A network of small, community-owned Village Fish Reserves in Samoa

by Michael King & Ueta Fa'asili [1]

Summary

Under a community-based fisheries extension programme in Samoa, 44 coastal villages have developed their own Village Fisheries Management Plans. Each plan sets out the resource management and conservation undertakings of the community, and the servicing and technical support required from the government Fisheries Division. Community undertakings ranged from enforcing laws banning destructive fishing methods to protecting critical habitats such as mangrove areas. An unexpectedly large number of villages (38) chose to establish small Village Fish Reserves in part of their traditional fishing areas. Although by social necessity many of the community-owned reserves are small, their large number, often with small separating distances, forms a network of fish refuges. Such a network may maximise linking of larval sources and suitable settlement areas and provide the means by which adjacent fishing areas are eventually replenished with marine species through reproduction and migration. As the Fish Reserves are being managed by communities which have a direct interest in their continuation and success, prospects for continuing compliance and commitment appear high. Results confirm our belief that the responsible management of marine resources will be achieved only when fishing communities themselves accept it as their responsibility.

Introduction

In many countries in the tropics, inshore catches of fish and shellfish are declining. In Samoa, catches of seafood from lagoons and inshore reefs have been decreasing for over ten years (Horsman & Mulipola, 1995). Reasons for this decline include overexploitation, the use of destructive fishing methods (including explosives, chemicals and traditional plant-derived poisons) and environmental disturbances.

Despite concerns over declining fish stocks, government actions and national laws to protect fish stocks are rarely successful. This is due to many factors, including poor enforcement regimes and particularly the lack of community involvement. Fishing communities are often repositories of valuable traditional knowledge concerning fish stocks, and have a high level of awareness of the marine environment (Johannes, 1982). In addition, many subsistence fishers in tropical regions live in discrete communities that have some degree of control, either legal or traditional, over adjacent waters. Together, these factors provide an excellent basis to encourage and motivate communities to manage their own marine resources.

Methods

The community-based fisheries extension project began in 1995. After staff training, a culturally acceptable extension process was developed which recognised the village *fono* (council) as the prime instigator of change, while still allowing ample opportunities for the wider community to participate (Figure 1; also King and Fa'asili, 1999). Full field operations began in 1996.

Following an indication of interest, a village *fono* meeting was arranged to provide the community with information to allow either acceptance or refusal of the extension programme. If the *fono* accepted, it was then asked to arrange for meetings of several village groups, including women and untitled men *(aumaga).*

Over a series of meetings, each group held separate meetings to discuss their marine environment and fish stocks, decide on key problems, determine causes, propose solutions, and plan remedial actions. Problem/solution trees were recorded on a portable white board by a trained facilitator. Finally, a village Fisheries Management Advisory Committee was formed, with three people nominated from each group, to prepare a draft Village Fisheries Management Plan (assisted by Extension Officers) for discussion and approval by the village *fono.* One third of all village group meetings were for women only, and approximately one third of members of the management committees were women. The proportions for untitled village men were similar.

Each Village Fisheries Management Plan listed the resource management and conservation undertak-

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ings of the community, and the servicing and technical support required from the Fisheries Division. If the plan was accepted, the *fono* then appointed a Fisheries Management Committee to oversee the working of the plan.

Results

Within almost two years of full operation, fisheries extension staff attempted to introduce the extension programme in 65 villages. The extension process was rejected by nine villages and discontinued in a further four villages when extension staff noted a lack of community commitment (King & Faasili, 1999). So far 44 of the remaining villages have produced Village Fisheries Management Plans. The time taken from initial contact to approval of the plan by each village community averaged 13.4 weeks.

In their plans, communities included undertakings to support and enforce Government laws banning the use of chemicals and explosives to kill fish. Traditional destructive fishing methods, such as the use of plant-derived fish poisons *(ava niukini)* and smashing of coral to catch sheltering fish (*fa'amo'a* and *tuiga*), were also banned. Most villages made their own rules to enforce national laws banning the capture of fish less than a minimum size, and some set their own (larger) minimum size limits. Some villages placed controls on the use of nets and on underwater torches for spearfishing at night. Community conservation measures included collecting crown-of-thorns starfish (*Acanthaster planci* [L]), and banning the removal of beach sand and dumping of rubbish in lagoon waters. An unexpectedly large number of villages (38) chose to establish their own small Village Fish Reserves, closed to all fishing, in part of their traditional fishing area (see Figure 2, next page). The size of reserves ranged from 5,000 to 175,000 m^2.

Fisheries Division actions to support community undertakings included the provision of assistance with the farming of tilapia *(Oreochromis niloticus)* in freshwater (in 16% of villages), facilitating the purchase of medium-sized boats to allow community members to fish outside the lagoons (39%), and restocking giant clams *(Tridacna derasa)* in Village Fish Reserves (82%).

Giant clams have been heavily depleted in Samoa and ongoing attempts to breed from native species *(Tridacna squamosa* and *T. maxima)* have been hampered by the difficulty of finding enough large

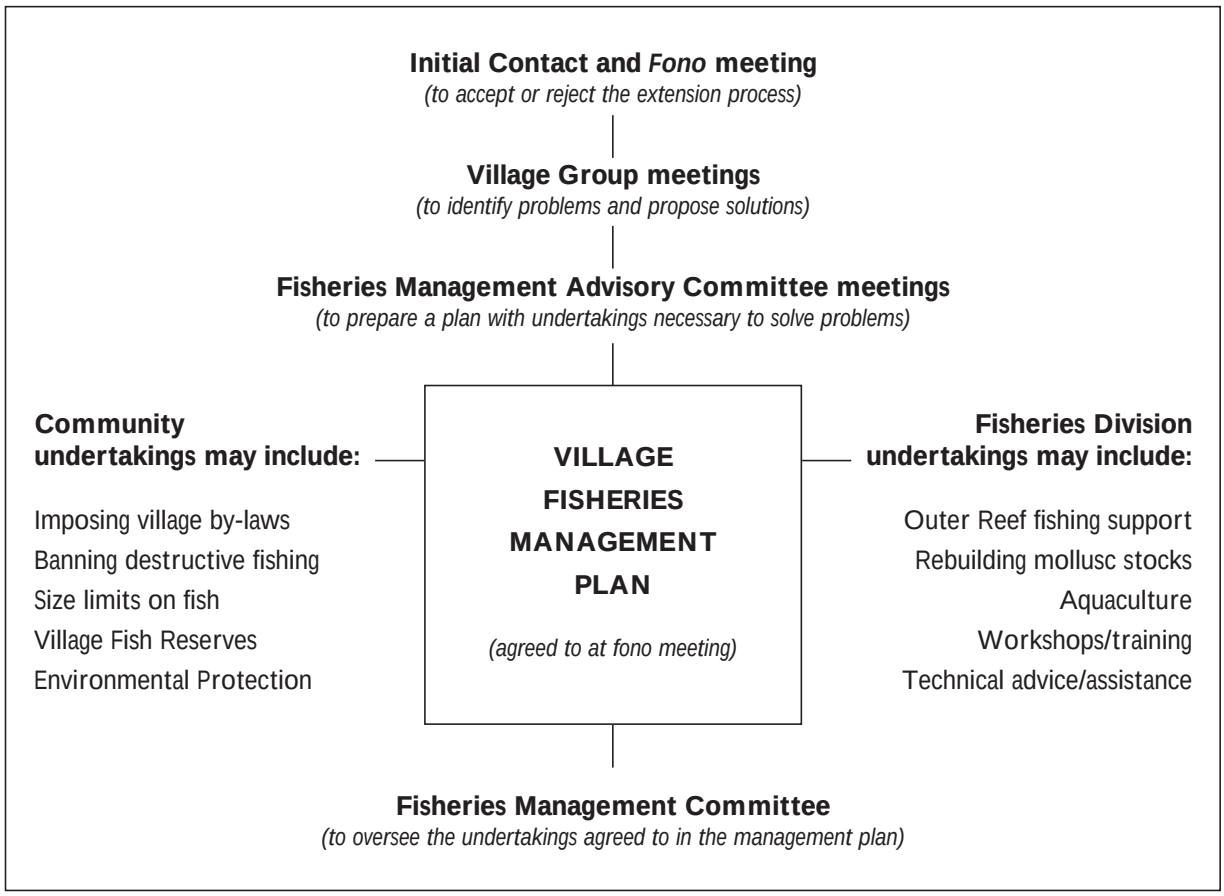

Figure 1: The community-based fisheries extension process in Samoan villages

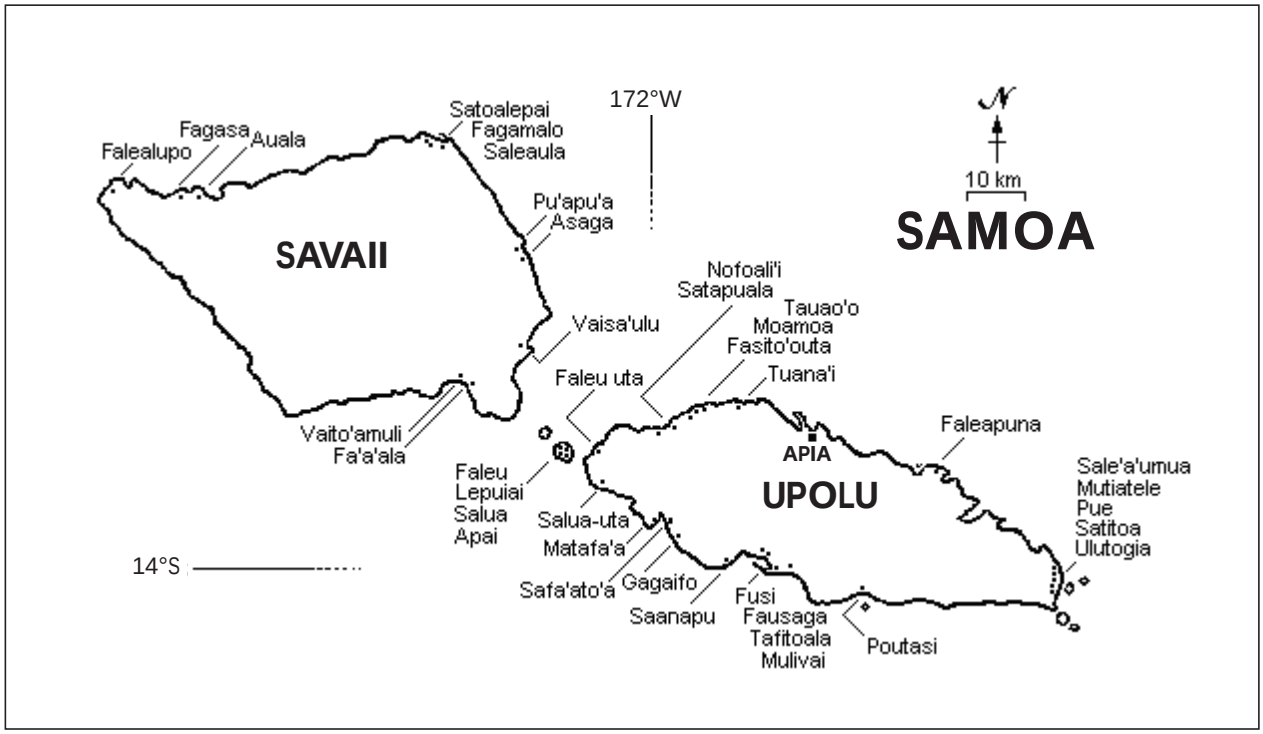

Figure 2. **Villages with community-owned Village Fish Reserves in Samoa.**

animals in the wild. Large numbers of a related species *(T. derasa)* were imported from American Samoa to fill the vacant ecological niche (for a photosynthesising filter-feeder). After a quarantine period, these were placed in village reserves to be monitored and cared for by communities. These translocations were regarded as low risk, involving hatchery-raised clams from an adjacent island, which is geographically, if not politically, the same country.

A quantitative assessment of villages with Fisheries Management Plans in place for over six months revealed that all but eight were still actively pursuing undertakings and enforcing conservation rules included in their plans. Villages received low scores for various reasons, including holding few village Fisheries Management Committee meetings, not enforcing village rules, failing to care for restocked clams and poorly maintaining their reserve signs and markers.

Discussion

Community-owned Fish Reserves may be discussed in terms of expected benefits to both villages and government. The community expectation is that, by banning fishing in part of its traditional fishing area, fish catches in adjacent areas will eventually improve. Although government authorities may share this expectation, there are additional public benefits relating to management, compliance and sustainability.

Because the Samoan Village Fish Reserves are being managed by communities with a direct interest in their success, compliance with bans on fishing is high and there are not the enforcement costs associated with national reserves. Most villages with reserves have actively enforced their own rules, and applied often severe penalties, including traditional fines of pigs or canned goods, for infringements. Some villages have made their village rules into fisheries by-laws, so they can be applied to people from other villages (Faasili, 1997). Community enthusiasm and commitment suggests that the prospects for continuity of the reserves are high.

The fisheries management benefits of marine protected areas are usually stated in terms of providing refuges in which invertebrate and fish stocks can grow and reproduce without interference. There is evidence that fish biomass increases, rapidly for some species, in areas where fishing is excluded (e.g. Roberts, 1995), and some evidence that this increase will result in higher catches in adjacent fishing areas (Roberts & Polunin, 1991; Alcala & Russ, 1990). Fish larvae, previously thought of as passive drifters, may be able to detect the presence of, and to swim towards, reefs several kilometres away (Wolanski *et al.*, 1997). This suggests that refuge-derived larvae may actively move to and repopulate nearby reefs. Alternatively, if larvae settle in the same area in which they were spawned, juvenile or adult fish may eventually move out of refuges in response to

increased crowding and competition. Tagging studies in South Africa suggest that excess stocks of fish in reserves move to adjacent exploited areas (Attwood & Bennett, 1994).

Ideally, a reserve should be located in such a position, and be of sufficient size, to encourage a significant increase in the numbers of sedentary species (including corals) and fish stocks. However, in the case of village-ownership there are often constraints on both position and size.

In Samoa, when a village had proposed a reserve in an unsuitable position (e.g. an area of bare sand or coral rubble), additional scientific information was provided to encourage the community to select a more appropriate site. Some villages initially elected to have very large reserves, and a few wanted to ban fishing in their entire lagoon area. In such cases, extension staff were obliged to curb over-enthusiasm, and ask the community to balance the perceived fish production advantages of a large reserve against the sociological disadvantages of banning fishing in a large proportion of the village's fishing area. In the latter case, although young men would still be able to go fishing beyond the reef, women (who traditionally collect echinoderms and molluscs in subtidal areas) and the elderly would be particularly disadvantaged in losing access to shallow-water fishing areas. A large reserve may also force people to fish in the waters of neighbouring villages, thereby increasing the potential for inter-village conflict.

In terms of total fisheries production, a small reserve is unlikely to be as effective as a large one. Larger reserves are more likely to provide suitable breeding areas for small inshore pelagic fish, such as mullets and scads, but studies in South Africa (Buxton 1996) suggest that even small reserves are beneficial for non-migratory species. Indeed, it could be argued that for non-migratory species the combined larval production from many small reserves is likely to be greater than that from a smaller number of large ones. However, as the interconnections between larval sources and settlement areas are poorly understood, this remains a hypothesis, which is not easy to test.

There is currently a proposal to subsume several existing small, single-village Village Fish Reserves within two larger MPAs which would be managed by districts rather than single villages (Kelleher, pers. com). If these larger MPAs contain some no-fishing areas, as is proposed, it is possible that two large reserves connected via a broken chain of smaller Village Fish Reserves may confer the dual benefits of linking larval sources with settlement areas and providing larger breeding areas for inshore migratory species.

In addition to the availability of people-motivating skills, the success or otherwise of community-based fisheries management depends on the availability of professional technical support for the communities involved. Scientific input is required to assist communities with alternative sources of seafood and to advise on and monitor community actions.

Whether community-based or not, most fisheries conservation measures, including the prevention of destructive fishing and the imposition of fish size limits, will cause a short-term decrease in catches. The same is so for Village Fish Reserves, as they reduce the area available for fishing. As most subsistence fishers require seafood for their families on a daily basis, it is unreasonable to expect fishing communities to adopt conservation measures which will initially reduce present catches of seafood even further without offering alternatives. Accordingly, the Samoan extension programme included the promotion and development of alternative sources of seafood to those resulting from the present heavy and destructive exploitation of near-shore reefs and lagoons. These alternatives included the introduction of medium-sized, low-cost boats (to divert fishing pressure to areas immediately beyond the reefs), the promotion of village-level aquaculture and the restocking of depleted species of molluscs in village areas. It is doubtful that community-based fisheries management would continue on a sustainable basis without such ongoing support.

Scientific input is also required to advise on, and monitor the effects of, village actions. For the community-owned Village Fish Reserves, this included providing advice on the placement of reserves, monitoring biological changes within the reserves, and collecting data on fish catches in adjacent areas. An additional benefit of fisheries staff working closely with communities is that the collection of scientific data on subsistence fisheries is greatly facilitated by community involvement. A large amount of information, and even estimates of sustainable yield by area, may be gained from such extensive surveys on subsistence fisheries. Where data are collected from different areas with similar ecological characteristics it may be possible to apply a surplus yield model (over area rather than time) to estimate not only the average sustainable catch, but also indicate villages where resources are presently under pressure (King, 1995).

The Samoan model appears applicable to other countries in which fishing communities have either traditional, *de facto* or legal control over their adjacent waters. In countries where this is not the case, it may be necessary to grant such rights (Territorial Use Rights in Fisheries, or

TURFs) as proposed in the Philippines (Agbayani and Siar, 1994) to facilitate community management and the establishment of Village Fish Reserves. Indeed, results in Samoa have confirmed our belief that, regardless of legislation or enforcement, the responsible management of marine resources will be achieved only when fishing communities themselves see it as their responsibility. If community actions include the declaration of even small Fish Reserves, this may contribute to fisheries and biodiversity conservation.

Finally, it should be noted that the small, community-owned, Village Fish Reserves in Samoa are not easy to classify under existing IUCN categories for MPAs. Category IV (Habitat/Species Management Area) appears to provide the best fit, although the category guidelines refer to national rather than community ownership. Given the increasing trend towards community-based management, the popularity of reserves as a fisheries conservation tool and the necessarily small size of village MPAs, there may be a need for another IUCN category for "networks of small, highly protected, community-owned MPAs".

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References

AGBAYANI, R. F. & S.V. SIAR. (1994). Problems encountered in the implementation of a community-based fishery resource management project, p 149–160. **In**: R.S. Pomeroy (ed.) Community management and common property of coastal fisheries in Asia and the Pacific: concepts, methods and experiences. ICLARM Conf. Proc. 45.

Alcala, A.C. & G.R. Russ. (1990). A direct test of the effects of protective management on abundance and yield of tropical marine resources. Journal du Conseil International pour l'Exploration de la Mer 46: 40–47.

ATTWOOD, C.A. & B.A. BENNETT. (1994). Variation in dispersal of galjjoen *(Coracinus capensis)* (Teleostei: Coracinidae) from a marine reserve. Canadian Journal of Fisheries and Aquatic Sciences, 51, 1247–1257.

BUXTON, C. (1996). The role of Marine Protected Areas in the management of reef fish: a South African example. Developing Australia's Representative System of Marine Protected Areas, Ocean Rescue 2000 Workshop Series. 114–124.

FA'ASILI, U. (1997). The use of village by-laws in marine conservation and fisheries management. Pacific Science Association Intercongress, July 1997, Fiji.

HORSMAN, N. & A. MULIPOLA. (1995). Catch data and collection from market surveys in Western Samoa. South Pacific Commission and Forum Fisheries Agency Workshop on the management of South Pacific Inshore Fisheries. Integrated Coastal Fisheries Management Project Technical Document. South Pacific Commission, Noumea.

JOHANNES, R.E. (1982). Traditional conservation methods and protected marine areas in Oceania. Ambio 11(5): 258–261.

King, M. (1995). Fisheries biology, assessment, and management. Fishing News Books/Blackwell Scientific Books. Oxford, England.

KING, M. & U. FA'ASILI. (1999).Community-based management of subsistence fisheries in Samoa. Fisheries Ecology & Management 6,133–144.

ROBERTS, C.M. (1995). Rapid build-up of fish biomass in a Caribbean marine reserve. Conservation Biology. 91(4) 815–826.

ROBERTS, C.M. & N.V.C. POLUNIN. (1991). Are marine reserves effective in management of reef fisheries? Reviews in Fish Biology and Fisheries, 1, 65–91.

WOLANSKI, E., P. DOHERTY & J. CARLETON. (1997). Directional swimming of fish larvae determines connectivity of fish populations on the Great Barrier Reef. Naturwissenschaften 84, 262–268.