Validating camouflage grouper, *Epinephelus polyphekadion*, spawning aggregations: A preliminary study from Fiji fisher interviews

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Reef fish spawning aggregations are exploited for both live and dead fish, for subsistence and, increasingly, for commercial use. In the Indo-Pacific, there are very few studies or long-term fishery datasets that provide information on the history and current status of exploited aggregations. Therefore, much use has been made of fishers' traditional and community knowledge to gather such information, following the pioneering work in this field by Robert Johannes (e.g. Johannes et al. 2000; Hamilton 2005; Hamilton et al. 2006; SCRFA country reports). It is important, however, to try to validate information from interviews to check species identifications and confirm sites and times of spawning. In doing so, it is important to work with local fishery officers and communities. It is also necessary to ensure the confidentiality of spawning site locations, at least until they are protected or managed, to safeguard them from further exploitation.

The following article is from newsletter # 8 (December 2005) of the Society for the Conservation of Reef Fish Aggregations (SCRFA), which has many more articles on spawning aggregations from around the tropics (see http://www.scrfa.org/server/whatsnew/newsletter.htm).

As part of an attempt to validate fisher interviews conducted by SCRFA in the western Pacific and Southeast Asia, a preliminary field validation was carried out in Fiji during the summer of 2005. Specifically, we wanted to confirm species, timing and locations of spawning aggregations of reef fish identified in interviews conducted since 2003.

Several fish species aggregate in large numbers in or near the channels and passes of Fiji's outer reefs for just a few months each year, although the timing for each species appears to vary substantially across the country. These species include several groupers, including camouflage grouper, *Epinephelus polyphekadion* (locally *kesala*), squaretail coralgrouper, *Plectropomus areolatus* (*batesai*), brown-marbled grouper, *E. fuscoguttatus* (*delabalea*), and the speckled blue grouper, *E. cyanopodus* (*raravuya*), as well as several other species such as a sweetlips, *Plectorhinchus chaetodontoides* (*sevaseva*), and emperor fish (Lethrinidae). Many of these species evidently spawn in large numbers at predictable locations, and have become severely reduced in the fishery as a result of fishing on those large aggregations. Between 2003 and 2005, interviews were conducted in a widely dispersed set of communities throughout the country to examine the status, species and history of exploited aggregations (see also the SCRFA database: http://www.scrfa.org/server/database/dbaccess.htm).

The validation study was conducted by interviewing fishermen in several different communities, and then by diving at four identified aggregation sites in outer reef channels during one of the identified spawning seasons. Catches on site were inspected and gonads examined, while fish traders in nearby urban areas were also interviewed. In 2003, interviews were conducted in fishing communities in Vanua Levu. In 2005, the same area was revisited during the reported spawning aggregation season and divers visited aggregation sites. The work was conducted in close collaboration with the Research Division of the Fisheries Department of Fiji's Ministry of Fisheries and Forests, and allowed us to confirm species identifications, aggregation condition, catch levels and gonad status at four aggregation sites during a key reported aggregation period.

The results of the 2005 summer visit confirmed the presence of camouflage grouper and squaretail coralgrouper, as indicated by previous interviews at reported aggregation sites. Observations of catches of these two species in the boats of fishers present at these aggregation sites also confirmed that these species were frequently caught, and were ripe and ready to reproduce. Small catches of other grouper species, such as *E. howlandi* and *E. cyanopodus*, were also observed, and individuals of these two species also had ripe ovaries.

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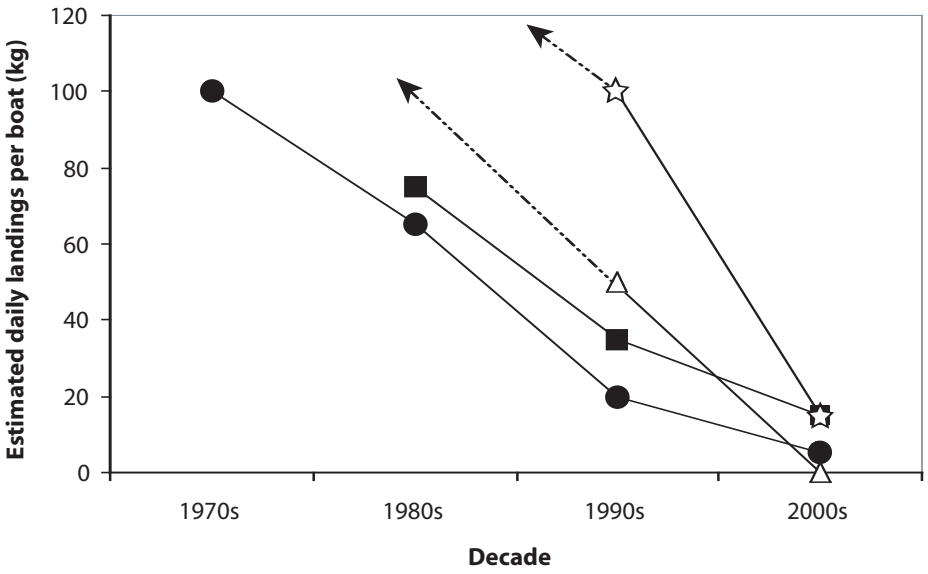

Figure 1. Camouflage grouper landings from four different aggregations in Fiji according to fisher interviews (2003–2005) and preliminary validation in 2005 (dash lines point backwards to decades when fishers reported "hundreds" of kg per trip). Each line represents a different aggregation site.

Overall, the results show classic signs of overfishing of aggregations and supported earlier interviews. From both the interview information, as well as from the on-site dives and catch inspections, it was clear that several aggregations of camouflage grouper, the species for which there is the most information, had probably been too heavily fished. During the 2005 summer visit, numbers of fish at aggregation sites were low, despite the time being a reproductive period; ripe fish, bulging with eggs, were seen at some of the sites and inspections of catches revealed many ripe gonads. Underwater observations of groupers at aggregation sites were fully consistent with the low numbers of fish being caught (i.e. low catch rates) by fishers during our visit, and with previous interviews. It is clear that there have been steady declines in catches of camouflage grouper at all aggregation sites surveyed, since at least the 1980s (Fig. 1). Catch rates are now very low compared with catch rates in the 1980s, sometimes with declines of 70% or more. One site in particular (white triangles in Fig. 1), previously reported to have been very productive for camouflage grouper, had no fish, and no fishing boats were on the site despite the excellent weather. Indeed, the nearby community in whose traditional fishing area (marine tenure system, known as *qoliqoli*) the aggregation site was located is so concerned over declines in recent years that they are discussing the possibility of establishing a fishing ban at the site.

The declining trends are also fully consistent with the information provided by two major traders/middlemen based in a nearby urban centre. About 200 boats now fish commercially for grouper along the Great Sea Reef during the aggregation season, according to middlemen, and this is at least 10 times more boats than 15 years ago. Moreover, to maintain catches to meet demand, boats now travel farther and spend more time at sea. All indicators are that the reef fish fishery, in general, is considerably more heavily fished compared with a decade or so ago, and that current levels of fishing pressure have caused serious declines in at least one species, the camouflage grouper, at all four studied aggregation sites.

Because a large proportion of annual landings of camouflage grouper was reported to be taken at spawning aggregation times, SCRFA submitted several recommendations to the government:[2]

- Facilitate community management of *qoliqoli* to protect aggregation sites from overfishing (e.g. reduce fishing effort on aggregations by com-

2. The results of this study were also presented and discussed at a workshop on reef fish fisheries held in July, 2006, in Suva (see article by Sadovy and Batibasaga, p. 38–39, this issue). The Minister of Fisheries and Forests gave the opening speech and called for much greater attention to be paid to managing reef fisheries in Fiji. The workshop was co-organised by SCRFA and Fiji's Fisheries Research Division.

munity regulations; reduce number of licenses issued, etc.), with government assistance for development of management plans and enforcement.
- Prohibit commercial use — including the purchase by government ice plants — of fish from spawning aggregations, and prohibit fishing by non-community members.
- Undertake educational initiatives to explain to communities why fish numbers are declining and what options are available to halt declines.
- Incorporate spawning aggregation sites in ongoing marine protected area designations.
- Prohibit night-diving, or diving with compressed air, on aggregations.

Summary

Fishers in fishing communities have a wealth of knowledge about their local fishery and its history. Interviewing fishers can be an effective way to compile such knowledge, and spawning aggregations, because they are so distinctive, lend themselves particularly well to the interview approach. However, validation of collected data with first-hand observations is advisable, whenever possible, to ensure the best recommendations for management, and great care is needed in collecting and interpreting data. As one example from our Fiji work, we found that *E. howlandi* (*varavara*) also aggregates at some of the sites, but in shallow areas. Since our original interviews had not included fishers working in shallow waters, interviews did not record this as an aggregating species. Poorly applied (i.e. by insufficiently prepared workers or poorly designed questionnaires), the interview approach can be a waste of time and effort or could lead to inappropriate or insufficient protection. As another example, interviews in Palau did not identify all aggregation months for certain groupers (subsequently identified by detailed field work), thereby resulting in insufficient management protection (Johannes et al. 1999). It is clear from my own experiences, as well as those of others who have conducted interviews, that familiarity with local fish species and fishing practices is essential to gain the respect and interest of interviewees. It is also important to ensure that questions are unambiguous and reasonable, and to examine responses for consistency among respondents. Importantly, interview occasions should be used to transfer information on exploited species back to communities. The confidentiality of aggregation site locations should also be maintained.

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