Cadman & Weinstein, 1988).

With this background, it was envisaged to study the nutritional and energetic aspects in Scylla serrata and Portunus pelagicus.