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Overfished coral reefs in American Samoa: no quick fix

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Major hurricanes strike American Samoa at intervals of about 3-9 years, so we see a cycle of coral reef disturbance followed by a lengthy period of recovery. The hurricane in 1991 was particularly bad -- many of our reefs were reduced to rubble and rolling hills of pink coralline algae with low-relief corals. But as the years progressed, coral growth was slow but steady and diverse thickets reappeared.

But a certain despair has crept into our view. The one thing that hasn't recovered much are the fish. That's hard to gauge, of course, if we don't know how many fish used to be on these reefs. Nonetheless, today we see what must be a shadow of former population abundances -- there are relatively few and/or small sizes of the species commonly taken for food. Figure 1 shows the pooled lengths of all surgeonfish, unicornfish, parrotfish, snappers, emperors, groupers, jacks and sharks sighted during extensive surveys on the reef slope at the 10-m depth. It is readily apparent that few fish were 40 cm (16 inches) or larger in total length (TL). Those data were derived from belt transects 3 x 50m. When wider transects (20 x 50 m) were used to focus on species that are diver wary and/or particularly vulnerable to exploitation due to the large sizes they can attain (70-200 cm), the same pattern emerges (Fig. 2). These include sharks, maori wrasse and several large species of parrotfish, but all were less than 60 cm (24 inches) on Tutuila Island. This depressing picture is not a sudden event – surveys in 1996 (Green 2002) and 2004 (R. Brainard, NOAA, pers. com.) document that local reefs have had few large fish for at least 8 years. Bohnsack (1998) notes the tremendous loss of spawning potential this can represent – one large female red snapper (61 cm) has the spawning potential of 212 smaller females (42 cm).

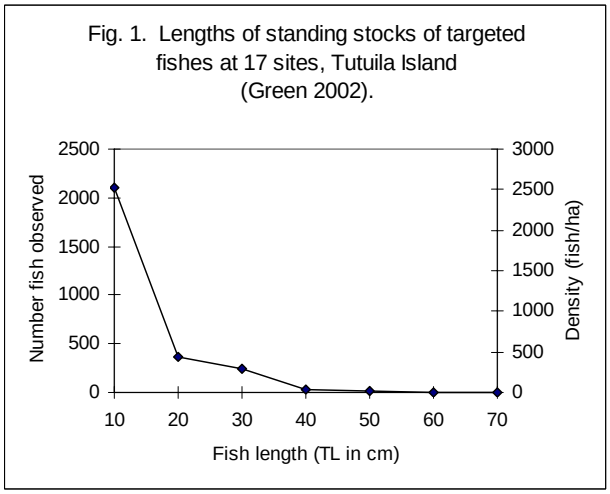

Fig. 1. Lengths of standing stocks of targeted fishes at 17 sites, Tutuila Island (Green 2002).

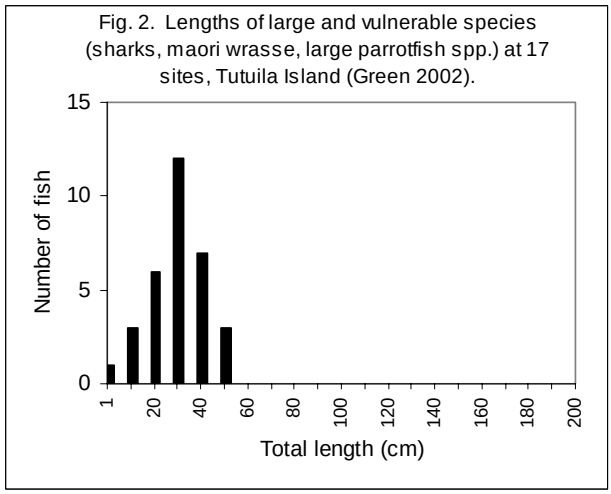

Fig. 2. Lengths of large and vulnerable species (sharks, maori wrasse, large parrotfish spp.) at 17 sites, Tutuila Island (Green 2002).

Observing the post-hurricane recovery of corals in the territory, a visiting ecologist captured the problem when he remarked that it was as if "the house had been rebuilt, but the rooms were empty". Where were the fish?

We don't mean to imply that hurricanes caused these problems. A much more likely culprit is fishing pressure. The consensus among local biologists and visiting coral reef experts is that American Samoa's reefs have simply been overfished, and some research supports this. Even though current levels of fishing do not seem excessive, the area of our reefs is rather small and consequently it is easily fished out. Fish stocks may well have been depleted years ago -- knowledgeable locals and elder Samoans recall seeing far more fish on our reefs 25 years ago.

(over)

One straightforward solution is, of course, to reduce fishing pressure, but there is more to it than that. Another little-discussed factor may also be working to keep our fish stocks at a perpetual low level: their longevity (or lack of it). As more and more coral reef fishes have been aged, an unanticipated pattern is emerging: the fish are far older than expected. They can live on the reef for decades; maximum ages of 20-30 years are common, even for small surgeonfish. Forget the old idea that coral reef fishes are high-turnover populations that can be fished hard because they grow fast and die young. Most don't.

The realization that coral reef fish can be old is not merely interesting, it has significant management implications. A likely rationale for this life history pattern is that mortality of their young is extremely high, so a fish has to live and spawn for decades in order to insure that at least a few of its juveniles successfully make it back to a reef and grow to maturity. For all the millions and millions of eggs a fish spawns during its long lifetime, only two recruits per adult pair must survive to adulthood in order for the overall population to maintain itself at its current abundance. Successful recruitment must be a very rare event. And it would be even rarer if the number of spawners has been reduced to a skeleton population through overfishing.

We are looking here at an entrenched case of "recruitment overfishing" where fishing reduces the size of the adult stock to a point where production of larvae and subsequent recruitment are impaired. Further, the reduced gamete production of today's small population, coupled with naturally occurring years of recruitment failure, makes population recovery exceedingly difficult and may, in effect, hold the population down at a lower level of abundance, a sort of impoverished steady state.

We might perk up and say that's where the role of MPAs comes in as a vital conservation measure. True in concept, but unfortunately none of our MPAs provides long-term protection for harvested resources. None has an effective enforcement capability; indeed, the territory itself has limited ability to conduct marine enforcement activities of any sort. But that's not really the issue -- most fishing on the territory's coral reefs is completely legal.

Consequently, a meaningful recovery will require nothing short of a territory-wide reduction in the harvest of coral reef fishes for *at least* 10 years, with specific protection for the larger fish. That's what the long life span of the fish is telling us. There is no quick fix.

Additionally, a comprehensive recovery effort would need to address a number of related issues, particularly (1) the essential need to strengthen our MPAs, but also the need to (2) promote other sources of fish for consumption (such as the bycatch of pelagic fish caught by the domestic longline fleet), (3) develop a policy about imported coral reef fish (ie, we shouldn't transfer our overfishing problem to a neighboring country by importing their coral reef fish), (4) prohibit export of all coral reef products, (5) strengthen territorial fisheries regulations to prevent the introduction of overly efficient types of fishing gear, (6) ensure that fishermen are well informed about protected no-take zones, and (7) implement a long-term monitoring program that specifically provides quantitative data on these fisheries issues.

A balanced solution might still allow for some subsistence needs (which appear to be at a modest level and have been declining steadily over the past 20 years due to lifestyle changes), but any overall strategy would need to demonstrate an actual reduction in harvest and meaningful protection of resources in the territory's MPAs.

References

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