

# THE DEVELOPMENT OF SMALL-SCALE FISHERIES FOR BOTTOMFISH IN AMERICAN SAMOA (1961–1987) — PART 2

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## SECOND-GENERATION FISHERY DEVELOPMENT

### Introduction

The 1978 visit by Paul Mead of the SPC Deep Sea Fisheries Development Project brought new gear and techniques to an aging dory fleet. These were to revolutionise domestic fisheries and offer an alternative to fishing on the already heavily-exploited, shallow-water bottomfish grounds adjacent to Tutuila. The gear used by Mead, including grapnel anchors, inexpensive polypropylene anchor line and depth sounders, became standard on boats engaged in the fishery during the early 1980s.

However, it was the introduction of the simple, wooden handreel which was most responsible for increasing the catching power of the boats and making the deep-water snapper resources of the Territory available to local fishermen. Until then, this resource had been unexploited on the outer reef slopes of Tutuila and on the offshore submarine banks and seamounts of the Territory.

This year also saw the addition of two 12.2 m, diesel-powered vessels to a fishery that had previously been exploited solely by 7.3 m dories. The new boats carried crews of four to five fishermen and made fish-

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ing trips of up to four days or more (Wass, 1978). The increased catching power and autonomy of these vessels make comparisons of catch rates with the dory programme invalid or subject to careful adjustments. The longer range of the larger craft allowed the first bottomfish exploitation of the offshore banks, seamounts and outer reef slopes of the remote islands of American Samoa, i.e. Swain's Island and Rose Atoll.

### Fleet composition

At the close of the 1970s, the last remaining dories were operating alongside the two larger, diesel-powered craft described

above. The 1980s signalled the end of the dory fleet and a rapid growth in the quantity and variety of small commercial/artisanal craft in the Territory.

Figure 3 shows this dramatic increase in different fishing-vessel types that peaked in 1985, with 49 boats engaged in the bottom and troll fisheries. The sharp decline in the number of vessels shown in 1987 was partly due to hurricane Tusi, which damaged or destroyed all nine vessels of the Manu'a Islands fleet (Itano, 1987a).

The most popular fishing craft used in Samoan fisheries is the FAO-designed alia catamaran, and plywood, aluminum or fibreglass alia were used during bottomfishing operations. The majority were 8.5 m aluminium alia constructed in Apia, and powered by a single 25–40 hp outboard motor.

These vessels, fully equipped with fishing gear, were made available for purchase by Pago Pago-based fishermen through the OMR at relatively low, government-subsidised rates. In 1981, an American boat-builder

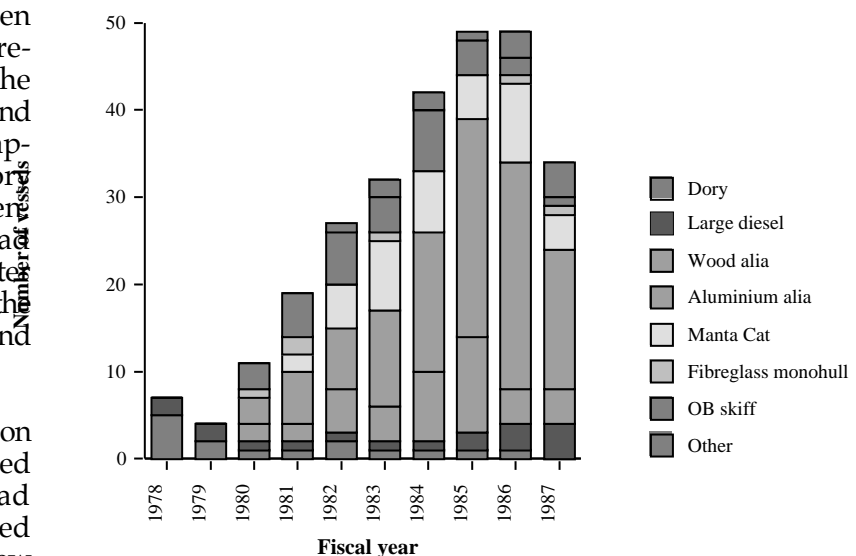


Figure 3: Composition of the artisanal fishing fleet engaged in bottomfish exploitation

established a workshop on Tutuila, and began turning out plywood and fibreglass catamarans for the local fishing industry.

These vessels, called Manta Cats, quickly became the boat of choice for the more dedicated, full-time commercial fishermen. They were 6.7–9 m in length and generally powered by two 40 hp outboard motors. They were easily capable of exploiting the offshore banks and seamounts, and were used for multiple-day bottomfishing trips. Increasing availability of US- or New Zealand-built aluminum skiffs and fibreglass craft in the mid-1980s added variety to the artisanal fleet.

### Deep-water snapper fishing grounds

The Dory Project vessels concentrated effort on the broad shelf areas around Tutuila Island near Cape Taputapu and Aunu'u Island or between Ta'u and Olosega in the Manu'a group. Larger boats and better fishing gear and techniques meant that fishing operations

expanded to include seamounts and pinnacles over 70 km from Pago Pago. Figure 4 shows all of the areas that produced significant quantities of deep-water snappers and groupers during the 1980s. These areas were well known during the early 1980s, except for 2% Bank which was first exploited for deep-water snappers in 1986 (Crook, pers. comm.).

### Bottomfish marketing and export

#### *Shallow-water species*

During the early years of the dory project, the ex-vessel price of bottomfish in American Samoa was around US\$ 0.23–0.27/kg. By 1980, the price received for bottomfish had risen to an average of US\$ 0.57/kg (Wass, 1974, 1980b).

In December 1980, a fish market opened in Pago Pago (Fagatogo) This allowed the fishermen to market their own catch at a centralised, relatively sanitary location and improved the quality of OMR fishery data collection. Dory fishermen ex-

perienced difficulty in marketing their fresh fish at a profitable price due to stiff competition with inexpensive sales of 'miscellaneous' fish from the canneries. This consisted of bycatch and discards from the large tuna canneries based in Pago Pago Harbor.

There are three sources of miscellaneous fish that compete with the local sale of fresh fish in American Samoa: direct sale by canneries of longline bycatch (wahoo, swordfish, etc.); longline by-catch illegally bartered to Samoans by crews (wahoo, tuna, mahi mahi, sharks, billfish, etc.); and purse-seine bycatch that is sorted from the tuna catch by unloading crews (rainbow runner, mahi mahi, wahoo, triggerfish, undersized tuna, etc.).

These sources of frozen fish (mostly wahoo) account for a tremendous amount of the local fish consumption in American Samoa and dominate sales to local restaurants and some markets. Fishermen found it increasingly difficult to compete and an increasing amount of

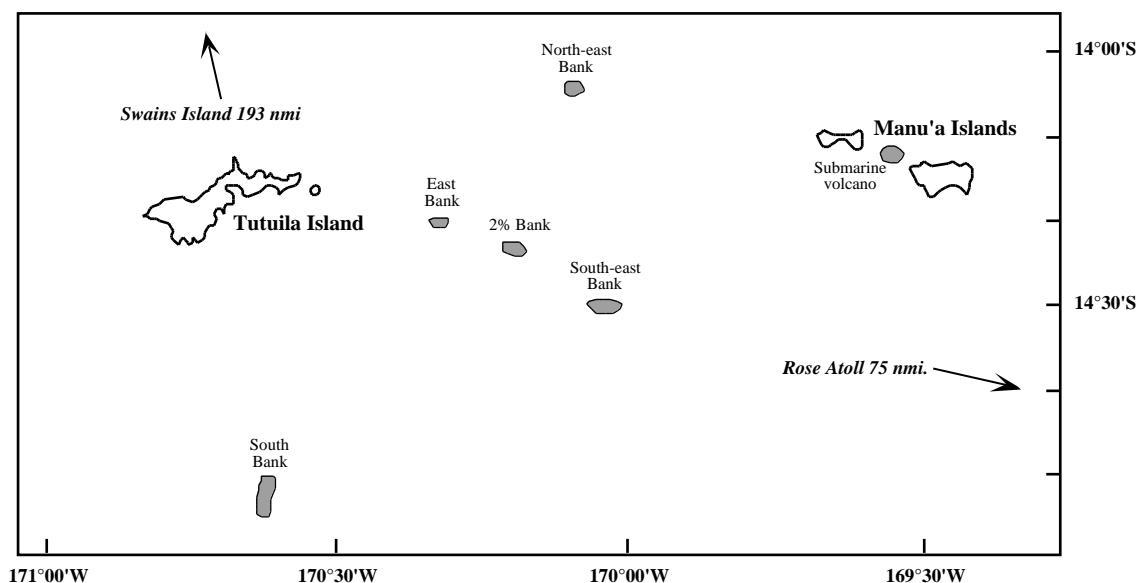


Figure 4: Deep-water snapper fishing grounds in American Samoa

their time was required to market their own catch. This situation turned them into fish peddlers, when their time could have been better spent on fishing or vessel maintenance.

Competition problems with cannery 'miscellaneous' fish and purse-seine by-catch were compounded by the Polynesian preference for eating whole, small fish in the 0.5–2 kg range.

Fishermen were now landing high-value *Etelis* spp. of 5–10 kg, and having great difficulty marketing them in Samoa outside the limited European restaurant trade that had already been inundated with cannery fish.

In order to maximise the potential economic benefit of the deep-water snappers that were now within the range of the local fishery, the OMR pursued various options to train local fishermen in handling and storage techniques that would allow them to export their catch to high-value markets outside of Samoa.

#### *Fish handling, processing and marketing*

In April 1982, the Pacific Tuna Development Foundation (PTDF), which was later to become the Pacific Fisheries Development Foundation (PFDF), contracted Richard Howell to administer and conduct the American Samoa Fish Handling and Marketing Training Project.

The objectives of the project were to increase income and maximise benefits to local fishermen through improved handling of catches that would allow a diversification to better markets (Howell, 1983).

Fishermen were trained in proven techniques of brain spiking, bleeding, ice-slush brining and icing of deep-water snappers.

Demonstrations were given on how to pack and ship to fresh-fish markets by air with a minimum of packing materials (which add weight and shipping costs). Manuals on exporting fish were prepared and translated into Samoan.

During the first four months of the project, high-quality fish from a single, highly skilled fisherman were sent to one Hawaii-based buyer at a fixed price of US\$ 0.82/kg. The buyer assisted in the start-up of the project by providing current price information and boxes, paying freight and making contacts with the Hawaiian fish marketing industry.

When fishermen were landing export-quality fish in adequate quantities, catches were sent directly to the United Fishing Agency, which represented the catch at auction, kept track of transactions and remitted the money back to Samoa minus a 10 per cent commission fee.

The fish were shipped in a chilled but dry state in fish-shipping cartons and kept cold in flight, as they were stored in the unheated cargo compartments.

Tare weights were approximately 5–7 per cent of the total and air freight charges at the start of the project were US\$ 0.14/kg. Waxed boxes were available to the fishermen at US\$ 5.00 per box. The OMR assisted by providing current auction prices to the fishermen and handling the importation, storage and sale of boxes (Howell, 1982).

An increase in bottomfish effort, landings and trip length was noted during 1983 as a result of this project (Wass & Aitaoto, 1983). During the first nine months of shipping to the auction, over 2,727 kg of high-quality bottomfish were sent to Hawaii and marketed at an average price of US\$ 1.64/kg (Howell, 1983). Over 55 per cent of the exports during this time period were *Etelis* spp., 14 per cent *Aphareus rutilans* and 17 per cent *Aprion virescens*.

Other fish regularly exported included *Pristipomoides filamentosus*, *P. flavipinnis*, *P. multidentis* and *P. zonatus*, groupers, jacks (*Caranx lugubris* and *C. ignobilis*), wahoo and mahi mahi.

#### *Fresh fish exporting*

The American Samoa Fresh Fish Exporting Programme contracted Jim McGuire from December 1983 to May 1984 to continue the work begun by Howell under PTDF funding. The project provided assistance to fishermen by funding phone calls to the Honolulu auction block to obtain current price information, importing and selling shipping boxes, transporting fish to the airport, assisting with packing and helping to fill out the various shipping documents.

The shipping of groupers and jacks was discontinued after 1985, and the programme manager emphasised shipping eteline snappers and *Pristipomoides* spp. (Aitaoto, 1987). This phase of the project concentrated on maximising the value of high-priced bottomfish by sending selected species to Hawaii only when the prices and profit margins were highest. This strategy was designed to leave valuable bottomfish species stored 'in the water' around

Samoa until the prices were right and the fishermen could expect to obtain the highest possible return on their efforts (McGuire, 1985).

### THIRD-GENERATION FISHERY DEVELOPMENT

#### General

The export of high-priced bottomfish began to decline in American Samoa by the mid-1980s, and only three fishermen exported fish to Honolulu in 1986 and 1987. This was partially due to the depletion of the deep-water bottomfish stocks around American Samoa and the general decline of the artisanal fishery.

The major emphasis of work conducted by OMR shifted away from fisheries development and towards resource assessment, monitoring and management. Most of the fisheries development work concentrated on FAD-related fisheries and attempts to develop completely new fisheries on unexploited resources.

#### PVC bottom longline trials

In 1985, a consultant from Hawaii visited American Samoa to implement trial fishing and the demonstration of a multiple-hook, longline system for bottomfish. The project was funded by the PFDF and chartered local fishing vessels and fishermen.

The system used two-metre PVC pipes, each rigged with six hooks and weighted at one end with steel reinforcing rod. Each pipe was clipped to a polypropylene mainline, and set on the bottom in depths of 80 to 200 m.

A typical set of the gear consisted of approximately 20 to 30

PVC pipes, each with six baited leaders. The extremely rugged bottom topography and steep slopes of the offshore banks in American Samoa caused severe fouling of the gear on most attempts. The method was unsuccessful for these reasons and was never adopted for use by the local fishermen.

#### Hydrographic surveys

In August 1985, the Western Pacific Regional Fishery Management Council met in Hawaii, and the Bottomfish Advisory Panel to the Council passed a resolution that stressed the need for better charts of the offshore banks and seamount areas of American Samoa.

In early 1986, the NMFS/NOAA research vessel *Townsend Cromwell* visited Pago Pago en route to albacore surveys in the southern convergence zone. Five days were spent performing hydrographic soundings. This resulted in the generation of five charts by NMFS staff in Honolulu that were later circulated to American Samoa fishermen (Ralston & Goolsby, 1986; Itano, 1987a).

The surveys did not discover any new bottomfishing grounds, but charted the exact location and bottom profiles of the known banks and seamounts that had been exploited for deep-water snappers since the late 1970s. The survey of the East Bank area came very close to locating what was later known as 2% Bank; this was discovered by a local fishermen and exploited for deep-water snappers later in 1986.

The surveys did confirm that the area of deep-water bottomfish habitat in American Samoa is extremely limited, with most of it existing only on the steep

outer slopes of the offshore seamounts and high islands.

The *Townsend Cromwell* visited American Samoa again in March 1987 on the final leg of an extensive South Pacific cruise that included stops in Tahiti, Rarotonga and Niue. Pyramid-style shrimp traps and deep-water fish traps were tested on South-east Bank, East Bank and 2% Bank.

Eight species of *Heterocarpus* shrimp were taken, but catch rates were below commercial quantities. The fish traps produced very little, but the cephalopod *Nautilus pompilius* was found to be very common at depths of 250 to 375 m. During the cruise, the exact position of 2% Bank was charted. A small amount of bottom lining was conducted on the three banks but catch rates generally were very poor (Itano, 1987b), and the catch rates of eteline snappers were very low.

#### SPC Deep Sea Fisheries Development Project—second visit, 1988

A second visit of the SPC Deep Sea Fisheries Development Project (DSFDP) was made between 3 February and 13 June 1988. Masterfisherman Archie Moana spent most of his visit training local fishermen in the use of vertical longline gear on FADs to target large, deep-swimming tunas. Five bottomfishing trips were made, four to offshore banks and one to Cape Taputapu (Tutuila). The bulk of the catch consisted of shallow-water snappers, emperors and barracuda, as more time was spent fishing in depths of less than 80 m.

Deep-water snappers (*Etelis coruscans*) made up only 9.4 per cent of the catch by weight. The

dominant species in order of weight were barracudas, *Lutjanus bohar*, *Elagatis bipinnulata*, *Aprion virescens* and *Lethrinus amboinensis*. The blue-lined snapper, *Lutjanus kasmira*, was numerically dominant in the catch (Moana, 1988).

#### CATCH-AND-EFFORT RESULTS

##### Fishing area summary

Bottomfishing during the expanding years of the Dory Project was basically restricted to the shallow shelf areas around Tutuila and the Manu'a Islands.

A limited amount of deep-water snapper fishing was conducted on the steep outer reef slopes around Tutuila, particularly on the south coast during rare northerly wind conditions (Pedro, pers. comm.).

After 1978, with the introduction of handreels and larger vessels, the offshore banks came under exploitation and the outer reef slopes of Tutuila and Manu'a were fished down.

The order of discovery and intensive fishing of the outer reefs and seamounts was probably East Bank, followed by South Bank, Southeast Bank, Northeast Bank and 2 % Bank.

The bottomfish stocks of Swain's Island and Rose Atoll have also come under sporadic exploitation by the larger diesel-powered vessels in the fleet and a 15.5 m multi-purpose research/training vessel operated by the Department of Marine and Wildlife Resources (DMWR<sup>1</sup>). The chartlets produced by the *Townsend Cromwell* hydrographic surveys

were used with a linear tracking device to yield an estimate of the 100-fathom isobath around the seven islands and offshore banks of American Samoa of 109.8 and 33.5 nmi respectively.

##### Fishing effort summary

The start of the Dory Project in 1972 signalled the first serious exploitation of bottomfish in American Samoa. During this period, an average of 3.4 to 4.7 men took part in the fishing trips, and most trips engaged in bottomfishing with handlines (Wass, 1973).

Each dory was of a similar size and catching power during the early project, so each dory could be equated to one unit of catching power, i.e. three or four men each fishing with one handline for one evening per trip. The size of the dory fleet expanded rapidly during the first three years of the boat-building programme, and the local fishery experienced a strong growth pattern from 1972 to 1975.

After this boom period, the number of vessels actively engaged in the fishery declined steadily through disrepair, sinking, sale to Western Samoa or general disinterest in commercial fishing.

The two 12.2 m diesel-powered monohull vessels joined the fleet in 1978, with crews of four to five men making multiple-day trips. The FAO handreels and depth sounders were also quickly adopted by American Samoan fishermen after 1978, which greatly increased fishing efficiency. The 1980s brought a rapid expansion of fishing-vessel types, including alias,

aluminum skiffs and Boston Whaler fibreglass skiffs (Wass, 1980b).

However, it was the alia, or catamaran-style vessels, that quickly became the favoured fishing vessel in American Samoa (see Figure 3).

The years 1980–1985 could be considered the second boom period in local fishing effort, as virgin deep-water snapper grounds came under initial exploitation, and the bottomfish export programmes were active.

Wass credited these programmes with increasing bottomfishing effort, landings and average trip length. Most of the fishermen stopped exporting fish after 1985, after which time only three of the most successful fishermen continued to send deep-water snappers to Hawaii.

Apparently, the majority of fishermen abandoned shipping their catches to Hawaii for procedural or cultural reasons, as well as due to a decline in ready availability of deep-bottomfish stocks near Tutuila.

These reasons included: inexperience in catching deep-bottom stocks already culled by exploitation; the volatility of the auction market, with some low prices; a general lack in trust of others handling their catch and fairly representing it at auction; a general prejudice against non-Hawaiian fish by some Honolulu fish buyers, resulting in unfairly low purchase prices offered; dissatisfaction with waiting to be paid for the catch as opposed to the preferred 'cash in hand' transaction; and

<sup>1</sup> The Office of Marine Resources (OMR) became the Office of Marine and Wildlife Resources (OMWR) in 1987 and the Department of Marine and Wildlife Resources (DMWR) in 1988.

a decrease in OMR assistance and free services to fishermen.

Bottomfishing effort for the deep-water snappers dropped away sharply after 1985 and an increasing amount of shallow-water reef and bottomfish was supplied by imported catch from Western Samoa. A further decrease in effort was caused by the destruction of the floating docks and alia fleet of the Manu'a Islands by hurricane Tusi in 1987.

Bottomfish landings in American Samoa dropped to the lowest on record during 1987 and exports of deep-water snappers had virtually ceased by 1989.

**Landings and CPUE summary**

*General*

The direct comparison of CPUE over the time-span covered in this paper (1961–1987) is difficult, as a common unit of effort was not recorded during this period and completely different stocks of bottomfish are involved. To further complicate matters, a great deal of the information on the early period is no longer available. This analysis will examine CPUE and landing trends for the separate

periods that have been outlined in previous sections.

*Dory Project years*

Table 1 lists the catch rates in kg per trip for the *Tautai A'e* surveys, the Dory Project vessels and the first SPC DSFDP visit to American Samoa, covering the years 1967 to 1978

The table also summarises the number of dories existing in American Samoa, the number of dories fishing regularly around Tutuila, and the number of fishing trips and total catch of the Tutuila fleet per year. The *Tautai A'e* surveys and Dory Project vessels fished shallow-water grounds around Tutuila and most trips were of only one night's duration.

The data indicate that the dories experienced a catch rate similar to the *Tautai A'e* surveys during the first year, after which CPUE dropped to around 60 to 90 kg/trip between 1972 and 1977. Anecdotal information indicated that catch rates on local bottomfish grounds declined during this period.

However, the slight increase in CPUE evident in the data may have been due to the exploita-

tion of new fishing grounds combined with increasing fishing skill of the fishermen and a decrease in fishing effort (Wass, 1976; 1977).

The first visit of the SPC DSFDP recorded a similar catch rate (average of 83.9 kg per trip). The masterfisherman during this visit used dories for his fishing surveys; he averaged 9.5 hours of bottomfishing and 3.2 fishermen per trip, which is quite similar to average dory effort.

Significantly higher catch rates might have been expected, as Mead was a highly experienced fisherman using wooden handreels, but his fishing concentrated on much deeper fishing grounds which typically produce lower catch rates.

Figure 5 page 40 plots the CPUE of vessels listed in Table 1 against the number of artisanal vessels operating in the fishery for each year. This figure indicates what appears to be a dramatic drop in catch rates in response to the sharp rise in fishing effort (fleet size) during 1973–1974.

Catch rates then indicate a gradual increase as the number of vessels began to decline after

**Table 1: Shallow-water bottomfish catch rates in American Samoa (1967–1978)**

Date	No. of dories	No. fishing Tutuila	No. of trips	Total (kg)	Catch per trip (kg)	Comments	Information source
July 67/March 69	N/A	1	104	14,456	139.0	<i>Tautai A'e</i> surveys	Ralston, 1978
Feb. 72/June 72	5	5	42	6,670	158.8	Dories–handlines	Wass, 1972
July 72/June 73	13	13	?	?	95.5	Dories–handlines	Wass, 1973
July 73/June 74	21	14	673	42,892	63.7	Dories–handlines	Wass, 1974
July 74/June 75	23	11	312	19,650	63.0	Dories–handlines	Wass, 1975
July 75/June 76	23	13	305	22,119	72.5	Dories–handlines	Wass, 1976
July 76/June 77	18	9	?	?	82.3	Dories–handlines	Wass, 1977
April 78/June 78	4	2	36	3,022	83.9	SPC/DSFDP handreels	Mead, 1978

1975, possibly due to the explanation of lowered effort and increased fishing experience put forth by Wass.

Ralston also noted that catch rates in line-hours dropped over the course of the Dory Project, but reported that fishing was thought to improve in the later years, as fewer boats meant decreased effort on the stocks (Ralston, 1978). The sharp increase in CPUE in 1978 was caused by the entry of the two large, diesel vessels and the introduction of the FAO handreel by Paul Mead.

*Deep-water snapper exploitation*

Table 2 lists catch rates for Tutuila-based fishing vessels from 1978 to 1983, which was a transition period between the end of the Dory Project and the start of deep-water snapper exploitation. It is difficult to interpret these data, as a large variety of fishing vessel types was engaged in the fishery (see Figure 3). However, there is some indication of high initial catch rates that may have been

a result of the use of handreels, followed by a decline to CPUE levels similar to those of the late Dory Project.

Table 3 summarises the amount (kg) and species of all bottomfish exported from American Samoa to the Honolulu Wholesale Auction between September 1982 and December 1987. The export of groupers and jacks ('Others' in the table) was discontinued after 1985 and exports concentrated on sending only high-value, deep-water snappers. The catch rates of eteline snappers declined as virgin stocks were fished, and fishermen extended operations to more remote banks and islands (Crook, Kitiona, pers. comm.).

The total catch of eteline snappers rose sharply in 1986, while the number of fishermen had dropped from ten in 1985 to only three in 1986. This increase in catch rate can be partially explained by the improved skills of the few remaining fishermen and the better fishing experienced due to a drop in fishing pressure.

However, the main reason for increased landings in 1986 was the discovery and exploitation of virgin deep-water snapper stocks on an isolated seamount, named 2% Bank (Crook, pers. comm.). A depletion study of the eteline snappers taken from 2% Bank between 23 February and 21 May 1986 has been conducted through the examination of Honolulu Wholesale Auction data and interviews with the fishermen involved (Moffitt, 1989).

This analysis estimated a 78 per cent removal of the eteline snappers during the three-month period. The removals of *Etelis coruscans* and *E. carbunculus* during this period, according to the Moffitt report, amounted to 2,203 kg, which is 69 per cent of the total amount of eteline snappers exported from American Samoa for the entire year.

The conclusion of this report, which supports anecdotal sources in American Samoa, is that deep-water snappers in American Samoa can be quickly depleted from the very

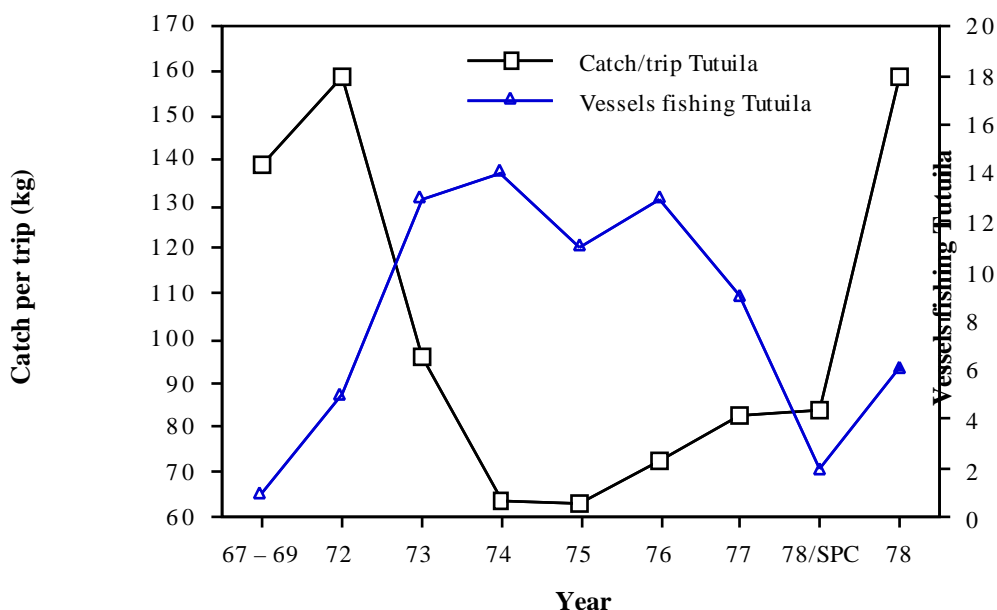


Figure 5: Catch per trip (kg) vs the number of vessels engaged in the bottomfishery of American Samoa (1967-1978)

**Table 2: Catch rates of Tutuila bottomfish vessels (1977–1983)**

Date	No. of dories fishing	Other vessels	No. of trips	Total (kg)	Catch per trip (kg)	Comments	Information source
July 77/June 78	4	2	13	2,067	159.0	Dories + 2 large diesel boats with handreels	Wass, 1978
July 78/June 79	2	2	?	?	103.2	Dories + 2 diesels	Wass, 1979
July 79/June 80	1	12	162	?	115.0	Alias, skiffs	Wass, 1980
July 80/June 81	1	18	209	12,137	58.1	Alias, skiffs, Manta cats	Wass, 1981
July 81/June 82	2	25	?	?	50.0	Some deep snappers	Wass, 1982
July 82/June 83	1	31	?	?	81.4	Fish export begun	Wass & Aitaoto, 1983

**Table 3: American Samoa bottomfish exports to Hawaii (1982–1987)**

	Sept. 82/May 83	1984	1985	1986	1987	Total
<i>Etelis coruscans</i>	868.6	1,393.0	548.2	1,940.2	466.6	5,216.6
<i>Etelis carbunculus</i>	639.9	1,021.4	443.2	1,250.9	16.1	3,371.5
<i>Etelis radiosus</i>	0.0	0.0	19.3	6.8	0.0	26.1
<i>Pristipomoides</i> spp.	145.9	722.3	278.2	369.1	339.3	1,854.8
<i>Aphareus rutilans</i>	386.6	265.4	205.4	258.4	5.9	1,121.7
<i>Aprion virescens</i>	459.8	101.1	29.8	36.4	15.2	642.3
<i>Paracaesio kusakarii</i>	0.0	0.0	13.6	300.9	15.0	329.5
Others	145.7	286.4	79.5	0.0	0.0	511.6
<b>Total</b>	2,646.5	3,789.6	1,617.2	4,162.7	858.1	13,074.1
No. of fishermen	?	18	10	3	3	N/A

Source: Howell, 1983; Aitaoto, 1984; DMWR/NMFS data from United Fishing Agency, 1984–1987

limited habitat available. Exports of *E. coruscans* and *E. carbunculus* dropped to only 467 and 16 kg respectively in 1987.

## CONCLUSIONS

The development of artisanal bottomfisheries in American Samoa can be grouped roughly within two 'boom and bust' cycles corresponding to (1) the Dory Project and (2) the export of high-value deep-water snappers. This type of fisheries development, in the long term, is no good for the fishermen or for the resource, and runs counter to the development of sound,

sustainable fisheries. At the same time, a number of positive developments and benefits were derived from both programmes.

The Dory Project spent a great deal of time and energy on a vessel type that was not suited to conditions in American Samoa.

A great deal of time was also spent on experimentation with various engine types and drive systems, resulting in the most appropriate combination of the outboard-driven alia using wooden handreels.

When aid projects involve low-interest or government-subsidised equipment, cultural and societal influences often spoil the intent of programmes.

Some of the positive aspects of the Dory Project were not maximised. Some of the dories were given to persons of high social standing (who did not use them for earning a living), instead of to young, enthusiastic fishermen with a higher incentive for profit-making and full-time operation.

Another aspect of aid-subsidised development is that fishermen become accustomed to

receiving free training, assistance, gear and easy charter fees, and their expectations of profit are unrealistic. This situation led to the abandonment of the fishery by several part-time fishermen when the 'freebies' were no longer available.

In addition, employment with the American Samoa Government provides a steady salary without the hardships involved in making a living with a small commercial fishing vessel. This is especially true given the low price of locally-sold fresh fish caused by the availability of frozen wahoo and by-catch from the canneries.

Some restaurants and markets in Pago Pago prefer this source of fish as it can provide delivery of large quantities of fish at a low price on a fixed schedule. Landings from the artisanal fleet are often curtailed by rough weather or seasonal availability of particular species.

The sudden appearance of 23 dories was a good example of over-capitalisation on a limited resource and a poorly-developed market structure. The rapid expansion of the fleet was also not regulated by normal economic constraints, as low-interest loans made the dories easily available to fishermen.

In addition, full-time commercial fishing is basically incompatible with traditional Samoan cultural norms. Providing fresh fish for their families and other social obligations will always be a primary concern to the local fishermen, and serves to preserve strong cultural values.

Most, if not all of the fishermen in American Samoa have other sources of income, and fish for a variety of reasons beside profit: i.e. subsistence, barter,

recreation and to fulfil social obligations.

The export snapper programmes were extremely successful in promoting the exploitation of deep-water snapper resources in the Territory. Unfortunately, the limited extent of the resource was not known during the initial years of the programme, and stocks were quickly depleted.

In summary, the advice and cautions made in the Marr report of 1961 were quite sound, and a number of the recommendations have been fulfilled (see *Fisheries Newsletter* #76).

The OMR became a full department of the American Samoa Government in 1988 and has legislated a full set of conservation, fishery and wildlife regulations for the Territory. A suitable artisanal fishing craft is now in use and an appropriate harvesting technology has been adopted.

However, cannery fish and industrial fisheries by-catch, as well as cultural aspects, will always inhibit domestic fisheries development. The main aspect of rational fisheries development that was not stressed in Marr's report was the need for assessment and management of the resource from the beginning of the fishery.

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