

# **REPORT ON SAMOA'S LONGLINE FISHERY**

**Workshop on Precautionary Limit Reference Points for Highly Migratory Stocks Western  
and Central Pacific**

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## 1. Introduction

Samoa (Figure 1) is situated in the central Pacific and consists of two major islands, Savaii and Upolu and two smaller islands, Manono and Apoliina. The total land area is approximately 2,839 km<sup>2</sup> with a population of 161,298 people (1991 Population Census). The Exclusive Economic Zone of Western Samoa covers an area of about 120,000 km<sup>2</sup> and is the smallest in the South Pacific region.

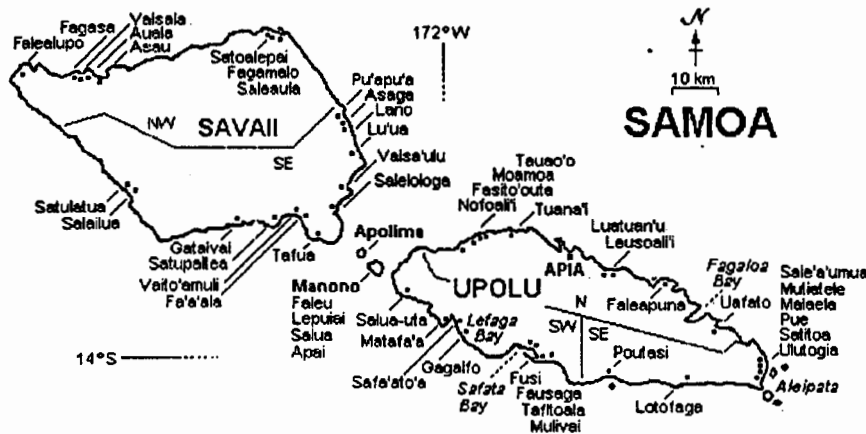


Figure 1. The map of Samoa

Samoa is not well endowed with vast lagoons and coral reefs like other Pacific islands, however, fringing reefs and barrier reefs enclosing lagoons surround all the islands. The reef and lagoon areas surrounding the islands have been estimated to be approximately 23,100 ha for depth less than 50 m (Johannes 1982). The mangrove and swampy areas have been estimated to be about 1,000 ha (Bell 1984).

Historically, the inshore lagoons and reefs have provided the local population with sustenance. This is still the case with marine organisms, including fish, crustaceans and molluscs, being the major dietary protein sources of many coastal communities. Likewise, these marine animals also provide the primary source of income for individuals and households in many coastal villages. With the increase in population, the demand for foods and income has significantly impacted on the commercialization of exploitable fishery resources, particularly tuna and deepwater snappers. Declining catches of inshore fisheries have also contributed significantly to the promotion of commercial exploitation of highly priced tuna species.

The inshore fisheries resources of Samoa are considered to be overfished (Zann 1983,1991; Helm 1989; King et al. 1995). Helm (1989) noted that the inshore resources have possibly exceeded their maximum sustainable yield. Horsman and Mulipola (1995) have suggested that the decline in fish and shellfish is due to the outcomes of overexploitation, the use of destructive fishing practices and environmental disturbances. Subsequently, since the early 1970's, local fishing efforts have been channeled predominantly to the development of the offshore fisheries (deepwater snappers and tuna species). Consequently, the export of tuna has now become one of Samoa's most important foreign exchange earners.

## 2. The longline fishery and how it was developed.

The development of the offshore fishery was initiated in 1975 under a FAO/DANIDA project which, resulted in the local production of a 28ft catamaran (*alia*) powered by a 40 hp outboard engine. The *alia* was used in the exploration and the exploitation of tuna and bottomfish species within the 30-40 miles radius of Samoa's EEZ. The program was considered to be very successful (Fisheries Annual Report 1983)

and resulted in more than 200 *alias* being constructed, significantly increasing fishery production during the 1970's and the 1980's.

Figure 2 illustrated the trends in landings of pelagic and deepwater species in Samoa between 1975 to 1992. Landings of pelagic species increased significantly from 1975 to 1983 due to the growth in fishing effort (number of *alias*). The sudden increase in the early 1980's (Zann et al. undated) reflects the highly successful introduction of fishing aggregating devices (FADS). The decline in landings of pelagic species from 1984 was due to the decline in fishing effort (number of *alias* and FADS) as the subsidised boat building and marketing programs began to wind down (Fisheries Annual Reports 1988). Skipjack and yellowfin tuna comprised the large proportion of offshore pelagic landings during the 1970's to the early 1990's. The species were dominantly captured using surface trolling.

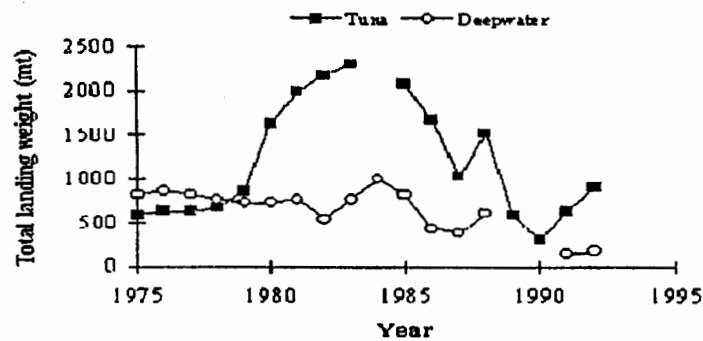


Figure 2. Landings of pelagic and deepwater fisheries in Samoa

With the assistance of government subsidies, more than 200 *alias* were constructed since 1975 (Figure 3). However the number of *alias* were dramatically reduced due to the damage sustained by two destructive cyclones, Ofa and Valeia in 1990 and 1991. Mulipola and Vaofusi (1992) reported that more than 70% of the active fishing fleet were damaged or destroyed, at these times.

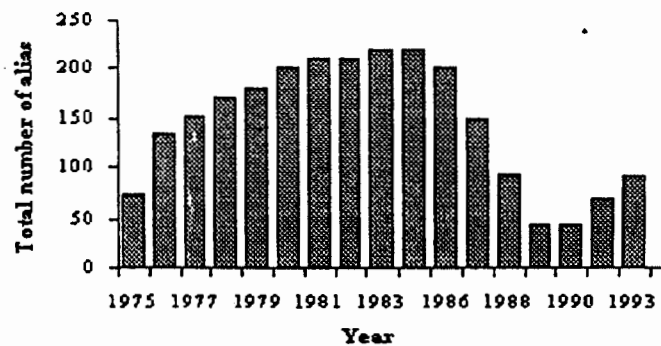


Figure 3. Total number of *alias* (motorised fishing vessels) reported actively engaged in the offshore fishery

The development of the longline fishery in Samoa started in 1991 with the assistance of the SPC Oceanic Fisheries Programme. Between March and July 1991, the Fisheries Division with the assistance of a Master fisherman from the SPC-OFP undertook trials using the Division's research fishing boat *Tautai Matapalapala* (42 ft) using vertical longlines around Fish Aggregating Devices (FADs). This trial program also provided the first demonstrations to locals of how to catch albacore and bigeye. To suit the existing size and the capacity of the *alia*, demonstration gear was modified and trials were conducted with these important gear and technology modification using hand-driven longline drums.

Results from the vertical longline trials conducted on the *Tautai matapalapala* and the *alia, Tautai Iapani*, suggested that a viable commercial fishery utilizing the existing fishing fleet could be sustained in Samoa. The first trial conducted on the 42 ft fishing vessel yielded a total of about 18899.9 kg of pelagic fish with a mean catch rate of 5.0 kg per dropline. Results utilising the *alia* catamaran with modified gear far exceeded those of the *Tautai matapalapala*. The *alia* trials produced a total of 2819.2 kg of fish (gutted and gilled) with an average catch rate of 15.0 kg per vertical dropline. In addition to the better catch rate, about 50% reduction in fuel was achieved for an average *alia* fisherman employing the longline method as compared to the surface trolling which was the commonly used tuna fishing method. The trials revealed that the albacore tuna could only be caught at depth around 45 fathoms or deeper in waters of Samoa. Realising the potential of the longline fishing technology for capturing highly commercial tuna species, the vertical longline gear was further revised and developed into a horizontal longline gear.

The simple longline gear presently in use on an average *alia* consists of a mainline (monofilament 1200 lb test) of about 5-9 miles in length with snood lines (4 yards of monofilament 450 lb test) spaced at about 45 yards intervals. With this simple arrangement the mainline can carry up to 350-500 hooks. Preliminary horizontal longline catch and effort samplings indicated that an average of about 6 fish (about 15 kg mean weight) is yielded per 100 hooks.

### 3. Longline fishery catches

The fisheries in Samoa can be divided into subsistence (village-level) fisheries and commercial (artisanal) fisheries. Furthermore, the commercial fisheries are separated into bottomfish (mainly deepwater snappers, emperors, etc.), inshore fish (parrotfish, surgeonfish, etc.), pelagic non-tuna fish (dolphinfish, marlin, etc.), and pelagic tuna (albacore, yellowfin, etc.).

The best current estimate of the domestic fishery catch in Samoa for both the export and subsistence was approximately 6,543 mt, valued approximately 31.6 million *tala* (Faasili and Time, 1997). Of the overall estimated total landings, about 33% were fish and invertebrates landed commercially for the domestic and export markets. Tuna and billfish from longline catches constituted more than 90% of the total volume of fishery items landed during the 1996/97 period.

Table 1 presents the annual totals of tuna (all species combined) between 1993 and 1997. These estimates were generated from local market samplings and from the export certification of exported fishery products (Fisheries Division Database). The total volumes and value of tunas and billfishes exported from Samoa between 1992 to 1997 are presented in Table 2.

Table 1. Yearly totals of tuna landings in Samoa

Year	Total Wt (mt)	Total Value (million <i>tala</i> )
1993/94	727.4	1.90
1994/95	763.0	1.70
1995/96	711.7	2.55
1996/97	1,908.7	12.40

Source: Fisheries Division Database

Table 2. Annual total volumes and values of exported tunas

Year	Total Wt (mt)	Total Value (thousand <i>tala</i> )
1994/95	85.2	152
1995/96	712.0	2,600
1996/97	1,772	11,770

Source: Fisheries Division Database

Official figure of exports released by the Samoa Central Bank show that fish exports have increased from \$70,000 *tala* in 1992 to \$2.287 million *tala* in 1996. However, the export figures may not be a true reflection of the situation as Stanley and Toloa (1998) suggested that export volumes can be lowered by as much as between 40-50%. The unreported export volumes may be due to the misrepresentation of exported volumes and the deliberately avoidance of the certification process by export agents.

Because of the under-reporting variable, the Fisheries Division believes that the annual estimates of tuna yielded from the long line fishery are best estimated from port samplings. Port sampling programme where catch and effort are sampled on a random basis was initiated in 1995. Financial support has been provided from the SPC- OFP to conduct a thorough and detail sampling of the longline fishery. Table 3 summarises the yearly estimated landings of longline catches over the past four years.

Table 3. Longline catch estimates generated from port samplings.

Year	No. <i>alias</i>	CPUE(kg/hk)	Avg hks no.	Avg trips/mnth	Est tot wt(mt)
1994*	20-30	0.750	250	15	843.8
1995*	40-50	0.600	300	15	1,458
1996*	80-100	0.287	350	20	2,200
1997**	160-180	0.226	400	20	4,000

\* FD Creel Census \*\* FD/SPC port sampling programme

The development of the longline fishery over the past four years saw the increase in fishing effort (numbers of *alias* and hooks). However, the catch rates have declined by about 70% since 1994. The decline (Figure 4) in catch may be due to increased fishing effort concentrated in only 35-40% of Samoa's total fishing area. The concentration of fishing effort is due mainly to the restricted and limited capacity of the existing fleet to explore further fishing grounds. The dramatic decline in catch rates in early 1998 is probably primarily due to the abnormal El Nino weather pattern

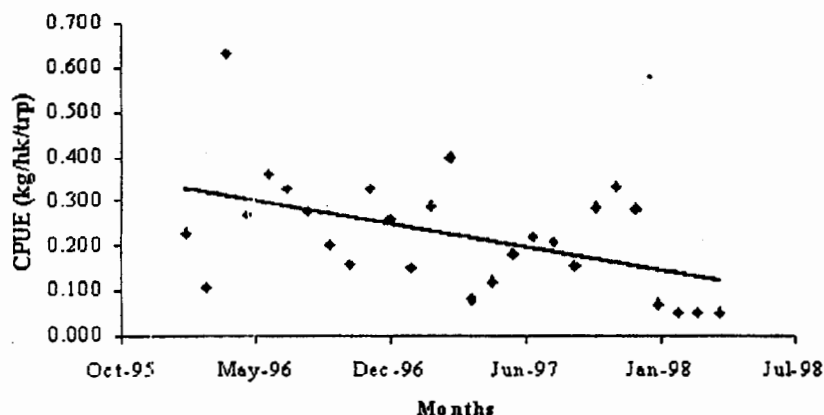


Figure 4. Monthly catch rates of the longline fishery between January 1996 and April 1998

The annual species composition of catches by the horizontal longline gear between 1994 and 1997 are presented in Table 4. Albacore and yellowfin are the two dominant species constituting more than 90% of total catch.

Table 4. Species compositions (percentage) of longline catches

Year	ALB	YFT	BYT	OTH
1994/95	70.8	27.2	1.4	0.6
1995/96	91.3	6.7	2.0	0
1996/97	62.0	37.0	1.0	0

Source: Fisheries Division Database

American Samoa and Hawaii are the two major final market destinations for exported tuna and billfish as shown in Table 5. More than 70% of the annual total exports of tuna and billfish were shipped or air freighted to the two canneries in American Samoa and to the Hawaiian markets.

Table 5. Final market destinations for exported tunas and billfish (percentage of wt)

Year	Am Sam	USA	AUST	NZ	OTH
1994/95	18.5	56.3	8.5	14.5	2.2
1995/96	77.3	15.3	6.9	0.2	0.3
1996/97	86.1	13.8	-	0.1	-

Source: Fisheries Division Database

4. Longline fishing fleet.

Figure 5 illustrated the trend of operative *alias* that are actively engaged in the offshore fishery between 1993 to 1997. In the past three years, more than 80% of the total existing fishing fleet is now involved in the longline fishery. There are 225 fishing vessels currently engaged in the longline fishery with 175 vessels being locally registered and based. The current fishing fleet is divided into three categories based on length, 166 *alias* in the 29-32 ft category, 6 *alias* in the 32-46 ft category and 3 vessels in the >50ft category. Moreover, it is estimated that more than 1,000 men and women currently participating in all components of the longline fishery industry in Samoa.

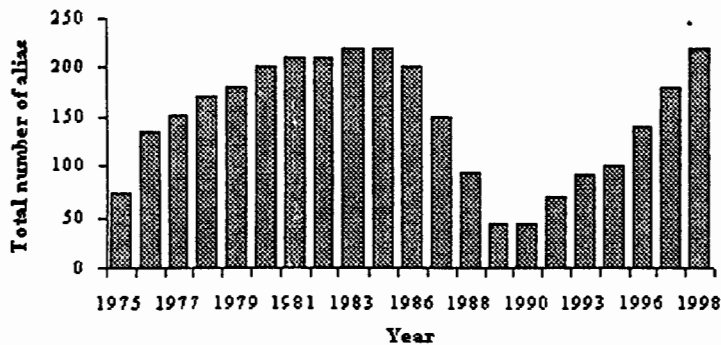


Figure 5. The trend of the motorised fishing fleet in Samoa between 1993 to 1998

The majority of longline fishing activities have occurred between 10-30 miles east of Savaii and on the northern and eastern sides of Upolu Island. Additionally a quite significant proportion of fishing is conducted on the east-southeast of Upolu. The Fagaloa Bay area on the northern side of Upolu Island is the most frequently fished area. The frequency of fishing trips per major areas in 1997 and the first four months of 1998 is presented in Table 6. Attached is the creel map for Samoa's longline fishery.

Table 6. Frequency of longline fishing activities in major fished areas.

Year	Fishing Area	Freq of fishing trips
1997	East Savaii-North Upolu (10-30 miles from coastal)	77.0%
	West-North Savaii (10-20 miles)	5.0%
	Fagaloa bay Area (10-20 miles)	12.1%
	Other areas	5.9%
1998	East Savaii-North Upolu (10-30 miles from coastal)	52.3%
	West-North Savaii (10-20 miles)	4.8%
	Fagaloa bay Area (10-20 miles)	30.9%
	East - SE Upolu (10-30 miles)	11.1%
	Other areas	0.9%

Apart from the US Multi-treaty access fishing vessels, four TROPAC Korean longline fishing vessels have current license to fish inside Samoa's EEZ until the end of 1998.

##### 5. Constraints of the longline fishery development

- The development of the longline fishery in Samoa has been associated with dramatic constraints relating to safety, over-crowding, gear sabotage, poor fish quality and the lack of proper and sustainable resources controls and management.
- The longline in Samoa is based on an FAO designed *alia*. The desire to maximise returns from the highly priced tunas and billfish resources has resulted in the production of larger *alias* by local builders. A large numbers of *alia* fishing boats have been built beyond the size recommended by the FAO/DANIDA project. Consequently, many of these new larger vessels have low endurance capacity and are incapable of sustaining high wave impacts. Between April and December 1997, more than 20 lives were lost together with vessels. It is suspected that the lack of skills in naval architecture and boat building have contributed to these losses (Faasili and Time, 1997). In addition, lack of safety and survival skills, exploration of much further fishing areas, engine failures and insufficient fuels have also contributed to loss of life and capitals.
- Due to the restricted carrying capacity of the FAO designed *alia*, many vessels are unable to carry sufficient ice to maintain good fish quality. Insufficient deck space of the *alia* has also contributed to poor onboard handling.
- Out of the 220 operative fishing boats, about 115 *alias* are based in Apia thus causing overcrowding for mooring spaces and fishing spots, and gear sabotage due to line crossing and line entanglement.

##### 6. Future prospects and developments

To resolve some of these constraints associated with the longline fishery, the Government has already developed a fishermen radio communication network, where every fishing boat is required under legislation, to carry a two-way radio. The radio is vitally important for monitoring fishing activities, search and rescue operations as the overcrowding problem is forcing many boats to seek more remote new fishing grounds.

The Government has also initiated a proposal to redesign a larger version of the *alia* to incorporate the following characteristics (Faasili and Time 1997):

- Built-in fish boxes with a carrying capacity of about 2 tons.
- Fish boxes insulated to keep ice for a 3 day fishing trip.
- Strong boat design to withstand rough weather including the installation of foam flotation for maximum buoyancy.
- Cabin designed to mount compass, two-way radio, and store charts.

- A new longline hauling system (hydraulic or other) to reduce labour requirements
- A system of mounted outboard motors with wheel steering

Incorporation of all the above characteristics into a new fishing *alia* will undoubtedly increase safety, markedly reduce loss of lives and greatly improve fish quality.

Recently the Government has approved the construction of a new wharf to accommodate the growing numbers of fishing boats requiring mooring spaces. There are also plans to upgrade existing storage facilities within the Government Fish Market, (proposed by one of the cannery companies from American Samoa). Additionally, the provision of well loading and unloading facilities is also planned as part of the Government effort to effectively promote the development of the longline fishery industry in Samoa.

To further assist the development of the longline fishery, the Government also intends to provide fishermen with the following assistance:

- Free training on fish handling and fish quality.
- Free training on fishing gear and methods.
- Rebate on fuel (Fishermen fuel subsidy) where custom duty on fuel is exempted.
- Training for fish exporters on HACCP plans.

One of the primary goals pertaining to the development and the management of the longline fishery in Samoa lies with its determination to research the potential of a sustainable level of the tuna resources. It is anticipated that annual allowable effort be determined from on-going sampling findings. SPC and the Samoa Fisheries Division are working together to assess the potential of the tuna resources to determine sustainable levels. It is envisaged that appropriate and practical management strategies can be identified as a result of the sampling program to sustainably manage Samoa's tuna and billfish resources.

## 7. References

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WESTERN SAMOA FISHING GRID ZONES

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