3.0 DESCRIPTION OF THE PROJECT

3.1 Previous Relevant Studies

A major problem in evaluating the effects of existing marine reserves on harvested populations and communities has been the lack of data collected prior to establishment of the refuge (Dugan and Davies 1993). There are numerous examples of this problem from both temperate and tropical regions, including the Philippines (Russ and Alcala 1989), Australia's Great Barrier Reef (Ferreira and Russ 1995), Africa (McClanahan 1995, Watson and Ormond 1994), the Caribbean (Roberts and Polunin 1993, Roberts 1995), California (Carr and Reed 1993) and New Zealand (Cole *et al.* 1990). Many scientists have argued that marine reserves have substantial benefits for conservation of aquatic communities and maintenance of harvestable stocks (Ballantine 1991, Ivanovici *et al.* 1993 and papers therein, Roberts and Polunin 1991, 1993, Russ 1991, Bohnsack 1993, Carr and Reed 1993, Dugan and Davies 1993). Others have pointed-out, however, that setting aside areas for marine reserves can have great social and economic cost for those who previously derived food, employment or recreational benefit from those areas (Bergin 1993). Therefore, scientists and managers need to assess whether specific reserves deliver the benefits attributed to them, and then inform those whose livelihoods are affected by the closure.

De Martini (1993) examined potential replenishment of non-protected areas adjacent to marine reserves by computer modelling based on growth curves and mobility of Pacific coral reef fishes. He asserted that there was little empirical evidence to suggest that reserves replenished non-protected areas, citing Russ and Alcala (1989) as the best (but still inconclusive) evidence from the field.

Most of the work done on marine reserves has focused on the first two benefits listed above, namely, species diversity/abundance and size (or, more recently, age structure - see Ferreira and Russ 1995). The design of field studies for this work usually includes sampling the reserve and one or more non-protected areas (as control or reference sites) but excludes, in most cases, sampling of reserve and non-protected areas prior to declaration of the reserve. Thus, in most cases, there is no measure of the extent to which reserve and non-protected areas differ due to natural variability, or to an effect due to the reserve.

In order to cast doubt on many of the earlier studies, one merely needs to demonstrate that: 1) variability among sites in the absence of a marine reserve is of a similar magnitude to that reported between reserve and non-protected sites; or 2) that variability through time within a site not subject to protection is comparable to variability within a site before and after it is declared a marine reserve.

Dugan and Davies (1993) summarised studies comparing reserve and non-protected areas and found that reserves had two to 13 times more individuals than non-protected areas. However, this trend may be explained by the original selection of the reserves, which may have had intrinsic natural features that supported naturally large populations of marine organisms.

3.2 The Situation in the Pacific

The tropical Pacific encompasses a vast area and many independent states. Many of the people living in the region rely almost totally on marine resources for food, recreation, culture and cash income. Management of fisheries stocks on coral reefs is difficult using traditional methods and marine reserves potentially offer an effective management tool (Roberts and Polunin 1993). The World Conservation Union (IUCN) and the South Pacific Regional Environment Program (SPREP) have initiated a cooperative program to promote the establishment of a system of marine protected areas (MPAs) within the tropical Pacific. Despite the large size of the region, only 67 MPAs had been established by 1994 (Kenchington and Bleakley 1994) and, until the present project commenced, none had been declared in Solomon Islands, other than two small closures to fishing in the vicinity of the ICLARM research facilities.

Programs seeking to encourage declaration of marine reserves within the tropical Pacific will be able

to promote this management tool far more easily if the benefits of reserves are evaluated and documented. In the present study, the planning and management of the MCA at the Arnavon Islands was implemented in conjunction with a program to monitor the success of the MCA in facilitating an increase in the populations and sizes of harvested invertebrates. This has been done using a rigorous, quantitative survey program based on the procedures developed for environmental impact assessment (Underwood 1989, 1993).

Large invertebrates are an important part of the local fisheries in Solomon Islands - such species are relatively easy to harvest, can be preserved without refrigeration, and yield significant export income (Richards *et al.* 1994). Important groups of invertebrates include giant clams, pearl oysters, trochus and holothurians (known commonly as sea cucumbers and processed into beche-de-mer). There is information - mostly in terms of export volumes - to suggest that these invertebrates are either fully or over-exploited (Richards *et al.* 1994 and references therein). There is some regulation of harvesting at the government level (e.g. maximal and minimal size limits on trochus and bans on the export of wild giant clams and pearl oysters). There are also regulations on harvesting at the community level. For example, in Ontong Java, harvesting of white teatfish (*Holothuria fuscogilva*) sea cucumbers is prohibited during alternate years (Holland 1994). The limited information available suggests, however, that such measures are not enough to sustain the present rates of harvest. One management measure that has been suggested is the establishment of sanctuaries to provide stock, whose propagules can replenish surrounding areas on a regular basis (Richards *et al.* 1994).

3.3 Study Participants and Linkages

The major participants in the study included:

- The Nature Conservancy (TNC), which negotiated the original MCA, took responsibility for training and support of the Conservation Officers (COs) and provided some of the equipment for the study.
- ICLARM, which recognised the need for the project, designed the sampling program and provided logistical support and equipment for the study.
- ACIAR as funding agency.
- The Government of Solomon Islands, which assisted in the management and support of the COs, provided Fisheries Officers to assist with sampling and made the Daula and its crew available as a support vessel for the project.
- GBRMPA, which provided scientific and management support, including peer review of the study.
- Dr Marcus Lincoln Smith of The Ecology Lab Pty Limited, who was engaged by GBRMPA as Project Scientist.

There was strong collaboration between all participants to ensure that the project was planned and executed successfully. Linkages also extended to the publication of study findings and the training of Solomon Islanders in practical and theoretical aspects of the study (see below).

3.4 Timetable

The timetable for the project reflected the objectives listed in Section 2. The Pilot Investigation was completed in October 1994, followed by the three surveys prior to declaration, which were done in January-February, April-May and July-August 1995. The annual interim surveys were done in September ñ October 1996 and 1997. The final three (post-declaration) surveys were done in September 1998, January-February 1999 and April 1999.