

## ■ REEF FISHERIES OBSERVATORY

Staff of the coastal component of the European Union funded Pacific Regional Oceanic and Coastal Fisheries Development Programme (PROCFish/C) and the Coastal Fisheries Development Programme (CoFish) continued to compile and edit country reports as well as conduct some follow-up finfish surveys in Tonga. In addition, analysis of the PROCFish/C regional dataset continued with the assistance of Auckland UniServices Limited, the group contracted by the project to provide statistical assistance.

### Update on the compilation, finalisation and publishing of country reports

During the fourth quarter, Ms Sarah Langi and Ms Celine Barre made good progress with compiling and editing country reports. The first three reports (Vanuatu, Nauru and Tuvalu) were published in the third quarter. Final drafts of reports for French Polynesia, Wallis and

Futuna, Niue, Samoa, Kiribati, and Papua New Guinea (PNG) were sent to the respective countries for comment and clearance, and the reports for New Caledonia and Solomon Islands are nearing completion. Following clearance of the Wallis and Futuna report in English, the full

report is now being translated into French. As reports are published they are placed on the PROCFish/C Web portal on the country specific pages as public domain documents.



### Analysis of regional dataset

Associate Professor Brian McArdle of the University of Auckland made his second visit to Noumea in November to provide statistical assistance to project staff who are analysing the regional dataset. Good progress was made in drawing linkages between the different disciplines, with data analysis based

on current finfish and invertebrate resources and user status, complemented by habitat and socioeconomic data. Tailor-made queries provide access to data as desired, and analysis is based on a range of statistical procedures including descriptive, linear analytic and multivariate methods.

The simplified diagram (Figure 1 on page 3) shows the steps that have already been taken. First results have been summarised and were presented at the PROCFish/C Advisory Committee meeting held in early February 2009.



### Finfish resource assessments in Tonga

The last finfish surveys for the PROCFish/C project were done in September/October 2008 at four villages in the Kingdom of Tonga (Manuka and Haatafu on the island of Tongatapu, and Lofanga and Koulo in the Haapai group), repeating assessments previously done in 2001/2002, but following the adopted methodology for PROCFish/C finfish surveys. A total of 50 transects were sampled, and more than half of the transects were carried out at the same locations as those sampled during the 2001/2002 PROCFish visit, providing a unique chance to compare changes over time. The PROCFish/C survey team was

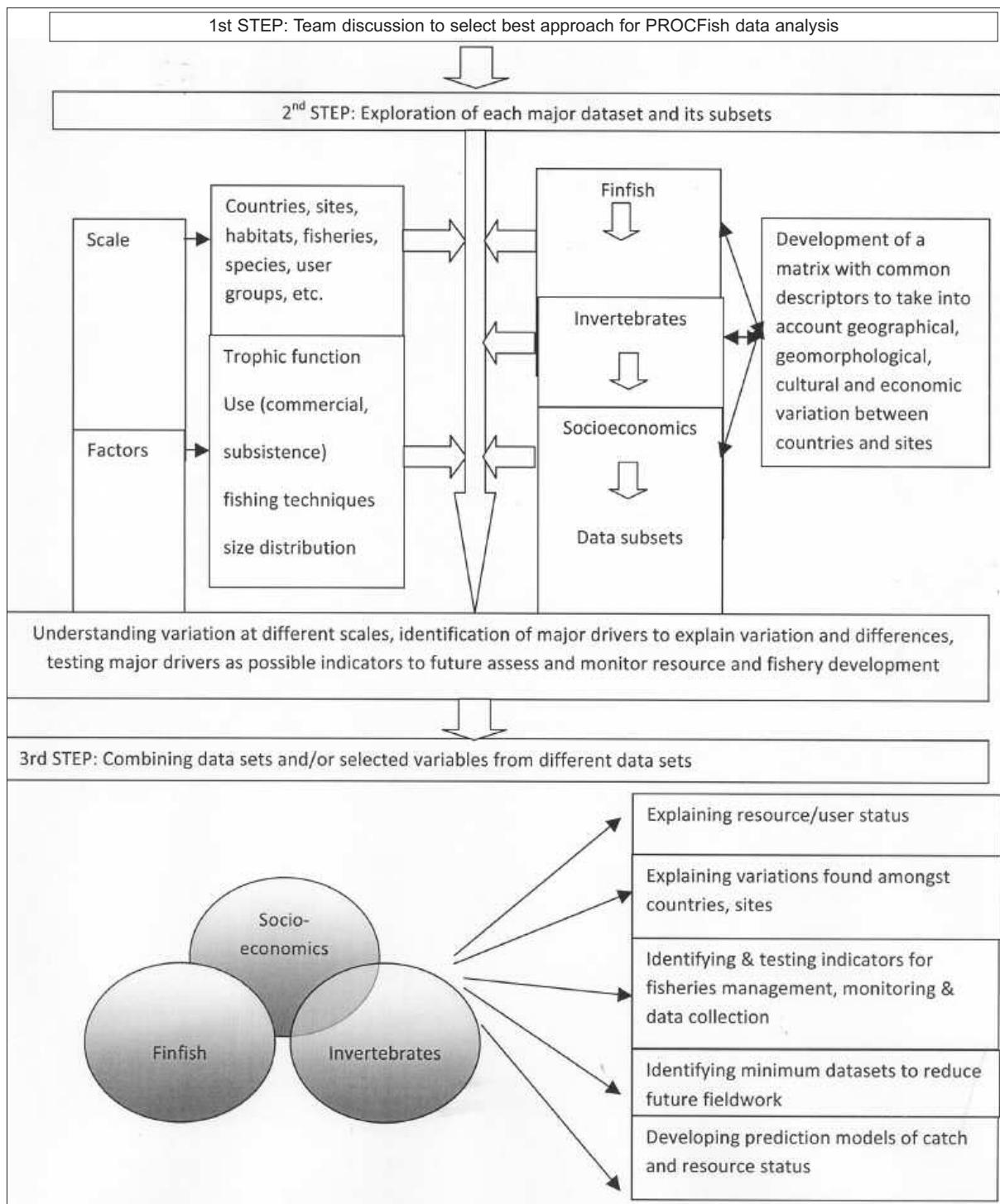
made up of Pierre Boblin, Silvia Pinca and Enelio Liufao from Wallis, and was assisted by Sione Vailala Matoto, Secretary for Fisheries; Ulunga Faanunu, Deputy Secretary for Fisheries; and Sioli Malimali, Mele Makasini, and Vea Kava, Fisheries Officers.

#### TONGATAPU

Tongatapu is a coral atoll with mean coordinates of 21°10' South and 175°10' West, and a lagoon that has the unusual feature of opening to the north, which gives it the shape of a crescent and should classify it in the pseudo lagoon category

(Figure 2). The sites do not have any clearly defined fishing areas and the inhabitants practice 'open access' fishing. The fishing surface area is about 10 nautical miles wide and 20 nautical miles long, and fish traps are used in some locations (Figure 3). There were three different habitats to survey, i.e. coastal, outer and back reefs, but there was a total lack of intermediate reefs due to the lack of a lagoon. Therefore, the sampling plan called for 18 transects by village, six per habitat.

The state of resources in this reef complex is very poor and the zone has been seriously impacted.

**Figure 1: Steps taken in analysis of regional dataset**

Densities were so low it was difficult to quantify them and the observed sizes were particularly small; most of the fish counted were post-juveniles, if not actual juveniles. The rare adult-sized fish had an immediate flight response and did not return. The observations of those fish were made by divers at a distance —

often more than 10 meters; the response of the fish therefore confirms excessive spearfishing. The already low biodiversity risks becoming even poorer in the future if fishing pressure is not reduced. Divers also noted a total absence of apex predators. Density and biomass of fish were dominated by the herbivo-

rous Acanthuridae and Scaridae. The most important species in terms of biomass and density were small-sized species of those two families, such as: *Ctenochaetus striatus*, *Zebrafoma scopas*, and *Chlorurus sordidus*. Biomass of other families was extremely low. Mean sizes of major families were particularly

small: Balistidae, Labridae, Lethrinidae, Lutjanidae, Scaridae and Siganidae displayed mean size below 50 per cent of the maximum values, indicating the effect of heavy fishing.

The Atata Island reserve was recently created and two transects were done windward and leeward of this zone. It was interesting to note that the reaction of fish there was completely different from the reaction of fish in the other sectors; obser-

vation distances there were shorter and there was almost no flight reaction. This proves that fishers respect the restrictions in this reserve and that such areas are needed.

Overall, the western village in Tongatapu, Manuka, appeared much poorer than the eastern village of Haatafu, in terms of diversity of species, density of commercial fish, average size and size ratio of fish as well as biomass. Both back and outer reefs were particularly poor, with the lowest density, biomass and diversity of fish among all the sites surveyed. Live coral cover was also very poor in the outer reefs.

#### THE HAAPAI GROUP

The Haapai island group is located at the mean coordinates 19°4' South and 174°25' West. It comprises a multitude of small coral atolls often bordered by motu, coral islands, and volcanic islands, one of which still shows signs of reduced activity in the form of fumaroles (Tofua Island). The volcanic island of Lofanga, located in the southwest of the island group at the coordinates 19°49.2' South and 174°33.3' West, is a slightly elevated piece of land (maximum altitude 15 meters), which has no lagoon and is inhabited by a community of about 300 people. The village is only accessible by sea from the west or south-eastern coast. It is about 1 nautical mile long by 0.5 nautical miles wide. The fishing area, excluding the island itself, includes, to the north and northwest, the lagoon reef complexes of Hakau Houaulu (3 x 0.8 nautical miles, the motu of Niniva included) and Hakau Lahi (2.6 x



**Figure 2 (top): Map of sampling sites in Tongatapu**

**Figure 3 (middle): Fish trap in Tongatapu**

**Figure 4 (bottom): Sampling sites in the Haapai group**

1 nautical miles, the motus of Nukupule and Meama included). Southeast of Lofanga, fishers also use the reefs on the small islands of Makauata and Luangahu, along with about a dozen other reef microstructures, each no more than 200 meters in diameter. Figure 4 shows the survey sites.

At Lofanga village there are only two types of reef habitat: outer reefs and back reefs. This fishing area is not exclusive, although logically it is preferred by the local community as it is closer and has more fish. There are no fishing reserves; however, there does seem to be an overall willingness to create a protected area, and this came through at the fishing group meeting on the island.

The status of the resources is mediocre, and the fish have an instantaneous flight reflex at certain sites, only returning much later and always keeping a great

distance. Densities were average and sizes were below normal. There were some good-sized fish, but they were very rare. As to the number of species, this was relative to the distance from the centre of biodiversity — that is to say rather poor, and also poorer than countries to the East of Tonga. The existence of *Siganus niger*, endemic to Tonga, was confirmed. Big predators were rare, particularly sharks and Epinephelidae.

Koulo is a village located at the northern end of the coral island of Lifuka at the mean coordinates of 19°46' South and 174°20' West. In the eastern part, a barrier reef exposed to the prevailing winds is not accessible by sea, and the northern part of the island is linked to the island of Foa by backfill and a road. The fishing system is open access, which is why all of the western part of Lifuka and the southern part of Foa were sampled. There are only two types of habitat at

this site, i.e. outer and back reefs. We were not able to categorise the reef structures along the island as coastal since there was no terrigenous effect due to the lack of rivers and mangroves.

Our initial impressions were quite clear from the first dives and only grew stronger with time. Fish swam away very quickly and the biggest ones kept a good distance. Densities were very low and sizes were small, particularly in the southern part of Lifuka; this was true for all the species. In the northern part of the site, i.e. the southern part of Foa, we were able to note an appreciable difference: numbers were higher and specimen sizes larger. But the impact was still high at this site and the general status of resources was very poor. The level of biodiversity was similar to the level at the other two sites. Here again, we observed the local *Siganus niger*. No sharks or large predators were recorded.



## GIS/RS conference

The yearly Geographic Information Systems and Remote Sensing (GIS/RS) Pacific Users Conference was held at the University of the South Pacific (USP) in Suva, Fiji Islands, from 2 to 5 December 2008. It brought together practitioners from Pacific Island countries and territories (PICTs) and Council of Regional Organisations in the Pacific (CROP) agencies as well as representatives from GIS/RS software and services companies and global positioning system (GPS) equipment companies.

During the workshop we presented the use of open source software OpenLayers to build Web-based GIS applications and provided many examples

and code snippets. This technology allows the display of geo-

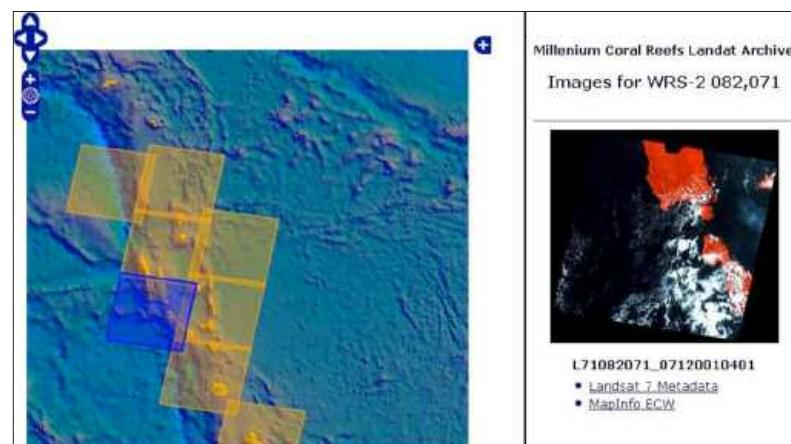
graphic information on top of existing base layers provided by



**Figure 5: Position of PROCFish/C survey stations**

Web map servers (WMS), Google Maps, Virtual Earth or raster images (Figure 5).

OpenLayers is used within the PROCFish/C portal to deliver GIS/RS products to fisheries officers, in particular compressed Landsat images of reef areas for direct use in MapInfo (Figure 6). Participants expressed their interest in this software as it is a free alternative to commercial systems, and is sufficient when the need is limited to map display and basic interaction.



**Figure 6: Landsat image footprints showing what images are available**



### Annual science day in Noumea

The annual science day organised by the non-governmental organisation (NGO) Symbiose was once again hosted at the Secretariat of the Pacific Community (SPC) compound. For the event, the PROCFish/C invertebrate team and the Information Section organised a stand to familiarise the public with marine invertebrate identification. A 140-litre aquarium was installed, holding about 35 different species of gastropods, bivalves, crustaceans, sea cucumbers and other echinoderms collected around Noumea during the two weeks preceding the event.

Using the SPC poster 'Marine Invertebrates of the Pacific Islands' (Figure 7), which describes 55 of the most commonly used invertebrate species of the region, children and adults had to identify the species presented in the aquarium. It was a real challenge for those without a trained eye. The winners were rewarded with SPC pens, lanyards and inverte-

brates posters. The playful aspect of the game and the many species unknown to most

visitors created a craze around the aquarium, making the day a real success.



**Figure 7: Marine Invertebrates of the Pacific Islands poster**