GOVERNMENT OF SAMOA
FISHERIES DIVISION
MINISTRY OF AGRICULTURE, FORESTS, FISHERIES
AND METEOROLOGY

SAMOA FISHERIES PROJECT
an **AusAID** - assisted project of the Fisheries Division,
Ministry of Agriculture, Forests, Fisheries & Meteorology.

Estimates of rejection in the Samoan tuna fishery

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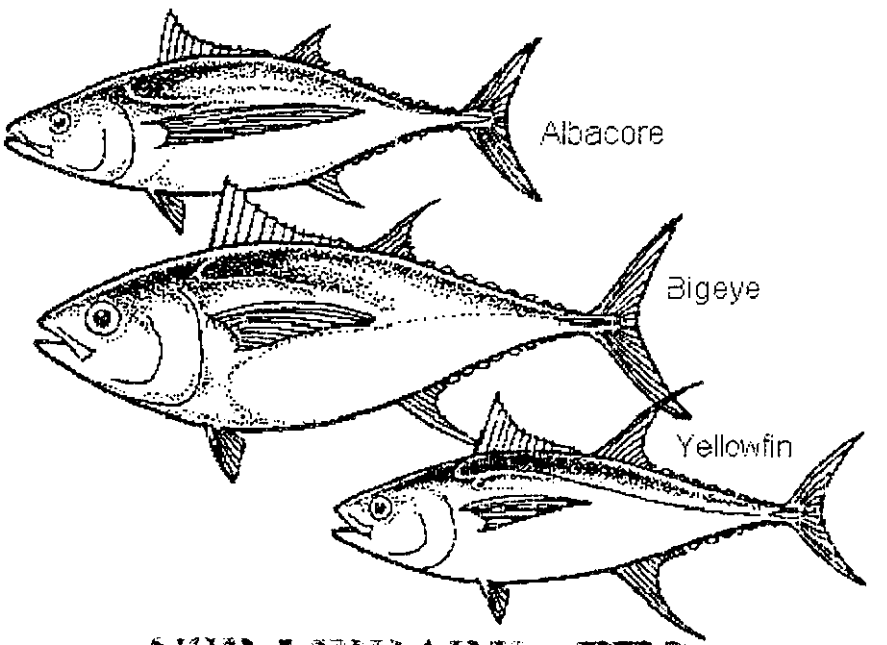
Project milestone 32, August 1999



Endorsed on behalf of the Fisheries Division

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CONTENTS

GLOSSARY

Alia	Samoan word for catamaran
EU	European Union
FAO	Food and Agriculture Organisation
FDA	Food and Drug Administration (of the USA)
HACCP	Hazard Analysis Critical Control Point
ST	Samoan Tala
SPC	Secretariat of the Pacific Community
USD	United States Dollar

EXECUTIVE SUMMARY

The offshore tuna longline industry in Samoa was virtually non-existent before the mid-1990s; since that time there has been rapid growth within the industry. In 1993, there were only 92 *alia* catamarans actively involved in commercial fishing activities, mostly trolling offshore for pelagic species. By 1998, over 250 vessels were participating in tuna longline fishing activities.

The rapid development of the tuna fishing industry resulted in catches of an estimated 2482 tonnes in 1996, 5747 t in 1997, and 6072 t in 1998. Two canneries, based in Pago Pago, American Samoa, imported an estimated 1520 t in 1996, 4300 t in 1997 and 4500 t in 1998 from Samoa. Also, an estimated 572 t of fresh chilled yellowfin, bigeye and some albacore were exported annually by air cargo from 1996 to 1998 to the United States. The substantial increase in catches from 1996 resulted in high rejection levels of fish delivered to the fish buyers in Apia and exported to Pago Pago, Hawaii and the United States mainland. A survey (which forms the basis of this report) was conducted in June 1999 to estimate the rejection of fish in the Samoan tuna longline fishery and to identify problem areas concerning fish quality. Results of the survey and associated investigations suggest that:

- The catches from the tuna longline fleet resulted in the export of approximately 2092 tonnes in 1996, worth ST$13.8 million, 4872 tonnes in 1997, worth ST$27 .5 million and 5072 tonnes in 1998, worth ST$29.6 million.
- The estimated number of tonnes of tuna rejected from the two canneries and the fish exporters in Apia was 154.4 tonnes in 1996, 382 tonnes in 1997 and 517 tonnes in 1998. Tuna rejection resulted in a loss of foreign revenue estimated at ST$756,560 in 1996, ST$1,871,800 in 1997, and ST$2,662,550 in 1998.
- Approximately 150 tuna longline vessels do not carry ice when going to sea. It is estimated that the present ice production capacity of 26,000 kg per 24 hours could supply only 70 vessels setting 500 hooks each a day.
- If the USA Food and Drug Administration (FDA) enforces its seafood import regulations, the tuna fishing industry in Samoa would be drastically affected. The industry is heavily reliant on the export of tuna to the United States.

The following conclusions and recommendations are made.

- A single government department should be responsible for seafood safety issues concerning the export of fish from Samoa.
- The Government of Samoa should establish a Competent Authority to monitor seafood safety requirements to assist with the export of seafood products to the European Union.
- An HACCP refresher workshop should be initiated to assist fish exporters in reviewing and updating their HACCP plans. *
- Ice production needs to be increased to meet the requirements of the tuna longline industry.
- Fish handling workshops should be initiated by the project to train local fishermen in techniques to maintain fish quality. *
- A workshop on tuna longline vessel parameters should be initiated by the Project to introduce fishermen to alternative vessel designs suitable for the fishery in Samoa. *
- The export of tuna for the fresh fish market would be enhanced by the provision of a refrigerated cool room to store fish near the airport.
- In order to de-centralise the fleet, and benefit the Savaii fishermen, the existing ferry operating between Upolu and Savaii needs to be replaced with a larger ferry capable of transporting freezer containers.

* Workshops and training suggested in this report will be discussed further with key players in the fishing industry before inclusion in the industry Training Needs Analysis planned under the project (milestone 25).

1. INTRODUCTION

Samoa is an independent Polynesian nation consisting of two major islands, Upolu and Savaii, and two smaller islands (Manono and Apolima) with a total land area of 2,934 sq. km. The island group lies at the western edge of Polynesia, between 13° 20'-14° 05' S and 172° 55'- 171° 15'W. The Economic Exclusive Zone is the smallest in the Pacific and covers an area of approximately 120,000 sq. km. The population is approximately 170,000 (Upolu 126,000 and Savaii 44,000), almost all of whom are indigenous. Approximately the same number of Samoans has migrated to other countries, particularly New Zealand. Thick tropical vegetation covers the islands except on recent lava flows. The shores are characterised by second growth woodland, pandanus and some areas of mangroves. Fringing reefs and barrier reefs enclosing shallow lagoons surround most of the islands.

As in most of Polynesia, fresh fish is in great demand throughout Samoa and a wide variety of subsistence and commercial fishing is practised. It is estimated that 5000 t of fish are harvested on the inshore reefs and lagoons (Mulipola 1997) and this level of exploitation is considered high in relation to the available resource.

Due to the limited inshore resources, some of which have declined from over-harvesting, the offshore pelagic resources have become increasingly more important. The tuna longline fishery now plays an extremely important role in the economy of the country. The tuna longline fleet catches resulted in the export of an estimated 5072 tonnes in 1998, worth approximately ST$29,581,400. This fishery is now the major export earner in Samoa.

The rapid development of the tuna longline fishery resulted in high rejection levels of the catch, both from the fish exporters and importers. A survey was initiated in June 1999 to identify problem areas within the Industry concerning the on board handling and processing of fish for export.

2. BACKGROUND OF TUNA LONGLINE FISHERY

2.1. Offshore Fishery Development

To reduce fishing pressure on the inshore reefs and lagoons, the development of an offshore fishery was initiated under a joint FAO/DANIDA project in the 1970s (Fa'asili & Time, 1997). The result was the introduction of a novel offshore fishing craft, an 8.5 m catamaran (*alia*). This design proved to be popular and successful as it was based on a traditional hull design. It provided a stable platform, it was fast enough to chase schools of tuna offshore and it was relatively inexpensive to build. The *alia* was originally fabricated from plywood, 8.5 m in length and powered by a 25 hp outboard engine. Approximately 120 plywood *alias* were fabricated in local boatyards between 1975 and 1979. Near the end of the 1970s boat builders began to use aluminium for construction of the *alias*. The vessels were lengthened to 9.0 m and powered by a 40 hp outboard engine. Over 200 of these vessels were built in local boat yards, some of which were exported to other countries (King & Fa'asili 1997). The *alias* were outfitted with up to four wooden hand reels, also developed in Samoa, and trolling booms. In 1991 two cyclones, (Ofa and Valelia) devastated the *alia* fleet. The fleet was rebuilt through US Treaty funds and by 1993, ninety-two *alias* were reported operational (Mulipola & Vaofusi, 1994).

Alias were used for two main offshore fisheries, bottom fishing in depths up to 400 m for deep-water snappers and trolling offshore for tunas and other pelagic fish. Bottom fishing activities generally took place 1 to 5 miles offshore depending on the outer reef slope. Catches of deep-water species averaged around 400 to 500 t through to mid the 1980s and peaked in 1986 at approximately 950 t (Anon 1998). The *alia* fleet also engaged in offshore trolling, mainly around Fish Aggregating Devices (FADs), deployed 5 to 10 miles offshore by the Fisheries Division. The trolling catch was mainly comprised of skipjack (*Katsuwonus pelamis*) and small yellowfin tuna (*Thunnus albacares*). Trolling catches averaged around 1,500 t through the 1980s and peaked in 1983 with 2,300 t (Anon 1989).

2.2. Tuna Longline Fishery Development

A survey conducted in 1989-1991 estimated that the maximum sustainable yield for the deep-slope species of snappers was approximately 80 t annually (King 1989). With little opportunity for expansion of the inshore fisheries, and growing population pressure, the Fisheries Division initiated a project in 1990 to introduce more efficient techniques to target offshore pelagic resources. A Master fisherman from the Secretariat of the Pacific Community (SPC) was recruited to conduct vertical and horizontal longline trials to target albacore (*Thunnus alalunga*), yellowfin tuna (*Thunnus albacares*) and big eye tuna (*Thunnus obesus*). Trials were conducted on the fisheries research vessel *Tautai Matapalapala* and later on an *alia* catamaran. Results of the trials were very promising with 4685 kg of targeted fish caught in 33 fishing trips (Watt et al. 1998). During the Master fisherman's visit local fishermen became involved in the project and fabricated vertical longlines to fish around FADs for large tunas. Some continued fishing using vertical longlines into the mid-1990s.

In 1994/95 a few fishermen began to outfit their vessels with horizontal longlines to target large tunas. They equipped their *alia* catamarans with a manual longline drum with a 5-7 mile monofilament mainline and 300-500 branch lines. This system proved suitable for their *alias* and was a very effective in capturing large tunas. The longline gear on the *alias*

was deployed and hauled in much the same manner as on larger commercial longline vessels that fish throughout the Pacific region. The mainline is set as the vessel motors forward, 30-60 m float lines with plastic pressure resistant longline floats are clipped onto the mainline to suspend it in the water. Twenty to thirty baited 8-10 m monofilament branch lines are clipped along the mainline spaced 50 m apart between the longline floats. The mainline once deployed is left to soak for 5-8 hours before being retrieved.

The success of the fishery generated a huge demand for new vessels. Many of the local boat builders modified the hull design to increase the carrying capacity and to enable the vessels to fish further offshore in more severe weather conditions. The height of the gunwales was increased by 20 cm and often the mounting area for the outboard engines was redesigned to accommodate two engines. In four years the fleet expanded rapidly to 230-250 modified *alia* catamarans which constitute 90% of all tuna longline vessels and 10-20 larger purpose built tuna longliners in the range of 12 to 24 meters. Approximately 10 of these larger vessels were imported in 1998 and the number is expected to increase further in 1999. The government has recently implemented a policy to limit the number of vessels over 15 m imported into Samoa under joint venture arrangements with foreign investors, to 10 vessels.

The main species targeted by the longline fleet are large (>15 kg) albacore (*Thunnus alalunga*) yellowfin (*Thunnus albacares*) and bigeye (*Thunnus obesus*). The majority of the catch is landed in Apia where six fish exporters are based. Some of the fish exporters also supply the fishermen with ice, bait, and fishing gear. In 1998, one of the exporters established a processing plant that provides services for over 30 fishermen at Salelologa in Savaii.

Albacore comprise approximately 65% of the tuna longline catch in Samoa. Two tuna canneries based close by in Pago Pago, American Samoa provide a market for fish buyers to export large volumes of the catch. The canneries almost exclusively purchase frozen albacore from the Samoan fish exporters. Exports of tuna from Samoa to the canneries increased from 8 metric tonnes in 1994 to 5072 metric tonnes in 1998. Bigeye, yellowfin and some albacore are also exported fresh chilled to Hawaii and the mainland of the United States, quality permitting. Fresh chilled exports into the United States have increased from 7 metric tonnes in 1994 to 572 metric tonnes in 1998.

With the rapid development of the fishing industry and the substantial increase in catches. the fishermen and exporters had difficulty maintaining proper fish handling and processing procedures. Often the fish supplied to the exporters was substandard as few fishermen carry ice to chill the catch. Many exporters were accepting fish even though they were aware that it had not been chilled at sea. In some cases, refrigerated containers were used to freeze large volumes of tuna. Refrigerated containers are designed to hold a product that is already frozen, not for freezing down fresh produce. Fish quality problems reached a peak in 1998 when 190 metric tonnes of tuna were rejected by the two American Samoan canneries.

3. SURVEY METHODS

A survey was initiated in June 1999 to determine the rejection levels of tuna delivered to the six fish exporters based in Apia and rejection of tuna exported from Samoa to American Samoa, Hawaii and the mainland of the United States. Sources of information for the survey consisted of a compilation of data collected from the Fisheries Division, the Central Bank and a questionnaire (see Attachment) that was distributed to all the fish exporters. The exporters were requested to answer questions concerning ice production capacity, cold room capacity, number of vessels carrying ice, species composition of fish exported, number of kilos of fish exported, percentage of the catch rejected by exporters and number of kilos of fish rejected by importers from 1996 to 1998. The fish exporters were also requested to comment on problems within the industry concerning the export of tuna. Five of the six fish exporters filled out the questionnaire properly. The two canneries in Pago Pago, American Samoa, were requested to provide the tonnage and the rejection levels of tuna imported from Samoa from 1996 to 1998. Interviews were conducted with fishermen to determine the percentage of the by-catch from longline sets and current fish handling practices. Air cargo agents were contacted to determine the tonnage of fresh chilled fish exported from Samoa and boat builders interviewed about catamaran hull designs suitable for carrying sufficient ice to chill tuna catches.

4. SURVEY RESULTS

4.1. Estimated catches of the tuna longline fleet, 1994-1998

Catches of albacore, yellowfin and big eye tuna have increased substantially with the rapid expansion of the fishing fleet since 1994. Estimates of catches in tonnes for longliners in Samoa are listed below in Table 1. All estimates for 1994-1995 were determined from information provided by the Fisheries Division and the Secretariat of the Pacific Community. Estimates for catches from 1996-1998 were determined from data provided by the VCS-Sampac cannery, data provided by the sole fish exporter who sells tuna to the Star Kist cannery, air cargo agents in Apia. an estimate of a 13% by-catch rate determined from interviews with fishermen and an estimate of fish rejected by the exporters of 5.0% for 1996, 4.4% for 1997 and 6.0% for 1998. Estimates of albacore, yellowfin and big eye were calculated from port sampling data to determine species composition of the total catch.

TABLE 1. ESTIMATED CATCHES BY TUNA LONGLINERS (Tonnes)

Year	Vessels Active	Albacore	%	Bigeye	%	Yellowfin	%	By-Catch	%	Total
1994	25	641	76	14	2	73	9	116	13	**844**
1995	45	1883	76	40	2	216	9	340	13	**2479**
1996	90	1613	65	25	1	521	21	322	13	**2482**
1997	170	3736	65	57	1	1207	21	747	13	**5747**
1998	250	3947	65	61	1	1275	21	789	13	**6072**

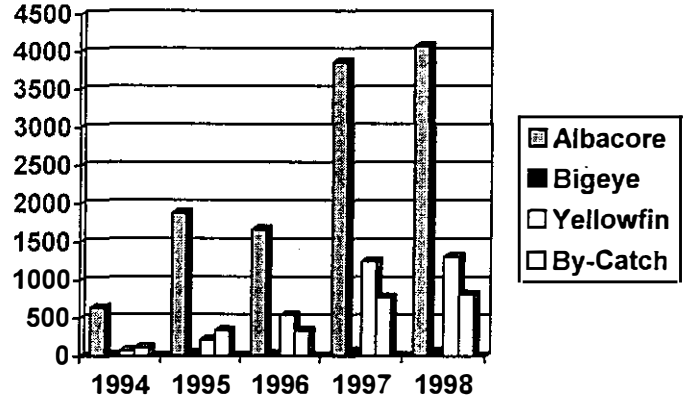

FIGURE 1. ESTIMATED CATCHES BY TUNA LONGLINERS (Tonnes)

4.2. Estimates of foreign revenue generated from exported tuna.

Estimates of tuna exported from Samoa are based on records provided from the VCS-Sampac cannery, records from the sole fish exporter who sells tuna to Star Kist and an interview with the air cargo agent in Apia responsible for the export of fresh chilled tuna. are listed in Table 2.

Value of the catch is based on the average price for frozen tuna at the canneries of ST$4900 per metric tonne from 1996 to 1997. The average price for frozen tuna at the

canneries in 1998 is estimated at ST$5150 (USD1700) per metric tonne as the price dropped to ST$4242 (USD1400) in the latter part of the year. The average price for fresh chilled tuna and other species exported air cargo to the United States is estimated at ST$11.20 per kilo (based on information provided by fish exporters).

TABLE 2. TUNA EXPORTS FROM SAMOA

Tuna (all species)	1996	1997	1998
Tonnes of tuna exported to VCS-Sampac	1150	2800	3400
Tonnes of tuna exported to Star Kist *	370	1500	1100
Tonnes of tuna exported as air cargo **	572	572	572
Total tonnes exported	**2092**	**4872**	**5072**
Foreign revenue from tuna exports (ST$)	**13,844,400**	**27,476,400**	**29,581,400**

* small quantities of tuna were sold to Star Kist by other exporters in 1995; most of these exporters terminated their businesses after 1996.

** air cargo agents estimated that approximately 11 tonnes of tuna were exported by air from Samoa per week from 1996 to 1998.

4.3. Tuna Rejection

The percentage of tuna rejected from the canneries increased from 2.8% in 1996 to 4.2% in 1998. In spite of this increase, there has been a significant improvement in the on-board handling and processing of fish. The large rate for 1998 was influenced by the rejection of a single large shipment of tuna to one cannery. Interviews with fish exporters indicate that the rejection level of fresh chilled fish exported by air cargo is negligible.

The main reason for rejection of fish from Samoa is high levels of histamine. Histamine is a toxin that is mostly associated with *scombroid* fish (a group to which all tunas belong). The toxin develops when bacteria found naturally on tuna multiply when landed if the fish are not chilled properly. Excessive histamine levels would be completely eliminated if fishermen iced their catch after capture and the exporters froze the fish quickly when landed at the port.

Most exporters are improving their on-shore facilities by expanding cold room capacity, utilising more efficient freezing methods and increasing ice production. Also, many of the exporters are becoming more discriminating in the quality of fish accepted. Some exporters test the temperature of the inner flesh of the tunas to ensure the fish were iced when landed. But rejection levels of tuna from Samoa are still high in comparison to the fish sold to the cannery from foreign and American fishing vessels. According to one of the Pago Pago canneries the average rejection rate of the other tuna suppliers to the canneries is 1 percent or less.

Tuna Rejection by VCS-Sampac cannery, Star Kist cannery, and Samoa Fish Exporters

The data provided by the VCS-Sampac cannery, the sole fish buyer in Samoa exporting tuna to the Star Kist cannery and information provided by the fish exporters in the questionnaire is listed below in Table 3.

TABLE 3. ESTIMATED TONNES OF TUNA REJECTED

Tuna (all species)	1996	1997	1998
Tonnes rejected by VCS-Sampac cannery	36.0	140	70
Tonnes rejected by Star Kist cannery	7.0	14	120
Tonnes rejected by Samoan fish exporters *	111.4	228	327
Total tonnes rejected due to poor quality	**154.4**	**382**	**517**

* based on an estimate of rejections of fish offered for sale to the Samoan exporters of 5% in 1996, 4.4% in 1997 and 6% in 1998 (small tunas and un-exportable fish species were not included in the calculation).

Loss of Foreign Revenue due to Rejection

The estimated total loss of foreign revenue due to rejection of tuna by the two canneries in Pago Pago and the fish exporters from 1996 to 1998 is listed below (Table 4).

TABLE 4. LOSS OF FOREIGN REVENUE DUE TO REJECTION

Tuna (all species)	1996	1997	1998
Total tonnes rejected due to poor quality	154.4	382	517
Total revenue lost (ST$)	**756,560**	**1,871,800**	**2,662,550**

The cannery prices for frozen albacore and yellowfin were an average of ST$4900 (USD2100) per metric tonne in 1996 and 1997. The prices decreased in the later part of 1998 reaching a low of ST$4090 (US$1350) per metric tonne. The average cannery price is estimated at ST$5150 (US$1700) per metric tonne for the year of 1998.

It should be noted that estimates of fish rejected by the Samoan exporters do not include small tunas and species considered not suitable for export. These fish are usually not offered to the exporters and are sold either at the Apia Fish Market, to local residents, restaurants or hotels. The crews of the fishing boats often distribute the rejected fish to their families. Interviews with the tuna longline fishermen indicated that approximately 13% of the total catch was not suitable for export. Approximately 3% of this fish was given to the crew and the remaining 10% were sold locally.

4.4. Ice Production

Sufficient ice production capacity to maintain fish quality is one of the main factors considered in the development of a tuna longline fishery. Samoa's tuna longline fishery is unique in that the tuna are caught relatively close to the two main islands, Upolu and Savaii, so the majority of the fishing trips are only one or two days in duration. Also, the majority of the catch is frozen in Apia by the fish buyers and exported to the two canneries in American Samoa. This situation has enabled many fishermen to go to sea without carrying ice to chill the catch. Although the canneries accept most of the catch, almost 200 tonnes of tuna are rejected annually. The main reason for rejections of tuna is excessive histamine levels in the fish caused by fishermen not carrying ice to chill their catches. In December 1997, the United States implemented HACCP regulations to monitor seafood safety. The first critical checkpoint in the plan is the seafood product must be chilled after it is landed to preserve the quality of the catch. If Samoan fish buyers intend to continue to export fish into the United States, this country's regulations will require the fishermen to carry ice when going to sea.

The present ice production capacity in Samoa is sufficient for the tuna longline vessels that carry ice to sea. However, approximately 150 vessels involved in the tuna longline industry still do not carry ice (questionnaire 1999). If these vessels were forced by the exporters to carry ice to comply with the regulations imposed by importing countries, the present ice production capacity would be insufficient. The ice production capacity in Apia from 1996 to 1998 is listed below in Table 5.

TABLE 5. SAMOA ICE PRODUCTION

Ice Production	1996	1997	1998
Total ice production capacity (kg per 24 hr) *	6000	16000	26000

*this excludes ice produced at a much higher price at drink outlets in Apia.

Although there has been a significant increase in ice production since 1996 there would not be enough capacity to supply the fleet if it was required that all catches were chilled when landed. The average catch rate for tuna longliners in Samoa is approximately 75 kg/100 hooks (Mulipola 1997). For one or two day fishing trips at least 1 kg of ice is required to chill 1 kg of tuna. Large tuna longline vessels that spend 10-14 days at sea typically use 2-3 kg of ice to chill 1 kg of tuna. Most of the 9 m *alia* catamarans are setting 300-500 hooks a day. The larger vessels 12 meters and over are setting 1000-1600 hooks a day and spend from 3-8 days at sea depending on the catch. With an average of 500 hooks set a day by the fishermen the catch rate would be approximately 375 kg (500 × 75/100 hooks). To properly chill 375 kg of tuna on a one-day trip the fishermen would need to carry at least 375 kg of ice. Therefore, the present ice production capacity is capable of supplying only 70 small to medium sized vessels (26000 ÷ 375) with sufficient ice to chill the catch.

5. DISCUSSION, CONCLUSIONS AND RECOMMENDATIONS

5.1 Discussion

The fishing industry in Samoa is obligated to comply with the seafood safety regulations of foreign countries. Most of the tuna caught in Samoa is exported to the United States (including American Samoa). As the industry continues to grow the exporters will seek out new markets. The most likely new market will be the European Union. The United States and the European Union have differing seafood safety regulations to monitor, sample and test seafood products imported into their territories.

It is important to note that these regulations are imposed by the importing country authorities and not the Government of Samoa.

United States

The majority of tuna catch in Samoa is exported either frozen to the canneries in Pago Pago, or fresh chilled to Hawaii, and Los Angeles. In December 1997, the United States implemented Hazard Analysis Critical Control Point (HACCP) regulations to improve the monitoring of seafood safety, make sampling and testing more efficient, and to shift the burden of seafood safety onto the processors and suppliers.

A processor must, where an identifiable food safety hazard is reasonably likely to exist, establish a HACCP plan consistent with the U.S. regulations. Any imported seafood that is not processed under a HACCP plan will be considered "adulterated" and the FDA will deny entry of the product into the United States.

The processor's HACCP plan must contain:

- a list of food-safety hazards likely to occur,
- a list of critical control points for each of the identified hazards,
- a list of critical limits that must be met at each critical control point,
- a list of monitoring procedures to be used at each critical control point to ensure compliance with the critical limits,
- corrective action plans to be used where a deviation from the critical limits at the critical control point occurs,
- a list of the procedures to be employed to verify that the HACCP plan is adequate and effective, and
- provision for a record-keeping system that documents actual values and observations obtained during monitoring of critical control points.

The HACCP plan adopted by a processor must be developed by an individual that has received training in the application of HACCP principles deemed adequate by the FDA. The HACCP-trained individual must also regularly reassess, modify and review both the HACCP plan and its implementation.

The US importer must also be able to verify to the FDA that the seafood seeking entry into the United States has been processed or produced in accordance with an effective

HACCP plan. If an importer is unable to show that the seafood product in question has been processed or produced under an HACCP plan, the seafood will be considered adulterated and will be denied entry.

Written verification procedures must include affirmative steps sufficient to prove that the seafood has been processed under an effective HACCP plan. The affirmative steps for an importer to take include:

- maintaining a copy of the foreign processor's HACCP plan and a written guarantee from the processor that the seafood was processed consistent with the HACCP plan.
- periodically testing the imported seafood,
- regularly inspecting the foreign processor's facilities to ensure that the seafood is being processed pursuant to an HACCP plan,
- obtaining from the processor the HACCP monitoring records that relate to the specific seafood sought to be imported, and
- obtaining a certificate from the foreign country's inspection authority or a competent third party that the seafood was processed under an HACCP plan.

European Union

The European Union, with a population of over 300 million people where there is a huge demand for fresh fish, is considered to be the most likely new importer from Samoa in the future. There is also a convenient air-link from Samoa through Los Angeles to Frankfurt, Germany.

For seafood to enter the European Union processors must have effective HACCP systems in operation, and a competent authority (institution or body) in the government of the exporting country to ensure that the persons responsible for the premise where fishery products are prepared, processed, chilled, frozen, packaged or stored, in a manner equivalent to the E.U. seafood safety regulations as outlined in the E.U. Seafood Directive.

The Seafood Directive includes specifications regarding:

- harvesting and the handling of fish on-board vessels,
- handling during and after landing,
- the establishments in which processing take place,
- handling, packaging, preparing, processing, freezing, defrosting or storing in the processing establishments, and,
- parasite checks, packaging, identification marks, storage and transportation.

The European Union must be convinced through its own investigation and local inspection that equivalent standards to the European Union processors facilities are being achieved by the exporting country. A team of experts from the European Commission visit the country intending to export seafood into the European Union to determine whether the country's laws, seafood safety standards, actual health conditions and the inspection procedures used by the exporting country's competent authority are equivalent

to those within the European Union.

If the exporting country is approved as having equivalent standards, they are required to list the approved establishments that are monitored by an official inspection service and comply with requirements equivalent to those of the E.U. Seafood Directive. The establishments are then registered and approved by the Commission. A health certificate must be issued by the exporter's government to accompany consignments to the European Union (McDorman 1997).

5.2. Conclusions

1) The six main exporters in Samoa have received HACCP training and have developed HACCP plans in a joint FAO/SPC workshop conducted in 1997. Unfortunately, most of the exporters do not follow their plan, as the FDA has not strictly enforced the regulations in the United States. Many of the exporters still accept fish that has not been chilled properly when landed by the fishermen. Their processing plants do not meet HACCP requirements. Their staff does not adhere to proper sanitary procedures when processing fish. Proper verification procedures are not followed to ensure the fish are processed under an effective HACCP plan. The lack of concern about following HACCP plans will probably continue in Samoa until the FDA enforces the regulations.

Indications are that the FDA has begun to step up the enforcement of the seafood safety regulations. Recently, some of the exporters have been requested to provide third party verification that the imported tuna was handled and processed under an effective HACCP plan. Also, the FDA has tested some shipments of tuna from Samoa into the United States. If the FDA decides to enforce the regulations, the tuna fishing industry in Samoa would come to an abrupt halt as it relies heavily on the export of tuna to the United States. If this happened the fishermen would be required to conduct proper fish handling procedures aboard their fishing vessels, exporters would be required to adhere to their HACCP plans, the design and management of fish processing plants would have to meet HACCP requirements and verification procedures would have to be followed to verify that the seafood has been processed under an effective HACCP plan.

2) Many of the fishermen do not handle the catch properly when landed to ensure the fish is acceptable for export. An on-board fish handling workshop was conducted in Apia by the Training Section of the Secretariat of the Pacific Community in 1998. But most of the fishermen do not practice the techniques taught during the workshop. Ice is still not carried on an estimated 150 vessels. The catch is often left on the deck for hours before being gilled and gutted. Often fishing boats are seen cleaning their catch at the mouth of Apia harbour before entering the port.

3) The ice production capacity in Apia would be insufficient to supply the entire fishing fleet if it was mandatory for all vessels to ice their catch. It is estimated that the present ice production capacity of 26.000 kg per 24 hours could only supply 70 fishing vessels that set 500 hooks each a day.

4) Most of the fleet is comprised of 9 m *alia* catamarans which are too small to safely carry the crew, fuel, the catch and ice from the fishing grounds to port. Between 1997 and 1998, twenty five lives were lost at sea. Some of the lives were lost due to the *alias* being over loaded and swamping during severe weather conditions. Many of the boat builders have designed larger catamarans to carry heavier loads and to withstand more severe weather conditions. Although most of the local boat builders are quite skilled in

fabricating 9 m *alia* catamarans, many do not understand the principles involved in designing a safe fishing vessel. It is believed that some of the lives lost at sea were due to improper vessel design. To address this issue the Fisheries Division recruited a consultant marine architect to design and construct a catamaran capable of conducting multiple day fishing trips. The marine architect designed a 12.2 m by 5.5 m catamaran hull powered by two 48 hp Yanmar diesel engines. There is a 7 tonne fish hold that is capable of storing sufficient ice for approximately 3 tonnes of fish. Construction of the vessel will begin in September 1999.

5) There is a lack of infrastructures to adequately support the export of tuna from Samoa. Exporters sending fresh chilled fish air cargo to Hawaii or the United States mainland do not have a refrigerated area near the airport to store their boxes of fish. If flights are delayed or there is insufficient cargo space for their fish boxes, the exporters must transport the fish back to their processing plants to store in refrigerated cool rooms.

Fishermen in Savaii have a distinct economic and strategic disadvantage compared to Upolu fishermen as the ferry between Upolu and Savaii is not capable of carrying freezer containers. Presently, there are approximately 30 fishermen who sell their catches to one fish exporter in Salelologa. The exporter stores the fish in freezer containers until there is a sufficient quantity to hire a barge to transport the containers to Upolu. Consequently, the fishermen receive a lower price for their catch and the exporter has difficulty in maintaining the quality as the containers sometimes remain in Salelologa a month or more before there is a sufficient quantity of fish to warrant hiring the barge.

5.3. Recommendations

1) As the FDA in the United States is likely to enforce the HACCP regulations in the near future, the Samoan government should be proactive in initiating measures to assist fish exporters to comply with the seafood safety requirements. One of the affirmative steps to verify that seafood products imported into the United States are processed under effective HACCP plans is a recognised third party inspection. At present, there are not any certified HACCP inspectors in Samoa. The Fisheries Division is responsible for only ensuring that marine products exported from Samoa are:

- harvested from areas without health prohibitions and are not contaminated by petroleum products,
- fit for human consumption,
- stored and transported by such means that ensure their conditions are maintained, and,
- legal size, non poisonous and non-berried females.

The Department of Health is responsible for ensuring the food products in Samoa are processed under conditions that meet government sanitary, safety and environmental regulations.
The six exporters have personnel who are trained to write up and monitor HACCP plans but they are not qualified to be HACCP inspectors. At present, a certified inspector would have to be recruited from another country if the FDA requested verification from a recognised third party that the seafood exported from Samoa was processed under an effective HACCP plan. In most circumstances the burden of recruiting an offshore HACCP inspector would be the responsibility of the United States importer or the Samoan exporter.

To address this issue the Fisheries Division has investigated conducting a HACCP inspectors workshop to train and certify at least four persons to conduct third party inspections and provide seafood safety verification that is recognised by the FDA. It is recommended that one government department should be responsible for seafood safety issues concerning the export of fish from Samoa. Inspection of fish processing plants and verification that HACCP plans are followed, would come under the umbrella of this government department. This would assist the fish exporters in providing the FDA with documented verification that the fish exported was processed under an effective HACCP plan and would also protect the industry from rogue exporters who do not adhere to HACCP regulations and could possibly affect the reputation of Samoa's seafood industry.

2) The Government of Samoa should investigate establishing a Competent Authority to monitor seafood safety requirements to export fish products into the European Union. The Competent Authority should be the responsibility of one government department. preferably the Fisheries Division. Although the Department of Health is responsible for monitoring processing and hygiene, the Fisheries Division is more closely linked to seafood safety issues and catch handling at sea. Regulations for seafood safety standards and inspection procedures should be implemented that are equivalent to those within the European Union. The competent authority should be responsible for a laboratory to test seafood for parasites, histamines and bacteria to ensure seafood products are safe for human consumption. Also seafood inspectors should be trained to verify that seafood products exported from Samoa were handled and processed in conditions equivalent to European standards.

3) Depending on the results of the planned Training Needs Analysis, the Project will work with the Fisheries Division to run a refresher workshop to assist the fish exporters in reviewing and updating their HACCP plans. The workshop would provide the exporters with the opportunity to assess their HACCP plans, discuss mutual problems, focus on areas within their processing operations that do not meet HACCP standards and address changes to HACCP regulations since its implementation in December 1997.

4) Incentive schemes should be considered to increase the ice production capacity to meet the needs of the tuna fishing industry. Entrepreneurs should be encouraged to establish supply depots in small fishing ports outside of Apia to sell ice, fuel, bait and fishing gear. The incentives could include low interest loans or lease arrangements for ice machines and freezer containers.

5) Depending on the results of the planned Training Needs Analysis, the project could assist the Fisheries Division to conduct a series of fish handling workshops to train fishermen techniques to maintain fish quality. The workshops should be conducted on Upolu and Savaii in fishing ports where tuna longline activities take place. The focus of the workshops should be proper gaffing, bleeding, gill and gutting, cleaning and icing of the catch.

6) A workshop on tuna longline fishing vessel parameters should be initiated to introduce the local fishermen to the new vessel design proposed by the Fisheries Division and other vessel designs suitable for fishery in Samoa. Depending on the results of the planned Training Needs Analysis, the syllabus could include various hull designs, required fuel capacity, fish hold capacity, engine capacity and electronic equipment for tuna longline vessels suitable for the Samoa Fishery.

7) The export of tuna for the fresh fish market would be enhanced by the provision of a

refrigerated cool room to store fish near the airport. A refrigerated cool room would allow the fish exporters to store their fish at a proper temperature to maintain high quality before being loaded on the plane for export to Hawaii or the United States mainland.

8) In order to de-centralise the fleet, and benefit Savaii fishermen, the existing ferry operating between Upolu and Savaii needs to be replaced with a larger ferry capable of transporting freezer containers.

6. REFERENCES AND BACKGROUND LITERATURE

Anon. (1989) Fisheries Division estimates of pelagic landings from 1980-1989, Fisheries Division, Ministry of Agriculture, Forests, Fisheries and Meteorology. Apia, Samoa 1989

Anon. (1998) Annual Report - 1996-97. Fisheries Division, Ministry of Agriculture, Forests, Fisheries, and Meteorology, Apia, Samoa 1998

Anon. (1999) Annual Report - 1997-98. Fisheries Division, Ministry of Agriculture, Forests, Fisheries, and Meteorology, Apia, Samoa

Anon. (1999) Annual Report - 1997-1998. Central Bank of Samoa, Apia Samoa

Boyle, J. (1999) Samoa Tuna Industry Export Market Study, 1999. Apia, Samoa

Chapman, L. (1998) The Rapidly Expanding and Changing Tuna Longline Fishery in Samoa, SPC Fisheries Newsletter #84 1998. South Pacific Commission. Noumea, New Caledonia

Fa'asili, U. & S. Time (1997) Alia Longline Fishery in Samoa. Apia, Samoa 1997

King, M. (1989) Fisheries Research and Stock Assessment in Western Samoa 1989. FAO Terminal Report.

King, M. & U. Fa'asili (1997) Fisheries in Western Samoa. Apia, Samoa 1997

Lawson, T. (1997) South Pacific Commission Tuna Fishery Yearbook, 1996. South Pacific Commission, Noumea, New Caledonia

McDorman, T. (1997) Seafood Safety Standards. Review of the import regulations of the U.S. and E.U. and relevant laws of the South Pacific region 1997. Secretariat of the Pacific Community, Noumea, New Caledonia

Mulipola, A. & Vaofusi. (1994) Alia Fishing Vessel Survey, 1994. Apia, Samoa

Mulipola, A. (1997) Inshore Fisheries Resource Survey. 1997. Apia, Samoa

Mulipola, A. (1997) Estimate of the Catch per Unit Effort for the Tuna Longline in Samoa, 1997. Apia, Samoa

Watt. P., L. Chapman & P. Cusack (1998) Unpublished Report on Small-Scale Tuna Fisheries Development in Western Samoa 1998, South Pacific Commission. Noumea, New Caledonia

ATTACHMENT: FISH EXPORTERS SURVEY FORM

Fish Exporter No:

GENERAL	1996	1997	1998
Your Fish Plant ice production capacity (kg per hr)			
Average kilos of ice sold per week			
Your Fish Plant freezer capacity (> 0 Celsius)			
Your Fish Plant cool room capacity (< 0 Celsius)			
No. of fishing boats < 15 m selling fish to you			
No. of fishing boats > 15 m selling fish to you			
Average No. of days at sea: fishing boats < 15 m			
Average No. of days at sea: fishing boats > 15 m			
No. of boats selling fish to you carrying ice			
No. of boats selling fish to you not carrying ice			

PURCHASES AND EXPORTS	1996	1997	1998
Total No. of kilos of fish purchased			
No. of kilos purchased from boats < 15m			
No. of kilos purchased from boats > 15 m			
No. of kilos of fish exported fresh			
No. of kilos of fish exported frozen to cannery			
No. of kilos of fish sold locally			

FISH SPECIES EXPORTS	1996	1997	1998
No. of kilos of albacore exported to cannery			
No. of kilos of yellowfin exported to cannery			
No. of kilos of albacore exported fresh			
No. of kilos of yellowfin exported fresh			
No. of kilos of big eye exported fresh			
No. of kilos of other species exported fresh			

REJECTION OF FISH	1996	1997	1998
Percentage of fish offered by fishermen rejected by your company			
Percentage of fish offered by fishermen rejected by your company from vessels < 15 m			
Percentage of fish offered by fishermen rejected by your company from vessels > 15 m			
Percentage of fish offered by fishermen rejected by your company from boats carrying ice			
Percentage of fish offered by fishermen rejected by your company from boats not carrying ice			
No. of kilos of fish exported frozen by your company to cannery rejected			
No. of kilos of fish exported fresh by your company rejected			
Percentage of fish exported to cannery due to the quality being too poor to export fresh			

Reasons your company rejected fish from fishermen over the last six months

Poor Quality	Poor Handling	Fish Too Small	Unmarketable Species	Others
%	%	%	%	%

Problems that need to be overcome to improve the quality of fish for export

Comments: