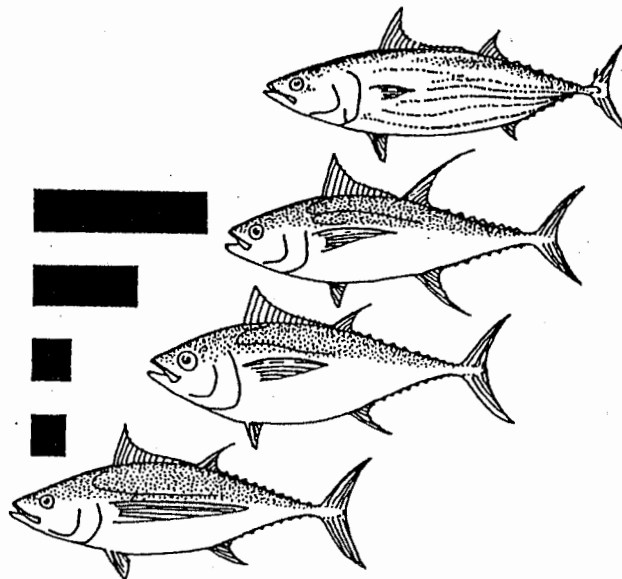


A REVIEW OF THE STATISTICS ON COMMERCIAL LANDINGS OF FISH AND INVERTEBRATES IN WESTERN SAMOA



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J. SAMUVA
STATISTICS

Report prepared for the Government of Western Samoa by the Food and Agriculture Organization of the United Nations based on the work of Leon P Zann, L. Bell, T. Sua, A. Mulipola and H. Winterstein.

1. INTRODUCTION

The collection of fisheries statistics is a primary function of a fisheries management agency. Regular monitoring of the catch (species, numbers, sizes, weights, and various other biological parameters as necessary) and effort (number of fishing units, fishing time, season, gear, techniques, economics etc) is essential in managing a fishery. It is necessary to have such detailed information to assess the fish stocks, to monitor changes in the fishery, to evaluate the performance or efficiency of a particular development project, to determine the economic value of the fishery, to determine the nutritional benefits to the consumers etc. (eg Molina, 1988).

Statistics on Western Samoa's commercial and subsistence fisheries landings are scant and unreliable (eg Johannes, 1982; Helm, 1988). Because reliable, long-term statistics on fisheries catch and effort is lacking, the Fisheries Division has not been able to assess the increasingly alarming reports of declines in inshore fish stocks, or to accurately monitor the development of the offshore commercial fisheries.

Although the Annual Reports of the Fisheries Division have included an estimate of each year's landings since 1975, most are approximations only, and should be interpreted with caution. The first statistically based survey of Western Samoa's landings was undertaken during 1978 by the Department of Statistics (1978), but its findings were rejected by the Fisheries Division as grossly inaccurate. In 1986 the Fisheries Division's Research Section commenced a statistically based sampling program to monitor the sales of inshore species at the Apia Municipal Fish Market (Helm, 1988). This was extended in 1989 to include sales of offshore bottom fish and pelagic species (Anon, 1989). In 1989 a survey of fish sales at other retail outlets was undertaken (Brotman, 1989), and the landings of deepwater snapper and spiny lobsters were estimated (King et al., 1990a and 1990b). The landings of the large subsistence fishery are currently being surveyed in this FAO project (FAO, 1991a).

As much of these data gathered on the commercial landings since 1986 had not been databased or analysed, the initial priority was given to the compilation and critical evaluation of the existing data on both the inshore and offshore commercial fisheries to assess their relative importance. The following is a compilation and critical evaluation of these fisheries statistics.

2. FISHERIES SURVEY, 1978 (DEPT. STATISTICS)

Declining catches from Western Samoa's inshore waters were evident as early as the 1970s. Because it was considered that the catch from reefs and lagoons was not able to meet the demands of a growing population, the Western Samoan Department of Statistics undertook a survey in 1978 to describe the state of the fishery, and determine the landings from inshore and offshore waters (Dept. Statistics, 1978).

2.1 Methods

For the purposes of the survey, Western Samoa was divided into six strata based on geographical features and populations, four on Upolu and two on Savaii. The Apia area was excluded from the survey. Two villages were randomly selected from each strata. Each was surveyed four times in the year by pairs of recorders from the Fisheries Division for a period of one week (Dept. Statistics, 1978).

2.3 Estimates of landings 1978

It was estimated that the total landings of all fish and shellfish were 1,090 metric tonnes (mt). Reef and lagoonal fish accounted for 666 mt and offshore species 423 mt. The average

per capita consumption of fresh fish was estimated as 8.99 kg pa (Dept. Statistics, 1978). Details are summarised in Figure 1 and Table 1.

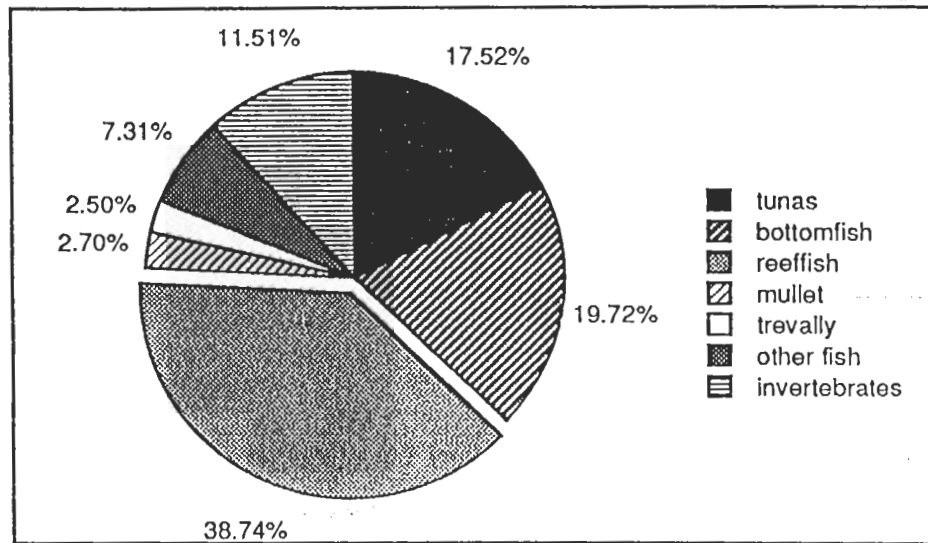


Figure 1. Landings of major types of fish and invertebrates by % weight, 1978 (see Table 1 for details).

Although the survey appears to have been soundly designed, it apparently grossly underestimated the landings as its findings were totally rejected by the Fisheries Division at that time (L. Bell, pers.comm.). The Fisheries Division's own estimate of the offshore landings in 1978 was 1,500 mt (ie x5 larger). Johannes (1982) stated that the Chief Fisheries Officer (A. Phillip) considered that the estimate of the inshore landings was too low because of 'incomplete data gathering'. However, it must be noted that the Fisheries Division's own estimates were not statistically derived and probably overestimate the landings (see section 6).

The estimate of the average fish consumption (ie 9 kg per capita pa) is very low for a Pacific Island country with a subsistence agriculture/fishing economy. This figure approximates that in European countries which have a relatively large red meat diet (eg Germany, France, United Kingdom: FAO, 1971), and in American Samoa which imports 90% of its foodstuffs (Wass, 1980). It would be expected that fish consumption in Western Samoa would be similar to that of neighbouring Pacific Islands (eg Fiji which consumes about 47 kg of fish per capita pa: Sharma, 1988)).

Major errors are apparent in the above report (eg 'offshore landings' erroneously include inshore shellfish and all the Lutjanids and Lethrinids, which are major families of reef fish). The catch of tuna and other pelagics was therefore recalculated as 191.16 mt. The inshore catch of finned fish was recalculated as ca. 594 mt and the inshore invertebrates as 122.3 mt. However there is insufficient explanation of the methodology of the report and too little unprocessed data to identify the major causes of error in the survey.

The Department of Statistics survey therefore appears to be seriously flawed and must be regarded as grossly underestimating fisheries landings and consumption. However, it probably does reflect the relative importance of the different fisheries in 1978.

3. SALES OF INSHORE FISH AND INVERTEBRATES AT APIA FISH MARKET, 1986

The very close proximity of the Apia Municipal Fish Market and commercial boat harbour to the Fisheries Division represents an ideal opportunity to gather information on not only fish landings, but on effort and size distributions of selected species (Helm, 1988).

The Apia fish market was constructed near the Fisheries Centre in 1981 under a Japanese aid scheme. It comprises an open public area where most of the reef and lagoonal fish are sold and an enclosed area with freezers and processing rooms. Sales counters are available on the market 'floor' (the public section) which individual fishermen, family members or their representatives pay WS\$1 per day per tray as a rental fee. Smaller reef fish are sold by the string, larger species are sold separately. No refrigeration is available, though unsold fish may be stored in private ice chests overnight. The enclosed area of the Fish Market was initially operated by Fisheries Division but is currently leased to a commercial fish processor, SAMPAC, based in Australia.

3.1 Methods

Market surveys are conducted randomly on two or three days per working week by casual staff employed the Fisheries Division. On each sampling day the major taxa (families to species, as appropriate) of fishes and invertebrates are recorded, measured and counted. Because most fish presented for sale are already tied in strings and individual fish cannot be separated, total weights are estimated from fish lengths, using a Table of length/weight relationships for various types of fish produced for similar studies in Fiji (Zann, 1982). The sellers are also interviewed to determine the prices, origin of the catch, and fishing methods.

The number of individuals of each taxon, their estimated weight and relative importance (% of total weight) on each sample day are entered in a Microsoft dBase 3 database on the Fisheries Division's Hewlett Packard Vectra computers. Landings are estimated monthly, and reviewed annually. Records of inshore landings for 1987 and for pelagics from 1986-88 remained unanalysed because of manpower shortages in the Division.

The major constraints in the sampling program are the mixed species on strings which prevents individual weights from being estimated, the general lack of sampling at weekends, and disinformation given by the retailers (Helm, 1988).

3.2 Current landings

Market landings from 1985-90 are summarised in Table II. Composition of landings for 1989 (a 'typical' year, as 1990 was affected by cyclone Ofa (see Section 7) is illustrated in Fig. 2.

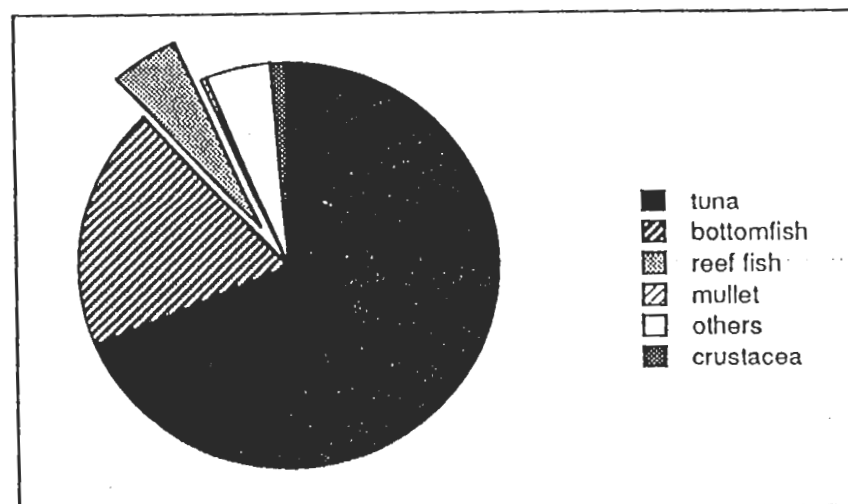


Figure 2. Market landings in 1989 (% total landings by weight)

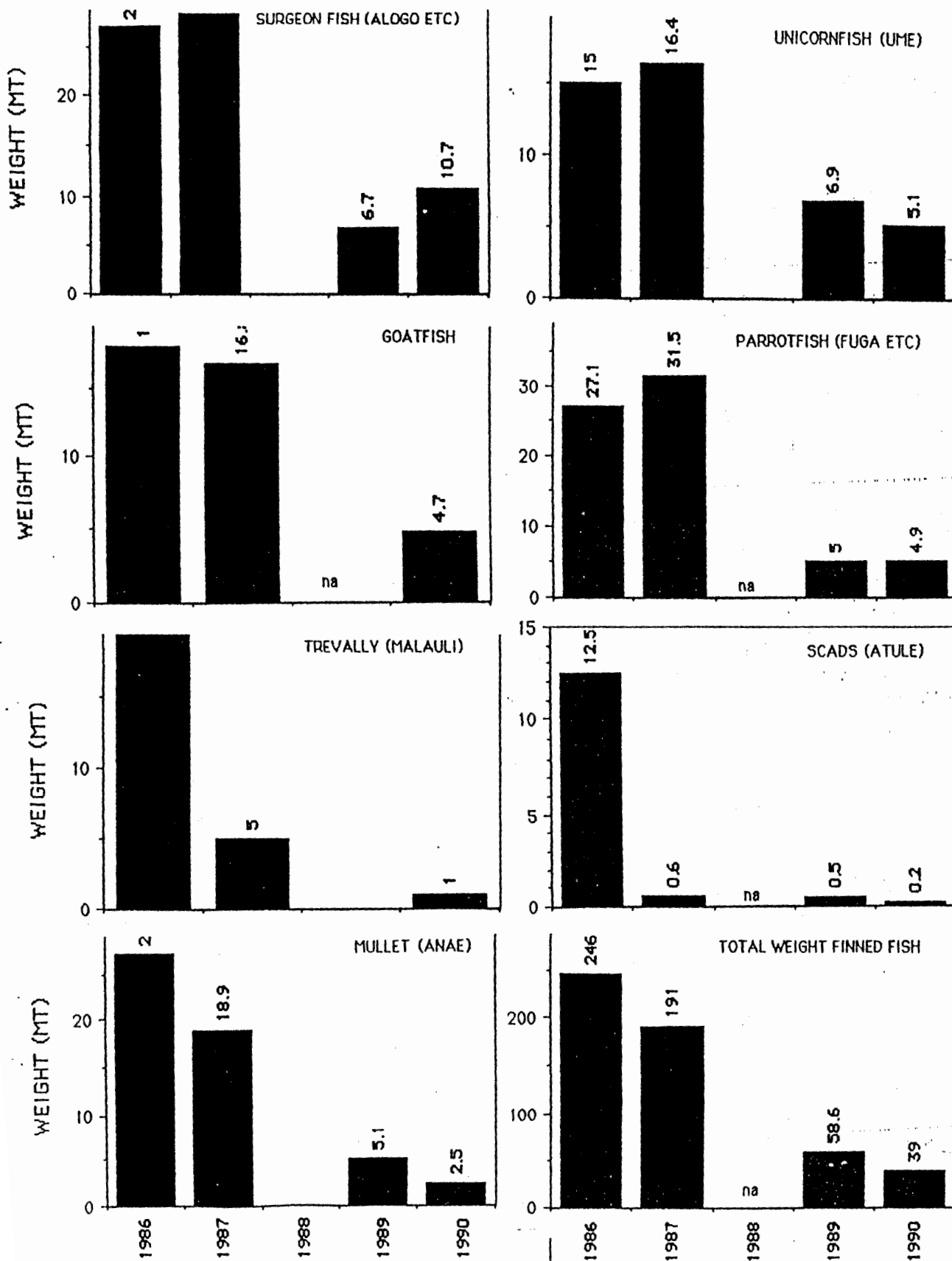


FIGURE 2. Annual landings of major groups of inshore fishes, Apia Market,

3.3 Trends in market sales of inshore landings between 1986-1990

Landings at the Apia Fish Market between 1986-90 are summarised in Table II. The total landings on each year are graphed in Figure 3, and details of landings of the major taxa are graphed in Fig. 4, a-h.

Although the period of monitoring has been brief, major declines (of orders of magnitude in some groups) have occurred. During the five years of monitoring to date, the total landings of inshore fish declined from 246 mt to 39 mt, with virtually all groups showing major declines in landings. The most dramatic declines in landings occurred in:

- big eye scads or atule (*Selar crumenophthalmus*) which declined suddenly from 12.5 mt to 0.5 mt between 1986 and 1987;
- giant clams (*Tridacna* spp), from 10 mt to 0.1 mt in three years;
- trevallies from 20 mt to 1 mt;
- mullet (Mugilidae) from 27 mt to 2.5 mt;
- coral cods (serranids) from around 12 mt to 0.6 mt; and
- parrotfish (scarids) from 27 mt to 4.9 mt.

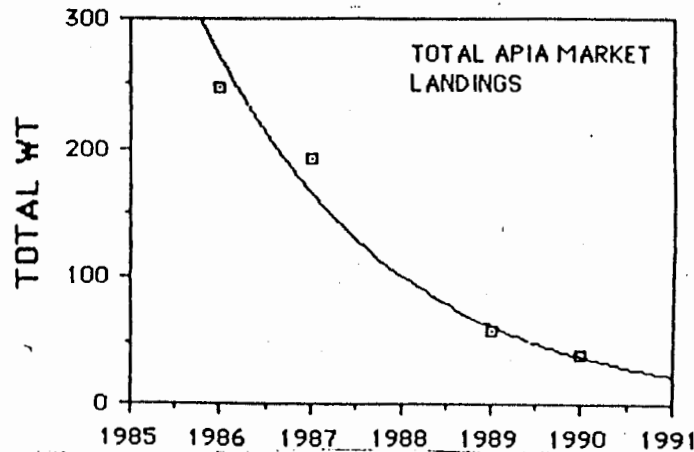


Fig 3. Estimates of total inshore landings at Apia Fish Market, 1985-90

4. SALES OF INSHORE FISH THROUGH OTHER RETAIL OUTLETS IN 1989-90

A relatively large number of private wholesale and retail outlets in Apla, and several in other areas, also purchase fish and shellfish directly from village fishermen. To estimate the extent sales of fish through these outlets a survey was undertaken in 1989 by a Peace Corps volunteer at the Fisheries Division (Brotman, 1989). A subsample of these outlets were monitored during 1990 (Winterstein, 1991).

4.1 Methods

A total of 25 outlets were initially identified as purchasing fish directly from fishermen. These outlets were categorised as 'processors' (eg hotels and restaurants which clean, fillet and cook the product) and 'non-processors' (eg shops and stores which sell fresh or frozen fish). Each was visited between February and November in 1989, at intervals of 3/week to 1/month, depending on the outlet's accessibility and record keeping. Information on fish sales was obtained from sales receipts and accounts, or from an interview with the vendor. As the vendors often did not record species names for many types of fish, sales were grouped into major categories: 'reef fish'; 'bottom fish'; 'lobsters'. The number of fishermen supplying the outlets were estimated the sales records. As the vendor's records generally omitted the numbers of fish, only the weights and prices of each type of fish were recorded. Because of logistical constraints, a subsample of 14 outlets were monitored over an eight month period in 1990.

4.2.1 1989 landings

It was estimated that sales of fish at 'other retail outlets' were about 210 mt of finned fish and 21 mt of invertebrates. Over 1,000 inshore fishermen sold fish directly to these outlets (Brotman, 1989).

The major 'processors' of inshore fish on Upolu were identified as: Aggie Grey's Hotel; Tusitala Hotel; Amigo's Restaurant; Skippy's Restaurant; Ah Kuoi's shop; Isa's Restaurant; Alafua Campus of the University of the South Pacific; SAMPAC International. The two 'processors' on Savaii were the Safua and Vaisala Hotels.

The major 'non-processors' or retailers of fish on Upolu were: Auntie Lanu's Store; Sebs Shop; Rasmussen's Shop; Lynn Netzler's Shop; Boon's Store; Ah Wa's Shop; Moana Mart; Pele-Rose Mini Mart; Toi Aukuso's Store; Helesoe's Shop; Tavita Chung's Shop; Chan Mow's Market; Apolima Shop; and Auala Shop.

Unfortunately Brotman's report is not clearly presented. Important details of the methods and analyses of data are omitted, and the presentation of data is often unclear or ambiguous. Where possible, the landings have been re-calculated from the original data.

Sales through 'other retail outlets' are summarised in Table III. The composition of the bottomfish catch is given in Table IV and Figure 5, and that of the pelagic catch is given in Table V and Figure 6.

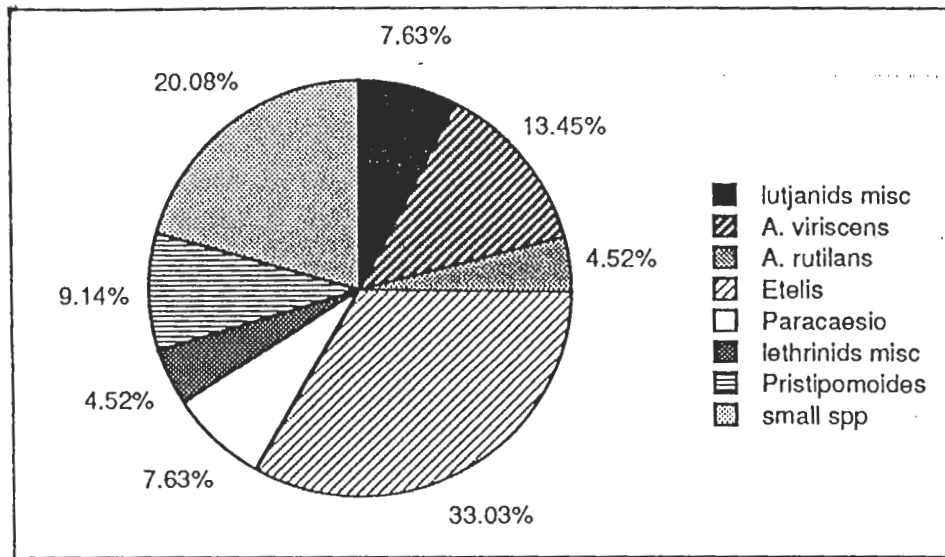


Figure 5. Catch composition of deepwater bottomfish sold through 'other retail outlets' in 1989

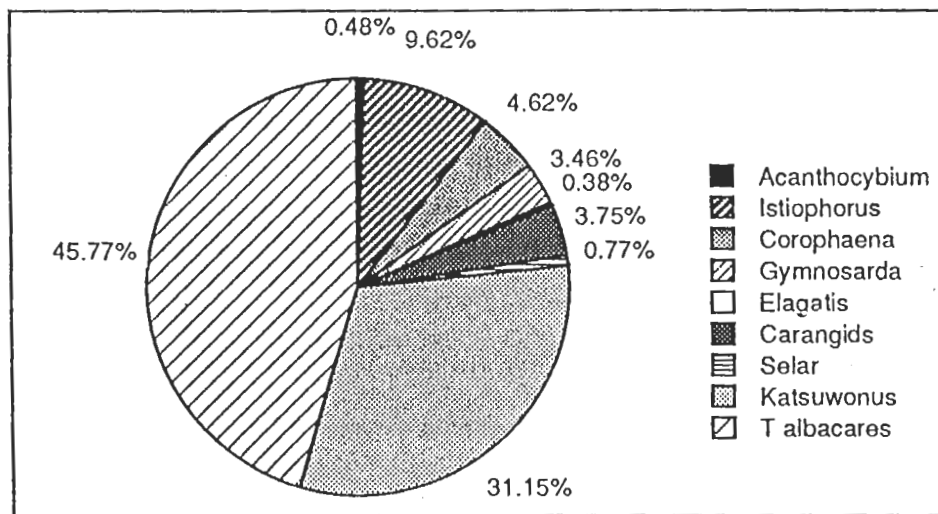


Figure 6. Catch composition of pelagic catch, 'other marker outlets', 1989

4.2.2 1990 landings

The major fish species or groups were not recorded in 1990 and reef fish and bottom fish could not be differentiated. From the estimated sales of 10.3 mt of invertebrates, 60.1 mt of reef fish and bottomfish and 47.2 mt of pelagics, the total annual sales of 'other retail outlets' were calculated as 25.7 mt invertebrates, 150.3 mt of reef fish and bottomfish and 118.1 mt of pelagics (Winterstein, 1991).

While the total reef fish and bottomfish sold in 1990 remained unchanged from 1989, the amount of pelagics increased by 50% and invertebrates by 20%. The increase in pelagics sold

through 'other retail outlets' reflects increasing purchases by the industrial wholesaler, SAMPAC.

5. COMMERCIAL LANDINGS FROM THE 'SEMI-SUBSISTENCE' SECTOR

In traditional times in Samoa all fish surplus to the immediate requirements of the *aiga* (extended family) were distributed amongst relatives and others in the village according to custom. There was little or no preservation and storage of surplus fish.

Because the decline of the traditional system of distribution and the advent of the cash economy, part of a 'subsistence' fisherman's catch is often sold within the village, at the roadside, by the fisherman or his family at the Apia Fish Market (section 3), or directly to hotels, stores and supermarkets (section 4).

The total proportion of the 'semi-subsistence' catch which is sold is being estimated independently in the FAO inshore fisheries project and will be reported at the conclusion of this project.

6. TRENDS IN LANDINGS IN OFFSHORE PELAGIC FISHERIES

Although the offshore pelagic fisheries of Western Samoa have been actively promoted since 1975 by FAO (FAO, 1979), USAID (McCoy, 1988) and other agencies, reliable statistics on landings are only available from 1989. The estimates of annual landings of pelagic species published in the Annual Reports of the Fisheries Division since 1975 are approximations only.

6.1 Methods

The first statistically based survey of landings of offshore fish was undertaken by the Department of Statistics in 1978 (see Section 2 for details).

Survey methods used to estimate the commercial landings published in the Annual Reports of the Fisheries Division from 1975-1985 are not explained in the reports but they are thought to have been based on estimates by the former Chief Fisheries Officers of the number of *alia* fishing boats in the fishery each year (from *ad hoc* interviews with fishermen), on the approximate frequency of fishing trips, average catches, and from rough estimates (approximations) of market sales. They are considered to be more reliable than the corresponding 'estimate' of the inshore catch given in some Annual Reports.

The Fisheries Division commenced more accurate, statistically based estimates of landings of pelagic species in 1989 (see section 3.2 for details of methodologies). Note that the 1987-88 data is available but has not yet been databased.

6.2 Trends in offshore landings, 1975-90

All 'estimates' of offshore landings are collated in Table V. Note that these vary in accuracy, ranging from crude approximations to statistically derived estimates. Trends in landings of pelagic species are summarised in Fig. 7.

Despite the varying quality (and reliability) of the data on the pelagic fishery, Fig 7 probably reflects the general trends in the pelagic fishery. The increase in landings from 1975-83 occurred as the fishing effort (number of *alia*) was increasing rapidly at that time. The sudden increase in 1980 reflects the highly successful introduction of FADS in that year. The sudden

decline in 1984 reflects the temporary decline in FAD deployment (to one) in that year. The progressive decline 1985 indicates a reduction in fishing effort as the subsidised boat building and marketing programs began to wind down.

The marked decline in 1989 (the first year of statistically based estimates) indicates that previous year's estimates were probably exaggerated by as much as 50%, but it is known that a number of alia left the tuna fishery on that year to fish the new Falealupo snapper grounds. The final decline (from 600 mt to 330 mt) occurred in 1990 after cyclone Ofa destroyed half of the alia fleet.

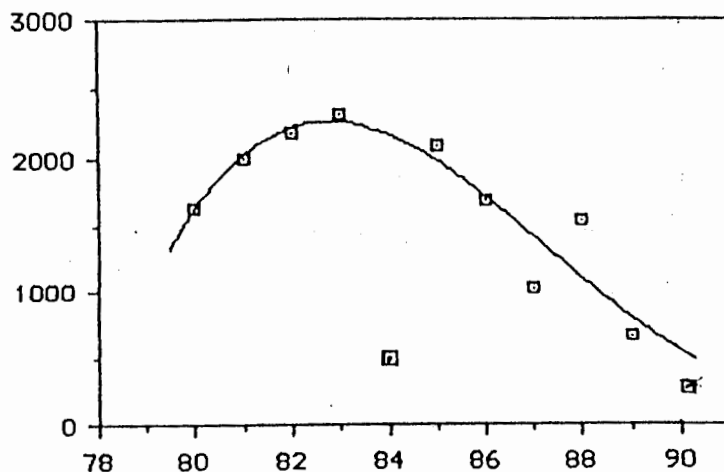


Figure 7. Estimates of landings of pelagic species by Fisheries Division. (Note only 1989 and 1990 were based on statistical sampling. The 1984 landings (low because only one FAD was deployed) have been omitted from the regression.)

7. EFFECTS OF CYCLONE OFA ON COMMERCIAL LANDINGS, 1990

Cyclone Ofa struck Western Samoa between 2-3 February 1990, causing serious loss of life and unprecedented damage to property, agriculture, forests and reefs. The commercial fishing fleet was very seriously affected. Most of the FADS deployed around both Islands were lost in the cyclone and almost half the fishing fleet (53 of 97 vessels) were damaged. The effects of the cyclone are described in detail in FAO Technical Report 2 (FAO, 1991 b)

7.1 Damage to commercial fleet

Details of the damage to alia are summarised in Table V. The cost of replacement craft was estimated to be WST\$186,000 on Savaii, and WST\$222,000 on Upolu, based on a replacement costs of an Alia of \$22,164 (costs have subsequently risen). The cost of repairs was estimated to be \$31,000 on Savaii and \$60,000 on Upolu. Total costs of repairs and replacement of Alia hulls alone was estimated at \$498,500. The cost of replacing motors and other gear was additional.

7.2 Effects on fish landings

The loss of almost half the fishing fleet had a major effect on fish landings in 1990. Tuna landings at Apia Fish Market declined from about 660 mt in 1989 to about 350 mt in 1990. The decimation of the fleet has had a somewhat beneficial consequence as prior to the cyclone the deep water snapper resource was considered inadequate to support the then deepwater fishery. King et al. (1990a) estimated the maximum sustainable yield of the snappers was

about 80 mt pa, and recommended the effort be reduced to 12 alias. Around this number is currently engaged in the fishery.

8. ESTIMATE OF CURRENT COMMERCIAL LANDINGS (1989)

Because landings in 1990 had been seriously affected by Cyclone Ofa, 1989 has been selected for the estimation of 'current' landings. A total of 949 mt of finned fish and 33 mt of invertebrates were sold at the Apia Fish Market and other retail outlets in that year. An additional amount was sold by the roadside and within villages, and at the main Agriculture Market. Details of known fisheries landings are summarised in Table VI, and illustrated in Fig. 8.

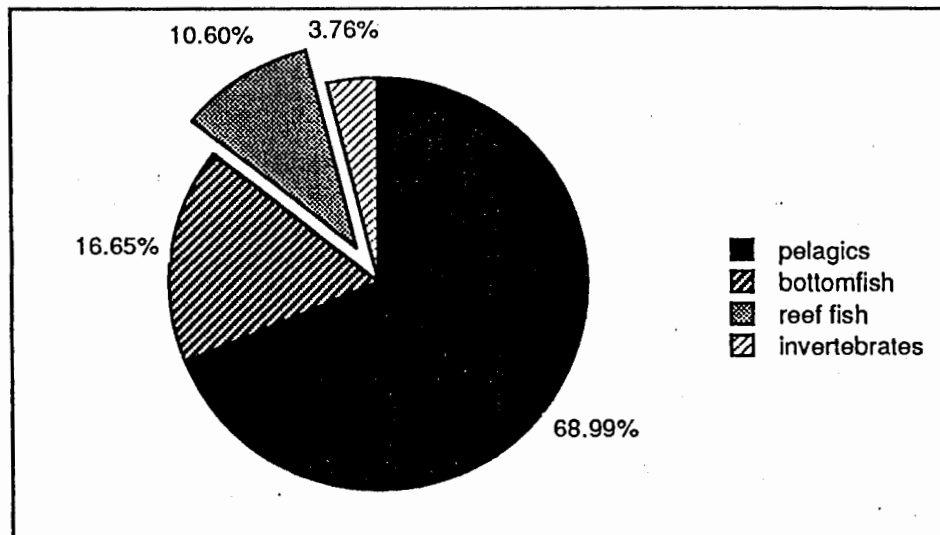


Figure 8. Commercial landings of fish and invertebrates from Apia Fish Market and other retail outlets in 1989 by % of total weights

9. GENERAL DISCUSSION OF TRENDS IN COMMERCIAL LANDINGS

The fisheries statistics from Western Samoa are limited and are of variable quality. However the relatively short duration of records from Apia Fish Market (1986-90) indicate dramatic declines have occurred in inshore landings. The less reliable estimates of pelagic landings (1975-90) also indicate a considerable decline in those species. Inconsistencies in the recording of deepwater bottomfish (sometimes combined with inshore reef fish) prevent any determination of trends.

9.1 Decline in commercial landings of inshore fish and invertebrates

The dramatic decline in landings at the Apia Fish Market may be attributed to a number of factors: changes in distribution (eg an increase in sales through other retail outlets in Apia, in roadside sales, and local sales in the villages of origin); an increase in domestic consumption in the villages of origin; a decrease in the artisanal fishing effort (eg because of emigration of young men for salaried employment); and/or a decrease in fish and invertebrate stocks (because of overfishing and loss of nursery habitat).

A change in marketing has contributed to the decline in landings of certain groups at the Apia Fish Market. For example, the lethrinid and lutjanid landings declined at least partially because the private fish processor SAMPAC began purchasing deepwater bottomfish directly from the alia fishermen in 1988-89. The deepwater snappers purchased by SAMPAC are now included under 'other retail outlets' (3.2, above). The reduction in spiny lobster landings at the Apia Fish Market is likewise attributed to SAMPAC's entry to the market. Formerly many spiny lobsters were sold on the market floor but in 1988-89 SAMPAC began to purchase spiny lobsters directly from the artisanal fishermen for processing and export. Higher prices were paid for larger lobsters, increasing fishing effort and landings. Sales from the market floor declined as 'other outlet' sales increased.

However, changing marketing trends do not satisfactorily explain the decline in commercial landings of the other inshore fish and invertebrates (which are not purchased by SAMPAC). Nor has there been a significant increase in the number of 'other retail outlets' which might have diverted sales from the Apia Fish Market. Total sales through 'other retail outlets' in 1989 were about 37% of those at the Apia Fish Market, insufficient to explain the four fold decrease in inshore landings at Apia Fish Market landings between 1986 and 1989.

Given that the artisanal fishing effort has declined by about 35% since 1983 (FAO, 1991a), much of the decline in landings at the Apia Fish Market landings is therefore attributed to a decline in inshore stocks. This substantiates the anecdotal reports of artisanal fishermen over the past two decades. Growth overfishing is evident by the very small size of many reef species offered for sale at the market. Stock overfishing is also evident in the case of *Selar crumenophthalmus* (akule), giant clams (faisua) and probably mullet (anae).

Landings of *Selar* dropped from 12.5 mt in 1986, to 0.6 mt in 1987, and were attributed by Helm (1988) to stock overfishing. (Note that 'other retail outlet' sales of this species was only 0.5mt in 1989: Brotman, 1989). Stock overfishing has certainly occurred in the *Tridacna* clams which have been depleted to virtual local extinction in many areas. The mullets which have been heavily fished with fish fences, gillnets and dynamite, and suffered loss of nursery habitat with the destruction of mangroves and marshes. The decline in the inshore fishery will be the subject of a later report.

9.2 Decline in commercial landings of offshore species

Although the lack of historical information on deepwater bottomfish landings precludes discussion of trends in landings, it is evident that they are vulnerable to overfishing and that stocks have been depleted. King, et al. (1990a) estimated that the maximum sustainable yield of the deepwater snappers is about 88 mt and that the fishery should be limited to 14 alias. The current landings are somewhat in excess of this figure.

The decline in tuna landings can be attributed to declining fishing effort rather than declining stocks. Although a total of 350 alias have been constructed since 1978, only 50-60 are now actively fishing. The reduction of fishing effort has occurred for a number of reasons: aid to the fishery has declined (eg reduced subsidies on vessel construction, reduced extension and promotion); less serious fishermen have left the fishery; fuel costs have greatly escalated greatly; many fishermen have gone over to deepwater bottomfishing; and the market demand for skipjack has stagnated. The offshore tunas no doubt comprise Western Samoa's only underfished resources.

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Table I. Type of fish, origin and % total landings in Western Samoa 1978
(Dept. Statistics, 1978)

TYPE OF FISH	TOTAL CATCH (tonnes)	% TOTAL
Skipjack	183.359	16.82
other tuna, mackeral etc	7.811	0.71
Lutjanidae	13.735	1.26
Lethrinidae	68.470	6.28
other deep water fish	133.603	12.25
sharks, rays and skates	7.328	0.67
Reef fish	422.552	38.76
Carangidae	27.132	2.49
Mugulidae and milkfish	30.003	2.75
eels	23.442	2.15
other fish	50.687	4.65
crustacea	27.960	2.56
shellfish	18.512	1.69
cephalopods	31.123	2.86
echinodermata	44.786	4.11

Table II. Reef and lagoon fish and invertebrates sold through Apia market, 1986-90

YEAR	1986	1987	1988	1989	1990
(1) REEF FISH					
Snappers (Lutjanids)	5.2	3.4		2.1	-
Sweetlip (Lethrinids)	59.0	28.7		5.6	5.8
Siganidae	2.5	2.1		6.7	-
Wrasses (Labrids)	2.0	1.5		-	-
Parrotfish (Scaridas)	27.1	31.5		5.0	4.9
Surgeons (Acanthurids)	27.1	28.6		6.7	10.7
Unicornfish (<i>Naso</i> spp)	15.0	16.4		6.9	5.1
Bigeye scad (<i>Selar</i>)	12.5	0.6		0.5	-
Trevally (Carangids)	19.9	5.0		-	1
Goatfish (Mullids)	18.0	16.8		4.7	-
Mullet (Mugulids)	27.1	18.9		5.1	2.5
Mojarras (<i>Gerres</i>)	2.0	0.4		-	-
Soldierfish (Holocentrus)	2.7	6.5		0.6	-
Coralcod (Serranids)	6.9	12.0		1.7	0.6
Moray eels (<i>Gymnothorax</i>)	8.4	4.6		1.9	1.3
others	10.8	15.1		11.1	7.0
TOTAL	246.2	191.3		58.6	39.0
(2) INVERTEBRATES					
Mangrove crabs (<i>Scylla</i>)	9.6	10.5		5.4	1.2
Lobsters (<i>Panulirus</i>)	10.7	9.2		3.6	1.8
Clams (<i>Tridacna</i>)	10.1	1.9		0.1	0.1
Octopus	4.9	5.2		2.1	2.3
TOTAL	37.1	26.8		12.3	5.6
(3) METHOD (% WT)					
net	24	40			
spear	48	31			
trap	12	16			
hook & line	16	13			
(4) CATCH BY REGION					
Apia area	15	16			
NE Upolu	14	8			
E Upolu	3	0.3			
SE Upolu	1	0.2			
SW Upolu	3	3			
W Upolu	7	2			
NW Upolu	22	20			
Manono & Apolima	35	50			

(Notes: '-' refers to taxa not recorded separately in database because of small landings)

Table III. Summary of landings of inshore fish and invertebrates at other retail outlets in 1989 (re-calculated from data presented by Brotman, 1989)

GROUP	%	Wt (mt)	Notes
(1) reef fish	16.4%	34.4	All groups, combined
(2) bottomfish	55.6%	116.6	Mainly exports of snappers SAMPAC
(3) pelagics	28.0%	58.7	skipjack and yellowfin tunas

FISH (TOTAL)	100%	209.7	

(4) invertebrates			
Mangrove crabs (<i>Scylla</i>)	7.2%	1.5	
Lobsters (<i>Panulirus</i>)	88%	18.3	Mainly exports by SAMPAC
Clams (<i>Tridacna</i>)	1.4%	0.3	
Octopus	3.3%	0.7	

TOTAL	100%	20.8	(2.5 mt, excluding exported lobsters)

beche de mer		11.4	Export of 3 consignments

Table VI. Commercial landings of offshore pelagics (tunas) and bottomfish (deep water snappers) 1989 (in metric tonnes)

OUTLETS	PELAGICS (TUNAS ETC)	BOTTOM FISH	INSHORE FISH	TOTAL FISH	TOTAL INVERTEBRATES
Fish Market	546.4	39.3	58.6	739	12.3
Other Outlets	58.7	116.6*	34.4	210*	20.8
TOTALS	605.1	145.9	93.0	949	33.1

* about 30 mt exported.

Table ^{IV} ~~A~~. Estimates of commercial landings in Western Samoa, 1975-present. Note the varying accuracy of the estimates)

YEAR	PELAGICS (TUNA ETC)	BOTTOMFISH* SNAPPER ETC	INSHORE REEF FISH**	INSHORE SHELLFISH	SOURCE
1975	650	900			(a) Approximations
1976	700	950			(a)
1977	700	900			(a)
1978	750	850			(a)
1979	950	800			(a)
1978	191	216	666	122.3	(b) Discarded by F. Div
1980	1,636	727	-	18	(a)
1981	2,000	772	-	18	(a)
1982	2,182	545	-	18	(a)
1983	2,318	772	-	18	(a)
1984	464	1,000	-	27	(a) Note 1 FAD operating
1985	2,082	822	545	96	(b)
1986	1,688	440	617 (246***)	144 (37***)	(a) (c)
1987	1,034	384	480 (191***)	106 (27***)	(a) (c)
1988	1,536	616	440	80	(a)
1989	609***	155***	na (158***)	86***	(a)
1990	350***				

Notes: * 'Bottomfish' between 1975-84 apparently included reef fish and deepwater snappers sold at Apia Fish Market. These were separated in 1985.

** 'Reef fish' in 1978 was an estimate of the artisanal catch by the Dept. Statistics. The 1985-88 'estimate' was derived arbitrarily from this by the Fisheries Division. It is considered a gross underestimate.

*** Statistically based estimates of commercial sales.

Sources: (a) Fisheries Division Annual Reports; (b) Dept Stats (1978); (c) N. Helm: Inshore reef fish and shellfish landings from Helm (1988). Note Apia Fish market sales monitored only.

Table V Sales of offshore fish by types, % and weight from 'other retail outlets', 1989 (recalculated from Brotman,1989)

BOTTOM FISH	%	WEIGHT (mt)
Lutjanids (misc)	7.6%	8.8
<i>Aphareus viriscens</i>	13.4%	15.5
<i>Aphareus rutilans</i>	4.5%	5.2
<i>Etelis</i> spp	32.9%	38.3
<i>Paracaesio</i> spp	7.6%	8.8
Lethrinids (misc)	4.5%	5.2
<i>Pristipomoides</i> spp	9.1%	10.6
misc small fish	20.0%	23.3
TOTAL BOTTOM FISH	100%	116.6
PELAGICS		
<i>Acanthocybium</i>	0.5%	0.3
<i>Istiophorus</i>	10.0%	3.5
<i>Corophaena</i>	4.8%	2.8
<i>Gymnosarda</i>	3.6%	2.1
<i>Elagatis</i>	0.4%	0.3
Carangids	3.9%	2.2
<i>Selar</i>	0.8%	0.4
<i>Katsuwonis</i>	32.4%	19.0
<i>Thunnus albacares</i>	47.6%	28.0
TOTAL PELAGICS	100%	58.7

Table V. Estimate of damage to fishing fleet by cyclone Ofa, 1990

ISLAND:	UPOLU	SAVAII	TOTAL
NO. OPERATING 1988:	58	37	95
TOTAL DAMAGED:	23(2*)	19(4*)	42
TOTAL WRITTEN OFF:	12	10	22
TOTAL UNDAMAGED:	35	18	53

(*) Refers to vessels not in regular operation before Ofa. This number may have been much larger: (I. Isaaki, pers. comm.).