CHAPTER 1

INTRODUCTION

Coral communities are one of the most important marine ecosystems, because of their high densities of individuals belonging to various species, suggests that there are fine subdivisions of the basic environmental resources, particularly of food and space. These subdivisions are reflected in structural and behavioural adaptations that enable the individual species to utilize aspects of the environment that are not available to other species (Smith & Tyler, 1972). Many animals adapt their behaviour to live in association with another animal and interphyletic associations are always found in coral communities (Allen, 1972 : Smith, 1973 : Gendron & Mayzel, 1976 : Vander 1983). One of these associations is the goby-alpheid shrimp association.

The associations between burrowing alpheid shrimp and gobiid fish have a wide circumtropical distribution (Karplus, 1979). They were first recorded 30 years ago in the Palau Islands of the Pacific (Bayer & Harry-Rofen, 1956). Since then, they have been reported in many other localities, including the Red Sea (Luther, 1958 ; Klausewitz 1960, 1964, 1968, 1969, 1974a,1974b; Fishnelson, 1971), the Persian Gulf (Palmer, 1963), Indian Ocean (Polunin & Lubbock, 1979), Japan (Harada, 1969), the Hawaiian Islands (Baldwin, 1972) : Preston, 1978) and the tropical Atlantic (Karplus, 1979).

These associations have been intensively studied from various point of view, including taxonomy (Klausewitz, 1960, 1969, 1974a, 1974b) Miya & Miyake 1969, Baldwin, 1972 ; Lubbock & Polunin, 1977 : Polunin & Lubbock, 1977, 1979, 1980 ; Yanagisawa, 1978 ; Hoese & Steene, 1978 Hoese & Lubbock, 1982 ; Hoese and Randall 1982 ; Banner & Banner, 1980, 1982 ; Akihito & Meguro, 1978, 1983 ; Yoshino & Senou, 1983), behaviour and communication (Harada 1969 ; Karplus *et al.*, 1972a, 1972b, 1974 ; Preston, 1978), and life history (Yanagisawa, 1982, 1984).

Several gobiid species of various genera living in association with alpheid shrimps have been recorded *Cryptocentrus* (Klausewitz, 1960 ; Fishnelson, 1971 ; Karplus *et al.*, 1972a, 1972b, 1974 ; Polunin & Lubbock, 1977, 1980 ; Akihito *et al.*, 1984), *Psilogobius* (Baldwin, 1972 ; Preston, 1978), *Ctenogobiops* (Klausewitz, 1960 ; Lubbock & Polunin, 1977 ; Polunin & Lubbock, 1977 ; Yoshino and Senou 1983 ; Akihito *et al.*, 1984),*Stonogobiops* (Polunin & Lubbock, 1977 ; Hoese & Randall, 1982 ; Yanagisawa, 1982 ; Akihito *et al.*,1984), *Myersina* (Akihito & Meguro, 1978 ; Akihito *et al.*, 1984 ; Hoese & Lubbock, 1982), *Vanderhorstia* (Klausewitz, 1974b ; Polunin and Lubbock, 1977) ; Yanagisawa, 1982 ; Akihito *et al.*, 1984) *Apocryptodon* (Harada, 1969 ; Akihito *et al.*, 1984). *Vireosa* (Harada, 1969), *Lotilia* (Klausewitz 1960), *Tomiyamichthys* and *Mahidolia* (Yanagisawa, 1982 ; Akihito *et al.*, 1984).

Only one genus of alpheid shrimps, *Alpheus* has been recorded living in association with the goby. Most species of this genus are of the Brevirostris Group. (Banner & Banner, 1966 ; Miya & Miyake, 1969 ; Harada 1969 ; Karplus *et al.*, 1972a, 1972b, 1974 ; Karplus, 1979 ; Preston, 1978 ; Banner & Banner, 1982 ; Yanagisawa, 1982, 1984). There is one species, however, in the Edwardsii Group that has been reported with similar associations, (Banner & Banner, 1980).

These associations are mutual beneficial partnerships in which the goby uses the burrow excavated by the shrimp as shelter and for nesting while providing the shrimp with a tactile alarm communication which serves to avoid predation (Karplus, 1979). These associations have been observed and in general conform to the following description. The goby always sits at the burrow entrance which the shrimp digs and maintains. The shrimp exists from its burrow, antennae first. As long as the shrimp's antennae are in contact with the tail of the goby the shrimp continues to exit from the burrow. If the shrimp is out of the burrow when the intruder animal approaches, the goby quivers it's caudal part. In response, the shrimp generally sits still or flees into the burrow. Depending on the nature of the disturbance, the goby may remain at the entrance of the burrow or may turn and flee into the burrow after the shrimp. The duration between the disappearance and reappearance of the goby and the shrimp varies greatly upon which goby reappears first (Preston, 1978). In-burrow behaviours of the goby and alpheid shrimp has been observed in laboratory by Harada (1969) and Karplus *et al.* (1972) in which Karplus *et al.* reported cleaning of goby by alpheid shrimp. The goby-alpheid shrimp association provides a rare example of a tactile alarm communication system. This system is even more restrictive, since they require the communicating animals to be very close to each other. The goby and alpheid shrimp completely fulfil the condition for using a tactile communication system, sicne they maintain a constant antennl contact (Karplus *et al.*, 1979).

Recently, considerable information has been accumulated on the behaviour of the partner animals (Karplus, 1979 ; Karplus *et al.*, 1972a,

1972b, 1974, 1979), communication system (Preston, 1978), associated lives of these animals from population and developmental aspects (Yanagisawa, 1982, 1984) and the comparision of relationship between the different species of partners (Preston, 1978). To understand the roles of each partner in nature and the relationship of these associations, comparative studies on the behavioural pattern in natural condition are required.

In Thailand, gobiid fishes and alpheid shrimps are locally known as "Pla bu" and "Kung Diid Khan". These two names, however, applied to most gobiid fishes and alpheid shrimps. The associations between them are very poorly known in Thailand. Their associations were first reported very briefly in "The Alpheid Shrimp of Thailand" by Banner & Banner (1966). After that they were reported by Polunin & Lubbock (1979) and Nakasone & Manthachitra (1986). The related works were mostly concerned with taxonomic study of both gobiid fishes and alpheid shrimps. Earlier workers such as Smith (1932, 1945), Suvatti (1936, 1950), Fowler (1937), and Koumans (1953) described gobiid fishes in the genus *Cryptocentrus*. Wongratana (1975) described 9 species of *Cryptocentrus* found in Thailand, *C. callopterus, C. maudae, C. pavoninoides, C. cyanotaenia, C. diproctotaenia, C. leptocephalus, C. crocatus* (a new described species), *C. fontanesii* and *C. gymnocephalus*. The last two species were later placed to the genus *Amblyeleotris* by Hoese & Steene (1978) who also point out that *Cryptocentrus* and *Amblyeleotris* are the most speciose genera that live in association with alpheid shrimps. Polunin & Lubbock (1979) described five new alpheid shrimp-associated gobies of the genus *Amblyeleotris* with some specimens of

A. latifasciata collected from Thailand. Nakasone & Manthachitra (1986) in a preliminary study on the association between gobies and alpheid shrimps in Sichang Island recorded seven species of gobies, of which only five species were collected, *Cryptocentrus cinctus, C. caeruleomaculatus, C. singapurensis, Cryptocentrus* sp.1 and *Cryptocentrus* sp.2. The last two species were undescribed species (Yoshino & Senou pers. comm.)

For the alpheid shrimps, only *Alpheus rapax* was first reported living in association with gobiid fishes by Banner & Banner (1966). Twenty years later, Nakasone & Manthachitra (1986) reported three species, *Alpheus djiboutensis, A. bellulus* and *Alpheus* sp.1, which were living in association with gobiid fishes from Khang Khao Island.

The objective of this study is to show behavioural patterns outside the burrow of gobiid fishes and alpheid shrimps which live in association in natural condition. Moreover, observations on inside burrow activity in laboratory are conducted in order to provide more informations, also with taxonomic and ecological study.