THE 1992 REPORT ON THE INSHORE FISHERIES COMMERCIAL LANDINGS AT THE APIA FISH MARKET

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1. Introduction

The primary function of a fisheries management agency is the collection of fisheries statistics. The regular monitoring of the catch (species, numbers, weights, sizes and other biological parameters as necessary) and effort (number of fishing units, fishing time, season, gear, methods, economics, etc) is very important in managing a fishery. It is essential to have such detailed information to assess the level of fish stock, to monitor changes and to determine the economic value in the fishery. Also it is very useful in the evaluation of perfomance or efficieny of a particular fishery, development project and to determine the nutritional benefit to the consumer (Molina, 1988; Zann, 1990)

The market survey of reef and lagoon fish catch is a Fisheries Division ongoing progarm in which sales of inshore fish and invertebrates at the Apia Municipal Fish Market are regularly monitored. The very close proximity of the Fish Market and the commercial alias harbour to the Fisheries Division represent an ideal opportunity to collect and gather information on catch and effort.

The reef and lagoon fisheries are the major food\protein sources of many rural villages and also very important in the subsistence economy of Western Samoacash. The inshore fisheries of Western Samoa are apparently overfished by many individuals and fishing groups. Declining catches in inshore waters were evident as early as the 1970's (Dept of Statistics, 1978 Survey). The high demand of the growing population was not met by the catch from the inshore as the main factor stated by the 1978 Statistics Department survey. Estimates of total inshore landings at Apia Fish Market from 1985 to 1991 indicated the dramatic declines have occurred in inshore fisheries (Zann, 1990). Figure 1. illustrated the general trend of inshore landings at the Apia Fish Market.

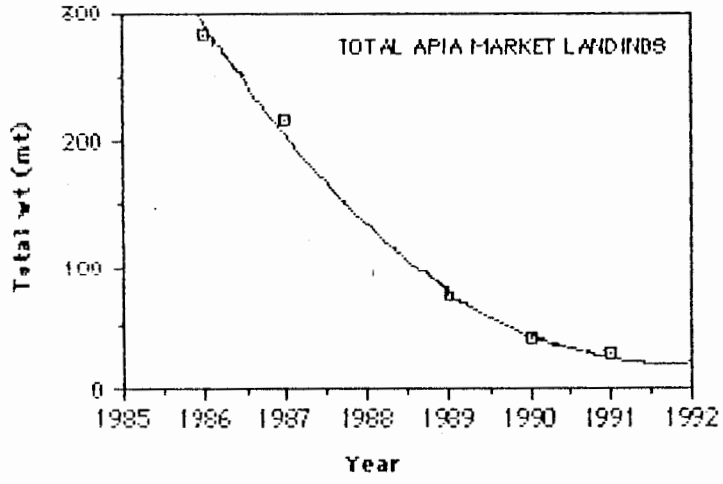

Figure 1. Estimates of total inshore landings at Apia Fish Market, 1986-1991.

A survey was conducted by the Department of Statistics in 1978 estimated Western Samoa's inshore fish and invertebrates catch to be about 1090 mt. The 61.1% of the estimated landings was reef and lagoon fish catch. Although the survey appears to have been soundly designed, it apparently grossly underestimated and the estimated landings were rejected by the Fisheries Division (Bell per comms cited in Zann, 1990). Several reports mentioned inshore fish catch to be much higher than what has been reported by the 1978 survey. Johannes (1982) estimated inshore fish landings to be 932 mt. Fisheries Annual Reports reported the inshore fish catch as 120 short tonnes at the same year.

Recent statistically based estimates of inshore fisheries landings at Apia Fish Market were estimated as 283.7 mt in 1986 and 218 mt in 1987 (Helm 1987). The Fishery Resources Assessment For Management in Westertern Samoa, an FAO/UNDP project conducted in 1989 to 1991 (SAM/89/002: Feb 1990-Dec 1991) reported that the total landings of inshore species overall were estimated as 3,000 mt in 1990 of which 40.6 mt (1990) and 29 mt (1991) were landed at the Apia Fish Market. During the project it found that the state of inshore fisheries was rapidly declined. Commercial sales of inshore fish had declined by about 500% since 1986, the subsistence catch had declined by about 100% since 1983 and the catch per unit effort had declined by about 35% since 1983 (Zann, 1991). Table 1 summaried the total inshore landings landed at the Apia Fish Market over six year period.

Table I. Reef and lagoon fisheries estimated landings at the Apia Fish Market between 1986 and 1991.

YEAR	WEIGHT (mt)	VALUE ('mT)	COST/WT (T/kg)
1986	284	1.1	3.80
1987	218	1.0	4.58
1988	na	na	
1989	74.5	0.4	5.73
1990	40.6	0.26	6.40
1991	29	0.16	5.51

2. Methods

Market surveys are conducted on 2 or 3 randomly chosen days by Fisheries staff and casual workers. On each sampling days, major taxa of fish and invertebrates (families to species) are recorded, measured, weighed and counted.

Most inshore fish are sold in strings, total weights are estimated from fish total length using a Length\Weight Conversion Chart developed from similar fish of Fiji (Zann, 1982). More information are retrieved from interviews with sellers regarding fishing technique, gear, location and effort.

2.1 Formula

Obtained survey information are entered in the Apple Macingtosh SE/HD computer using an EXCEL 4.0 database application for analysis. Landings are estimated monthly using the following formula:

$$\mathbf{MET} = \frac{\mathbf{MAW}}{\mathbf{MSD}} \mathbf{X} \{\mathbf{MTD}-(\mathbf{SD}+\mathbf{BD})\}$$

MET-Monthly estimate total (in weight and value)
MAW-Monthly actual weight (or value)
MSD-Monthly survey days
MTD-Monthly total days
SD-Sundays of the month .
BD-Bad weather days; assumption is made that no fishing took place when the wind speed reached 33 to 40 nautical miles.

2.2. Constraints

The 1992 market survey has faced the followings constraints:

(i) fish presented for sales in strings and mixed species in a string.
Fish presented for sale on a string prevents individual weights from being accurately weighed. The mixed species in a string prevents individual weights from being estimated.

(ii) Disinformation presented by sellers during interview
Disinformation given by sellers can greatly affected the result of the survey because of sometime fishers exaggerated the true landing catch.

(iii) the lack of sampling on Sunday
The general lack of selling fish on Sunday can also affected the survey result as well because of the high proportion of inshore and lagoonal fresh fish are sold at the market on Sunday at 4:30 to 8:00 am for the important Sunday meal. All fish selling activities ceased afterd 8:00 am.

2.3. Assumptions and Justifications.

Certain assumptions are made about the universe being sampled and about the data for the reef and lagoon fish survey. A statement of these assumption and their justification are given.

1. The strings sampled are representative in weight and composition of each person's or a small group of fishermen employing the same fishing method and unit's catch. Inshore catch usually include fish of more than one species and a range of sizes. The sellers usually make up strings of fish for sales from fish of same sizes and this is resulted in strings of which are about the same weight and have similar species mix.

2. The sampling days each month form a representative sample of the month as a whole. Each sampling days are randomly chosen except Sunday where no sampling occurred. The randomly selected survey days for each month represented the whole month.

3. Accurate information is obtained from sellers. Assumption is made that information provided by seller when intervewing are true and correct.

4. No fishing activity takes place during bad weather days. Assumption is made that days the wind speed reached 33 knots or more, no fishing activities are assumed to occurred.

3. Results

The monthly summary of estimated inshore fisheries landings is showed in Table II. The annual total of inshore fish and invertebrates landed at the market is 47.5 mt and valued at 238.3 thousands WS tala. Inshore fisheries were sold at an average of 5.10 Tala per kilogram. Of the total estimates; 85% were of finfish, 2% were of shellfish and 13% were of crustacean.

Table II. The monthly summary of estimated inshore (reef and lagoon) fisheries landings at the Apia Fish Market in 1992.

MONTH	WEIGHT (mt)	VALUE (T'000)	COST/KG
January	1.6	2.6	1.63
Feburary	3.1	6.6	2.13
March	4.8	29.0	6.04
April	3.5	23.5	6.70
May	6.3	12.0	1.90
June	3.8	24.5	6.45
July	5.3	32.2	6.07
August	4.3	23.0	5.34
September	4.7	25.4	5.40
October	5.0	25.2	5.04
November	2.9	9.5	3.27
December	2.2	24.8	11.30
TOTAL	47.5	238.3	5.10

Table III summarised total inshore estimates from 1986 to 1992 by major reef and lagoon finfish and invertebrate species. The major proportion of the inshore finfish market landings of 1992 were the surgeon fish (12%), parrot fish (15%), unicornis (12%) and lethrinus fish species (18%). Other finfish species made up the 43% of the total estimated landings.

Lobsters, crabs (both mud and reef crab) and giant clams were the primary invertebrate species landed at the market throughout the 1992. Out of the total invertebrate landings, 54% were lobsters, 38% were crabs (mostly *Scylla serata)* and 8% were of tridacnid giant clams. The total inshore fisheries landed at the Apia Fish Market was comprised of 86% finfish and 14% invertebrates.

Table III. Reef and lagoon fish and invertebrate species sold through Apia fish market 1986-1992.

SPECIES	1986	1987	1988	1989	1990	1991	1992
REEF\LAGOON FISH							
Surgeon fish	27.1	28.6		6.7	10.7		5.2
Parrot fish	27.1	31.5		5.0	4.9		6.1
Unicornis	15	16.4		6.9	5.1		5.0
Grouper	6.9	12.0		1.7	0.6		1.8
Rabbit fish	2.5	2.1		6.7	-		0.7
Snappers	5.2	3.4		2.1	-		1.7
Goatfish	18.0	16.8		4.7	-		3.0
Soldierfish	2.7	6.5		0.6	-		1.4
Lethrinus	59.0	28.7		5.6	5.8		7.5
Morray eel	8.4	4.6		1.9	1.3		1.0
Mullets	27.1	18.9		5.1	2.5		4.4
Caranx	19.9	5.0		-	1.0		2.0
Scads (Atule)	12.5	0.6		0.5	-		0.2
Geres	2.0	0.4		-	-		0.2
O\fish	10.8	15.1		11.1	7.0		1.3
INVERTEBRATES							
Lobster	10.7	9.2		3.6	1.8		3.5
Mud crab	9.6	10.5		5.4	1.2		2.5
Giant clam	10.1	1.9		0.1	0.1		0.5

The summary of catch (%wt) by fishing methods and fish locations or regions are summarised in Table IV. Most of the total landings of inshore fisheries were caught by spearing (38%) and line and hook (31%) fishing methods. The Upolu West (Falelatai-Mulifanua including Manono and Apolima) region has the highest captured inshore fisheries landed at the market with the Apia-Faleolo area (NW Upolu region) landed the second most high with the least landed by the SE region. Referred to Figure 2 for the map of fishing areas.

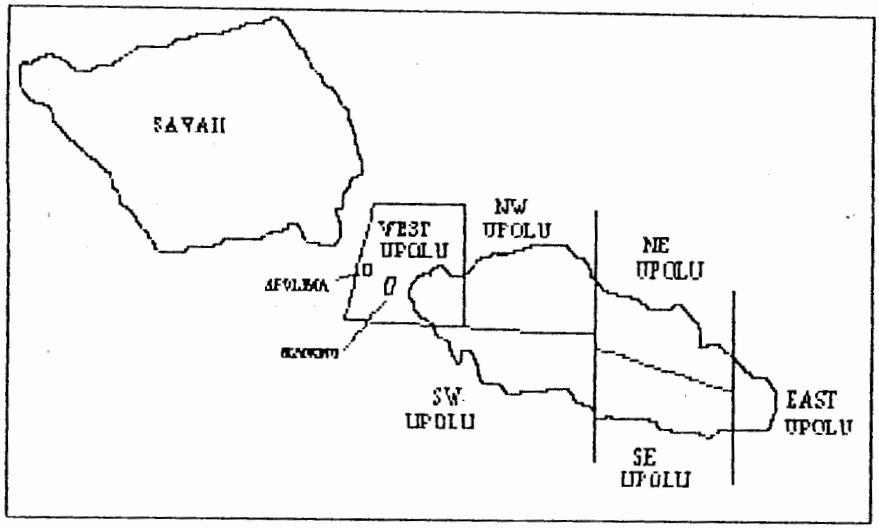

Figure 1. The map of fishing locations where inshore fisheries landed in 1992.

Table IV. Catch (%wt) by fishing methods and fishing location

METHOD (%WT)	1986	1987	1988	1989	1990	1991	1992
Net	24	40					21
Spear	48	31					38
Trap	12	16					10
Hook & Line	16	13					31
CATCH BY REGION							
NE Upolu	29	24					13.7
E Upolu	3	0.3					2.3
SE Upolu	1	0.2					2.5
SW Upolu	3	3					1.6
W Upolu	42	52					41.1
NW Upolu	22	20					39.5

4. Discussion.

The monthly summary of inshore fish and non-fish landed at the Apia Fish Market is summarised by Table II, hence accounted for about 45% of the total inshore landings in Western Samoa. Although, there was a variation of landings per month but it showed quite clearly that the month of May has the highest landed inshore fish and non-fish of 6.5 mt. The lowest total was landed in January. Several factors which attributed to the lowest landings in January included the reduction of fishing effort due to the destruction of many fishing unit by Cyclone Val. The highest landings on May was attributed to the high demand of fresh fish for "fafaga' to the CCCS annual meeting held at the last week of May before the celebration of the Independence week. Demanding for cash by local fishermen for the independence week was also a possible factor influenced the higher landings in the month of May.

Overall, the volume of reef and lagoon fisheries in 1992 is increased by about 39% from 1991 and still dropped by about 83% compared to the 1986 landings. The total catch composition (1992) shows that finfish is increased by 48%, crustacean increased by 82% and the shellfish is also increased by 80% compared to composition volume landed in 1991. However, in comparison with the 1986 landings; finfish is declined by 83% and invertebrates is decreased by 78.6%.

Comparisons of the 1992 market landings with the 1990 landings, indicates several finfish species have recovered. The mullet is increased by 43%, caranx by 50%, parrotfish by 20%, grouper by 67% and lethrinus by 23%. Several species are still remained unchange with others were still declined, like the surgeon fish which is decreased by 51%. The most significant declines in landings contrasted to the 1986 landings occurred in bigeye scads (from 12.5 mt to 0.2 mt), lethrinus (from 59 to 7.5 mt), mullet (from 27.1 to 4.4 mt), surgeon fish (from 28.6 to 5.2) and giant clams (from 10.1 to 0.5 mt)

The shellfish catch composition of 1992 compared to the 1990 Fish Market landings showed lobster is increased by 48%, mudcrab is increased by 52% and tridacnid clams by 80%. However, despite the increasing from 1990, in comparison to the 1986 landings, lobsters is decreased by 67%, mudcrab by 74% and tridacnid clams by dramatically 95%.

The breakdown of the Apia fish market landings of 1992 by region showed that more than 80% of inshore fisheries sold came from Upolu West (Falelatai-Mulifanua) and NW Upolu (Faleolo-Toamua) areas. The landings at NW Upolu is increased by about 49% and Upolu West is decreased by 21% from 1986.

About 40% of all inshore finfish landed in 1992 were caught by spearing with 31% were landed by the hook and line fishing methods. Fish caught by net were significantly dropped by 48% and by 40% of trap method compared to the 1987 landings. The hook and line landings is increased by 58% with spear caught fish is up by 20%.

Although there was an increase in landing of reef and lagoonal fish and invertebrates in 1992, but the general trend of inshore commercial landings as from 1986 upto date (1992) is evidently declined. There were several reasons attributing for the decline in inshore commercial landings at the Apia Fish Markets;

1. changes in landing market.
   A large number of reef and lagoonal fish and invertebrates were landed directly at shops, restaurant and retailers.

2. declining inshore fisheries stocks by
   - overfishing of inshore waters because of increasing demand for fresh fish.
   - use of effective and non-selective fishing techniques (gill nets, fish fences etc)
   - use of destructive techniques (poisons and dynamites)
   - loss of nursery ground for juveniles (mangroves and marshes area) by reclamation and development.
   - destruction of inshore habitat (reef and lagoon) by man-induced effects (coastal development and poor land management), cyclones actions and crown-of-thrown infestation.

3. reduction in fishing efforts
   - Lesser people were involved or engaged in fish harvesting for sale.
   - destruction and damaging of many fishing units (canoes, etc) by cyclone Lin in the beginning of the year.