

## ‘Eua survey report<sup>1</sup>

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### 1. Sedimentation survey out of ‘Eua Harbor (23 July 2002)

#### (1) Background and Objectives

People in ‘Eua have environmental concerns including soil run-off from farms, logging sites and roads onto coastal waters through streams (Figures 1 and 2). A stream running into ‘Eua Harbor is one of the main river systems in ‘Eua and is likely to carry sediment into waters more than any other streams in ‘Eua. To evaluate sedimentation on the coral reefs, we observed the sea floor outside of the harbor, where the chance of detecting sedimentation is likely to be the highest in ‘Eua.

Figure 1. ‘Eua’s roads with steep slope where erosion is often observed



Figure 2. Sedimentation on the river floor adjacent to ‘Eua Harbor



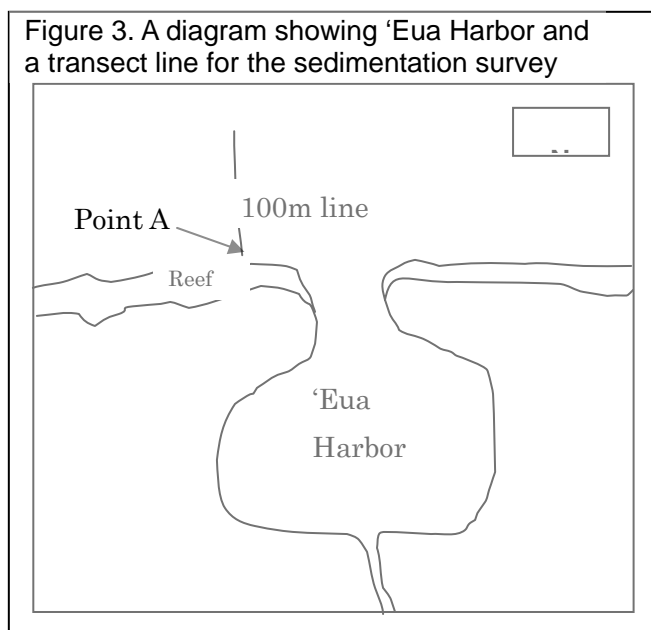
#### (2) Methods:

From a point near entrance of the harbor, a SCUBA diver laid a 100m transect line perpendicular to the coast line (Figure 3). The diver swam from the deepest point (end of the line) towards the coast (beginning of the line) and estimated live hard coral cover (%), dead hard coral cover, soft coral cover, every 10m (with the width of 10m). The diver observed the sedimentation on the substrata (Rank: 0, none; 1, little; 2, some; 3, a lot).

<sup>1</sup> Report of the trip should include: 1. objectives; 2. itinerary; 3. members participated; 4. cost; 5. Env. Committee Meeting (members participated, issues raised); 6. PCB testing; 7. Water quality; 8. Sedimentation; 9. Spot check; 10. Town meeting. This paper covers only 8 and 9 above.

### (3) Results

Three divers (Asipeli, Peter and Seiji) were scheduled to participate. Due to cancellation of the transport from Nuku'alofa to 'Eua, and due to problems of equipment, only one diver conducted the survey<sup>2</sup>.



From Point A (Fig. 3) in the shallow (2m) area near the entrance of the harbor to about 70m off with depth of 10m, the coverage of live hard corals, dead hard coral<sup>3</sup>, soft corals were estimated to be 25%, 25% and 5%, respectively. The dominant hard coral colonies were corymbose *Acropora*. About 95% of substratum was hard bottom, while 5% or less sandy bottom. The largest *Acropora* (corymbose) was around 100cm in diameter. In the deeper area, from 70m to 100m away from Point A (Fig. 3), where the depth is

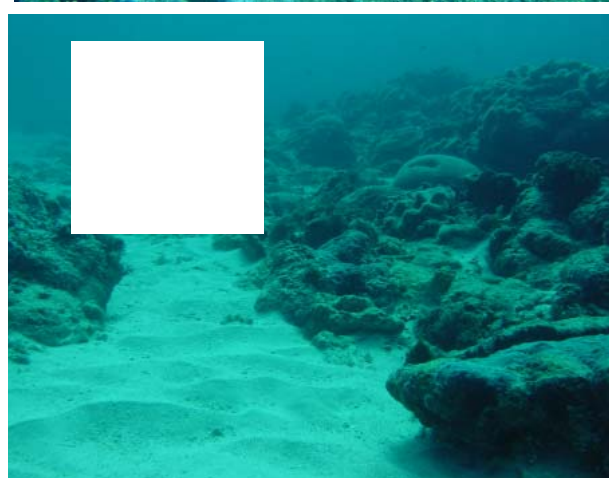
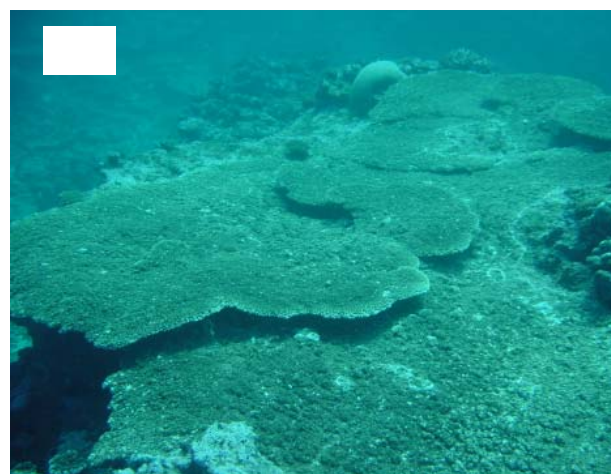
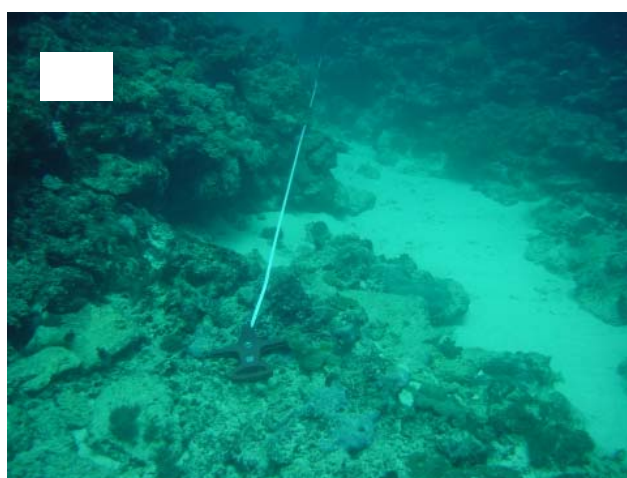
about 20m, the percentage covers of live hard corals, dead hard coral, soft corals were estimated to be 5%, 5% and 5%, respectively, with dominant massive and encrusting hard corals. Large colonies, with about 5m in diameter, of tabular *Acropora* were observed (Figure 4). Five to 10% of the substratum is sandy bottom, which increases as depth becomes greater (20% at 20m deep). Very small surface was covered by sand (<5%). No sign of sedimentation was observed along the line<sup>4</sup> (Figure 5).

<sup>2</sup> Well planning and well maintenance of equipment is essential.

<sup>3</sup> Dead hard corals are distinguished from "rocks" by the remaining calice structures, although they are often not clear.

<sup>4</sup> The ranks (0: nothing – 4: lot of sediment) needs evaluation and should be improved.

Figure 4. A) Large (>5m diameter) tabular *Acropora* near the entrance of 'Eua Harbor. B) and C) 100m away from the entrance of the harbor with the depth of about 20m. No symptom of sedimentation was observed.



#### (4) Discussions

In spite of the muddy water of the stream running into the harbor indicating heavy soil run-off from upper areas, the waters surrounding the harbor showed high transparency (Figures 1, 2 and 4). There was no notable effect of sedimentation at the point we dived (Figure 4). Sediment from stream is likely to be flashed away by current, once it goes out of the harbor. Observation of the reef flats surrounding the harbor also suggests that there is no notable effect of sedimentation (Figure 5). Despite this, as soil run-off is obvious in 'Eua, it may be recommended to monitor sedimentation around the mouth of stream<sup>5</sup>.

Collaboration between 'Eua Town Office, Tonga Visitors Bureau<sup>6</sup>, Ministry of Fisheries

<sup>5</sup> There are several methods to monitor sedimentation, including sediment traps, measuring SS (suspended substance), and measuring the proportion of soil particles in calcareous coral sand. An easy-to-use and maintenance-free method is appropriate for monitoring in remote areas such as 'Eua.

<sup>6</sup> As 'Eua is promoting eco-tourism, conservation of coral reefs is critical. To achieve this, collaboration between DoE and tourism sector, especially Tonga Visitors Bureau (TVB), is important. For a better collaboration with TVB, basic information including "Annual Reports" and "Strategic Plan" should be obtained and fully studied.

should be sought after for a better monitoring of natural environment including the coral reefs.

Figure 5. Comparatively small coral colonies on the reef flat adjacent to 'Eua Harbor



## 2. Spot check (24 July 2002)

### (1) Objectives

There are environmental concerns among people in 'Eua in relation to coral reefs potentially affected by soil run-off and formerly proposed harvesting of corals and live rocks<sup>7</sup>. However, there is no known study reported on coral reefs of 'Eua. Therefore, we conducted a pilot survey to obtain general baseline view on the reefs.

### (2) Methods

As there are difficulties in obtaining SCUBA tanks in 'Eua and as we expected to visit as many sites as possible, we applied spot check method by using snorkel. We planned to visit (1) Loloniui beach (near Houma); (2) Ufilei (located between 'Ohonua and Houma); (3) Ha'aluma (southern-western beach); (4) Beach adjacent to Hideaway (between 'Ohonua and Tufuvai); and Lokupo Beach (Central eastern beach). We planned to access the reef slope from beaches by traveling by a car. At each point the following parameters were recorded on a prepared record sheet (Appendix A):

- Record the coordinates of the points by using a GPS
- Two or more divers snorkel in a direction on haphazard bases for 10 minutes, within a

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<sup>7</sup> It is important to collaborating with Ministry of Fisheries (MoF) that issues permits for harvesting of corals and live rocks in Tonga. Basic information including MoF strategic plan, annual reports and records of permits granted and logbooks kept by coral harvesters should be obtained and studied.



determined area (an imaginary circle with a diameter of 60m) and estimate a small number of basic parameters including:

- live hard coral cover to the nearest multiple of 5%,
- dead hard coral cover to the nearest multiple of 5%,
- soft coral cover to the nearest multiple of 5%,
- type and % cover of substrata on which corals are not settled (such as “sand” and “rubble”) to the nearest multiple of 5%,
- estimated diameter of the largest plate-like *Acropora* colony observed  
(This is an effective indicator of the length of time when the environment has been suitable for the growth of corals),
- dominant type of coral colonies,
  - ☐ Branching *Acropora*,
  - ☐ Plate & Corymbose *Acropora*,
  - ☐ Mixture of ① and ②,
  - ☐ Specific type,
  - ☐ Various types without dominant types,
  - ☐ Softcoral.
- sedimentation (Rank: 0, none; 1, little; 3, some; 4, a lot),
- the number and estimated mean size of Crown-of-Thorns starfish observed,
- depth range, and
- other notable findings.

### (3) Results:

We experienced some unexpected difficulties in conducting land-based spot check. Due to large distance and steep paths to the beaches from roads, it took unexpectedly long time to get to and come back from each site. Moreover, due to difficulties and risks in accessing reef slope from beaches for the large swell despite reasonably calm weather, we were not able to snorkel at some sites (Ha'aluma and near Hideaway). Rain prohibited us to walk the cross-island path to the eastern coast to do survey at Lokupo. The following is on the results of survey at Lononiu Beach, Ufilei Beach and Beach near Hideaway.<sup>8</sup>

#### a. Loloni beach (S21°18'41.8";W174°56'13.1")

Between the reef crest and beach, a narrow (<50m by eye measurement) and shallow (<1m) moat with sandy bottom with scattered patches of corals exists. The outer slope (3 – 10m

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<sup>8</sup> Slate for Peter should be prepared before the next trip.

deep) was observed. Coverages of live hard coral, dead hard coral and soft coral were 5, 5 and 5%, respectively, with various live forms of coral (corymbose *Acropora* and massive *Porites* are dominant). About 10% of the bottom was covered with sand or rubble, where no live corals were observed (Figure 6). The largest tabular *Acropora* was 80cm in diameter. No sign of sedimentation was observed.

Figure 6. Scene of preparation for spot check at Loloniu Beach and a photo of outer slope



b. Ufilei (S21°20'21.2"; W174°57'20.2")

On the shallow (<1m) moat out of beautiful sandy beach, a large part of floor is occupied by patches of corals (Figure 7). On the outer slope (3 – 10m deep), coverages of live hard coral, dead hard coral and soft coral were 10, 10 and 5% respectively, with mixture of various live forms of corals with no notable dominant form. All the bottom was hard substratum without areas covered by sand or rubble. The largest tabular *Acropora* was 40cm in diameter. No sign of sedimentation was observed.

Figure 7. Healthy shallow reef at Ufilei



c. Near Hideaway (S21°25'43.6"; W174°56'42.1")

Shallow (<1m) moat are full of patches of corals. Coverage of live hard corals was 30% with high proportion of branching *Acropora*, with no notable dead hard corals and soft corals. Outer slope was not accessible due to heavy surf and strong current.

#### (4) Discussions

We observed very healthy (in terms of live/dead coral ratio by eye measurement) coral assemblage in moats, no sign of sedimentation and no individual of crown-of-thorns starfish, at all the visited sites. The coverage of live hard coral was, however, low (5-10%) at the sites. We had an impression that this figure is very low considering surrounding conditions, i.e., clear water, low sedimentation, constant strong current, comparatively low human disturbance including fishing pressure, no COTS. We need to increase samples to generalize the findings. We did not hear any incidents of coral bleaching or outbreak of COTS from people on the island, although comprehensive study has yet to be conducted to gather local knowledge on historical change of coral reefs. As coral reefs are of extreme importance for 'Eua to pursue its eco-tourism development, it is worth commence reef monitoring through collaboration among DoE, 'Eua Town Office, Tonga Visitors Bureau, and Ministry of Fisheries. As the access to the reef slope from beaches are extreme dangerous, future survey should be conducted by boat-based diving, which will be less expensive taking the time spent for moving from one site to another and the risk of injury/life of divers into consideration.

**Appendix A. Data sheet for Spot check method**

Snorkel survey data sheet

Reef Name: \_\_\_\_\_

Date: \_\_\_\_\_

Diver: \_\_\_\_\_

- ☐ Branching Acropora,  
☐ Plate & Corymbose Acropora,  
☐ Mixture of ① and ②,  
☐ Specific type (SPECIFY),  
☐ Various types without dominant types,

Point #	Time	Live hard coral %	Dead H C %	Soft Coral %	Dominant coral type*	No. COTs, Size (cm)	Type of substratum with no corals (%)	Sediment (0, none – 4, a lot)	Largest Plate Acropora size (cm)	Depth range (Xm–Ym)	Other remarks	Photo taken	GPS Site No.
1								0 1 2 3 4					
2								0 1 2 3 4					
3								0 1 2 3 4					
4								0 1 2 3 4					
5								0 1 2 3 4					
6								0 1 2 3 4					
7								0 1 2 3 4					
8								0 1 2 3 4					
9								0 1 2 3 4					
10								0 1 2 3 4					
11								0 1 2 3 4					
12								0 1 2 3 4					
13								0 1 2 3 4					



