# CORAL POPULATIONS FRINGING ISLANDS: LARVAL CONNECTIONS'

J. A. Stoddart
Australian Institute of Marine Sciences.
Townsville. Qld.

## ABSTRACT

Connectivity in natural systems is a central issue in predicting not only how 'far a perturbation at one point will spread through a system, but also the role the rest of'the system will play in that point's recovery. Population genetics studies are well placed to estimate the level and pattern of connectedness for 'a system's component species. This paper compares estimates of;' 'connectedness between populations of Pocillopora damicornis on fringing reefs around an island, Rottnest Island off southwestern Australia, with estimates for populations on patch reefs within an embayment of similar' size, Kaneohe Bay on the northeastern coast of Oahu, Hawaii.

Pocillopora damicornis utilises two modes of larval dispersal; one operates over short distances and involves a,, brooded, asexually-produced, planula;, the second acts over longer distances and involves a sexual propagule. When examined genetically, larval connections between definable populations were weaker between fringing reefs around an island than they were between patch reefs in an embayment of similar dimensions. Differing hydrodynamic regimes are inferred to explain this pattern.

Estimates of genetic similarity between populations at each area were calculated on a basis designed to reflect either the spread of clones by asexual reproduction, the dispersal of sexually produced propagules, or a combination of both. The major' difference between, the pattern of genetic structure of the' populations around Rottnest Island and the pattern of those within Kaneohe Bay resulted from the extended distribution of clones within the latter set. The most likely explanation for the paucity of shared clones among the Rottnest Island reefs is that once larvae are swept offshore from these small embayments they are almost never returned to the, island. However, in Kaneohe Bay the water has a substantial period of residence allowing a greater proportion-of the recently produced planulae to settle. This settlement most probably occurs on a reef adjacent to the site of planulae production. Recruitment from sexual reproduction plays a minor role at Rottnest Island but has virtually no influence in Kaneohe Bay.

This comparison suggests strongly that in Pocillopora damicornis..., and presumably those species of coral with similar modes of reproduction, patch reefs within large embayments are strongly. connected in a stepping-stone fashion as a result o'f obtaining the bulk of their recruits, from asexually produced planulae orginating from neighbouring reefs. Populations in isolated embayments fringing islands receive the majority of their recruitment from larvae with significant dispersal capability, presumably resulting from sexual reproduction, which originate from sites outside the system. They 'are connected weakly in a pattern following an 'island' model.

The implications of this result are:

1) patch reefs like those of Kaneohe Bay will recover from major perturbations faster than those located in embayments fringing islands,

2) perturbations at a single reef within a large embayment may produce noticeable effects on adjacent reefs, while similar disruption in an isolated fringing reef should have no 'distant' effects,

3) the greater genetic isolation of fringing reefs in situations like those around Rottnest Island is likely to produce unique populations, while one patch reef will be much like another.

Taken together, results 1 and 3 point to the special consideration which must be given to the conservation of fringing reefs if we wish to retain the rich variety of reefs which occur in such areas.