Improving biological knowledge of deepwater snapper in the Pacific

Deepwater snapper are an important fisheries resource in several Pacific Island countries, where they support important domestic and export markets. Observations of localised depletions in some fisheries have raised concerns about the sustainability of current fishing rates. However, quantitative assessments of deepwater stocks in the Pacific region have been limited by the lack of adequate biological and fisheries data. SPC's Oceanic Fisheries Programme (OFP) is working on several fronts to improve understanding of the biology of deepwater snapper and other deepwater species in the region. New biological information will be used to underpin improved assessments and allow sustainable development of deepwater snapper in Pacific Island countries.

It is generally assumed that deepwater snapper are long-lived, slow-growing and late to mature, making them vulnerable to overfishing. However, there is surprisingly little information on the biology of most deepwater species to verify this assumption. The SPC OFP is implementing two biological sampling strategies to obtain detailed information on age, growth rates, mortality rates, maturity schedules and stock structure of deepwater snapper throughout the region.

The first approach is to conduct dedicated research cruises in several countries on remote seamounts that have received little historical fishing pressure. Biological samples from these cruises will provide a picture of what the biology of relatively unexploited populations looks like. The second approach is to collect biological samples from fishers after they land their catch in port. These samples allow estimation of what the biology of an exploited population looks like. Researchers can then compare the unexploited exploited populations to exploited ones to determine the impact of fishing.

The specific biological samples being collected include otoliths, gonads and fin clips (Fig. 1). Like trees, otoliths have distinct growth rings that can be counted to estimate the age of the fish. Growth rates can then be determined by relating fish age to fish size. Gonads are used by scientists to determine the sex of fish and the stage of reproductive development (e.g. immature, mature, spawning), and to estimate fecundity for females (Fig. 2). This information is important for fisheries management as it makes it possible to determine the proportion of the population that is reproductively active, which is required to estimate the ecological sustainability of the fishery. DNA from fin clips will be used to examine the genetic variability in deepwater snapper populations across the Pacific and to identify management units in Pacific Island countries.

The SPC OFP is also collaborating with Dr Kim Andrews, a geneticist at the Hawai'i Institute of Marine Biology, University of Hawai'i, who has recently discovered that one of the key target species in the deepwater snapper fisheries, the ruby snapper (*Etelis carbunculus*), may actually consist of two separate species (*E. carbunculus* and *E. marshi*) (Fig. 3). From the samples collected from the fishery in New Caledonia, *E. carbunculus* range in size from 28 to 115 cm fork length (FL), but *E. marshi* only range from 25 to 35 cm FL. The large difference in maximum size suggests that growth rates and maturity schedules are also likely to be different between the two species.

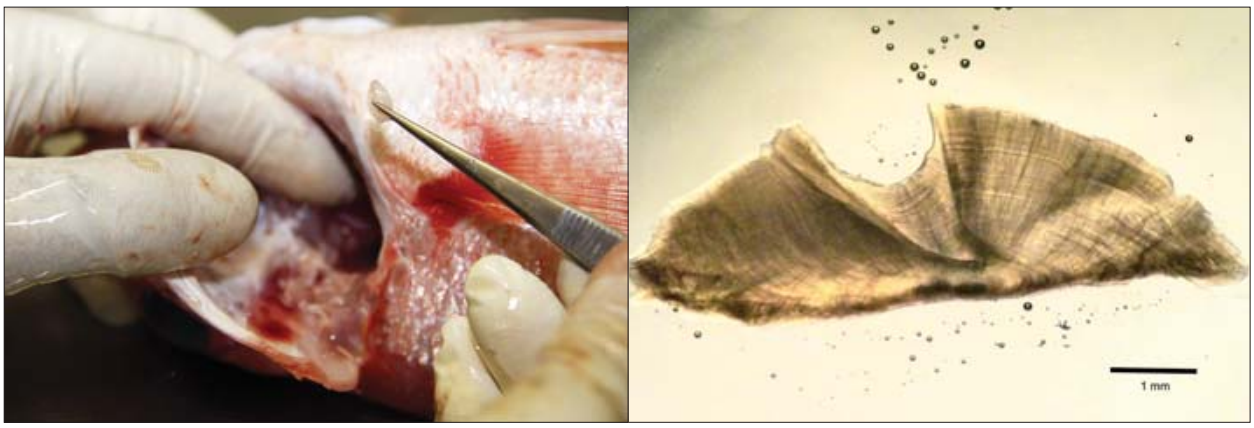

Figure 1.
*Left: an otolith removed from a ruby snapper (*Etelis carbunculus*).*
Right: a sectioned otolith from a ruby snapper viewed under a microscope.

Fin clips collected from individuals caught in New Caledonia have been sent to the laboratory at the University of Hawai'i for analysis, and morphometric measurements and photographs have been taken from each individual. Preliminary results have shown that approximately 15% of the ruby snapper sampled in New Caledonia were actually *E. marshi*. By comparing the results from the genetic analysis with images and measurements, SPC OFP scientists hope to identify reliable features that can be used to distinguish between the two species in the field. At this stage, SPC scientists have identified one consistent difference between the two species. All of the *E. carbunculus* collected so far have a small black margin on the upper lobe of the caudal fin (see white circle in Fig. 3); whereas all of the *E. marshi* do not have this feature (Fig. 3).

It will be important that these species are identified correctly in the catch records from deepwater fisheries because species with different biology are likely to respond differently to fishing pressure. The SPC OFP will be working closely with the SPC Fisheries Information Section to update the species identification booklet for deepwater species as necessary.

*Figure 2. Removing the gonads from an immature ruby snapper (*Etelis carbunculus*).*

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Figure 3.
*Two species currently described as a single species (*Etelis carbunculus*)*
*A: Ruby snapper (*Etelis carbunculus*); B: New species (proposed:* Etelis marshi*).*