

#### **4. KNOWN BIOLOGY OF POTENTIAL AQUARIUM FISH** **AND IMPLICATIONS POSED BY COLLECTING**

This section of the report considers the possible implications collection may have on the structure of reef fish communities and on individual species themselves. Despite the greatly increased attention to coral reefs shown by ecologists in the past decade, the questions tackled have been primarily community level ones. The basic demographic process in possible target species have been largely neglected. However, some of the factors that maintain the diversity of reef communities are thought to be:

- habitat variety;
- variable recruitment;
- pelagic larvae leading to dispersion;
- large numbers of larvae;
- and, extended breeding seasons (Reese, 1973; Sale, 1975).

In order to evaluate the impact of collection on reef communities, some knowledge of both community structure and recruitment must be sought.

##### **4.1 Community structure**

To date, the structural nature of the communities has been interpreted in two different ways. Depending upon the system envisaged, different consequences due to collection might be predicted.

##### **4.1.1 Order theory**

Very simply this states that the structure of the community is maintained by interactive communities made up of species specializing in different ways, thus partitioning the resources of the environment (Anderson et al., 1981). In such a system, collecting might remove a species thus vacating a niche. This niche may then be re-occupied by a member of the same

species, the total process having little effect on the equilibrium of the reef.

#### 4.1.2 Chaos theory

This states that the structure of the community is maintained by chance colonization by species with broad and largely overlapping requirements, which do not interact with each other sufficiently to shape the community being formed. (Sale and Dybdahl, 1975). In this system the vacating of a niche through the collection of a particular species would not necessarily lead to its reoccupation by a member of the same species. This could have more serious consequences on the diversity within reef systems.

Neither theory has been unequivocally confirmed, and the possible effects from fish collecting are necessarily hypothetical. In 'order' systems, for instance, there is no guarantee that a niche vacated by a particular species will be re-occupied by a member of the same species. Likewise in a 'chaos' system there maybe so much 'noise' that it is hard to envisage any deleterious effects from low levels of fish collecting. From the available evidence compiled from fish collectors and the research projects which have addressed the problem, the observed effects of collection seem to be negligible (Nolan, 1978; Russ, 1984).

#### 4.2 Recruitment

As with community structure, until recently little work had been undertaken on recruitment. Two theories have been proposed.

#### 4.2.1 Resource limited recruitment

In this system, any space that becomes available is refilled from a saturated pool of larvae, the limiting factor therefore being space (Sale, 1975). In such a system the predicted effects of collecting would be short-term and minor.

#### 4.2.2 Recruitment limited population

In contrast to the first recruitment theory, this suggests that the number of available recruits, not the resource, is the limiting factor (Robertson et al., 1981). In such a system, the potential effects from collecting could be a reduction in that year class, thus producing a more serious reduction in the abundance of that species at that location until further recruitment occurred. Long-term effects are not really known.

As with 'community structure' these are hypothetical situations based upon only a few relevant research projects. A fuller understanding of effects of collecting on both community structure and recruitment requires greater information than we now have concerning accuracy of sampling methods, reproductive seasons, fecundity, larval survival and behaviour, longevity of reef fishes and species interactions. Information on events at the moment of larval settlement on the reef will be crucial to our further understanding of reef fish communities.

In addition to obtaining long-term monitoring studies will be useful to obtain some idea of natural fluctuations in the given areas, particularly considering that reef fish communities are often thought to exist in a permanent state of disequilibrium (Connell, 1978; Sale, 1980; Doherty, pers comm.). The degree and determinants of natural fluctuations must be ascertained before fluctuations in reef fish communities due to aquarium fish collecting, or any other external cause, can be established.