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Use of Area Closures to Mitigate Interactions Between Large-Scale and Small-Scale Tuna Fisheries

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Introduction

The continuing development and expansion of Pacific fisheries targeting tuna and billfish is likely to lead to increasing conflicts among different user groups. A particularly difficult and divisive issue is the competition for these pelagic resources between industrial vessels, both foreign and locally based, and small boats operated by artisanal, subsistence and recreational fishermen. In some cases the conflict is intensified by differences in the economic status or ethnicity among fisheries participants.

The dilemma faced by Pacific island governments is how to reconcile potentially divergent economic, social and political goals in fisheries development and management. The economic incentive to accommodate the industrial fishing vessels of distant-water fishing nations within exclusive economic zones (EEZs) will continue to be strong for those countries that depend upon foreign fishing access fees for a significant portion of their recurrent government revenue. Currently, 1,332 foreign purse seine, longline and pole-and-line vessels are eligible for licensing in the region (Kingston 1997). In addition, there is an interest by many Pacific island nations in developing locally-based tuna industries in order to generate foreign exchange income and increase the overall economic benefits derived from their marine resources. One way this is being accomplished is by encouraging the build-up of locally-based industrial fishing fleets. At present, there are nearly 400 industrial-scale tuna vessels based in the region (Kingston 1997). Some of these vessels are owned by domestic or foreign private companies while others are operating in government controlled or owned ventures.

At the same time, the majority of Pacific islands have an interest in protecting and preserving domestic small-boat fisheries because of their importance as a source of food for local consumption, income and employment and as a means of preserving island communities and cultural values. The thousands of individuals that engage in these fisheries do so in wide array of wind-, paddle- or motor-driven canoes, dinghies and skiffs. Subsistence fishing from small boats continues to be an essential supplement to cash income in most islands. Artisanal fishing fleets have long been important suppliers of fish to domestic markets, and some small-scale commercial fleets are emerging as significant

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contributors of export products. Finally, recreational fishing is gaining popularity in many islands in the form of gamefish tournaments and charter boat industries serving a tourism-based clientele.

Conflict Between Large-Scale and Small-Scale Fisheries in American Samoa

The dilemma outlined above is well illustrated by the case of American Samoa. Small-boat operators in American Samoa have long protested that purse seine vessels supplying fish to the two local tuna canneries occasionally set their nets near the fishing grounds of the small-boat fleet. Fishermen claim that the seiners intercept fish migrating to local waters and reduce the supply of skipjack tuna and other pelagic species available for capture by artisanal, subsistence and recreational fishermen. In addition, there have been complaints for many years that a portion of the fish landed by the large tuna vessels enters the local market, creating an oversupply and depressing prices for fish caught by small-scale commercial fishermen.

Recently, fishermen in American Samoa have also become increasingly concerned about the possible adverse impacts of fishing by large longline vessels on the catches of small longline boats. In the last few years, four domestic longline vessels ranging in length from 20 to 36 m have become based in Pago Pago. These vessels are harvesting albacore, yellowfin and bigeye tuna, most of which is currently sold to the local canneries. In time, the vessel operators would also like to supply high-quality fresh tuna to overseas markets. The species caught by the large longliners are also targeted by small *alia* catamarans equipped with longline gear. There is growing apprehension among these artisanal fishermen that additional large United States longline vessels will seek new fishing opportunities in the EEZ around American Samoa as fisheries in other areas of the U.S. EEZ become increasingly depleted or restricted. The small-boat operators contend that in a competition with large vessels over common resources they will likely lose against vessels with greater fishing power and range.

For its own part, the American Samoa government has attempted to be supportive of both the large-scale and small-scale fleets. On the one hand, the government has sponsored over the years multiple projects and activities intended to assist in the development of economically viable artisanal fishing enterprises (cf, Itano 1996). The offshore artisanal fishery in American Samoa began in earnest during the early 1980s with the introduction of the FAO-designed *alia* catamaran. The number of vessels participating in commercial pelagic and bottomfish fisheries quadrupled between 1980 and 1985. Almost all of the commercial catch of pelagic species was taken by trolling near fish aggregating devices (FADs) deployed by the government (Craig et al. 1993). More recently, the adoption of longline gear by artisanal fishermen has opened up new profitable opportunities to harvest large albacore, yellowfin and bigeye tuna. Longline catches by the small-boat fleet rose from nearly zero prior to 1994 to more than 363 mt in 1997.

The government also acknowledges the non-monetary value of the small-boat fishery and has supported studies to document these benefits. Despite increasing commercialization of fish harvests in American Samoa, subsistence fishing remains an integral part of the island economy (Ponwith 1992). Furthermore, subsistence fishing continues to contribute to the integrity of Samoan culture which is organized around a complex web of family, kinship and village expectations and obligations (Severance et al. 1998). The methods and equipment for catching skipjack tuna have changed, but

many of the fish landed are still distributed within villages according to age-old ceremonial traditions.

Lastly, the government has helped promote offshore tournament fishing ever since it began in the Territory in the early 1980s. Catches of tuna and billfish from tournaments are often sold, as most of the entrants are the local small-scale commercial fishermen. Typically, 7 to 14 *alia* catamarans and other small vessels participate in each tournament, which are held 2 to 5 times per year (Craig et al. 1993).

On the other hand, the American Samoa government recognizes that small vessels may not have the harvesting capability sufficient to support substantial participation in tuna fisheries. Small boats such as the 28-ft *alia* catamarans have a limited fishing range, are often restricted to fishing seasonally due to weather conditions and may lack chilling capacity to maintain good fish quality. Like most other Pacific island governments, the American Samoa government views tuna as a resource which is not yet fully exploited and is actively promoting tuna fishing as a growth industry. In its view industrial-scale fisheries offer the best opportunity to expand the local economy and help the Territory attain a higher level of economic self-sufficiency.

In particular, the American Samoa government is committed to supporting the local tuna processing industry. For more than four decades the canneries in Pago Pago have been the largest private-sector employers in American Samoa and its leading exporters. Loss of the industry would have a devastating effect on employment and income in the Territory as well as on the viability of the government's fiscal position. The American Samoa government is understandably reluctant to impose restrictions that may be perceived by the industry as unduly onerous. This deference extends to the principle suppliers of fish to the canneries - the U.S. purse seine fleet. The most productive fishing grounds of these vessels lie in the EEZ waters of Papua New Guinea, Federated States of Micronesia and other Pacific island nations far to the west of American Samoa. However, representatives of the purse seine fleet have expressed a concern to the American Samoa government that restrictions on their fishing activity in the EEZ around American Samoa may lead other Pacific islands to impose tighter constraints on purse seine fishing in the central and western Pacific.

With regard to fishing by foreign vessels in the EEZ around American Samoa, the American Samoa government has a new incentive to encourage such fishing. Recently revised U.S. federal legislation authorizes access fees paid by foreign vessels to be deposited in the coffer of the American Samoa government rather than in the U.S. Treasury. Given the mounting debts and major budget deficit that the American Samoa government is currently experiencing, it may well find it difficult to refuse an attractive offer of money from a foreign fishing company in exchange for granting the company fishing rights.

Documentation of Interactions Between Large-Scale and Small-Scale Fisheries

The predicament of the American Samoa government is complicated by a lack of data to document the existence and extent of interactions between large-scale and small-scale fisheries. An absence of hard evidence that a significant fisheries interaction is occurring is not unusual. The 1991 FAO Expert Consultation on Interaction of Pacific Tuna Fisheries noted that evidence for interactions is available for only a few tuna fisheries in the Pacific, and these interactions have been quantified for

even fewer fisheries (Shomura et al. 1994). Efforts to document interactions are hampered by inadequate fishery data, insufficient knowledge of the biology and population dynamics of the resource and a lack of understanding of the influence of the environment on tuna resources (Shomura 1996). However, by the Second FAO Expert Consultation on Interaction of Pacific Tuna Fisheries, held in 1995, a number of studies were available that provided at least an initial assessment of the impact of fishing by industrial fleets on the catch rates of small-boat fleets in certain areas of the Pacific basin.

For example, Hampton et al. (1996) examined possible negative impacts of purse seine fishing on artisanal catches in the EEZ around the Gilbert Islands of the Republic of Kiribati. Since 1990, purse seine catches, mainly by U.S. vessels, have increased dramatically in this area, reaching approximately 120,000 mt in 1993 (Hampton et al. 1996). The researchers found some negative effects of purse seine fishing on artisanal catches of yellowfin tuna when purse seiners fished within 60 nm or less from the shorelines of the Gilbert Islands. However, over large areas, e.g., within 300-600 nm of the islands, artisanal and purse seine catch rates of yellowfin tuna are generally positively correlated, suggesting that at this scale, variations in abundance or catchability of yellowfin affect both purse seine and artisanal harvests in the same way.

Muhlia-Melo (1996) provides evidence of interactions between large-scale and small-scale fisheries in the eastern Pacific. Japanese longline fleets began to expand fishing operations in the eastern tropical Pacific during the early 1960s with effort concentrated around the Baja coast of Mexico. The effort level of the longline fleet rose to 85 million hooks in 1976. Over this time period, longline tuna and billfish catch rates declined, and a parallel decline, particularly for striped marlin, was also experienced by recreational troll fishermen operating from coastal ports in Mexico.

The declaration of Mexico's 200-mile EEZ in 1976 and the subsequent enforcement of this zone between 1977 and 1980 produced a rapid recovery of overall gamefishing catch rates, most notably for striped marlin and swordfish (Muhlia-Melo 1996). However, entry of a limited number of longliners after 1980 was marked by another period of declining catch rates among both longline and recreational troll fishermen. In 1983, Mexico established a sport-fishery preserve which extended from the coastline to 50 nm offshore along the Pacific coast. Fishing by longline vessels was completely banned within this area, and in 1987 the prohibited fishing area was extended further offshore (Squire and Au 1990; Muhlia-Melo 1996). Squire and Au (1990) noted that the decline and recovery of the striped marlin catch rates reflected the fishing down and rebuilding of two localized near-shore areas where fish are attracted and regularly linger during their life cycle.

A more obvious type of interaction occurs when the gear in one fishery interferes directly with gear in another.⁴ An example of "physical" competition between large-scale and small-scale fisheries was clearly evident in Hawaii during the late 1980s (Pooley 1990). The Hawaii-based longline fleet increased from 37 vessels in 1987 to 75 in 1989, and then doubled again to 156 vessels in 1991. Many of these new longline vessels were recent arrivals from the United States mainland. The rapid influx of longliners precipitated heated confrontations between these vessels and the established local fishing

⁴This type of non-harvest competition between tuna fisheries was not examined in the 1991 and 1995 FAO consultations.

fleet consisting mainly of small troll and handline vessels. In addition to straining harbor facilities, the expanding longline fleet led to crossing and tangling of gear, gear wrapped around fish aggregation devices, crowding and restrictions on vessel movement and willful destruction of gear.

Use of Area Closures to Mitigate Fisheries Interaction-Related Conflicts

Progress has been made in assessing the nature and extent of interactions between some tuna fisheries, but most fishery managers confronted with an interaction-related conflict are not likely to have the necessary data collection, analysis and modeling to adequately document the existence of fisheries interactions or make reliable scientific predictions regarding the outcome of management options. Yet, simply concluding that all the necessary information to assess an interaction is unavailable is not going to diffuse the conflict (Anganuzzi 1996). The social tension and unrest associated with some perceived fisheries interactions often compel governments to take remedial action whether supportive data is available or not.

The American Samoa government is addressing the conflict between its large-scale and small-scale fisheries by proposing a spatial separation of different sized vessels. The current preferred management option is to prohibit the taking of tuna and billfish by fishing vessels larger than 50 ft from waters within an area that is approximately 50 nm of the baselines of Tutuila Island, Rose Atoll and the Manu'a Islands, and approximately 30 nm of the baseline of Swain's Island.

A similar area closure has been proposed in Samoa where fishing by a large number of *alia* catamarans in a limited area of the EEZ has led to competition and gear conflict between vessels (Chapman 1998). The Samoa government is concerned that these problems may be exacerbated by the entry of larger fishing vessels with greater fishing capacity. In March 1998, the government introduced regulations that would establish a 50-nm area around the islands of Samoa that is closed to fishing vessels greater than 50 ft in length (Chapman 1998).

The use of area closures to mitigate conflicts associated with potential interactions between tuna fisheries has a long history in the Pacific basin.⁵ As noted earlier, Mexico established a longline exclusion zone in 1983 to increase gamefishing catch rates. In 1981, the Solomon Islands prohibited foreign and domestic pole-and-line vessels from fishing within 500 meters of low water mark or within one nautical mile of any village in order to protect artisanal and subsistence fisheries. The arrival in the central and western Pacific of purse seine fleets from the U.S. and other distant water fishing nations in the early 1980s generated concern that these vessels would be competing for the same resources harvested by pole-and-line bait boats operating from bases in Papua New Guinea. This concern led to the establishment in 1981 of an area in the northern waters of Papua New Guinea that was closed to purse seining (SPC 1992). More recently, under the Treaty on Fisheries Between the Governments of Certain Pacific Island States and the Government of the United States implemented in 1989, several Pacific island nations have established closed areas to restrict the fishing area of U.S. purse seine vessels that have acquired access to fish in the region (Table 1).

⁵The use of area closures by Pacific island villages as a tool to conserve and allocate inshore marine resources has a much longer history.

In 1991, the United States established a domestic longline vessel exclusion zone around the main Hawaiian Islands ranging from 50 to 75 nm to prevent the gear conflicts described above between domestic longliners and troll and handline boats. Certain small longline vessels in Hawaii are exempted from the area restriction and all longliners are allowed in otherwise closed areas when bigeye tuna are seasonally closer to shore and small boat activity is relatively low.

A final example that will be mentioned is the 50-nm longline exclusion zone that the Republic of the Marshall Islands established around the atolls of Majuro and Kwajalein in 1996. The Marshall Islands government is promoting sportfishing activities for tourism, but sportsfishermen have expressed concern that trolling catch rates for game fish species such as blue marlin and yellowfin tuna have declined in recent years (Bigelow and Lewis undated). The sportsfishermen attribute the decline to the harvest of these fish by the locally-based longline fleet. The purpose of the area closure is to minimize interaction between the longline and recreational fisheries.

Discussion and Conclusion

The conflict between large-scale and small-scale fisheries that the American Samoa government is grappling with is occurring, or is likely to occur, all around the Pacific islands region. Spatial separation of fisheries may offer fishery managers an expedient way to address these contentious issues. Area closures are gaining popularity within the region as an effective method of allaying concerns about stock-mediated interactions (harvesting the same resources) and gear competition or interference between fisheries. Many, if not most, of the area closures in the region were established in the absence of quantitative data that could be used to document the existence and level of fisheries interactions. However, the implementation of area closures has often yielded beneficial results, not the least of which is an abatement of the bitter accusations and disputes that often arise when fisheries interactions are suspected of occurring.

By partitioning different sized vessels or gear types into appropriate areas and reducing the likelihood of conflict, area closures are consistent with Article 7.6.5 of the FAO Code of Conduct for Responsible Fisheries:

States and fisheries management organizations and arrangements should regulate fishing in such a way as to avoid the risk of conflict among fishers using different vessels, gear and fishing methods.

Moreover, the establishment of a closed area may help ensure that the fishing grounds that have traditionally been the most important to the small-scale fishing fleets will be reserved for their use. This allocation of fishing space is consistent with Article 6.18 of the Code of Conduct for Responsible Fisheries:

Recognizing the important contributions of artisanal and small-scale fisheries to employment, income and food security, States should appropriately protect the rights of fishers and fish-workers, particularly those engaged in subsistence, small-scale and artisanal fisheries, to a secure and just livelihood, as well as preferential access, where appropriate, to traditional fishing grounds and resources in the waters under

their national jurisdiction.

On the other hand, the establishment of an area closure may involve significant costs. Those Pacific island countries that depend upon foreign fishing access fees for a significant portion of their recurrent government revenue must weigh the benefits to small-boat fisheries resulting from the exclusion of large foreign vessels to certain waters against the costs in the form of foregone license fees that could otherwise have been obtained if access was unrestricted (FFA 1996a). In addition, the establishment of a closed area that excludes all large fishing vessels, both foreign and domestic, may discourage island residents from making potentially profitable investments in large vessels.

The monitoring and enforcement of an area closure will also entail costs that many island governments can ill-afford. However, it is possible that these costs may be reduced if vessels that harvest fish in more than one EEZ or on the high seas are required to carry an automated, satellite-based vessel monitoring system (FFA 1996b). Such surveillance systems have proven to be a cost-effective technology for the monitoring and enforcement of longline area closures in Hawaii, which total about 414,000 km².

Finally, it is important to note that area closures are not the only management option to mitigate interactions between large-scale and small-scale tuna fisheries. In response to the concern that purse seine activity may adversely affect the catch rates of the artisanal fleet, Kiribati imposed a limit on the number of licenses available to purse seine vessels seeking access to the Kiribati EEZ (FFA 1996a). In New Zealand regulations prohibiting the retention of marlin by commercial vessels operating in the EEZ are expected to reduce the competition between sport and commercial fisheries. Similar legislation has been proposed in Australia. These restrictions on inputs (e.g., vessels) or outputs (e.g., fish catch) have their own costs (Hunt 1997).

In conclusion, the statement by Shomura et al. (1996) that fisheries management decisions "usually only begin with scientific evidence and are completed within a milieu of politics and emotion" may be correct. However, that should not discourage fisheries managers from providing policy makers with an analysis of the expected biological, economic and social impacts of area closures and other management options (including the alternative of taking no action), even if these impacts can only be described in qualitative terms (e.g., Pooley 1994).

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Table 1. Areas in various Pacific island EEZs that are closed to U.S. purse seine vessels

Australia	Entire EEZ
Cook Islands	12 nm territorial waters
FSM	12 nm territorial waters
Fiji	Internal and archipelagic waters of main island group and 12 nm territorial waters from archipelagic boundary around main islands and Rotuma
Kiribati	Archipelagic waters between islands, 12 nm territorial waters and 2 nm from anchored fish FADs
Marshall Islands	12 nm territorial waters and 2 nm from anchored FADs
Nauru	12 nm territorial waters
New Zealand	Entire EEZ except northern part above 39°S west of main islands and above 40°S east of main islands. Within permitted area, 12 nm territorial waters and a further 6 nm are closed.
Niue	12 nm territorial waters around Niue and 3 nm around Beveridge, Antiope and Harans reefs
Palau	12 nm territorial waters around Palua and an area encompassed in an arc with a radius of 50 nm centered on reef entrance to Malakal Pass
Papua New Guinea	12 nm territorial waters and an area between 0°30' S–3°30' S and 149° E–153° E around New Ireland
Solomon Islands	Entire EEZ except for area between 4°20' S–8°S and 161° E–169°55' E
Tonga	All waters less than 1000 m in depth within coordinates 15°S–23°30'S and 173°W–177°55' W and 12 nm from islands of Teleki Tonga and Teleki Tokelau
Tuvalu	12 nm territorial waters and 2 nm from Macau, Kosciusko, Rose, Bayonnaise and Hera banks
Vanuatu	12 nm territorial waters and archipelagic and internal waters
Western Samoa	12 nm territorial waters, various banks and sea mounts and 2 nm from anchored FADs