dumped on the reef by the surf, losing diving gear and a fair bit of self-respect in the process), right until the last day. After an extremely rough 28-hour boat trip home, everyone was still keen to participate in the final discussion of the management plans, which began mid-Sunday afternoon and continued until 8 at night.

The workshop proved to be both an invaluable source of information on all aspects of the trochus resource, and an effective means of heightening awareness of the factors influencing fishery management decisions on the part of the Pacific Island participants. In particular, the socio-economic aspects of management, and the requirements of the shell trade, were emphasised, so that any management decisions made are not by biological considerations alone. This approach ultimately resulted in participants developing considered management plans that were likely to make sense to rural people dependent on the fishery for their income.

Trochus reseeding experiment in Vanuatu

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In recent years the harvesting activity of trochus shells in Vanuatu has increased due to the steadily growing demand for the shell, whose market value has increased markedly. This has resulted in the establishment of three shell processing factories in Port Vila, thus increasing the level of exploitation of the resource throughout the island regions.

To determine whether re-seeding of depleted reefs with hatchery reared juveniles is a practical tool for management, an experiment on re-seeding of trochus was carried out in May 1991. This article is a summary of a progress report written in August 1991, about 3 months after the release was made. For further details, refer to Working Paper 26 from the Twenty-third SPC Regional Technical Meeting on Fisheries (August 1991).

Trochus were spawned at the Vanuatu Fisheries Department hatchery in Port-Vila during the first 3 months of 1990. A total of 1400 juvenile *T. niloticus* were tagged and released. Of these 1,000 had maximum basal shell diameter greater than 20 mm and 400 had basal shell diameter less than 20mm

The juvenile *T. niloticus* were segregated into 4 groups, with each group containing 350 juveniles with a separate tag colour (Group 1 – pink; Group 2 – white; Group 3 – green and Group 4 – blue tags). The juveniles in each group were individually marked in three different ways:

a) small numbered polyethylene Hallprint tags attached to the shell with cyanocrylate glue;

b) a drop of red-coloured cyanocrylate glue applied to the apex of the shell; and

c) the number on the polyethyelene tag was inscribed with pencil on the nacre inside the lip of the shell.

The juvenile Trochus were then measured (with Vernier callipers to the nearest 0.1 mm) and returned to a flowing seawater tank, where they were all left overnight before being transferred to the reef.

For convenience, a reef flat on the seaward side of Erakor Island, close to Port-Vila, was chosen as the release area. Before the experiment commenced, the village that owned the reef agreed to ban trochus fishing on it for a period of one year. All the release sites chosen were within the suitable habitat zone, so that comparison of survival rates could be done at different levels of protection from predators. The most suitable place for releasing the juveniles was a narrow band of coral rubble immediately shoreward of the elevated reef crest. The rubble was encrusted with coral and algae and the spaces between the rubble were considered the most appropriate size for small trochus to shelter.

The tagged juveniles were collected from the tanks at the Fisheries Department, taken in tanks of seawater to Erakor Island and placed in the shade at the top of the beach. Lumps of coral were placed in the tanks, and the juveniles were placed on the coral. These blocks with juveniles attached were later transferred to the sites selected for releases. They were placed at each of the four chosen sites and were provided with the following types of protection from the predators:

—Group 1: the coral blocks with the juveniles attached were covered with coral rocks (mainly plate *Acropora*) to shelter them from wave action and predation;

—Group 2: plastic mesh with 1 cm holes was placed over the blocks. The mesh was anchored in place with coral blocks placed around the edge while steel rods were hammered through the substrate to hold corners of the mesh firmly in place;

— Group 3: as for group 1 but looser (more open) coral covering the blocks to which the released juveniles were originally attached;

—Group 4: as for group 2.

Juveniles were released during the early hours of the evening (2 hours before low tide) to help them adjust to their new surroundings before the reef was fully recovered and to minimize exposure to predation immediately after release.

Recapture surveys, with minimal disturbance of the substrate, were carried out to assess rates of recovery, mortality and movement of the juveniles. Each of the four sites was searched thoroughly for juveniles, both live and dead. The area around each of the four sites was also searched carefully, to find juveniles that might have moved out from the shelter of the site, and the distance that these juveniles had moved was noted. The site was then dismantled (mesh removed, all shelter boulders removed and placed to one side after carefully searching for attached juveniles). All juveniles were removed, and their tag numbers recorded. They were then placed on coral lumps to which they could to attach. They were later replaced in each site. Crushed shell fragments were collected and tag number (if still attached to the shell fragment) recorded.

Recapture of juvenile trochus for each group for the period 21 May – 10 July, with intervals of 4, 7, 16 and 22 days between the five surveys carried out, provided the following results:

—Group 1: of the total juveniles released, 352, 268, 142, 107 and 79 respectively were recaptured during the five surveys;

—Group 2: of the total juveniles released, 350, 303, 184, 156 and 164 were recaptured;

—Group 3: of the total juveniles released, 350, 316, 138, 190 and 194 were recaptured; and

— Group 4: of the total juveniles released 350, 346, 253, 166 and 187 were recaptured.

After each survey the juveniles were replaced and the shelter reconstructed.

Two measurements of about 50 juvenile *T. niloticus* from each group were made roughly every fortnight, using Vernier callipers.

Growth rate appeared to be fast, since the number inscribed with pencil on the shell lip had moved inside the shell aperture.

The movement pattern showed juveniles going out from under the shelters (more found outside the shelters than in them). The shelters seemed too dark, and the darkness is likely to inhibit algal growth. The juveniles moved different distances at the four sites, with movement being most at Site 1, somewhat less at Site 2 , and not very much at the sites with group 3 and4.

A strong net direction movement toward the sea (movement into the reef crest) was recorded at site 1. The juveniles were found up to 25 m from the shelter. Some juveniles had moved into spaces between the coral rubble, while others sought shelter under pieces of dead coral.

Forty-nine days after release, the total survival, mortality and missing rates of juveniles for the 4 groups were 42.2, 7.1.and 48.7 per cent respectively.

Further recaptures and size-frequency sampling will take place at periodic intervals during the next few months, in order to gather data on survival and growth over a one-year period. The data will be analysed using multiple-recapture techniques after this time. An update on the experiment, and hopefully final results, will be presented in the next issue of this bulletin.