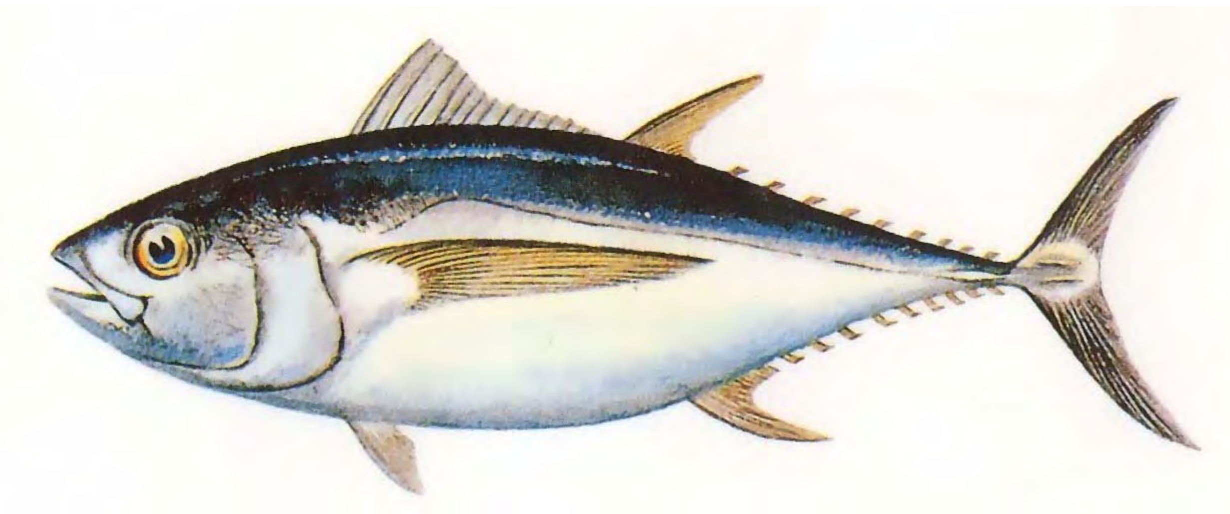
Pelagic Fisheries of the Western Pacific Region



2004 Annual Report

June 2005
Western Pacific Regional Fishery Management Council
Honolulu, Hawaii

Cover photo: Bigeye Tuna (*Thunnus obesus)* Similar in general appearance to yellowfin tuna (the other species known as ahi), the bigeye may be recognized by its plump body, its larger head and its unusually large eyes.

Adult bigeye tuna are the deepest occurring of all tuna species, with the depth range of greatest concentration at 150 to 250 fathoms. Smaller bigeye (20-30 pounds) may be encountered in shallower waters in the vicinity of seamounts or floating objects, including fish aggregation buoys.

The availability of bigeye tuna in Hawaii has increased as a result of an expansion of the domestic longline fleet and an extension of the fleet's fishing range to as far as 800 nautical miles from port.

The peak in Hawaii's landings of bigeye tuna occurs during the winter season (October-April), which is the off-season for harvesting other tuna species.

Bigeye tuna is harvested in Hawaii primarily by longline boats which set hooks at the deep swimming depths of this species. Bigeye tuna is a minor component of the catch made by the small-boat handline (ika-shibi) fleet off the island of Hawaii. It is rarely caught by trollers.

The longline catch of bigeye tuna is marketed primarily through the Honolulu fish auction. Most of the handline (ika-shibi) catch is sold through the fish auction in Hilo and through the intermediary buyers on the island of Hawaii. Virtually all bigeye is sold fresh.

Caught in deeper, cooler water, bigeye tuna typically has a higher fat content than yellowfin and is preferred over yellowfin by more discriminating sashimi buyers. For less discriminating raw fish consumers, the two species are interchangeable. They are also interchangeable with other tuna and marlin species for grilling purposes. (http://www.state.hi.us/dbedt/seafood/bigeye.html)

A report of the Western Pacific Regional Fishery Management Council pursuant to
National Oceanic and Atmospheric Administration Award No. NA77FC0008

Pelagic Fisheries of the Western Pacific Region

2004 Annual Report

Printed on June 30, 2005

Prepared by the Pelagics Plan Team and Council Staff

for the

Western Pacific Regional Fishery Management Council
1164 Bishop Street, Suite 1400, Honolulu, Hawaii 96813

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Pelagic Fisheries of the Western Pacific Region — 2004 Annual Report

I. Introduction

A. Background

The Fishery Management Plan (FMP) for Pelagic Fisheries of the Western Pacific Region was implemented by the National Oceanic and Atmospheric Administration's National Marine Fisheries Service (NMFS) on 23 March 1987. The Western Pacific Regional Fishery Management Council (WPRFMC, or Council) developed the FMP to manage the pelagic resources that are covered by the Magnuson Fishery Conservation and Management Act of 1976 and that occur in the US Exclusive Economic Zone (EEZ) around American Samoa, Guam, Hawaii, the Northern Mariana Islands, and the US possessions in the Western Pacific Region (Johnston Atoll, Kingman Reef and Palmyra, Jarvis, Howland, Baker, Midway, and Wake Islands).

The objectives of the Pelagics FMP were revised in 1991. The abridged objectives are to:

- Manage fisheries for Pacific pelagic management unit species (PPMUS) to achieve optimum yield (OY).
- Promote domestic harvest of and domestic fishery values associated with PPMUS[1] (e.g., by enhancing the opportunities for satisfying recreational fishing experience, continuation of traditional fishing practices and domestic commercial fishers to engage in profitable operations).
- Diminish gear conflicts in the EEZ, particularly in areas of concentrated domestic fishing. Improve the statistical base for conducting better stock assessments and fishery evaluations.
- Promote the formation of regional/international arrangements for assessing and conserving PPMUS throughout their range.
- Preclude waste of PPMUS associated with longline, purse seine, pole-and-line or other fishing operations.
- Promote domestic marketing of PPMUS in American Samoa, Guam, Hawaii and the Northern Mariana Islands.

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1 The Magnuson Act was amended to allow the inclusion of tunas in US fishery management authority as of January 1992. In the Pacific, tuna management is the responsibility of the regional fishery management councils. Pacific pelagic management unit species (PPMUS) includes former pelagic management unit species (PMUS) and tunas.

Non-tuna PPMUS are sometimes referred to as “other PPMUS” in this report. This term is equivalent to PMUS (Pelagic Management Unit Species) used in annual reports previous to 1992, before tunas were included in the management unit.

The PPMUS are caught in the troll, longline, handline and pole-and-line (baitboat) fisheries. They are caught in oceanic as well as insular pelagic waters. Most of these species are considered to be epipelagic because they occupy the uppermost layers of the pelagic zone. All are high-level predators in the trophic sense. Pelagic fisheries for PPMUS are among the most important, if not the dominant Pacific Island fisheries.

B. Report Content

This report contains fishery performance data from each of the four island groups through 2004, interpretations of trends or important events occurring in the fisheries and recommendations. This report was prepared using reports submitted by the following agencies. The Hawaii report is an integration of State of Hawaii Division of Aquatic Resources and NMFS summaries.

- Territory of American Samoa, Department of Marine and Wildlife Resources
- Territory of Guam, Division of Aquatic and Wildlife Resources
- Territory of Guam, Department of Commerce
- State of Hawaii, Division of Aquatic Resources
- Commonwealth of the Northern Mariana Islands, Division of Fish and Wildlife
- NMFS, Pacific Islands Region (including Pacific Islands Fisheries Science Center, Pacific Islands Regional Office and Office for Law Enforcement)
- US Coast Guard, District 14
- Pelagic Fisheries Research Program, University of Hawaii

C. Report Appraisal

The report content has changed over the years. More recently, in addition to the four main modules (American Samoa, Guam, Hawaii, Northern Mariana Islands), the report now contains and international module, a recreational fisheries appendix, a synopsis of landings data for the US West Coast, and a section on the value of the Western Pacific Region fisheries.

D. Plan Team Members

The FMP requires the Council’s Pelagic Plan Team (Team) to prepare an annual report on the status of the pelagic fisheries taking place in each of the island areas served by the Council (American Samoa, Guam, Hawaii and Northern Mariana Islands), to evaluate the effectiveness of the FMP in meeting its goals and objectives, and make recommendations for future management and administrative action.

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The list of Management Unit Species (MUS) managed under the Pelagic FMP has been revised to exclude dogtooth tuna (*Gymnosarda unicolor*) and all sharks except the following nine species: pelagic thresher shark (*Alopias pelagicus*), bigeye thresher shark (*Alopias superciliosus*), common thresher shark (*Alopias vulpinus*), silky shark (*Carcharhinus falciformis*), oceanic whitetip shark, (*Carcharhinus longimanus*), blue shark (*Prionace glauca*), shortfin mako shark (*Isurus oxyrinchus*), longfin mako shark (*Isurus paucus*), and salmon shark (*Lamna ditropis*).

The previous MUS shark listing used to include oceanic species of the families *Alopiidae, Carcharinidae, Lamnidae, Sphynidae*. However, this could be construed to mean all members of these four shark families, which would also include nearshore and demersal sharks. The Pelagics Plan Team recommended in 1999 revising the sharks contained in the management unit when the Council had completed a Coral Reef Ecosystem FMP (CREFMP), which would include nearshore species in the management unit The Plan team also recommended removing dogtooth tuna as this is not a true pelagic fish but a nearshore reef species. The CREFMP was completed in 2001 and among other measures, amended the Pelagics FMP by removing dogtooth tuna from the management unit and listed only 9 true pelagic sharks for inclusion therein (Table1).

A summary of the total pelagic landings during 2004 in the Western Pacific and the percentage change between 2003 and 2004 is shown in Table 2.

Table 2. Total pelagic landings in lbs in the Western Pacific Region in 2004

Species	**Am Samoa**	**% change**	**Guam**	**% change**	**Hawaii**	**% change**	**CNMI**	**% change**
Swordfish	8,791	-46.5						
Blue marlin	23,431	-5	48,268	-26.9			2,001	+77.1
Striped marlin	4,840	-45.7						
Other billfish	7,795	-52.6	3,579	?			433	+216.1
Mahimahi	43,380	-47.4	197,209	+135.5			34,989	+387.8
Wahoo	472,200	+8.6	116,991	+89.9			6,854	-12.2
Opah (moonfish)	4,482	-51.7						
Sharks (whole wgt)	2,970	-66.4						
Albacore	5,428,764	-38.5						
Bigeye tuna	499,353	-10.4						
Bluefin tuna								
Skipjack tuna	536,426	+136.1	161,839	-11.4			146,491	-14.5
Yellowfin tuna	1,964.151	+71.5	102,228	+51			26,877	+5.4
Other pelagics	8,500	-26.5	64,917	+51.6			17,737	+25.4
Total	**9,005,683**	**-21.1**	**695,031**	**+37.3**			**235,382**	**+3.6**

Table 1. Names of Pacific Pelagic Management Unit Species

English Common Name	Scientific Name	Samoan or AS local	Hawaiian or HI local	Chamorroan or Guam local	S. Carolinian or NMI local	N. Carolinian or NMI local
Mahimahi (dolphinfishes)	*Coryphaena* spp.	Masimasi	Mahimahi	Botague	Sopor	Habwur
Wahoo	*Acanthocybium solandri*	Paala	Ono	Toson	Ngaal	Ngaal
Indo-Pacific blue marlin Black marlin	*Makaira mazara:* *M. indica*	Sa'ula	A'u, Kajiki	Batto'	Taghalaar	Taghalaar
Striped marlin	*Tetrapturus audax*		Nairagi			
Shortbill spearfish	*T. angustirostris*	Sa'ula	Hebi	Spearfish		
Swordfish	*Xiphias gladius*	Sa'ula malie	A'u kū, Broadbill, Shutome	Swordfish	Taghalaar	Taghalaar
Sailfish	*Istiophorus platypterus*	Sa'ula	A'u lepe	Guihan layak	Taghalaar	Taghalaar
Pelagic thresher shark Bigeye thresher shark Common thresher shark Silky shark Oceanic whitetip shark Blue shark Shortfin mako shark Longfin mako shark Salmon shark	*Alopias pelagicus* *Alopias superciliosus* *Alopias vulpinus* *Carcharhinus falciformis* *Carcharhinus longimanus* *Prionace glauca* *Isurus oxyrinchus* *Isurus paucus* *Lamna ditropis*	Malie	Mano	Halu'u	Paaw	Paaw
Albacore	*Thunnus alalunga*	Apakoa	'Ahi palaha, Tombo	Albacore	Angaraap	Hangaraap
Bigeye tuna	*T. obesus*	Asiasi, To'uo	'Ahi po'onui, Mabachi	Bigeye tuna	Toghu, Sangir	Toghu, Sangir
Yellowfin tuna	*T. albacares*	Asiasi, To'uo	'Ahi shibi	'Ahi, Shibi	Yellowfin tuna	Toghu
Northern bluefin tuna	*T. thynnus*		Maguro			
Skipjack tuna	*Katsuwonus pelamis*	Atu, Faolua, Ga'oga	Aku	Bunita	Angaraap	Hangaraap
Kawakawa	*Euthynnus affinis*	Atualo, Kavalau	Kawakawa	Kawakawa	Asilay	Hailuway
Moonfish	*Lampris* spp	Koko	Opah		Ligehrigher	Ligehrigher
Oilfish family	Gempylidae	Palu talatala	Walu, Escolar		Tekiniipek	Tekiniipek
Pomfret	family Bramidae	Manifi moana	Monchong			
Other tuna relatives	*Auxis* spp, *Scomber* spp; *Allothunus* spp	(various)	Ke'o ke'o, saba (various)	(various)	(various)	(various)

II. Summary [2]

A. Plan Administration

This module was not available at the time of first publication of the 2004 Pelagic Annual Report (June 30, 2005). It will be included in future publications when it is made available.

B. Island Areas

In **American Samoa,** total landings of all pelagic species decreased 21 %, continuing the decline that started in 2003. An estimated 9,005,683 lb (-21.1%) of pelagic fish were landed in 2004. The average price for all pelagics was $0.92/lb (-2.1%).

Sixty-one vessels reported landing pelagic species in 2004, which was a decrease of 10.1% from 2003. Of these, 41 reported fishing with longline gear (-18%), and 18 reported fishing as trollers (-10%).

Trolling vessels made 272 trips a decrease of 11.4% from 2003 and 57.6% of the long term average. Longline data are derived from both creel survey extrapolations and through submitted logbooks. Logbook data reported a total 4,804 sets for 2004, or a decrease of 22.8% from 2003. Creel survey extrapolation reported 4,930 longline sets, a 26% decrease on the 2003 creel survey estimate of sets. The average duration for trolling trips in 2004 was 4.4 hr/trip, a 29.4% increase from 2003. The average longline set duration by calculated via logbooks was 19.4 hr/set (+2.1%) and by creel survey was 18.4 hr/set (+5.7%). Data from the troll fishery suggests that the catch per unit effort (CPUE) in 2004 decreased by 21.2% and about 0.5% above the long term average. Albacore accounts for about 60% of the total longline catch. Overall longline albacore catch rates decreased between 2003 and 2004 (-38%).

In **Guam** landings of all pelagics amounted to 695,031 lbs, an increase of 37.3%. The total revenues decreased to $433,911, or an increase of 8%. Tuna landings increased to 275,407 lbs (+6.6%), with a 25.3% decrease in revenues to $122,098. The overall tuna landings have fluctuated around a relatively constant average for the past decade. Non-Tuna PPMUS landings increased to 366,212 lbs (+71.7%), and adjusted revenues also increased to $278,721 (+20.5%). Landings in 2004 followed the 1997 trend in Guam's pelagic fisheries towards targeting other PPMUS, principally mahimahi and wahoo, rather than tuna. Tunas comprised about 40% of the 2004 pelagic landings, in the previous four years, they formed between 41 and 54% of pelagic landings. Mahimahi comprised 28% of the total pelagic landings, yellowfin tuna 15%, skipjack 23% blue marlin 7% and wahoo 17%.

Guam's adjusted prices for pelagic fish remained fairly stable in 2004, following a general decline since 1980. The adjusted price ($/lb) of tuna has declined since 1996, and non-tuna PPMUS has started to decline in the past few years.

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[2] Percentages in parentheses indicate percent change from previous year

Virtually all the landings of pelagic fish are made by trolling vessels. The fleet size in 2004 was an estimated 401 vessels. The fleet size has grown in 2004 from 2003 (+8.1%). The number of trips (7,296) was up in 2004 (+4.8%), and hours fished (34,565) were also up (+8%), and hours per trip (4.7) was the nearly the same as 2003, up slightly at 8%.

Foreign longline landing activity in Guam decreased (-11.6%) overall in Guam during 2004, with yellowfin tuna landings decreasing by 18.1% and bigeye by 1.2%.

*The **Hawaii** fisheries information was not available at the time of first publication of the 2004 Pelagic Annual Report (June 30, 2005). It will be included in future publications when it is made available.*

Landings of all pelagics in the **Northern Mariana Islands** (NMI) increased (+3.6%) between 2003 and 2004 to 235,382 lb. Skipjack landings of 146,491 lb were down (-14.5%) from 2003, but yellowfin tuna increased from 2003 (+5.4%) with 26,877 lbs. Mahimahi landings surpassed wahoo landings in 2004, and was up nearly 387% in 2004 and was at its third-highest landings since 1983 with 34,989 lbs. Wahoo landings decreased (-12.2%) for the second straight year in 2004 while Blue marlin landings increased (+77.1%). The increase in landings during 2004 were matched by a small (+4.9%) increase in total adjusted revenues ($466,490) over those in 2003.

The number of fishers making commercial pelagic landings decreased in 2004 (-18.9%), from 73 to 68, and below the long term average (-23%). However, the number of trips landing any pelagic fish slightly increased (+0.5%) in 2004 and was higher (+9.6%) than the long term average. Thus the average number of trips per fisher in 2004 increased to 25.3 from 23.3 trips per fisher in 2003.

The inflation adjusted price of tunas decreased and non-tuna PPMUS remained the same in 2004. The average adjusted price of tunas decreased to $1.95/lb (-1.5%) and other PPMUS remained at $2.14/lb (0%). Tuna prices were at the long term average, and prices for other PPMUS were slightly above the long term average (+1.9%).

C. Species

Mahimahi landings (42,923 lbs) in American Samoa during 2004 was at its lowest since 2000, and continued the decreasing trend for the third year in a row, 47.4% from 2003. Guam’s 2004 mahimahi landings (197,209 lbs) increased substantially (+135.5%) from 2003, and the highest recording landings since 1998. Mahimahi landings in Guam have displayed wide, unexplained annual fluctuations since 1987. The trolling catch rate for mahimahi in 2004 was at its highest since 1995 with a CPUE of 5.7 lbs/hr. Northern Marianas mahimahi landings (34,989 lb) increased in 2004 rocketing up after last year’s all time low. As with Guam, NMI experiences annual fluctuations in the catch of mahimahi. Mahimahi accounted for 78% of the total non-tuna PPMUS landings. The trolling catch rate in 2004 in the NMI was way up (+225.7%) from 2003.

Blue marlin catches in American Samoa (23,431 lbs) decreased (-5%) for the second straight year, of which the longline accounted for all landings. Guam’s landings of blue marlin (48,268 lbs) dipped down from the 2003 three-year high. The 2004 trolling catch rate was nearly 1/3 of the 2003 catch rate. Blue marlin landings in the Northern Marianas (2,001 lbs) increased in 2004 by 77% from 2003 landings.

The catch rate of blue marlin in the American Samoa troll fishery decreased from its six-year high in 2003 to nothing in 2004 with no landings, while the 2004 longline fishery had a CPUE of 0.11 from the logbooks, and 0.17 from the creel surveys. In Guam, blue marlin troll catch rate in 2004 (1.4 lb/troll-hr) decreased 33% from 2003 (2.1 lb/troll-hr). In the Northern Marianas, the 2004 catch rate increased by about 20.8% from 2003, but was still 63.6% below the long-term average.

Striped marlin landings rarely appears in the domestic landings from other areas, but increasing amounts of striped are being caught in American Samoa's developing longline fishery, with 4,840 lb landed in 2004, down nearly 46% from 2003.

Sailfish landings were insignificant in most areas. American Samoa's reported landings of 4,511 lbs of sailfish in 2004 were an almost 34% decrease on 2003 landings with nearly all of the catch coming from longlining, with only 31 lbs from trolling. Guam caught 3,579 lbs of sailfish in 2004, a huge increase from 0 lbs in 2003. The Northern Marianas reported landings of 433 lbs in 2004 which was a 216% increase from 2003 landings.

In American Samoa, 2,970 lbs of **Sharks** were caught with over 85% of the catch from longlining. Shark landings from other areas were relatively minor, if landed at all.

Shortbill spearfish landings were reported for the first time in American Samoa at 1,902 lbs in 2004, a 62% decrease over 2003 landings. No catches were reported in Guam or NMI during 2004.

Swordfish was landed by the American Samoa longline fishery with 8,791 lbs in 2004, down (-46%) from 2003. Other areas did not report landing of swordfish.

American Samoa reported landings of 5,428,764 lbs of **Albacore tuna** during 2004, a 38.5% decrease on 2003 landings. This was the fourth-highest albacore landings recorded by the American Samoa fleet. Other areas did not report landings of albacore.

No other areas reported **Bigeye tuna** landings apart from American Samoa, where the expanding longline fishery in 2004 caught 499,353 lbs, a decrease of 10% on 2003 landings.

Skipjack tuna landings in American Samoa in 2004 (536,426 lbs) increased dramatically (+136%) following a decrease in 2003. The 2004 landings for longline fishing were almost five-times higher than the long-term average between 1982 and 2004. Skipjack landings in the troll fishery increased (+21%). Due to the focus on longlining, troll landings continued to be significantly below the long term average, representing only 1/3 of the average of troll landings between 1982 and 2004. However, trolling catch rate was 10% lower than the 2003 value but above the long-term average. Guam skipjack landings in 2004 (161,839 lbs) decreased following a surge in 2003. This represented a one year decrease of about 11% on the 2003 landings. Catch rates decreased from 5.7 lb/trolling hour in 2003 to 4.7 lb/trolling hour in 2004, an decrease of

17.5%. Northern Marianas Islands skipjack landings decreased by about 14.5% from 171,312 1b in 2003 to 146,491 lb in 2004. The catch rate in 2004 significantly decreased (-41.3%) from 2003, and was 47.2% below the long-term average.

Yellowfin tuna landings in American Samoa (1,964,151lbs) increased by nearly 72%; the longline fleet catching 99.7% of the yellowfin which had a 6.5% increase in catch rates from 2004 logbook data, and was about 8% higher from creel survey data. Catch rates decreased 30% in the troll fishery and was below the long term average. Guam yellowfin landings (102,228 lbs) increased 51% in 2004 from 2003. Trolling catch rates were 43% higher in 2004 and at its highest since 1992. Northern Mariana Islands yellowfin landings increased in 2004 to 26,877 lb, a 5.4% increase from 2003. Catch rates decreased in 2004 (9lb/hr) 25% and was 10% below the long-term average.

Wahoo landings in American Samoa increased in 2004 (+8.6%), following a large increase in 2002 and again in 2003. This increase in landings was generated from the longline fishery as catch from trolling was about 0.11% of the total. The trolling catch rate declined to 0.47 lb/hr in 2004 (-19%) after a peak in 2003 at 0.58 lb/hr. Guam's wahoo landings continue to show extreme interannual variability and in 2004 was at its highest since 2001. Landings of wahoo in Guam (116,991 lbs) increased by about 90% in 2004. Troll catch rates for in Guam in 2004 increased to 3.4 lb/hr, an increase of 70% from 2003 catch rates. The 2004 Northern Marianas wahoo landings (6,854 lb) decreased (-12.2%) and catch rate (2.19 lb/trip) decreased (-41%) from the 2003 estimates. The 2004 CPUE was nearly half the long-term average (49%).

D. Gear

Troll fisheries continue to dominate the domestic fisheries in Guam and the Northern Mariana Islands. Growing charter fishing businesses in Guam and the Northern Mariana Islands contributed heavily to troll fishing effort.

III. Issues

This module was not available at the time of first publication of the 2004 Pelagic Annual Report (June 30, 2005). It will be included in future publications when it is made available.

IV. 2004 Region-wide Recommendations

1. The Plan Team recommends that the Council and WPacFIN explore standardized training options for fisheries technical staff on species recognition, especially coral reef and bottomfish species. Such training may result in a certification program for technical staff in completion of a course of instruction.

V. Plan Administration

A. Administrative Activities *prepared by NMFS-PIRO

This module was not available at the time of first publication of the 2004 Pelagic Annual Report (June 30, 2005). It will be included in future publications when it is made available.

B. Longline Permits

The following longline permits were issued in 2004:

<u>Hawaii longline limited access permit holders in 2004</u>

VESSEL NAME	HOLDER
F/V ADRAMYTTIUM	THK Fishing Inc.
F/V ALEUTIAN BEAUTY	Daniel Gunn/William Widing
F/V AMANDA K	Amanda K Inc.
F/V AO SHIBI III	Ao Shibi Inc.
F/V ARROW	Arrow Inc.
F/V ASTARA	Astara Co. LLC
F/V BARBARA H	Arthur/Barbara Haworth
F/V BLACK MAGIC	Black Magic LLC
F/V BLUE FIN	Liet An Lu/Mai Thi Do
F/V BLUE SKY	Blue Sky Fishing Producer
F/V BRANDI	RBKL Inc.
F/V CAPT. GREG	Aquanut Co. Inc.
F/V CAPT. MILLIONS I	Nga Van Le
F/V CAPT. MILLIONS III	Capt. Millions III, Inc.
F/V CAPT. MILLIONS IV	H and M Fishery Inc.
F/V CARLETA	Carleta LLC
F/V CAROLEIGH	Vessel Management Assoc.
F/V CAROLYN J	Mid Pac Fisheries
F/V CRYSTAL	Davis B Inc.
F/V CUMBERLAND	Leland Oldenburg
TRAIL	KYL Inc.
F/V DAE IN HO	Wynne Inc.
F/V DAE IN HO IV	DukSung Fishing Inc.
F/V DASHER II	Star Polaris Fisheries Inc
F/V DEBBIE SUE	Amko Fishing Co. Inc.
F/V DEBORAH ANN	Edward G. Co. Inc.
F/V EDWARD G	Brian Porter/Larry Suezaki
F/V ENTERPRISE	Bruce Picton
F/V EXCALIBUR	Vessel Management Assoc.
F/V FINBACK	Firebird Fishing Corp.
F/V FIREBIRD	Gail Ann Co. Inc.
F/V GAIL ANN	Konam Fishing
F/V GARDEN SUN	Roy Yi
F/V GLORY	Golden Sable Fisheries Inc.
F/V GOLDEN SABLE	Kim Fishing Co.
F/V GRACE	Thomas Webster
F/V HAVANA	Intl. Quality Fishery Inc
F/V HAWAII POWER	Heola Inc.
F/V HEOLA	White Inc.
F/V HOKUAO	Martin Noel Inc.
F/V IMMIGRANT	Independence Inc.
F/V INDEPENDENCE	Quality Tuna Co.

F/V ISABELLA T	Ohana Fishing LLC
F/V JANE	Trans World Marine Inc.
F/V JANTHINA	Kil Cho Moon
F/V JENNIFER	Michael Pulu
F/V JULIE IRENE	Fishrite Inc.
F/V KAIMI	Pacific Jennings Inc.
F/V KAMI M	K.A. Fishing Co. Inc.
F/V KATHERINE II	Song Fishing Corp.
F/V KATHERINE Y	Vessel Management Assoc.
F/V KATY MARY	Vessel Management Assoc.
F/V KAWIKA	Kelly Ann Corp.
F/V KELLY ANN	Si Tan Nguyen/Michael Ostendor
F/V KILAUEA	Awahnee Oceanics Inc.
F/V KINUE KAI	Kuku Fishing Inc.
F/V KUKUS	Lady Alice Co. Inc.
F/V LADY ALICE	Jong Ik Fishing Co. Inc.
F/V LADY CHUL	Tony Tran
F/V LADY KAREN	Crivello Fishing LLC
F/V LAURA ANN	M.S. Honolulu Inc.
F/V LEA LEA	Amak River Legacy
F/V LEGACY	White Inc.
F/V LIHAU	Duoc Nguyen
F/V LUCKY I	KMC & PCC Inc.
F/V MAN SEOK	Two Bulls Inc.
F/V MANA LOA	Vessel Management Assoc.
F/V MARIAH	Viking V Inc.
F/V MARIE M	Viking V Inc.
F/V MARINE STAR	Palmer Pedersen Fisheries
F/V MISS JANE	Quan Do
F/V MISS JULIE	Miss Lisa Inc.
F/V MISS LISA	Robert Cabos
F/V MOKULELE	Charles A. Dye
F/V NATALIE ROSE	Fishrite Inc.
F/V PACIFIC FIN	John Gibbs
F/V PACIFIC HORIZON	Twin N Fishery Inc.
F/V PACIFIC PARADISE	Gunn Pacific Reflection
F/V PACIFIC	Tuan Nguyen
REFLECTION	Pacific Sun Marine Inc.
F/V PACIFIC STAR	Jackson Bay Co.
F/V PACIFIC SUN	Dongwon Marine Inc.
F/V PACIFICA	Dang Fishery Inc.
F/V PAN AM II	Nguyen Fishery Inc.
F/V PARADISE 2001	Gilbert DeCosta
F/V PARADISE 2002	Ka'upu Ltd.
F/V PEARL HARBOR II	Princess K Fishing Corp.
F/V PETITE ONE	Queen Diamond Inc.
F/V PRINCESS K	Reagan Nguyen
F/V QUEEN DIAMOND	Bethel Inc.
F/V QUYNH VY	Xuan Nguyen
F/V RACHEL	Universal Fishing Co.

F/V RED DIAMOND
F/V ROBIN
F/V ROBIN II
F/V ROBIN V
F/V SANDY DORY
F/V SAPPHIRE
F/V SAPPHIRE II
F/V SEA DIAMOND
F/V SEA DIAMOND II
F/V SEA DRAGON
F/V SEA DRAGON II
F/V SEA FALCON
F/V SEA GODDESS
F/V SEA HAWK
F/V SEA MOON
F/V SEA MOON II
F/V SEA PEARL
F/V SEA QUEEN II
F/V SEA SPIDER
F/V SEASPRAY
F/V SEEKER II
F/V SEVEN STARS
F/V SKY SUN
F/V SPACER K
F/V ST. MICHAEL
F/V ST. PETER
F/V SUSAN K
F/V SWELL RIDER
F/V SYLVIA
F/V TANYA ROSE
F/V TUCANA
F/V TWO STAR
F/V ULHEELANI
F/V VICTORIA
F/V VIRGINIA CREEPER
F/V VUI VUI II
F/V VUI-VUI
F/V WHITE NIGHT
F/V WONIYA
F/V ZEPHYR

H & Lee Inc.
L.S. Fishing Inc.
Highliner Inc.
H-N Fishery Inc.
H-N Fishery Inc.
Nancy Nguyen
Sea Diamond II Inc.
Long Thanh Nguyen
Sea Dragon II Inc.
Frank/Michelle Crabtree
Capt. Washington I Inc.
Hawaii Fishing Co.
Sea Flower Inc.
Sea Moon II Inc.
Coldwater Fisheries Inc.
Thoai Van Nguyen
Paul Seaton, Trustee
Hanson/Hanson Fishing Co.
Seeker Fisheries Inc.
Kwang Myong Co. Inc.
Kyong Dok Kim
Hwa Deog Kim
Tony/Lorna Franulovich
N. Pac. Fishery Inc.
Mini Corp.
Bayshore Mgmt. Inc.
B-52 Inc.
Port Lynch Inc.
Pacboat LLC
Two Bulls Inc.
Ulheelani Corp.
Aegis Fishing Inc.
Sylvan Seafoods Inc.
Vui Vui II Inc.
Nick Van Pham
Natalia/Kiril Basargin
Sierra Fisheries Inc.
Zephyr Fisheries LLC

2004 Hawaii longline limited access permit holders without vessels

Lan Thi Van	
Steven Nguyen	
Quy Thanh Truong	
Paik Fishing Inc.	
Ocean Associates Corp.	
Andy Hoang	
Lindgren-Pitman Inc.	
James Chan Song Kim	
Tom C.Y. Kim	
Larry DaRosa	
Pacific Fishing & Supply	2 Permits
Tina Hoang	
Quang Nguyen	
Bac Tran	
Christine Tran	2 Permits
Tom The Van Le	
Scotty Nguyen	
Pacific Seafoods Inc.	3 Permits
Lady Ann Margaret Inc.	
Stewart Miyamoto	
Gary Painter	
Alan Duong	2 Permits
Ho Son Nguyen	
K.R. Fishing Inc.	
Peter Webster	
Natali Fishing Inc.	
Alan Duong	
Frank James	
Donald C Aasted, Trustee …	

Western Pacific longline general permit holders in 2004

American Samoa

VESSEL NAME	HOLDER
F/V 38 SPECIAL	Peter Reid
F/V AAONE	Asaua Fuimaono
F/V ADELITA	Adelita Fishing LLC
F/V AETO	Aleni Ripine
F/V ALI-B	Harbor Refuse and Environmental Services
F/V ALLIANCE	Offshore Adventures Inc.
F/V AMERICA	Robert/Dorothy Pringle
F/V AMERICAN ISLANDER	American Workboats Inc.

F/V AURO	Longline Services Inc.
F/V BREANA LYNN	Feli Fisheries Inc.
F/V EASTERN STAR	Mataio Tiapula
F/V FAIVAIMOANA I	Faivaimoana Fishing Co Lt
F/V FETUOLEMOANA	Tuna Ventures Inc.
F/V FLORA	Feli Fisheries Inc.
F/V GLORIA PARK	Mee Won Inc.
F/V INJA	Taufuiava Vaivai
F/V JIMMY JR.	Jimmy Vaiagae
F/V JULIE IRENE	Michael Pulu
F/V LADY BARBARA	Barbara H Inc.
F/V LADY CARMEN	Eliseo Mamani
F/V LADY FRANCELLA	Faamausili Pola
F/V MIDDLEPOINT	Island Tuna Mgmt. Inc.
F/V NO 1 JI HYUN	Ji Hyun Inc.
F/V NORTHWEST	Harbor Refuse & Environm
F/V PAGO NO 1	Samoa Enterprises Inc.
F/V PAGO NO 3	Samoa Enterprises Inc.
F/V PENINA	Longline Services Inc.
F/V PIILANI	Taamila/Ale Mokoma
F/V PRINCESS KARLINNA	Wearefish Inc.
F/V PRINCESS YASMINNA	Wearefish Inc.
F/V RIM REAPER	Hamilton Caldwell
F/V SALVATION II	Tagialisi Misa
F/V SALVATION III	Tagialisi Misa
F/V SAMOAN BOY	Feli Fisheries Inc.
F/V SEA VENTURE	Gunn Sea Venture LLC
F/V SIVAIMOANA	Tuna Ventures Inc.
F/V SOUTH WIND I	Elvin Mokoma
F/V SOUTH WIND II	Elvin Mokoma
F/V SOUTH WIND III	Elvin Mokoma
F/V SOUTH WIND IV	Elvin Mokoma
F/V TAIMANE	Longline Services Inc.
F/V TIFAIMOANA	Longline Services inc.
F/V TRACEY C	Tracey C Fishing LLC

Guam

VESSEL NAME	HOLDER
[no name]	Larry Taylor

C. Foreign Fishing Permits

This module was not available at the time of first publication of the 2004 Pelagic Annual Report (June 30, 2005). It will be included in future publications when it is made available.

D. Protected Species Conservation

The following reports by the Hawaii Longline Observer Program are provided by the NMFS-PIRO website.

HAWAII LONGLINE OBSERVER PROGRAM
ANNUAL STATUS REPORT
January 1, 2004 - December 31, 2004
Pacific Islands Regional Office
National Marine Fisheries Service
January 25, 2005

The Hawaii-based pelagic longline fishery targeting swordfish and tunas has been monitored under a mandatory observer program since February 1994. Beginning March 1994, branch personnel have conducted daily shoreside dock rounds in Honolulu to determine which fishing vessels are in port. These dock rounds are used to obtain an estimate of fishing effort on a real-time basis by assuming that a vessel is fishing when it is absent from the harbor. This report is used to ensure prompt dissemination of Hawaii Longline Observer Data and may be revised after final data editing has been completed. The following table summarizes percent observer coverage for vessel departures, vessels arriving with observers, and protected species interactions for vessels arriving with observers during 2004.

Vessel Departures – 2004 (January 1, 2004 – December 31, 2004)	
Departures	1344
Departures with Observers	330
Observer coverage 2004	**24.6%**
Vessels Arriving with Observers – 2004	
Departures with observers in 2004	330
Observers departing in 2003 arriving in 2004	10
Observers departing in 2004 arriving in 2005	13
Total vessels arriving with observers – 2004	327
Protected Species Interactions – 2004	
Vessels arriving with observers in 2004	327
Trips with turtle interactions	17
Trips without turtle interactions	310
Trips with marine mammal interactions	8
Trips without marine mammal interactions	319
Trips with seabird interactions	7
Trips without seabird interactions	320
Total Sea Turtle Interactions	**17**
Released Injured	
Leatherback	3
Released Dead	
Olive Ridley	13
Green	1
Total Marine Mammal Interactions	**8**
Released Injured	
False Killer Whale	5
Humpback Whale	1
Shortfinned Pilot Whale	1
Released Dead	
False Killer Whale	1

Total Seabird Interactions	**8**
Released Dead	
Unidentified Shearwater	2
Laysan Albatross	2
Black-footed Albatross	4
Total Sets	**3,958**
Total Hooks Retrieved	**7,900,681**
Turtles per 1,000 Hooks	**0.002**
Seabirds per 1,000 Hooks	**0.001**
Marine Mammals per 1,000 Hooks	**0.001**

Note: The percent of observer coverage is based on vessel departures. Protected species interactions are based on vessel arrivals. For the purpose of this report, an animal that becomes hooked or entangled is an interaction.

HAWAII LONGLINE OBSERVER PROGRAM
SHALLOW SET
ANNUAL STATUS REPORT
January 1, 2004 – December 31, 2004

Pacific Islands Regional Office
National Marine Fisheries Service
January 25, 2005

The Hawaii-based pelagic longline fishery targeting swordfish and tunas has been monitored under a mandatory observer program since February 1994. In 2004, the Hawaii swordfish fishery was reopened with restrictions on allowable gear used in the fishery. This report is used to ensure prompt dissemination of Hawaii Swordfish Observer Data and may be revised after final data editing has been completed. The following table summarizes percent observer coverage for vessel departures, vessels arriving with observers, and protected species interactions for vessels arriving with observers during 2004.

Vessel Departures - 2004 (January 1, 2004 - December 31, 2004)	
Departures	11
Departures with observers	11
Observer coverage 2004	**100.0%**
Vessels Arriving with Observers - 2004	
Departures with observers in 2004	11
Observers departing in 2003 arriving in 2004	0
Observers departing in 2004 arriving in 2005	5
Total vessels arriving with observers – 2004	6
Protected Species Interactions - 2004	
Vessels arriving with observers - 2004	6
Trips with turtle interactions	2
Trips without turtle interactions	4
Trips with marine mammal interactions	0
Trips without marine mammal interactions	6

Trips with seabird interactions	1
Trips without seabird interactions	5
Total Sea Turtles Interactions	**2**
Released Injured	
Loggerhead	1
Leatherback	1
Total Marine Mammal Interactions	**0**
Total Seabird Interactions	**1**
Released injured	
Laysan Albatross	1
Total Sets	**88**
Total Hooks Retrieved	**76,750**
Turtles per 1,000 Hooks	**0.026**
Seabirds per 1,000 Hooks	**0.013**
Marine Mammals per 1,000 Hooks	**0.000**

Note: The percent of observer coverage is based on vessel departures. Protected species interactions are based on vessel arrivals. For the purpose of this report, an animal that becomes hooked or entagled is an interaction.

E. USCG Enforcement Activities

The following is a summary of U. S. Coast Guard fisheries law enforcement activity in the western and central Pacific Region and covers the period from January 1, 2004, to December 31, 2004.

The Coast Guard conducted aerial patrols of the Exclusive Economic Zone (EEZ) surrounding the Main Hawaiian Islands, Kingman Reef, Palmyra Atoll, Jarvis Island, Howland Island, Baker Island, American Samoa, Guam, and the Northern Mariana Islands. We had 15 suspected foreign fishing vessel encroachments during the course of the year, but were unable to respond, due to nonavailability of resources.

The USCG capitalized on patrol support available from out-of-area assets to the greatest extent possible. During this period, they had tasked one of the Coast Guard's polar icebreakers transiting to and from Antarctica to patrol the Howland and Baker EEZ along her route.

In January, using the Vessel Monitoring System, the USCG detected two domestic longliners possibly setting gear in the Kiribati EEZ. NOAA Fisheries Enforcement contacted both vessels and directed them to stop fishing, and they complied. One vessel was boarded, and one was met at the pier upon their return to Honolulu. NOAA Fisheries Enforcement is investigating both incidents for possible violations of the Magnuson Stevens Fisheries Conservation Management Act and Lacey Act.

In March, USCGC WALNUT deployed to the southern portion of the Fourteenth Coast Guard District's area of responsibility. USCGC WALNUT patrolled the Kingman Reef, Palmyra Atoll, Jarvis Island, Howland Island, Baker Island, and American Samoa EEZs, with no sign of illegal activity. USCGC WALNUT also patrolled the American Samoa large vessel closed area, with no violations detected.

During the month of May, USCGC KUKUI and USCGC WASHINGTON conducted a multiunit law enforcement patrol. These two units conducted a joint patrol of the Kingman Reef, Palmyra Atoll, and Jarvis Island EEZs, in addition to boarding some of the domestic longliners working south of the Main Hawaiian Islands, during their two-week patrol. No significant violations were noted.

Guam-based cutters continued to patrol the Guam and Northern Mariana Islands EEZs and board foreign fishing vessels inbound to Apra Harbor.

In January, the USCG assisted the Western Pacific Regional Fishery Management Council by providing C-130 support to conduct a privately owned fish aggregating device (PFAD) mapping flight east of the island of Hawaii.

USCG surface assets patrolled the vicinity of the Main and Northwest Hawaiian Islands, conducting boardings and monitoring the activity of the domestic longline fleet, and patrolling the Northwestern Hawaiian Island Coral Ecosystem Reserve. No significant violations were noted.

The Coast Guard conducted dedicated surface and aerial patrols of the Hawaiian Island Humpback Whale National Marine Sanctuary in concert with NOAA enforcement officers from December 2003 through the end of May 2004, with no significant violations noted during the season.

During the month of January, a U. S. Navy patrol boat found a small pleasure craft adrift in Apra Harbor, with a live green sea turtle onboard. The Navy turned the pleasure craft and sea turtle over to USCGC GALVESTON ISLAND, who cited the owner for a violation of the Endangered Species Act.

In April, the USCG provided C-130 transportation for four NOAA personnel to the island of Lanai to aid in the recovery of a beached, female orca. In May, the USCG transported NOAA personnel to the island of Molokai to aid in the disentanglement of two Hawaiian monk seals. During April - May period, the USCG also had two requests to assist with the removal of dead whales. The first incident involved a humpback whale that had washed up on Waimanalo Beach, and the second involved a sperm whale that had washed up on the outer reef at Kaneohe Bay. However, the USCG was unable to safely get surface units in close enough to provide assistance in either case.

In June, the USCG used a C-130 to transport three NOAA/NMFS personnel to the island of Kauai to assist a 500 lb. monk seal with a hook embedded in its digestive tract. The monk seal was then transported back to Oahu for surgery. In July, after the monk seal had recovered, a C-130 was used to transport the monk seal back to Kauai. On the return flight to Oahu, a deceased young whale was transported back to Air Station Barbers Point for further non-Coast Guard transport back to NOAA facilities in San Francisco for an autopsy.

During the month of May, the USCG responded to a report from a U. S. fisherman in the North Pacific that he had sighted a vessel actively engaged in large-scale driftnet operations. As a result, a C-130 from Barbers Point successfully located and documented three foreign vessels outfitted for driftnet operations. Due to on scene conditions, the USCG was unable to obtain the documentation necessary to prosecute any of the vessels. The USCG credits these sightings to U. S. fishermen working in the North Pacific, who reported the activity as it occurred to the Coast Guard.

The USCG directed the USCGC HEALY to patrol the high seas driftnet high threat area during its transit from Japan to the Arctic Ocean. Although numerous foreign fishing boats were sighted outfitted for squid jigging, no vessels were sighted that were rigged for driftnetting. Air Station Kodiak conducted numerous high seas driftnet surveillance flights on the northern edge of the Fourteenth District area of responsibility, and passed sighting information to the People's Republic of China law enforcement vessel ZHONG GUO YU ZHENG No. 201. No vessels were found to be engaged in illegal activity, though low visibility in the area often hampered search efforts.

In May, June, and December, USCGC WALNUT conducted three law enforcement patrols south of the Main Hawaiian Islands that focused on the domestic longline fleet. Most of the violations USCGC WALNUT detected were minor, such as floats not properly marked or the official number not properly displayed, although one vessel was cited for short float lines. USCGC KUKUI conducted a law enforcement patrol of the Northwestern Hawaiian Islands in August, boarding the bottom fishing vessels she encountered along the way and reporting on the surface activity in the area. Surface activity was very light and no fisheries violations were detected.

In May, USCGC WASHINGTON, along with a NOAA (ole) SIA, responded to a reported assault of an observer on one of the domestic longliners. USCGC WASHINGTON boarded the vessel at-sea and removed the person who allegedly assaulted the observer.

F. NOAA Fisheries Office for Law Enforcement Pacific Islands Enforcement Division

This module was not available at the time of first publication of the 2004 Pelagic Annual Report (June 30, 2005). It will be included in future publications when it is made available.

Appendix 1

American Samoa

Introduction

The pelagic fishery in American Samoa has historically been an important component of the traditional domestic fisheries. Prior to 1995 the pelagic fishery was largely a troll-based fishery. The horizontal method of longlining was introduced to the Territory by Western Samoan fishermen in 1995. The local fishers have found longlining to be a worthwhile venture to engage in because they land more pounds with less effort and use less gas for trips. Almost all of the vessels used are "alias". These are locally built, twin-hulled (wood with fiberglass or aluminum) boats about 30 feet long, powered by 40HP gasoline outboard engines. Navigation on the alias is visual, using landmarks with the exception of a few modernized alias which have global positioning systems (GPS) for navigation. The gear is stored on deck attached to a hand-crank reel which can hold as much as 10 miles (25 miles for the jig-boat) of monofilament mainline. The gear is set by spooling the mainline off the reel and retrieved by hand pulling and cranking the mainline back onto the reel. Trips are one day long (about 8 hours) with the exception of 2 boats which go out fishing more than one day. These boats at 40 feet or so are slightly bigger than the regular alia (32+feet). Setting the equipment generally begins in the early morning. Haulback is generally in the mid-day to afternoon. The catch is stored in containers secured to the deck, or in the hulls. Albacore is the primary species caught, and is generally stored in personal freezers until a sufficient amount is accumulated to sell to the canneries. Some of the catch is also sometimes sold to stores, restaurants, local residents and donated for family functions.

In mid-1995 five alias began longlining. This number grew to 12 boats involved in longline fishing in 1996. In 1997, 33 vessels had permits to longline of which 21 of those were actively fishing on a monthly basis. Also, in 1997 the first longline vessel of 60 plus feet in length capable of making multi-day trips began operating in American Samoa. In 1998, 50 local vessels received federal permits to longline but only 25 did longline. Fifty-nine local vessels received federal permits in 1999 to longline but only 29 participated in the longline fishery. In 2000, 37 vessels were active in the longline fishery. In the last half of 2000 the number of larger multi-day longline boats operating in American Samoa grew dramatically to over a half a dozen. In 2001, the number of vessels participating in the longline fishery increased dramatically by 68%, whereas the number of vessels participating in the trolling fishery slightly decreased by 5%. In 2002, 66 boats registered and 60 participated in the longline fishery while in 2003 the number of boats which registered dropped to 57 and the number effectively fishing dropped to 51. In 2004 the decline observed during 2003 continued and for 45 registered, 40 participated, which is 21.6% less than in 2003.
In 2004, the number of Alia longlining has drop by 40 % from 15 boat in 2003 to 9 boats in 2004.

Prior to 1985, only commercial landings were monitored. From October 1985 to the present, data was collected through an offshore creel survey that included subsistence and recreational fishing as well as commercial fishing. In September, 1990 a Commercial Purchase (receipt book) System was instituted in which all businesses in Samoa, except for the canneries, that buy fish

commercially were required by local law to submit to DMWR a copy of their purchase receipts. In January 1996, in response to the developing longline fishery a federal longline logbook system was implemented. All longline fishermen are required to obtain a federal permit which requires them to submit logs containing detailed data on each of their sets and the resulting catch. From 1996 to 1999, the logbooks submitted by the local longliners were edited in Samoa for any missing data and were then sent to the NMFS Honolulu Lab every week for further editing and data processing. Starting with 2000, logbook data was entered and maintained in Samoa and downloaded to NMFS in Hawaii periodically.
On July of 1999, In response to a problem with delinquent longline logs, the Department of Marine and Wildlife initiated a Daily Effort Census (DEC) program to monitor the local longline fleet. Using the Daily Effort Census form, which contains all active longline vessels, data collectors go out on a daily basis, except on Sundays, Holidays, and off-duty days, to check which boats are out longlining and which boats are in port. The DEC form is returned to DMWR for data entry at the end of each working day. Federal logbooks are required to be submitted to DMWR by the following Monday after each fishing trip. If they are not, warnings are issued to the fishermen and more punitive measures are taken if these warnings are not heeded.

Toward the end of 2000 many new multi-day trip boats joined the longline fleet making it hard to tell what they were doing when they were not in port. To solve this problem the longline logbook data was compared with reports from the canneries of fish unloaded by these boats to identify which boats were delinquent in their longline logs and to take corrective action.

Newly discovered "peculiarities" in the historical data, the emergence of new, bigger boats that make multi-day trips required amending and supplementing the algorithms that expand American Samoa's offshore creel survey data. WPacFIN staff have completed modifications to the Visual FoxPro data processing system to address these data concerns to better reflect the status of the territory's pelagic fisheries. These changes are outlined below. The data from 1982-1985 has been left unchanged from the Dbase IV Commercial Catch Monitoring System but data from 1986-2004 in this report has been re-expanded with the new Visual FoxPro data processing system. These expansions are true annual expansions of the entire year's interviews across the entire year's sample days and are no longer sums of 12 monthly expansions. Note that there are some changes to the historical data due to the new re-expanded and adjusted data. As a result, the graph presentations have also changed.

Total landings data covers all fish caught and brought back to shore whether it enters the commercial market or not. Commercial Landings covers that portion of the Total Landings that was sold commercially in Samoa both to the canneries and other smaller local business that buy fish. Total landings include both the commercial and recreational/subsistence components of the fishery. Commercial Landings data from 1982-1985 was imported from the Commercial Catch Monitoring System without change. From 1986 to 1990, the estimated total landings and estimated commercial landings data was taken from the Offshore Creel Survey System expansion.

One of the problems with the offshore creel survey was that spear fishing and bottom fishing trips are usually done at night. These boats came in early in the morning before the interviewers were on duty resulting in very few interviews for these types of trips. These fishermen still had to sell their fish so starting in 1991 the Commercial Purchase System provided information on what they caught. From 1991 to present the Offshore Creel Survey landings were replaced by Commercial Purchase System landings for species where the Commercial Purchase System landings exceeded the Offshore Creel Survey landings. This happens most often for swordfish and dogtooth tuna.

Until 1995 all trips where interviews were not obtained were put in the "unknown" fishing method category. For all of the trips where interviews were obtained a percentage of trips by fishing method was calculated. The unknown trips were then divided up by this percentage and added to the interviewed trips. Since most of these unknown trips were bottomfishing and spearfishing trips and very few real interviews for these fishing methods were obtained, these two fishing methods were under represented in the offshore creel survey expansion.

Since the vessels involved in these unknown trips was known and since certain boats only engaged in certain fishing methods, their fishing method could be changed from unknown to some known method. From 1995 and after this was done except for vessels engaging in multiple fishing methods at the same time. The fishing method for these remained unknown. The number of unknown fishing trips was greatly reduced and the bottomfishing and spearfishing trips became better represented in the offshore creel survey.

In 1997 the first vessel to make multi-day trips started operating in Samoa. It unloaded only at the canneries and if an interview could be obtained it would be hard to fit its data into the offshore creel survey system which was designed for vessels making one day trips. Toward the end of 2000 six more vessels joined this category known as non-interviewed vessels. Fortunately all of these larger non-interviewed vessels are required to submit longline logs. The longline log record of kept fish from these non-interviewed vessels was added to the longline total landings from interviewed vessels in the offshore creel survey system.

From 1997 to 2000, the entire logbook kept catch of wahoo, albacore, bigeye, skipjack and yellowfin tuna by the non-interviewed vessels was assumed to have been sold to the canneries and was added to the commercial landings at canneries prices obtained from the creel survey system. All other species of kept fish in the longline logs of non-surveyed vessels was treated as unsold and were only added to the total landings. Starting in 2001, the disposition of fish kept by the non-surveyed vessels became available from Cannery Sampling Forms. From these Cannery Sampling Forms a percentage of each species that were sold locally, sold to the canneries, or not sold could be calculated for the year and applied to the entire non-surveyed catch. This allowed the proper percentages of each species to be added to the commercial landings with either the canneries price/pound or the local price/pound.

These Cannery Sampling Forms also listed the lengths of individual fish from which their weights can be calculated. They started in 1998 listing only albacore lengths but in 2001 they listed lengths of other species as well. The weight per fish for the non-surveyed vessels was first taken as the monthly average of the cannery sampling data if there were at least 20 samples for a month. It was then taken as the annual average of the cannery sampling data if there were at least 20 samples for the year. If there wasn't enough cannery samples for a species, the weight per fish was calculated from the offshore creel survey data on a monthly basis where there were 20 or more samples or on a yearly basis. If there weren't 20 samples for a year a default value of weight per fish was obtained by averaging all of the offshore creel survey data or by manually entering a value.

In 1999 vessels emerged that made 3-5 day trips and could still be interviewed. Since the interview data is generally better than log data, these vessels are treated like normal interviewed vessels in the offshore creel survey system but their catch is divided by the number of sets they made during their multi-day trips.

Starting in 1999, many of the longline boats began landing their catches gilled and gutted to obtain higher prices at the canneries. The offshore creel survey system was modified to calculate appropriate round weights from the non-round weight using standard conversion factors for all species.

Starting in 2000, many interviewers started recording the length of the larger fish rather than trying to weigh them. The offshore creel survey system was modified to calculate appropriate round weights from the length measurements using a standard regression formula.

Starting in 2001 the method of determining price/pound was revised. Before 2001 price/pound was determined by averaging offshore creel survey data. This sometimes resulted in 4-5 samples, some of which were erroneous determining the price per pound for an entire species for a year. In 2001, the price per pound for fish sold locally in Tutuila was first determined by averaging the Commercial Purchase System (Receipt Book) data for each month. For months and species without any monthly data an annual average price/pound value from the receipt book data was used. If there was no annual average from the receipt book data a monthly average of the offshore creel survey data was calculated for each of three price/pound categories; Tutuila-Local, Manua_local and Cannery. Again if there was no monthly samples available for a given month, species and category an annual average of creel survey data was used. In cases where there was no creel survey data for a species and category for a year a value was entered manually. Values were also entered manually to override calculated values that were determined to be erroneous.

The "other pounds" category in Table 1 includes pelagic species not caught by longlining or trolling. Examples are barracuda, rainbow runner and dogtooth tuna, caught with bottomfishing or spearfishing methods. In addition, "other sharks" as it is identified on Table 1, categorizes all species of sharks that could and could not be identified by the fishermen.

The Offshore Creel Survey System showed almost no By-Catch species during 2002 thus the bycatch for longlining was assumed to be the released species in the longline logbook system. In addition, the number of bycatch has impressively increased for this year. There were no fishing tournaments held during 2002.

The island of Tutuila is also a major base for the trans-shipment and processing of tuna taken by the distant-waters longliner and purse seine fleets. The domestic pelagic fishery is monitored by the Department of Marine and Wildlife Resources (DMWR), through a program established in conjunction with the Western Pacific Fishery Information Network (WPacFIN). This report was prepared by DMWR using information obtained and processed as explained above.

With the increase of the longline fishery since its development, many different-size vessel entered the fisheries, especially 2001. For this latest report (2001), the following tables have been included to better represent effort & catch, bycatch percentages, and CPUE for the different-size vessels:

Table 3 & 4 represents longline effort and catch
Table 5 represents longline bycatch percentages
Table 7 represents longline catch per 1000 hooks
Table 8 has been modified to include the cannery sampling average weight per fish.

Summary

Landings (in pound, not number of fish) - In 2004, we observed a decrease in the tuna landings by 19.2% (decrease of 28.7% in 2003) and an increase by 12.4% in the total landings for other pelagic species. Longlining, like in 2003, constituted approximately 99.7 % of the total landings whereas trolling constituted 0.3 % of landings recorded. All in all, there has been a 18.5% decrease in the total landings for all species caught using the longline method. The total landings of albacore, which is the main target, has decreased by 38.5%.

CPUE - The CPUE for total catch has decreased by 2.9% (22.5% in 2003), the increase in SKJ and YF CPUE masking the decrease in Albacore CPUE. The CPUE for the first specie targeted has decreased in 2004 by 21.2 % (from 16.41 to 12.93 fish per 1000 hooks). In 2003 Albacore CPUE had already decreased by 35.6%.Masimasi CPUE decreased by 50.3% (from 0.44 to 0.22 fish per 1000 hooks)..
Skipjack CPUE increased by 34.6 % from 2.93 to 3.94 fish per 1000 hooks (in 2003 CPUE decreased by 40.4 from 4.92 to 2.93 fish per 1000 hooks).
Yellow Fin Tuna CPUE increased by 52.4 % (from 2.15 to 3.27 fish per 1000 hooks), big eye CPUE increased also by 11.1 % (from 1.14 to 1.27 fish per 1000 hooks), wahoo CPUE has increased by 40.1 % (from 1.13 to 1.59 fish per 1000 hooks, while billfish and shark CPUE have increased by 16.6 % and 10.3 %.

Fish Size – After the dramatic decreased of the average size of the main targeted pelagic fish in 2003, we still observe a decrease for Albacore (from 37.8 to 36.5 lbs/fish), for Big eye (from 37.4 to 35.9 lbs/fish), for mahi mahi (from 20.7 to 13.0 lbs/fish) and for wahoo (from 30.0 to 27.4 lbs/fish). But we observe an increase in average size for Skipjack (from 9.4 to 13.6 lbs/fish) and Yellowfin tuna (from 44.3 to 52.1 lbs/fish).
Those observations are made from the cannery sample, as they seems more representative of the fishery. (ie : the creel survey sampling concern only Alia's catch covering less than 2 % of the total long lining catches). For the majority of the remaining of the pelagic species, the reported catch is too small to come to any conclusion about the variability in the average size.

Pelagic fishing revenues - The total revenue of $8,329,330.00 has decreased by 24.7% compared to last year ($11,068,447.00) (Table 2). This reflects the lower catch and the lower prices for all the fish.

Evolution of the longline fishery - During 2004, 45 boats engaged in the longline fishery of American Samoa whereas 18 boats participated in the trolling fishery. This depicts a 21.1% decrease from the 57 boats that engaged in the longline fishery last year and a 10% increase from the 20 boats participating in the trolling fishery in 2003.

After the changes we observed last year (with a decrease of 44% in the Alia fleet (from 27 to 15)), we still observe the same trend with only 9 Alias longlining in 2004 which is 40 % less than in 2003. What is new is that the large vessels have started to quit the AS EEZ for other fishing grounds and it's the first year we have registered less big boat than the previous year. (from 32 to 29 monohull >50 feet). This change is reflected in the decrease in sets deployed (-22.8%) and by the greater number of hooks per set deployed. The CPUE for the large monohull has increased lightly (+2.9%) while it has decreased for Alia (-22%) and small monohull (-25.2%).

Evolution of the trolling fishery - Trolling catch rates have varied since 1982, with a steady decrease between 1999 and 2002. After an important increase in the catch rate in 2003 (+60.9%), we observe a decreased by 21.2 % in 2004. the total hours (1197 hours) spend trolling has increased by 15.7 % compared to 2003 (1035 hours). At the same time, less boats were trolling than last year. There are more Alia available to go trolling with the disaffection of the longline activity, but the price of the gas is probably a main obstacle to the increase of the trolling activity.

Conclusion - Overall, the longline fishery has been growing from 1995 to 2002. At first the growth was mainly in the small scale fishery of the Alia fleet, than the growth as been in the industrial fishery and their large vessels. In 2003 the declining trend of the fishing, biological and commercial indicators has been a strong warning for the pelagic fishery. In 2004 the low catch, the higher and higher price of the fuel and the lower price of the tuna discouraged several local fishermen but also big longliners who preferred to leave for other fishing grounds. The decline in resources is probably the result of an overfishing situation at least for the Albacore. It would be wise anyway to compare fishing data with climatic data, as the effect of El nino or La Nina can have an effect on the resource too. By the end of 2003, some large longliners have left the American Samoa fishery for the Hawaiian fishery, which may be more profitable.

2004 Recommendations and current status:

1. The Pelagic Plan Team recommends that, pending the results of a re-analysis of the longline set data with the verified area closure coordinates, the Council send a letter to NMFS Office of Law Enforcement outlining concerns that large (>50ft) longline vessels may be fishing within the 50 nm closed area around the islands of American Samoa, and that NMFS OLE should conduct an investigation and take action to ensure that these violations are curtailed. [The letter should include the results of an investigation of a rerun of the data with the verified coordinates for the area closures].

2. The Pelagic Plan Team recommends that as the Council and DMWR move forward with the original recommendation for closer collaboration with neighboring Samoa that this be expanded to include broader cooperation with all the countries bordering the American Samoa EEZ, to collect and process regional data in order to have a regional view of the fisheries. Contact have been taken with neighbor countries by the director Ray Tulafono during the meeting of the head of fisheries in Noumea (He meet them and give a letter and a sample of the work produce with the GIS application developed by the DMWR), but we never received any answer or any mark of interest.

3. The Pelagic Plan Team recommend that DMWR seek grants to develop infrastructure and processes to utilize bycatch, which may require hiring a qualified contract grant writer. Has not been done

Plan Team Action Items

The Pelagic Plan Team recommends that DMWR continue to develop their GIS mapping capability of the American Samoa longline catch, effort and CPUE data. Done

2. The Pelagic Plan Team recommend that WPacFIN develop a time series of vessels by size classes as per the four size classes used in the limited entry amendment for the 2005 Pelagic Plan Team annual meeting.

2005 Recommendations :

The Pelagic Plan Team recommend that DMWR seek grants to develop infrastructure and processes to utilize bycatch, which may require hiring a qualified contract grant writer.

The Pelagic Plan Team recommend to propose a limited number of longline permit in the AS EEZ (with a maximum size of line or number of hooks)

The Pelagic Plan Team recommend that an appropriate training be given to the technician in order to increase their skills in identifying fish. The council should organize a standardized training for all the technicians of the American pacific territories. This training aims to give certification to the participant and should be provided every year.

Table 1. American Samoa 2004 estimated total landings by pelagic species by gear type.

Species	LongLine Pounds	Troll Pounds	Other Pounds	Total Pounds
Skipjack Tuna	516,348	20,078	0	536,426
Albacore	5,428,714	50	0	5,428,764
Yellowfin Tuna	1,958,424	5,727	0	1,964,151
Kawakawa	0	450	0	450
BigeyeTuna	499,353	0	0	499,353
Tunas	198	0	0	198
TUNAS SUBTOTALS	8,403,037	26,305	0	8,429,342
Mahimahi	42,923	457	0	43,380
Black marlin	1,382	0	0	1,382
Blue marlin	23,431	0	0	23,431
Striped Marlin	4,840	0	0	4,840
Wahoo	471,588	523	89	472,200
All Pelagic Sharks	2,526	310	133	2,970
Swordfish	8,791	0	0	8,791
Sailfish	4,480	31	0	4,511
Spearfish	1,902	0	0	1,902
Moonfish	4,482	0	0	4,482
Oilfish	1,159	0	0	1,159
Pomfret	1,771	0	0	1,771
NON-TUNA PMUS SUBTOTALS	569,277	1,320	222	570,819
Barracudas	1,518	428	584	2,530
Rainbow runner	235	327	89	652
Dogtooth tuna	27	218	461	707
Other Pelagic Fish	1,634	0	0	1,634
OTHER PELAGICS SUBTOTALS	3,415	973	1,135	5,522
TOTAL PELAGICS	**8,975,729**	**28,598**	**1,356**	**9,005,683**

The “troll pounds” category includes the pelagic landings of combined troll/bottomfishing trips as well as the landings of purely troll trips. The “other pounds” category in Table 1 includes pelagic species not caught by longlining or trolling such as barracuda, rainbow runner and dogtooth tuna, caught with bottomfishing or spearfishing methods.

In 2004, longlining represent 99.67% of the pelagic fish unload, trolling being a tiny part of the total.

Table 2. American Samoa 2004 estimated commercial landings, value and average price by pelagic species.

Species	Pounds	$/LB	Value($)
Skipjack Tuna	516,491	$0.62	$319,463
Albacore	5,667,969	$0.94	$5,345,433
Yellowfin Tuna	1,949,896	$0.85	$1,665,699
Kawakawa	103	$1.75	$181
BigeyeTuna	495,536	$1.10	$546,901
TUNAS SUBTOTALS	8,629,995	$0.91	$7,877,676
Mahimahi	6,748	$1.92	$12,989
Black marlin	989	$1.00	$989
Blue marlin	2,327	$1.01	$2,356
Wahoo	446,216	$0.93	$417,009
All Pelagic Sharks	82	$0.50	$41
Swordfish	7,367	$2.03	$14,934
Sailfish	1,249	$0.91	$1,136
Spearfish	156	$1.50	$234
Moonfish	1,066	$1.24	$1,318
Oilfish	24	$1.00	$24
Pomfret	314	$1.99	$625
NON-TUNA PMUS SUBTOTALS	466,537	$0.97	$451,654
Barracudas	1,445	$1.74	$2,520
Rainbow runner	391	$1.91	$748
Dogtooth tuna	71	$1.75	$123
OTHER PELAGICS SUBTOTALS	1,907	$1.78	$3,392
TOTAL PELAGICS	**9,098,439**	**$0.92**	**$8,332,723**

The price/pound of barracuda is high because most of the interviews with barracuda price/pound data are when they are caught by bottomfishing and sold at bottomfish prices with the rest of the bottomfish catch.

Table 3. American Samoa 2004 longline effort, kept and released by three sizes of longline vessels

EFFORT

	Alias	Monohull < 50'	Monohull > 50 '
Boats	9	2	29
Trips	430	16	177
Sets	512	148	4,144
1000 Hooks	157	261	11,198
Lightsticks	634	0	1,831

KEPT (Number of Fish)

Species	Alias	Monohull < 50'	Monohull > 50 '	All Vessels
Skipjack Tuna	467	0	36,996	37,463
Albacore	2,163	3,143	143,909	149,215
Yellowfin Tuna	1,384	334	35,031	36,749
BigeyeTuna	129	93	13,747	13,969
Tunas	1	0	12	13
TUNAS SUBTOTALS	4,144	3,570	229,695	237,409
Mahimahi	334	14	1,653	2,001
Black marlin	0	0	4	4
Blue marlin	18	2	190	210
Striped Marlin	18	0	44	62
Wahoo	481	136	16,263	16,880
All Pelagic Sharks	1	0	37	38
Swordfish	16	2	148	166
Sailfish	7	0	50	57
Spearfish	1	0	38	39
Moonfish	14	0	100	114
Oilfish	1	0	80	81
Pomfret	6	0	175	181
NON-TUNA PMUS SUBTOTALS	897	154	18,782	19,833
Barracudas	0	0	40	40
Other Pelagic Fish	0	0	34	34
OTHER PELAGICS SUBTOTALS	0	0	74	74
TOTAL PELAGICS	**5,041**	**3,724**	**248,551**	**257,316**

RELEASED (Number of Fish)

Species	Alias	Monohull < 50'	Monohull > 50 '	All Vessels
Skipjack Tuna	0	309	8,034	8,343
Albacore	0	0	927	927
Yellowfin Tuna	0	23	1,249	1,272
BigeyeTuna	0	0	731	731
Tunas	0	0	1	1
TUNAS SUBTOTALS	0	332	10,942	11,274
Mahimahi	0	2	548	550
Black marlin	0	0	13	13
Blue marlin	0	20	1,871	1,891
Striped Marlin	0	2	158	160
Wahoo	0	32	1,520	1,552
All Pelagic Sharks	7	340	9,536	9,883
Swordfish	0	0	165	165
Sailfish	0	20	715	735
Spearfish	0	0	924	924
Moonfish	0	10	568	578
Oilfish	0	41	7,861	7,902
Pomfret	0	12	963	975
NON-TUNA PMUS SUBTOTALS	7	479	24,842	25,328
Barracudas	0	0	453	453
Other Pelagic Fish	0	0	1,068	1,068
OTHER PELAGICS SUBTOTALS	0	0	1,521	1,521
TOTAL PELAGICS	**7**	**811**	**37,305**	**38,123**

Interpretation: This table indicates the effort and catch data by three different types of vessels participating in the American Samoa longline fishery in the year 2004. Clearly it illustrates that the majority of the effort and catch is performed by the monohulls that are greater than 50 ft. in length. They account for 96.6% of the total pelagics caught (93.5% in 2003), compared to the 1.4%by the monohulls less than 50 ft (3.5 % in 2003). and 2.0% by the alias (3.0% in 2003). It also shows that 97.9% of the releases are made by the big boats while smaller monohull make the rest. It's important to note that the alias fleet release no fish beside a limited number of sharks.

Calculation: These values are sums of Longline Logbook data for the three types of longline vessels in Samoa. The kept values for sharks include those that were finned. All species of sharks entered in the Longline Logs are combined in the Other Sharks species. Rays and Sunfish are included in the Other Pelagic Fish species. A trip is a unique combination of boats and return dates where the return date is in the current year.

Table 4. American Samoa 2004 longline effort and catch ny boats < 50' long and > 50' long inside and outside of restricted areas less than 50 miles from shore

EFFORT

	Boats < 50' Inside	Boats < 50' Outside	Boats > 50' Inside	Boats > 50' Outside
Boats	10	4	18	29
Trips	425	3	50	145
Sets	553	75	98	4,078
1000 Hooks	270	129	179	11,037

CATCH (Number of Fish)

Species	Boats < 50' Inside	Boats < 50' Outside	Boats > 50' Inside	Boats > 50' Outside
Skipjack Tuna	323	206	627	44,650
Albacore	3,378	1,704	2,557	142,503
Yellowfin Tuna	1,426	165	608	35,822
BigeyeTuna	151	59	165	14,325
Tunas	0	0	1	13
TUNAS SUBTOTALS	5,278	2,134	3,958	237,313
Mahimahi	265	15	100	2,171
Black marlin	0	0	0	17
Blue marlin	27	13	30	2,031
Striped Marlin	15	2	3	202
Wahoo	494	89	234	17,615
All Pelagic Sharks	179	161	110	9,471
Swordfish	16	1	7	307
Sailfish	16	10	10	756
Spearfish	0	0	3	960
Moonfish	16	8	8	660
Oilfish	12	30	69	7,872
Pomfret	9	9	14	1,124
NON-TUNA PMUS SUBTOTALS	1,049	338	588	43,186
Barracudas	0	0	3	490
Other Pelagic Fish	0	0	20	1,082
OTHER PELAGICS SUBTOTALS	0	0	23	1,572
TOTAL PELAGICS	**6,327**	**2,472**	**4,569**	**282,071**

Interpretation: This table shows the longline effort and catch by boats less than and greater than 50 feet in length inside and outside the 50 miles from shore. Albacore continues to be the most commonly caught species inside and outside of the 50 mile areas regardless of boat size.

It is important to note that even though the percentage of fish caught by the boats > 50 feet illegally in the restricted areas is only 1.6% of the fish caught by them legally outside of the restricted areas 50 nm around Tutuila and Swains, that the boats > 50 feet catch over 72% as much fish as the boats < 50 feet do inside of the restricted areas.

Calculation: These values are sums of Longline Logbook catch (kept + released + finned) data for longline vessels in Samoa that are less than 50 feet long and more than 50 feet long. The less than 50 foot category includes alias and monohulls less than 50 feet long. The 50 mile areas include one around Tutuila bounded by the following four points

13 deg 30 min S latitude x 170 deg 50 min W longitude
13 deg 30 min S latitude x 167 deg 25 min W longitude
15 deg 13 min S latitude x 167 deg 25 min W longitude
15 deg 13 min S latitude x 171 deg 39 min W longitude

and one around Swains's Atoll bounded by the following four points

10 deg 13 min 11 sec S latitude x 170 deg 20min W longitude
11 deg 48 min S latitude x 170 deg 20min W longitude
11 deg 48 min S latitude x 171 deg 50min W longitude
10 deg 23 min 30 sec S latitude x 171 deg 50min W longitude

A set is considered inside one of these areas if any of the begin set, end set, begin haul or end haul positions is inside one of these areas. All species of sharks entered in the Longline Logs are combined in the Sharks species. Rays and Sunfish are included in the Other Pelagic Fish species.

A trip is defined as a unique pair of boats and return dates where the return date is in the current year. A trip is considered inside of the 50 mile areas if any of its sets are in the 50 mile areas.

There are three vessels over fifty feet in length who are allowed to fish inside of the 50 mile restricted zones because they were longline fishing before 11/13/97 and are grandfathered in. Their sets are in the **Boats > 50' Outside** category regardless of where they actually fished.

Table 5A. American Samoa 2004 longline bycatch percentages for the three sizes of longline vessels

Species	Alias	Monohulls < 50'	Monohulls' > 50 '	All Boats
Skipjack Tuna	0.00 %	100.0 %	17.84 %	18.21 %
Albacore	0.00 %	0.00 %	0.64 %	0.62 %
Yellowfin Tuna	0.00 %	6.44 %	3.44 %	3.35 %
BigeyeTuna	0.00 %	0.00 %	5.05 %	4.97 %
Tunas	0.00 %	0.00 %	7.69 %	7.14 %
TUNAS SUBTOTALS	0.00%	8.51%	4.55%	4.53 %
Mahimahi	0.00 %	12.50 %	24.90 %	21.56 %
Black marlin	0.00 %	0.00 %	76.47 %	76.47 %
Blue marlin	0.00 %	90.91 %	90.78 %	90.00 %
Striped Marlin	0.00 %	100.0 %	78.22 %	72.07 %
Wahoo	0.00 %	19.05 %	8.55 %	8.42 %
All Pelagic Sharks	87.50 %	100.0 %	99.61 %	99.62 %
Swordfish	0.00 %	0.00 %	52.72 %	49.85 %
Sailfish	0.00 %	100.0 %	93.46 %	92.80 %
Spearfish	0.00 %	0.00 %	96.05 %	95.95 %
Moonfish	0.00 %	100.0 %	85.03 %	83.53 %
Oilfish	0.00 %	100.0 %	98.99 %	98.99 %
Pomfret	0.00 %	100.0 %	84.62 %	84.34 %
NON-TUNA PMUS SUBTOTALS	0.77%	75.67%	56.95%	56.08 %
Barracudas	0.00 %	0.00 %	91.89 %	91.89 %
Other Pelagic Fish	0.00 %	0.00 %	96.91 %	96.91 %
OTHER PELAGICS SUBTOTALS	*****%	*****%	95.36%	95.36 %
TOTAL PELAGICS	**0.14%**	**17.88%**	**13.05%**	**12.90 %**

Table 5B. American Samoa 2004 Trolling Bycatch

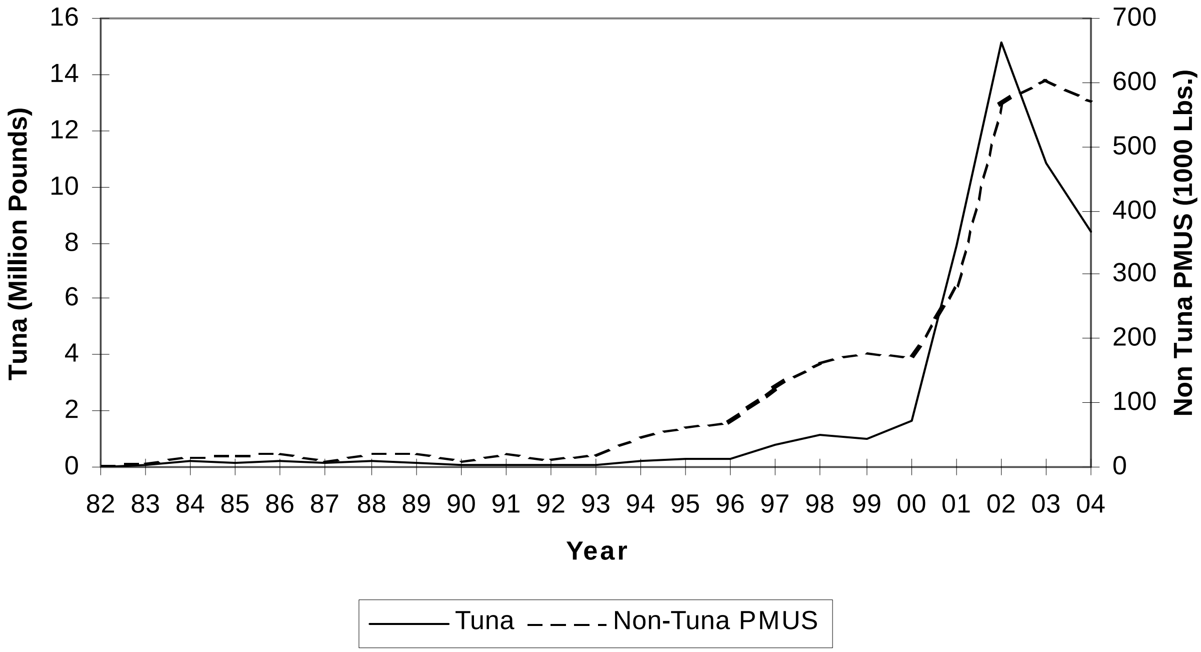
	Bycatch						Interviews		
Species	Alive	Dead Inj	Unk	Total	Catch	%BC	With BC	All	%BC
Other Pelagic Sharks	0	1	0	1	3	33.33			
All Species (Comparison)					3744	0.027	1	381	0.26

Interpretation: Table 5A shows longline and trolling bycatch percentages for the three different sizes of longline vessels in 2004. It shows that the fishery is mostly focused on one group of species (there was little bycatch for the tuna). The bycatch is far more important for the large industrial vessels than for the alias, which can sell their incidental catch locally keeping from becoming bycatch. Table 5B shows 3 bycatch for the trolling method during this period, which represent 0.027% of the total catch.

Calculation: The percentages in Table 5A are sums of the Longline Logbook numbers of released fish divided by the sums of the numbers of kept+released fish for each species and size of vessel. For shark species the numbers of fish kept includes those finned. The percentages for all boats is the sum of released species for all boats divided by the sum of kept plus the sum of released for all boats. The percentages in the SUBTOTALS and TOTALS row are similarly weighted percentages. All shark species in the Longline Logs are combined in the Other Sharks species. Rays and Sunfish are included in the Other Pelagic Fish species.

The Trolling Bycatch table is obtained from creel survey interviews. The Bycatch numbers are obtained by counting fish in the interviews for purely trolling trips with a disposition of bycatch. The catch for all species included for comparison is obtained by counting all species of fish caught by purely trolling interviews and the number of interviews is a count of purely trolling interviews

Figure 1. American Samoa annual estimated total landings of Tuna and Non-Tuna PMUS

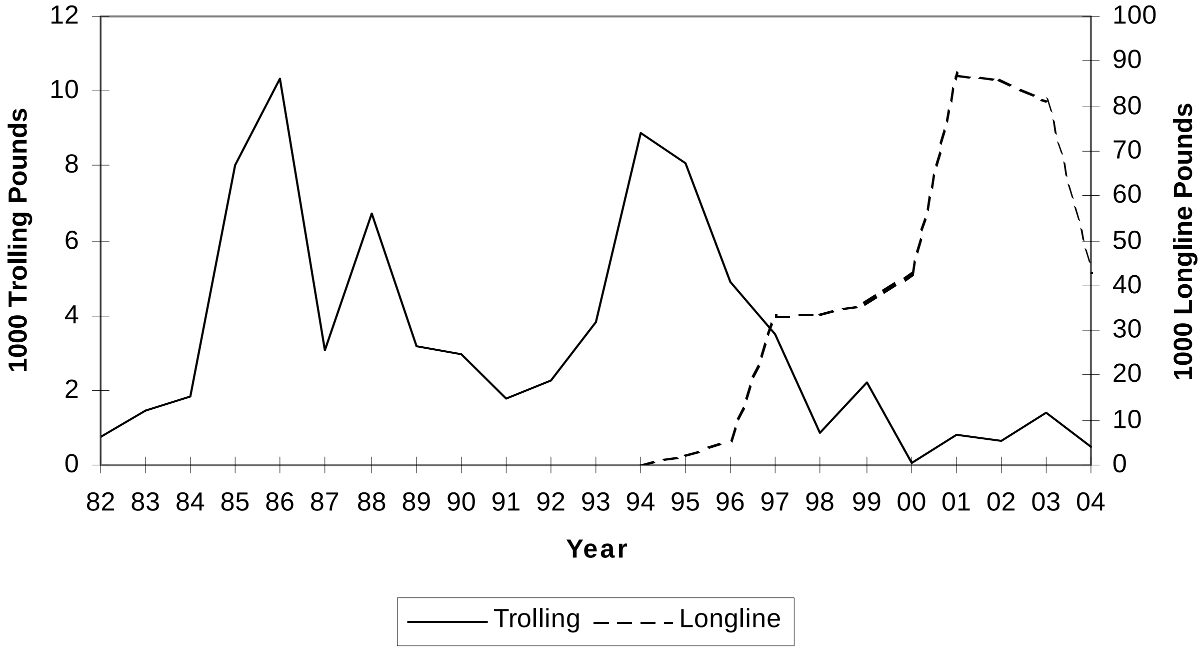


Interpretation: Estimated total landings are variable in the 1980s up to 1993. However there was an increase in the number of total landings from 1993 to the present. This year there has been a 22.0% decrease in the total landings of tuna compared to the 28.7% decrease from 2003. This is mainly the result of the decrease in Albacore catch. The total landing for other pelagic species also decrease about 5.7% for 2004.

Calculation: Estimated total landings for Tunas and Non-Tuna PMUS were calculated by summing the total landings for the species in these categories as defined by Table 1.

	Pounds Landed	
Year	**Tuna**	**Non Tuna PMUS**
1982	23,042	2,106
1983	90,057	4,806
1984	198,961	15,121
1985	107,659	19,686
1986	187,909	23,415
1987	144,121	10,899
1988	207,083	23,462
1989	173,518	20,720
1990	78,827	9,848
1991	71,425	21,100
1992	92,600	11,893
1993	45,806	19,104
1994	187,459	47,418
1995	282,897	61,931
1996	315,320	67,946
1997	791,399	122,687
1998	1,160,079	163,953
1999	1,007,322	179,187
2000	1,668,188	172,252
2001	7,863,783	283,665
2002	15,152,595	566,075
2003	10,803,361	605,532
2004	8,429,342	570,819
Average	**2,134,033**	**131,462**
Std. Dev.	**4,068,209**	**188,088**

Figure 2. American Samoa annual estimated total landings of Mahimahi by gear.

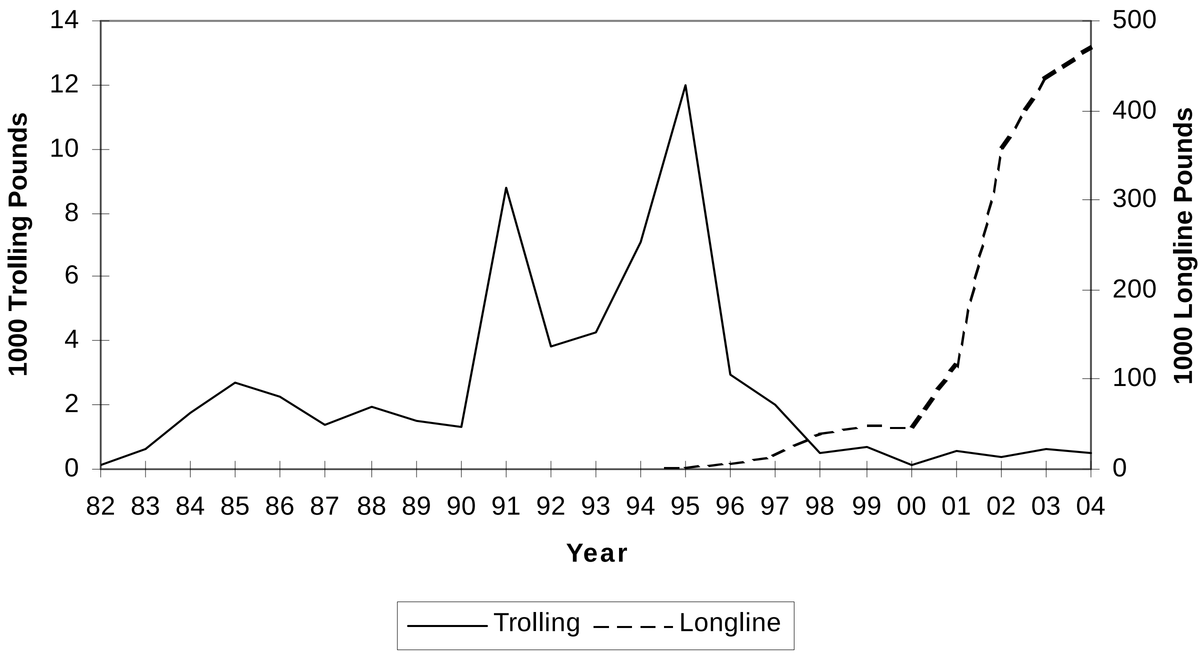


Interpretation: Through the years, Mahimahi landings have been variable. From 1984-1988, American Samoan fishermen exported mahimahi to Hawaii so landings were unusually high and remained stable until 1995. After 8 years of increase in catch by longlining, 2004 is the third consecutive year of decrease (47.0% less since 2003). The number of pounds landed by trolling decreased by 67.6 % this year. In 2004, longliners caught 98.9% of the mahimahi and trolling took in only 1.1%

Calculation: The estimated total annual landings of mahimahi is listed for longline and trolling fishing methods. The All methods landings may be greater than the sum of the longline and trolling landings when mahimahi are caught by other methods..

	Pounds Landed	
Year	**Longline**	**Trolling**
1982	0	777
1983	0	1,443
1984	0	1,844
1985	0	8,011
1986	0	10,327
1987	0	3,051
1988	0	6,736
1989	0	3,201
1990	0	2,971
1991	74	1,748
1992	0	2,242
1993	215	3,809
1994	98	8,869
1995	2,301	8,052
1996	5,395	4,906
1997	33,031	3,517
1998	33,458	843
1999	35,909	2,193
2000	42,616	66
2001	87,114	786
2002	85,912	654
2003	80,994	1,411
2004	42,923	457
Average	**32,146**	**3,388**
Std. Dev.	**31,910**	**2,934**

Figure 3. American Samoa annual estimated total landings of Wahoo by gear.



Interpretation: Although there is a decline in the number of trolling activities for wahoo, the number of total landings by longlining have been on an increasing trend since 1995. Longliners took in almost the rest of the landings this year for wahoo, the remaining 0.11 % is accounted for by trollers. The continuous increase in wahoo landings was primarily due to the increase in longline trips and effort until 2003. In 2004, we had a 8.6 % increase of pounds landed compared to last year (with 8.4% of wahoo released compared to the 11.3% released last year).

Calculation*:* The estimated total annual landings of wahoo is listed for longline and trolling fishing methods. The All methods landings may be greater than the sum of the longline and trolling landings when wahoo are caught by other methods.

	Pounds Landed	
Year	**Longline**	**Trolling**
1982	0	114
1983	0	632
1984	0	1,777
1985	0	2,678
1986	0	2,244
1987	0	1,395
1988	84	1,962
1989	0	1,489
1990	0	1,299
1991	369	8,764
1992	0	3,848
1993	557	4,250
1994	0	7,124
1995	1,576	11,986
1996	6,931	2,945
1997	15,620	2,001
1998	40,405	487
1999	48,303	685
2000	47,355	140
2001	114,517	588
2002	358,101	351
2003	434,221	603
2004	471,588	523
Average	**90,566**	**2,517**
Std. Dev.	**157,061**	**2,937**

Figure 4. American Samoa annual estimated total landings of Blue Marlin by gear.

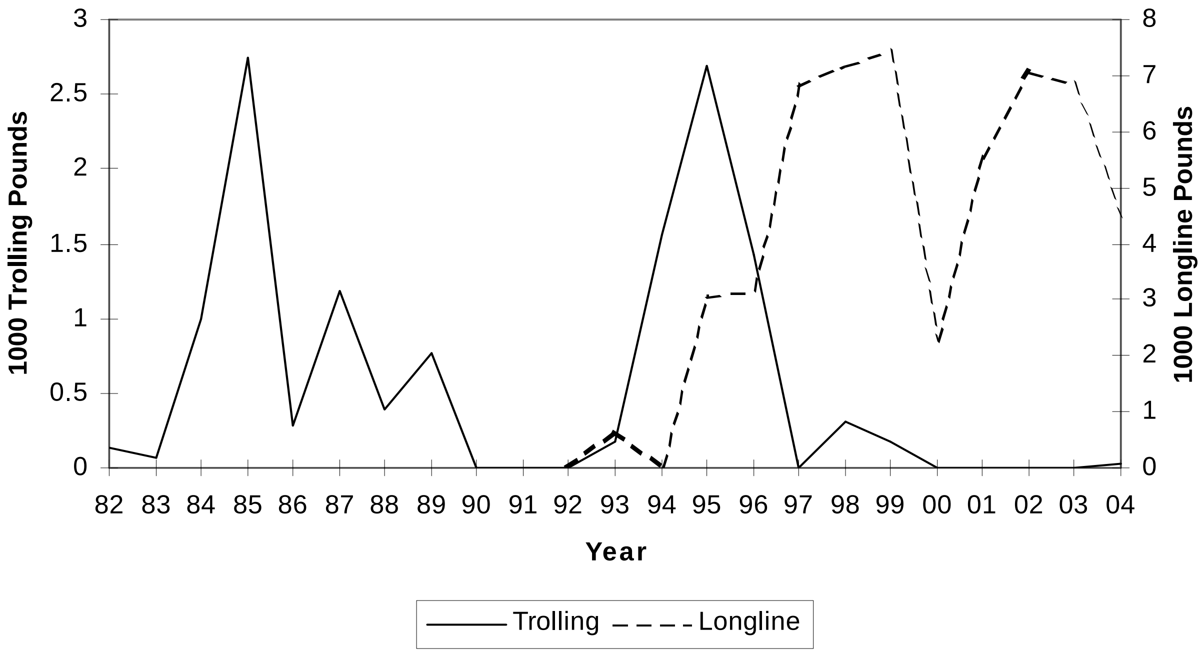
Interpretation: All of the blue marlin landings were caught by trolling method since 1982 until 1994, except in 1993 where blue marlin catches were recorded being caught by four vessels that were engaged in longline activities. A gradual increase in blue marlin landings by longline method since 1995 is primarily due to the influx in the longline fishery by the local fishermen, whereas catches by trolling method began to decline. Unlike 2003, the landings in 2004 did not included trolling pounds. After the large increase of 126% in 2002, and a large decrease of 68.5% in 2003 we observed a stagnation this year.

Any how, as those comparison are based on pound landed and not in catches, and that the percentage of fish kept varies between years, it doesn't make sense to compare these figures as to compare quantity landed for other by catch species. They might reflect the local capacity of utilizing this species. In 2004, the Blue marlin kept were 10% of those caught. In 2003 this was 8.4 %.

	Pounds Landed	
Year	**Longline**	**Trolling**
1982	0	315
1983	0	1,083
1984	0	6,097
1985	0	2,574
1986	0	4,223
1987	0	265
1988	0	10,217
1989	0	10,680
1990	0	4,012
1991	0	6,726
1992	0	4,524
1993	2,193	6,331
1994	0	18,538
1995	5,267	20,196
1996	21,450	7,547
1997	31,869	5,160
1998	45,440	1,592
1999	34,981	590
2000	57,100	623
2001	32,836	0
2002	74,216	0
2003	23,368	1,294
2004	23,431	0
Average	**29,346**	**4,895**
Std. Dev.	**21,222**	**5,486**

Calculation: The estimated total annual landings of blue marlin is listed for longline and trolling fishing methods. The All methods landings may be greater than the sum of the longline and trolling landings when blue marlin are caught by other methods. The average and standard deviation for the Longline Method is calculated from 1993 onward.

Figure 5. American Samoa annual estimated total landings of Sailfish by gear.

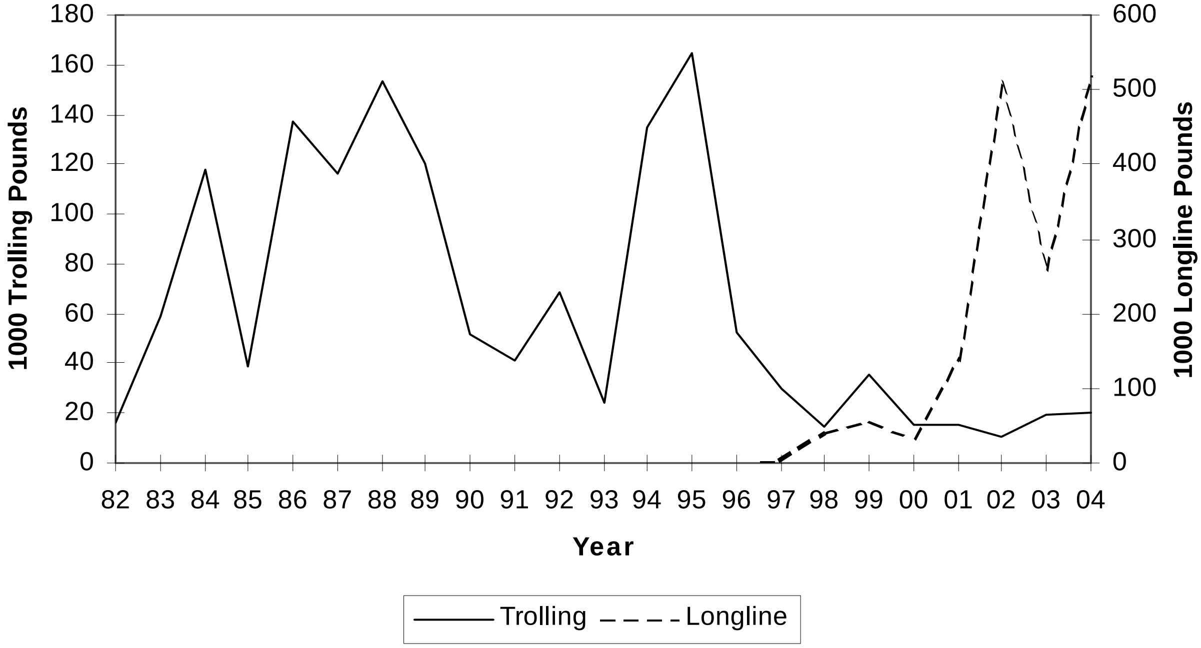


Interpretation: Sailfish landings are variable throughout the years. Initially trolling was the dominant method of fishing however longlining grew to be the popular fishing method. In 1990 to 1992, for unknown reasons, there were no sailfish recorded. Due to the continuous development of the longline fishery in 1995, there was a gradual increase in sailfish landings by longliners until 2000, where there was a 70% decrease. After that sailfish landings increased by 27% in 2002, stayed almost flat in 2003 and decreased by 34.2% this year. (but only 7.2 of the sailfish caught were kept, while in 2003 11.5% of the fish caught were kept).

Calculation*:* The estimated total annual landings of sailfish is listed for longline and trolling fishing methods. The All methods landings may be greater than the sum of the longline and trolling landings when sailfish are caught by other methods.

	Pounds Landed	
Year	**Longline**	**Trolling**
1982	0	127
1983	0	74
1984	0	989
1985	0	2,744
1986	0	279
1987	0	1,188
1988	0	394
1989	0	767
1990	0	0
1991	0	0
1992	0	0
1993	626	183
1994	0	1,561
1995	3,048	2,693
1996	3,146	1,420
1997	6,822	0
1998	7,185	314
1999	7,424	184
2000	2,245	0
2001	5,535	0
2002	7,060	0
2003	6,858	0
2004	4,480	31
Average	**4,536**	**563**
Std. Dev.	**2,559**	**817**

Figure 6. American Samoa annual estimated total landings of Skipjack Tuna by gear.



Interpretation: There was a gradual increase in skipjack landings for longlining since 1995, except for a 43% decrease in 2000, and a notable decrease of 49.4% in 2003.This year is the highest unload ever and cant be explained by several reason.

The low catch of albacore and bigger average size of Skipjack encourage the big longliner to discard less Skipjack (8343 in 2004, 11738 in 2003). If the catch (+10.3% from 41522 to 45806 fish) and CPUE (+34.6%) are higher in 2004 than 2003, the raise of 100.4% in the amount landed is also explained by a bigger average size of the fish (from 9.4 lbs in 2003 to 13.6 lbs in 2004).

This species is characterized by a large stock size, fast growth, early maturity and high fecundity. The fluctuation of the catch can be explained by variation in the recruitment in the two last years.

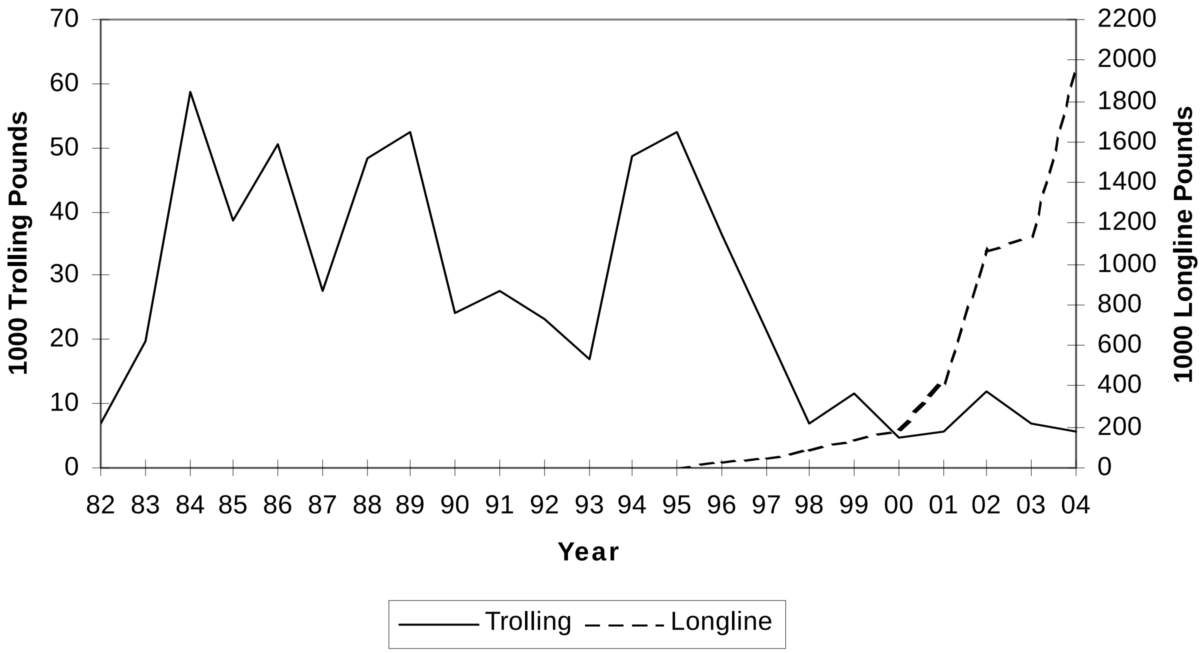
Trolling has declined since 1995 as a result of an increase in longline activities, except in 1999 when skipjack landings increased by 137%. This reflects the increase in number of boats that were involved in trolling

	Pounds Landed	
Year	**Longline**	**Trolling**
1982	0	15,877
1983	0	58,997
1984	0	117,693
1985	0	38,902
1986	0	137,180
1987	0	116,505
1988	0	153,671
1989	0	120,171
1990	0	51,650
1991	345	40,992
1992	0	68,977
1993	539	24,264
1994	101	134,955
1995	160	164,957
1996	434	52,562
1997	2,517	29,894
1998	40,596	14,822
1999	56,171	35,171
2000	31,871	15,477
2001	137,947	15,169
2002	509,426	10,803
2003	257,676	19,374
2004	516,348	20,078
Average	**111,009**	**63,397**
Std. Dev.	**178,257**	**50,519**

activities before obtaining their longline permit to begin longlining.

Calculation: The estimated total annual landings of skipjack tuna is listed for longline and trolling fishing methods. The All methods landings may be greater than the sum of the longline and trolling landings when skipjack tuna are caught by other methods.

Figure 7. American Samoa annual estimated total landings of Yellowfin Tuna by gear.



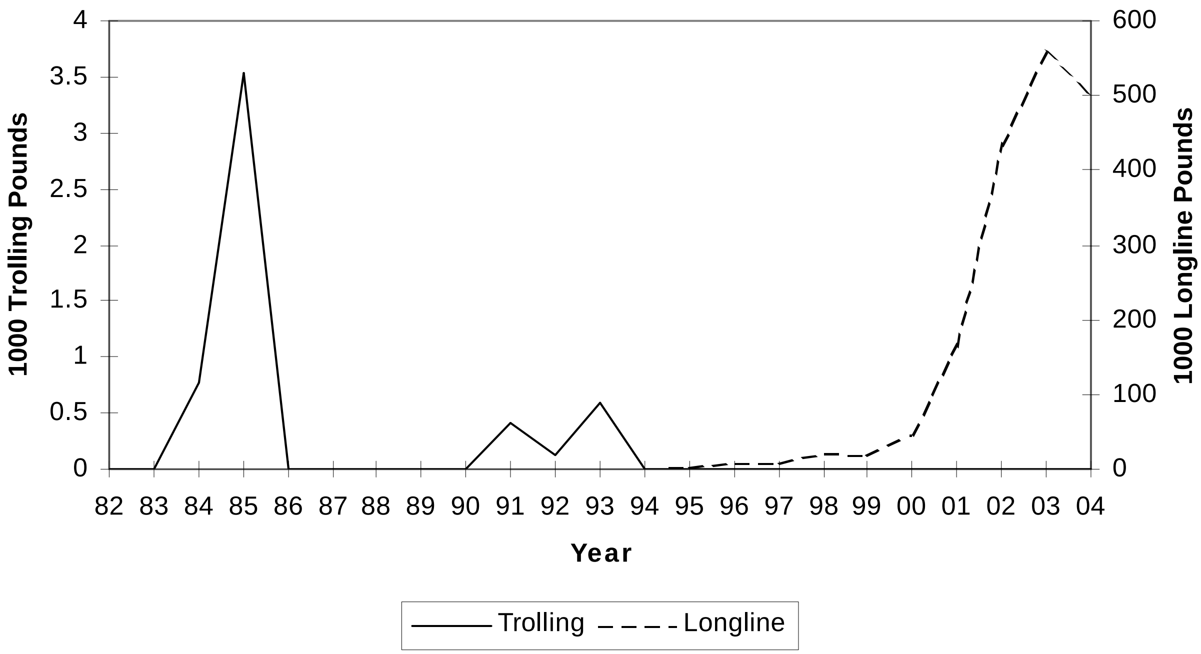
Interpretation: Trolling activities yielded all of the Yellowfin tuna landings in the 1980s until 1987 and the number of landings were variable until 1995 when trolling activities began to decline. With the increase in longline fishery in 1995, yellowfin landings began a rapid increase that escalated until today.

The total YF landing increased by 71.5% (+72% longlining, -17.1% trolling).Two main explanations to this global increase : CPUE increased by 52.4% and the average size of the fish increased too, from 44.3 lbs to 52.1 lbs (cannery sampling). It seems to indicate a good health of the stock.

Calculation: The estimated total annual landings of yellowfin tuna is listed for longline and trolling fishing methods. The All methods landings may be greater than the sum of the longline and trolling landings when yellowfin tuna are caught by other methods.

	Pounds Landed	
Year	**Longline**	**Trolling**
1982	0	7,038
1983	0	19,789
1984	0	58,704
1985	0	38,586
1986	0	50,622
1987	0	27,467
1988	1,775	48,316
1989	129	52,350
1990	0	24,152
1991	262	27,525
1992	0	23,247
1993	2,225	16,990
1994	1,637	48,548
1995	4,022	52,428
1996	25,655	36,551
1997	47,996	21,219
1998	92,462	6,763
1999	140,061	11,566
2000	188,949	4,829
2001	413,986	5,573
2002	1,068,969	11,781
2003	1,138,397	6,909
2004	1,958,424	5,727
Average	**299,115**	**26,377**
Std. Dev.	**541,856**	**17,792**

Figure 8. American Samoa annual estimated total landings of Bigeye Tuna by gear.

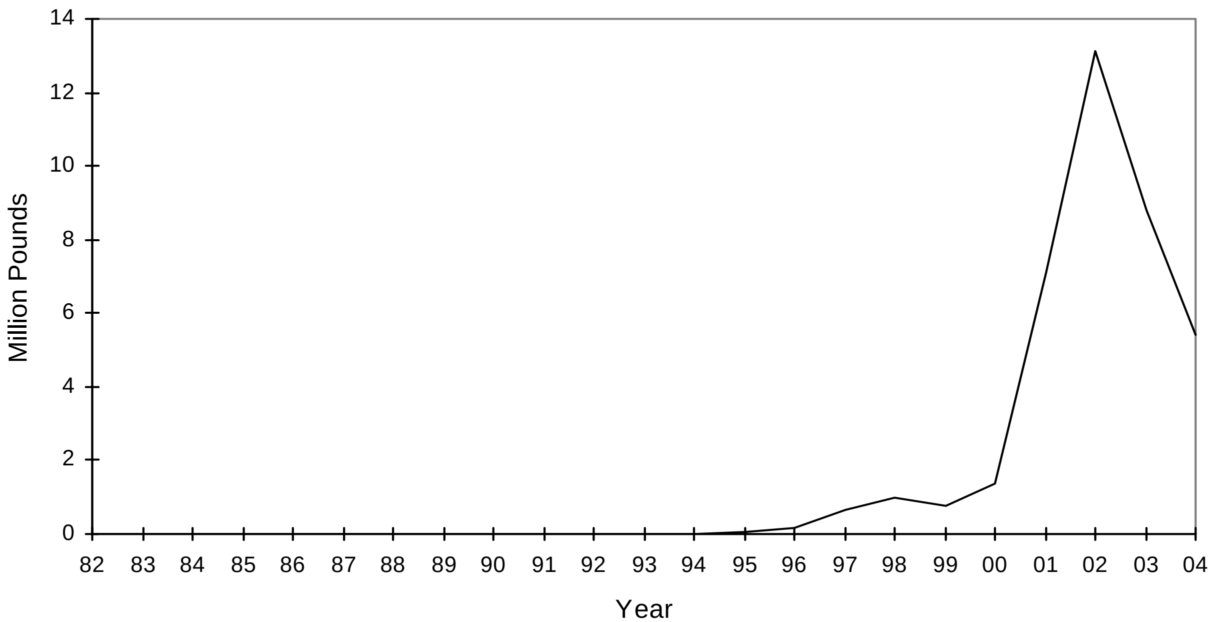


Interpretation: Before the Longline Fishery began, Bigeye tuna was sometimes caught by trolling. In 1985 there was a high peak of 3,527 pounds of Bigeye, however from 1995 to the present, there has been a steady increase in the number of total landings by longline fishermen. All 100% of the total landings of Bigeye caught from 1995 to 2003 was by longlining. In 2003, there was a significant increase of Bigeye landings by 29% but this year a little decrease of 10.4 %. Thus the CPUE increased of 9.2% while the average size is lightly smaller than last year according to the canneries data (-4%).

Calculation: The estimated total annual landings of bigeye tuna is listed for longline and trolling fishing methods. The All methods landings may be greater than the sum of the longline and trolling landings when bigeye tuna are caught by other methods. The average and standard deviation for the Longline Method is calculated from 1991 onward.

	Pounds Landed	
Year	**Longline**	**Trolling**
1982	0	0
1983	0	0
1984	0	769
1985	0	3,527
1986	0	0
1987	0	0
1988	0	0
1989	0	0
1990	0	0
1991	18	417
1992	0	126
1993	79	604
1994	0	0
1995	2,191	0
1996	8,653	0
1997	8,355	0
1998	22,287	0
1999	19,254	0
2000	46,873	0
2001	165,420	0
2002	432,367	0
2003	557,557	0
2004	499,353	0
Average	**125,886**	**237**
Std. Dev.	**199,263**	**731**

Figure 9. American Samoa annual estimated total landings of Albacore by longlining.

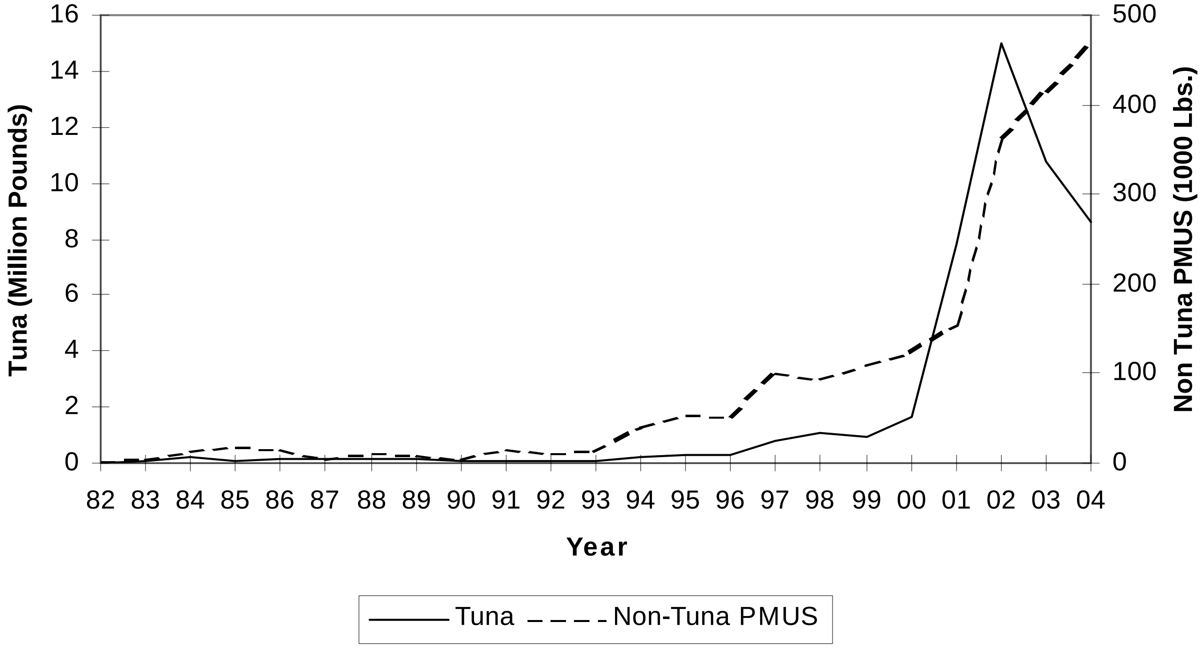


Interpretation: Since the Longline Fishery initially began, it has been the most commonly used method of fishing for pelagic species. Until 2002, there has been a continuous increase since 1995 in the number of estimated albacore landings with exception of the landings in 1999 where there was a 24% decrease. Compared to the estimated number of landings in 2003, there has been a 38.5% decrease of albacore landings in 2004. this reflect the probable over fishing state of the stock as the CPUE drop by 24.9% and the average size by 3.4 %.

Calculation: The estimated total annual landings of albacore tuna is listed for the longline and trolling fishing methods. The All methods landings may be greater than the sum of longline and trolling landings when albacore are caught by other methods. The average and standard deviation is calculated from 1988 onward.

Year	Pounds
1982	0
1983	0
1984	0
1985	0
1986	0
1987	0
1988	1,875
1989	244
1990	0
1991	1,730
1992	0
1993	35
1994	1,572
1995	58,446
1996	189,210
1997	680,806
1998	983,017
1999	744,980
2000	1,380,060
2001	7,125,536
2002	13,118,759
2003	8,821,199
2004	5,428,714
Average	**2,266,834**
Std. Dev.	**3,809,686**

Figure 10. American Samoa annual commercial landings of Tunas and Non Tuna PMUS.



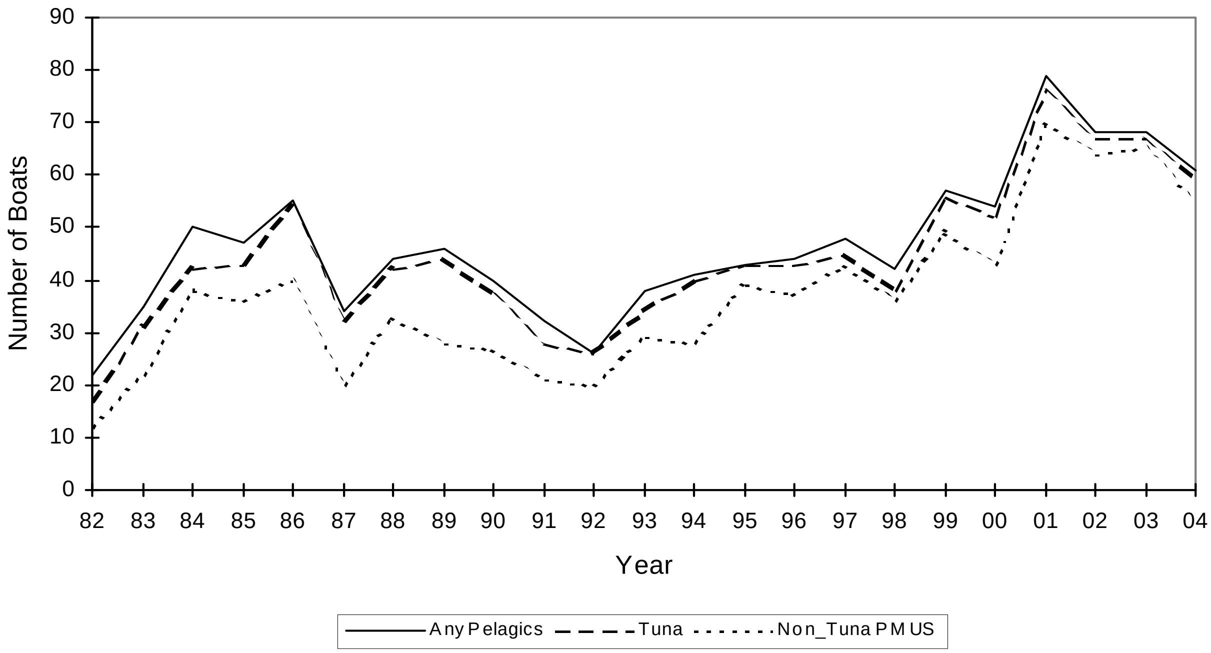
Interpretation: Commercial landings for all pelagic species and tuna significantly varied throughout the 1980s until 1995 where a steady increase in landings began to appear. This was primarily due to a surge in longline effort.

After 2003 when we record a significant decrease of 28.3 % in tuna and an increase of 14.4 % of non-tuna PMUS, we record a 19.6 % decrease in tuna and a 12.4 increase in non tuna PMUS. The proportion of non tuna PMUS in the total catch increased from 3.7 % in 2003 to 5.5 % in 2004. One of the probable explanation is that the low catch in albacore push the fishermen to keep more of the other fish they used to discard before.

Calculation: Estimated commercial landings for Tunas and Non-Tuna PMUS were calculated by summing the commercial landings for the species these categories as defined by Table 2.

	Pounds Landed	
Year	**Tuna**	**Non Tuna PMUS**
1982	22,065	1,515
1983	85,069	4,441
1984	196,100	13,458
1985	99,987	17,515
1986	167,791	14,995
1987	132,316	4,843
1988	172,788	12,110
1989	114,671	8,240
1990	55,420	3,564
1991	57,474	15,236
1992	88,953	10,698
1993	43,525	14,053
1994	186,199	40,708
1995	276,332	53,127
1996	309,147	50,781
1997	789,260	100,024
1998	1,114,702	94,933
1999	949,355	109,960
2000	1,630,410	122,511
2001	7,795,730	154,409
2002	14,978,767	363,014
2003	10,740,154	415,181
2004	8,629,995	466,537
Average	**2,114,618**	**90,950**
Std. Dev.	**4,053,502**	**133,531**

Figure 11. Number of American Samoa boats landing any pelagic species, tunas and non-tuna PMUS.

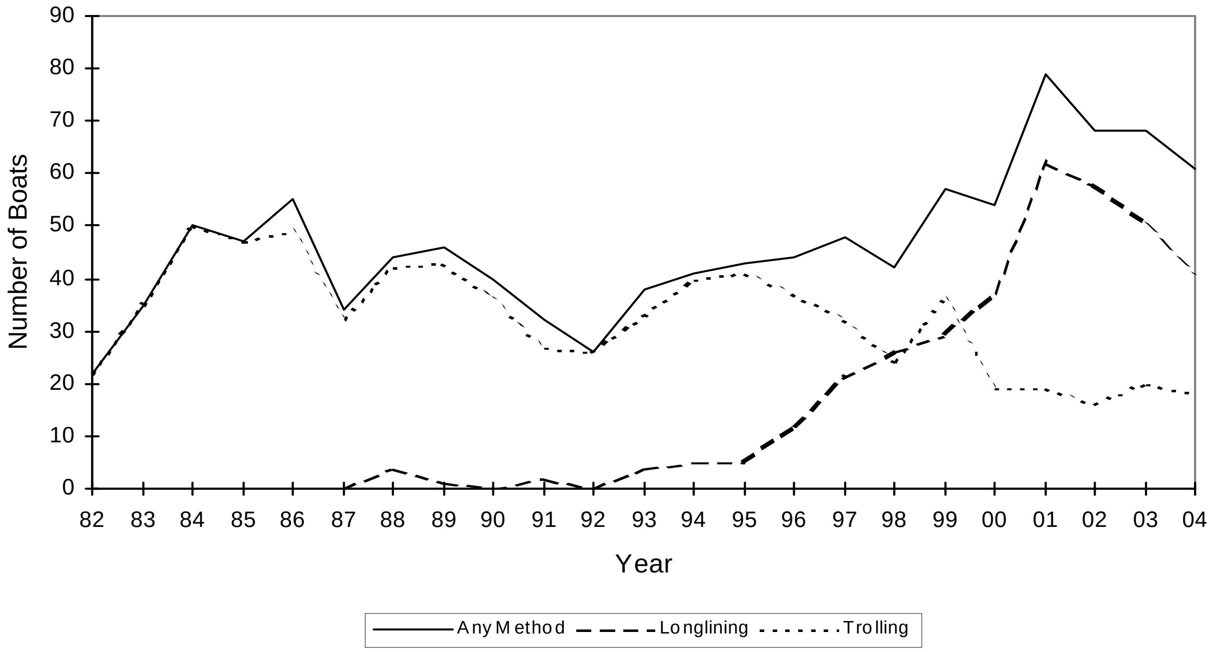


Interpretation: Since 1982, the number of boats that landed any pelagic species, tuna and Non-Tuna PMUS varied. However in 2001, there was a dramatic increase in the number of boats landing pelagic fish in American Samoa. This is the highest number of boats ever recorded participating in the pelagic fishery since 1982. This year, and for the third consecutive year, there has been a decrease in the number of boats landing fish, due to the rarity of the albacore, the decrease in the prices at the canneries and to the increase of the gas prices.

	Number of Boats Landing		
Year	**Any Pelagics**	**Tuna**	**Non-Tuna PMUS**
1982	22	17	12
1983	35	31	22
1984	50	42	38
1985	47	43	36
1986	55	54	40
1987	34	32	20
1988	44	42	33
1989	46	44	28
1990	40	37	27
1991	32	28	21
1992	26	26	20
1993	38	34	29
1994	41	40	28
1995	43	43	39
1996	44	43	37
1997	48	45	43
1998	42	38	36
1999	57	56	49
2000	54	52	43
2001	79	76	70
2002	68	67	64
2003	68	67	65
2004	61	59	55
Average	**47**	**44**	**37**
Std. Dev	**13**	**14**	**15**

Calculation: Prior to 1997, each boat counted in the Any Pelagics column made at least one landing in an offshore creel survey interview of at least one species in Table 2 in the given year. Likewise each boat counted in the other two columns made at least one landing in an offshore creel survey interview of at least one species in the corresponding subgroup of Table 2 in the given year. In 1997 and after the count of non-interviewed boats that made at least one landing of the appropriate species in a longline log was added to the count of interviewed boats from the offshore creel survey.

Figure 12. **Number of American Samoa boats landing any pelagic species by longlining, trolling and all Methods.**



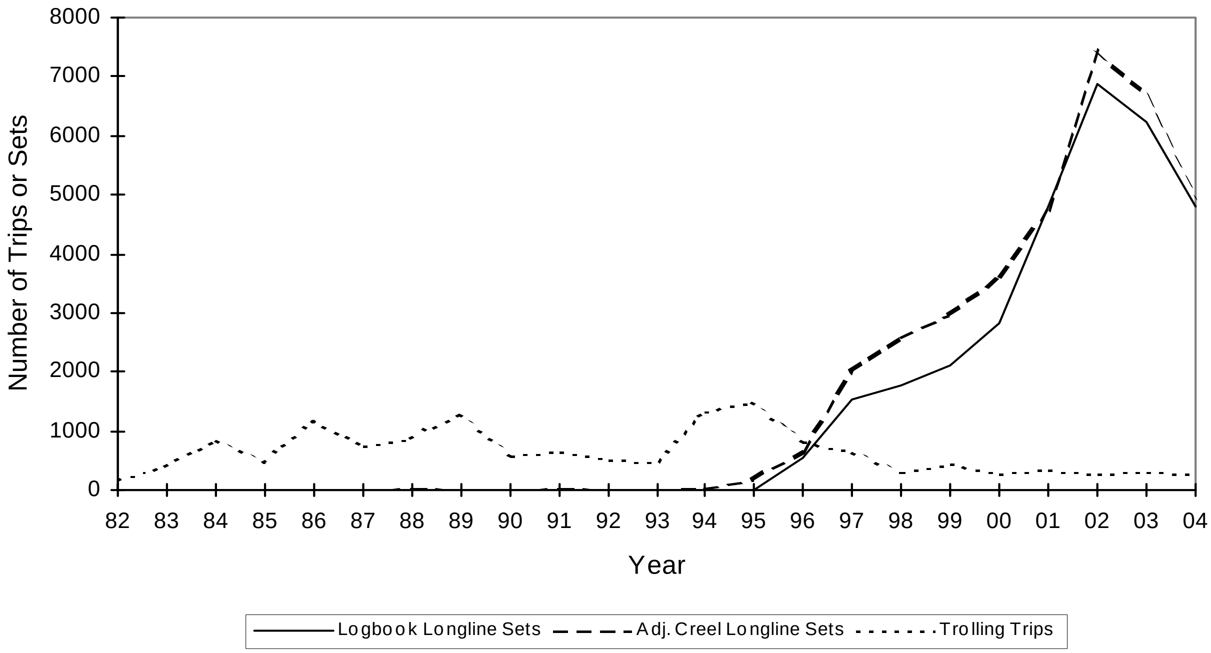
Interpretation: Since the longline fishery was introduced, there has been a continuous increase in the number of boats using this kind of fishing method till 2001. For the last 2 years, a decrease in the number of boats longlining shows a shift in the fishery. More large vessels that make multiple day trips with a large number of hooks are replacing small alias that make daily trips and set less hooks. Conversely, the number of boats fishing commercially by trolling have steadily decreased from 40 in 1994 to only 18 in 2004 due to the development of the longline fishery. The Alia longline fishery is declining and only a few of the boat are actively fishing. The diminution of the trolling activity is probably due to the importante increase in the gas price and the smaller fish they

	Number of Boats Using		
Year	**Any Method**	**Longlining**	**Trolling**
1982	22	0	22
1983	35	0	35
1984	50	0	50
1985	47	0	47
1986	55	0	49
1987	34	0	32
1988	44	4	42
1989	46	1	43
1990	40	0	36
1991	32	2	27
1992	26	0	26
1993	38	4	33
1994	41	5	40
1995	43	5	41
1996	44	12	37
1997	48	21	32
1998	42	26	24
1999	57	29	36
2000	54	37	19
2001	79	62	19
2002	68	58	16
2003	68	50	20
2004	61	41	18
Average	**47**	**21**	**32**
Std. Dev.	**13**	**21**	**10**

catch (average weight from 8.6 in 2003 to 8.1 lbs per fish in 2004)

Calculation: Prior to 1997, each boat counted in the Any Method column made at least one landing in an offshore creel survey interview of at least one species in Table 2 in the given year. Each boat counted in the Longlining and Trolling columns made at least one landing in an offshore creel survey interview of at least one species in Table 2, using the longline or troll or combined troll/bottom fishing methods in the given year. In 1997 and after the count of non-interviewed boats that made at least one landing of the species in Table 2 in a longline log during the given year was added to the count of interviewed boats from the offshore creel survey in the Any Method and Longlining columns. The average and standard deviation for the number of boats using Longlining is calculated from 1988 onward.

Figure 13. Number of American Samoa fishing trips or sets for all pelagic species by method.



Interpretation: Trolling trips varied from 1982 until 1997 when the number of boats decreased to a stable level of around 300 trips a year. Since 1996 and the establishment of the longline logbook system, the longline sets increased continuously until 2002. A first change occurred in the fishery during the first 3 years of this period, with a majority of the boats switching from trolling to longlining. Then the big vessels started to enter the fishery and represent a more and more important part of the sets deployed. This year is the second year that the number of sets have decreased (22.8%), but it's the first year that the total number of hooks has decrease (18%). Still due to the reduction of the Alia fleet, the number of hooks per set still increase (+6.2%).

		Longline Sets	
Year	**Troll Trips**	**Logbook**	**Creel (Adj)**
1982	177	0	0
1983	406	0	0
1984	853	0	0
1985	464	0	0
1986	1,208	0	0
1987	752	0	0
1988	875	0	31
1989	1,277	0	3
1990	587	0	0
1991	634	0	21
1992	506	0	0
1993	464	0	17
1994	1,330	0	19
1995	1,504	0	184
1996	834	528	650
1997	645	1,529	2,009
1998	316	1,754	2,582
1999	428	2,108	2,978
2000	285	2,814	3,598
2001	331	4,800	4,722
2002	289	6,872	7,428
2003	307	6,220	6,662
2004	272	4,804	4,930
Average	**641**	**3,492**	**3,951**
Std. Dev.	**373**	**2,117**	**2,071**

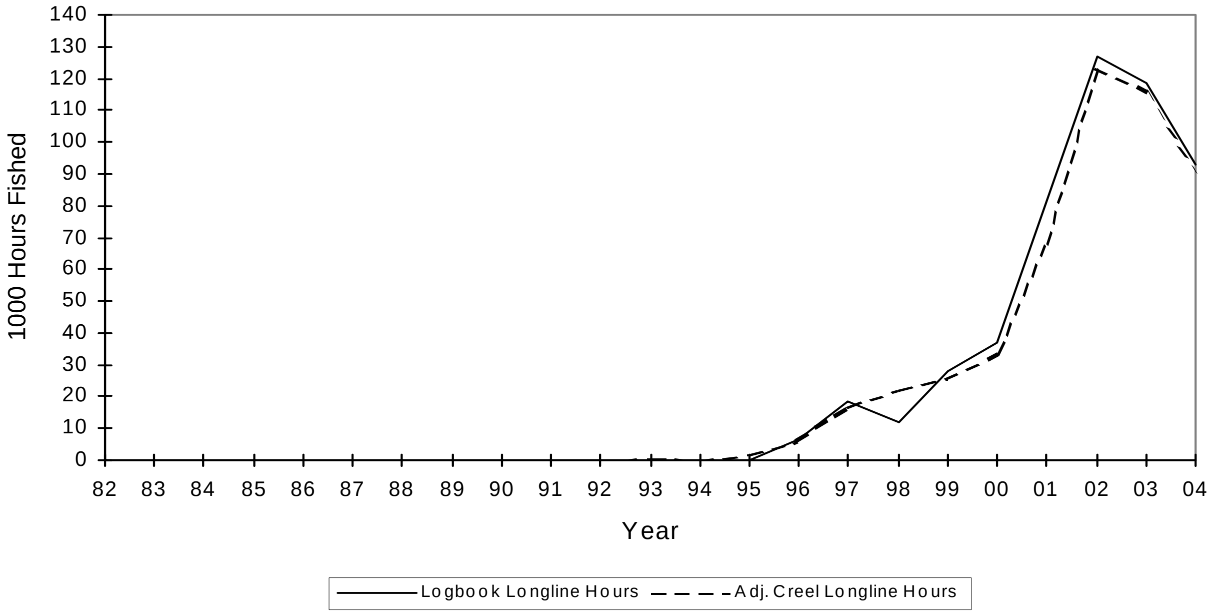
The number of longline sets reported in the Adjusted Creel Survey has always been more than that reported in the Longline Logbook System due to delinquency in turning in longline logs primarily by alias. The delinquency problem was almost eliminated in 2001 resulting in the logbook number of sets actually being more than those reported in the Adjusted Creel Survey Data.

Calculation The number of Troll Trips is calculated by first subtracting the total longline pounds of Table 1 from the total pounds to get an estimate of the number of pounds caught by trolling and other fishing methods. This value is divided by the catch per hour for pure troll trips, from the offshore creel survey system expansion, to get the number of trolling hours. The number of trolling hours is then divided by the hours per trip for a purely trolling trip from the offshore creel survey system expansion to get the number of troll trips.

The number of longline sets using logbook data is obtained by counting all of the sets entered in the longline logbook system for the given year for interviewed and non-interviewed boats.

Prior to 1997, the number of longline sets using creel survey data is the expanded number of longline fishing trips from the offshore creel survey system. In 1997 and after this number is the expanded number of longline fishing trips from the offshore creel survey system for interviewed vessels plus the count of all of the sets entered in the longline logbook system for non-interviewed vessels. The average and standard deviation for Longline Sets from logbook data and creel data is calculated from 1996 onward for comparison.

Figure 14. Number of American Samoa hours fished for all pelagic species by longlining.



Interpretation: The combination of longline hours from Longline Logbooks and the Longline Creel Survey significantly shows a continuous increase in hours fished every year since the Longline Fishery was initially introduced, until 2002. In 2004, according to the longline creel survey, there was a 21.6% decrease in the number of hours spent fishing and according to the Logbook monitoring system, this decrease was 21.4%. This indicates that there is a decrease in the amount of effort put into the fishery.

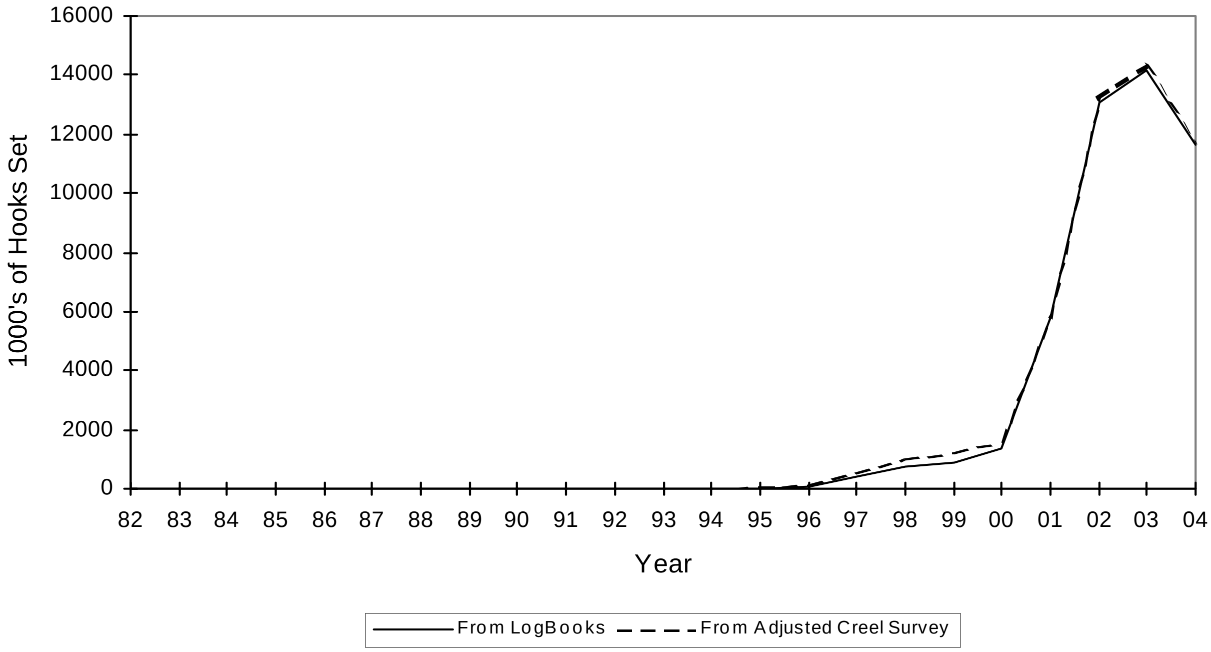
The hours fished reported by the Longline Logbook system in the early years before the large boats dominated the fishery is usually larger than that reported by the adjusted Creel Survey System because the logbook hours are calculated from actual beginning of set times and end of haul times while many trips in the offshore creel survey system are entered as “8 hours”

	Hours Fished	
Year	Longline Logbook	Longline Creel (Adj.)
1982	0	0
1983	0	0
1984	0	0
1985	0	0
1986	0	0
1987	0	0
1988	0	198
1989	0	17
1990	0	0
1991	0	164
1992	0	0
1993	0	299
1994	0	156
1995	0	1,824
1996	6,403	5,877
1997	18,760	16,754
1998	11,981	21,953
1999	27,773	25,865
2000	36,973	33,288
2001	81,264	67,707
2002	127,023	123,088
2003	118,417	115,820
2004	93,027	90,768
Average	**57,958**	**55,680**
Std. Dev.	**44,545**	**42,243**

Calculation: The number of longline trip-hours using logbook data is obtained by summing the duration all of the sets entered in the longline logbook system for the given year for interviewed and non-interviewed boats. The duration of a set is defined as from beginning of set time to the end of haul time.

Prior to 1997, the number of longline trip-hours using creel survey data is the expanded number of longline fishing trip-hours from the offshore creel survey system. In 1997 and after this number is the expanded number of longline fishing trip-hours from the offshore creel survey system for interviewed vessels plus the sum of the duration of the sets entered in the longline logbook system for non-interviewed vessels. The average and standard deviation for Hours Fished from logbook data and creel data is calculated from 1996 onward for comparison.

Figure 15. **Thousands of American Samoa longline hooks set from logbook and creel survey data.**



Interpretation: Since the Longline Fishery began in 1995, the number hooks set has been increasing at a steady rate and became an explosion in 2000 with 10 times increase by 2002. According to the Logbook data, the number of hooks decreased by 18% and according to the creel survey by 18.3%. This is the first year we have a decline in the effort. It reflects an economic problem of the fishery with lower price ever for tuna at the cannery, the high price of the gas and of course, the low catch of albacore. Several large longliner have left the American fishing grounds late in 2003 and in 2004 releasing the fishing pressure in the AS EEZ.

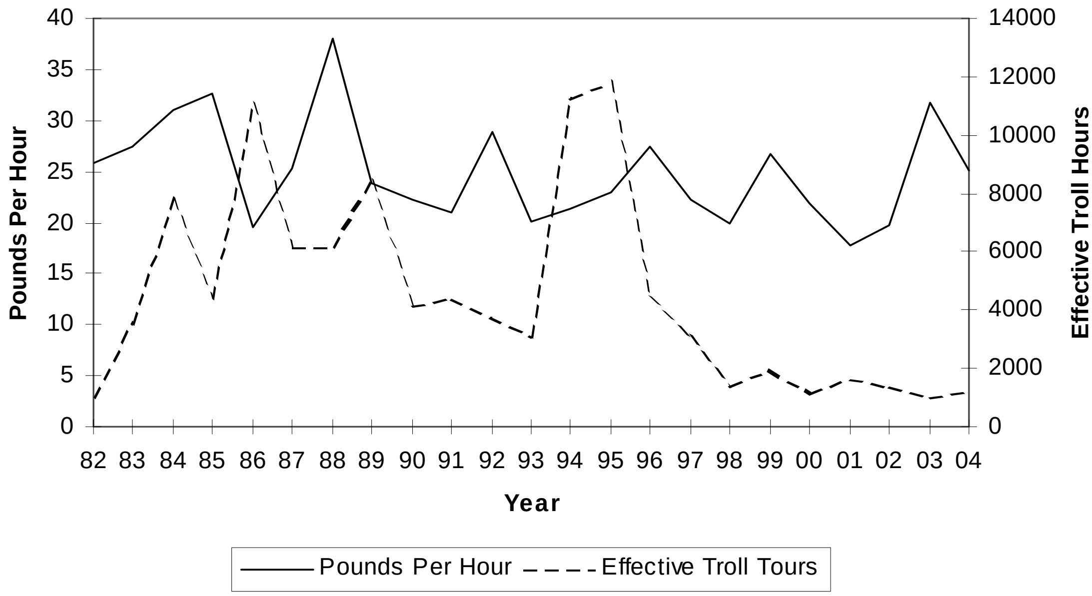
Calculation: The number of longline hooks using logbook data is obtained by summing the number of hooks for sets entered in the longline logbook system for the given year for interviewed and non-interviewed boats and dividing by 1000.

Prior to 1997, the number of longline hooks using creel survey data is the expanded number of longline hooks from the offshore creel survey system. In 1997 and

	1000's of Hooks From	
Year	**Logbook Data**	**Creel (Adjusted)**
1982	0	0
1983	0	0
1984	0	0
1985	0	0
1986	0	0
1987	0	0
1988	0	1
1989	0	0
1990	0	0
1991	0	0
1992	0	0
1993	0	2
1994	0	0
1995	0	45
1996	99	157
1997	420	512
1998	771	1,042
1999	914	1,229
2000	1,332	1,567
2001	5,794	5,806
2002	13,099	13,241
2003	14,168	14,292
2004	11,616	11,678
Average	**5,357**	**5,503**
Std. Dev.	**5,636**	**5,603**

after this number is the expanded number of longline fishing hooks from the offshore creel survey system for interviewed vessels plus the sum of the number of hooks for the sets entered in the longline logbook system for non-interviewed vessels. The average and standard deviation for 1000's of Hooks from logbook data and creel data is calculated from 1996 onward for comparison.

Figure 16. **American Samoa pelagic catch per hour of trolling and number of trolling hours.**



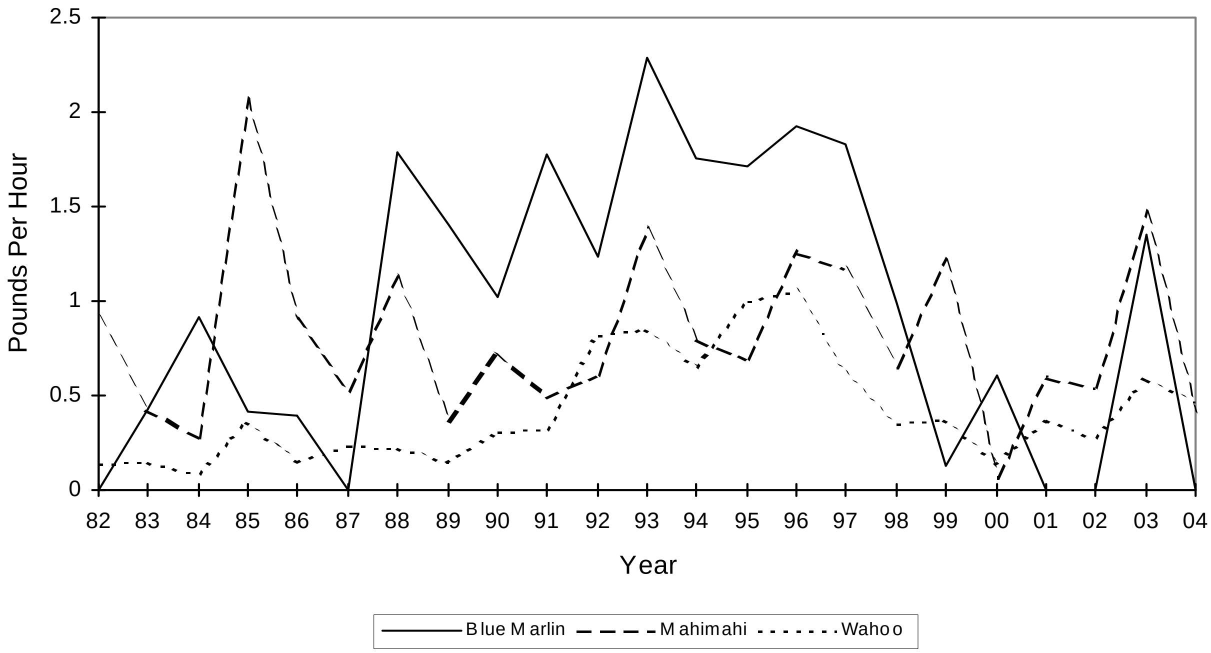
Interpretation: The overall catch per hour for pelagic species by trolling is primarily the combined skipjack and yellowfin CPUE shown in Figure 18. These two species constituted 90.4% of the total pelagic troll catch this year.
The decline in trolling hours in 1996 was mainly due to the popularity of the longline fishery since it was introduced. However, 1999 was an exceptional year because of the number of new boats that entered the pelagic fishery and were involved in trolling before obtaining their longline permits. This year, the hours spent in trolling have increased a little since 2003. At the same time the number of boats has decreased by 10 % from last year. Compared to last year, the CPUE has decreased by 21.2 %. A part of the explanation come from a very bad year for mahi mahi (catch decreased by 67.6 %), blue marlin (no blue marlin caught recorded this year) and little decrease in Yellow fin catch.

Year	CPUE	Hours
1982	25.91	1,019
1983	27.41	3,513
1984	30.97	7,785
1985	32.59	4,394
1986	19.49	11,030
1987	25.34	6,182
1988	38.01	6,126
1989	23.87	8,425
1990	22.16	4,136
1991	20.93	4,407
1992	28.90	3,748
1993	20.17	3,065
1994	21.37	11,211
1995	23.01	11,781
1996	27.36	4,365
1997	22.29	3,089
1998	19.93	1,405
1999	26.81	1,977
2000	21.94	1,122
2001	17.72	1,661
2002	19.79	1,359
2003	31.78	1,035
2004	25.03	1,197
Average	**24.90**	**4,523**
Std. Dev.	**4.93**	**3,352**

Calculation: For purely trolling trips where the number of hours was recorded, the total catch was divided by the total number of trolling hours to obtain CPUE.

The number of effective Trolling Trip_Hours is calculated by first subtracting the total longline pounds of Table 1 from the total pounds to get an estimate of the number of pounds caught by trolling and other fishing methods. This value is divided by the catch per hour for pure troll trips, from the offshore creel survey system expansion, to get the number of trolling trip-hours

2004
Figure 17. American Samoa trolling catch rates for Blue Marlin, Mahimahi, and Wahoo.



Interpretation: Blue marlin CPUE is variable but generally increased over time until about 1997 when it began to decline. It is not known if this decrease has any relationship to the huge growth in the longline fishery during this time span.

Mahimahi CPUE is very erratic through the years. In 2003 it increased to it's highest level since 1985, with a increase of 172% from last year, than decreased by 71.4% in 2004.

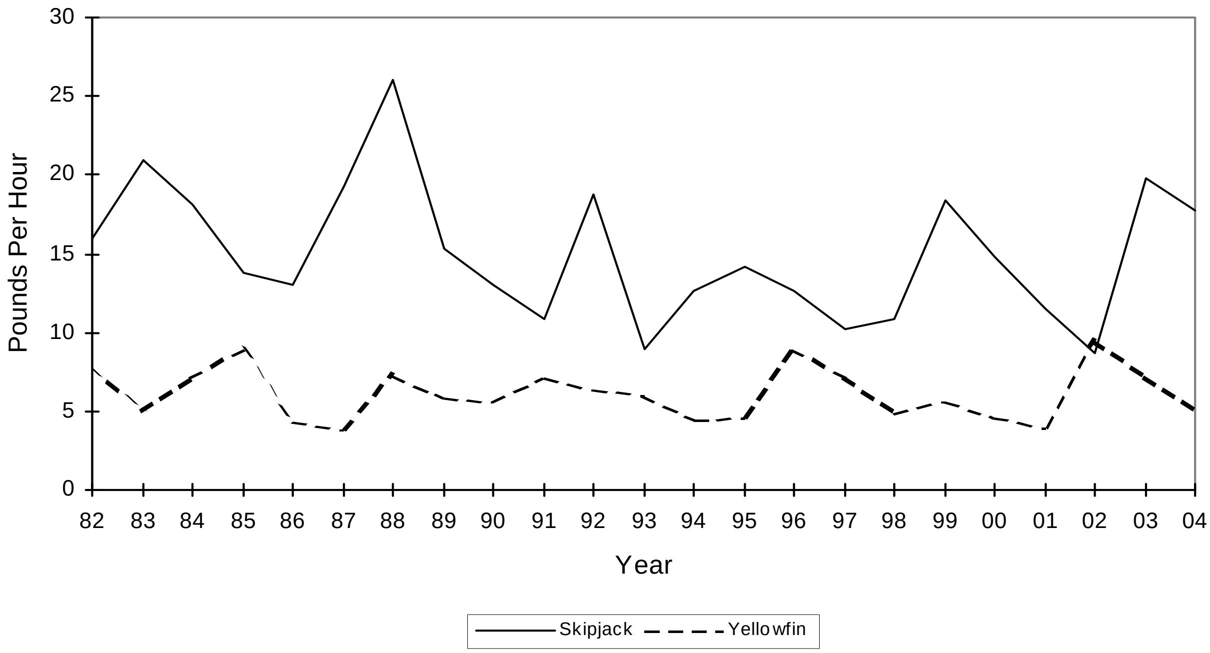
Since 1996 wahoo catch rates have dropped similar to blue marlin rates. This may be related to the increase in longline activity around the island. This year Wahoo CPUE has indeed decreased by 19% after the 107% increase in 2003.

	Pounds Caught Per Trolling Hour		
Year	**Blue Marlin**	**Mahimahi**	**Wahoo**
1982	0.00	0.92	0.14
1983	0.43	0.43	0.15
1984	0.91	0.28	0.09
1985	0.41	2.06	0.36
1986	0.39	0.90	0.15
1987	0.00	0.52	0.23
1988	1.79	1.13	0.22
1989	1.40	0.36	0.15
1990	1.02	0.72	0.31
1991	1.78	0.49	0.32
1992	1.23	0.61	0.82
1993	2.29	1.38	0.85
1994	1.76	0.80	0.65
1995	1.71	0.69	1.00
1996	1.93	1.26	1.05
1997	1.83	1.17	0.62
1998	0.99	0.65	0.35
1999	0.13	1.21	0.37
2000	0.61	0.06	0.14
2001	0.00	0.60	0.37
2002	0.00	0.54	0.28
2003	1.35	1.47	0.58
2004	0.00	0.42	0.47
Average	**0.95**	**0.81**	**0.42**
Std. Dev.	**0.75**	**0.45**	**0.28**

We can observe that the trends in CPUE are similar for mahi mahi and wahoo if we exclude 1983, 87, 88 and 95. However it is difficult to interpret the small amount of data we have this year.

Calculation: The values for each of the three species is obtained by dividing the Troll Pounds for each species in Table 1 by the expanded number of trip-hours for purely trolling trips from the offshore creel survey system.

Figure 18. American Samoa trolling catch rates for Skipjack and Yellowfin Tuna

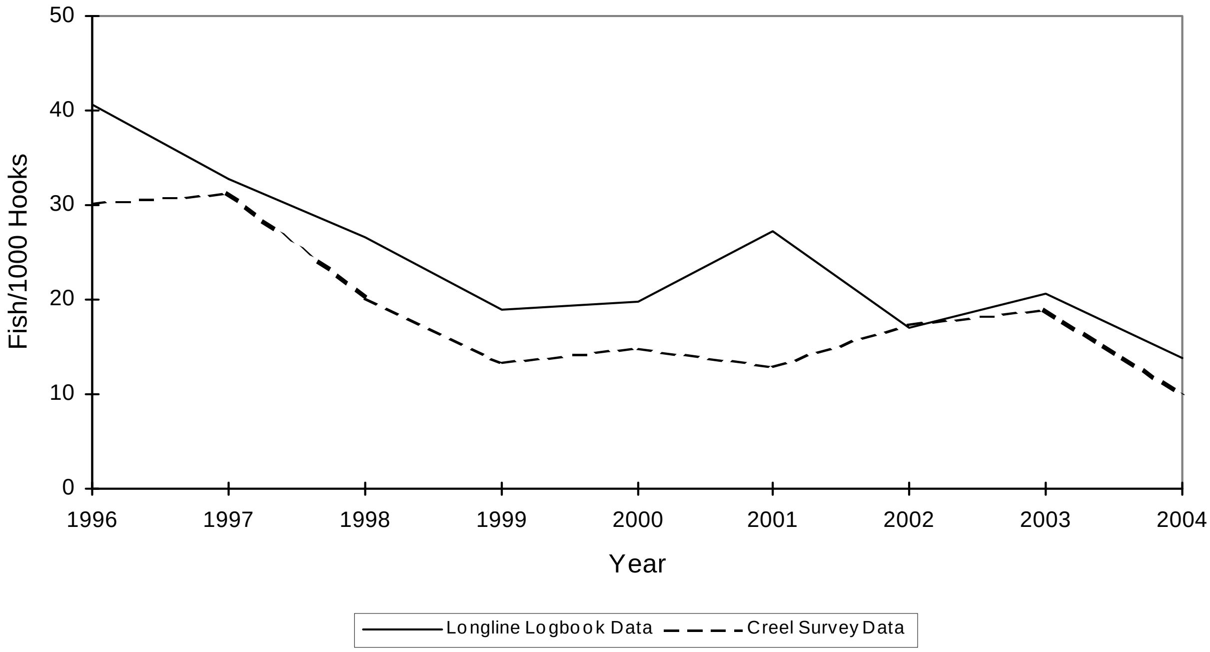


Interpretation: The values for Skipjack and Yellowfin CPUE has been variable through the years. During 1999, a couple of boats did some extensive trolling before obtaining their longline permits to longline. This however was a contributing factor to the increase in the number of trolling activity at this time. CPUE for Skipjack decreased by 10.1% this year from 2003 whereas the CPUE for Yellowfin experienced a 30.3% decrease this year.

Calculation: The values for each of the two species is obtained by dividing the Troll Pounds for each species in Table 1 by the expanded number of trip-hours for purely trolling trips from the offshore creel survey system.

	Pounds Caught Per Trolling Hour	
Year	**Skipjack**	**Yellowfin**
1982	15.90	7.80
1983	21.00	5.04
1984	18.10	7.20
1985	13.80	8.90
1986	13.00	4.35
1987	19.30	3.88
1988	26.00	7.30
1989	15.30	5.91
1990	13.00	5.59
1991	10.80	7.16
1992	18.80	6.34
1993	8.94	6.03
1994	12.70	4.50
1995	14.20	4.56
1996	12.70	8.99
1997	10.20	7.21
1998	10.80	4.89
1999	18.40	5.62
2000	14.80	4.64
2001	11.50	4.01
2002	8.67	9.49
2003	19.80	7.10
2004	17.80	4.95
Average	**15.02**	**6.15**
Std. Dev.	**4.23**	**1.62**

Figure 19. American Samoa catch per 1000 hooks of Albacore for the Alia longline fishery, Comparing Logbook and Creel Survey Data



Interpretation The longline fishery in American Samoa is a newly developed fishery that emerged in 1995. Both monitoring systems (Longline Logbook and Creel Survey) indicate similar fluctuations of the catch rates of albacore through this fishery since it first started. Alias are the most commonly used boats by the local fishermen in the fishery and albacore the primary target species. The value of albacore catch rate through the years since 1996 have been declining except for the peak in 2001. The dip in catch rate in 2001 in the Creel Survey data was due to poor data taking in the Creel Survey. During this period many longline interviews were missed and those that were done didn't weigh, measure and report on all of the albacore caught. In 2004, the Longline Logbook indicates a 33% decrease whereas the Offshore Creel Survey shows a decrease of 47.9%. This decline seems to be the result of a global overfishing those last years. Anyway, with the industrial tuna fishery explosion these last 4 years, the rarity of the fish and it's low price, and the high price of the gas, we are witnessing the collapse of the Alia longline fishery.

The global decrease of CPUE for the Alia longline fishery probably reflects their interaction with the large vessel activity around the island. The large vessels still catch 72% as much fish inside the 50 nm restricted areas as the alias do, even if these catch inside the 50nm have decreased by 26.7 %.

In 2004 the CPUE calculated by the two methods are quite different. The CPUE calculated by the creel survey data is lower by 28 % than by the logbook method. The difference between these two methods can be partially explained by considering different factors. Same big Alias have started to fish for multiples days and have reported their catch in only one log, increasing the CPUE. Also, the catches of multiple sets in one trip are often partially estimated as all the fish are stocked together in big coolers.

Calculation: These values compare the CPUE's of only the alias. For the longline logbook data, the total number of kept fish of each species is divided by the sum of the hooks in the sets of alias or surveyed vessels over the given year used to catch them. For the creel survey data the expanded total landings for each species given in Table 1 is divided by the pounds/fish value obtained by averaging creel survey data over the year to find the number of pieces of each species. The number of pieces for each species caught during the year is divided by the expanded number of hooks for the given year.

Table 6A. American Samoa 1996-1999 catch per 1000 hooks by species for the alia longline fishery comparing logbook and creel survey Data

	Number of Fish Per 1000 Hooks							
	1996		1997		1998		1999	
Species	**Log**	**Creel**	**Log**	**Creel**	**Log**	**Creel**	**Log**	**Creel**
Skipjack Tuna	0.06	0.29	1.15	0.60	3.71	4.01	4.97	4.77
Albacore	40.60	30.26	32.77	31.20	26.61	20.23	18.83	13.44
Yellowfin Tuna	6.50	4.32	2.73	2.48	2.18	2.27	6.73	4.49
BigeyeTuna	1.33	1.06	0.30	0.14	0.27	0.11	0.68	0.20
Tunas					0.01			
Mahimahi	2.29	1.31	2.24	2.84	1.70	1.83	2.24	1.76
Black marlin			0.09	0.02			0.18	0.03
Blue marlin	0.93	0.90	0.65	0.61	0.55	0.49	0.50	0.38
Striped Marlin			0.02		0.03		0.02	
Wahoo	0.83	0.52	0.90	0.85	2.20	2.03	2.03	1.57
All Pelagic Sharks	0.28	0.37	0.12	0.17	0.12	0.08	0.06	0.03
Swordfish	0.03	0.01	0.06	0.01	0.03	0.02	0.03	0.01
Sailfish	0.18	0.23	0.17	0.21	0.05	0.14	0.01	0.13
Spearfish					0.03			0.01
Moonfish			0.10	0.15	0.07	0.07	0.07	0.13
Oilfish					0.01	0.04	0.01	0.01
Pomfret							0.01	
Barracudas		0.57		0.87		0.42		0.19
Rainbow runner				0.01		0.01		0.02
Dogtooth tuna						0.00		
Other Pelagic Fish					0.22	0.01	0.25	

Table 6B. **American Samoa 2000-2004 catch per 1000 hooks by species for the alia longline fishery, comparing logbook and creel survey data.**

	Number of Fish Per 1000 Hooks									
	2000		2001		2002		2003		2004	
Species	**Log**	**Creel**	**Log**	**Creel**	**Log**	**Creel**	**Log**	**Creel**	**Log**	**Creel**
Skipjack Tuna	2.02	1.95	3.01	3.35	5.94	5.44	7.31	3.92	2.97	2.90
Albacore	19.75	14.81	27.23	12.94	17.08	17.55	20.55	18.93	13.74	9.87
Yellowfin Tuna	6.22	3.25	3.27	4.19	7.04	10.65	8.25	6.98	8.79	7.54
BigeyeTuna	0.40	0.22	0.61	0.35	0.58	0.48	1.17	0.46	0.82	0.56
Tunas							0.02		0.01	
Mahimahi	1.71	1.76	3.35	4.46	3.99	2.97	4.47	3.16	2.12	1.43
Black marlin	0.11		0.07	0.03		0.07		0.13		0.04
Blue marlin	0.46	0.47	0.38	0.26	0.23	0.35	0.26	0.13	0.11	0.17
Striped Marlin	0.06		0.03		0.05		0.02		0.11	
Wahoo	1.15	0.90	1.43	1.44	2.64	2.37	2.99	2.63	3.06	2.65
All Pelagic Sharks	0.01	0.04	0.01	0.02	0.01	0.02	0.03	0.01	0.01	0.01
Swordfish	0.02		0.10	0.02	0.11	0.02	0.08	0.09	0.10	0.09
Sailfish	0.03	0.06	0.04	0.13	0.05	0.17	0.08	0.19	0.04	0.12
Spearfish	0.01				0.02				0.01	0.02
Moonfish	0.07	0.20	0.10	0.07	0.08	0.05	0.10	0.11	0.09	0.10
Oilfish			0.03	0.10	0.02		0.04	0.04	0.01	0.02
Pomfret	0.02	0.04	0.02		0.02	0.11			0.04	0.19
Barracudas		0.30	0.02	0.14		0.26	0.02	0.47		0.48
Rainbow runner						0.03				0.15
Dogtooth tuna				0.02		0.02				0.01
Other Pelagic Fish			0.03				0.03			

Table 7A. American Samoa catch/1000 Hooks
for the three sizes of longline vessels for 2000 and 2001

	2000		2001		
	Alias	Mono-	Alias	Monohull	
Species		hull		< 50'	> 50'
Skipjack Tuna	2.02	1.70	3.11	1.74	2.21
Albacore	19.79	28.08	27.26	28.34	33.83
Yellowfin Tuna	6.23	3.07	3.31	1.39	1.41
BigeyeTuna	0.40	0.97	0.63	0.47	1.04
TUNAS SUBTOTALS	28.44	33.82	34.31	31.94	38.49
Mahimahi	1.71	0.36	3.36	0.60	0.50
Black marlin	0.11	0.10	0.07	0.00	0.02
Blue marlin	0.47	0.23	0.39	0.42	0.21
Striped Marlin	0.06	0.32	0.03	0.02	0.08
Wahoo	1.15	1.06	1.45	0.42	0.67
All Pelagic Sharks	0.01	0.70	0.04	1.18	0.63
Swordfish	0.02	0.01	0.10	0.04	0.03
Sailfish	0.03	0.04	0.05	0.02	0.03
Spearfish	0.01	0.09	0.00	0.02	0.04
Moonfish	0.07	0.15	0.10	0.10	0.08
Oilfish	0.00	0.12	0.03	0.14	0.22
Pomfret	0.02	0.12	0.02	0.07	0.09
NON-TUNA PMUS SUBTOTALS	3.66	3.31	5.64	3.03	2.60
Barracudas	0.00	0.00	0.02	0.01	0.03
Rainbow runner	0.00	0.00	0.00	0.00	0.00
Other Pelagic Fish	0.00	0.00	0.03	0.00	0.05
OTHER PELAGICS SUBTOTALS	0.00	0.00	0.05	0.01	0.07
TOTAL PELAGICS	**32.11**	**37.13**	**40.00**	**34.98**	**41.17**

Table 7B. American Samoa catch/1000 Hooks
for the three sizes of longline vessels for 2002 and 2003

	2002			2003		
	Alias	**Monohull**		**Alias**	**Monohull**	
Species		**< 50'**	**> 50'**		**< 50'**	**> 50'**
Skipjack Tuna	5.94	2.13	5.11	7.31	1.38	2.92
Albacore	17.08	23.18	25.97	20.55	15.51	16.37
Yellowfin Tuna	7.04	0.99	1.32	8.25	1.67	2.05
BigeyeTuna	0.58	0.44	0.95	1.17	1.15	1.14
Tunas	0.00	0.02	0.00	0.02	0.01	0.01
TUNAS SUBTOTALS	30.64	26.76	33.35	37.30	19.71	22.48
Mahimahi	3.99	0.91	0.56	4.47	0.16	0.38
Blue marlin	0.23	0.21	0.29	0.26	0.14	0.20
Striped Marlin	0.05	0.00	0.03	0.02	0.02	0.02
Wahoo	2.64	1.04	1.01	2.99	0.65	1.12
Sharks	0.02	1.31	0.79	0.03	1.11	0.77
Swordfish	0.11	0.05	0.04	0.08	0.01	0.03
Sailfish	0.05	0.01	0.03	0.08	0.03	0.04
Spearfish	0.02	0.02	0.02	0.00	0.00	0.03
Moonfish	0.08	0.07	0.07	0.10	0.07	0.07
Oilfish	0.02	0.26	0.52	0.04	0.23	0.54
Pomfret	0.02	0.03	0.09	0.00	0.07	0.08
NON-TUNA PMUS SUBTOTALS	7.23	3.90	3.45	8.06	2.48	3.28
Barracudas	0.00	0.00	0.09	0.02	0.01	0.03
Other Pelagic Fish	0.00	0.05	0.27	0.03	0.03	0.21
OTHER PELAGICS SUBTOTALS	0.01	0.06	0.36	0.05	0.03	0.24
TOTAL PELAGICS	**37.88**	**30.72**	**37.17**	**45.42**	**22.23**	**26.00**

Table 7C. American Samoa catch/1000 Hooks for the three sizes of longline vessels for 2004

	2004		
	Alias	**Monohull**	
Species		**< 50'**	**> 50'**
Skipjack Tuna	6.01	1.48	4.65
Albacore	17.36	11.97	14.26
Yellowfin Tuna	8.03	1.69	3.82
BigeyeTuna	0.71	0.48	1.30
Tunas	0.02	0.00	0.00
TUNAS SUBTOTALS	32.13	15.61	24.03
Mahimahi	1.12	0.09	0.14
Blue marlin	0.17	0.05	0.20
Striped Marlin	0.09	0.01	0.01
Wahoo	1.57	0.62	1.28
Swordfish	0.09	0.01	0.03
Sailfish	0.02	0.09	0.08
Spearfish	0.02	0.00	0.10
Moonfish	0.03	0.03	0.07
Oilfish	0.02	0.07	0.70
Pomfret	0.09	0.04	0.13
NON-TUNA PMUS SUBTOTALS	3.21	1.00	2.74
TOTAL PELAGICS	**35.34**	**16.62**	**26.77**

Interpretation: Since the development of the longline fishery in 1995, a growing number of boats with a range of different sizes entered the fishery. These boats include alias, averaging around 28 to 30 feet, monohull less than 50 feet, and monohull greater than 50 feet in length. Table 7 has been included in this report to better represent the catch per 1000 hooks for each type of longline vessel. Additionally, total catch rates for pelagic species dropped this year for the Alia and monohulls <50ft compared to rates in 2002 and 2003 while the catch rates for monohulls >50ft increased a little (mostly due to the good catch rate for the Skipjack). When compared to the albacore catch rate this shows that the fishery in American Samoa is becoming more diverse and not just all albacore catch.

Calculation: These values are sums of the Longline Logbook catch (number of fish kept + released + finned) for the three types of longline vessels in Samoa divided by the total number of hooks set by each type of vessel. In 2000 there was only one monohull < 50' so its catch was combined with the rest of the monohulls. All species of sharks entered in the Longline Logs are combined in the Other Sharks species. Rays and Sunfish are included in the Other Pelagic Fish species.

Table 8. American Samoa estimated average weight per fish by species from the Offshore Creel Survey Interviews and from Cannery Sampling

	Creel Survey Annual Average Pounds per Fish								
Species	**1996**	**1997**	**1998**	**1999**	**2000**	**2001**	**2002**	**2003**	**2004**
Skipjack Tuna	9.6	8.4	12.5	9.7	11.6	14.8	11.1	8.6	8.1
Albacore	39.9	44.0	45.7	42.6	45.1	44.8	45.5	38.6	37.8
Yellowfin Tuna	37.9	44.2	45.9	33.1	38.1	31.3	28.0	17.8	34.7
BigeyeTuna	52.3	82.8	79.2	57.1	61.1	69.2	67.6	37.2	45.3
Tunas									
Mahimahi	26.2	25.6	23.3	22.3	24.8	19.7	19.3	20.3	21.7
Black marlin		148.3		101.9		67.2	31.9	90.0	103.0
Blue marlin	151.8	117.7	119.9	101.9	135.7	70.9	190.4	98.8	62.9
Striped Marlin									
Wahoo	44.3	38.4	26.3	27.3	31.9	29.7	28.2	30.8	28.1
All Pelagic Sharks	112.3	96.8	69.3	38.0	39.5	68.8	68.5	62.4	71.7
Swordfish	150.0	100.0	212.6	12.0		59.4	23.4	117.4	37.7
Sailfish	88.4	70.7	67.0	61.8	39.1	42.0	33.8	57.6	44.9
Spearfish				46.0					46.0
Moonfish		70.3	33.5	57.7	30.9	102.5	78.3	107.1	59.7
Oilfish			12.7	10.0		23.9		11.1	7.8
Pomfret					16.5		8.2		8.2
Barracudas	13.5	14.6	15.3	11.0	13.1	7.6	9.2	8.8	10.4
Rainbow runner		14.0	17.5	6.5			16.1		6.9
Dogtooth tuna			10.0			15.6	40.8		16.2
Other Pelagic Fish			45.3						

	Cannery Sampled Average Lbs. per Fish						
Species	**1998**	**1999**	**2000**	**2001**	**2002**	**2003**	**2004**
Skipjack Tuna				15.7	10.7	9.4	13.6
Albacore	41.0	47.2	40.7	39.8	39.1	37.8	36.5
Yellowfin Tuna				57.0	62.4	44.3	52.1
BigeyeTuna				40.7	46.8	37.4	35.9
Mahimahi				16.2	13.5	20.7	13.0
Black marlin				36.3			
Wahoo				30.6	30.7	30.0	27.4
Sailfish					34.0		
Moonfish				147.6	117.6		
Pomfret				2.2	2.2		
Rainbow runner					9.4		10.8

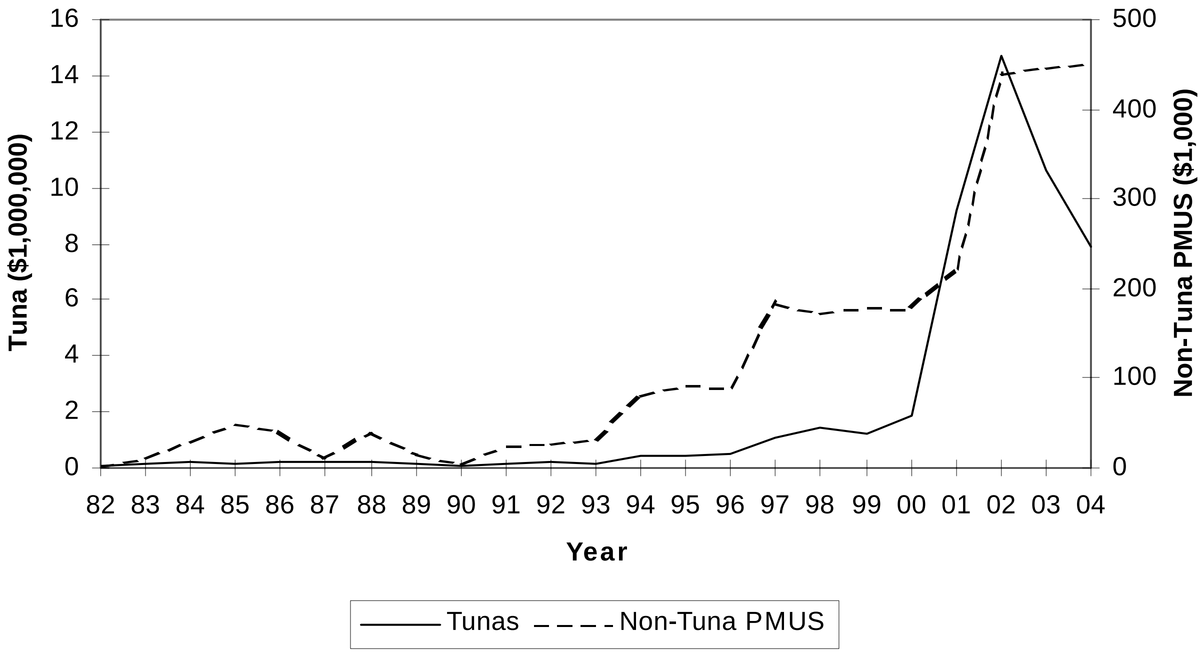
Interpretation : The table for cannery data represents the portion of the catch unloaded by larger vessels fishing further away from Tutuila while the table from the Creel Survey represents fish caught by alias near Tutuila. Like in 2003, we observed this year an important decrease of average lb/fish for the albacore. The values recorded are the lowest ever obtained for the Albacore from both creel survey and cannery data. Regarding the cannery data, the average size has decreased for the big eye, the mahimahi and the wahoo too, while it increased for yellow fin and skipjack tuna. All those values are not confirmed by the creel survey, as the average weight increased for big eye and mahi mahi and decreased for skipjack in the creel survey data.
Some explanation might be found. First, Alia fishermen retain small fish as well as large, while on the large vessels small fish are often discarded. Second, only the Alias troll, and trolling near the surface catches more small fish of some species like yellowfin, than longlining in deeper water.

In 1999 longline boats began landing their catches gilled and gutted to obtain higher prices at the canneries. It is possible that this new method could have an impact on size variation for the longline fishery.

Calculation: The Creel Survey Annual Average Pounds/Fish for each species was calculated from the creel survey interviews by dividing the total pounds of each species sampled during the year by the number of fish of sampled during the year. If the fish were sampled as other than whole (ie Gilled and Gutted) the sampled weight is divided by the appropriate factor (less than 1) to get the whole weight. All weights were measured directly before 2000, but after that most weights were calculated from length measurements. Since these fish are caught by alias operating close to Tutuila this represents fish sizes close to shore.

The Cannery Sampled Annual Average Pounds/Fish for each species was calculated from the length measurements made at the canneries when the fish are unloaded there. The weight of each sampled fish is calculated from the length measurements. These weights are summed over the year for each species and are then divided by the number of fish of that species sampled during the year. Since these fish are caught by larger boats operating away from Tutuila this represents fish sizes further out to sea from Tutuila

Figure 20. American Samoa annual inflation-adjusted revenue in 2003 dollars for Tuna and non-Tuna PMUS.



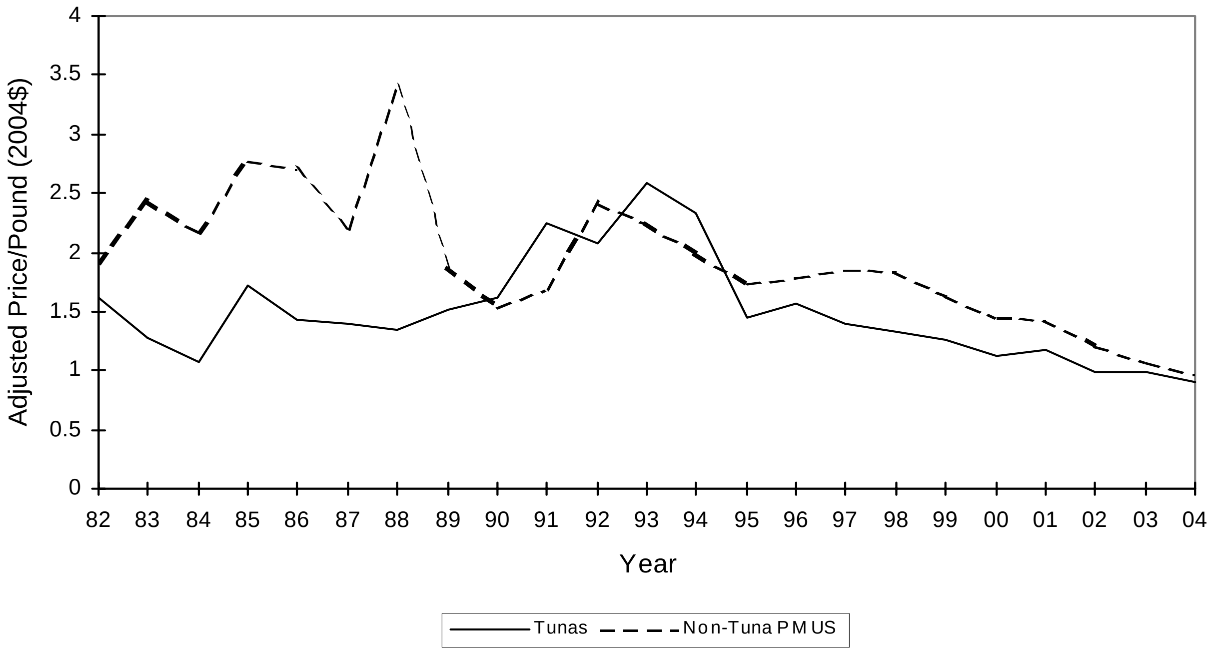
Interpretation: Until 2002, there has been an increase in revenues for commercial landings for all pelagic species since 1995, a period of great influx in the longline fishery, with a significant increase of 305% in 2001. In 2003, there was a decrease of 27.1% of revenues for all landed pelagic species (-27.9% for tuna and +1.2% for others species) and in 2004 a decrease of 24.7% (-25.8% for tuna and +1.4% for others species). The estimated revenue generated from these total landings in 2004 was $8,329,330.00 compared to the $11,068,447.00 in 2003 and the $15,184,912.00 in 2002. From the early 1980's to 1995, the primary gear type for the fishery was trolling, however from 1995 to the present the dominant form of fishing is longlining.

Calculation: The unadjusted revenues for Tunas and Other PPMUS were calculated by summing the values for the species in these categories as defined by Table 2. The unadjusted revenue for All Pelagics is the sum of the value for the Tuna, Other PPMUS and Miscellaneous categories as defined by Table 2.

The unadjusted revenues from commercial landings for the pelagic species subgroups above were adjusted for inflation by multiplying a given year's revenue by the 2000 consumer price index (CPI) divided by the CPI for that year.

		Revenue ($)			
		Tunas		Non-Tuna PMUS	
Year	**CPI**	**Unadjust**	**Adjusted**	**Unadjust.**	**Adjusted**
1982	100.0	$18,990	$35,606	$1,534	$2,876
1983	100.8	$58,561	$108,982	$5,828	$10,846
1984	102.7	$114,981	$209,840	$15,938	$29,087
1985	103.7	$95,157	$172,043	$26,800	$48,455
1986	107.1	$137,143	$240,137	$23,151	$40,537
1987	111.8	$110,076	$184,598	$6,347	$10,644
1988	115.3	$143,613	$233,658	$25,372	$41,281
1989	120.3	$111,425	$173,824	$9,901	$15,446
1990	129.6	$61,918	$89,719	$3,795	$5,499
1991	135.3	$93,060	$128,981	$18,525	$25,676
1992	140.9	$138,179	$183,778	$19,390	$25,789
1993	141.1	$84,341	$112,089	$23,700	$31,497
1994	143.8	$332,860	$434,050	$62,579	$81,603
1995	147.0	$312,638	$398,614	$71,891	$91,661
1996	152.5	$391,211	$480,799	$73,455	$90,276
1997	156.4	$919,535	$1,103,442	$154,121	$184,945
1998	158.4	$1,240,618	$1,468,892	$146,630	$173,609
1999	159.9	$1,018,884	$1,195,151	$153,750	$180,348
2000	166.7	$1,639,341	$1,845,898	$158,053	$177,968
2001	168.8	$8,235,858	$9,150,038	$199,269	$221,388
2002	169.2	$13,295,392	$14,744,590	$397,045	$440,322
2003	177.5	$10,069,027	$10,622,823	$422,393	$445,624
2004	187.2	$7,877,676	$7,877,676	$451,654	$451,654
Average	**139.0**	**$2,021,760**	**$2,225,879**	**$107,440**	**$122,914**
Std. Dev.	**26.44**	**$3,733,675**	**$4,017,341**	**$136,133**	**$141,284**

Figure 21. American Samoa average inflation-adjusted price per pound of Tunas and Non-Tuna PMUS.



Interpretation: The average inflation-adjusted price per pound varied since 1982 until 1992-1993 when a continuous decrease was seen. This gradual decrease may be due to the lower price that the canneries pay per pound of tuna compared to the price the local stores and restaurants pay. The decreasing percentage of longline catches that make it to the higher revenue local markets after 1993 probably contribute to this decline in prices for tuna.
Additionally, this decline in prices could be due to competition from frozen fish purchased from foreign longline vessels moored in Pago Harbor and from fishes imported from neighboring islands. This year, we observe the lowest price ever obtained per a pound of both tuna and non tuna PMUS. It is

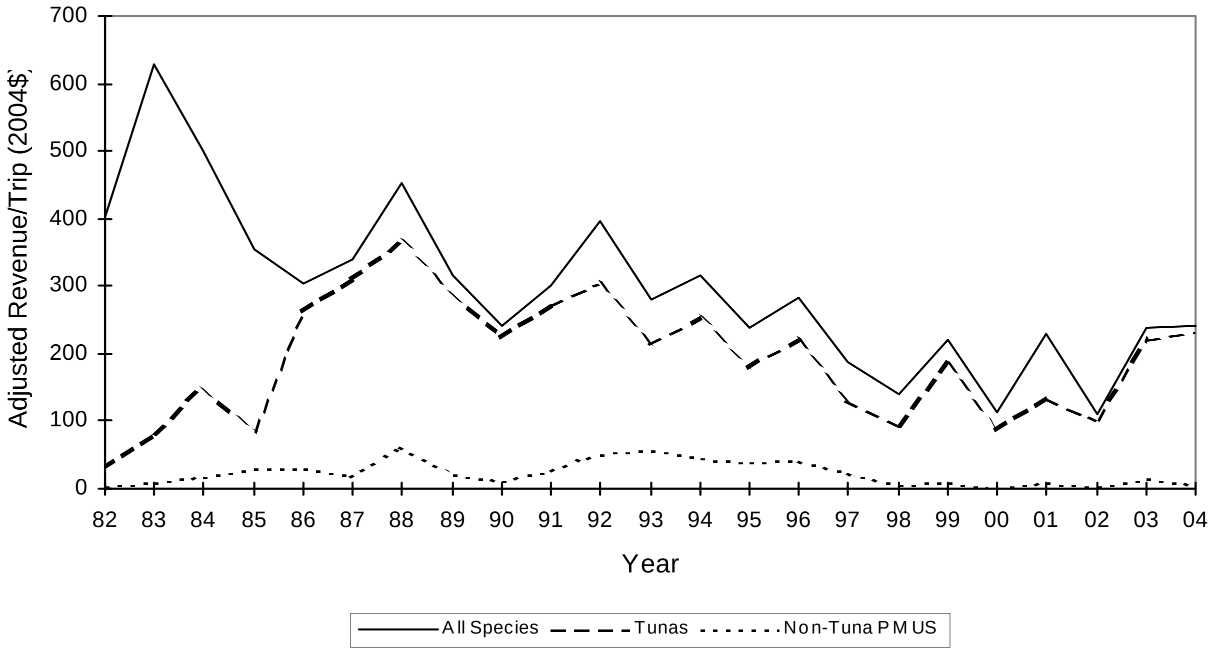
	Average Price/Pound ($)			
	Tunas		Non-Tuna PMUS	
Year	Unadjust.	Adjusted	Unadjust.	Adjusted
1982	$0.86	$1.61	$1.01	$1.90
1983	$0.69	$1.28	$1.31	$2.44
1984	$0.59	$1.07	$1.18	$2.16
1985	$0.95	$1.72	$1.53	$2.77
1986	$0.82	$1.43	$1.54	$2.70
1987	$0.83	$1.40	$1.31	$2.20
1988	$0.83	$1.35	$2.10	$3.41
1989	$0.97	$1.52	$1.20	$1.87
1990	$1.12	$1.62	$1.06	$1.54
1991	$1.62	$2.24	$1.22	$1.69
1992	$1.55	$2.07	$1.81	$2.41
1993	$1.94	$2.58	$1.69	$2.24
1994	$1.79	$2.33	$1.54	$2.00
1995	$1.13	$1.44	$1.35	$1.73
1996	$1.27	$1.56	$1.45	$1.78
1997	$1.17	$1.40	$1.54	$1.85
1998	$1.11	$1.32	$1.54	$1.83
1999	$1.07	$1.26	$1.40	$1.64
2000	$1.01	$1.13	$1.29	$1.45
2001	$1.06	$1.17	$1.29	$1.43
2002	$0.89	$0.98	$1.09	$1.21
2003	$0.94	$0.99	$1.02	$1.07
2004	$0.91	$0.91	$0.97	$0.97
Average	**$1.09**	**$1.49**	**$1.37**	**$1.93**
Std. Dev.	**$0.33**	**$0.43**	**$0.27**	**$0.56**

surprising to observe these low prices as the lack of fish has been strong enough to close the cannery for at least 1 week in summer 2004.

Calculation: The unadjusted price/pound for Tunas and Non-Tuna PMUS were calculated by dividing the sum of the values for the species in these categories as defined by Table 2 by the sum of their commercial landings or pounds.

The unadjusted price/pound values for the pelagic species subgroups above were adjusted for inflation by multiplying the given year's price/pound by the 2000 consumer price index (CPI) divided by the CPI for that year.

Figure 22. American Samoa average inflation-adjusted revenue per trolling trip landing pelagic species



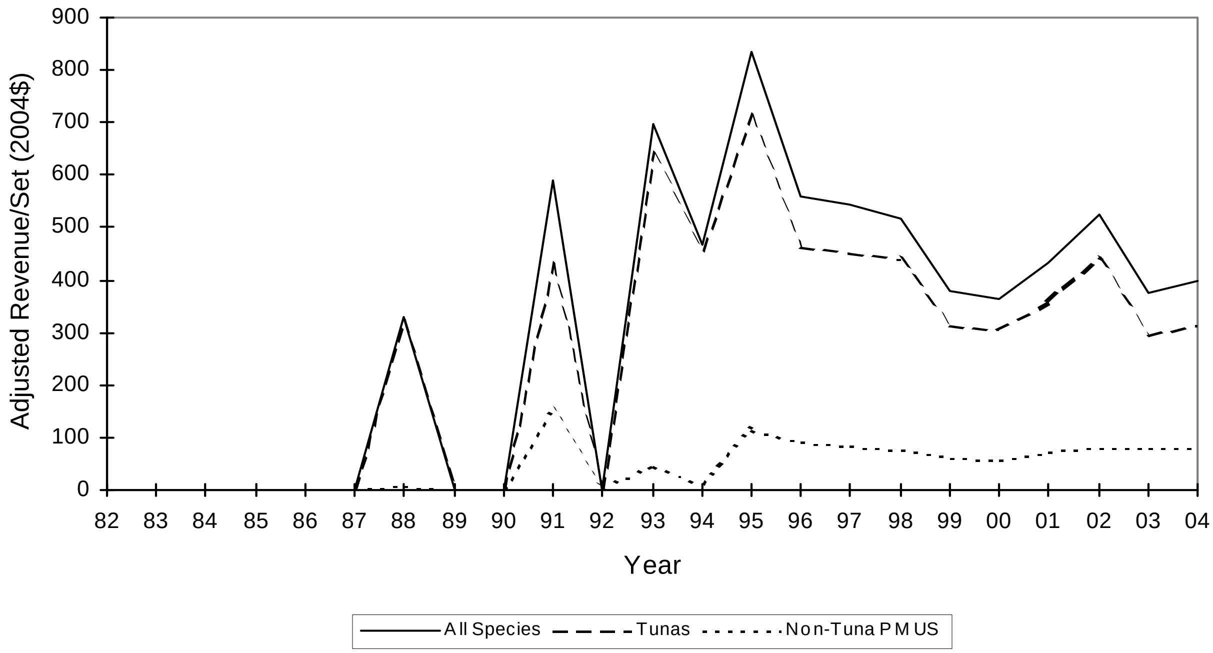
Interpretation: Since 1992 there has been a gradual decrease in revenue per trolling trip to 28% of the 1992 value in 2002 with a 114% jump in 2003 due to a jump in CPUE. This gradual decrease in revenue per trip tracks a decrease in hours per trip from 7.40 in 1992 to 4.4 in 2004 as the troll fishery has become less of a commercial fishery and more of a recreational fishery. This transition to a recreational fishery is also seen in the number of trips that sell their fish commercially declining from 90% in 1992 to 19% in 2003.

Calculation: The purely trolling interviews in the offshore creel survey system landing any of the species listed in Table 1 and selling part or all of their catch are first counted for the given year to get the number of trips. The unadjusted revenue/trip for Tunas and Non-Tuna PMUS is calculated by first summing the value of the species in these pelagic subgroups caught and sold by purely trolling methods and then dividing this by the number of pure trolling trips. The unadjusted revenue/trip for all species is the sum of the value of all species, in Table 1 or not, caught by the purely trolling trips that sold all or part of their catch divided by the number of such trips.

The unadjusted revenue/trip values for the pelagic species subgroups above and for all species were adjusted for inflation by multiplying the given year's revenue/trip by the 2003 consumer price index (CPI) divided by the CPI for that year.

Year	All Species		Tunas		Non-Tuna PMUS	
	Adj.	Unadj.	Adj.	Unadj.	Adj.	Unadj.
1982	$402	$214	$30	$16	$2.4	$1.3
1983	$629	$338	$80	$43	$9.7	$5.2
1984	$500	$274	$150	$82	$19.2	$10.5
1985	$355	$196	$84	$47	$28.6	$15.8
1986	$304	$174	$262	$150	$31.2	$17.8
1987	$340	$203	$310	$185	$18.6	$11.1
1988	$453	$278	$366	$225	$63.3	$38.9
1989	$316	$202	$289	$185	$20.1	$12.9
1990	$240	$166	$223	$154	$11.3	$7.8
1991	$300	$217	$272	$196	$25.6	$18.5
1992	$397	$298	$304	$228	$49.5	$37.2
1993	$281	$211	$215	$162	$56.0	$42.1
1994	$315	$241	$253	$194	$45.0	$34.5
1995	$239	$187	$177	$139	$38.1	$29.9
1996	$283	$231	$221	$180	$43.0	$35.0
1997	$187	$156	$132	$110	$23.6	$19.7
1998	$141	$119	$92	$78	$7.2	$6.1
1999	$219	$187	$185	$158	$8.7	$7.4
2000	$113	$100	$86	$76	$0.9	$0.8
2001	$228	$206	$134	$121	$9.9	$8.9
2002	$111	$100	$101	$91	$4.2	$3.8
2003	$240	$227	$221	$209	$14.9	$14.1
2004	$240	$240	$232	$232	$5.4	$5.4
Average	**$297**	**$207**	**$192**	**$142**	**$23.3**	**$16.7**
Std. Dev.	**$120**	**$57**	**$87**	**$62**	**$17.8**	**$12.8**

Figure 23. American Samoa average inflation-adjusted revenue per longline set by alias landing pelagic species.



Interpretation: The longline revenue per set has seen a gradual decrease since 1995 until 2001 and 2002. The decrease of revenue per set in 2003 (28.4% compared to 2002) was the result of the decrease in pounds landed.
In 2004, it is surprising to observe an increase in the revenue per trip as, if the catch has decreased by 55.2%, the number of set has in the same time decreased only by 39.9% (from 852 to 512 sets) and the price per pound has decreased too. We will follow up with this problem, possibly due to a calculation problem of the application.

Calculation: The longline interviews in the offshore creel survey system catching any of the species listed in Table 1 and selling all or part of their catch are counted and adjusted for multiset trips for the given year to get the number of sets. The unadjusted revenue/set for Tunas and Non-Tuna PMUS is calculated by first summing the value of the species in these pelagic subgroups caught by these sets and then dividing this by the number of sets. The unadjusted revenue/set for all species is the sum of the value of all species, listed in Table 1 or not, caught by these longline sets divided by the number of such sets.

The unadjusted revenue/set values for the pelagic species subgroups above and for all species were adjusted for inflation by multiplying the given year's revenue/set by the 2003 consumer price index (CPI) divided by the CPI for that year.

Year	All Species		Tunas		Non-Tuna PMUS	
	Adj.	Unadj.	Adj.	Unadj.	Adj.	Unadj.
1982	$0	$0	$0	$0	$0.0	$0.0
1983	$0	$0	$0	$0	$0.0	$0.0
1984	$0	$0	$0	$0	$0.0	$0.0
1985	$0	$0	$0	$0	$0.0	$0.0
1986	$0	$0	$0	$0	$0.0	$0.0
1987	$0	$0	$0	$0	$0.0	$0.0
1988	$331	$203	$322	$198	$8.8	$5.4
1989	$0	$0	$0	$0	$0.0	$0.0
1990	$0	$0	$0	$0	$0.0	$0.0
1991	$588	$424	$427	$308	$153	$110
1992	$0	$0	$0	$0	$0.0	$0.0
1993	$697	$524	$640	$481	$46.2	$34.8
1994	$467	$359	$455	$349	$12.0	$9.2
1995	$833	$653	$713	$559	$115	$90.1
1996	$559	$455	$464	$378	$92.1	$74.9
1997	$546	$455	$454	$378	$84.8	$70.7
1998	$517	$437	$441	$372	$74.9	$63.3
1999	$378	$323	$316	$269	$62.2	$53.0
2000	$364	$323	$306	$272	$57.3	$50.9
2001	$434	$390	$358	$322	$74.7	$67.2
2002	$524	$473	$441	$398	$82.1	$74.0
2003	$375	$356	$293	$278	$78.7	$74.6
2004	$398	$398	$314	$314	$80.0	$80.0
Average	**$412**	**$340**	**$350**	**$287**	**$60.1**	**$50.5**
Std. Dev.	**$227**	**$182**	**$195**	**$155**	**$42.6**	**$34.5**

Appendix 2

Guam

Introduction and Summary

Pelagic fishing vessels based on Guam are classified into two general groups: distant-water purse seiners and longliners that fish outside Guam's economic exclusive zone (EEZ) and transship through the island, and small, primarily recreational, trolling boats that are either towed to boat launch sites or berthed in marinas and fish only within local waters, either within Guam's EEZ or on some occasions in the adjacent EEZ of the Northern Mariana Islands. This annual report covers primarily the local, Guam-based, small-boat pelagic fishery.

The estimated annual pelagic landings have varied widely, ranging between 322,000 and 937,000 pounds in the 22-year time series. The 2004 total pelagic landings were approximately 691,366 pounds, an increase of 36% compared with 2003. Landings consisted primarily of five major species: mahimahi (*Coryphaena hippurus*), wahoo (*Acanthocybium solandri*), bonita or skipjack tuna (*Katsuwonus pelamis*), yellowfin tuna (*Thunnus albacares*), and Pacific blue marlin (*Makaira mazara*). Other minor pelagic species caught include rainbow runner (*Elagatis bipinnulatus*), great barracuda (*Sphyraena barracuda*), kawakawa (*Euthynnus affinis*), dogtooth tuna (*Gymnosarda unicolor*), double-lined mackerel (*Grammatorcynus bilineatus*), oilfish (*Ruvettus pretiosus*), and three less common species of barracuda. Sailfish and sharks were also caught during 2004. However, these species were not encountered during offshore creel surveys and was not available for expansion for this year's report. While sailfish is kept, sharks are often discarded as bycatch. In addition to the above pelagic species, approximately half a dozen other species were landed incidentally this year.

The number of boats involved in Guam's pelagic or open ocean fishery gradually increased from 193 in 1983 to 469 in 1998. This number decreased until 2001, but then began increasing, and has been increasing since. There were 401 boats involved in Guam's pelagic fishery in 2004, an increase of 8% over 2003. A majority of the fishing boats are less than 10 meters (33 feet) in length and are usually owner-operated by fishermen who earn a living outside of fishing. Most fishermen sell a portion of their catch at one time or another and it is difficult to make a distinction between recreational, subsistence, and commercial fishers. A small, but significant, segment of the pelagic group is made up of marina-berthed charter boats that are operated primarily by full-time captains and crews. Data and graphs for non-charters, charters, and bycatch are represented in this report.

There are general wide year-to-year fluctuations in the estimated landings of the five major pelagic species. 2004 mahimahi catch increased more than 134% from 2003, and reached the highest total since 1998. Wahoo catch totals increased 83% from 2003, and were the sixth highest total during the 23 year recording period. Pacific blue marlin landings decreased 28% from 2003, and were 24% below the 23 year average.

Aggregate landings of all pelagics, tuna, and non-tuna Pelagic Management Unit Species (PMUS) increased substantially in 2004. Landings of all pelagics increased 36%, with tuna PMUS increasing 8% and non-tuna PMUS increasing 70%, primarily due to increases in mahimahi and wahoo catch. Supertyphoon Pongsona's direct hit on Guam in December 2002 and subsequent negative impact on fishing during the first quarter of 2003 probably account for the low numbers of mahimahi caught during 2003. Participation and effort generally increased in 2004. The number of trolling boats increased by 8%, and the number of trolling trips and hours spent trolling increased by 4%. Again, 2003's numbers were probably low due to the effects of supertyphoon Pongsonga.

Trolling catch rates (pounds per hour fished) showed an increase compared with 2003.Mahimahi catch increased by 219%, and equaled the second highest rate in the 23 year reporting period. Wahoo increased by 70%, and was at the second highest level in the 23-year reporting period.

Commercial landings and revenues increased in 2004, with total revenues increasing .4%. The average price for all pelagics decreased 3%, with tuna PMUS prices decreasing 6%, and non-tuna PMUS decreasing 4%. Adjusted revenue per trolling trip decreased 10% for all pelagics, decreased 45% for tuna PMUS, and decreased 4% for non-tuna PMUS. Commercial landings show an overall increasing trend, although commercial revenues show a general decreasing trend but with more yearly fluctuations. The average price of tuna and revenue per trolling trip show a significant decrease from the early 1980's, but for the past five years appears to be leveling off. Despite decreasing revenues with increased commercial landings, pelagic fishing continues as a majority of trollers do not rely on the catch or selling of fish as their primary source of income. However, a downturn in Guam's economy in recent years, as well as increasing fuel costs have made fishing more difficult for the average fishermen to participate.

The loss of staff biologists has been significant in the past several years. Two fisheries technicians, however, were hired during 2004. DAWR staff biologists continue to provide on-going training to ensure the high quality of data being collected by all staff. All fisheries staff are trained to identify the most commonly caught fish to the species level. New staff are mentored by biologists and senior technicians in the field before conducting creel surveys on their own.

The makeshift ramp at Ylig Bay provides access to boating and fishing resources along the eastern cost of Guam. These fishing areas are not accessible most of the year due to rough seas, with most of the coast inaccessible for public shore-based fishing. However, as many as two dozen vehicles with trailers can be seen at Ylig during periods of calm weather, primarily trolling during the day, and bottomfishing and spearing during the evenings. Highliners that regularly utilize this ramp are able to weather more adverse sea conditions and can maneuver through Ylig River, a task difficult for most boaters. Participation and effort at Ylig may be significant during the summer months when compared to the three offshore creel census sites. Also, a new wave buoy deployed south of the ramp off Talofofo Bay is reported to aggregate pelagic fish. However, surveying this ramp remains challenging. Inadequate lighting, no public phone, return fishing times well after midnight, and other safety issues make fishery data collecting challenging. A lack of freshwater for rinsing and large catches which can require substantial time to sample do discourage fishermen from being interviewed since they prefer not to stay too long after trailering their boats. The few attempts in 2004 to informally obtain fishing data resulted in either incomplete information being given or an interview decline. Currently, creel census data cannot regularly be obtained at this site. An educational outreach and modifying current sampling techniques addressing all the above challenges is necessary before adding Ylig as a creel census site.

Several factors in recent years have negatively affected trolling activity and may affect fishing activity in the future. First, the downturn in Asia's economy compared from a decade ago has had a negative impact on Guam's economy, decreasing the number of tourists to Guam, with the average visitor spending less. Second, the price of fuel has increased significantly making it more costly to fish and also more attractive to sell fish to recoup costs. During 2004, adverse weather conditions from passing storms resulted in creel census days with zero activity. Trolling activity occurs regularly at FADs, and reported to have occurred significantly at offshore banks. At offshore banks, fishermen also reported more interaction with sharks.

Recommendations

2003 Recommendations and current status

1. Explore the feasibility of drafting new legislation requiring local fish vendors to participate in the "Commercial Fish Receipt Book Program."

This option was not pursued during by Guam's Department of Agriculture's Fisheries Section in 2004. Requiring local fish vendors to provide the sale of locally caught fish, which include pelagics, bottomfish, and reef fish, would provide local agencies with additional data to determine impacts to local fish stocks. This recommendation will be explored in 2005.

2004 Recommendations

2. Explore the feasibility of drafting new legislation requiring local fish vendors to participate in the "Commercial Fish Receipt Book Program."

Tables

Figures

Table 1. Guam 2004 Creel Survey - Pelagic Species Composition

Species	Total Landing (Lbs)	Non-Charter	Charter
Skipjack Tuna	161,839	144,455	17,384
Yellowfin Tuna	102,228	91,180	11,048
Kawakawa	11,317	10,825	492
Albacore	0	0	0
Bigeye Tuna	0	0	0
Other Tuna PMUS	23	23	0
Tuna PMUS	**275,407**	**246,483**	**28,924**
Mahimahi	197,209	163,584	33,625
Wahoo	116,991	101,558	15,433
Blue Marlin	48,268	24,409	23,859
Black Marlin	0	0	0
Striped Marlin	0	0	0
Sailfish	3,579	1,085	2,494
Shortbill Spearfish	0	0	0
Swordfish	0	0	0
Oceanic Sharks	0	0	0
Pomfrets	142	142	0
Oilfish	0	0	0
Moonfish	0	0	0
Non-tuna PMUS	**366,189**	**290,778**	**75,411**
Dogtooth Tuna	13,113	12,584	529
Rainbow Runner	28,079	26,300	1,779
Barracudas	12,216	12,216	0
Double-lined Mackerel	27	27	0
Misc. Troll Fish	0	0	0
Non-PMUS Pelagics	**53,435**	**51,127**	**2,308**
Total Pelagics	**695,031**	**588,388**	**106,643**

Source: The Division of Aquatic and Wildlife Resources (DAWR) offshore creel survey data. This table includes several species of barracuda and the double-lined mackerel, species that may not be included in other tables in this report. Pelagic totals may slightly differ in those tables.

Table2: Guam 2004 Annual Commercial Average Price of Pelagic Species

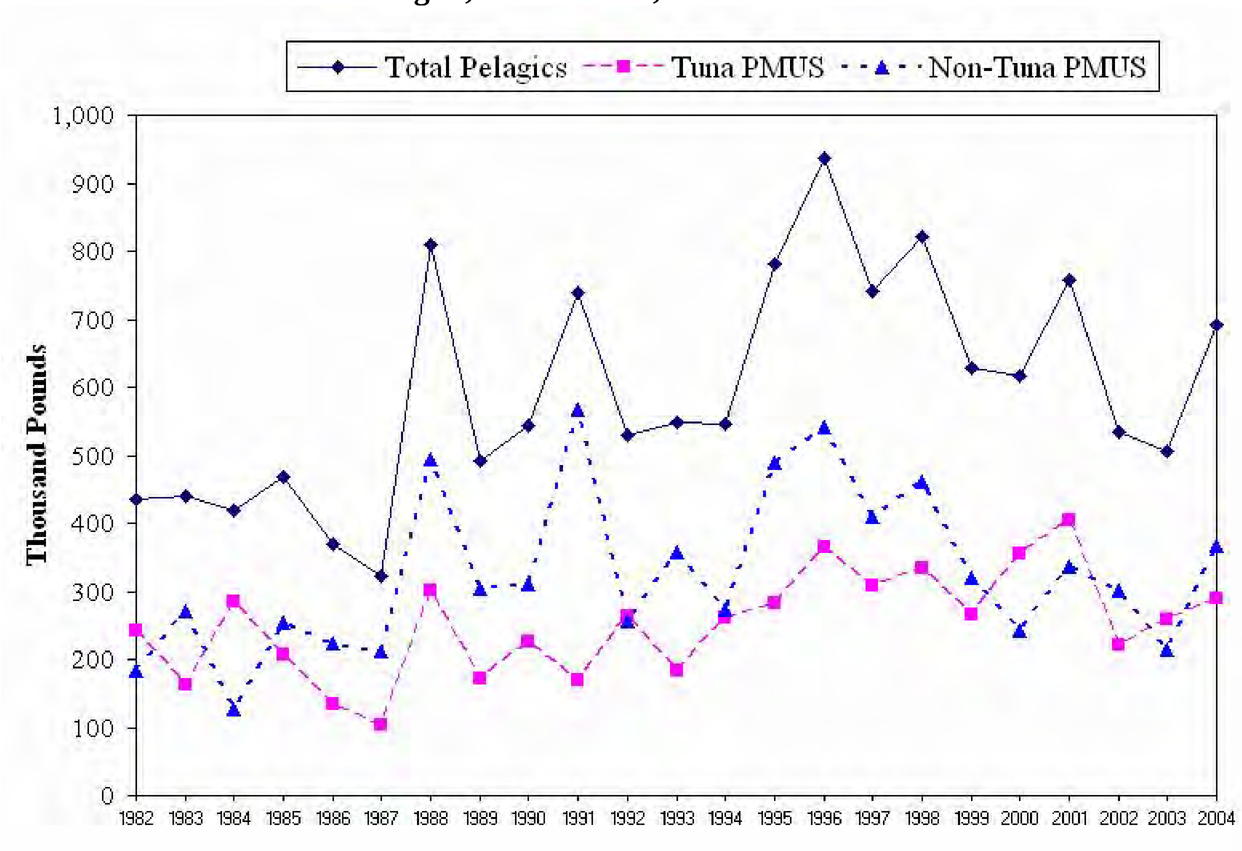
Species	Average Price ($/Lb)
Yellowfin Tuna	1.94
Bonita/skipjack Tuna	0.98
Tunas Subtotal	**1.36**
Monchong	2.16
Sharks	2.63
Spearfish	1.10
Sailfish	1.18
Marlin	1.00
Wahoo	1.95
Mahi / Dolphinfish	1.53
Non-tuna PMUS Subtotal	**1.59**
Troll Fish	2.33
Barracuda	1.89
Rainbow Runner	1.55
Dogtooth Tuna	1.11
Non-PMUS Pelagic Subtotal	**1.54**
Pelagic Total	**1.51**

Source: The WPacFIN-sponsored commercial landings system.

Table 3. Annual Consumer Price Indexes And CPI Adjustment Factors

Year	Consumer Price Index	CPI Adjust Factor
1980	134.0	4.20
1981	161.4	3.49
1982	169.7	3.32
1983	175.6	3.21
1984	190.9	2.95
1985	198.3	2.84
1986	203.7	2.77
1987	212.7	2.65
1988	223.8	2.52
1989	248.2	2.27
1990	283.5	1.99
1991	312.5	1.80
1992	344.2	1.64
1993	372.9	1.51
1994	436.0	1.29
1995	459.2	1.23
1996	482.0	1.17
1997	491.4	1.15
1998	488.9	1.15
1999	497.9	1.13
2000	508.1	1.11
2001	501.2	1.12
2002	504.5	1.12
2003	521.4	1.08
2004	**563.2**	**1.00**

**Figure 1a. Guam Annual Estimated Total Landings:
All Pelagics, Tuna PMUS, and Non-Tuna PMUS**



Interpretation: The estimated total pelagic, tuna, and non-tuna PMUS have exhibited a cyclic trend, with a peak year followed by one or two down years. Factors relating to this cycle may have to do with the biology of the fish or be weather related. Total pelagic catch peaked in 1996, and has been decreasing since. A downturn in the local economy, making it more expensive for boat repair and maintenance for the average recreational fishermen, a decrease in fishing effort, a significant number of bad weather days in 2003, and anecdotal evidence from the average fishermen that pelagic fish is not caught consistently year round around Guam may be contributing factors.

Compared with 2003, total pelagic and non-tuna PMUS increased 36% and 70% respectively, while tuna landings increased 8%. Generally, tuna species are consistently caught year round, with the other major pelagic species being more seasonal.

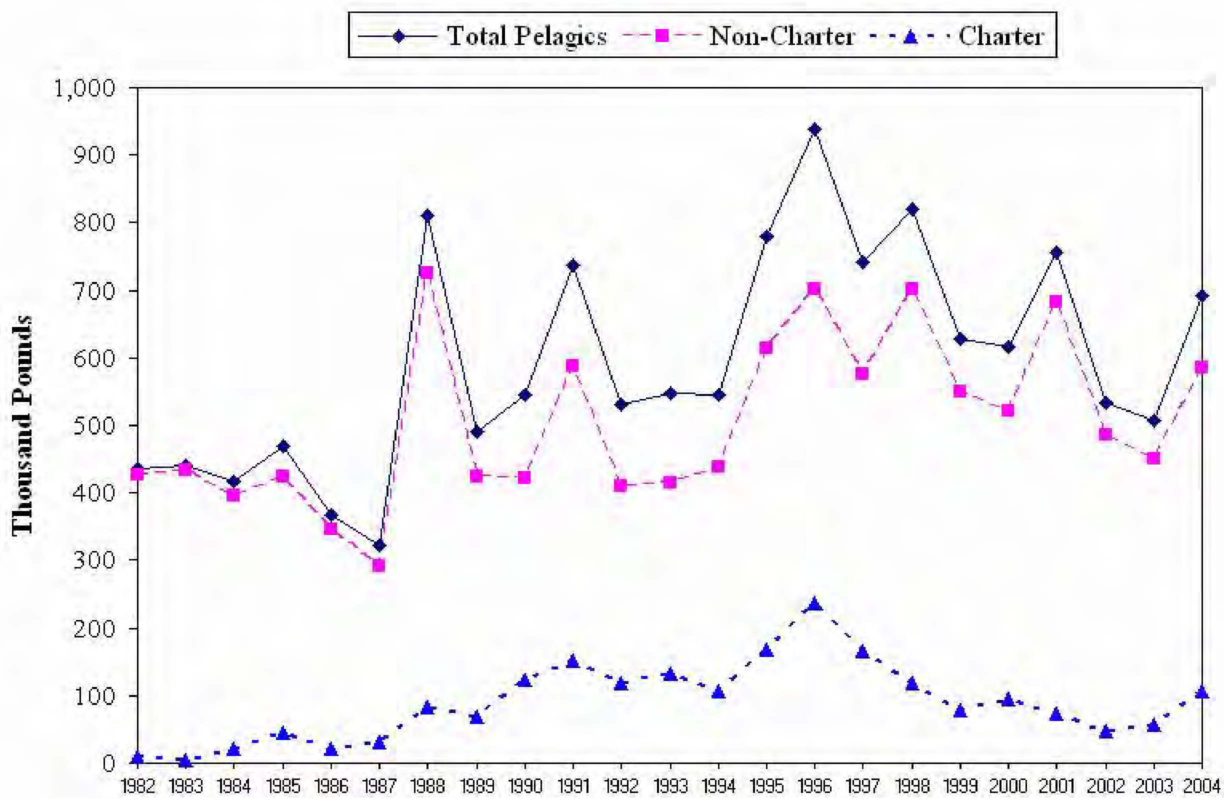
Source: The Division of Aquatic and Wildlife Resources (DAWR) offshore creel survey.

Calculation: A 365-day (366 days during leap years) quarterly expansion is run for each calendar year of survey data to produce catch and effort estimates for the pelagic fishery to avoid over-estimating seasonal pelagic species. Percent species composition is calculated by weight for the sampled catch for each method to produce catch estimates for each species for the expanded period. The annual catch for all pelagic species and the PMUS separately are summed across all methods to obtain the numbers plotted above.

Estimated Total Landings (Pounds)

Year	All Pelagics	Tuna PMUS	Non-Tuna PMUS
1982	435,648	243,184	182,782
1983	440,319	162,334	270,536
1984	418,010	284,871	127,711
1985	468,917	207,027	253,551
1986	368,355	133,570	224,390
1987	321,846	104,534	210,663
1988	810,303	301,785	494,864
1989	491,694	170,722	303,357
1990	544,457	225,926	311,622
1991	737,898	168,800	566,353
1992	529,634	264,392	256,282
1993	547,240	184,532	356,682
1994	544,922	261,665	272,697
1995	780,727	282,587	489,614
1996	937,450	365,855	541,991
1997	740,790	308,538	410,487
1998	820,007	334,991	460,380
1999	627,928	265,941	320,802
2000	615,724	355,710	243,470
2001	756,851	404,990	337,093
2002	533,850	221,396	300,841
2003	506,118	258,340	213,324
2004	**691,366**	**288,498**	**366,212**
Average	594,350	252,182	326,770
Standard Deviation	162,908	76,612	118,310

**Figure 1b. Guam Annual Estimated Total Pelagic Landings:
Total Pelagics, Non-Charter, and Charter**



Interpretation: Non-charter trolling trips have always accounted for the bulk of the pelagic catch, although charter boats, which make up less than 5% of the troll fleet, account for a high proportion of trolling effort and catch. Prior to 1988, non-charter boats accounted for over 90% of the troll catch. In 1988, this percentage decreased due to an increase in charter boat activity catering specifically to Asian visitors. Beginning in 1996 however, a downturn in Japan's economy caused a significant decrease in charter trips and subsequent landings. No such trend is observed for non-charters. In 2004, total pelagic and non-charter landings increased 36% and 29% respectively, while charter landings increased 90%. Non-charter boats landed 84% of all pelagics.

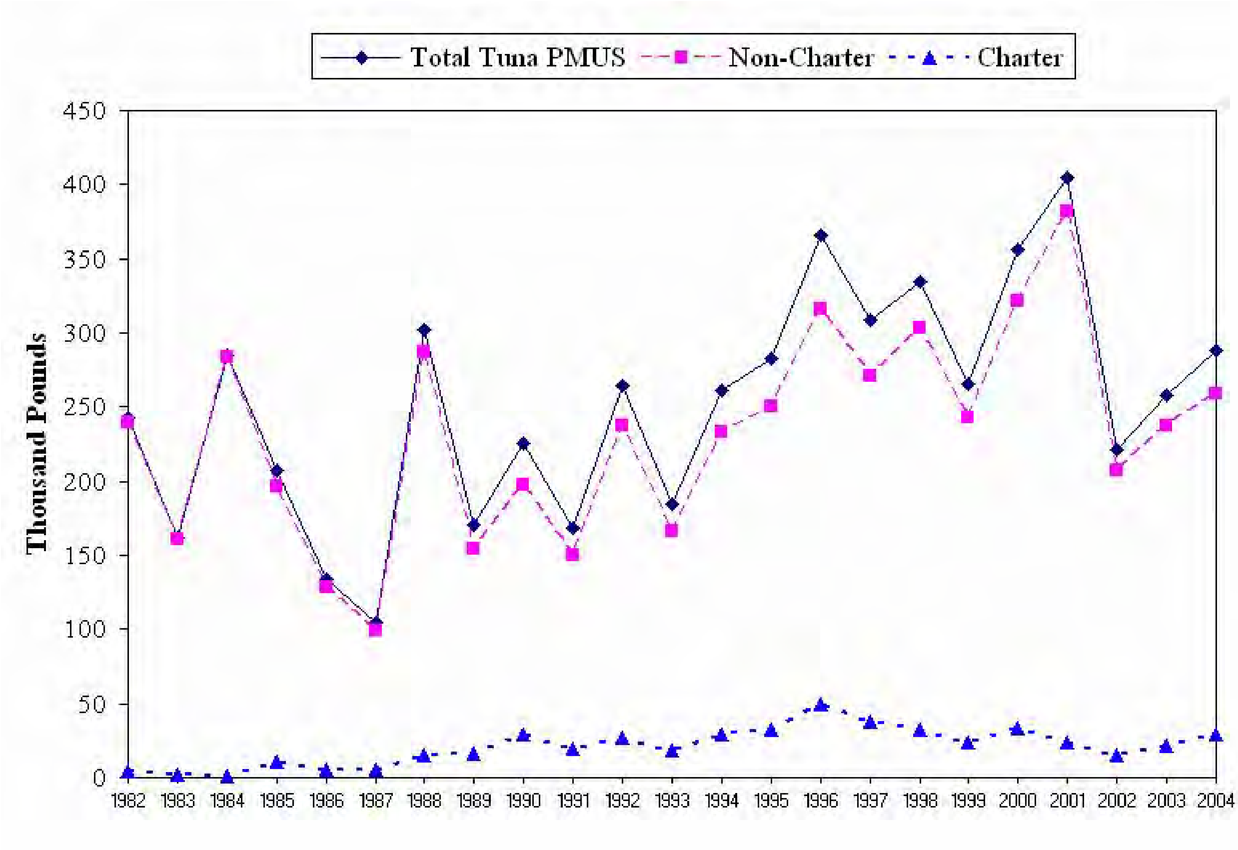
Source: The Division of Aquatic and Wildlife Resources (DAWR) offshore creel survey data.

Calculation: A 365-day (366 days during leap years) quarterly expansion is run for each calendar year of survey data to produce catch and effort estimates for trolling. Percent species composition is calculated by weight for the sampled catch for each method to produce catch estimates for each species for the expanded period. The annual catch for all pelagic species and the PMUS separately are summed across all methods to obtain the numbers plotted above.

Estimated Total Landings (Pounds)

Year	Total Pelagics	Non-Charter	Charter
1982	435,648	426,939	8,709
1983	440,319	434,664	5,655
1984	418,010	395,649	22,361
1985	468,917	424,389	44,528
1986	368,355	346,616	21,740
1987	321,846	291,913	29,933
1988	810,303	726,274	84,029
1989	491,694	424,043	67,651
1990	544,457	421,797	122,660
1991	737,898	587,400	150,498
1992	529,634	410,966	118,667
1993	547,240	415,432	131,809
1994	544,922	437,735	107,187
1995	780,727	613,379	167,347
1996	937,450	700,709	236,741
1997	740,790	574,977	165,812
1998	820,007	701,672	118,335
1999	627,928	550,613	77,314
2000	615,724	520,734	94,990
2001	756,851	683,347	73,504
2002	533,850	486,141	47,709
2003	506,118	450,094	56,024
2004	**691,366**	**584,724**	**106,643**
Average	594,350	504,792	89,559
Standard Deviation	162,908	122,120	58,192

Figure 1c. Guam Annual Estimated Tuna PMUS Landings: Total, Non-Charter, and Charter



Interpretation: The general trend of the estimated total tuna landings shows an increasing trend between 1987 and 2001. Non-charter boats account for the bulk of the total tuna catch, up to 95% in the 1980's. This decreased when charter boat activity began increased from the late 1980's until the mid 1990's. In 2004, 89% of tuna were caught by non-charter boats. In 2004, total tuna, non-charter, and charter tuna landings increased 8%, 5%, and 36% respectively. The 2004 estimated tuna PMUS landings were higher than the 23 year average.

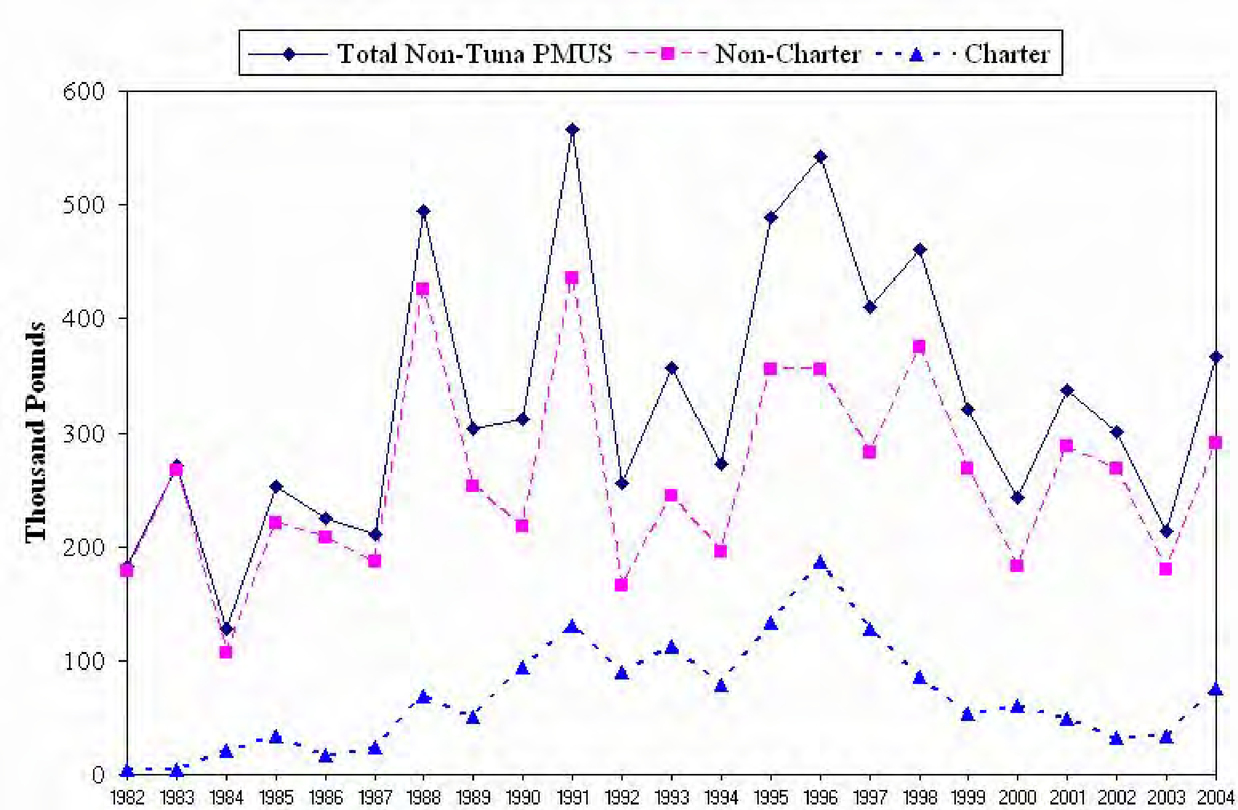
Source: The Division of Aquatic and Wildlife Resources (DAWR) offshore creel sampling program, expanded with the assistance of NMFS.

Calculation: A 365-day (366 days during leap years) quarterly expansion is run for each calendar year of survey data to produce catch and effort estimates for trolling. Percent species composition is calculated by weight for the sampled catch for each method to produce catch estimates for each species for the expanded period. The annual catch for all pelagic species and the PMUS separately are summed across all methods to obtain the numbers plotted above.

Estimated Total Landings (Pounds)

Year	Total Tunas	Non-Charter	Charter
1982	243,184	239,082	4,102
1983	162,334	160,613	1,721
1984	284,871	283,312	1,559
1985	207,027	196,020	11,007
1986	133,570	128,201	5,369
1987	104,534	98,820	5,714
1988	301,785	286,974	14,811
1989	170,722	154,355	16,366
1990	225,926	197,255	28,672
1991	168,800	149,735	19,065
1992	264,392	237,257	27,135
1993	184,532	165,705	18,827
1994	261,665	232,747	28,918
1995	282,587	249,901	32,686
1996	365,855	316,394	49,462
1997	308,538	271,288	37,250
1998	334,991	302,903	32,089
1999	265,941	242,440	23,501
2000	355,710	322,057	33,652
2001	404,990	381,583	23,407
2002	221,396	206,677	14,719
2003	258,340	236,938	21,401
2004	**288,498**	**259,045**	**29,453**
Average	252,182	231,274	20,908
Standard Deviation	76,612	69,094	12,536

Figure 1d. Guam Annual Estimated Non-Tuna PMUS Landings: Total, Non-Charter, and Charter



Interpretation: The estimated total PMUS landings show a general increase since 1984, corresponding with an increase in boats entering the fishery. Non-charter trolling trips accounts for the bulk of the other PMUS catch. Up until the mid-1980's, non-charter boats accounted for up to 90% of the non-PMUS species. This percentage began decreasing in the late 1980’s when charter fishing activity began increasing, associated with an increase in tourism. Charter PMUS harvest began decreasing after 1996, while non-charter PMUS landings show extreme yearly fluctuations. In 2004, total non-tuna PMUS and non-charter non-tuna PMUS increased 70% and 60% respectively, compared with 2003. Charter non-tuna PMUS increased 123%. Non-charter boats harvested 79% of non-tuna PMUS species in 2004.

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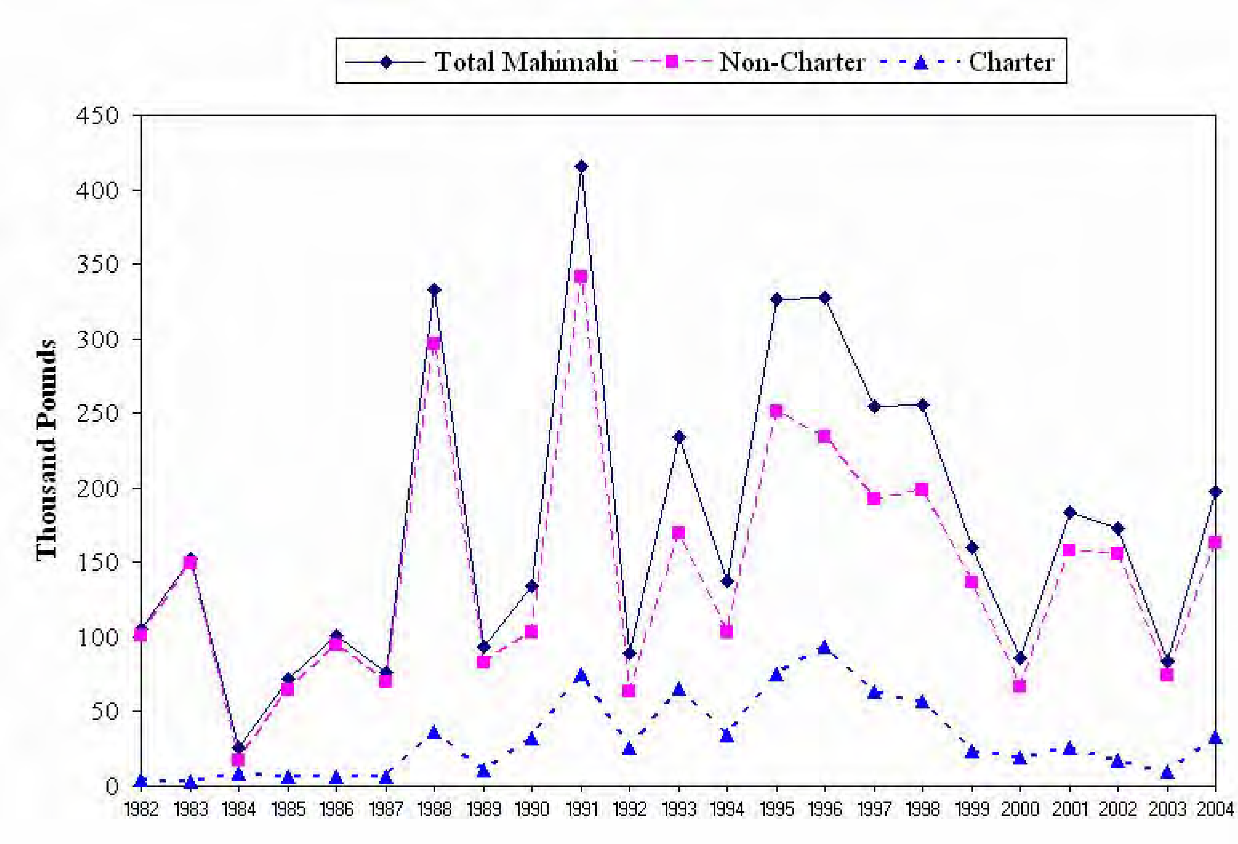
Source: The Division of Aquatic and Wildlife Resources (DAWR) offshore creel sampling program, expanded with the assistance of NMFS.

Calculation: A 365-day (366 days during leap years) expansion is run for each calendar year of survey data to produce catch and effort estimates for each fishing method surveyed. Percent species composition is calculated by weight for the sampled catch for each method to produce catch estimates for each species for the expanded period. The annual catch for all pelagic species and the PMUS separately are summed across all methods to obtain the numbers plotted above.

Estimated Total Landings (Pounds)

Year	Total Non-Tuna PMUS	Non-Charter	Charter
1982	182,782	178,551	4,231
1983	270,536	266,602	3,934
1984	127,711	106,910	20,802
1985	253,551	220,043	33,508
1986	224,390	208,111	16,279
1987	210,663	186,706	23,957
1988	494,864	425,850	69,015
1989	303,357	252,395	50,961
1990	311,622	218,154	93,468
1991	566,353	435,148	131,205
1992	256,282	165,882	90,400
1993	356,682	244,215	112,467
1994	272,697	194,674	78,022
1995	489,614	355,532	134,082
1996	541,991	355,315	186,675
1997	410,487	282,828	127,659
1998	460,380	374,650	85,730
1999	320,802	267,823	52,979
2000	243,470	182,533	60,937
2001	337,093	288,095	48,998
2002	300,841	268,271	32,570
2003	213,324	179,508	33,816
2004	**366,212**	**290,802**	**75,410**
Average	326,770	258,635	68,135
Standard Deviation	118,310	85,100	47,269

Figure 2a. Guam Annual Estimated Total Mahimahi Landings: Total, Non-Charter, and Charter



Interpretations: Historically, mahimahi catches have fluctuated wildly, with a good year followed by one or two down years. Catch peaked in 1996, and has been lower since, although still demonstrating the cyclical nature. Non-charter trips account for the bulk of the mahimahi catch, with charter activity harvesting proportionally more beginning in the late 1980's as tourist arrivals to Guam increased. A drop in charter catch corresponds to decreasing tourist arrivals in the late 1990's. In 2004, mahimahi landings drastically increased, with total, charter, and non-charter harvest increasing 134%, 237%, and 120% respectively. Mahimahi season generally occurs during the first quarter of the year, and the after effects of Supertyphoon Pongsona in December 2002 and a significant number of bad weather days may contributed to this decrease in 2003. The 2003 total and non-charter harvest are approximately half of the 23 year time series, with the charter harvest approximately a third of the 23 year average. The 2004 total mahimahi harvest was the highest across all categories since 1998.

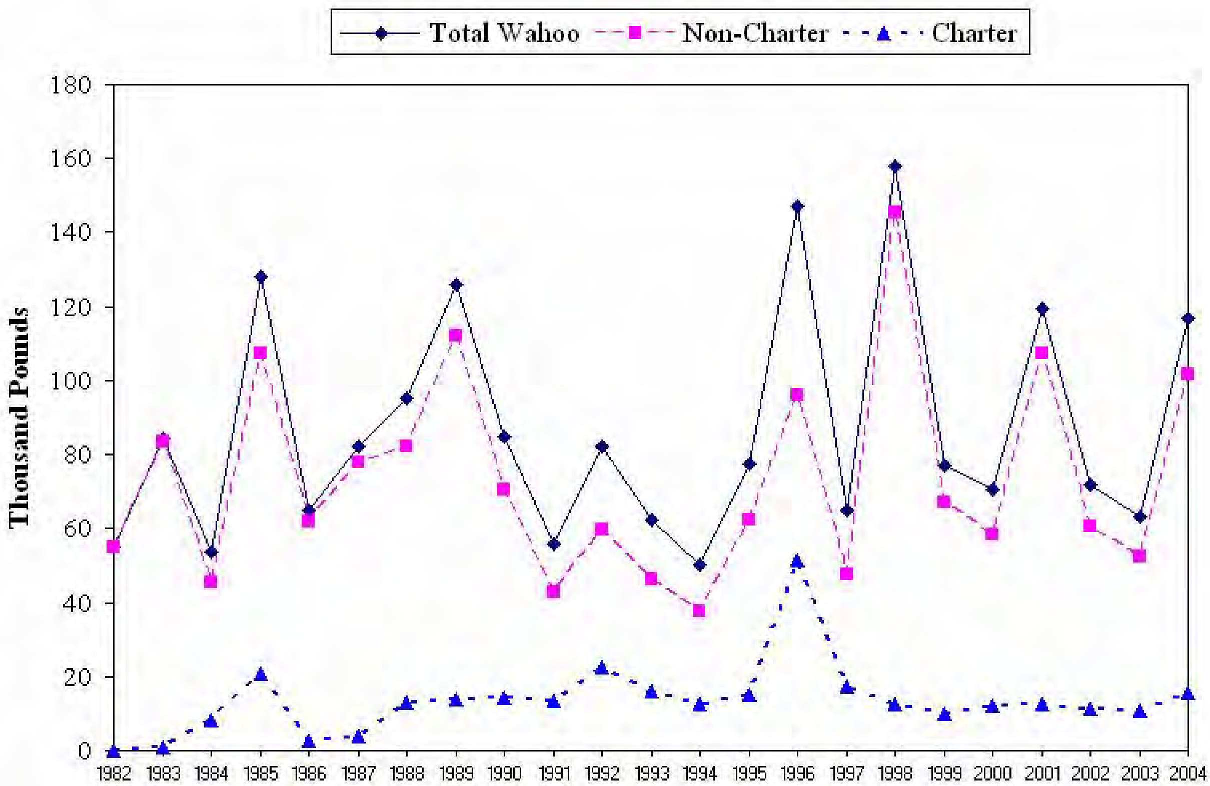
Source: The Division of Aquatic and Wildlife Resources (DAWR) offshore creel sampling program and its associated computerized data expansion system files, expanded with the assistance of NMFS.

Calculation: Totals by species are summed across all fishing methods as described in Figures 1a to 1d.

Estimated Total Landings (Pounds)

Year	Total Mahimahi	Non-Charter	Charter
1982	105,503	101,348	4,155
1983	152,678	149,531	3,147
1984	25,420	16,739	8,681
1985	71,569	64,619	6,951
1986	101,487	94,646	6,841
1987	76,129	69,326	6,803
1988	333,393	296,937	36,456
1989	93,709	83,069	10,640
1990	134,747	102,838	31,910
1991	416,053	341,358	74,695
1992	89,115	63,259	25,856
1993	234,522	169,200	65,322
1994	137,768	103,448	34,320
1995	326,868	251,367	75,501
1996	327,635	234,575	93,060
1997	254,806	191,864	62,942
1998	255,814	198,425	57,389
1999	160,150	136,229	23,921
2000	85,827	66,798	19,029
2001	184,011	158,409	25,601
2002	172,673	155,798	16,874
2003	83,734	73,771	9,963
2004	**197,208**	**163,584**	**33,625**
Average	174,818	142,919	31,899
Standard Deviation	103,056	81,337	26,725

Figure 2b. Guam Annual Estimated Total Wahoo Landings: Total, Non-charter, and Charter



Interpretations: The wide fluctuations in wahoo landings are probably due to the high variability in the year-to-year abundance and availability of the stocks. Until 1987, non-charter landings accounted for over 95% of the total catch. In 1988, this percentage decreased due to an increase in charter boat activity. In 1996, wahoo charter landings peaked, accounting for 35% of the total catch. In 2004, total, non-charter, and charter harvest of wahoo increased 83%, 91%, and 43% respectively from 2003. Non-charter boats harvested 86% of the total wahoo harvest. The 2004 harvest of wahoo was above the 23 year average across all categories.

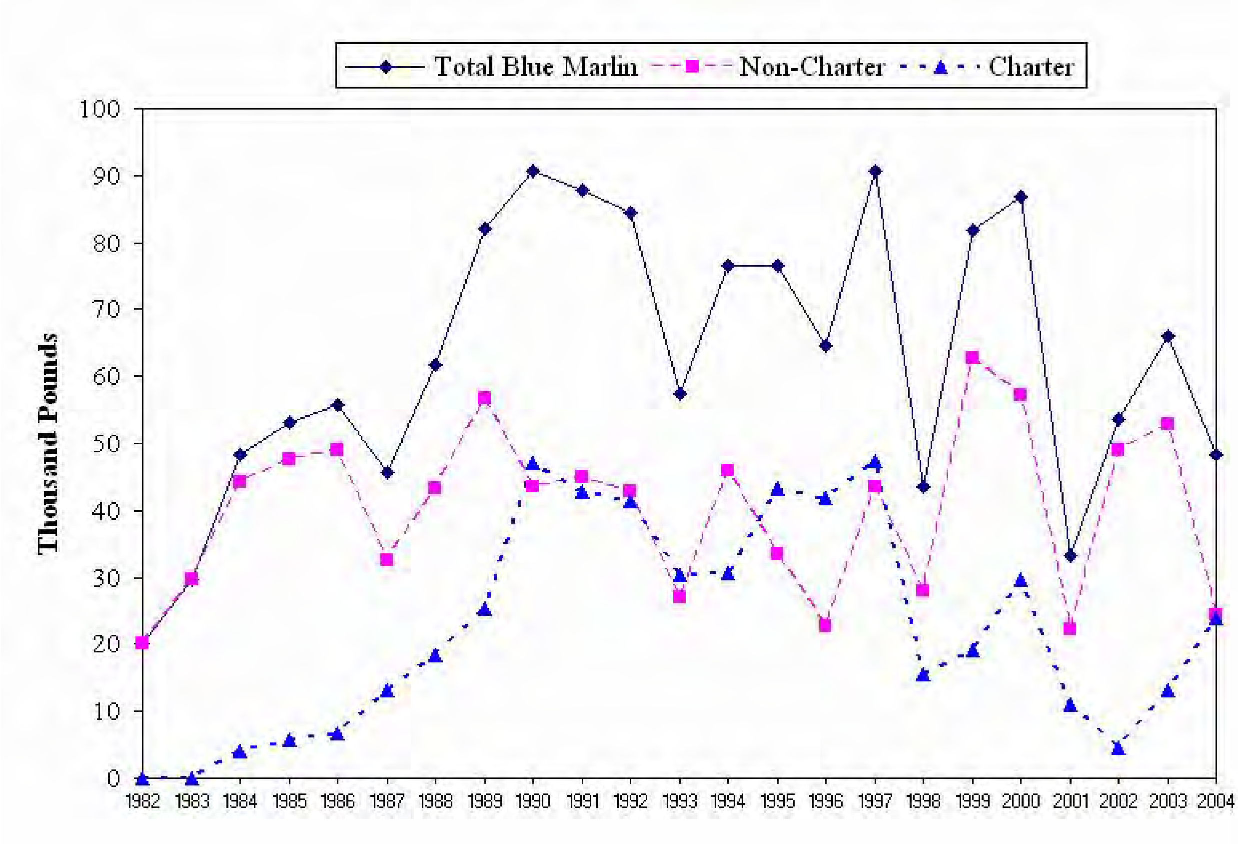
Source: The Division of Aquatic and Wildlife Resources (DAWR) offshore creel sampling program and its associated computerized data expansion system files, expanded with the assistance of NMFS.

Calculation: Totals by species are summed across all fishing methods as described in Figures 1a to 1d.

Estimated Total Landings (Pounds)

Year	Total Wahoo	Non-Charter	Charter
1982	54,976	54,900	75
1983	84,349	83,562	786
1984	53,490	45,424	8,066
1985	128,209	107,275	20,934
1986	64,756	61,985	2,771
1987	82,024	78,000	4,024
1988	95,180	82,107	13,073
1989	125,720	112,006	13,714
1990	84,873	70,698	14,176
1991	55,952	42,681	13,270
1992	82,238	59,675	22,563
1993	62,373	46,318	16,055
1994	50,390	37,712	12,677
1995	77,325	62,224	15,102
1996	147,181	95,884	51,297
1997	64,956	47,538	17,418
1998	157,947	145,524	12,424
1999	76,958	67,170	9,788
2000	70,614	58,436	12,178
2001	119,603	107,186	12,417
2002	71,809	60,654	11,155
2003	63,287	52,530	10,757
2004	**116,991**	**101,558**	**15,433**
Average	86,574	73,089	13,485
Standard Deviation	31,066	27,414	10,006

Figure 3a. Guam Annual Estimated Total Blue Marlin Landings: Total, Non-charter, and Charter



Interpretations: During the 1980's, non-charter boats accounted for the bulk of the blue marlin catch. In the early 1990's, charters share of the marlin catch began to increase, peaking at 64% in 1996. The increases were due to an increase in charter boat activity and the active targeting of blue marlin by charter boats during the summer months. The decrease in charter landings after 1997 corresponded to the decrease in tourist charter trips. In 2004, the overall, and non-charter blue marlin landings decreased 27%, and 55% respectively. Charter blue marlin catch increased by 82%, harvesting 49% of the total blue marlin harvest. Blue marlin landings were below the 23 year average in all categories.

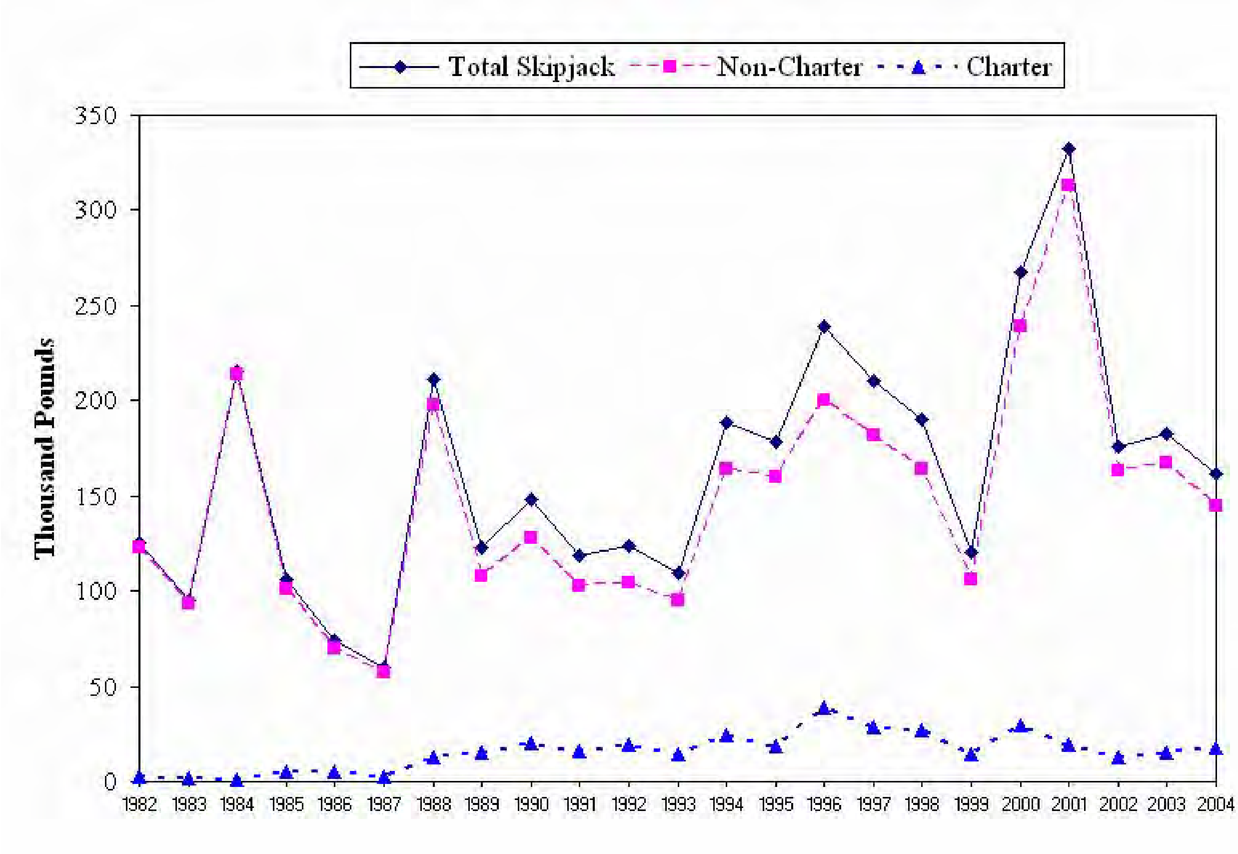
Source: The Division of Aquatic and Wildlife Resources (DAWR) offshore creel sampling program and its associated computerized data expansion system files, expanded with the assistance of NMFS.

Calculation: Totals by species are summed across all fishing methods as described in Figures 1a to 1d.

Estimated Total Landings (Pounds)

Year	Total Blue Marlin	Non-Charter	Charter
1982	20,086	20,086	
1983	29,688	29,688	
1984	48,239	44,185	4,055
1985	53,117	47,494	5,623
1986	55,766	49,099	6,667
1987	45,620	32,490	13,130
1988	61,816	43,342	18,474
1989	82,120	56,721	25,399
1990	90,749	43,600	47,148
1991	87,838	44,941	42,897
1992	84,356	42,937	41,419
1993	57,530	27,046	30,484
1994	76,514	45,889	30,625
1995	76,637	33,451	43,186
1996	64,677	22,742	41,935
1997	90,726	43,427	47,299
1998	43,511	27,886	15,625
1999	81,888	62,724	19,164
2000	86,891	57,161	29,730
2001	33,254	22,274	10,979
2002	53,552	49,012	4,540
2003	66,058	52,961	13,097
2004	**48,268**	**24,409**	**23,859**
Average	62,561	40,155	24,540
Standard Deviation	20,785	12,379	14,981

Figure 4a. Guam Annual Estimated Total Skipjack Landings: Total, Non-charter, and Charter



Interpretations: Skipjack tuna catch has fluctuated over the reporting period, peaking in 2001. A drop in skipjack tuna during 2002 may be due to direct hits by two supertyphoons, resulting in boat damage, lack of fish around Guam immediately after the storms, and infrastructure damage to the three major survey ports, and use of the survey ports by the Guam National Guard to disperse water. A direct hit by Supertyphoon Pongsona in December 2002 also caused a significant decrease in fishing activity during the month of January 2003. Unlike other PMUS, 2003 total skipjack tuna catch increased compared with 2002 harvest levels. This could be due to the nature of the fishery, which is less seasonal than other pelagic species.

Total skipjack tuna landings and non-charter landings decreased in 2004 by 11% and 13% respectively. Charter landings increased by 14%. Charter landings are higher than the 23-year average, while the other two categories are slightly below the 23-year averages.

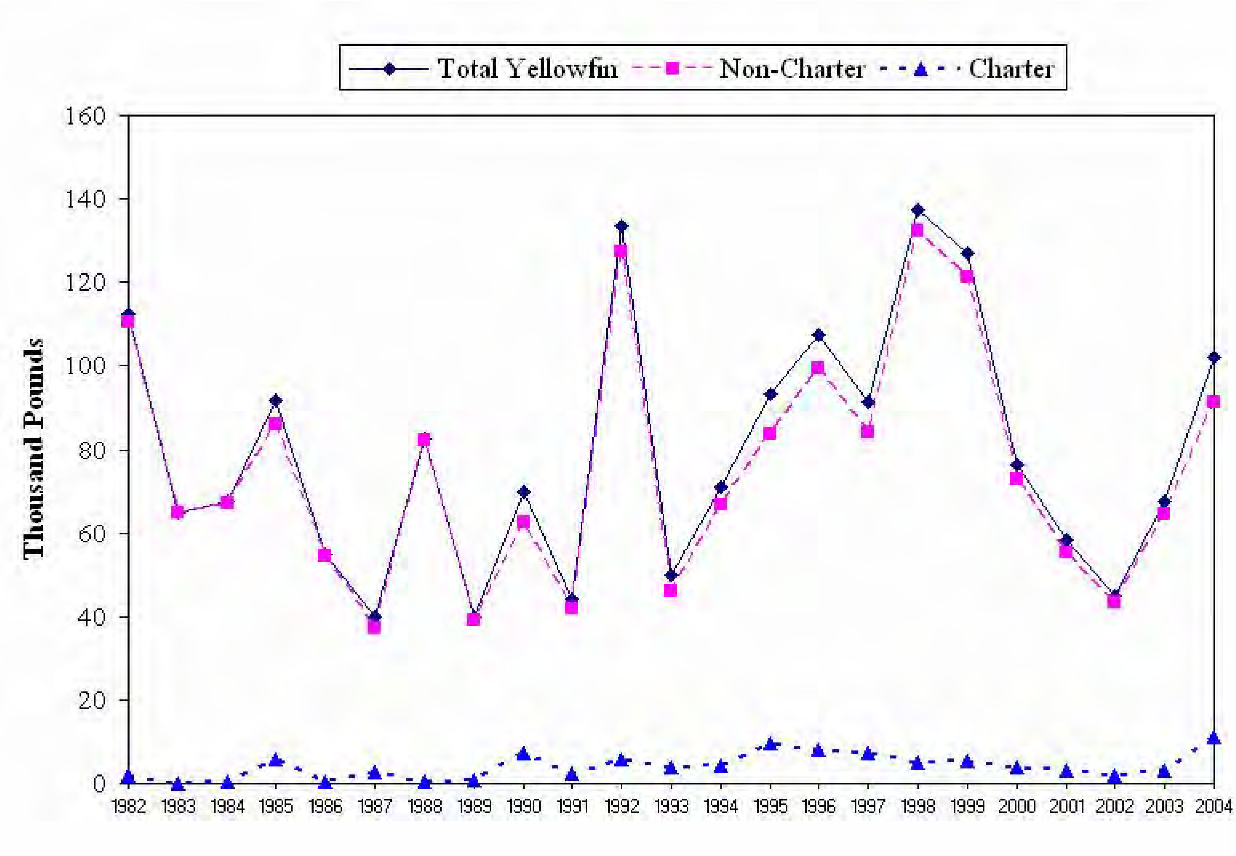
Source: The Division of Aquatic and Wildlife Resources (DAWR) offshore creel sampling program and its associated computerized data expansion system files, expanded with the assistance of NMFS.

Calculation: Totals by species are summed across all fishing methods as described in Figures 1a to 1d.

Estimated Total Landings (Pounds)

Year	Total Skipjack	Non-Charter	Charter
1982	125,472	123,247	2,225
1983	95,449	93,796	1,652
1984	215,102	213,937	1,165
1985	105,754	100,732	5,022
1986	74,450	69,642	4,808
1987	59,569	56,908	2,661
1988	211,014	198,085	12,929
1989	122,588	107,678	14,910
1990	147,702	127,870	19,832
1991	118,799	102,967	15,832
1992	123,731	104,504	19,227
1993	109,244	94,713	14,532
1994	188,408	163,937	24,471
1995	178,404	160,052	18,353
1996	239,006	199,958	39,048
1997	210,535	181,605	28,930
1998	190,466	163,858	26,609
1999	120,137	106,199	13,938
2000	267,562	238,529	29,033
2001	332,680	313,176	19,504
2002	175,834	163,118	12,716
2003	182,728	167,617	15,112
2004	**161,838**	**144,455**	**17,384**
Average	163,325	147,678	15,648
Standard Deviation	64,965	59,619	9,915

Figure 4b. Guam Annual Estimated Total Yellowfin Landings: Total, Non-charter, and Charter



Interpretations: The overall yellowfin landings showed wide fluctuations during the 22-year time series, although the total and non-charter estimated landings showed a significant decrease from 1998 to 2002. Charter landings of yellowfin tuna peaked in 1985, 1990, and 1995, and then showed a general decrease until 2002. In 2003, yellowfin landings increased in all categories. 2004 continued this trend, with total catch, non-charter catch, and charter catch up 49%, 39%, and 261%, respectively. Non-charter boats harvested 89% of the total yearly catch of yellowfin. All three categories are above their 23-year averages.

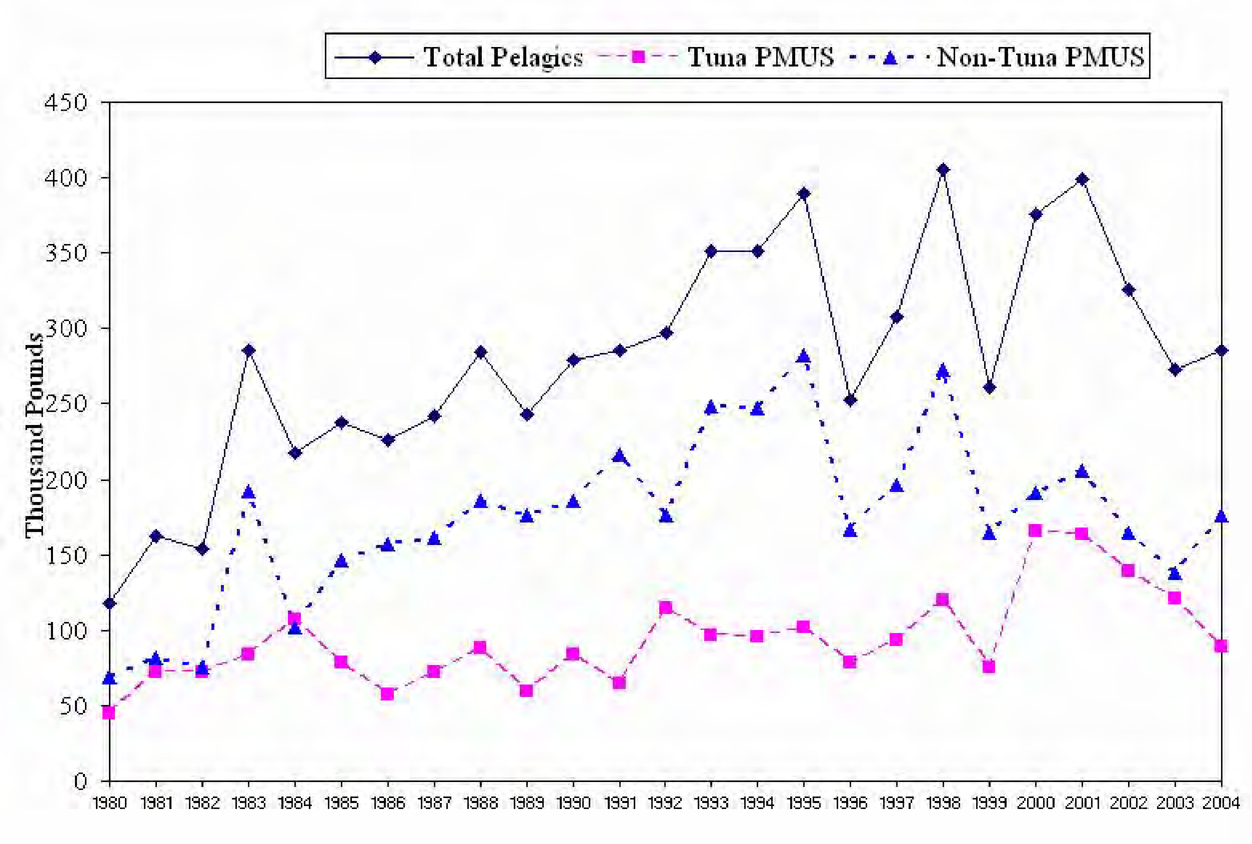
Source: The Division of Aquatic and Wildlife Resources (DAWR) offshore creel sampling program and its associated computerized data expansion system files, expanded with the assistance of NMFS.

Calculation: Totals by species are summed across all fishing methods for all years except 1992-93 as described in Figure 1.

Estimated Total Landings (Pounds)

Year	Total Yellowfin	Non-Charter	Charter
1982	112,287	110,410	1,877
1983	64,684	64,684	
1984	67,463	67,207	256
1985	91,560	85,813	5,748
1986	54,781	54,297	485
1987	39,766	37,061	2,705
1988	82,549	81,985	565
1989	39,967	39,048	920
1990	69,952	62,519	7,433
1991	44,073	41,865	2,208
1992	133,397	127,508	5,889
1993	49,973	46,053	3,920
1994	71,081	66,899	4,183
1995	93,329	83,703	9,626
1996	107,244	99,343	7,901
1997	91,455	83,982	7,474
1998	137,395	132,388	5,008
1999	126,858	121,398	5,460
2000	76,528	72,828	3,700
2001	58,446	55,208	3,238
2002	44,932	43,202	1,730
2003	67,691	64,636	3,055
2004	**102,228**	**91,180**	**11,048**
Average	79,463	75,357	4,292
Standard Deviation	29,804	28,309	3,025

Figure 5. Guam Annual Estimated Commercial Landings:
All Pelagics, Tuna PMUS, and Non-tuna PMUS



Interpretations: Commercial pelagic fishery landings have shown a general increase for the first 20 years in the 22-year time series. In 2002, the estimated commercial landings decreased overall by 17%, with a 15% decrease for tuna landings and a 20% decrease for landings of other PMUS, possibly due to direct hits by two supertyphoons, resulting in boat damage, lack of tourist for the commercial charter boats, and unavailability of ice for fishermen. A significant number of bad weather days following Supertyphoon Pongsona in December 2002 may have also affected fishing in the first quarter of 2003. In 2003, a significant number of bad weather days also occurred during creel census survey days.

The downward trend for commercial landings of all pelagics and non-tuna PMUS was reversed. Landings for all pelagics and non-tuna PMUS increased, by 4% and 27%, respectively, while commercial tuna PMUS landings decreased by 26%. All pelagics and non-tuna PMUS commercial landings were slightly above the 25-year average, while commercial tuna PMUS landings fell below the 25-year average.

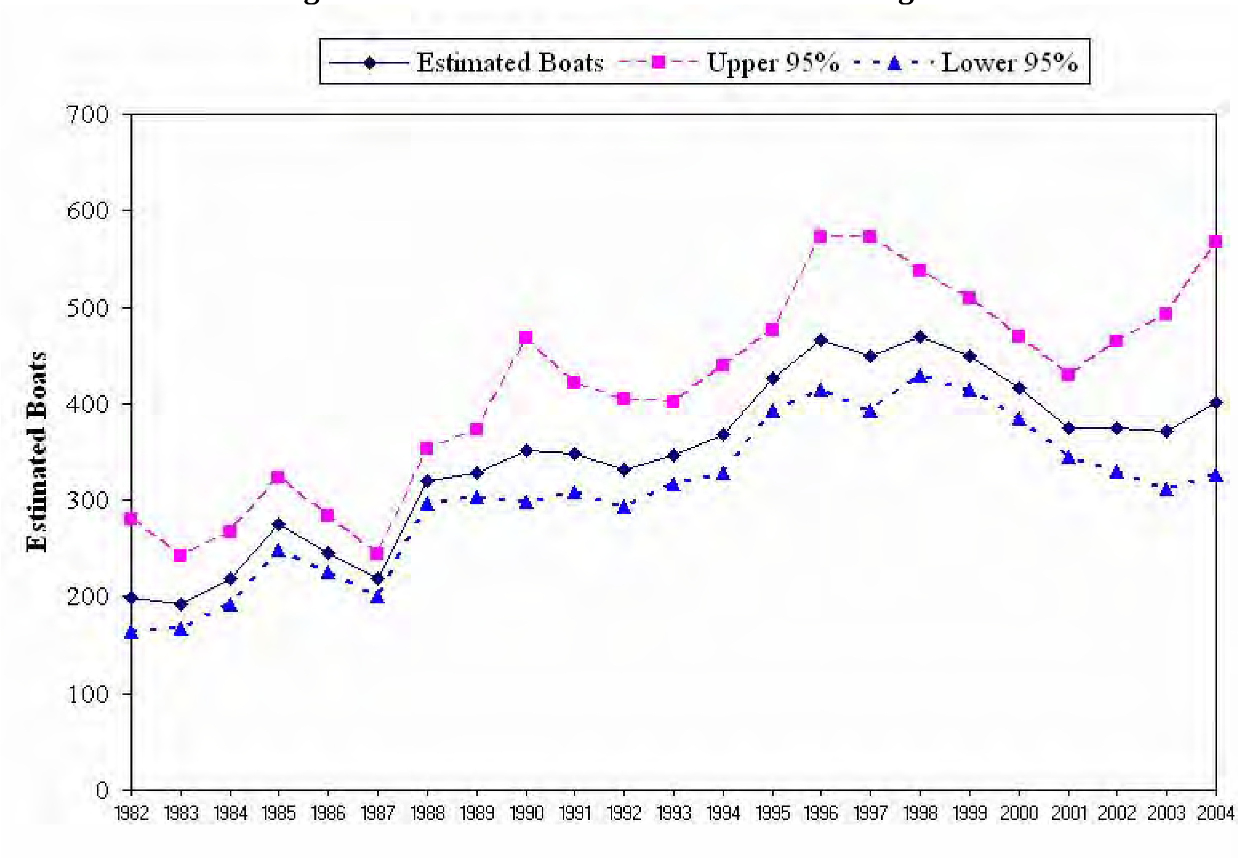
Source: The WPACFIN-sponsored commercial landings system.

Calculation: Total commercial landings were estimated by summing the weight fields in the commercial landings database from the principle fish wholesalers on Guam, and then multiplying by an estimated percent coverage expansion factor. The annual expansion factor was subjectively created based on as much information as possible depending on the year, including: an analysis of the "disposition of catch" data available from the DAWR offshore creel survey; an evaluation of the fishermen in the fishery and their entry/exit patterns; general "dock side" knowledge of the fishery and the status of the marketing conditions and structure; the overall number of records in the data base; and a certain measure of best guesses.

Estimated Commercial Landings (Pounds)

Year	All Pelagics	Tuna PMUS	Non-Tuna PMUS
1980	118,251	45,043	69,062
1981	162,186	72,229	81,808
1982	153,577	72,347	74,832
1983	285,118	83,764	191,676
1984	218,028	107,568	102,398
1985	237,695	79,028	146,477
1986	226,138	57,689	157,377
1987	242,444	72,004	161,657
1988	284,408	88,093	185,451
1989	242,554	59,825	175,667
1990	279,121	84,176	185,934
1991	285,696	64,694	216,611
1992	296,809	114,765	175,751
1993	351,201	96,289	248,070
1994	351,187	95,321	246,860
1995	389,849	102,236	282,468
1996	252,075	78,636	166,702
1997	307,754	93,825	196,324
1998	405,666	120,186	272,882
1999	260,669	75,346	164,082
2000	376,192	165,898	190,761
2001	399,471	163,369	205,648
2002	325,299	139,009	164,853
2003	272,633	121,326	138,160
2004	**285,545**	**89,479**	**175,777**
Average	280,383	93,686	175,092
Standard Deviation	74,529	30,524	55,407

Figure 6. Guam Estimated Number of Trolling Boats



Interpretations: The number of trolling boats on Guam has been steadily increasing, especially since the addition of two marinas to the offshore sampling program. There appears to be a general increase in the number of small boats participating in Guam's pelagic fishery, while the number of charter vessels has remained fairly constant for several years. In 2004, the number of trolling boats was 401, an increase of 8% over 2003.

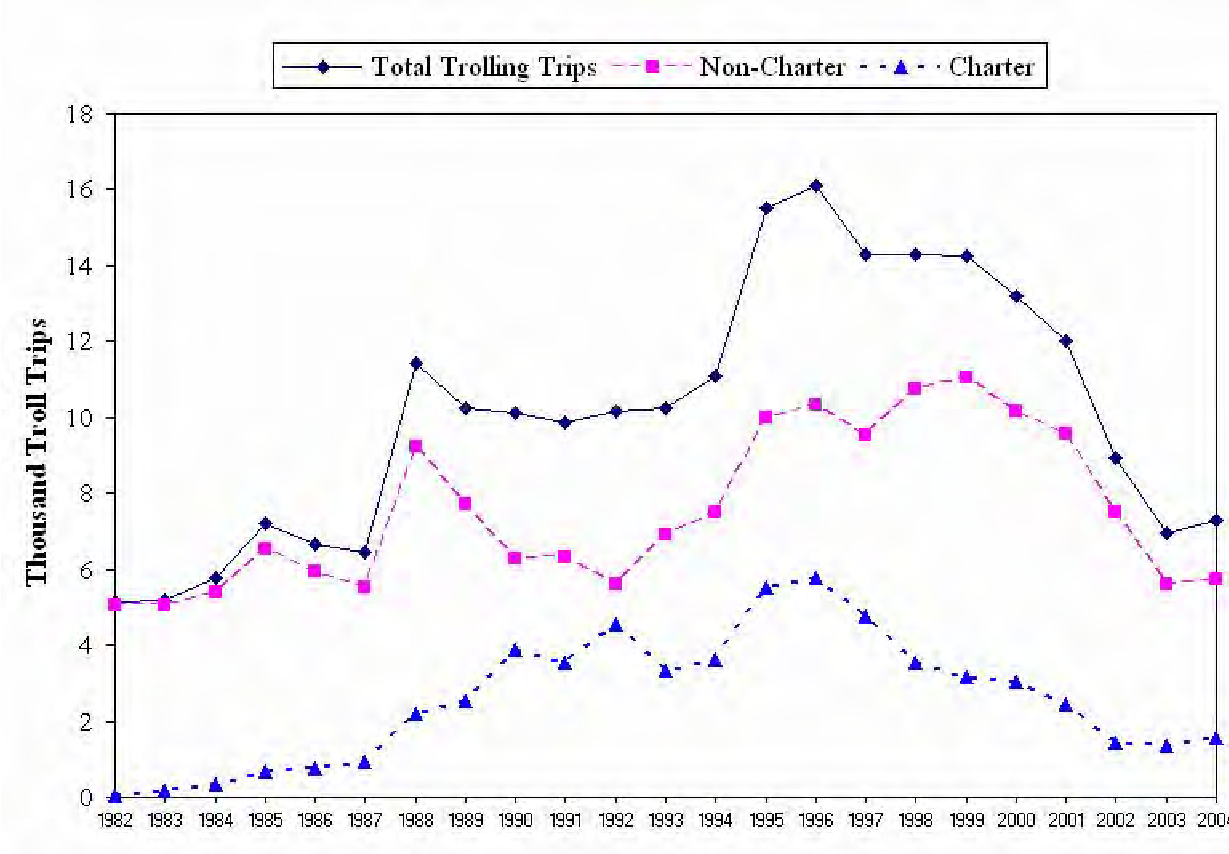
Source: The Division of Aquatic and Wildlife Resources (DAWR) offshore creel sampling program and its associated computerized data expansion system files, expanded with the assistance of NMFS.

Calculation: Since only a fraction of the days of the year are sampled, it is not possible to know the exact number of boats participating in the fishery. The 2004 trolling boat log was converted and processed through a boat estimator model 1,000 times.

Estimated Number of Trolling Boats

Year	Estimated Boat	Upper 95%	Lower 95%
1982	199	280	165
1983	193	242	168
1984	219	267	193
1985	276	323	249
1986	246	284	226
1987	219	244	201
1988	320	353	297
1989	329	374	303
1990	352	467	299
1991	349	422	309
1992	332	405	294
1993	346	401	316
1994	369	439	329
1995	427	476	393
1996	466	572	415
1997	449	572	393
1998	469	537	430
1999	449	510	415
2000	416	470	385
2001	375	429	345
2002	375	464	330
2003	371	492	312
2004	**401**	**568**	**326**

Figure 7a. Guam Annual Estimated Number of Troll Trips: Total, Non-charter, Charter



Interpretations: Non-charter and charter troll trips generally increased for the first 15 years of the 22-year time series. The number of troll trips began to decline in 1999, due to a number of factors including a continuing economic recession on the island, a decline in Asian visitors for charter boats, and an increase in cost to maintain, repair, and fuel boats for the average fishermen compared with fish caught for sale to make up for expenses. In 2002, a significant number of bad weather days and direct hits by two supertyphoons caused a significant decrease in troll trips. Limited access to the two largest public boat launching ramps during the first quarter of 2003 and a significant number of bad weather days during 2003 may have caused this decrease. In 2004, the total number of troll trips increased by 4%. The number of non-charter and charter trips increased, by 2% and 14%, respectively. Despite the increases, all three categories are well below the 23-year averages.

Source: The Division of Aquatic and Wildlife Resources (DAWR) offshore creel sampling program and its associated computerized data expansion system files.

Calculation: The data expansion system is run on a calendar year's worth of survey data to produce catch and effort estimates for each fishing method surveyed. These plots are of the estimated number of trips for the trolling method as taken directly from creel survey expansion system printouts.

Estimated Number of Trolling Trips

Year	Estimated Trips	Non-Charter	Charter
1982	5,138	5,078	60
1983	5,187	5,039	148
1984	5,763	5,411	353
1985	7,209	6,544	665
1986	6,677	5,932	744
1987	6,458	5,513	945
1988	11,412	9,221	2,192
1989	10,230	7,714	2,515
1990	10,130	6,264	3,865
1991	9,870	6,325	3,545
1992	10,165	5,614	4,551
1993	10,247	6,931	3,316
1994	11,103	7,497	3,606
1995	15,528	10,000	5,528
1996	16,098	10,317	5,781
1997	14,279	9,528	4,751
1998	14,295	10,758	3,537
1999	14,233	11,053	3,180
2000	13,204	10,152	3,052
2001	12,016	9,563	2,453
2002	8,933	7,512	1,421
2003	6,962	5,594	1,368
2004	**7,296**	**5,743**	**1,553**
Average	10,106	7,535	2,571
Standard Deviation	3,396	2,055	1,708

Figure 7b. Guam Annual Estimated Number of Troll Hours: Total, Non-charter, Charter

Interpretations: Trolling hours for non-charters and charters have generally increased over the past 20 years. Beginning in 1996, charter troll hours began to fluctuate. This corresponded to a downturn in Asian economies, which resulted in fewer charter trolling hours. After 2001, charter activity dropped off dramatically. Tourism was also down, due to the 9/11 attacks, the SARS scare, and twp typhoons striking Guam in 2002. In 2004, the number of troll hours increased for the first time since 2001. Total, non-charter, and charter totals increased by 8%, 5%, and 25%, respectively. All three totals are well below the 23-year average.

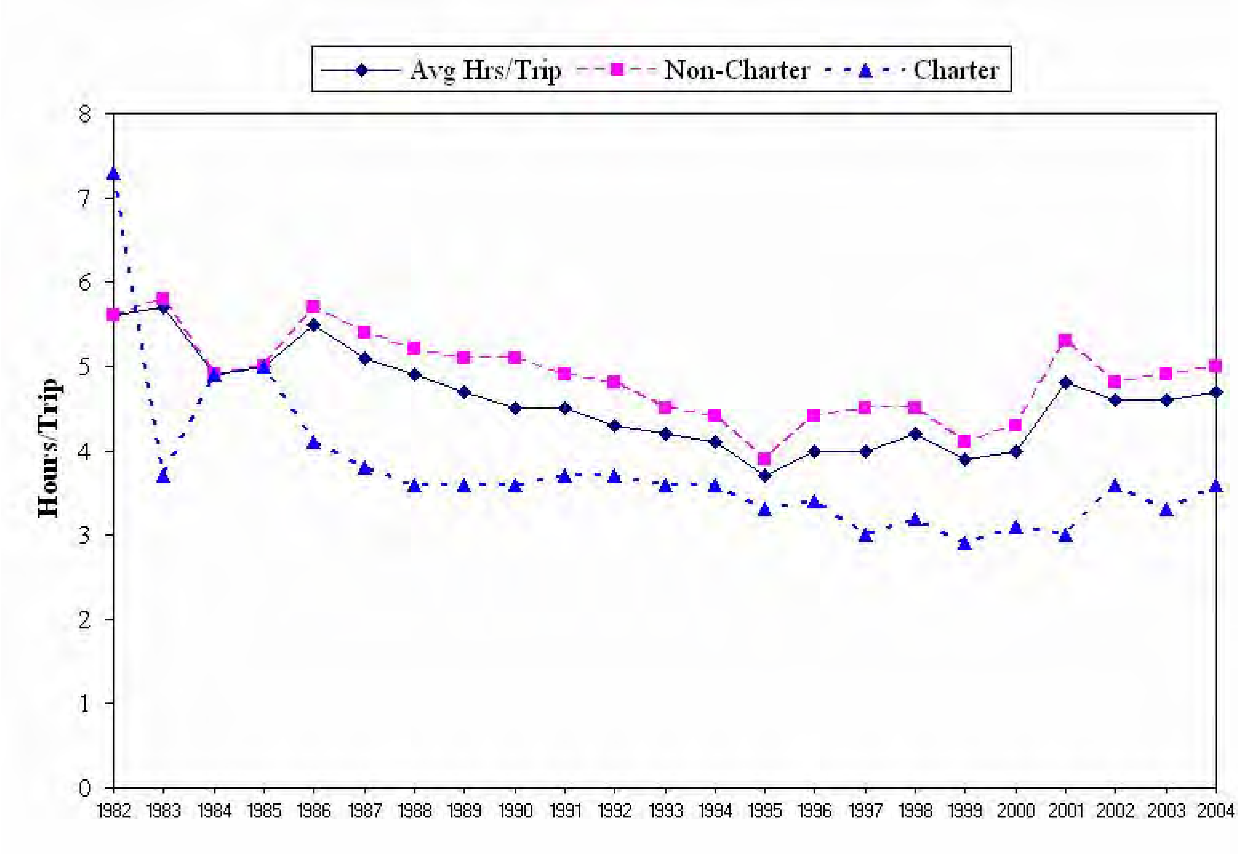
Source: The Division of Aquatic and Wildlife Resources (DAWR) offshore creel sampling program and its associated computerized data expansion system files.

Calculation: The data expansion system is run on a calendar year's worth of survey data to produce catch and effort estimates for each fishing method surveyed. These plots are of the estimated boat hours spent fishing for the trolling method as taken directly from creel survey expansion system printouts.

Estimated Number of Trolling Hours

Year	Estimated Hours	Non-Charter	Charter
1982	28,857	28,419	438
1983	29,555	29,009	546
1984	28,256	26,528	1,727
1985	35,895	32,593	3,302
1986	36,997	33,940	3,057
1987	33,187	29,605	3,582
1988	56,224	48,398	7,826
1989	48,226	39,063	9,163
1990	46,021	32,096	13,925
1991	44,151	31,016	13,135
1992	43,855	27,070	16,785
1993	43,131	31,274	11,857
1994	45,931	32,829	13,102
1995	57,626	39,284	18,342
1996	64,603	44,916	19,687
1997	56,994	42,856	14,137
1998	59,645	48,453	11,192
1999	54,991	45,685	9,305
2000	53,066	43,731	9,335
2001	57,825	50,489	7,336
2002	41,040	35,876	5,164
2003	31,834	27,380	4,454
2004	**34,565**	**28,957**	**5,608**
Average	44,890	36,064	8,826
Standard Deviation	11,158	7,827	5,661

Figure 7c. Guam Annual Estimated Trip Length:
Overall Average Hours/Trip, Non-charter, Charter



Interpretations: The overall average trolling trip increased slightly from 2003. The average trip length did not change significantly for non-charter and charter trips, increasing 2% and 10% respectively. The redeployment of fish aggregating devices (FADs) during 2003 to replace those missing during 2002 still provide charter boats and non-charter fishermen with a prescribed route for trolling activity, although many boats have been observed to be fishing banks located north and south of Guam more frequently. Overall trolling trip length appears to have remained constant throughout the 23-year time series. In 2004, all three categories show a slight increase in the number of hours per trip, increasing 2% for all trips and non-charter trips and increasing 10% for charter trips.

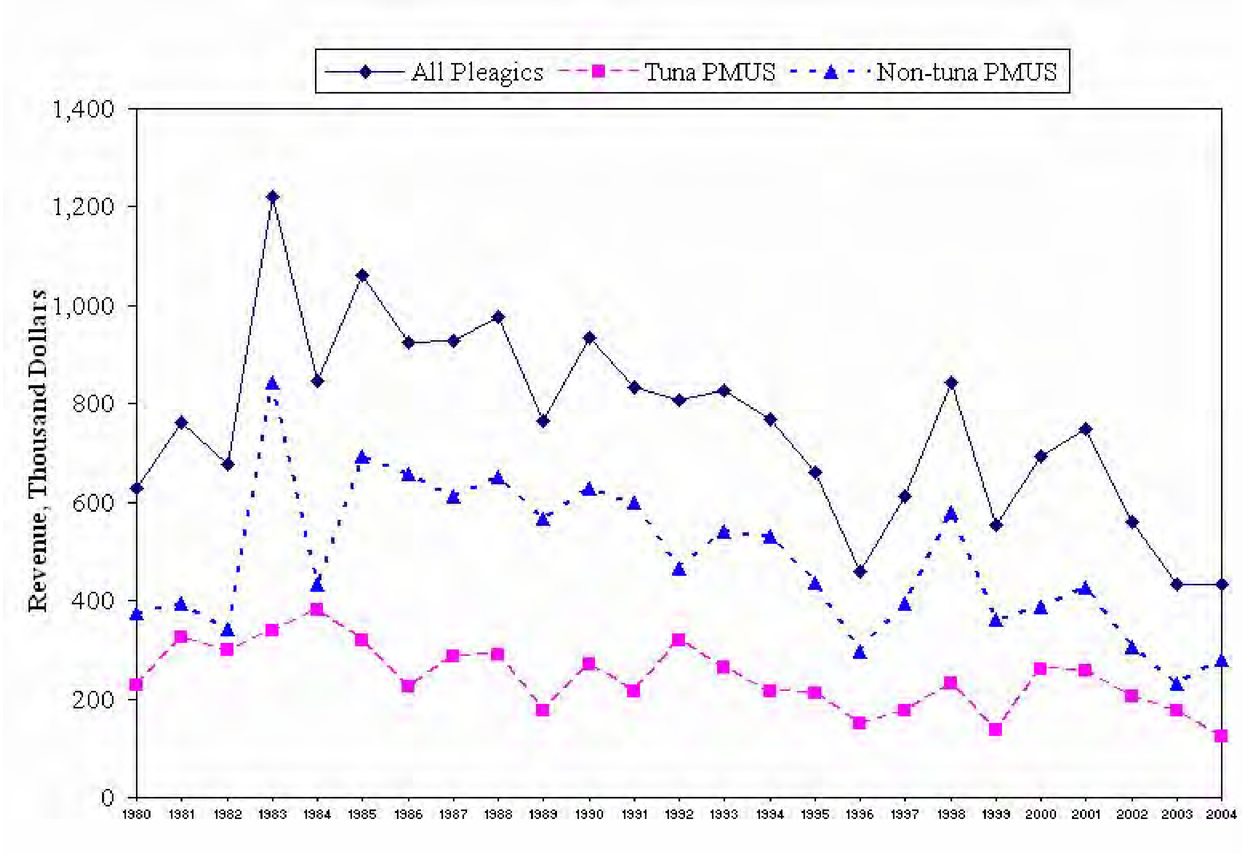
Source: The Division of Aquatic and Wildlife Resources (DAWR) offshore creel sampling program and its associated computerized data expansion system files.

Calculation: The data expansion system is run on a calendar year's worth of survey data to produce catch and effort estimates for each fishing method surveyed. These plots are of the estimated boat hours spent fishing and number of trips for the trolling method, as taken directly from creel survey, expansion system printouts.

Estimated Trip Length (Hours/trip)

Year	Average Length	Non-Charter	Charter
1982	5.6	5.6	7.3
1983	5.7	5.8	3.7
1984	4.9	4.9	4.9
1985	5.0	5.0	5.0
1986	5.5	5.7	4.1
1987	5.1	5.4	3.8
1988	4.9	5.2	3.6
1989	4.7	5.1	3.6
1990	4.5	5.1	3.6
1991	4.5	4.9	3.7
1992	4.3	4.8	3.7
1993	4.2	4.5	3.6
1994	4.1	4.4	3.6
1995	3.7	3.9	3.3
1996	4.0	4.4	3.4
1997	4.0	4.5	3.0
1998	4.2	4.5	3.2
1999	3.9	4.1	2.9
2000	4.0	4.3	3.1
2001	4.8	5.3	3.0
2002	4.6	4.8	3.6
2003	4.6	4.9	3.3
2004	**4.7**	**5.0**	**3.6**
Average	4.6	4.9	3.8
Standard Deviation	0.6	0.5	0.9

Figure 8. Guam Annual Estimated Inflation-Adjusted Commercial Revenues: All Pelagics, Tuna PMUS, and Non-tuna PMUS



Interpretations: The estimated inflation-adjusted commercial revenues for 2004 decreased 30% for tuna PMUS, and increased for total and for non-tuna PMUS, <1% and 20%, respectively. Overall, commercial revenues have shown a slow decrease since the early 1980's. This trend slowed in 2004, but all three adjusted revenue categories are still well below the 25-year averages.

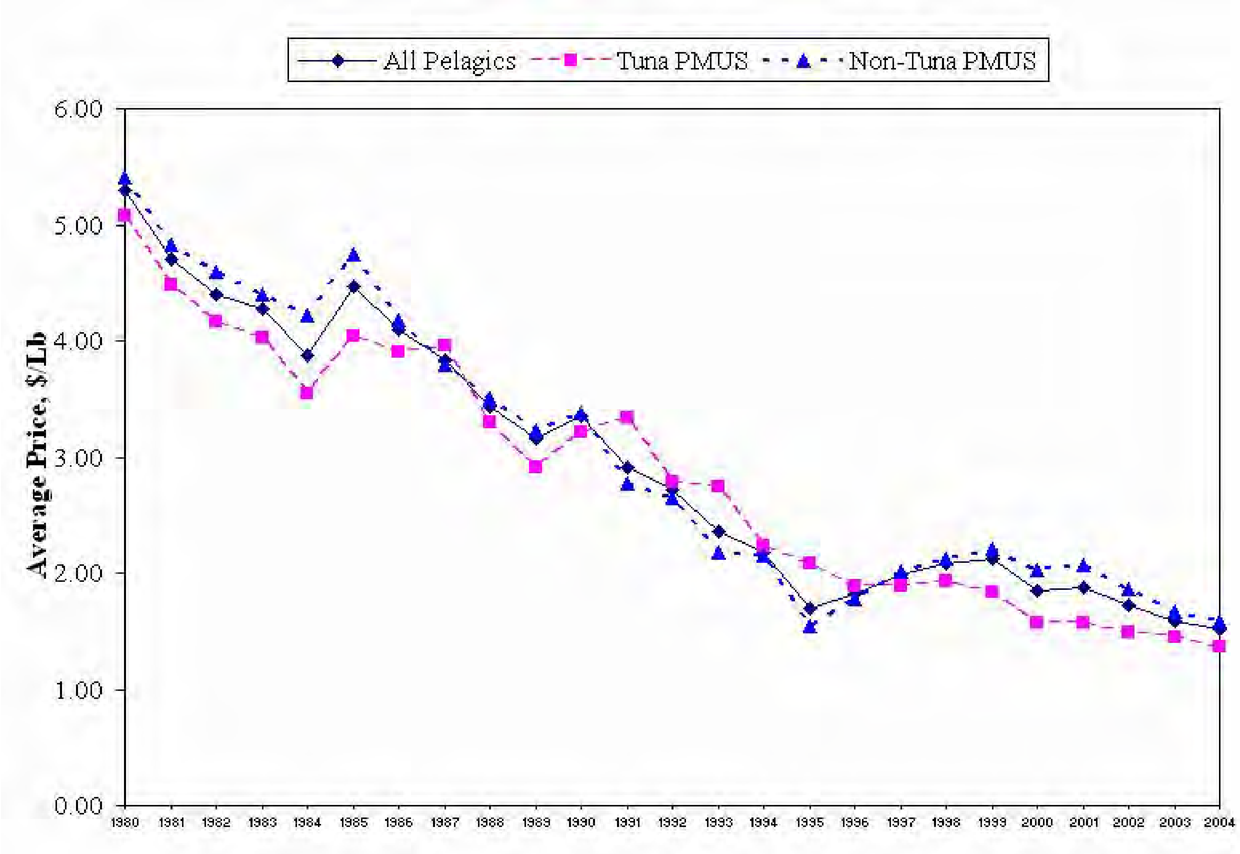
Source: The WPACFIN-sponsored commercial landings system.

Calculation: Commercial revenues were estimated by summing the revenue fields in the commercial landings database from the principle fish wholesalers on Guam, and then multiplying by the same percent coverage expansion factor, as in figure 5. Inflation-adjusted total revenue per trip is derived from the Guam Annual Consumer Price Index (CPI).

Inflation-Adjusted Commercial Revenues ($)

Year	All Pelagics		Tuna PMUS		Non-Tuna PMUS	
	Unadjusted	Adjusted	Unadjusted	Adjusted	Unadjusted	Adjusted
1980	149,124	626,767	54,353	228,444	88,775	373,123
1981	218,384	761,943	92,914	324,178	113,212	394,998
1982	203,847	676,569	90,719	301,096	103,459	343,380
1983	380,231	1,219,399	105,308	337,723	262,817	842,854
1984	286,490	845,145	129,389	381,698	146,339	431,701
1985	373,796	1,061,579	112,286	318,891	244,423	694,162
1986	334,955	926,151	81,299	224,793	237,826	657,589
1987	350,828	928,992	107,642	285,036	231,451	612,881
1988	388,630	977,792	115,243	289,952	258,203	649,640
1989	337,586	765,982	76,865	174,408	249,421	565,935
1990	471,241	935,886	136,321	270,733	316,491	628,551
1991	462,191	832,867	119,640	215,592	333,096	600,239
1992	492,707	806,069	195,547	319,914	284,546	465,518
1993	547,835	827,231	175,360	264,794	358,592	541,474
1994	593,838	767,239	165,296	213,562	411,832	532,087
1995	537,889	659,452	173,629	212,870	356,256	436,770
1996	392,442	458,373	127,375	148,774	254,063	296,746
1997	534,352	612,368	154,819	177,422	344,972	395,338
1998	733,101	844,532	201,639	232,288	502,801	579,227
1999	489,605	553,743	122,023	138,008	319,342	361,176
2000	626,803	694,497	234,735	260,087	349,312	387,038
2001	667,648	750,436	228,652	257,004	379,174	426,191
2002	500,777	558,867	184,705	206,131	274,929	306,821
2003	399,989	431,988	163,423	176,497	214,143	231,275
2004	**433,911**	**433,911**	**122,098**	**122,098**	**278,721**	**278,721**
Average	436,328	758,311	138,851	243,280	276,568	481,337
Standard Deviation	143,396	194,914	47,373	67,095	97,651	152,234

Figure 9. Guam Annual Estimated Inflation-Adjusted Average Prices: All Pelagics, Tuna PMUS, and Non-tuna PMUS



Interpretations: The inflation-adjusted price of tuna and other non-tuna PMUS has shown a dramatic decline since data on the pelagic fishery was first collected in 1980. The adjusted price for all pelagics, tuna PMUS, and non-tuna PMUS decreased 3%, 6%, and 4% respectively in 2004. Locally caught pelagic fish continues to have to compete with cheaper pelagic fish caught by longliners. These are as value-added products sold at several supermarkets and roadside vendors.

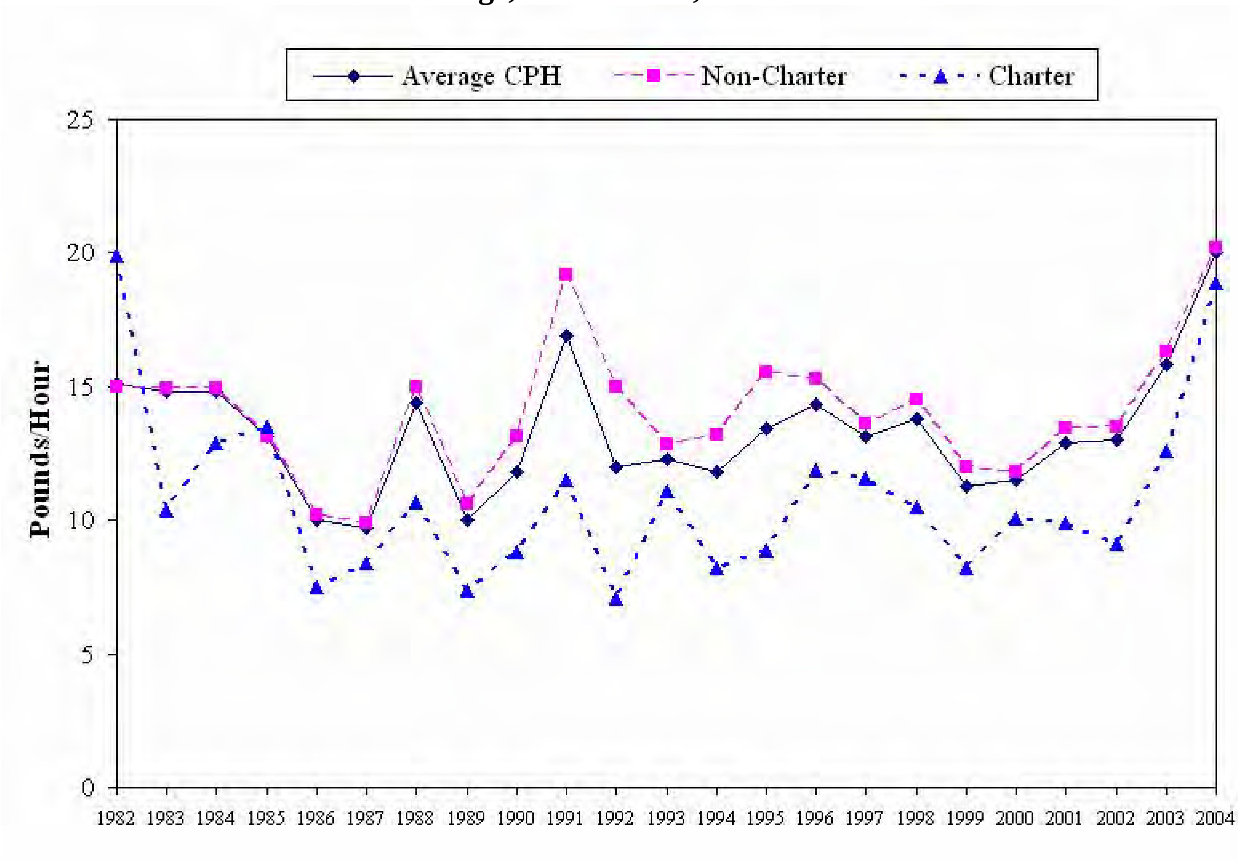
Source: The WPACFIN-sponsored commercial landings system.

Calculation: The average price of the Tunas and other PMUS groups are calculated by dividing the total revenue for each by the sold weight. The inflation adjustment is made by using the Consumer Price Index (CPI) for Guam and establishing the current year figure as the base from which to calculate expansion factors for all previous years (e.g., divide the current year CPI by the CPI of any given year), and then multiplying that factor by the unadjusted average price for the given year.

Inflation-Adjusted Average Price ($/Pounds)

Year	All Pelagics		Tuna PMUS		Non-Tuna PMUS	
	Unadjusted	Adjusted	Unadjusted	Adjusted	Unadjusted	Adjusted
1980	1.26	5.30	1.21	5.07	1.29	5.40
1981	1.35	4.70	1.29	4.49	1.38	4.83
1982	1.33	4.41	1.25	4.16	1.38	4.59
1983	1.33	4.28	1.26	4.03	1.37	4.40
1984	1.31	3.88	1.20	3.55	1.43	4.22
1985	1.57	4.47	1.42	4.04	1.67	4.74
1986	1.48	4.10	1.41	3.90	1.51	4.18
1987	1.45	3.83	1.49	3.96	1.43	3.79
1988	1.37	3.44	1.31	3.29	1.39	3.50
1989	1.39	3.16	1.28	2.92	1.42	3.22
1990	1.69	3.35	1.62	3.22	1.70	3.38
1991	1.62	2.92	1.85	3.33	1.54	2.77
1992	1.66	2.72	1.70	2.79	1.62	2.65
1993	1.56	2.36	1.82	2.75	1.45	2.18
1994	1.69	2.18	1.73	2.24	1.67	2.16
1995	1.38	1.69	1.70	2.08	1.26	1.55
1996	1.56	1.82	1.62	1.89	1.52	1.78
1997	1.74	1.99	1.65	1.89	1.76	2.01
1998	1.81	2.08	1.68	1.93	1.84	2.12
1999	1.88	2.12	1.62	1.83	1.95	2.20
2000	1.67	1.85	1.41	1.57	1.83	2.03
2001	1.67	1.88	1.40	1.57	1.84	2.07
2002	1.54	1.72	1.33	1.48	1.67	1.86
2003	1.47	1.58	1.35	1.45	1.55	1.67
2004	**1.52**	**1.52**	**1.36**	**1.36**	**1.59**	**1.59**
Average	1.53	2.93	1.48	2.83	1.56	3.00
Standard Deviation	0.17	1.16	0.20	1.11	0.19	1.21

Figure 10a. Guam Trolling CPUE (Pounds/Hour): Average, Non-charter, and Charter



Interpretations: The fluctuations in CPUE are probably due to variability in the year-to-year abundance and availability of the stocks. However, since it is not possible to allocate species-specific effort, effort used to target other species can also result in artificially high or low catch rates for a given species. This is especially true with charter boats targeting blue marlin during the summer months. In 2004, total overall, non-charter, and charter trolling catch rate increased 26%, 23%, and 50%, respectively. Charter catch rates have generally been lower than catch rates of non-charter boats, probably due to their shorter fishing time, and non-charter boats beginning earlier in the morning and ending as late as early evening.

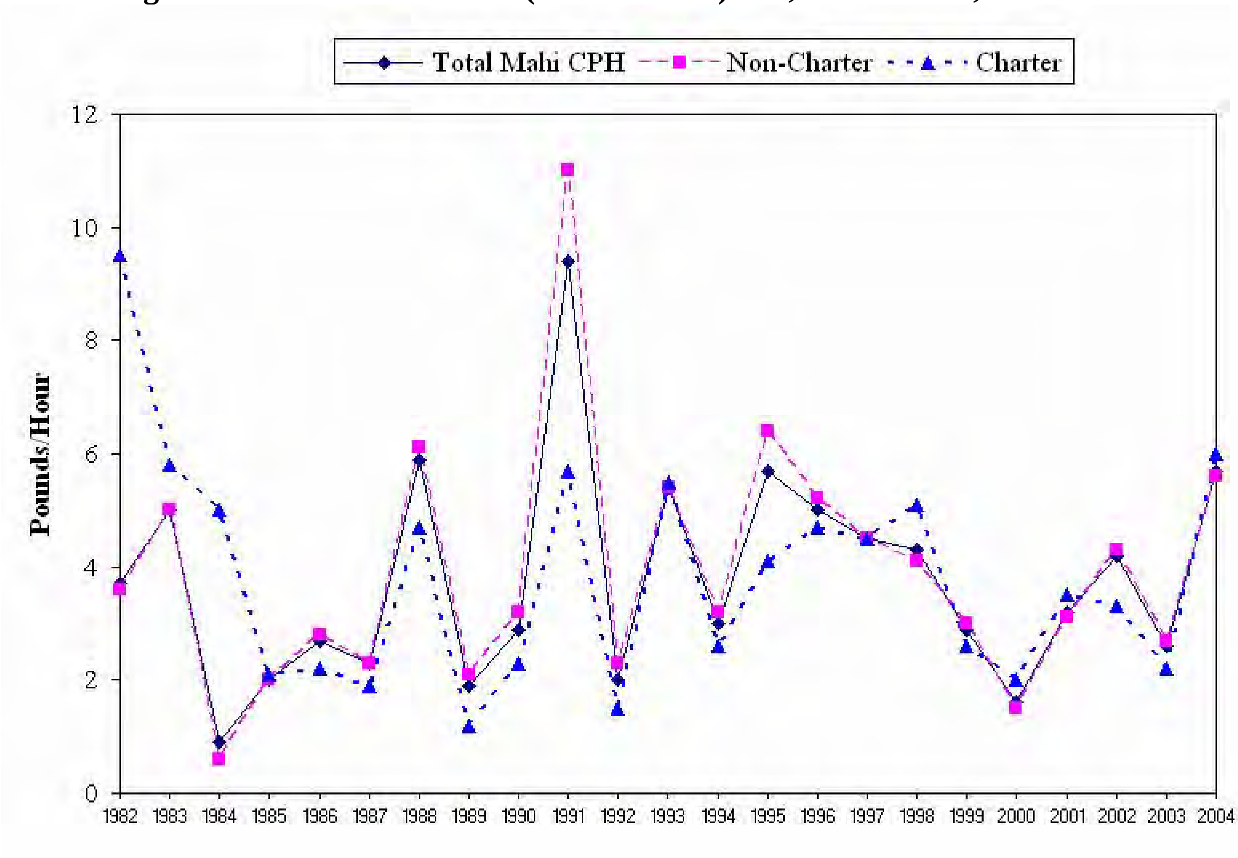
Source: The Division of Aquatic and Wildlife Resources (DAWR) offshore creel sampling program and its associated computerized data expansion system files.

Calculation: The data expansion system is run on a calendar year's worth of survey data to produce catch and effort estimates for each fishing method. This plot and table of catch per unit of effort (CPUE) are based on the total annual landings of all troll catch, divided by the total number of hours spent fishing (gear in use).

Trolling Catch Rates (Pounds/Hour):

Year	Catch Rate	Non-Charter	Charter
1982	15.1	15.0	19.9
1983	14.8	14.9	10.4
1984	14.8	14.9	12.9
1985	13.1	13.1	13.5
1986	10.0	10.2	7.5
1987	9.7	9.9	8.4
1988	14.4	15.0	10.7
1989	10.0	10.6	7.4
1990	11.8	13.1	8.8
1991	16.9	19.2	11.5
1992	12.0	15.0	7.1
1993	12.3	12.8	11.1
1994	11.8	13.2	8.2
1995	13.4	15.5	8.9
1996	14.3	15.3	11.9
1997	13.1	13.6	11.6
1998	13.8	14.5	10.5
1999	11.3	12.0	8.2
2000	11.5	11.8	10.1
2001	12.9	13.4	9.9
2002	13.0	13.5	9.1
2003	15.8	16.3	12.6
2004	**20.0**	**20.2**	**18.9**
Average	13.3	14.0	10.8
Standard Deviation	2.4	2.5	3.3

Figure 10b. Mahimahi CPUE (Pounds/Hour): All, Non-charter, and Charter



Interpretations: The wide fluctuations in mahimahi CPUE values are probably due to the high variability in the year-to-year abundance and availability of the stocks. It is not possible to allocate species-specific effort one particular species; effort used to target other species can result in artificially high or low catch rates for a given species. In 2004, the catch rate for total, non-charter, and charter mahimahi all increased significantly, increasing 119%, 107%, and 172% respectively. All three categories were well above their 23-year averages.

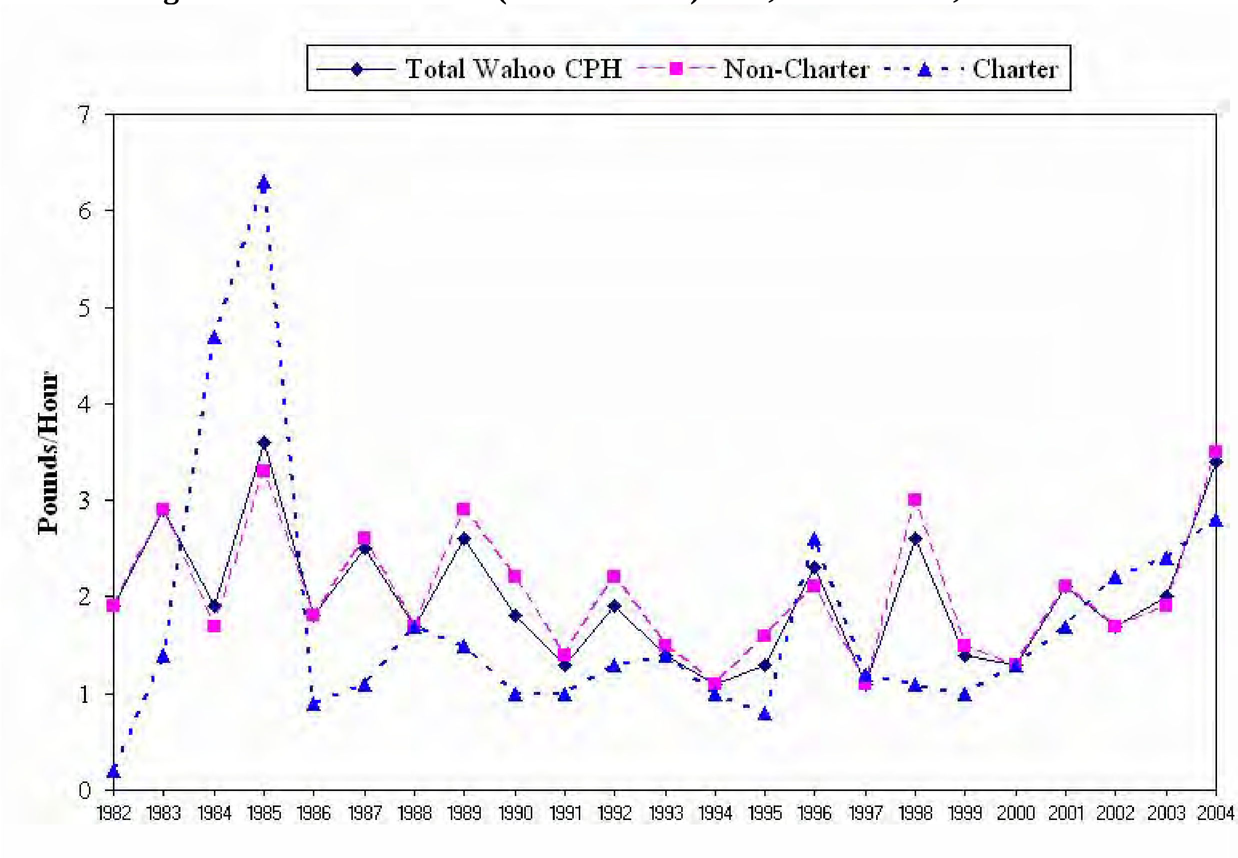
Source: The Division of Aquatic and Wildlife Resources (DAWR) offshore creel sampling program and its associated computerized data expansion system files.

Calculation: The data expansion system is run on a calendar year's worth of survey data to produce catch and effort estimates for each fishing method. This plot and table of catch per unit of effort (CPUE) are based on the total annual landings of mahimahi divided by the total number of hours spent fishing (gear in use).

Trolling Catch Rates (Pounds/Hour)

Year	Total Mahimahi	Non-Charter	Charter
1982	3.7	3.6	9.5
1983	5.0	5.0	5.8
1984	0.9	0.6	5.0
1985	2.0	2.0	2.1
1986	2.7	2.8	2.2
1987	2.3	2.3	1.9
1988	5.9	6.1	4.7
1989	1.9	2.1	1.2
1990	2.9	3.2	2.3
1991	9.4	11.0	5.7
1992	2.0	2.3	1.5
1993	5.4	5.4	5.5
1994	3.0	3.2	2.6
1995	5.7	6.4	4.1
1996	5.0	5.2	4.7
1997	4.5	4.5	4.5
1998	4.3	4.1	5.1
1999	2.9	3.0	2.6
2000	1.6	1.5	2.0
2001	3.2	3.1	3.5
2002	4.2	4.3	3.3
2003	2.6	2.7	2.2
2004	**5.7**	**5.6**	**6.0**
Average	3.8	3.9	3.8
Standard Deviation	1.9	2.2	2.0

Figure 10c. Wahoo CPUE (Pounds/Hour): All, Non-charter, and Charter



Interpretations: The wide fluctuations in CPUE are probably due to the high variability in the year-to-year abundance and availability of the stocks. However, it is not possible to allocate species-specific effort, since effort used to target other species can result in artificially high or low catch rates for a given species. In 2004, the total non-charter, and charter catch rates for wahoo all increased, increasing, 70%, 84%, and 16% respectively. All three categories are above their 23-year averages.

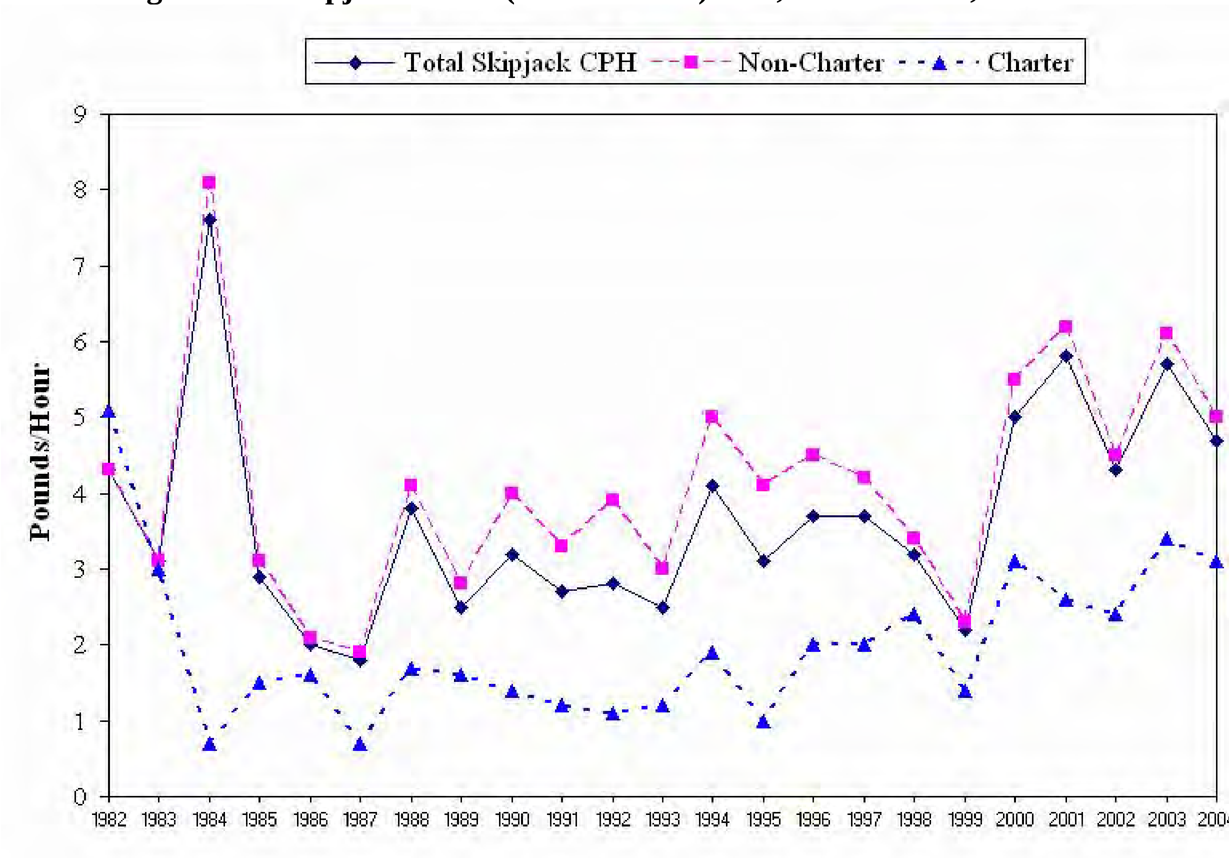
Source: The Division of Aquatic and Wildlife Resources (DAWR) offshore creel sampling program and its associated computerized data expansion system files.

Calculation: The data expansion system is run on a calendar year's worth of survey data to produce catch and effort estimates for each fishing method. This plot and table of catch per unit of effort (CPUE) are based on the total annual landings of wahoo divided by the total number of hours spent fishing (gear in use).

Trolling Catch Rates (Pounds/Hour)

Year	Total Wahoo	Non-Charter	Charter
1982	1.9	1.9	0.2
1983	2.9	2.9	1.4
1984	1.9	1.7	4.7
1985	3.6	3.3	6.3
1986	1.8	1.8	0.9
1987	2.5	2.6	1.1
1988	1.7	1.7	1.7
1989	2.6	2.9	1.5
1990	1.8	2.2	1.0
1991	1.3	1.4	1.0
1992	1.9	2.2	1.3
1993	1.4	1.5	1.4
1994	1.1	1.1	1.0
1995	1.3	1.6	0.8
1996	2.3	2.1	2.6
1997	1.1	1.1	1.2
1998	2.6	3.0	1.1
1999	1.4	1.5	1.0
2000	1.3	1.3	1.3
2001	2.1	2.1	1.7
2002	1.7	1.7	2.2
2003	2.0	1.9	2.4
2004	**3.4**	**3.5**	**2.8**
Average	2.0	2.0	1.8
Standard Deviation	0.7	0.7	1.3

Figure 11a. Skipjack CPUE (Pounds/Hour): All, Non-Charter, and Charter



Interpretations: The wide fluctuations in CPUE for skipjack tuna are probably due to the high variability in the year-to-year abundance and availability of the stocks, although skipjack tuna is caught year round. However, it is not possible to allocate species-specific effort, since effort used to target other species can result in an artificially high or low catch rate for a given species. In 2004, the catch rates for total, non-charter, and charter skipjack tuna decreased 17%, 18%, and 8% respectively. Despite these drops, all three categories were still above their 23-year averages.

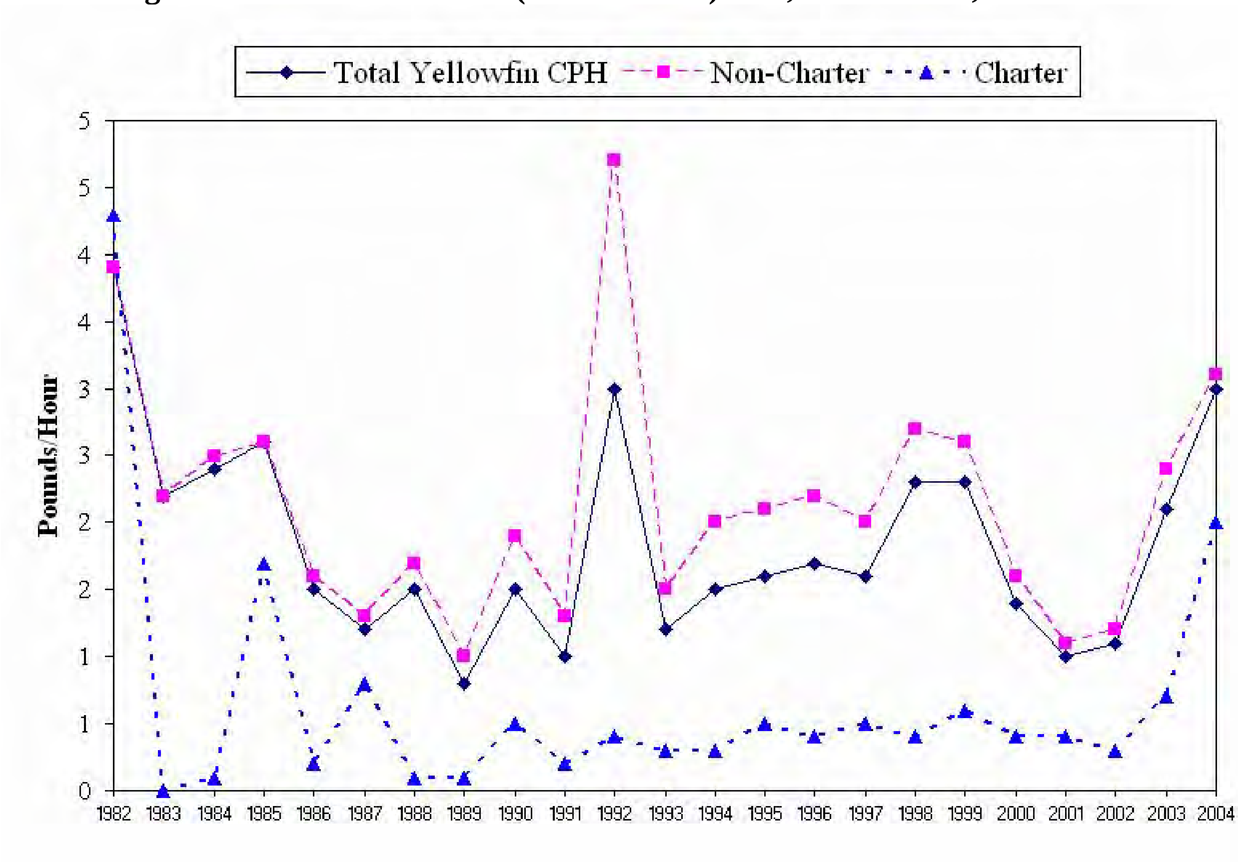
Source: The Division of Aquatic and Wildlife Resources (DAWR) offshore creel sampling program and its associated computerized data expansion system files, expanded with the assistance of NMFS.

Calculation: The data expansion system is run on a calendar year's worth of survey data to produce catch and effort estimates for each fishing method surveyed. This plot and table of catch per unit of effort (CPUE) are based on the total annual landings of skipjack divided by the total number of hours spent fishing (gear in use).

Trolling Catch Rates (Pounds/Hour)

Year	Total Skipjack	Non-Charter	Charter
1982	4.3	4.3	5.1
1983	3.1	3.1	3.0
1984	7.6	8.1	0.7
1985	2.9	3.1	1.5
1986	2.0	2.1	1.6
1987	1.8	1.9	0.7
1988	3.8	4.1	1.7
1989	2.5	2.8	1.6
1990	3.2	4.0	1.4
1991	2.7	3.3	1.2
1992	2.8	3.9	1.1
1993	2.5	3.0	1.2
1994	4.1	5.0	1.9
1995	3.1	4.1	1.0
1996	3.7	4.5	2.0
1997	3.7	4.2	2.0
1998	3.2	3.4	2.4
1999	2.2	2.3	1.4
2000	5.0	5.5	3.1
2001	5.8	6.2	2.6
2002	4.3	4.5	2.4
2003	5.7	6.1	3.4
2004	**4.7**	**5.0**	**3.1**
Average	3.7	4.1	2.0
Standard Deviation	1.4	1.5	1.0

Figure 11b. Yellowfin CPUE (Pounds/Hour): All, Non-charter, and Charter



Interpretations: The wide fluctuations in CPUE for yellowfin tunas are probably due to the high variability in the year-to-year abundance and availability of the stocks. It is not possible to allocate species-specific effort, since effort used to target other species can also result in an artificially high or low catch rate for a given species. In 2004, the yellowfin catch rates for total, non-charter, and charter catch increased 42%, 29%, and 185% respectively. All three categories are above their 23-year averages.

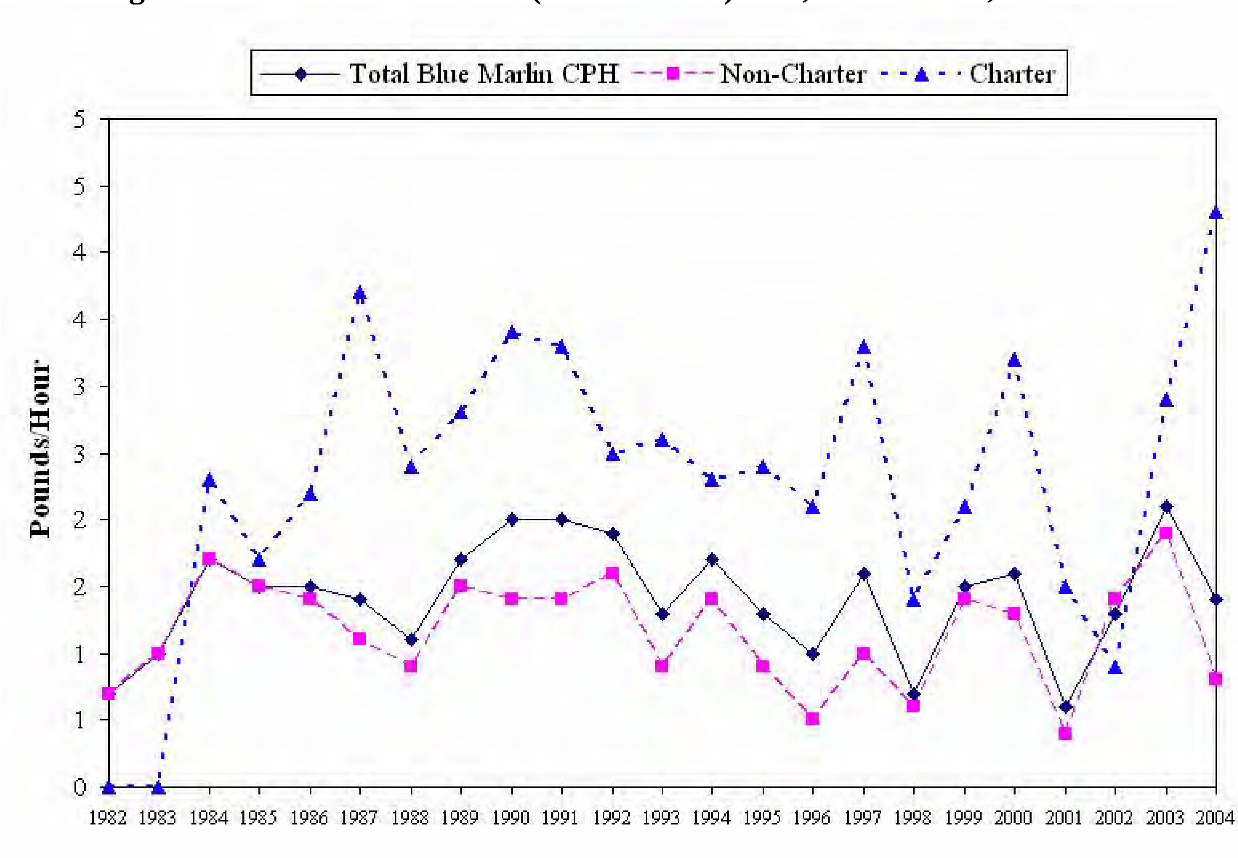
Source: The Division of Aquatic and Wildlife Resources (DAWR) offshore creel sampling program and its associated computerized data expansion system files, expanded with the assistance of NMFS.

Calculation: The data expansion system is run on a calendar year's worth of survey data to produce catch and effort estimates for each fishing method surveyed. This plot and table of catch per unit of effort (CPUE) are based on the total annual landings of Yellowfin divided by the total number of hours spent fishing (gear in use).

Trolling Catch Rates (Pounds/Hour)

Year	Total Yellowfin	Non-Charter	Charter
1982	3.9	3.9	4.3
1983	2.2	2.2	0.0
1984	2.4	2.5	0.1
1985	2.6	2.6	1.7
1986	1.5	1.6	0.2
1987	1.2	1.3	0.8
1988	1.5	1.7	0.1
1989	0.8	1.0	0.1
1990	1.5	1.9	0.5
1991	1.0	1.3	0.2
1992	3.0	4.7	0.4
1993	1.2	1.5	0.3
1994	1.5	2.0	0.3
1995	1.6	2.1	0.5
1996	1.7	2.2	0.4
1997	1.6	2.0	0.5
1998	2.3	2.7	0.4
1999	2.3	2.6	0.6
2000	1.4	1.6	0.4
2001	1.0	1.1	0.4
2002	1.1	1.2	0.3
2003	2.1	2.4	0.7
2004	**3.0**	**3.1**	**2.0**
Average	1.8	2.1	0.7
Standard Deviation	0.8	0.9	0.9

Figure 11c. Blue Marlin CPUE (Pounds/Hour): All, Non-charter, and Charter



Interpretations: The wide fluctuations in CPUE are probably due to the high variability in the year-to-year abundance and availability of the stocks. Since it is not possible to allocate species-specific effort, effort used to target other species can also result in an artificially high or low catch rate for a given species. The 2004 blue marlin catch rates decreased for total and non-charter by 33% and 60%, respectively. Charter blue marlin catch increased by 48%. The total was on the 23-year average, while the non-charter was below and the charter was above their 23-year averages.

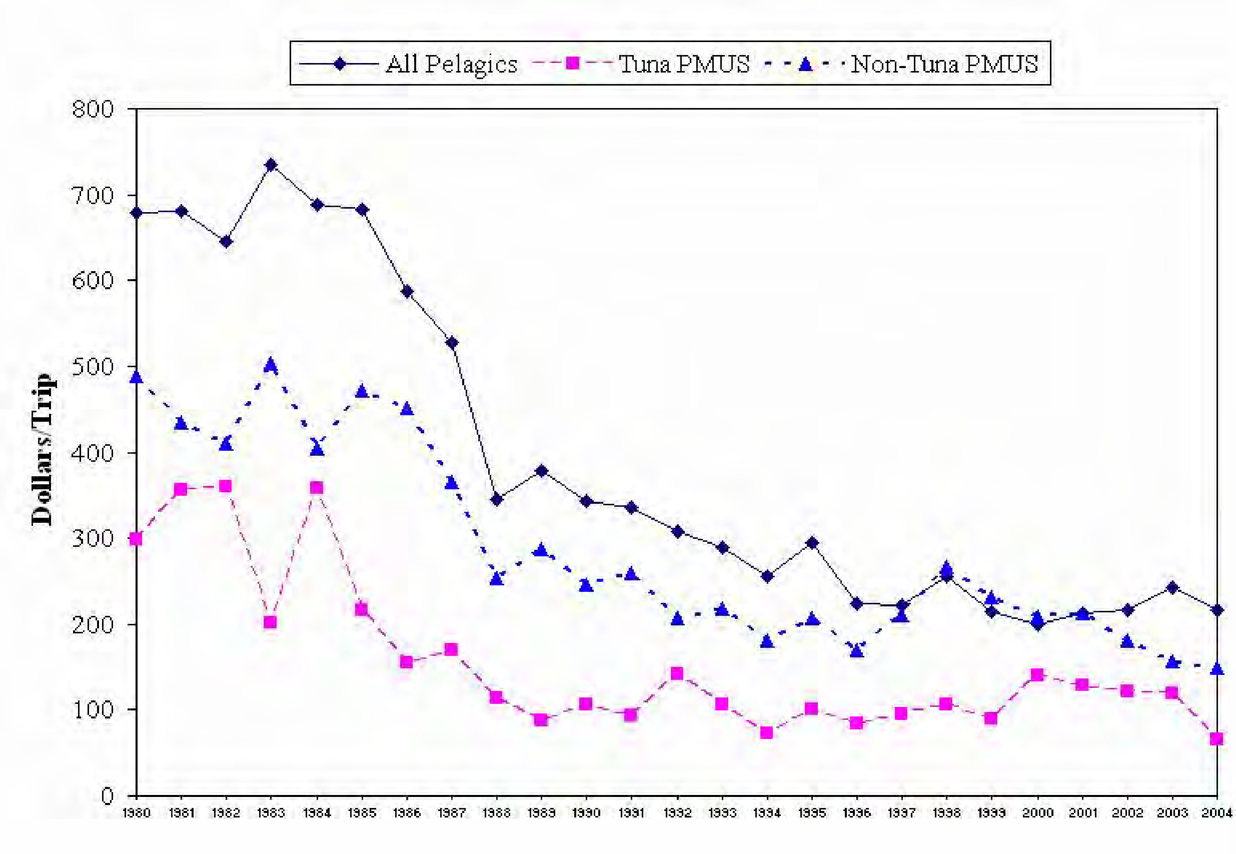
Source: The Division of Aquatic and Wildlife Resources (DAWR) offshore creel sampling program and its associated computerized data expansion system files, expanded with the assistance of NMFS.

Calculation: The data expansion system is run on a calendar year's worth of survey data to produce catch and effort estimates for each fishing method surveyed. This plot and table of catch per unit of effort (CPUE) are based on the total annual landings of marlin divided by the total number of hours spent fishing (gear in use).

Trolling Catch Rates (Pounds/Hour)

Year	Total Blue Marlin	Non-Charter	Charter
1982	0.7	0.7	
1983	1.0	1.0	
1984	1.7	1.7	2.3
1985	1.5	1.5	1.7
1986	1.5	1.4	2.2
1987	1.4	1.1	3.7
1988	1.1	0.9	2.4
1989	1.7	1.5	2.8
1990	2.0	1.4	3.4
1991	2.0	1.4	3.3
1992	1.9	1.6	2.5
1993	1.3	0.9	2.6
1994	1.7	1.4	2.3
1995	1.3	0.9	2.4
1996	1.0	0.5	2.1
1997	1.6	1.0	3.3
1998	0.7	0.6	1.4
1999	1.5	1.4	2.1
2000	1.6	1.3	3.2
2001	0.6	0.4	1.5
2002	1.3	1.4	0.9
2003	2.1	1.9	2.9
2004	**1.4**	**0.8**	**4.3**
Average	1.4	1.2	2.5
Standard Deviation	0.4	0.4	0.8

Figure 12. Guam Annual Estimated Inflation-Adjusted Revenue per Trolling Trip: All Pelagics, Tuna PMUS, and Non-tuna PMUS



Interpretation: There has been a general decrease from 1980 in the adjusted revenues per trolling trip for all pelagics, tunas and other PMUS, although the revenue values have remained fairly constant for past 7 years. In 2004, the adjusted revenue per trip decreased for all pelagics, for tuna PMUS, and for non-tuna PMUS, by 10%, 45%, and 4%, respectively. Despite continual declines in revenues, trolling effort still occurs since most charter and non-charter trolling boats do not rely on selling fish caught as their primary source of income and a reliable market exists for members of the local fishermen's cooperative which provides additional income.

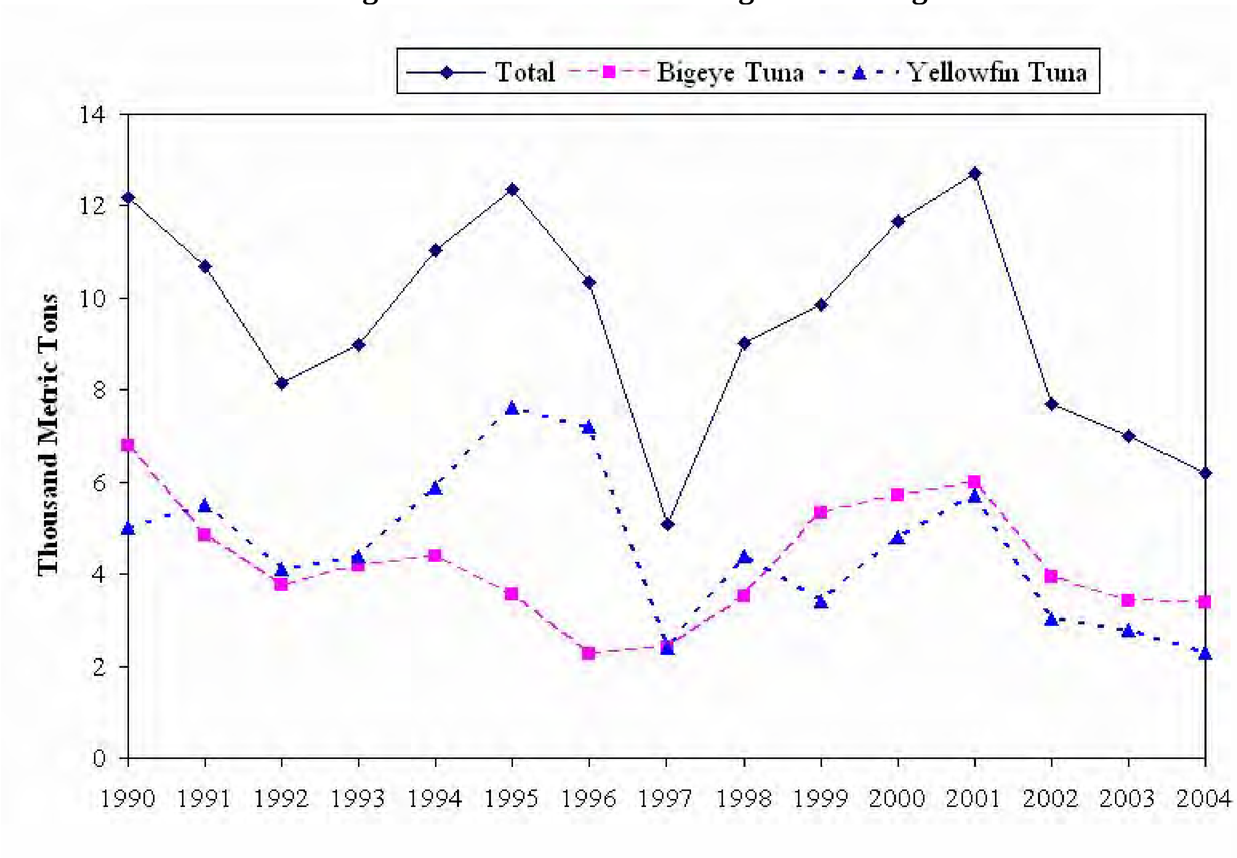
Source: The WPacFIN-sponsored commercial landings system.

Calculation: The average revenue per trip was calculated by summing the revenue of all species sold then dividing by the number of trips, and summing the revenue of tunas and other PMUS sold, and then dividing each by the number of trips, respectively, for any trip, which landed PMUS. Adjusted revenue per trip was derived from the Guam Annual Consumer Price Index (CPI).

Inflation-Adjusted Revenues per Trolling Trip ($/Trip)

Year	All Pelagics		Tuna PMUS		Non-Tuna PMUS	
	Unadjusted	Adjusted	Unadjusted	Adjusted	Unadjusted	Adjusted
1980	161.31	677.99	71.14	299.00	116.20	488.39
1981	195.29	681.37	102.24	356.72	124.58	434.66
1982	194.29	644.85	108.45	359.95	123.68	410.49
1983	229.26	735.24	62.81	201.43	156.75	502.70
1984	233.01	687.38	121.56	358.60	137.48	405.57
1985	240.34	682.57	76.21	216.44	165.90	471.16
1986	212.25	586.87	55.68	153.96	162.89	450.39
1987	199.18	527.43	64.07	169.66	137.77	364.81
1988	137.30	345.45	44.98	113.17	100.78	253.56
1989	166.79	378.45	38.89	88.24	126.20	286.35
1990	172.68	342.94	53.19	105.64	123.50	245.27
1991	185.96	335.10	51.79	93.33	144.20	259.85
1992	188.33	308.11	86.72	141.87	126.18	206.43
1993	191.92	289.80	70.60	106.61	144.36	217.98
1994	197.09	254.64	56.32	72.77	140.32	181.29
1995	239.79	293.98	82.55	101.21	169.38	207.66
1996	191.10	223.20	72.55	84.74	144.71	169.02
1997	192.95	221.12	82.74	94.82	184.35	211.27
1998	221.01	254.60	92.81	106.92	231.44	266.62
1999	190.05	214.95	78.35	88.61	205.04	231.90
2000	179.42	198.80	127.01	140.73	189.00	209.41
2001	188.68	212.08	113.92	128.05	188.92	212.35
2002	193.42	215.86	109.41	122.10	162.85	181.74
2003	223.73	241.63	110.95	119.83	145.38	157.01
2004	**215.73**	**215.73**	**65.56**	**65.56**	**149.66**	**149.66**
Average	197.64	390.80	80.02	155.60	152.06	287.02
Standard Deviation	24.98	192.73	25.02	91.78	30.30	115.24

Figure 13. Annual Guam Longline Landings



Interpretation: Annual landings from a primarily foreign longline fishing fleet have ranged from a low of 5,093 metric tons in 1997 to a high of 12,627 metric tons in 2001. These vessels fish primarily outside Guam's EEZ, but transship their catch through Guam. The dramatic drop observed in 1997 was due to a large number of foreign fishing boats leaving the western Pacific that year for several reasons, including availability of fish stocks. Compared with 2003, the 2004 total longline landings decreased 11%, with bigeye landings decreasing 1% and yellowfin landings decreasing 18%.

Source: The Bureau of Statistics and Plans.

Calculation: Pre-1990 data was extracted directly from transshipment agents' files. Beginning in 1990, a mandatory data submission program was implemented.

Foreign Longline Landings (Metric tons)

Year	Total	Bigeye	Yellowfin
1990	12,198	6,793	5,011
1991	10,707	4,824	5,505
1992	8,157	3,754	4,104
1993	8,981	4,178	4,379
1994	11,023	4,400	5,878
1995	12,366	3,560	7,635
1996	10,356	2,280	7,214
1997	5,093	2,395	2,392
1998	9,032	3,533	4,379
1999	9,865	5,328	3,404
2000	11,664	5,725	4,795
2001	12,716	5,996	5,711
2002	7,703	3,922	3,015
2003	7,004	3,416	2,792
2004	**6,190**	**3,375**	**2,287**
Average	9,537	4,232	4,567
Standard Deviation	2,349	1,291	1,641

Table 4a: Trolling Bycatch: Non-charter and Charter

Species Name	Number Released			Caught All	Bycatch (%)
	Alive	Dead/Injured	Both		
Non Charter					
Rhinecanthus aculeatus	1		1	1	100.00
Odonus niger	5		5	5	100.00
Balistidae	36		36	39	92.31
Mullidae	6		6	6	100.00
Lethrinus harak	4		4	197	2.03
Epinephelus merra	10		10	89	11.24
Cephalopholis urodeta	10		10	37	27.03
Carcharhinus amblyrhynchos	2		2	2	100.00
Non Charter Bycatch Total	74		74	376	19.68
Compare with All Caught				1743	4.25
Charter					
Rhinecanthus aculeatus	2		2	2	100.00
Odonus niger	20		20	20	100.00
Parupeneus bifasciatus	26		26	26	100.00
Charter Bycatch Total	48		48	48	100.00
Compare with All Caught				52	92.31
All Bycatch Total	122		122	424	28.77
Compare with All Caught				1795	6.80

*unexpanded total number of that species caught
**unexpanded total number of fish caught from non-charter trolling

4b. Trolling Bycatch: Summary

Year	Released alive	Released dead/injured	Total Number Released	Total Number Landed	Percent Bycatch*	Interviews with Bycatch	Total Number of Interviews	Percent of Interviews with Bycatch
2001	7	3	10	5,289	0.2	10	461	2.2
2002	1	2	3	3,443	0.1	3	258	1.2
2003	5	0	5	3,026	0.2	2	178	1.1
2004	0	0	0	4,292		0	91	0

*"percent bycatch" represents the number of pieces that were discarded compared to the total number of fish caught trolling. The bycatch information is from unexpanded data, taken only from actual interviews that reported bycatch.

Interpretation: Bycatch information was recorded beginning in 2000 as a requirement of the pelagic FMP. Historically, most fish that is landed by fishermen is kept regardless of size and species. Bycatch for this fishery are sharks, shark-bitten pelagics, small pelagics, or other pelagic species. In 2004, bycatch was not encountered by Fisheries staff when interviewing trollers.

Source: The DAWR creel survey data for bottomfishing method.

Calculations: Bycatch is obtained directly from trolling interviews where bycatch was voluntarily reported. The number of bycatch reported is from unexpanded data.

Appendix 3

Hawaii

Introduction

Hawaii's pelagic fisheries, which include the longline, main Hawaiian Island (MHI) troll and handline, offshore handline, and the aku boat (pole and line) fisheries; are the state's largest and most valuable. The target species are tunas and billfish, but a variety of other species are also caught with some regularity. The longline, MHI troll and handline, and aku boat fisheries have a long history, whereas the offshore handline fishery is relatively new and dates back to only 1990. Collectively, these pelagic fisheries caught[1] an estimated 25 million pounds worth an estimated ex-vessel revenue of $52 million in 2004.

The largest component of pelagic catch in 2004 was tunas. The trend for tuna catches is, in general, stable from the mid-1990s and represented 65% of the total pelagic catch in 2004. Bigeye tuna was the largest component of the tuna and increased more than five-fold from its catch in 1987. Billfish catch dominated catch in the early 1990s making up about half of the total pelagic catch during that period but has declined to represent only 12% of the total catch in 2004. Swordfish was the largest component of the billfish catch from 1990 through 2000, was replaced by blue marlin and striped marlin in the following years. Other pelagic catch rose from 970 thousand pounds in 1988 to a record 5.2 million pounds in 2004. Mahimahi was the largest component of other pelagic catch.

The longline catch was the largest of all pelagic fisheries in Hawaii and represented 74% of the total commercial pelagic catch in 2004. There were 125 active Hawaii-based longline vessels in 2004. Participation in the Hawaii-based longline fishery rose rapidly from 37 vessels in 1987 and peaked at 141 vessels in 1991decreased to 103 vessels in 1996 as vessels left for the U.S. mainland (primarily California) and Fiji. The number of vessels gradually increased to 125 vessels in 2000 with the return of the vessels that had migrated to the mainland and the arrival of new participants from the U.S. west coast and Alaska. Court-ordered regulations limiting swordfish-directed effort implemented in 2000 either forced vessels to convert and target tunas or leave Hawaii to fish for swordfish. Many of those longline vessels that left Hawaii continued to target swordfish out of California. The California-based swordfish fishery was closed in 2004 while the Hawaii-based swordfish fishery was reopened under new conditions, however, vessels were not allowed to fish for swordfish in Hawaii until the latter part of the year; after the peak swordfish season. Seventeen California-based longline vessels submitted federal longline logbook data in 2004.

The total number of longline trips out of Hawaii has remained relatively stable over the past ten years. However, there has been a significant change with a shift of longline effort from

[1] This module reports "catch", as opposed to "landings" in most cases.

swordfish to tunas. The number of swordfish-directed trips has declined from 319 in 1993 to 0 in 2003 and increased to 6 trips in 2004. In contrast, tuna-directed effort has increased during this period, from 458 trips in 1992 to 1,332 trips in 2004.

Pelagic landings of the main Hawaiian Islands (MHI) troll and handline fisheries were relatively stable throughout the late 1980s into 2004. The offshore handline fishery grew into a fishery with catches that rivaled the established aku boat fishery. The offshore handline landings more than tripled in 2004. There were only two aku boat vessels active in 2004, therefore, catch statistics for this fishery was combined with landings in the other gear category.

<u>Data Sources and Calculation Procedures</u>

This report contains the most recently available information on Hawaii's commercial pelagic fisheries. Commercial fisheries reports are compiled from four data sources: The State of Hawaii's Division of Aquatic Resources (HDAR) Commercial Fish Catch data, HDAR Commercial Marine Dealer data, the National Marine Fisheries Service (NMFS) Pacific Islands Fisheries Science Center's (PIFSC) longline logbook data, and joint NMFS and HDAR market sampling data.[2] Catch and revenue were calculated for each Hawaii pelagic fishery. The data sources and estimate procedures are described below:

<u>The Hawaii-based Longline Fishery:</u> The NMFS and HDAR market sampling data was used to estimate catch and revenue for the longline fishery from 1987 to 1991. Market data was collected on five of six business days and represented a coverage rate of about 80%. The market sample data was extrapolated as a proxy for a full coverage rate.

The federal longline logbook system was implemented in 1990 and was the source of data used to determine total number of fish caught. Due to limited manpower, the market sampling data collection program was reduced to two out of six business days for a coverage rate of about 33%. The number of fish kept from the longline logbook data was multiplied by the average weight per fish from the market sample data to derive estimated total landings. The estimated landings were then multiplied by the average price per pound from the market sampling data to yield estimated total revenue.

The HDAR Commercial Marine Dealer data system was implemented in 2001 with the first complete year of fish dealer data on record in 2002. The Commercial Marine Dealer data coverage of the longline landings and revenue was near complete and replaced the market sample data as the data source for average weight and average price. The longline purchases in the Commercial Marine Dealer data was identified and separated out by matching specific vessel names and commercial license numbers. The estimation procedure for longline landings and revenue was done by multiplying the total number of each species kept from the Federal longline logbook data by the corresponding average weight of fish from Commercial Marine Dealer data.

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[2] Ito, Russell Y. and Machado, Walter A. 2001. Annual report of the Hawaii-based longline fishery for 2000. Southwest Fisheries Science Center Admin. Rept. H-01-07.

The result was Pounds Caught for each species. This procedure was repeated on a monthly basis. There were exceptions though. When the sum of Pounds Bought for individual species from the Commercial Marine Dealer data was greater than the calculation for Pounds Caught, Pounds Bought was used as the final estimate for landings.

Aku Boat: This fishery includes pelagic species caught by the aku boat or skipjack pole-and-line method (HDAR gear code 1) in all HDAR statistical areas. The Pounds Sold and Value for the aku boat fishery was obtained by summing those fields in the Commercial Marine Dealer data identified as caught by aku boat fishing by matching vessel names and commercial license numbers. In cases where the pounds sold was greater than the pounds caught the pounds sold was used as the catch. Normally the pounds caught is used as the catch.

MHI Troll Fishery: The MHI troll fishery includes pelagic species caught by Miscellaneous Trolling Methods (HDAR gear code 6), Lure Trolling (61), Bait Trolling (62), Stick Trolling (63), Casting, Light Tackle, Spinners or Whipping (10) and Hybrid Methods (97) in HDAR statistical areas 100 through 642 which are areas that begin from the shoreline out to 20 minute squares around the islands of Hawaii, Maui, Kahoolawe, Lanai, Mokolai, Oahu, Kauai and Niihau.

MHI Handline Fishery: The MHI handline fishery includes pelagic species caught by Deep Sea or Bottom Handline Methods (HDAR gear code 3), Inshore Handline or Cowrie Shell (Tako) Methods (4), Ika_Shibi (8), Palu-Ahi, Drop Stone or Make Dog Methods (9), Drifting Pelagic Handline Methods (35) and Floatline Methods (91) in HDAR statistical areas 100 to 642 except areas 175, 176 and 181.

Offshore Handline Fishery: The offshore handline fishery includes pelagic species caught by Ika_Shibi (HDAR gear code 8), Palu-Ahi, Drop Stone or Make Dog Methods (9), Drifting Pelagic Handline Methods (35), Misc.Trolling Methods (6), Lure Trolling (61), and Hybrid Methods (97) in Areas 15217 (NOAA Weather Buoy W4), 15717 (NOAA Weather Buoy W2), 15815, 15818 (Cross Seamount) , 16019 (NOAA Weather Buoy W3), 16223 (NOAA Weather Buoy W1), 16221, 15819, 15918, 15718, 15523, 15423, 15417, 15416, 842, 839, 825, 816, 817, 807, 804, 900, 901, 898, 894, 892, 893, 181, 176 and 175. This fishery also includes pelagic species caught by Deep Sea or Bottom Handline Methods (3) in Area 16223

Other Gear: Even though this category is not mentioned specifically in this report, the catch is included in the overall total. It represents pelagic species caught by methods other than longlining and those methods mentioned above or in the areas other than those mentioned above. Catch and revenue from this category is primarily composed of pelagic species caught by trolling in areas outside of the MHI (the distant water albacore troll fishery) or pelagic species caught close to shore by diving, spearfishing, squidding, and netting inside of the MHI.

Calculating catch by the MHI troll, MHI handline, offshore handline, and other gear involved processing of two data sets; the HDAR Commercial Fish Catch data collected and submitted by the aforementioned fishers and HDAR Commercial Marine Dealer (Dealer) data collected and submitted by seafood dealers. "Pounds Caught" from HDAR Commercial Fish Catch data was summed on a species specific level for each of the above fisheries. Total "Pounds Caught" for each species was then calculated by summing the catch of that particular species for the MHI troll, MHI handline, offshore handline fisheries and other gear category. The percent catch of each species by fishery were also calculated and later used in conjunction with the Dealer data.

Catch in the Dealer data, referred to as "Pounds Bought", by each fishery was not clearly differentiated; however, "Pounds Bought" by the longline and aku boat fisheries were identified by Commercial Marine License number or vessel name and excluded. The remaining "Pounds Bought" was presumed to be from the MHI troll, MHI handline, offshore handline fisheries or other gear category. "Pounds Bought" from this subset of the data was summed on a species specific basis with fishery specific landings of each particular species allocated based on the percent catch by fishery calculated from the HDAR Commercial Marine Dealer data. The fishery specific allocation was then compared to the "Pounds Caught" from the Commercial Fish Catch total. The greater value of "Pounds Sold" from the Commercial Marine Dealer data or the "Pounds Caught" from the Commercial Fish catch data was used as the catch. This process was repeated on a monthly basis.

Detailed data are not available for recreational fishers because they are not required to file catch reports (if they sell no fish during the year) and there is no comprehensive creel survey of Hawaii anglers. Recent JIMAR research reports describe aspects of the relationship between commercial and recreational pelagic fishing, but accurate estimates of total recreational participation and catch remain absent.[3] The NMFS Marine Recreational Fisheries Statistical Survey (MRFSS) has reinitiated operations in Hawaii after a 20 year absence with the first full year of fielding in 2002. The combined telephone-creel intercept survey is being conducted in collaboration with the HDAR. In the interim, a summary of what is known about recreational fisheries, including preliminary estimates of recreational catch are included in Appendix 6.

This module was prepared by Russell Ito of NMFS and reviewed by Bill Walsh PFRP, JIMAR. Information from NMFS longline logbooks was provided by Frederick Dowdell of NMFS. HDAR Commercial Fish Catch and Commercial Marine Dealer data used calculate the MHI troll, MHI handline, offshore handline, and other gear landings were compiled by Craig Graham from UH, JIMAR. Information on HDAR Commercial Marine Licenses (CMLs) was provided by Reginald Kokubun, HDAR.

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[3] Hamilton, Marcia S and Stephen W. Huffman, 1997. Cost-earnings study of Hawaii's small boat fishery, 1995-96. University of Hawaii SOEST 97-06/JIMAR 97-314. 102 p.
McConnell, Kenneth E. and Timothy C. Haab, 2001. Small boat fishing in Hawaii: choice and economic values. University of Hawaii SOEST 01-01, JIMAR 01-336, 62 p.

Hawaii commercial marine license information[4]

Any fisherman who takes marine species for commercial purposes is required by the State of Hawaii to have a Commercial Marine License (CML) and submit a monthly catch report to HDAR. An exception to this rule is that only one person per vessel is required to submit a catch report. This person is usually, but not necessarily, the captain. Crew members do not ordinarily submit catch reports. HDAR asks fishermen to identify their primary fishing gear or method on the Commercial Marine License at time of licensing. This does not preclude fishermen from using other gears or methods.

A total of 3,083 fishermen were licensed in 2004, including 1,965 (64%) who indicated that their primary fishing method and gear were intended to catch pelagic fish. Most licenses that indicated pelagic fishing as their primary method were issued to trollers (70%) and longline fishermen (20%). The remainder was issued to ika shibi and palu ahi (handline) (9%) and aku boat fishers (1%).

Primary fishing method	Number of licensees	
	2003	**2004**
Trolling	1,494	1,378
Longline	356	390
Ika Shibi & Palu Ahi	156	172
Aku Boat (pole and line)	31	25
Total pelagic	**2,037**	**1,965**
Total all methods	**3,219**	**3,083**

2004 Plan Team Recommendations:

1. The Pelagics Plan team recommends that PIFSC conduct a study of the volume of imports of frozen and fresh tuna into Hawaii and what are the market impacts of these imports on the local commercial fishery sector.

2. The Pelagic Plan Team recommends that the team comprising PIRO and PIFSC staff, responsible for the Hawaii longline fishery observer database, generate an annual table of fish discards and their condition (alive or dead) for both the swordfish and tuna longline fisheries. This table is to be included in the Hawaii module of the Council's Pelagic Fisheries Annual Report.

[4] Information provided by the Hawaii Division of Aquatic Resources (HDAR).

Tables

Figures

Figures (continued)

Table 1. Hawaii commercial pelagic catch, revenue, and average price by species, 2003-2004.

Species	2003 Pounds caught (1000 lbs)	2003 Ex-vessel revenue ($1000)	2003 Average price ($/lb)	2004 Pounds caught (1000 lbs)	2004 Ex-vessel revenue ($1000)	2004 Average price ($/lb)
Tuna PMUS						
Albacore	1,340	$1,610	$1.20	1,150	$1,430	$1.24
Bigeye tuna	8,350	$26,630	$3.19	10,860	$28,460	$2.62
Bluefin tuna	1	$5	$10.29	1	$2	--
Skipjack tuna	1,580	$1,370	$0.87	1,070	$1,130	$1.06
Yellowfin tuna	3,420	$8,900	$2.60	3,150	$7,030	$2.23
Other tunas	10	$4	$0.40	10	$5	$0.50
Tuna PMUS subtotal	**14,700**	**$38,500**	**$2.62**	**16,200**	**$38,100**	**$2.35**
Billfish PMUS						
Swordfish	320	$710	$2.22	580	$1,110	$1.91
Blue marlin	1,160	$850	$0.73	1,000	$1,100	$1.10
Striped marlin	1,370	$1,200	$0.88	960	$1,330	$1.39
Other marlins	580	$280	$0.48	510	$440	$0.86
Billfish PMUS subtotal	**3,400**	**$3,000**	**$0.88**	**3,100**	**$4,000**	**$1.29**
Other PMUS						
Mahimahi	1,340	$3,010	$2.25	2,360	$4,910	$2.08
Ono (wahoo)	1,000	$1,960	$1.96	890	$2,190	$2.46
Opah (moonfish)	1,090	$1,560	$1.43	780	$1,220	$1.56
Pomfrets	460	$810	$1.76	810	$1,310	$1.62
Oilfish	280	$430	$1.54	330	$560	$1.70
Sharks (whole weight)	340	$110	$0.32	410	$70	$0.17
Other pelagics	20	$20	$1.00	40	$20	$0.50
Other PMUS subtotal	**4,500**	**$7,900**	**$1.76**	**5,600**	**$10,300**	**$1.84**
Total pelagics	**22,600**	**$49,400**	**$2.19**	**24,900**	**$52,400**	**$2.10**

Interpretation: The total commercial pelagic landings were 24.9 million pounds in 2004, up 10% (+2.3 million pounds) from 2003. Tunas represented 65% of the total catch. Bigeye tuna landings reached a record 11.0 million pounds in 2004; up 2.5 million pounds from the previous year. Bigeye tuna was the largest component of the landings (44%). Yellowfin tuna was the next largest component and was followed by mahimahi.

Total Hawaii commercial ex-vessel revenue ($52.4 million) was up 6% in 2004. Tunas comprised 73% of this total. Bigeye tuna alone accounted for 54% of the total revenue at $28.5 million. Yellowfin tuna was the next highest contributor to total revenue at $7.0 million. Billfish revenue increased 33% in 2004. Other pelagic catch increased the most of all groups (up 30%), with the highest revenue coming from mahimahi.

The total pelagic fish price decreased slightly in 2004. The average price for tuna remained fell slightly in 2004. Billfish and other PMUS average prices were up 32% and 13%, respectively.

Source and Calculations: NMFS longline logbook and HDAR Commercial Marine Dealer data was used to produce longline catch, revenue, and average price estimates. The MHI troll, MHI handline, offshore handline, and other gear catch, revenue, and average price estimates were produced from HDAR Commercial Fish Catch and Commercial Marine Dealer data.

"Other Billfish" includes unclassified billfish, sailfish, spearfish and black marlin. "Sharks" includes unclassified sharks, hammerhead sharks, mako sharks, thresher sharks, tiger sharks, blue sharks and white-tipped sharks. "Other Pelagics" includes unclassified tunas, kawakawa, sting rays, barracudas, flying fish, oilfish, sunfish, frigate mackerel and pomfrets.

The revenue for the current year is an unadjusted value while the revenue for the previous year is adjusted by the CPI. The average price is the total revenue divided by the pounds sold for each species where pounds sold is equal to or less than the total catch for each species.

Table 2. Hawaii commercial pelagic catch, revenue, and average price by fishery, 2003-2004.

	2003			2004		
Fishery	**Pounds caught (1000 lbs)**	**Ex-vessel revenue ($1000)**	**Average price ($/lb)**	**Pounds caught (1000 lbs)**	**Ex-vessel revenue ($1000)**	**Average price ($/lb)**
Longline	17,400	$39,880	$2.29	18,410	$39,000	$2.12
MHI trolling	2,690	$5,660	$2.10	2,970	$6,310	$2.12
MHI handline	1,150	$2,270	$1.97	1,400	$2,740	$1.96
Offshore handline	290	$440	$1.52	950	$2,180	$2.29
Aku boat	1,020	$1,030	$1.01	-	-	-
Other gear	70	$140	$2.00	1,190	$2,080	$1.75
Total	**22,600**	**$49,400**	**$2.19**	**24,900**	**$52,300**	**$2.10**

Interpretation: The longline fishery is the largest commercial fishery in Hawaii. Longline catch and revenue were 18.4 million pounds and $39.0 million, respectively, in 2004. Catch increased by 1 million pounds while revenue decreased by $900,000. Average price for the longline fishery was slightly higher in 2004

The Main Hawaiian Island troll fishery is the second largest commercial fishery. It produced 3.3 million pounds worth $6.3 million in 2004. Catch and revenue rose from 2003 by 300,000 pounds and $650,000 in 2004. Average price was about the same as the previous year for this fishery.

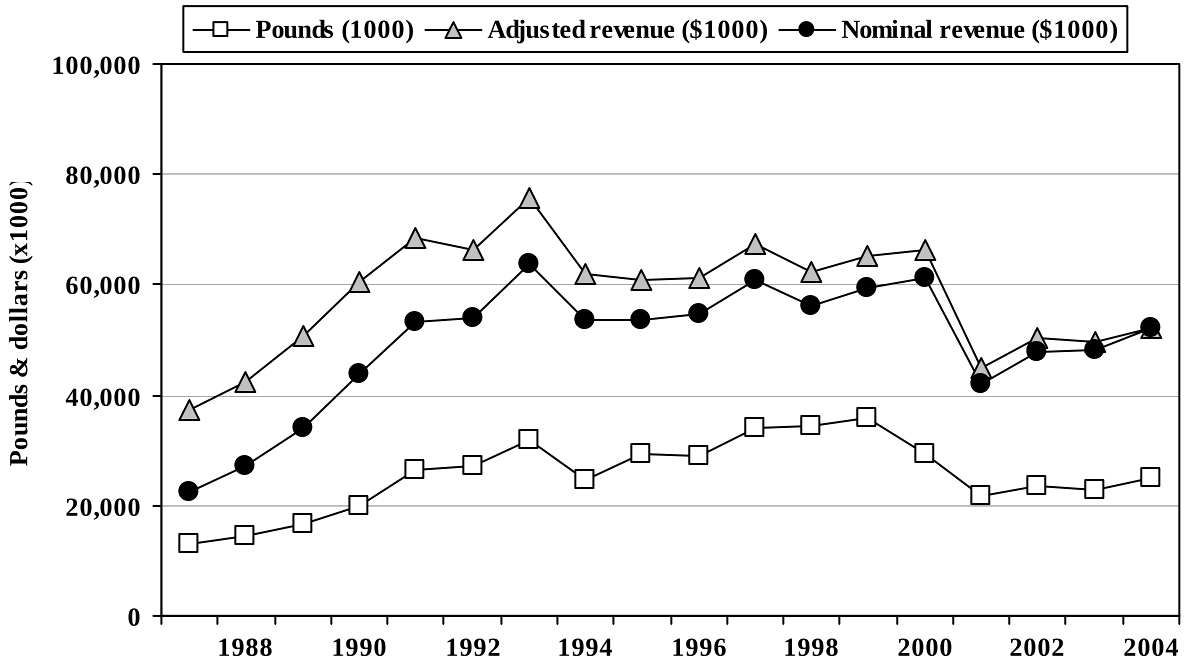
The Main Hawaiian Island handline fishery produced 1.4 million pounds of pelagic catch worth $2.7 million while the offshore handline fishery total catch was 950,000 pounds worth $2.2 million in 2004. Catch and revenue for both these fisheries increased in 2004.

The catch and revenue for the aku boat fishery in 2004 was not available due to confidentiality standards. There were only 2 vessels active this year, therefore, catch and revenue from this fishery was reallocated to Other Gear.

Source and Calculations: NMFS longline logbook and HDAR Commercial Marine Dealer data was used to produce longline catch, revenue, and average price estimates. The MHI troll, MHI handline, offshore handline, and other gear catch, revenue, and average price estimates were produced from HDAR Commercial Fish Catch and Marine Dealer data.

The catch and revenue for each fishery for each year is the sum of the catch and revenue for each of the species in that fishery for that year. The revenue for the current year is an unadjusted value while the revenue for the previous year is adjusted by the CPI. The average price is the total revenue divided by the pounds sold for each fishery where pounds sold is equal to or less than the total catch for each fishery.

Figure 1. Hawaii total commercial catch and revenue, 1987-2004.



Interpretation: Pelagic catch and revenue grew from the late 1980s into the early 1990's. Revenue peaked at $76 million in 1993 but the total catch peaked later at 36 million pounds in 1999. Both catch and revenue declined sharply in 2001 but remained stable through 2002 to 2004. Gear and species specific changes are explained in greater detail in the following figures and tables.

Source and Calculations: Longline catches and revenue were derived from NMFS logbook and market sample or HDAR Commercial Marine Dealer data. Troll, handline, and aku boat catches and revenue were compiled from HDAR Commercial Fish Catch and Marine Dealer data.

Total catch and nominal revenue is the sum of catch and revenue for all Hawaii pelagic fisheries. The adjusted revenue for was calculated by multiplying nominal revenue by the Honolulu CPI for the current year and then dividing by the Honolulu CPI for that corresponding year.

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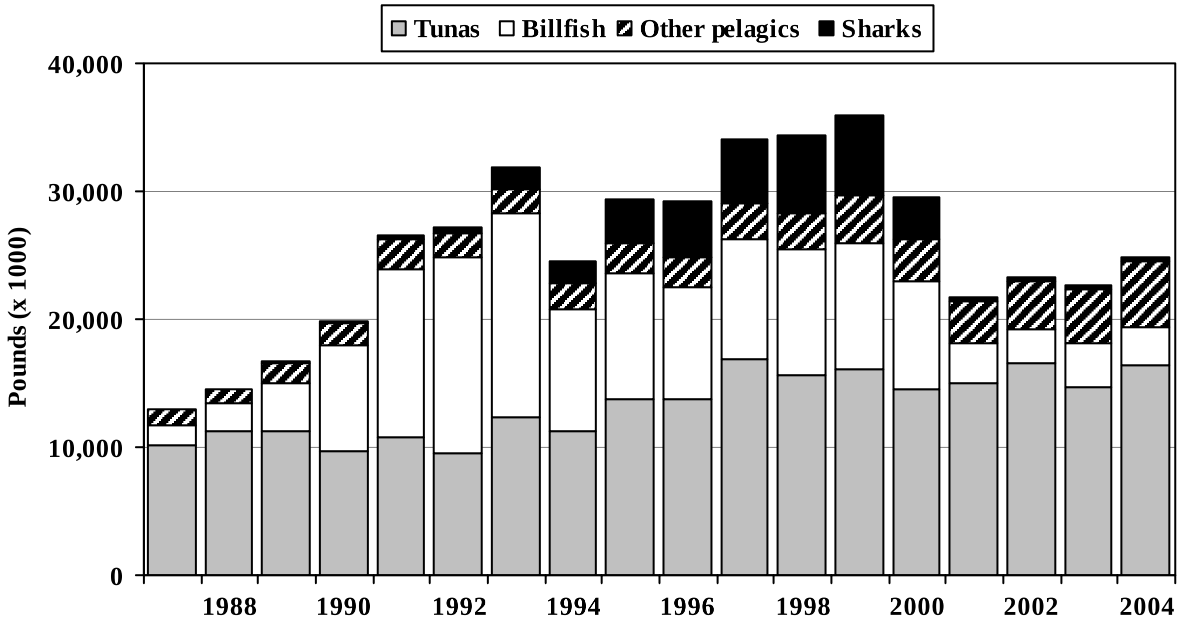
	Hawaii pelagic catch and revenue			
Year	**Pounds (1000)**	**Nominal revenue ($1000)**	**Adjusted revenue ($1000)**	**Honolulu CPI**
1987	13,000	$ 22,490	$ 37,310	114.9
1988	14,600	$ 27,090	$ 42,430	121.7
1989	16,800	$ 34,170	$ 50,600	128.7
1990	19,900	$ 43,850	$ 60,520	138.1
1991	26,600	$ 53,170	$ 68,470	148.0
1992	27,200	$ 53,810	$ 66,130	155.1
1993	31,900	$ 63,680	$ 75,810	160.1
1994	24,600	$ 53,610	$ 62,120	164.5
1995	29,400	$ 53,720	$ 60,910	168.1
1996	29,100	$ 54,710	$ 61,090	170.7
1997	34,200	$ 60,840	$ 67,460	171.9
1998	34,400	$ 56,170	$ 62,430	171.5
1999	36,000	$ 59,320	$ 65,240	173.3
2000	29,500	$ 61,230	$ 66,200	176.3
2001	21,800	$ 42,010	$ 44,880	178.4
2002	23,400	$ 47,650	$ 50,370	180.3
2003	22,700	$ 48,090	$ 49,680	184.5
2004	24,900	$ 52,300	$ 52,300	190.6
Average	**25,594.1**	**$ 49,153.5**	**$ 58,332.4**	
SD	**6,906.0**	**$ 11,885.4**	**$ 10,565.2**	

Figure 2. Hawaii commercial tuna, billfish, shark, and other pelagic PMUS catches, 1987-2004.



Interpretation: Pelagic catch grew from the late 1980s to a peak at 36 million pounds in 1999. Catches have since declined due to lower billfish and shark catches. Tuna catches grew by 50% since 1987 comprising two-thirds of the total catch in 2004. They were the largest PMUS group during 1987-1990 and 1994-2004. Most of this increase results from increased catches by the longline fishery.

Billfish catches rose rapidly in the early 1990s due to increased longline catches of swordfish. Billfish catches dropped in 1994 and remained fairly constant until declining sharply again in 2000 due to regulations prohibiting targeting swordfish to reduce interactions between longline gear and sea turtles. Billfish catches have remained at relatively low levels since 2001 representing 12% of the total catch in 2004.

Catches from the Other Pelagics category have increased more than five-fold over the 15 year period and is the second largest PMUS group. The Other Pelagics category made up 21% of the total catch.

Shark catches grew in the mid-1990s and peaked in 1999 as a result of the increasing practice of finning sharks by the longline fishery. This practice was prohibited by State and Federal law in 2000. Sharks catches dropped significantly and remained low after these regulations were implemented. Sharks accounted for 2% of the total catch in 2004.

Source and Calculations: Longline catches were derived from NMFS logbook and market sample or HDAR Commercial Marine Dealer data. Troll, handline, and aku boat catches were compiled from HDAR Commercial Fish Catch and Marine Dealer data.

The catch values are obtained by adding the catch values for species in the pelagic species groups defined below and all of the longline and non-longline fisheries for each year.

Tunas: Albacore, Bigeye Tuna, Bluefin Tuna, Kawakawa, Skipjack Tuna, Unclassified Tuna, Yellowfin Tuna

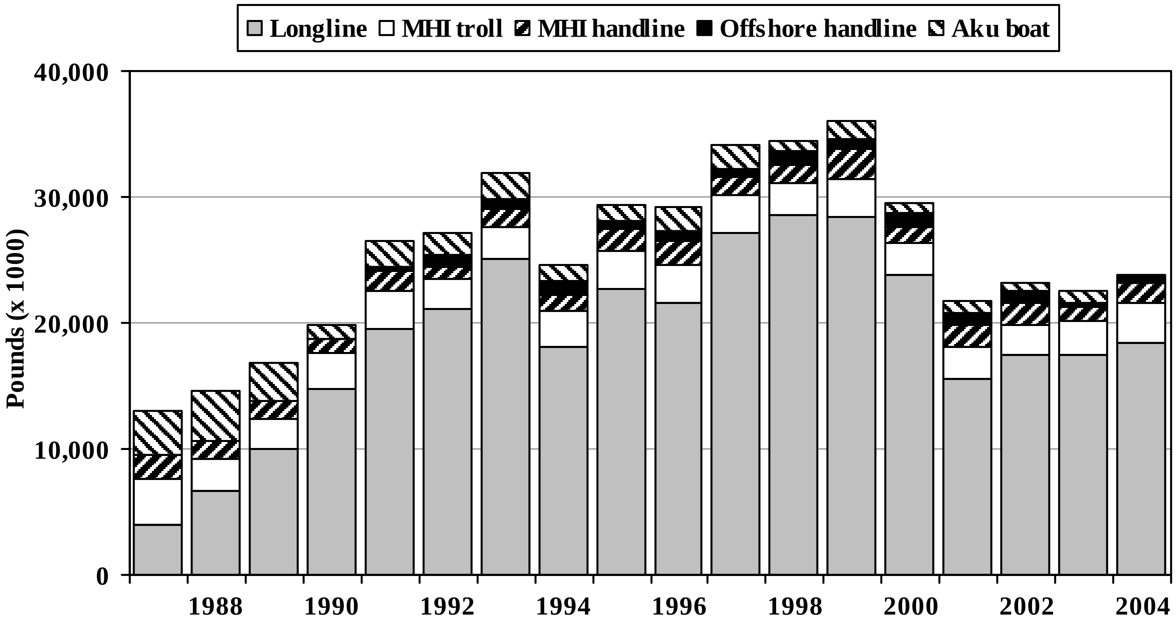
Billfishes: Blue Marlin, Black Marlin, Sailfish, Spearfish, Striped Marlin, Swordfish Unclassified Billfish

Other pelagics: Mahimahi, Moonfish, Oilfish, Pomfret, Wahoo

Sharks: Blue Sharks, Hammerhead Sharks, Mako Sharks, Thresher Sharks, Tiger Sharks, Unclassified Sharks, White-Tip Sharks

	Hawaii pelagic catch (1000 pounds)				
Year	**Tunas**	**Billfish**	**Other pelagics**	**Sharks**	**Total**
1987	10,120	1,560	1,290	40	13,000
1988	11,200	2,300	970	90	14,600
1989	11,180	3,880	1,530	200	16,800
1990	9,720	8,280	1,650	220	19,900
1991	10,790	13,130	2,300	320	26,500
1992	9,460	15,360	1,940	410	27,200
1993	12,420	15,920	1,850	1,740	31,900
1994	11,310	9,530	1,970	1,760	24,600
1995	13,820	9,730	2,420	3,470	29,400
1996	13,690	8,790	2,340	4,330	29,200
1997	16,810	9,490	2,830	5,010	34,100
1998	15,560	9,930	2,750	6,210	34,500
1999	16,150	9,760	3,800	6,270	36,000
2000	14,460	8,480	3,240	3,300	29,500
2001	14,950	3,220	3,270	330	21,800
2002	16,490	2,770	3,730	350	23,300
2003	14,700	3,430	4,190	340	22,700
2004	16,340	3,010	5,160	410	24,900
Average	**13,287.2**	**7,698.3**	**2,623.9**	**1,933.3**	**25,550.0**
SD	**2,532.5**	**4,497.1**	**1,104.2**	**2,228.0**	**6,706.3**

Figure 3. Total commercial pelagic catch by gear type 1987-2004.

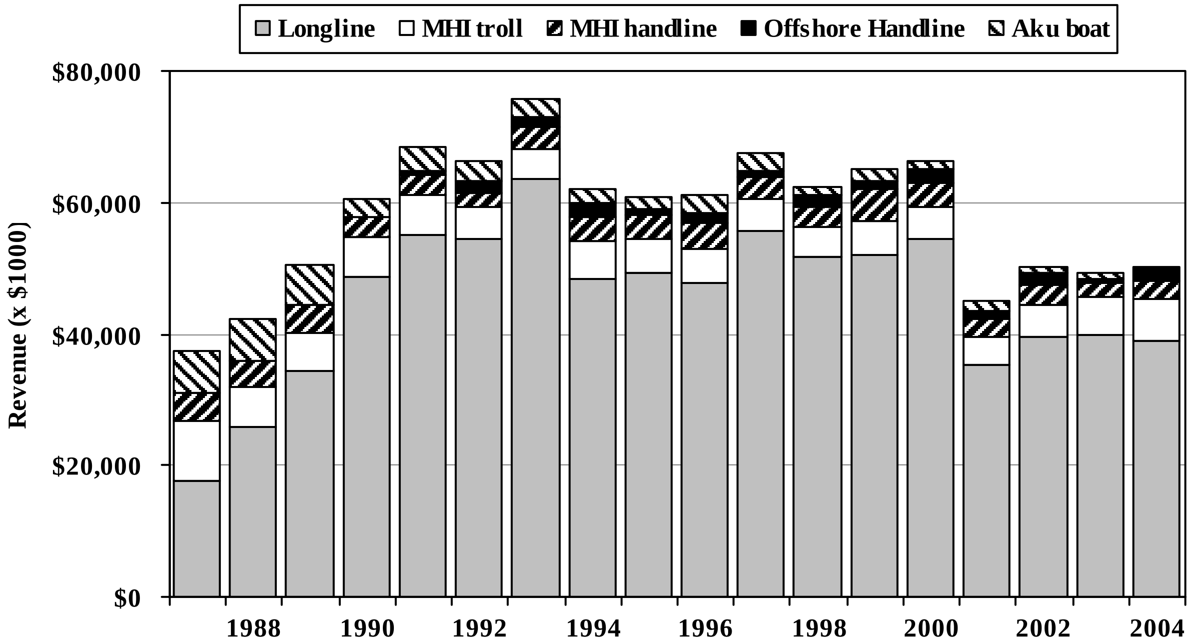


Interpretation: Hawaii commercial pelagic catch was dominated by longline catch. Longline catch rose in the late 1980s as the number of participants increased. Two additional factors contributed to growth in the 1990s. The first was caused by growing swordfish catches and the second was due to the increase practice of finning sharks. Prohibitions on finning sharks and targeting swordfish into 2000 are the reasons for the recent decline in this fishery. Catches by the MHI troll and MHI handline fisheries are the next two largest fisheries in Hawaii. Catch from these fisheries have remained relatively constant since 1987. The offshore handline fishery grew in the early 1990s with catches leveling off thereafter. In contrast, aku boat catches have declined from the late 1980s due to attrition of an aging fleet.

Source and Calculations: Longline catches were derived from NMFS logbook and market sample or HDAR Commercial Marine Dealer data. Troll, handline, and aku boat catches were compiled from HDAR Commercial Fish Catch and Marine Dealer data. The catch values were obtained by adding the catch values of all species for each fishery for each year.

Year	Longline	MHI troll	MHI handline	Offshore handline	Aku boat	Total
1987	3,890	3,710	1,910	-	3,500	13,000
1988	6,710	2,450	1,470	-	3,940	14,600
1989	9,940	2,400	1,490	-	2,960	16,800
1990	14,730	2,900	1,060	70	1,120	19,900
1991	19,490	3,100	1,480	330	2,150	26,600
1992	21,110	2,390	950	990	1,730	27,200
1993	25,010	2,580	1,530	680	2,140	31,900
1994	18,140	2,810	1,290	1,170	1,160	24,600
1995	22,730	2,970	1,730	710	1,290	29,400
1996	21,550	2,990	1,960	790	1,840	29,100
1997	27,150	3,020	1,480	560	1,950	34,200
1998	28,630	2,470	1,370	1,130	840	34,400
1999	28,350	3,010	2,410	890	1,310	36,000
2000	23,810	2,460	1,410	1,100	710	29,500
2001	15,560	2,610	1,600	1,010	990	21,800
2002	17,480	2,390	1,770	930	680	23,400
2003	17,440	2,690	1,150	300	1,020	22,700
2004	18,410	2,970	1,400	950	0	24,900
Average	**18,896.1**	**2,773.3**	**1,525.6**	**774.0**	**1,629.4**	**25,555.6**
SD	**6,979.3**	**346.5**	**345.8**	**422.5**	**1,023.2**	**6,701.8**

Figure 4. Total commercial pelagic ex-vessel revenue by gear type 1987-2004.



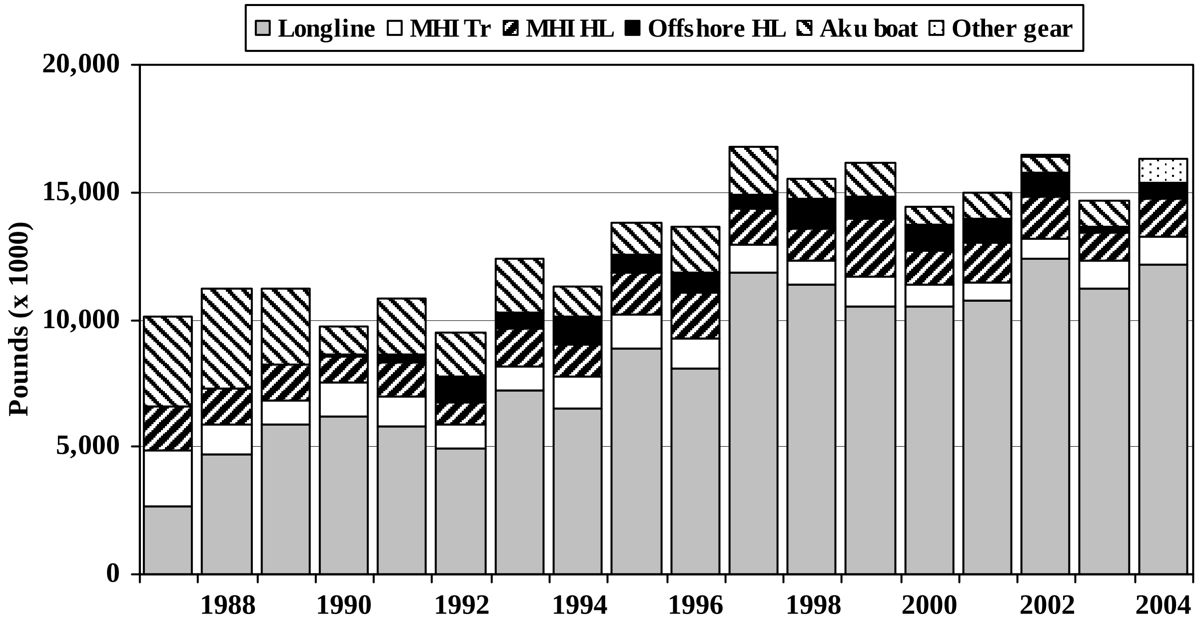
Interpretation: Ex-vessel revenue from Hawaii's pelagic fisheries was adjusted for inflation. Hawaii commercial pelagic catch is dominated by longline revenue. Longline revenue began to increase in the late 1980s as the fishery expanded. Longline revenue grew in the early 1990s due to growing swordfish catches peaking in 1993, dropping the next year, stabilizing up until restrictions and closure of the swordfish fishery in 2001. The MHI troll and MHI handline fisheries were ranked as the next two fisheries with the highest revenue. Revenue from these fisheries has remained relatively constant during the fifteen year period. The offshore handline fishery grew in the early 1990s with revenue leveling off thereafter. In contrast, aku boat revenue have declined from the late 1980s due fleet attrition and lower catches.

Source and Calculations: Longline revenue was derived from NMFS logbook and market sample or HDAR Commercial Marine Dealer data. Troll, handline, and aku boat revenue were compiled from HDAR Commercial Fish Catch and Marine Dealer data.

The ex-vessel revenue values were obtained by adding the revenue for all species of each fishery for each year. Ex-vessel revenue was then adjusted for inflation using the Honolulu Consumer Price Index (HCPI).

Year	Longline	MHI troll	MHI handline	Offshore Handline	Aku boat	Total
1987	$ 17,600	$ 9,180	$ 4,320	$ -	$ 6,220	$ 37,300
1988	$ 25,800	$ 6,070	$ 4,160	$ -	$ 6,360	$ 42,400
1989	$ 34,400	$ 5,770	$ 4,330	$ -	$ 6,140	$ 50,600
1990	$ 48,700	$ 6,200	$ 2,880	$ 130	$ 2,590	$ 60,500
1991	$ 55,200	$ 5,790	$ 3,260	$ 690	$ 3,480	$ 68,400
1992	$ 54,600	$ 4,620	$ 2,160	$ 1,820	$ 2,970	$ 66,200
1993	$ 63,600	$ 4,540	$ 3,480	$ 1,340	$ 2,880	$ 75,800
1994	$ 48,400	$ 5,670	$ 3,630	$ 2,260	$ 2,130	$ 62,100
1995	$ 49,400	$ 5,070	$ 3,560	$ 1,090	$ 1,760	$ 60,900
1996	$ 47,700	$ 5,190	$ 4,100	$ 1,450	$ 2,670	$ 61,100
1997	$ 55,600	$ 4,980	$ 3,380	$ 900	$ 2,650	$ 67,500
1998	$ 51,800	$ 4,460	$ 3,070	$ 1,880	$ 1,230	$ 62,400
1999	$ 52,100	$ 5,150	$ 4,730	$ 1,380	$ 1,840	$ 65,200
2000	$ 54,300	$ 5,050	$ 3,590	$ 2,100	$ 1,180	$ 66,200
2001	$ 35,300	$ 4,110	$ 2,920	$ 1,140	$ 1,460	$ 44,900
2002	$ 39,600	$ 4,770	$ 3,180	$ 1,590	$ 930	$ 50,300
2003	$ 39,900	$ 5,660	$ 2,270	$ 440	$ 1,040	$ 49,700
2004	$ 39,000	$ 6,310	$ 2,740	$ 2,180	-	$ 52,300
Average	**$ 45,166.7**	**$ 5,477.2**	**$ 3,431.1**	**$ 1,132.8**	**$ 2,795.9**	**$ 57,988.9**
SD	**$ 11,900.1**	**$ 1,134.7**	**$ 710.4**	**$ 757.2**	**$ 1,803.4**	**$ 10,567.1**

Figure 5. Hawaii commercial tuna catch by gear type, 1987-2004.

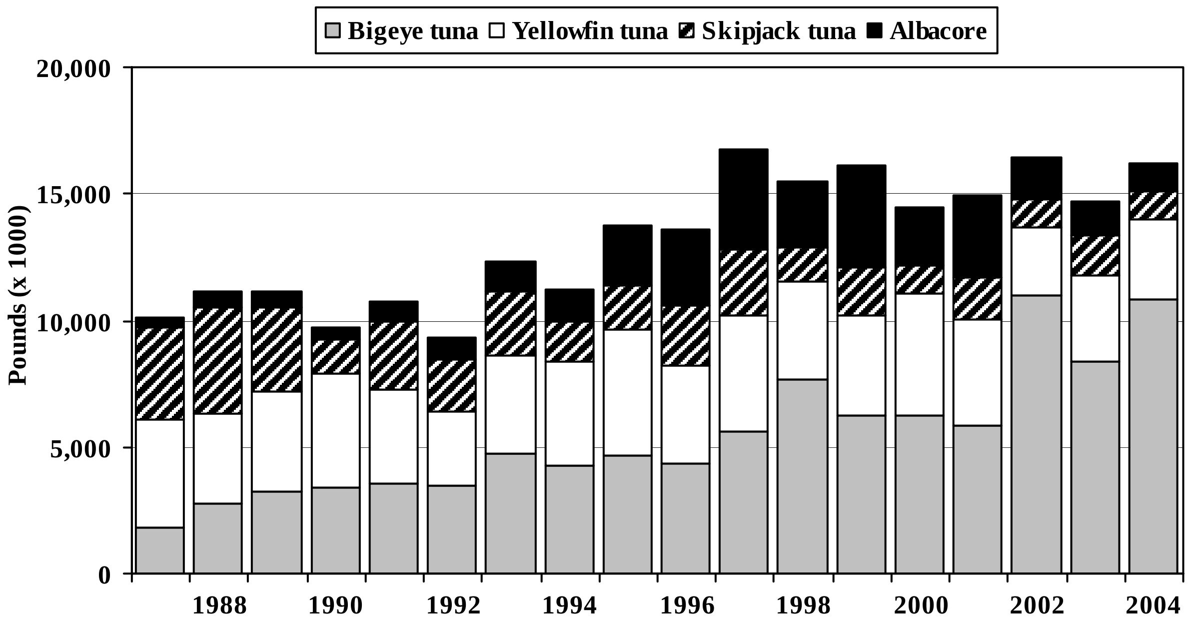


Interpretation: Longline gear has been the largest single contributor to Hawaii commercial tuna catch since1988 and was on a upward trend peaking in 2002. Tuna catches by the MHI troll fishery were highest in 1987, dropped the following year, and remained below 2 million pounds thereafter. The MHI handline fishery peaked in 1999 with fairly steady annual catches. Offshore handline tuna catches rose rapidly from 1990 to 1992 and varied substantially thereafter. Offshore handline tuna catch dropped substantially in 2003 and somewhat recovered in 2004. The aku boat fishery was on a declining trend with its lowest catch in 2002 and rebounded in 2003. Only two vessels were activity in 2004 rendering detailed tuna catch statistics by this fishery confidential. Therefore, aku boat catch was combined with the catch of other gear.

Source and Calculations: The tuna catch statistics were derived from NMFS longline logbook, HDAR Commercial Fish Catch, and Marine Dealer data and was calculated for each gear type. The tuna catch was composed of albacore, bigeye tuna, bluefin tuna, kawakawa, skipjack tuna, yellowfin tuna, and unclassified tunas.

	Hawaii tuna catch by gear type (1000 pounds)						
Year	**Longline**	**MHI Tr**	**MHI HL**	**Offshore HL**	**Aku boat**	**Other gear**	**Total**
1987	2,705	2,136	1,782	-	3,501	0	10,125
1988	4,725	1,141	1,395	-	3,936	0	11,197
1989	5,921	904	1,393	-	2,961	0	11,179
1990	6,162	1,401	981	66	1,116	0	9,725
1991	5,797	1,145	1,380	326	2,146	0	10,794
1992	4,908	980	885	967	1,721	0	9,461
1993	7,205	964	1,458	655	2,134	0	12,417
1994	6,540	1,239	1,213	1,157	1,158	0	11,307
1995	8,898	1,295	1,642	694	1,291	0	13,820
1996	8,074	1,146	1,845	776	1,844	0	13,685
1997	11,826	1,107	1,384	553	1,942	0	16,813
1998	11,359	933	1,298	1,121	845	0	15,555
1999	10,529	1,135	2,302	868	1,312	0	16,146
2000	10,534	845	1,324	1,050	707	0	14,460
2001	10,720	754	1,518	971	990	0	14,953
2002	12,368	810	1,665	904	677	64	16,488
2003	11,183	1,132	1,058	280	1,017	30	14,700
2004	12,175	1,112	1,431	626	-	1,000	16,344
Average	**8,423.8**	**1,121.1**	**1,441.9**	**611.9**	**1,723.4**	**60.8**	**13,287.2**
SD	**3,009.8**	**305.9**	**332.8**	**406.3**	**967.6**	**235.0**	**2,531.7**

Figure 6. Species composition of the tuna catch, 1987-2004.

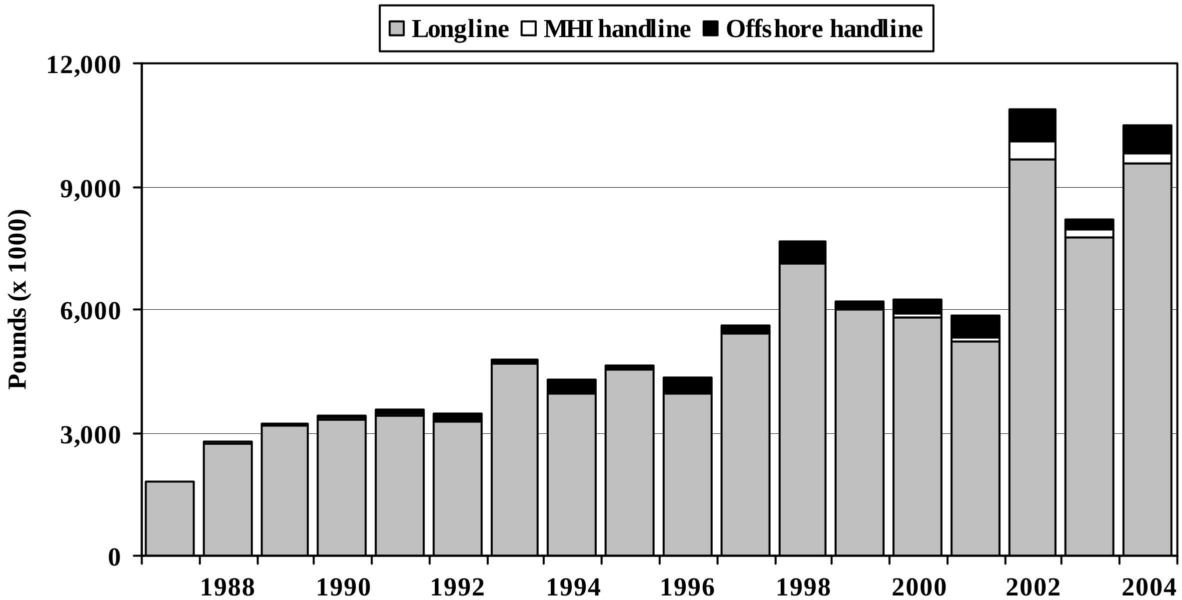


Interpretation: Bigeye tuna was the largest component of the tuna catch since 1996 and averaged about 41% of the tuna catch during 1987-2004. The bigeye tuna composition was higher than usual in the past three years due to larger than average catches. The longline fishery accounted for majority of the bigeye tuna catches. The composition of yellowfin tuna averaged 29% over the 18 year period. The composition of yellowfin tuna declined due to growing catches of bigeye tuna. The MHI troll and handline (both MHI and offshore) fisheries accounted for most of the yellowfin tuna catch until 1999 with the longline fishery contributing the highest catches from 2000. Skipjack tuna made up 16% of the tuna catches with the highest composition in the late 1980s. The aku boat (pole and line) fishery was the largest skipjack tuna fishery in Hawaii. The composition of albacore grew rapidly peaking in 1999 and declining thereafter. The longline fishery was responsible for majority of the catch for this tuna `species.

Source and Calculations: The tuna catch statistics were derived from NMFS longline logbook, HDAR Commercial Fish Catch, and Marine Dealer data and was calculated for each species. The gear types summarized for each species was composed longline, MHI troll, MHI handline, offshore handline, aku boat, and other gear.

	Hawaii tuna catch (1000 pounds)				
Year	**Bigeye tuna**	**Yellowfin tuna**	**Skipjack tuna**	**Albacore**	**Total**
1987	1,814	4,310	3,633	345	10,125
1988	2,770	3,550	4,156	695	11,197
1989	3,208	4,020	3,298	626	11,179
1990	3,425	4,460	1,389	421	9,725
1991	3,572	3,663	2,690	846	10,794
1992	3,455	2,943	2,098	855	9,461
1993	4,768	3,871	2,546	1,122	12,417
1994	4,279	4,105	1,554	1,292	11,307
1995	4,667	4,941	1,814	2,327	13,820
1996	4,331	3,851	2,425	3,021	13,685
1997	5,596	4,628	2,608	3,920	16,813
1998	7,641	3,896	1,326	2,645	15,555
1999	6,212	4,012	1,909	3,979	16,146
2000	6,243	4,806	1,104	2,290	14,460
2001	5,873	4,145	1,696	3,229	14,953
2002	10,968	2,677	1,163	1,667	16,488
2003	8,353	3,415	1,581	1,344	14,700
2004	10,856	3,152	1,065	1,153	16,235
Average	**5,446.2**	**3,913.7**	**2,114.2**	**1,765.3**	**13,281.1**
SD	**2,601.5**	**615.0**	**901.5**	**1,182.5**	**2,524.1**

Figure 7. Hawaii bigeye tuna catch, 1987-2004.

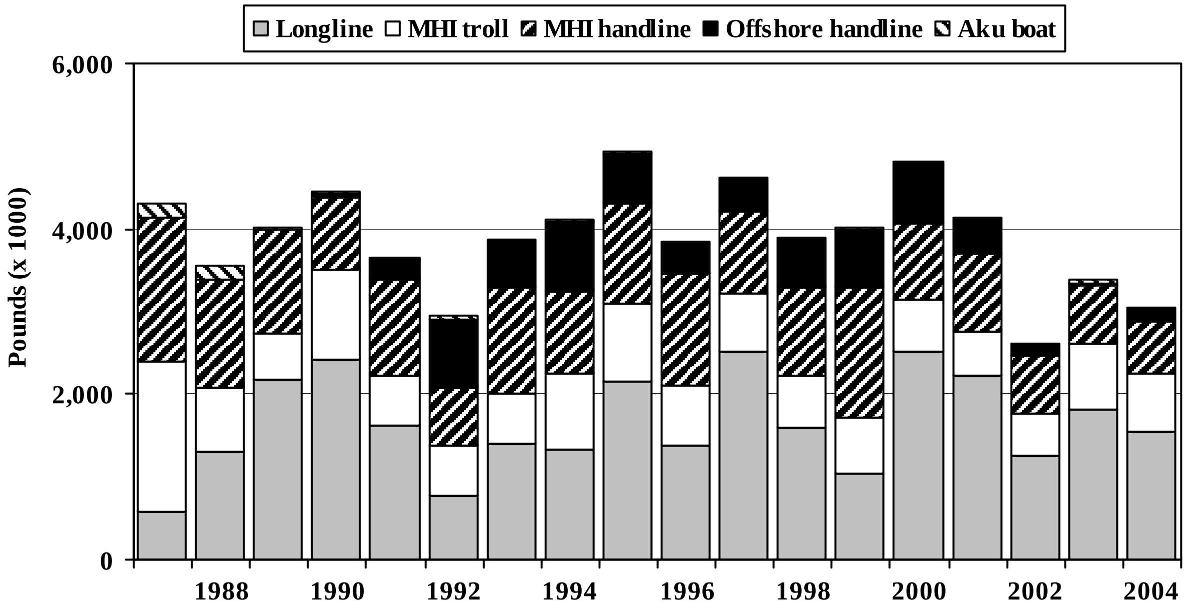


Interpretation: Annual bigeye tuna catches have increased six-fold during 1987-2004. The longline fishery typically produces about 90% of the total bigeye tuna catch. Bigeye catch by this fishery in 2004 was close to the record 9.7 million pounds observed in 2002. The offshore handline fishery was the second largest producer of bigeye tuna in Hawaii with 708,000 pounds in 2004 and was followed by the MHI handline fishery and MHI troll fishery, respectively.

Source and Calculations: Bigeye tuna catch statistics were derived from NMFS longline logbook, HDAR Commercial Fish Catch, and Marine Dealer data. The gear types summarized for catches of bigeye tuna included the longline, MHI troll, MHI handline, and offshore handline fisheries. The total column also contains small bigeye tuna catches by the aku boat fishery and other gear category.

	Hawaii bigeye tuna catch (1000 pounds)				
Year	**Longline**	**MHI troll**	**MHI handline**	**Offshore handline**	**Total**
1987	1,796	11	6	-	1,814
1988	2,732	10	28	-	2,770
1989	3,178	11	19	-	3,208
1990	3,338	15	41	31	3,425
1991	3,423	11	45	94	3,572
1992	3,277	9	19	151	3,455
1993	4,677	4	2	85	4,768
1994	3,940	6	10	324	4,279
1995	4,522	10	33	102	4,667
1996	3,940	4	11	375	4,331
1997	5,399	6	52	138	5,596
1998	7,113	5	15	508	7,641
1999	5,995	7	46	164	6,212
2000	5,788	6	133	317	6,243
2001	5,217	9	117	530	5,873
2002	9,679	100	427	762	10,968
2003	7,770	145	180	244	8,353
2004	9,538	70	248	708	10,856
Average	**5,073.4**	**24.4**	**79.6**	**251.8**	**5,446.2**
SD	**2,247.5**	**39.4**	**110.0**	**240.2**	**2,601.5**

Figure 8. Hawaii yellowfin tuna catch, 1987-2004.

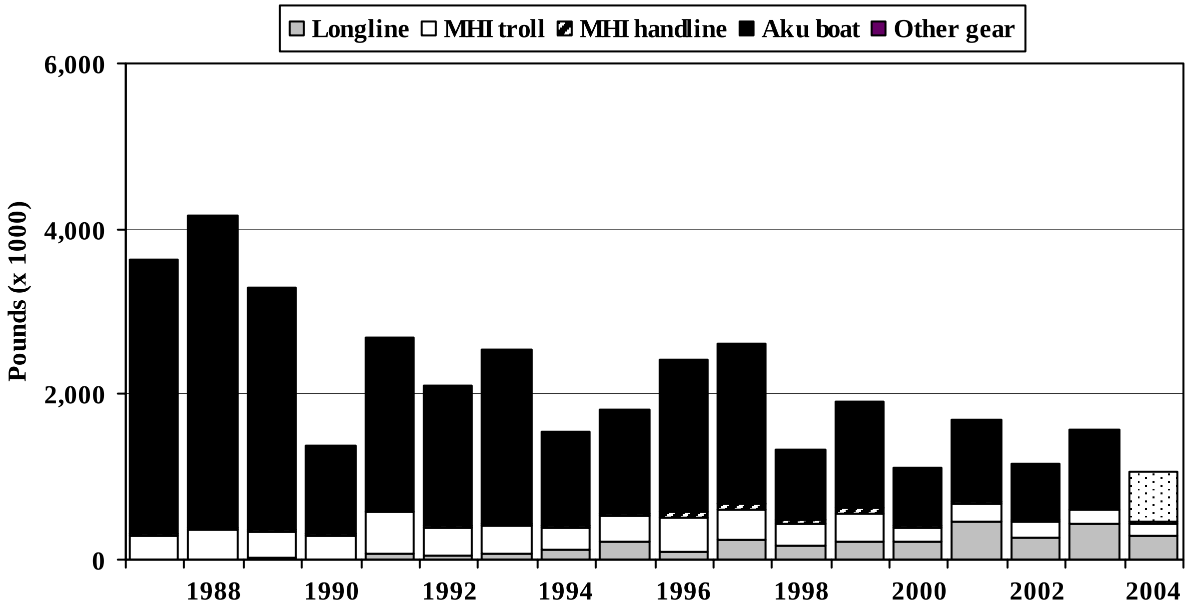


Interpretation: Annual catches of yellowfin tuna averaged 4 million pounds and varied from 2.7 million pounds to 4.9 million pounds during 1987-2004. The longline fishery typically had the highest yellowfin tuna catch. The MHI handline fishery usually was the second largest producer but has been on a downward trend from 1999. It was followed by MHI troll and offshore handline fisheries, respectively. The aku boat fishery had small catches of yellowfin tuna. This species is usually caught by the aku boat fishery when catches of skipjack tuna are poor.

Source and Calculations: Yellowfin tuna catch statistics were derived from NMFS longline logbook, HDAR Commercial Fish Catch, and Marine Dealer data. The gear types summarized for catches of yellowfin tuna included the longline, MHI troll, MHI handline, offshore handline and aku boat fisheries. The total column also contains small yellowfin tuna catches by other gear category.

	Hawaii yellowfin tuna catch (1000 pounds)					
Year	**Longline**	**MHI troll**	**MHI handline**	**Offshore handline**	**Aku boat**	**Total**
1987	575	1,828	1,734	-	173	4,310
1988	1,309	764	1,310	-	168	3,550
1989	2,174	559	1,266	-	21	4,020
1990	2,421	1,089	876	35	39	4,460
1991	1,617	615	1,154	232	44	3,663
1992	763	606	722	816	36	2,943
1993	1,392	616	1,283	571	10	3,871
1994	1,336	914	1,003	834	19	4,105
1995	2,159	949	1,207	591	34	4,941
1996	1,389	707	1,352	401	2	3,851
1997	2,515	712	986	415	0	4,628
1998	1,592	636	1,052	613	3	3,896
1999	1,042	687	1,559	703	21	4,012
2000	2,506	649	916	734	2	4,806
2001	2,233	514	952	442	4	4,145
2002	1,258	503	711	142	4	2,677
2003	1,820	805	687	36	50	3,415
2004	1,553	691	647	166	-	3,152
Average	**1,647.4**	**769.1**	**1,078.8**	**373.9**	**37.0**	**3,913.7**
SD	**584.4**	**305.3**	**305.6**	**302.9**	**52.7**	**615.0**

Figure 9. Hawaii skipjack tuna catch, 1987-2004.

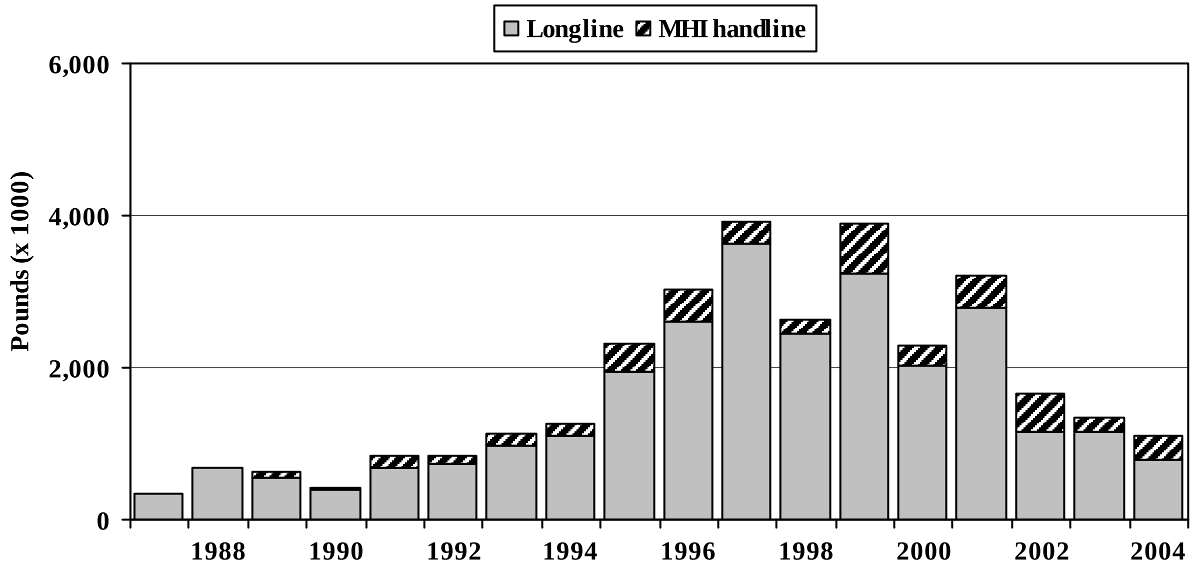


Interpretation: The trend for skipjack tuna catch is declining. Skipjack tuna catch was dominated by the aku boat fishery up to 2003, however, low participation prohibited divulging catch statistics in 2004. Aku boat catches were combined into the other gear category in 2004. The MHI troll fishery was usually the second largest contributor to skipjack tuna catch and was replaced by the longline fishery from 2000.

Source and Calculations: Skipjack tuna catch statistics were derived from NMFS longline logbook, HDAR Commercial Fish Catch, and Marine Dealer data. The gear types summarized for catches of skipjack tuna included the longline, MHI troll, MHI handline, aku boat fisheries, and other gear category.

	Hawaii skipjack tuna catch (1000 pounds)					
Year	Longline	MHI troll	MHI handline	Aku boat	Other gear	Total
1987	3	277	25	3,328	0	3,633
1988	8	351	29	3,768	0	4,156
1989	22	318	20	2,938	0	3,298
1990	12	278	26	1,073	0	1,389
1991	66	504	19	2,102	0	2,690
1992	49	347	21	1,682	0	2,098
1993	79	332	14	2,121	0	2,546
1994	116	283	21	1,133	0	1,554
1995	223	318	17	1,256	0	1,814
1996	91	424	69	1,842	0	2,425
1997	234	376	56	1,942	0	2,608
1998	168	278	38	842	0	1,326
1999	219	347	52	1,291	0	1,909
2000	206	181	13	704	0	1,104
2001	466	216	28	986	0	1,696
2002	276	195	18	672	2	1,163
2003	435	169	12	960	5	1,581
2004	293	147	13	-	612	1,065
Average	**164.8**	**296.7**	**27.2**	**1,684.7**	**34.4**	**2,114.2**
SD	**141.1**	**92.5**	**16.4**	**928.6**	**144.2**	**901.5**

Figure 10. Hawaii albacore catch, 1987-2004.

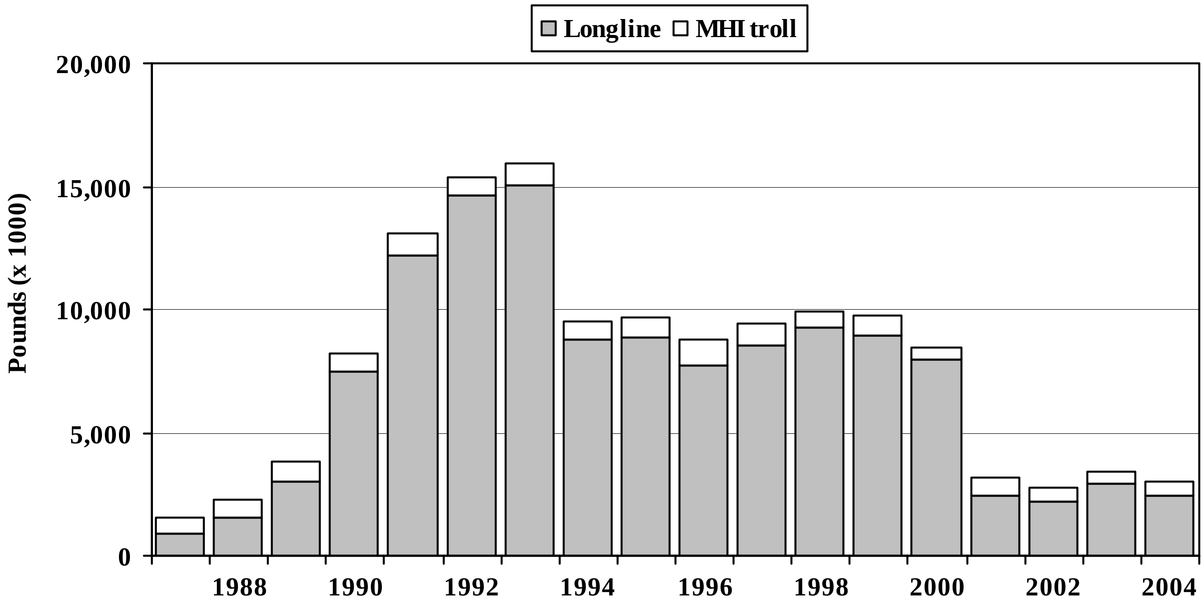


Interpretation: Albacore catch increased more than 12-fold from 1987 to 1999 and was on a declining trend thereafter. The longline fishery typically produces more than 80% of the albacore catch. Albacore catch by the MHI handline fishery was relatively small but grew over the 18-year period peaking at 642,000 pounds in 1999. On rare occasions, the MHI troll fishery has encountered short "runs" of albacore but those catches were negligible in comparison.

Source and Calculations: Albacore catch statistics were derived from NMFS longline logbook, HDAR Commercial Fish Catch, and Marine Dealer Data. The gear types summarized for catches of skipjack tuna included the longline, MHI troll, and handline fisheries.

	Hawaii albacore catch (1000 pounds)			
Year	**Longline**	**MHI troll**	**MHI handline**	**Total**
1987	331	1	12	345
1988	676	1	18	695
1989	547	1	78	626
1990	390	1	31	421
1991	687	2	157	846
1992	735	3	116	855
1993	965	3	154	1,122
1994	1,095	22	176	1,292
1995	1,938	10	380	2,327
1996	2,606	5	409	3,021
1997	3,626	7	287	3,920
1998	2,450	4	191	2,645
1999	3,250	87	642	3,979
2000	2,026	4	260	2,290
2001	2,802	10	417	3,229
2002	1,152	8	507	1,667
2003	1,157	8	179	1,344
2004	789	36	328	1,153
Average	**1,512.3**	**11.8**	**241.2**	**1,765.3**
SD	**1,043.1**	**20.7**	**177.3**	**1,182.5**

Figure 11. Hawaii commercial billfish catch by gear type, 1987-2004.

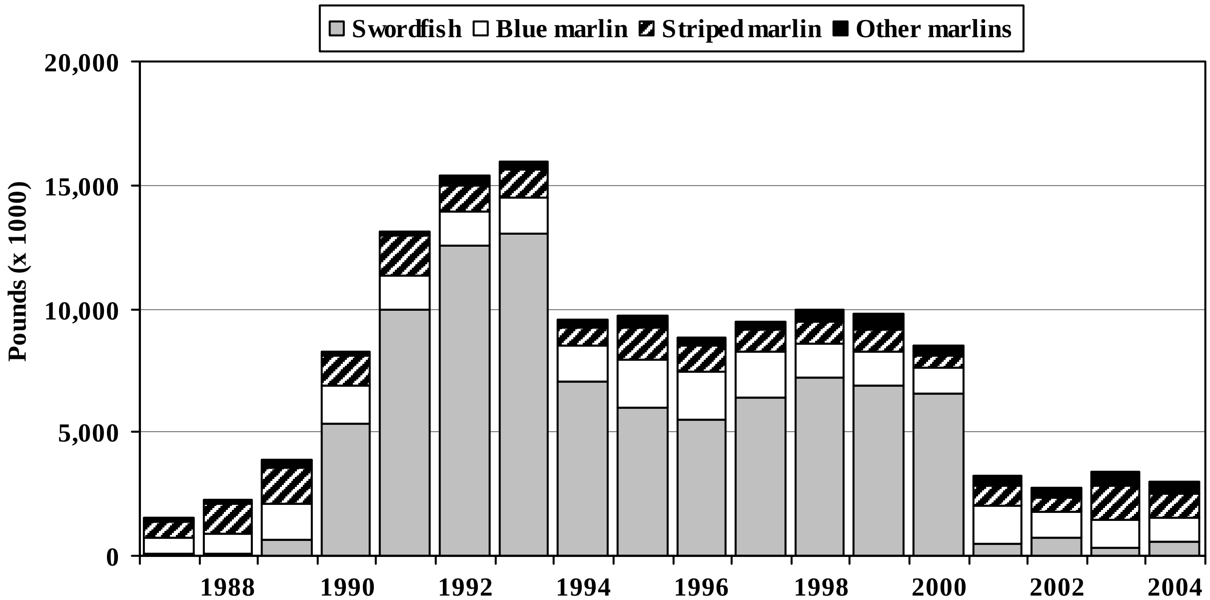


Interpretation: Billfish catch grew 10-fold from 1987 to 1993, but then dropped 40% the following year. Catch remained relatively unchanged through 2000, but then fell again by 60% in 2001, and remained low thereafter. The rapid rise and decline in billfish catch by the longline fishery from 1987-1994 was directly attributed to swordfish catch. The decline in billfish catch in 2001 was due to lower swordfish catches from regulations imposed on the longline fishery prohibiting targeting swordfish. Billfish catches by the MHI troll fishery were relatively stable up to the 1990s, with a peak in 1996, and with lower catches in the 2000s. The MHI handline fishery consistently had relatively low catches. Most of the billfish caught by the MHI troll and handline fisheries was usually blue marlin.

Source and Calculations: The billfish catch statistics were derived from NMFS longline logbook, HDAR Commercial Fish Catch, and Marine Dealer data and was calculated for each gear type. The billfish group was composed of swordfish, blue marlin, striped marlin, spearfish, sailfish, black marlin, and unclassified billfish.

	Hawaii billfish catch (1000 lbs)			
Year	**Longline**	**MHI troll**	**MHI handline**	**Total**
1987	860	666	30	1,555
1988	1,540	736	29	2,304
1989	3,040	805	31	3,877
1990	7,520	732	28	8,280
1991	12,210	890	31	13,131
1992	14,660	683	15	15,358
1993	15,030	870	23	15,923
1994	8,740	770	19	9,529
1995	8,840	856	30	9,727
1996	7,720	1,042	32	8,794
1997	8,520	935	39	9,494
1998	9,280	626	21	9,927
1999	8,960	769	31	9,760
2000	7,970	489	24	8,482
2001	2,440	756	25	3,221
2002	2,210	533	28	2,771
2003	2,930	478	25	3,433
2004	2,440	531	43	3,014
Average	**6,939.4**	**731.6**	**28.0**	**7,699.0**
SD	**4,432.6**	**158.5**	**6.6**	**4,496.9**

Figure 12. Species composition of the billfish catch, 1987-2004.

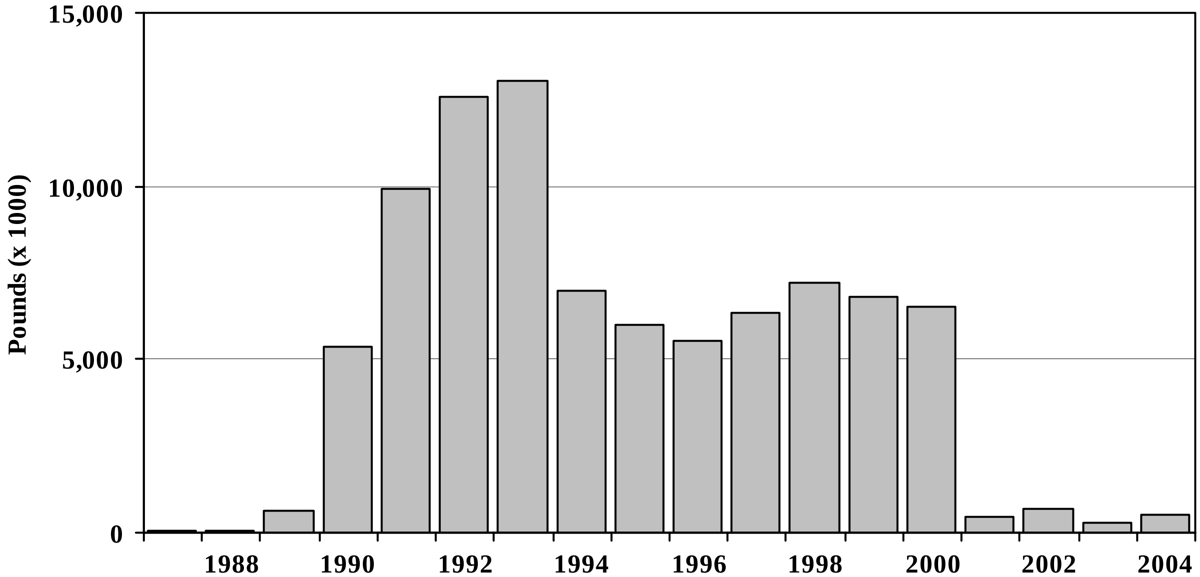


Interpretation: The billfish catch consisted mostly of marlins and small catches of swordfish from 1987 through 1989. However, in 1990 the composition changed and catch more than doubled as longline vessels began to target swordfish. Swordfish catches continued to dominate billfish catch from 1990 through 2000 despite a 46% decrease in 1994. Swordfish catches dropped 92% in 2001 from regulatory actions and remained low through 2004. Billfish composition during 2001 through 2004 resembled the billfish composition of the late 1980s, with marlins as the largest component. Blue marlin composed 17% of the billfish catch with catches peaking in 1995-1997. Striped marlin catches peaked in 1991 and declined to a low in 2000 with catch slightly below the long-term average in 2004.

Source and Calculations: The billfish catch statistics were derived from NMFS longline logbook, HDAR Commercial Fish Catch, and Marine Dealer data and was calculated for each species. The gear types summarized for each species was composed longline, MHI troll, MHI handline, offshore handline, aku boat, and other gear.

	Hawaii billfish catch (1000 lbs)				
Year	**Swordfish**	**Blue marlin**	**Striped marlin**	**Other marlins**	**Total**
1987	60	686	667	144	1,557
1988	65	812	1,231	194	2,301
1989	635	1,502	1,403	340	3,880
1990	5,383	1,485	1,247	164	8,279
1991	9,953	1,418	1,551	208	13,129
1992	12,569	1,339	1,097	349	15,354
1993	13,036	1,434	1,191	266	15,927
1994	7,010	1,454	796	267	9,526
1995	5,994	1,952	1,313	464	9,724
1996	5,529	1,931	1,044	292	8,797
1997	6,368	1,908	861	354	9,491
1998	7,208	1,403	891	421	9,924
1999	6,856	1,432	866	605	9,758
2000	6,520	1,121	472	371	8,482
2001	500	1,494	873	352	3,219
2002	725	1,045	618	387	2,774
2003	323	1,163	1,371	581	3,438
2004	578	996	956	505	3,035
Average	**4,961.8**	**1,365.2**	**1,024.9**	**347.9**	**7,699.8**
SD	**4,284.7**	**354.5**	**296.9**	**133.2**	**4,494.8**

Figure 13. Hawaii swordfish catch, 1987-2004.

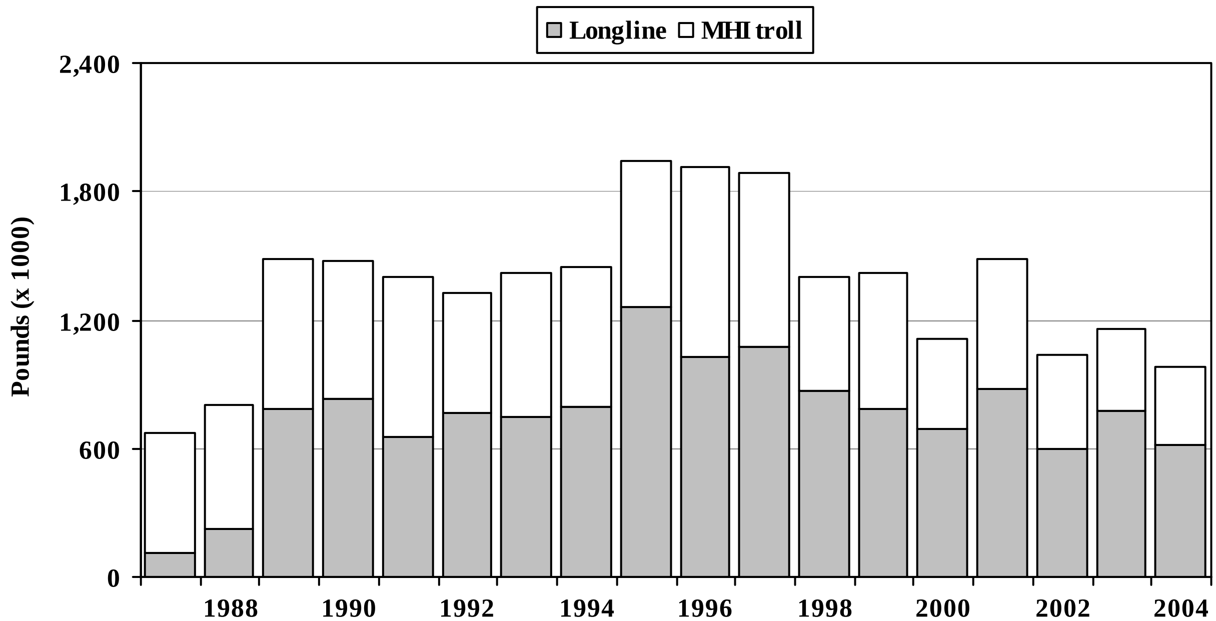


Interpretation: The trend in swordfish catches reflected both an increase in the number of vessels in the longline fishery and widespread targeting of swordfish by the fishery. Swordfish catches rose rapidly from 1988, peaked in 1993, and fell the following year. Catches remained relatively steady up to 2000 but dropped dramatically by 93% the following year and remained low through 2004 The low catch level was a result of regulations on shallow-set longline gear. Although the shallow set longline fishery was reopened under a new set of regulations in April 2004, swordfish catches remained low since it was past the peak of the swordfish season as well as longline fishermen unsure of the effectiveness of the new operational and gear requirements. MHI handline swordfish catch was low and probably caught by ika shibi handliners (night handline).

Source and Calculations: Swordfish catch statistics were derived from NMFS longline logbook, HDAR Commercial Fish Catch, and Marine Dealer data. The gear types summarized for catches of swordfish included the longline, MHI troll, and MHI handline fisheries. The total column also contains small swordfish catches by the other gear category.

	Swordfish catch (1000 lbs)			
Year	**Longline**	**MHI troll**	**MHI handline**	**Total**
1987	52	1	7	60
1988	52	2	11	65
1989	619	2	14	635
1990	5,372	1	10	5,383
1991	9,939	1	13	9,953
1992	12,566	0	3	12,569
1993	13,027	0	9	13,036
1994	7,002	1	7	7,010
1995	5,981	1	12	5,994
1996	5,517	1	11	5,529
1997	6,352	1	15	6,368
1998	7,193	1	14	7,208
1999	6,835	1	19	6,856
2000	6,502	1	16	6,520
2001	485	1	14	500
2002	699	5	21	725
2003	301	1	21	323
2004	542	1	34	578
Average	**4,946.4**	**1.3**	**14.0**	**4,961.8**
SD	**4,288.5**	**1.0**	**6.9**	**4,284.7**

Figure 14. Hawaii blue marlin catch, 1987-2004.



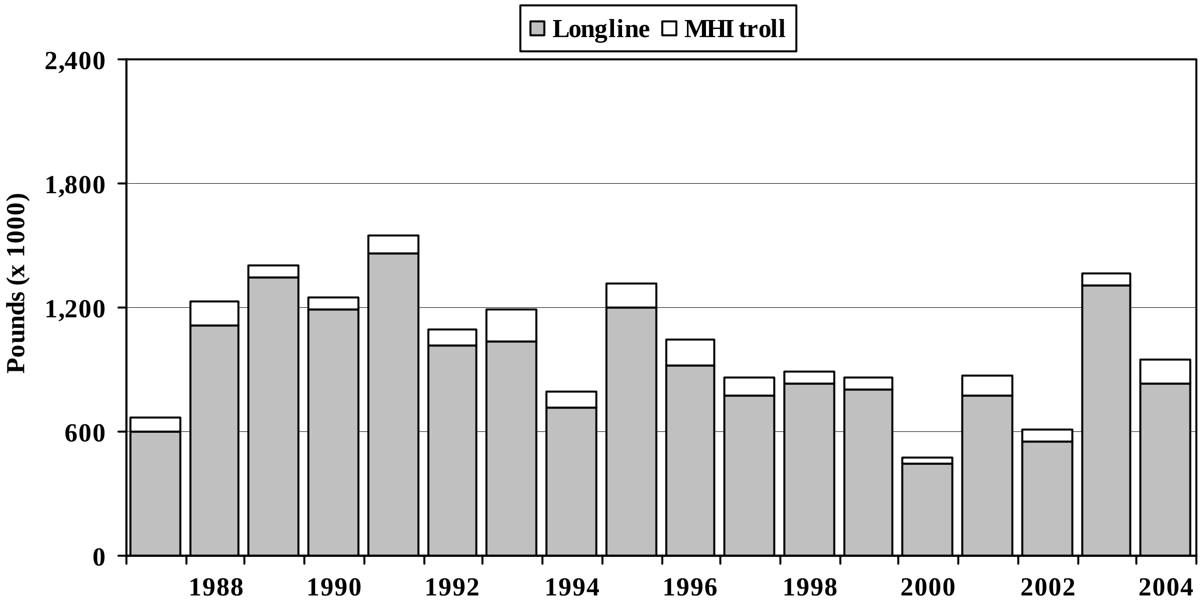
Interpretation: Total blue marlin catch rose from 1987 to a peak in 1995, and has since been on a generally declining trend. The MHI troll fishery had the largest catches early in the 18-year period but longline catches have consistently been the largest from 1992. Both fisheries had high blue marlin catches during 1989-90, 1995-97, and in 2001 (see below regarding species ID problems).

Source and Calculations: Blue marlin catch statistics were derived from NMFS longline logbook, HDAR Commercial Fish Catch, and Marine Dealer data. The gear types summarized for catches of blue marlin included the longline, MHI troll, and MHI handline fisheries. The total column also contains small blue marlin catches by the offshore handline fishery and other gear category.

The marlin catches by the longline fishery are nominal estimates which do not account for marlin ID problems. The latter is currently being studied in a Pelagic Fisheries Research Project (PFRP) project (see PFRP newsletter 7(10), 1-4).

	Blue marlin catch (1000 lbs)			
Year	Longline	MHI troll	MHI handline	Total
1987	112	557	18	686
1988	225	575	12	812
1989	784	704	14	1,502
1990	834	638	12	1,485
1991	654	749	14	1,418
1992	765	565	9	1,339
1993	748	675	11	1,434
1994	798	648	8	1,454
1995	1,257	684	11	1,952
1996	1,030	885	16	1,931
1997	1,074	814	20	1,908
1998	870	527	6	1,403
1999	787	635	10	1,432
2000	692	423	5	1,121
2001	879	610	5	1,494
2002	594	443	6	1,045
2003	771	387	4	1,163
2004	619	362	3	996
Average	**749.6**	**604.6**	**10.2**	**1,365.2**
SD	**268.0**	**142.4**	**4.9**	**354.5**

Figure 15. Hawaii striped marlin catches, 1987-2004.



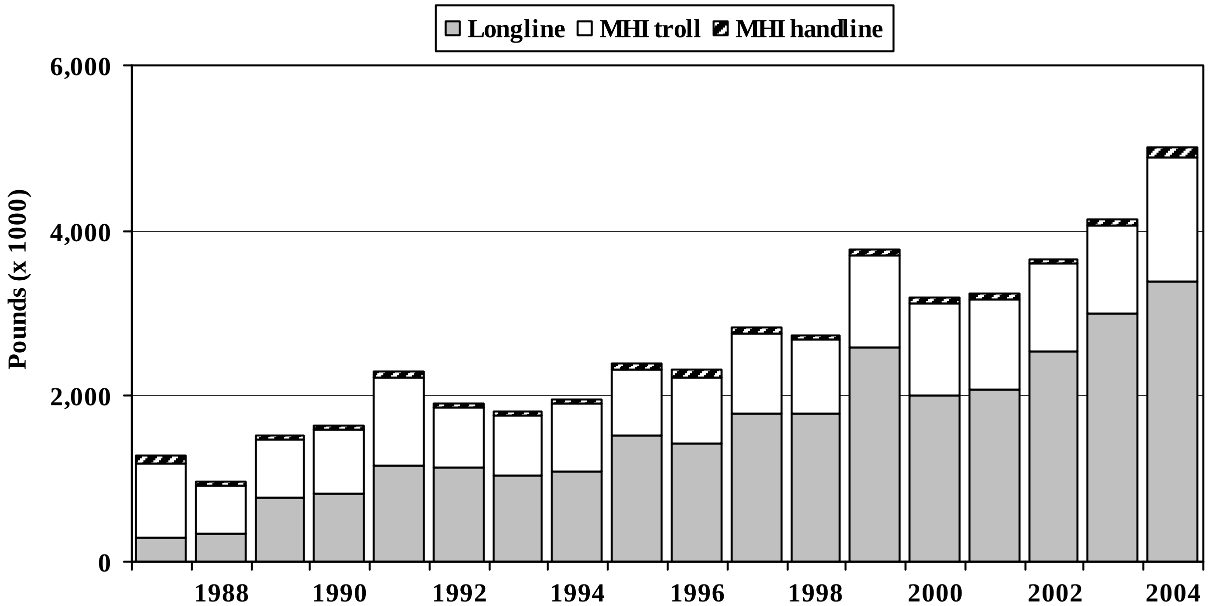
Interpretation: Total catch of striped marlin was highest in the early 1990's. Striped marlin catch declined to a record low in 2000 and considerable inter-annual variation thereafter. The longline fishery typically produces more than 90% of the total striped marlin catch. The MHI troll fishery was the second largest producer of striped marlin in Hawaii. There was no clear trend in catches of striped marlin by the MHI troll fishery.

Source and Calculations: Striped marlin catch statistics were derived from NMFS longline logbook, HDAR Commercial Fish Catch, and Marine Dealer data. The gear types summarized for catches of striped marlin included the longline, MHI troll, and MHI handline fisheries. The total column also contains small striped marlin catches by the offshore handline fishery and other gear category.

The marlin catches by the longline fishery are nominal estimates which do not account for marlin ID problems. The latter is currently being studied in a Pelagic Fisheries Research Project (PFRP) project (see PFRP newsletter 7(10), 1-4).

	Striped marlin catch (1000 lbs)			
Year	**Longline**	**MHI troll**	**MHI handline**	**Total**
1987	599	66	2	667
1988	1,110	118	2	1,231
1989	1,350	52	1	1,403
1990	1,186	59	1	1,247
1991	1,462	89	1	1,551
1992	1,013	83	2	1,097
1993	1,039	150	2	1,191
1994	719	76	1	796
1995	1,198	114	1	1,313
1996	923	119	2	1,044
1997	775	83	3	861
1998	834	57	0	891
1999	803	62	1	866
2000	441	30	1	472
2001	775	94	5	873
2002	549	64	1	618
2003	1,306	63	0	1,371
2004	836	108	4	956
Average	**939.9**	**82.6**	**1.6**	**1,024.9**
SD	**295.5**	**30.3**	**1.1**	**305.5**

Figure 16. Hawaii commercial catch of other pelagic PMUS by gear type, 1987-2004.

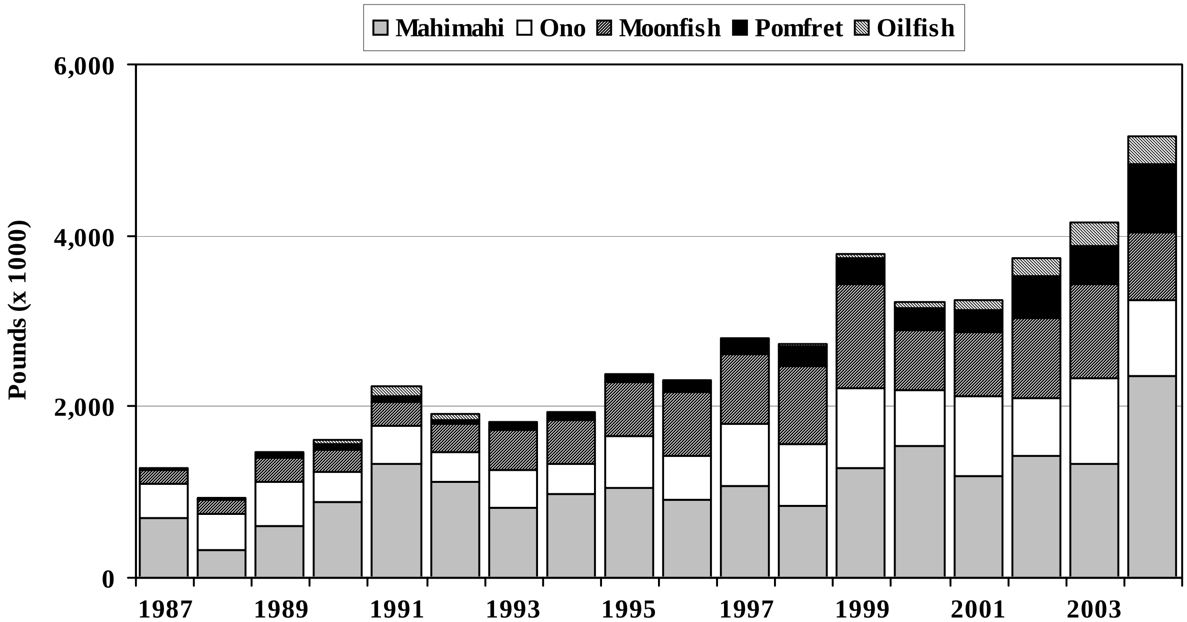


Interpretation: The catch of other pelagic PMUS showed an upward trend over the 18-year period reaching a record high in 2004. The longline fishery accounts for about 60% of other pelagic PMUS catch. The MHI troll fishery was the second largest producer followed by significantly smaller catches by the MHI handline, offshore handline and aku boat fisheries.

Source and Calculations: Other pelagic PMUS catch statistics were derived from NMFS longline logbook, HDAR Commercial Fish Catch, and Marine Dealer data and was calculated for each gear type. The other pelagic PMUS species include mahimahi, moonfish, oilfish, pomfret, and ono (wahoo).

	Catch of other pelagic PMUS (1000 lbs)					
Year	**Longline**	**MHI troll**	**MHI handline**	**Offshore handline**	**Aku boat**	**Total**
1987	280	907	102	-	2	1,291
1988	350	569	48	-	4	971
1989	780	691	63	-	1	1,534
1990	830	768	51	0	0	1,650
1991	1,160	1,067	66	5	0	2,298
1992	1,130	731	46	21	14	1,941
1993	1,030	744	51	23	3	1,852
1994	1,100	800	55	18	0	1,973
1995	1,520	815	61	20	0	2,416
1996	1,430	806	85	17	0	2,338
1997	1,790	974	56	9	5	2,835
1998	1,780	912	49	13	0	2,753
1999	2,590	1,109	82	20	0	3,801
2000	2,010	1,122	64	46	0	3,243
2001	2,070	1,104	61	36	0	3,271
2002	2,550	1,043	71	21	0	3,727
2003	2,990	1,082	62	19	1	4,192
2004	3,390	1,491	115	12	-	5,158
Average	**1,598.9**	**929.7**	**66.0**	**15.6**	**1.8**	**2,624.6**
SD	**876.9**	**217.6**	**19.0**	**12.5**	**3.5**	**1,103.7**

Figure 17. Species composition of other pelagic PMUS catch, 1987-2004.

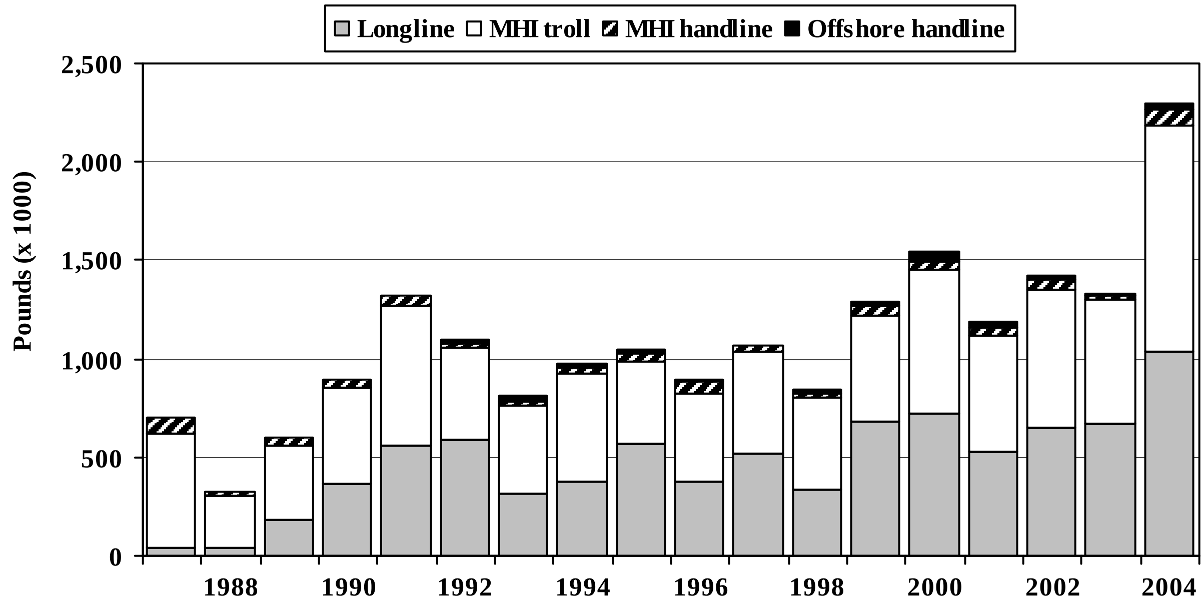


Interpretation: Mahimahi was the largest component of other pelagic catch in 2004 with catch consistently above 1 million pounds from 1999. Ono catch increased at a more gradual rate and was consistently above 500,000 pounds from 1995. Moonfish and pomfret catches increased at a higher rate during the 18-year period. Oilfish catch was relatively small and showed substantial variation from 1987-2004 with a substantial increase during the past five years.

Source and Calculations: The other pelagic PMUS catch statistics were derived from NMFS longline logbook, HDAR Commercial Fish Catch, and Marine Dealer data and was calculated for each species. The gear types summarized for each species include catches from the longline, MHI troll, MHI handline, offshore handline, aku boat fisheries, and other gear category.

	Catch of other pelagic PMUS (1000 lbs)						
Year	**Mahimahi**	**Ono**	**Moonfish**	**Pomfret**	**Oilfish**	**Misc**	**Total**
1987	704	400	152	23	2	11	1,292
1988	332	406	182	18	3	34	975
1989	596	522	274	49	24	64	1,529
1990	894	352	253	66	52	32	1,649
1991	1,321	456	270	75	130	41	2,293
1992	1,113	365	320	37	85	22	1,942
1993	814	451	454	92	0	42	1,852
1994	974	351	524	85	8	31	1,973
1995	1,044	606	629	93	10	34	2,416
1996	899	514	760	121	11	31	2,337
1997	1,077	715	823	178	15	29	2,837
1998	839	725	922	225	26	18	2,754
1999	1,293	929	1,210	313	29	26	3,800
2000	1,543	650	693	257	85	17	3,245
2001	1,191	922	756	255	119	26	3,270
2002	1,425	687	916	496	201	23	3,747
2003	1,335	1,001	1,092	458	278	21	4,185
2004	2,355	894	780	809	333	42	5,213
Average	**1,097.1**	**608.2**	**611.7**	**202.8**	**78.3**	**30.1**	**2,628.2**
SD	**439.2**	**218.2**	**323.0**	**207.9**	**99.6**	**12.1**	**1,111.7**

Figure 18. Hawaii mahimahi catch, 1987-2004.

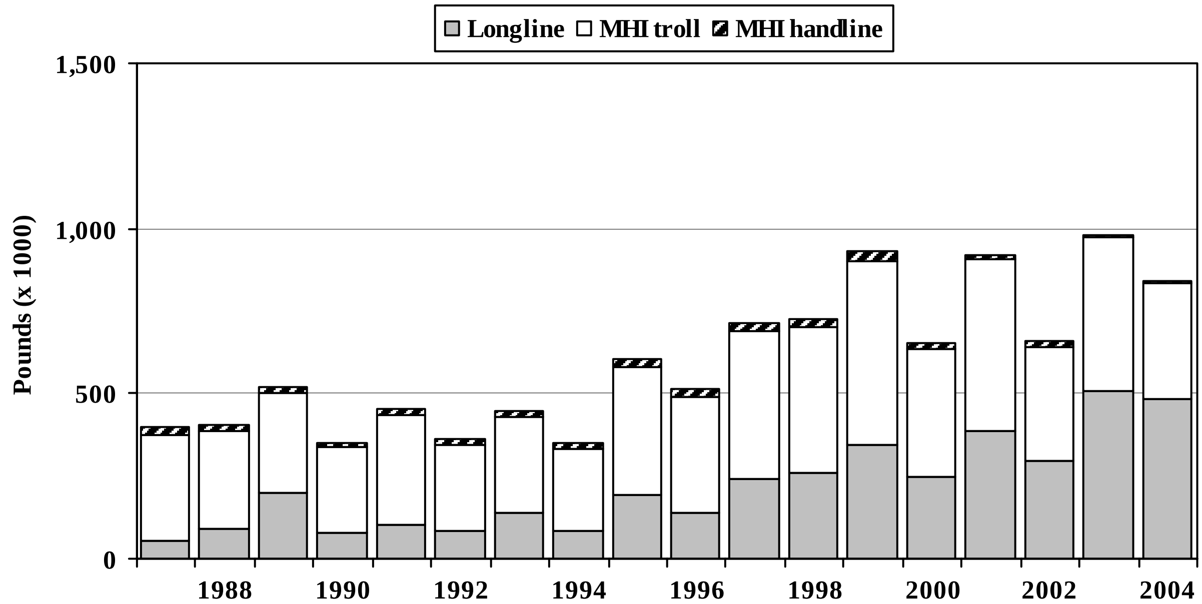


Interpretation: Total catch of mahimahi varied substantially over the 18-year period reaching a record high in 2004. The MHI troll fishery usually had the highest mahimahi catches, although this fishery showed no clear trend. In contrast, catches by the longline fishery increased during 1987-2004. There were also small catches of mahimahi by the MHI handline, offshore handline, and aku boat fisheries.

Source and Calculations: Mahimahi catch statistics were derived from NMFS longline logbook, HDAR Commercial Fish Catch, and Marine Dealer data. The gear types summarized for catches of mahimahi included the longline, MHI troll, MHI handline, offshore handline, and aku boat fisheries. The total column also contains small mahimahi catches by the other gear category.

	Mahimahi catch (1000 lbs)					
Year	**Longline**	**MHI troll**	**MHI handline**	**Offshore handline**	**Aku boat**	**Total**
1987	45	579	78	-	2	704
1988	39	264	25	-	4	332
1989	183	379	34	-	1	596
1990	366	491	37	0	0	894
1991	555	718	44	5	0	1,321
1992	593	461	24	21	14	1,113
1993	316	444	27	23	3	814
1994	377	546	33	18	0	974
1995	570	419	35	20	0	1,044
1996	375	451	56	17	0	899
1997	518	517	27	9	5	1,077
1998	336	464	26	13	0	839
1999	679	545	49	20	0	1,293
2000	721	731	45	46	0	1,543
2001	530	584	42	36	0	1,191
2002	655	695	49	21	0	1,425
2003	675	621	24	10	1	1,335
2004	1,040	1,140	86	35	-	2,355
Average	**428.6**	**518.0**	**39.3**	**19.2**	**1.9**	**1,003.6**
SD	**211.5**	**125.5**	**14.2**	**12.0**	**3.6**	**316.3**

Figure 19. Hawaii ono catch, 1987-2004.

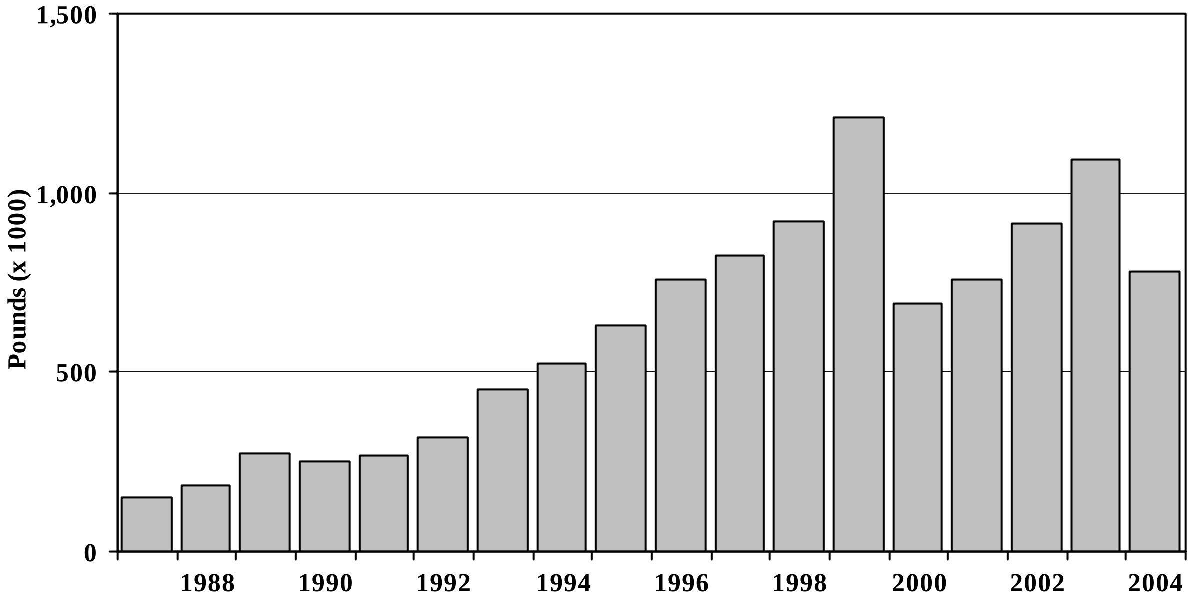


Interpretation: Ono catches were consistently above 500,000 pounds from 1995 with a record catch above 1 million pounds in 2003. The longline and MHI troll fisheries account for more than 90% of the ono catch. Catch by these two fisheries were above their respective the long-term averages from 1997. The MHI handline fishery accounted for relatively small catches of ono.

Source and Calculations: Ono catch statistics were derived from NMFS longline logbook, HDAR Commercial Fish Catch, and Marine Dealer data. The gear types summarized for catches of mahimahi included the longline, MHI troll, and MHI handline fisheries. The total column also contains small ono catches by the other gear category.

	Ono catch (1000 lbs)			
Year	**Longline**	**MHI troll**	**MHI handline**	**Total**
1987	53	324	23	400
1988	90	298	18	406
1989	202	298	22	522
1990	80	262	11	352
1991	101	337	18	456
1992	85	262	18	365
1993	142	286	22	451
1994	87	245	19	351
1995	195	388	23	606
1996	140	347	27	514
1997	239	451	25	715
1998	262	442	21	725
1999	343	558	28	929
2000	246	387	17	650
2001	388	516	17	922
2002	298	346	15	687
2003	511	461	10	1,001
2004	485	349	6	894
Average	**184.4**	**359.3**	**20.3**	**565.8**
SD	**103.2**	**92.4**	**4.5**	**190.6**

Figure 20. Hawaii moonfish catch, 1987-2004.

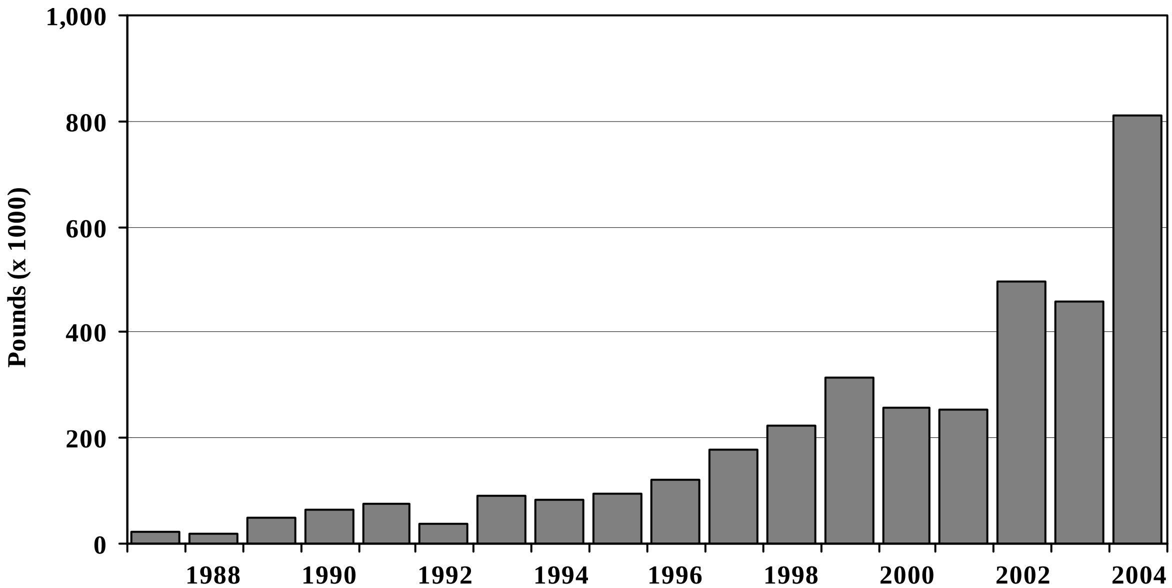


Interpretation: Moonfish catches rose and peaked at 1.2 million pounds in 1999; almost 8 times more than the catch observed in 1987 and exceeded 1 million pounds again in 2003. Moonfish is caught exclusively on longline gear.

Source and Calculations: Moonfish catch statistics were derived from NMFS longline logbook and HDAR Commercial Marine Dealer data. Moonfish was caught exclusively on longline gear as no record of moonfish was observed being caught by other Hawaii fisheries.

	Moonfish catch (1000 lbs)	
Year	**Longline**	**Total**
1987	152	152
1988	182	182
1989	274	274
1990	253	253
1991	270	270
1992	320	320
1993	454	454
1994	524	524
1995	629	629
1996	760	760
1997	823	823
1998	922	922
1999	1,210	1,210
2000	693	693
2001	756	756
2002	916	916
2003	1,092	1,092
2004	780	780
Average	**611.7**	**611.7**
SD	**323.0**	**323.0**

Figure 21. Hawaii pomfret catch, 1987-2004.

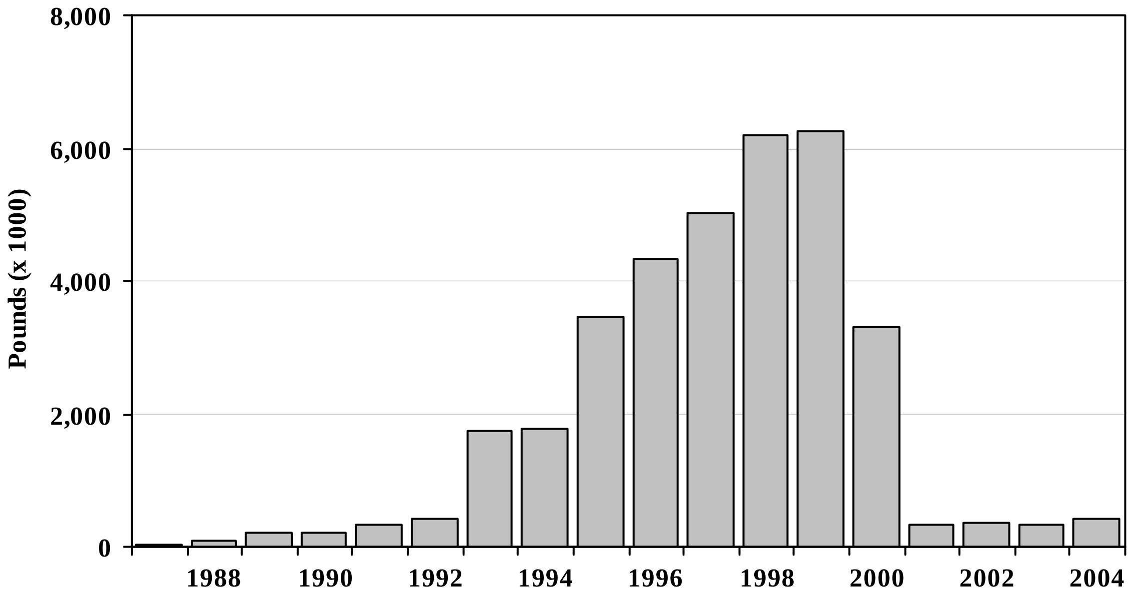


Interpretation: Pomfret catches rose gradually from 1987 to 1999 with substantially higher catch observed from 2002 peaking at 800,000 pounds in 2004. The longline fishery catches majority of the pomfrets in Hawaii although there were small catches of pomfrets by the MHI handline and offshore handline fisheries during the past three years..

Source and Calculations: Pomfret catch statistics were derived from NMFS longline logbook, HDAR Commercial Fish Catch, and Marine Dealer data. The gear types summarized for catches of mahimahi included the longline, MHI troll, and MHI handline fisheries. The total column also contains small ono catches by the other gear category.

	Pomfret catch (1000 lbs)			
Year	**Longline**	**MHI handline**	**Offshore handline**	**Total**
1987	23	0	-	23
1988	18	0	-	18
1989	49	0	-	49
1990	66	0	0	66
1991	75	0	0	75
1992	37	0	0	37
1993	92	0	0	92
1994	85	0	0	85
1995	93	0	0	93
1996	121	0	0	121
1997	178	0	0	178
1998	225	0	0	225
1999	313	0	0	313
2000	257	0	0	257
2001	255	0	0	255
2002	466	7	15	496
2003	416	27	0	458
2004	733	20	14	809
Average	**194.6**	**3.0**	**1.6**	**202.8**
SD	**125.4**	**1.8**	**3.8**	**130.6**

Figure 22. Hawaii shark catch, 1987-2004.

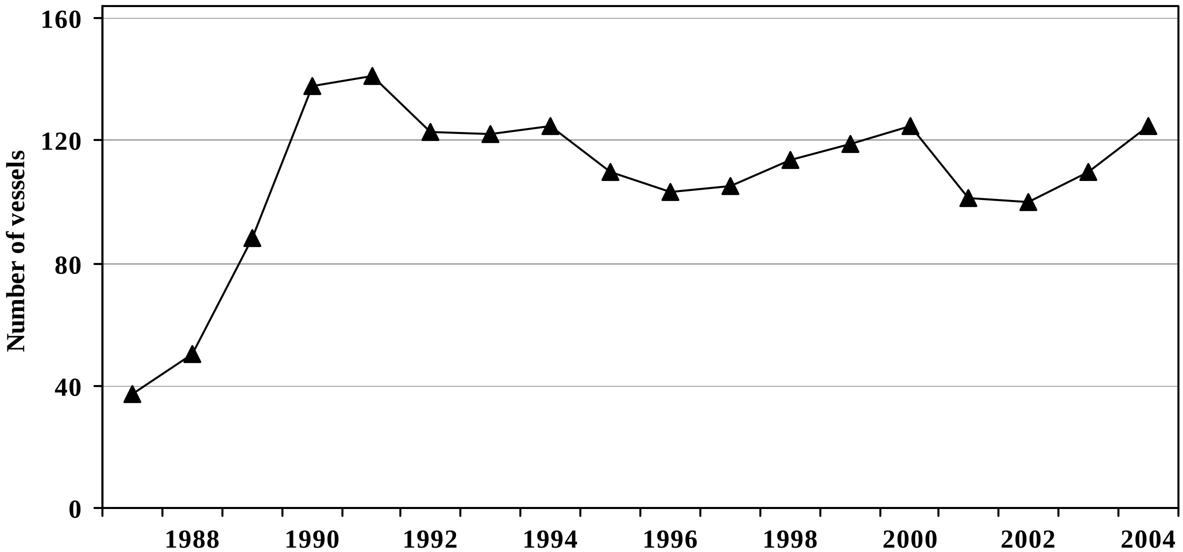


Interpretation: Sharks were caught and landed almost exclusively by the longline fishery. Shark catch increased dramatically from 1987 to a peak of 6.3 million pounds in 1999. Sharks were landed headed and gutted in the late 1980's but a market for shark fins began in the early 1990's. Finning sharks then became widespread throughout the longline fishery. Shark catch dropped by 47% in 2000 in response to a state law that prohibited finning. This was followed by the federal Shark Finning Prohibition Act which was passed shortly thereafter. These regulatory measures caused a 90% decline in shark landings observed in 2001 with landings remaining low through 2004.

Source and Calculations: Shark catches (in number of fish) were derived from NMFS longline logbook and extrapolated to weight by using the mean weight calculated from the Market sample or HDAR Commercial Marine Dealer data. When the practice of finning sharks was allowed (typically blue and other shark species) their carcasses were discarded at sea. These fish still represented a kept and landed fish. Since the mean weight could not be calculated using either the NMFS market sample or HDAR commercial marine dealer data, these finned shark catches were also extrapolated by multiplying the number of sharks finned by an average weight from the observer data as a crude method to estimate shark biomass.

	Shark catch (1000 lbs)	
Year	**Longline**	**Total**
1987	40	40
1988	90	90
1989	200	200
1990	220	220
1991	320	320
1992	410	410
1993	1,740	1,740
1994	1,760	1,760
1995	3,470	3,470
1996	4,330	4,330
1997	5,010	5,010
1998	6,210	6,210
1999	6,270	6,270
2000	3,300	3,300
2001	330	330
2002	350	353
2003	340	341
2004	410	411
Average	**1,933.3**	**1,933.6**
SD	**2,228.0**	**2,227.8**

Figure 23. Number of Hawaii-based longline vessels, 1987-2004.

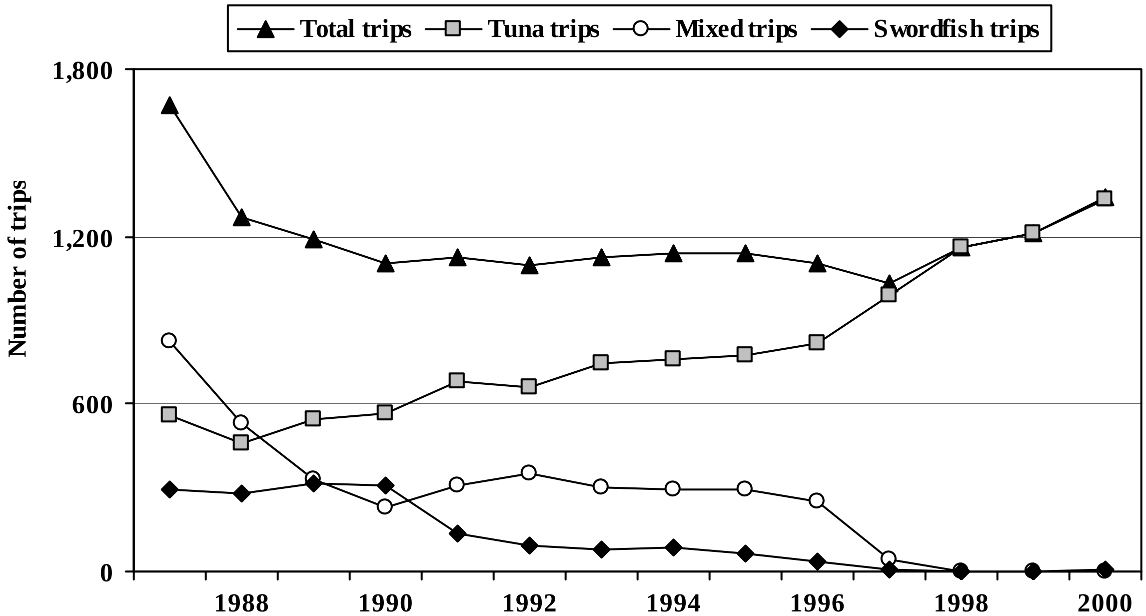


Interpretation: The number of active Hawaii-based longline vessels rose rapidly from 37 in 1987, to a peak of 141 vessels in 1991 and was followed by a decline to 103 vessels in 1996. Vessel activity grew slowly peaking at 125 in 2000 then dropped suddenly to 101 the following year. The drop observed in 2001 was due to Hawaii-based longline vessels leaving the fishery due to the prohibition of shallow-set gear,which caused vessels to move California, where they continued to target swordfish. Other vessels converted their gear and techniques to deep-set longline in order to target tuna. There were 125 active Hawaii-based longline vessels in 2004.

Source and Calculations: The number of Hawaii-based longline vessels was compiled from the NMFS marketing sample data from 1987-1990 and the NMFS longline logbook data from 1991-2004. The number of vessels was based on landing date.

Year	Vessels
1987	37
1988	50
1989	88
1990	138
1991	141
1992	123
1993	122
1994	125
1995	110
1996	103
1997	105
1998	114
1999	119
2000	125
2001	101
2002	100
2003	110
2004	125
Average	107.6
SD	27.0

Figure 24. Number of trips by the Hawaii-based longline fishery, 1991-2004.

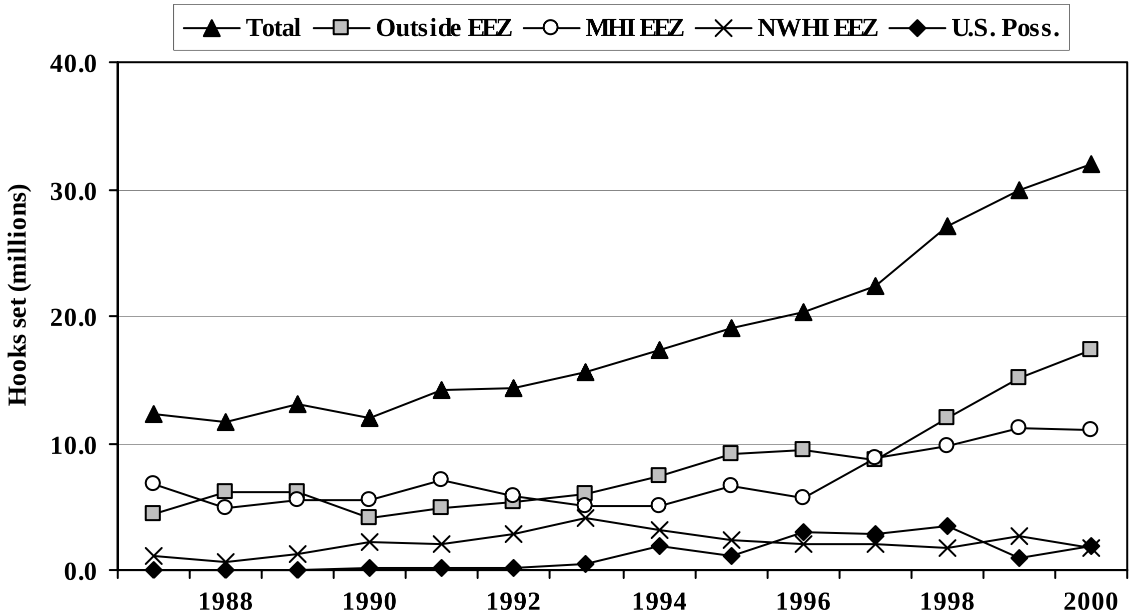


Interpretation: The first year in this 12-year time series, 1991, had significantly more trips than all subsequent years. The total number of Hawaii-based longline trips declined sharply in 1992 because a moratorium on new vessels from entering the fishery was implemented. Trip activity stabilized thereafter but there was a shift in effort from swordfish and mixed target trips toward tuna targeted trips. There was a total of 1,338 longline trips made in 2004. Tuna trips increased from a low of 458 trips in 1992 to a record 1,332 trips made in 2004. Swordfish and mixed target trips effort was highest in the early 1990's and stabilized up to 2000 then declined dramatically in 2001 due to the prohibition on shallow-set longline gear in that year. There were no swordfish trips in 2002 and 2003. Under a new set of regulations on shallow-set longline gear implemented in April 2004 five vessels targeted swordfish and made 6 trips by the end of the year.

Source and Calculations: The number of trips was compiled from NMFS federal longline logbook data collected from 1991 to 2004. The trip summary was based on landing date. The trip type was determined by an interview with the vessel captain or assigned by FMEP staff on the basis of gear characteristics, fishing techniques and locations, catch composition and past targeting strategy.

	Hawaii longline trip activity			
Year	**Total trips**	**Tuna trips**	**Mixed trips**	**Swordfish trips**
1991	1,671	556	823	292
1992	1,266	458	531	277
1993	1,192	542	331	319
1994	1,106	568	228	310
1995	1,125	682	307	136
1996	1,100	657	351	92
1997	1,125	745	302	78
1998	1,140	760	296	84
1999	1,138	776	297	65
2000	1,103	814	252	37
2001	1,034	987	43	4
2002	1,165	1,163	2	0
2003	1,215	1,215	0	0
2004	1,338	1,332	0	6
Average	**1,194.1**	**803.9**	**268.8**	**121.4**
SD	**157.1**	**271.5**	**225.2**	**123.8**

Figure 25. Number of hooks set by the Hawaii-based longline fishery, 1991-2004.



Interpretation: The total number of hooks set by the Hawaii-based longline fishery increased steadily since 1994 to a record 32.0 million hooks in 2004. Much of the increase is due to the shift in effort from swordfish and mixed target to tuna. Tuna sets typically set more hooks per day than swordfish and mixed target set types. Most of the hooks set were in the areas outside the EEZ (54%) and MHI EEZ (34%) in 2004. Effort in the NWHI EEZ (6%) decreased while effort in the EEZ of U.S. possessions (6%), particularly the areas of Johnston Atoll, Kingman Reef, and Palmyra Atoll, increased in 2004.

Source and Calculations: Number of hooks set was compiled from NMFS federal longline logbook data collected from 1991 to 2004. The summary of hooks set was based on date of haul.

	Number of hooks set by area (milions)				
Year	**Outside EEZ**	**MHI EEZ**	**NWHI EEZ**	**U.S. Poss.**	**Total**
1991	4.4	6.9	1.1	0.1	12.3
1992	6.1	4.9	0.7	0.0	11.7
1993	6.2	5.6	1.3	0.0	13.0
1994	4.1	5.5	2.2	0.2	12.0
1995	4.9	7.1	2.0	0.2	14.2
1996	5.4	5.9	2.9	0.2	14.4
1997	6.0	5.1	4.1	0.4	15.6
1998	7.4	5.0	3.1	1.9	17.4
1999	9.1	6.6	2.4	1.1	19.1
2000	9.5	5.7	2.1	3.0	20.3
2001	8.6	8.8	2.0	2.9	22.4
2002	12.0	9.7	1.8	3.5	27.0
2003	15.0	11.2	2.7	0.9	29.9
2004	17.3	11.0	1.8	2.0	32.0
Average	**8.3**	**7.1**	**2.2**	**1.2**	**18.7**
SD	**4.0**	**2.2**	**0.9**	**1.3**	**6.8**

Table 3. Distance traveled to first set by the Hawaii-based longline fleet, 1991-2004.

	Distance to first set (miles)							
	Average				Maximum			
Year	Tuna trips	Mixed trips	Sword trips	Fleet mean	Tuna trips	Mixed trips	Sword trips	Fleet maximum
1991	240	276	585	318	1,508	1,408	1,792	1,792
1992	260	404	733	424	1,156	1,543	1,871	1,871
1993	222	522	820	465	1,432	1,616	2,122	2,122
1994	252	323	833	430	945	1,298	2,814	2,814
1995	273	397	884	441	945	1,609	2,097	2,097
1996	284	410	790	367	1,866	1,547	2,037	2,037
1997	288	365	623	332	1,002	1,323	1,973	1,973
1998	384	439	708	422	1,154	1,611	1,522	1,611
1999	313	490	821	388	1,160	1,723	1,791	1,791
2000	472	674	879	557	1,461	1,747	1,945	1,949
2001	345	408	1,295	353	1,357	1,451	1,546	1,546
2002	370	---	---	370	1,378	---	---	1,378
2003	330	---	---	330	2,412	---	---	2,412
2004	355	---	1,092	359	1,374	---	1,460	1,460
Average	**313.4**	**428.0**	**838.6**	**396.9**	**1,367.9**	**1,534.2**	**1,914.2**	**1,918.1**
SD	**67.9**	**106.6**	**195.0**	**64.8**	**391.9**	**149.2**	**361.0**	**383.0**

Interpretation: The average miles traveled to first set for the Hawaii-based longline fleet was 359 miles in 2004. Tuna trips showed a general increase with longest average distance traveled to first set at 472 miles in 2000 then declining to 330 miles in 2003. When longlining for swordfish was allowed, swordfish trips usually traveled the farthest average distance before making their first set while tuna trips traveled the shortest average distance.

The farthest maximum miles to first set for the Hawaii-based longline fleet was 1,460 miles made on a swordfish trip in 2004. The maximum distance traveled to first set was in excess of 2000 miles from 1993 to 1996 due to the long distances traveled by vessels making swordfish trips. Maximum distance decreased thereafter but rose to 2,412 miles in 2003. In general, swordfish trips had the highest maximum distance to first set while tuna trips usually had the shortest maximum distance to first set.

Source and Calculation: Distance traveled to first set was calculated from NMFS federal longline logbook data. The calculated was based on the difference between Honolulu (21 degrees 18 minutes North, 157 degrees 52 minutes West) and the begin set position of the first set on a longline trip. The average and maximum miles to first set must be interpreted with caution because they may include atypical trips such as those that departed from California and landed in Hawaii. This type of trip activity was included since these vessels were permitted to operate in the Hawaii-based longline fishery. In contrast, trips which vessels departed from Hawaii and landed in California were not included.

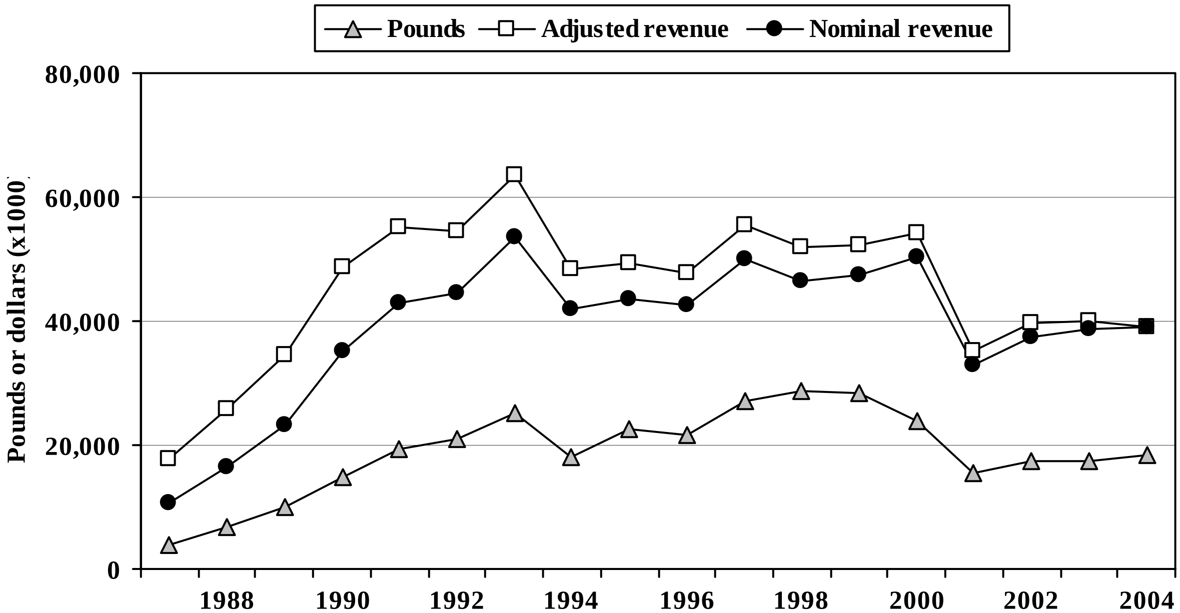
Table 4. Number of days fished per trip for the Hawaii-based longline fleet, 1991-2004.

	Days fished per trip							
	Average				Maximum			
Year	Tuna trips	Mixed trips	Sword trips	Fleet mean	Tuna trips	Mixed trips	Sword trips	Fleet maximum
1991	7.7	6.3	10.7	7.6	18	22	26	22
1992	8.4	7.8	12.7	9.1	14	21	26	26
1993	8.8	9.6	13.7	10.3	14	23	29	29
1994	8.9	8.0	13.4	10.0	16	19	26	26
1995	10.0	9.3	13.2	10.3	20	26	27	27
1996	10.3	10.3	12.7	10.5	28	30	28	30
1997	10.1	10.6	14.1	10.5	19	36	27	36
1998	10.3	11.9	14.5	10.9	17	24	24	24
1999	11.1	11.7	12.5	11.4	19	26	22	26
2000	11.0	13.3	15.5	11.7	19	29	25	29
2001	11.8	10.7	10.0	11.7	20	19	18	20
2002	12.1	---	---	12.1	21	---	---	21
2003	12.1	---	---	12.1	22	---	---	22
2004	11.9	---	14.7	11.9	32	---	19	32
Average	**10.3**	**10.0**	**13.1**	**10.7**	**19.9**	**25.0**	**24.8**	**26.0**
SD	**1.4**	**2.0**	**1.6**	**1.3**	**4.9**	**5.2**	**3.4**	**4.4**

Interpretation: There was an increasing trend for average number of days fished per trip for the Hawaii-based longline fleet. The average number of days fished per trip increased from 7.6 days per trip to a record 12.1 days fished per trip in 2002-2003 and remained about the same in 2004. This represents almost a 60% increase over the 13-year period. Swordfish trips or mixed target trips had the highest maximum number of fishing days per trip.

Source and Calculation: Average and maximum number of days fished per trip were compiled from federal longline logbook data. The number of days fished per trip is a summary of number of hauls on an individual trip and does not include travel days or days not fishing.

Figure 26. Hawaii longline catch and revenue, 1987-2004.



Interpretation: Total catch by the Hawaii-based longline fishery rose six-fold from 1987 to 1993. This was caused by increases in the number of vessels participating in the fishery and by growth in longline effort directed toward swordfish. Catch remained relatively stable until 1999 but decreased 44% over the next two years due to lower shark and swordfish catches. Catch remained low from 2001 to 2004.

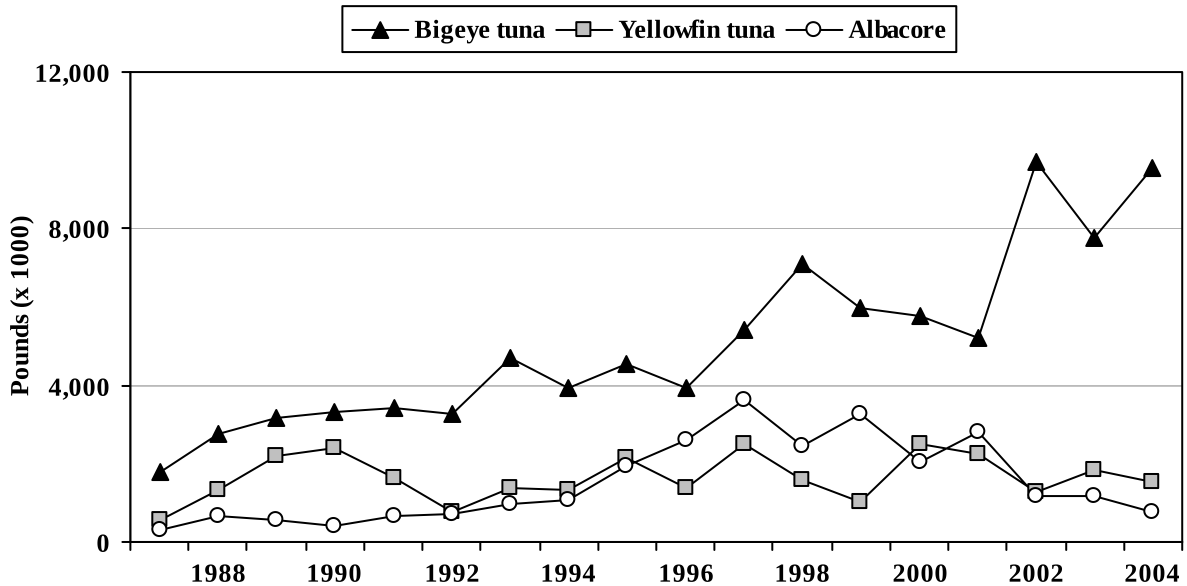
The pattern for revenue was similar to catch; it showed a rapid increase in the late 1980s and early 90s followed by a period of stability through 2000 and a 35% decline in 2001 largely due to lower swordfish revenue. Revenue remained about the same during 2002 through 2004.

Source and Calculations: Longline catch and nominal ex-vessel revenue estimates were compiled from NMFS logbook and market sample or HDAR Commercial Marine Dealer data.

Total catch and revenue estimates were calculated by extrapolating NMFS market sample data from 1987-1991, combining the number of fish from the federal logbook with the average weight per fish and average price per pound from the market sample data during 1992-2001, and the HDAR Dealer data from 2002 to 2004. The adjusted revenue was calculated by multiplying nominal revenue by the Honolulu CPI for the current year and then dividing by the Honolulu CPI for that corresponding year.

		Revenue	
Year	**Pounds**	**Adjusted revenue**	**Nominal revenue**
1987	3,890	$ 17,600	$ 10,600
1988	6,710	$ 25,800	$ 16,500
1989	9,920	$ 34,400	$ 23,200
1990	14,730	$ 48,700	$ 35,300
1991	19,480	$ 55,200	$ 42,900
1992	21,110	$ 54,600	$ 44,400
1993	25,010	$ 63,600	$ 53,400
1994	18,140	$ 48,400	$ 41,800
1995	22,720	$ 49,400	$ 43,600
1996	21,550	$ 47,700	$ 42,700
1997	27,150	$ 55,600	$ 50,100
1998	28,630	$ 51,800	$ 46,600
1999	28,350	$ 52,100	$ 47,400
2000	23,810	$ 54,300	$ 50,200
2001	15,550	$ 35,300	$ 33,000
2002	17,480	$ 39,600	$ 37,500
2003	17,440	$ 39,900	$ 38,600
2004	18,410	$ 39,000	$ 39,000
Average	**18,890.0**	**$ 45,170.0**	**$ 38,710.0**
SD	**6,980.0**	**$ 11,650.0**	**$ 11,590.0**

Figure 27. Hawaii longline tuna catch, 1987-2004.

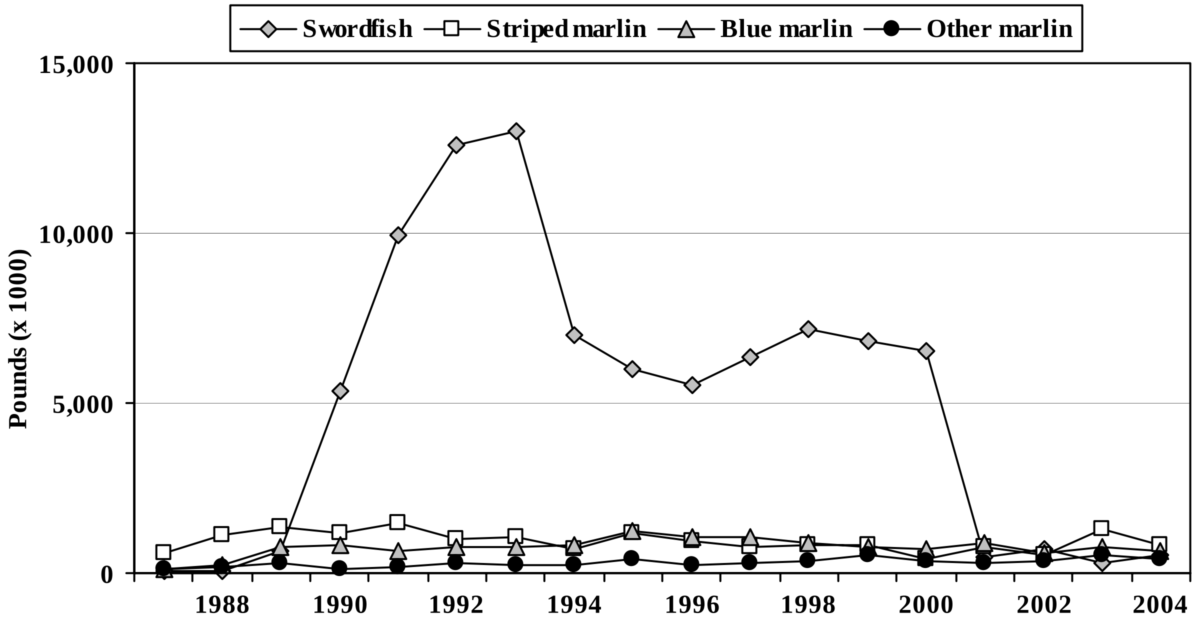


Interpretation: The three major tuna species caught by the Hawaii-based longline fishery are bigeye tuna, yellowfin tuna, and albacore. Bigeye tuna was the largest component of the longline catch and made up 78% of the tuna catch in 2004. Catches for bigeye tuna and albacore were on an upward trend up through the late 1990s due to increased effort directed towards tunas, but then declined in the early 2000s. Bigeye tuna catch then rose to a record level in 2002 while albacore continued on a downward trend. There was considerable variation in yellowfin tuna throughout the 18 year period. The longline fishery also caught small amounts of skipjack tuna and bluefin tuna.

Source and Calculations: The longline tuna catch estimates were derived from NMFS longline logbook, market sample, and Marine Dealer data. Longline tuna catches were estimated by either extrapolating the NMFS market sample data (1987-1991) or multiplying the number of fish from the logbook data by the average weight from the sample or HDAR Dealer data (1992-2004).

	Hawaii longline tuna catch (1000 lbs)					
Year	**Bigeye tuna**	**Yellowfin tuna**	**Albacore**	**Skipjack tuna**	**Bluefin tuna**	**Total**
1987	1,796	575	331	3	0	2,705
1988	2,732	1,309	676	8	0	4,725
1989	3,178	2,174	547	22	0	5,921
1990	3,338	2,421	390	12	1	6,162
1991	3,423	1,617	687	66	4	5,797
1992	3,277	763	735	49	84	4,908
1993	4,677	1,392	965	79	92	7,205
1994	3,940	1,336	1,095	116	53	6,540
1995	4,522	2,159	1,938	223	56	8,898
1996	3,940	1,389	2,606	91	48	8,074
1997	5,399	2,515	3,626	234	52	11,826
1998	7,113	1,592	2,450	168	36	11,359
1999	5,995	1,042	3,250	219	23	10,529
2000	5,788	2,506	2,026	206	8	10,534
2001	5,217	2,233	2,802	466	2	10,720
2002	9,679	1,258	1,152	276	2	12,368
2003	7,770	1,820	1,157	435	1	11,183
2004	9,538	1,553	789	293	1	12,175
Average	**5,073.4**	**1,647.4**	**1,512.3**	**164.8**	**25.7**	**8,423.8**
SD	**2,247.5**	**584.4**	**1,043.1**	**141.1**	**31.1**	**3,009.8**

Figure 28. Hawaii longline billfish catch, 1987-2004.



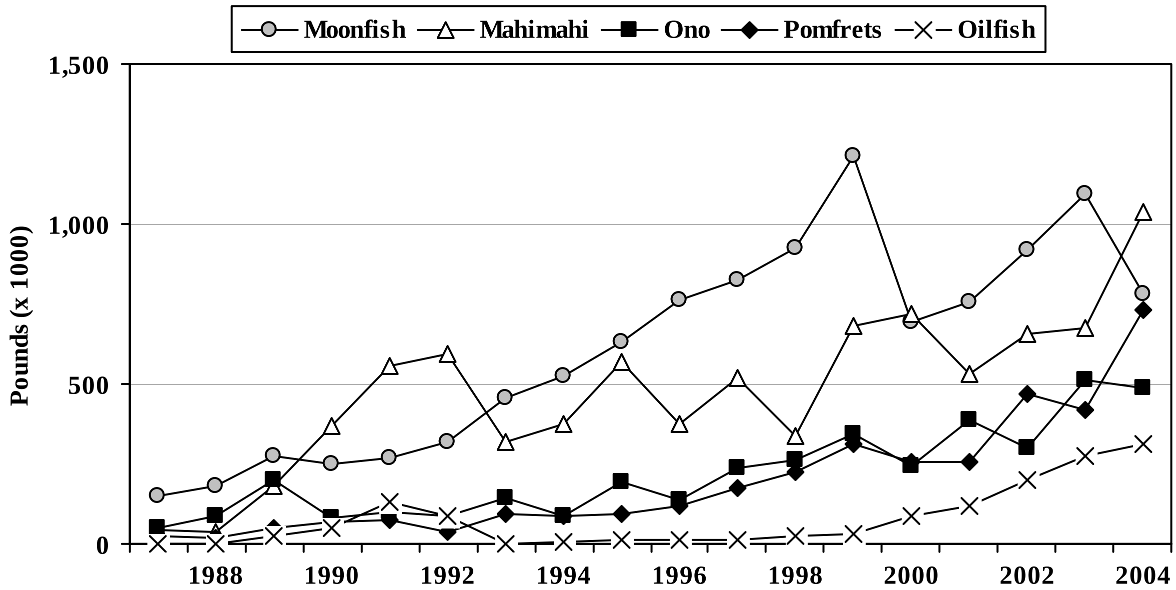
Interpretation: This catch rose rapidly in the early 1990s to a peak in 1993 as a result of increased effort directed towards swordfish. Swordfish catch dropped the following year and remained relatively stable through 2000 but decreased substantially in 2001 and remained through 2004. The decrease in swordfish catch was caused by the prohibition of targeting swordfish to reduce the turtle interactions.

Marlins are caught incidentally by the longline fishery, but are retained because they sell for a moderate market price. Longline catch of blue marlin remained stable from 1989 with slightly higher catches in 1995 through 1997 and was the largest component of the longline billfish catch in 2001. Striped marlin catch has been on a downward trend with a record low catch in 2000.

Source and Calculations: The longline billfish catch estimates were derived from NMFS longline logbook, market sample, and Marine Dealer data. Longline billfish catches were estimated by either extrapolating the NMFS market sample data (1987-1991) or multiplying the number of fish from the logbook data by the average weight from the sample or HDAR Dealer data (1992-2004).

	Hawaii longline billfish catch (1000 lbs)				
Year	**Swordfish**	**Striped marlin**	**Blue marlin**	**Other marlin**	**Total**
1987	52	599	112	99	862
1988	52	1,110	225	150	1,537
1989	619	1,350	784	290	3,043
1990	5,372	1,186	834	127	7,519
1991	9,939	1,462	654	153	12,208
1992	12,566	1,013	765	312	14,656
1993	13,027	1,039	748	220	15,034
1994	7,002	719	798	218	8,737
1995	5,981	1,198	1,257	401	8,837
1996	5,517	923	1,030	253	7,723
1997	6,352	775	1,074	316	8,517
1998	7,193	834	870	380	9,277
1999	6,835	803	787	533	8,958
2000	6,502	441	692	335	7,970
2001	485	775	879	299	2,438
2002	699	549	594	365	2,207
2003	301	1,306	771	554	2,932
2004	542	836	619	441	2,438
Average	**4,946.4**	**939.9**	**749.6**	**302.6**	**6,938.5**
SD	**4,288.5**	**287.8**	**268.0**	**130.8**	**4,432.4**

Figure 29. Hawaii longline of other pelagic PMUS catch, 1987-2004.

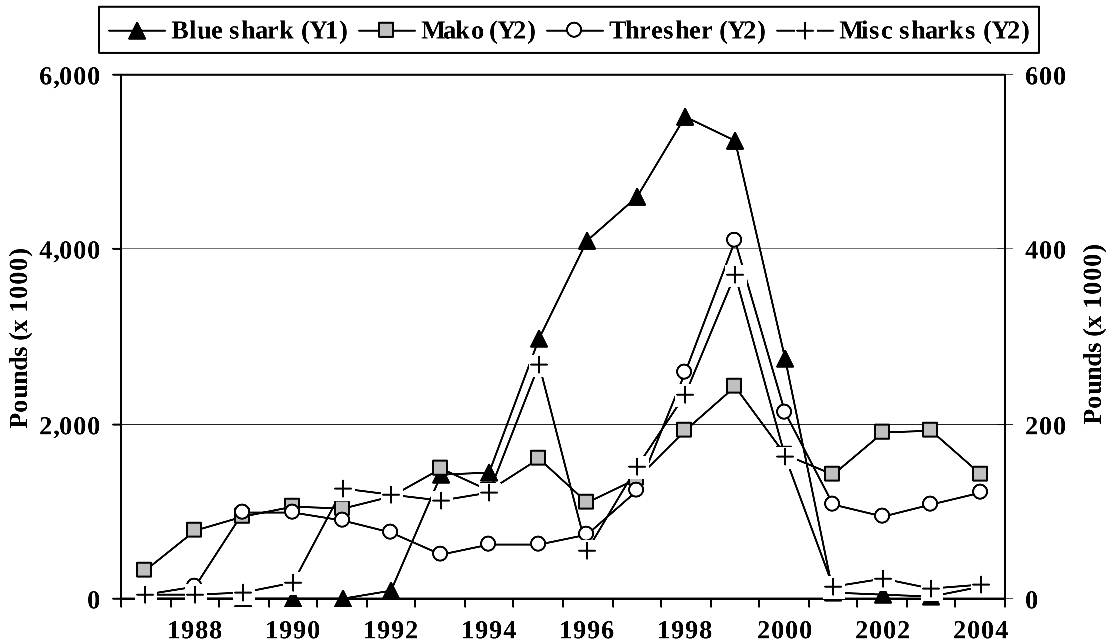


Interpretation: Longline landings of other pelagic PMUS show a general increase with a record catch for this category in 2004. Moonfish was usually the dominant component in this category peaking at 1.2 million pounds in 1999. However, mahimahi became the largest component in 2004 with a record catch of 1 million pounds. Pomfret catch also reached a record level at 700,000 pounds. Ono increased to a record high in 2003.

Source and Calculations: Estimates of longline catch of other pelagic species were derived from NMFS longline logbook, market sample, and Marine Dealer data. Catch of other pelagic species were estimated by either extrapolating the NMFS market sample data (1987-1991) or multiplying the number of fish from the logbook data by the average weight from the sample or HDAR Dealer data (1992-2004).

	Hawaii longline catch of other pelagic PMUS (1000 lbs)					
Year	**Mahimahi**	**Moonfish**	**Ono**	**Pomfrets**	**Oilfish**	**Total**
1987	45	152	53	23	2	275
1988	39	182	90	18	3	332
1989	183	274	202	49	24	708
1990	366	253	80	66	52	817
1991	555	270	101	75	130	1,131
1992	593	320	85	37	85	1,120
1993	316	454	142	92	0	1,004
1994	377	524	87	85	8	1,081
1995	570	629	195	93	10	1,497
1996	375	760	140	121	11	1,407
1997	518	823	239	178	15	1,773
1998	336	922	262	225	26	1,771
1999	679	1,210	343	313	29	2,574
2000	721	693	246	257	85	2,002
2001	530	756	388	255	119	2,048
2002	655	916	298	466	200	2,535
2003	675	1,092	511	416	277	2,971
2004	1,040	780	485	733	313	3,351
Average	**476.3**	**611.7**	**219.3**	**194.6**	**77.2**	**1,577.6**
SD	**250.2**	**323.0**	**140.4**	**189.6**	**96.5**	**877.0**

Figure 30. Hawaii longline shark catch, 1987-2004.



Interpretation: Blue shark catch increased in the 1990s due to catch retained for fins only. Blue shark catch dropped significantly in 2000 and in 2001 due to State and Federal laws which prohibited the practice of finning and landing sharks without the associated carcass. Blue shark catch remained at negligible levels through 2004. Mako and thresher sharks were retained mainly for their flesh. Catches of mako and thresher sharks were an order of magnitude lower, although also increasing in the 1990s (Y-2 axis). Like blue sharks, miscellaneous shark catches (Y-2 axis) were also retained for fins only. Miscellaneous shark catches increased as the practice of finning sharks became widespread in the longline fleet decreased when regulations prohibited finning.

Source and Calculations: Catch statistics for sharks were derived from NMFS longline logbook, market sample, and HDAR Dealer data. Shark catch landed whole was estimated by multiplying the number of fish from the logbook data by the average weight from the market sample or Dealer data. When the practice finning sharks was allowed, finned shark catches were also extrapolated to whole weight by multiplying the number of sharks finned by an average weight from the observer data as a crude method to estimate shark biomass.

	Hawaii longline shark catch (1000 lbs)				
Year	**Blue shark (Y1)**	**Mako (Y2)**	**Thresher (Y2)**	**Misc sharks (Y2)**	**Total**
1987	0	33	5	5	43
1988	0	77	13	4	94
1989	2	95	98	8	203
1990	0	105	98	19	222
1991	0	104	89	125	318
1992	97	117	76	120	410
1993	1,423	150	51	112	1,736
1994	1,454	124	61	122	1,761
1995	2,978	160	62	268	3,468
1996	4,088	110	73	56	4,327
1997	4,598	137	123	152	5,010
1998	5,527	192	259	234	6,212
1999	5,249	242	409	372	6,272
2000	2,756	166	212	163	3,297
2001	62	143	108	14	327
2002	46	190	93	24	353
2003	24	192	107	12	335
2004	130	142	122	15	409
Average	**1,579.7**	**137.7**	**114.4**	**101.4**	**1,933.2**
SD	**2,053.3**	**49.1**	**95.2**	**106.2**	**2,227.8**

Table 5. Hawaii-based longline catch (number of fish) by area, 1991-2004.

	Tunas			Billfishes				Other Pelagic PMUS			
Year	Bigeye tuna	Yellowfin tuna	Albacore	Swordfish	Blue marlin	Striped marlin	Other billfish	Mahimahi	Ono (wahoo)	Moonfish	Sharks
Main Hawaiian Islands											
1991	**22,517**	**7,150**	5,763	13,598	**2,881**	**18,117**	**8,197**	17,672	**1,885**	**2,569**	13,295
1992	**22,982**	**3,846**	3,979	7,102	**2,761**	**9,838**	**3,368**	13,313	**1,194**	**2,387**	11,748
1993	**25,031**	**8,895**	6,496	4,388	**2,720**	**10,426**	**3,440**	9,366	**2,641**	**3,261**	12,955
1994	**27,022**	**6,815**	10,833	2,842	**3,344**	**6,494**	**3,213**	**17,660**	**1,332**	**3,626**	14,455
1995	**31,899**	**13,018**	18,271	5,262	**4,168**	**12,472**	**6,900**	**30,410**	2,656	**4,041**	22,560
1996	**29,803**	**7,715**	19,259	4,634	**3,556**	**7,163**	**3,404**	**11,676**	1,527	**3,094**	19,418
1997	21,397	10,982	19,025	4,873	**4,085**	**4,193**	**3,662**	11,660	2,525	**2,847**	16,476
1998	26,723	4,678	12,482	4,721	1,698	**4,856**	**4,254**	7,664	2,305	**3,585**	14,685
1999	29,203	4,835	23,805	2,357	1,709	**5,607**	6,691	11,654	2,579	5,161	17,449
2000	21,546	5,240	5,952	2,510	1,557	2,438	3,486	17,586	1,201	2,759	16,561
2001	**36,928**	5,671	10,448	1,027	2,151	**7,651**	**4,029**	**21,608**	3,223	**3,404**	16,086
2002	51,177	2,463	2,706	752	873	**3,449**	3,761	21,374	1,345	3,373	14,810
2003	39,901	10,058	2,593	1,421	1,738	**12,243**	**8,284**	25,233	4,748	3,467	25,856
2004	49,001	8,773	3,022	1,166	1,135	**6,665**	5,366	26,609	3,199	2,688	24,923
Northwestern Hawaiian Islands											
1991	4,473	1,375	481	9,472	342	3,845	1,082	2,003	134	70	10,604
1992	2,624	396	311	5,228	244	1,776	330	2,321	77	187	9,042
1993	7,760	2,019	1,413	9,565	509	2,861	754	2,279	198	398	17,507
1994	10,726	2,015	5,592	9,752	554	2,679	719	3,037	227	707	28,346
1995	9,011	3,630	5,097	8,400	1,379	5,076	1,557	5,836	902	939	19,915
1996	15,409	2,451	12,738	3,987	1,114	4,184	1,651	1,995	659	2,388	16,539
1997	**30,168**	5,139	17,118	5,148	1,519	4,109	2,250	6,321	1,789	2,887	17,921
1998	16,629	2,713	6,802	10,611	1,217	5,757	2,927	3,527	761	1,862	20,152
1999	9,672	1,581	6,261	6,182	1,053	3,515	2,400	4,316	763	1,431	15,150
2000	7,660	1,395	2,969	6,679	418	2,309	1,082	6,458	224	750	11,446
2001	8,521	1,169	3,648	373	761	2,528	882	3,923	783	1,030	5,478
2002	9,492	806	1,897	109	295	1,352	1,339	3,485	313	882	4,950
2003	8,929	2,522	2,286	259	1,035	4,703	2,597	3,559	1,596	1,372	11,871
2004	8,918	932	708	203	265	1,292	938	3,866	469	662	6,854
U.S. Possessions											
1991	374	439	30	25	17	60	45	84	21	0	237
1992	70	42	0	16	7	1	7	6	8	0	223
1993	0	0	0	0	0	0	0	0	0	0	0
1994	1,127	1,649	151	53	37	173	55	37	77	24	705
1995	460	583	296	21	94	121	94	252	206	5	895
1996	766	1,184	1,612	17	86	192	93	49	155	57	756
1997	2,070	1,932	4,054	33	194	255	293	591	328	206	1,503
1998	17,666	6,313	3,784	174	308	307	450	831	1,127	258	5,892
1999	4,514	**5,737**	1,575	102	315	438	619	542	1,499	179	3,463
2000	7,483	**21,788**	8,766	234	762	733	916	1,202	1,916	448	8,307
2001	5,563	**20,777**	9,493	224	1,072	1,047	683	1,705	2,150	277	5,195
2002	18,110	**12,826**	6,342	532	778	1,015	765	957	2,429	377	7,660
2003	2,106	2,392	2,202	83	443	572	490	842	1,058	117	2,606
2004	9,813	4,587	2,661	253	426	618	533	1,049	1,344	288	4,860

Table 5 (cont.) Hawaii-based longline catch (number of fish) by area, 1991-2004.

	Tunas			Billfishes				Other Pelagic PMUS			
Year	Bigeye tuna	Yellowfin tuna	Albacore	Swordfish	Blue marlin	Striped marlin	Other billfish	Mahimahi	Ono (wahoo)	Moonfish	Sharks
Outside EEZ											
1991	13,559	4,305	**7,777**	**43,194**	1,008	6,730	3,511	**19,766**	695	440	**47,047**
1992	18,228	3,595	**15,523**	**61,968**	1,506	4,434	1,963	**41,044**	1,169	719	**73,884**
1993	22,008	5,147	**22,551**	**65,601**	1,895	4,920	1,486	**14,367**	1,600	856	**124,139**
1994	9,227	3,037	**14,553**	**30,698**	742	1,946	1,130	12,283	877	733	**71,150**
1995	18,577	6,419	**22,125**	**23,745**	3,165	4,885	3,220	23,315	**2,801**	1,382	**57,922**
1996	17,588	6,227	**23,719**	**29,495**	1,878	4,250	2,658	9,507	**2,116**	1,776	**64,081**
1997	26,149	**10,990**	**30,887**	**29,627**	2,457	4,080	2,819	**30,730**	**3,668**	2,314	**49,935**
1998	**37,762**	**8,004**	**25,621**	**28,269**	**2,125**	3,408	3,872	**10,157**	**4,068**	3,462	**59,180**
1999	**36,883**	4,817	**35,659**	**29,323**	**1,857**	4,857	**7,401**	**27,743**	**5,435**	**5,628**	**51,475**
2000	**37,804**	9,956	**22,088**	**27,600**	**1,772**	**2,459**	**3,527**	**32,529**	**4,410**	**3,079**	**43,049**
2001	27,712	9,460	**27,841**	**2,545**	**2,440**	5,209	3,414	17,715	**7,225**	3,068	**20,152**
2002	**62,068**	4,278	**9,643**	**2,275**	**2,025**	3,076	**4,215**	**22,407**	**4,791**	**4,658**	**23,196**
2003	**56,190**	**12,950**	**13,782**	**1,777**	**2,437**	8,417	7,076	**25,702**	**10,963**	**6,943**	**29,085**
2004	**74,230**	**11,541**	**10,941**	**3,569**	**3,020**	6,585	**7,741**	**35,061**	**10,593**	**4,905**	**38,280**
Total catch											
1991	40,923	13,269	14,051	66,289	4,248	28,752	12,835	39,525	2,735	3,079	71,183
1992	43,904	7,879	19,813	74,314	4,518	16,049	5,668	56,684	2,448	3,293	94,897
1993	54,799	16,061	30,460	79,554	5,124	18,207	5,680	26,012	4,439	4,515	154,601
1994	48,102	13,516	31,129	43,345	4,677	11,292	5,117	33,017	2,513	5,090	114,656
1995	59,947	23,650	45,789	37,428	8,806	22,554	11,771	59,813	6,565	6,367	101,292
1996	63,566	17,577	57,328	38,133	6,634	15,789	7,806	23,227	4,457	7,315	100,794
1997	79,784	29,043	71,084	39,681	8,255	12,637	9,024	49,302	8,310	8,254	85,835
1998	98,780	21,708	48,689	43,775	5,348	14,328	11,503	22,179	8,261	9,167	99,909
1999	80,272	16,970	67,300	37,964	4,934	14,417	17,111	44,255	10,276	12,399	87,537
2000	74,493	38,379	39,775	37,023	4,509	7,939	9,011	57,775	7,751	7,036	79,363
2001	78,724	37,077	51,430	4,169	6,424	16,435	9,008	44,951	13,381	7,779	46,911
2002	140,847	20,373	20,588	3,668	3,971	8,892	10,080	48,223	8,878	9,290	50,616
2003	107,126	27,922	20,863	3,540	5,653	25,935	18,447	55,336	18,365	11,899	69,418
2004	141,962	25,833	17,332	5,191	4,846	15,160	14,578	66,585	15,605	8,543	74,917

Interpretation: The bolded numbers in Table 5 show the area with the highest catch for a particular species. The highest bigeye tuna catches were observed in the MHI EEZ from 1991 to 1996. Catches remained high thereafter but bigeye tuna catch outside the EEZ was the most productive area for six of the past seven years. A similar pattern occurred for yellowfin tuna catch also except the highest catches now occur in the EEZ of U.S. possessions, primarily Kingman Reef and Palmyra Atoll. Albacore catches were consistently highest outside the EEZ.

Swordfish catch from outside the EEZ was consistently the predominant area of capture. Blue marlin catches was highest in the MHI EEZ up to 1997 and was replaced by outside the EEZ for the past seven years. Striped marlin catch was typically highest in the MHI EEZ.

In general, catches of mahimahi, ono, and moonfish were highest in the MHI EEZ but shifted outside the EEZ in the most recent years. The highest catches of sharks occurred outside the EEZ.

Source and Calculations: Catches by area were compiled from NMFS federal longline logbook data collected from 1991 to 2004. The catch (fish kept + fish released) summaries were based on date of haul.

Table 6. Average weight of the Hawaii-based longline catch by species, 1987-2004.

SPECIES	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	Average	SD
TUNAS																				
Albacore	63	60	62	61	52	45	44	41	51	53	55	55	52	55	56	56	56	46	**53.4**	**6.3**
Bigeye tuna	77	83	77	81	85	77	88	81	79	64	71	74	75	79	68	71	77	69	**76.3**	**6.3**
Bluefin tuna	-	-	-	638	185	192	203	190	271	223	239	177	202	165	190	151	273	-	**235.6**	**121.3**
Skipjack tuna	18	19	19	21	20	17	17	18	18	17	20	20	20	17	18	16	19	16	**18.1**	**1.4**
Yellowfin tuna	82	103	104	122	118	99	93	97	95	80	89	76	62	67	63	62	67	62	**85.6**	**19.5**
BILLFISH																				
Blue marlin	161	157	165	199	173	175	157	171	156	154	134	165	164	157	142	150	145	131	**158.6**	**15.8**
Striped marlin	66	57	62	62	58	66	64	64	58	58	66	60	55	62	48	55	49	55	**59.1**	**5.3**
Black marlin	208	151	191	204	184	155	136	167	72		190	167	131	155	151	222	150	187	**166.0**	**35.5**
Sailfish	52	51	55	55	51	45	49	55	47	40	46	43	45	57	48	59	56	40	**49.6**	**5.8**
Spearfish	34	31	31	35	32	34	34	33	33	31	31	32	29	35	31	33	31	30	**32.1**	**1.6**
Swordfish	129	119	130	152	153	178	171	163	171	157	163	176	188	181	147	146	141	134	**155.5**	**19.9**
OTHER PMUS																				
Mahimahi	21	20	23	19	15	11	13	12	10	17	13	16	16	14	12	14	13	16	**15.2**	**3.6**
Ono (wahoo)	33	32	35	36	32	35	33	34	31	31	30	32	34	33	29	33	29	31	**32.3**	**2.0**
Moonfish	111	108	104	98	97	98	101	103	101	105	103	101	98	100	99	98	93	92	**100.5**	**4.7**
Oilfish	20	22	23	22	23	22	21	13	23					18	16	17	16	16	**19.5**	**3.4**
Pomfrets	15	18	18	18	17	16	16	17	16	15	17	15	14	14	13	13	12	11	**15.2**	**2.1**
SHARKS																				
Mako shark	124	137	161	162	135	144	147	153	178	177	161	177	177	168	175	182	184	171	**161.8**	**18.1**
Thresher shark	97	122	158	167	180	176	199	164	172	156	160	171	202	166	166	166	196	169	**165.9**	**25.0**

Interpretation: Longline fishing effort can cover a large area within a trip. The data on individual fish from the market data cannot be directly linked to the exact area of capture, therefore, the average weight by location was referenced in general terms.

The three main tuna species, albacore, bigeye tuna, and yellowfin tuna, exhibited changes throughout 1987-2004. The average weight of albacore was about 60 pounds until 1990 then declined to less than 50 pounds during 1992-94. This decline was related to increasing incidental catches of small albacore north of the Hawaiian Islands by longliners targeting swordfish. The average weight of albacore then increased as a greater proportion of longline effort shifted further south to target tunas. The average weight of albacore dropped to 46 pounds in 2004. The average weight of bigeye tuna showed the least amount of change of the three main tuna species, ranging from 64 pounds to 88 pounds. Bigeye tuna average weight was 69 pounds in 2004. In contrast, yellowfin tuna average weight showed the most variation ranging from 62 pounds to 122 pounds. The average weight of yellowfin tuna was more than 100 pounds during 1988-1991 and decreased to less than 70 pounds from 1999 with average weight at 62 pounds in 2004. This probably reflects a trend of increasing effort in the EEZ of Kingman Reef and Palmyra Atoll where relatively small yellowfin tuna are caught.

Swordfish caught on tuna target trips are biased towards small swordfish in comparison to swordfish target trips. Average weight for swordfish was lowest in the late 1980s when the longline fishery targeted tunas only. The average weight increased in the early 1990s with as the number of swordfish target trips grew. Average weight peaked at 188 pounds in 1999 and was about the same in the following year. Swordfish effort (shallow-set longlining) was restricted in 2001 and prohibited altogether in 2002 and 2003. As a result, effort was almost exclusively directed towards tuna target (deep-set longline) and swordfish average weight then dropped to 147 pounds in 2001 and remained below 150 pounds through 2004.

Average weight of blue marlin varied substantially and ranged from 199 pounds in 1990 to 131 pounds in 2004. Average weight of striped marlin show very little variation over the 18-year period ranging from 48 pounds in 2001 to 66 pounds in 1987, 1992 and 1997 and was 55 pounds in 2004.

Source and Calculations: Average weight of the longline catch was summarized from the NMFS market sampling data from 1987 to 1999 and calculated from that HDAR Commercial Marine Dealer data from 2000 to 2004. With the exception of swordfish and sharks, most of the longline catch was landed whole. When fish were processed prior to sale, e.g., headed and gutted, gilled and gutted, a conversion factor was applied to convert it to an estimated whole weight. Discarded fish and sharks that were retained for fins only were not represented in these size summaries.

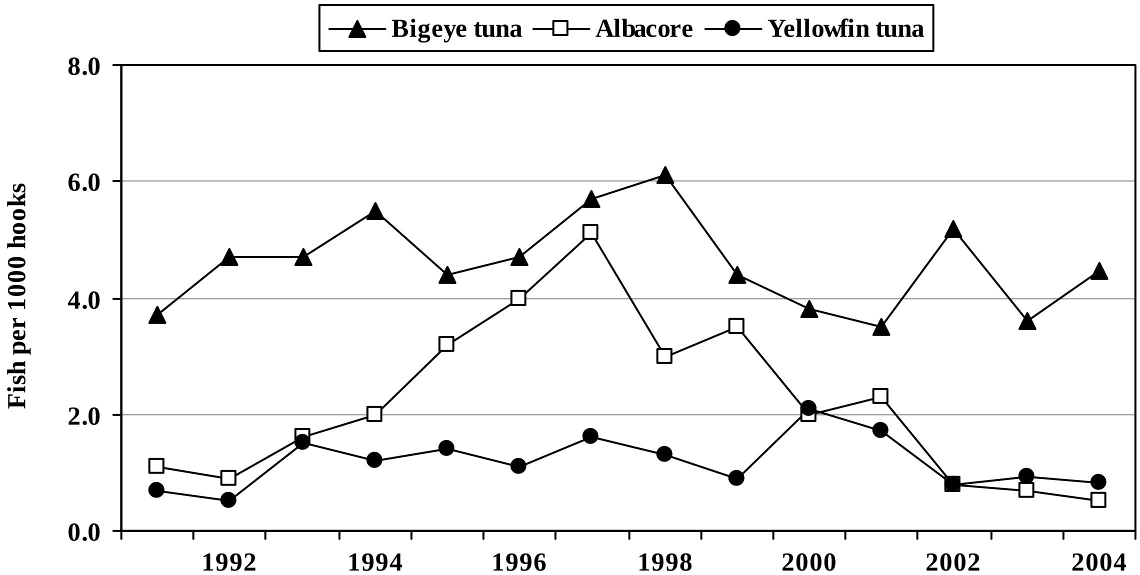
Table 7. Total catch, retained catch, and bycatch for the Hawaii-based longline fishery, 2004.

Interpretation: Bycatch of the Hawaii-based longline fishery was measured in number of fish released. The total bycatch for all species combined was 16% in 2004. Tunas, which are the primary target species of the longline fleet, had a low bycatch rate (2.5%). The number of bigeye tuna released was highest for all tuna species although the bycatch rate was relatively low (1.8%). Although billfish and other miscellaneous pelagic catch are not targeted, these species are highly marketable and also have low rates of discards (4.2% and 1.3%, respectively). Most of the sharks caught by the longline fishery were released. Blue shark, thresher shark, and other sharks are not marketable and therefore a high percentage of those species were discarded. In contrast, a relatively high proportion of mako shark is kept since there is a market for their flesh

Source and Calculations: Longline bycatch totals and percentages were compiled from NMFS longline logbook data. Longline catch was summarized on date of haul.

	Number of fish			
	Total catch	**Retained catch**	**Bycatch**	**% Bycatch**
Tuna				
Albacore	17,332	17,101	231	1.3
Bigeye tuna	141,962	139,356	2,606	1.8
Bluefin tuna	7	7	0	0.0
Skipjack tuna	20,004	18,632	1,372	6.9
Yellowfin tuna	25,833	24,999	834	3.2
Other tuna	91	67	24	26.4
Total tunas	**205,229**	**200,162**	**5,067**	**2.5**
Billfish				
Blue marlin	4,846	4,747	99	2.0
Spearfish	14,024	13,693	331	2.4
Striped marlin	15,160	14,871	289	1.9
Other marlin	554	536	18	3.2
Swordfish	5,191	4,264	927	17.9
Total billfish	**39,775**	**38,111**	**1,664**	**4.2**
Other pelagic fish				
Mahimahi	66,585	65,612	973	1.5
Moonfish	8,543	8,481	62	0.7
Oilfish	19,605	19,372	233	1.2
Pomfret	65,276	64,588	688	1.1
Wahoo	15,605	15,502	103	0.7
Miscellanous fish	1,904	1,692	212	11.1
Total other	**177,518**	**175,247**	**2,271**	**1.3**
Sharks				
Blue shark	64,808	1,303	63,505	98.0
Mako shark	1,856	830	1,026	55.3
Thresher shark	5,226	717	4,509	86.3
Other sharks	3,027	210	2,817	93.1
Total sharks	**74,917**	**3,060**	**71,857**	**95.9**
Total	**497,439**	**416,580**	**80,859**	**16.3**

Figure 31. Hawaii longline CPUE for major tunas on tuna trips, 1991-2004.



Interpretation: Tuna-target trips usually had the highest catch rate for bigeye tuna which is the primary target species. Bigeye tuna catch-per-unit-effort (CPUE) was consistently higher than those for albacore or yellowfin tuna. Bigeye tuna CPUE peaked at 6.1 in 1998 and was 4.5 in 2004. Bigeye tuna CPUE was usually highest in the MHI EEZ.

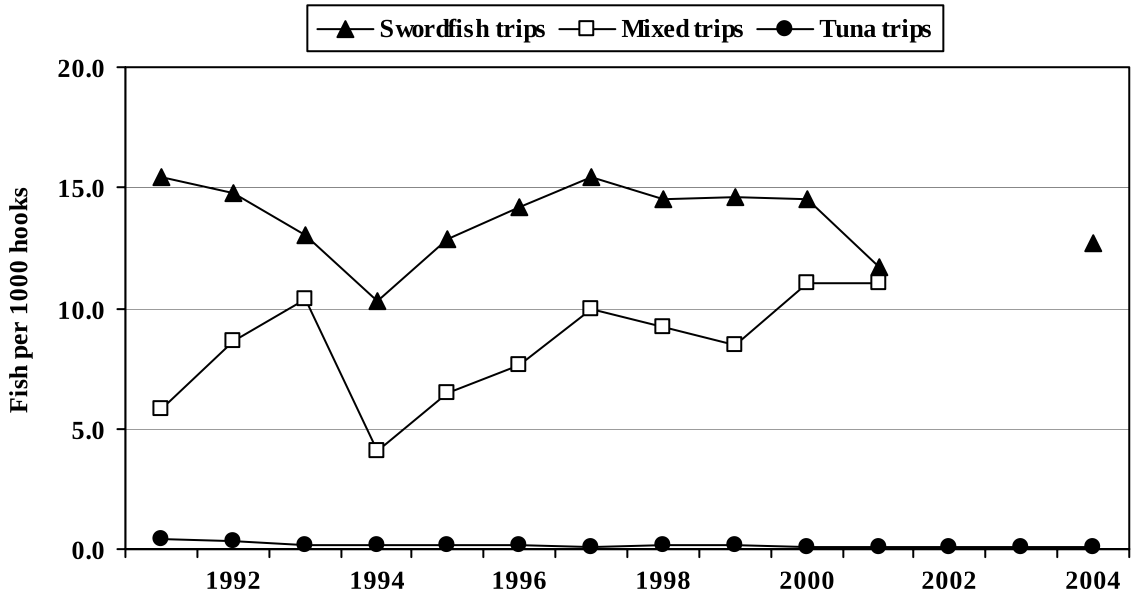
Since the average price for albacore is substantially lower than those for bigeye and yellowfin tuna, it is targeted only infrequently and is more often caught incidentally. Albacore CPUE rose rapidly in the early 1990s, peaked in 1997, then declined to a record low of 0.5 fish per 1000 hooks in 2004. Albacore CPUE is usually higher outside of the U.S. EEZ.

CPUE for yellowfin tuna was usually the lowest of the three major tuna species. Yellowfin tuna CPUE was lowest in 1992, increased slightly the following year, remained relatively stable until 1999, peaked in 2000 and then declined thereafter. High yellowfin tuna CPUEs were observed in the EEZ of Kingman Reef and Palmyra Atoll during 2000 and 2001.

Source and Calculation: Tuna CPUE was compiled from NMFS longline logbook data and summarized on date of haul. CPUE was measured as number of fish caught (kept + released) per 1000 hooks. Trip target information was collected from an interview with the longline captain or, if the captain could not be contacted, NMFS staff categorized the trip based on the vessels' fishing history and gear configuration.

	Tuna trip CPUE (fish per 1000 hooks)		
Year	**Bigeye tuna**	**Albacore**	**Yellowfin tuna**
1991	3.7	1.1	0.7
1992	4.7	0.9	0.5
1993	4.7	1.6	1.5
1994	5.5	2.0	1.2
1995	4.4	3.2	1.4
1996	4.7	4.0	1.1
1997	5.7	5.1	1.6
1998	6.1	3.0	1.3
1999	4.4	3.5	0.9
2000	3.8	2.0	2.1
2001	3.5	2.3	1.7
2002	5.2	0.8	0.8
2003	3.6	0.7	0.9
2004	4.5	0.5	0.8
Average	**4.6**	**2.2**	**1.2**
SD	**0.8**	**1.4**	**0.4**

Figure 32. Hawaii longline swordfish CPUE by trip type, 1991-2004.



Interpretation: Swordfish CPUE varies considerably depending upon the target species, and for this reason average swordfish CPUE for the longline fleet was not an accurate measurement of fishery performance. Effort with "shallow" longline gear, which is the typical method of fishing for swordfish and mixed trips, was drastically reduced in 2001 and prohibited beginning in 2002 due to sea turtle conservation measures. Therefore, swordfish CPUE for these trips types was unavailable for 2002 and 2003.

Swordfish-targeted trips had the highest swordfish CPUE of all trip types. Swordfish CPUE on swordfish target trips declined to a low in 1994 but returned to typical swordfish catch rates through 2000. Swordfish target effort was curtailed substantially in 2001, leading to a 19% decrease in CPUE. There were a few swordfish trips made at the end of 2004 and those trips had a swordfish CPUE of 12.7 fish per 1000 hooks.

Mixed-target trips (swordfish and tuna target) had intermediate swordfish catch rates. Mixed-target trips also exhibited a record low swordfish CPUE in 1994, and this decline was greater than that of the swordfish-target trips. The CPUE for this trip type then increased from this record low to peak catch rates in 2000 and 2001. Tuna-target trips had very low swordfish CPUEs throughout the monitoring period.

Source and Calculation: Longline swordfish CPUE was compiled from NMFS longline logbook data and summarized based on date of haul. CPUE was based on number of swordfish caught (kept + released) divided by the number of hooks set. Trip target information was collected from an interview with the longline captain or, if the captain could not be contacted, NMFS staff categorized the trip based on the vessels' fishing history and gear configuration.

	Swordfish CPUE (fish per 1000 hooks)		
Year	**Swordfish trips**	**Mixed trips**	**Tuna trips**
1991	15.4	5.8	0.4
1992	14.8	8.6	0.3
1993	13.0	10.4	0.2
1994	10.3	4.1	0.2
1995	12.9	6.5	0.2
1996	14.2	7.6	0.2
1997	15.4	10.0	0.1
1998	14.5	9.2	0.2
1999	14.6	8.5	0.2
2000	14.5	11.0	0.1
2001	11.7	11.0	0.1
2002	-	-	0.1
2003	-	-	0.1
2004	12.7	-	0.1
Average	**13.7**	**8.4**	**0.2**
SD	**1.6**	**2.2**	**0.1**

Figure 33a. Hawaii longline blue marlin CPUE by trip type, 1992-2004.

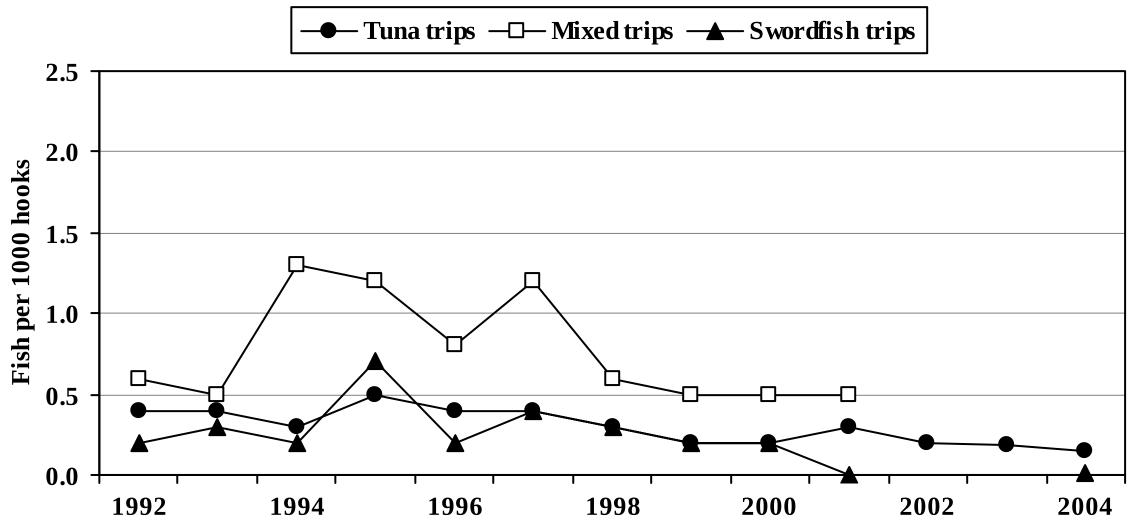
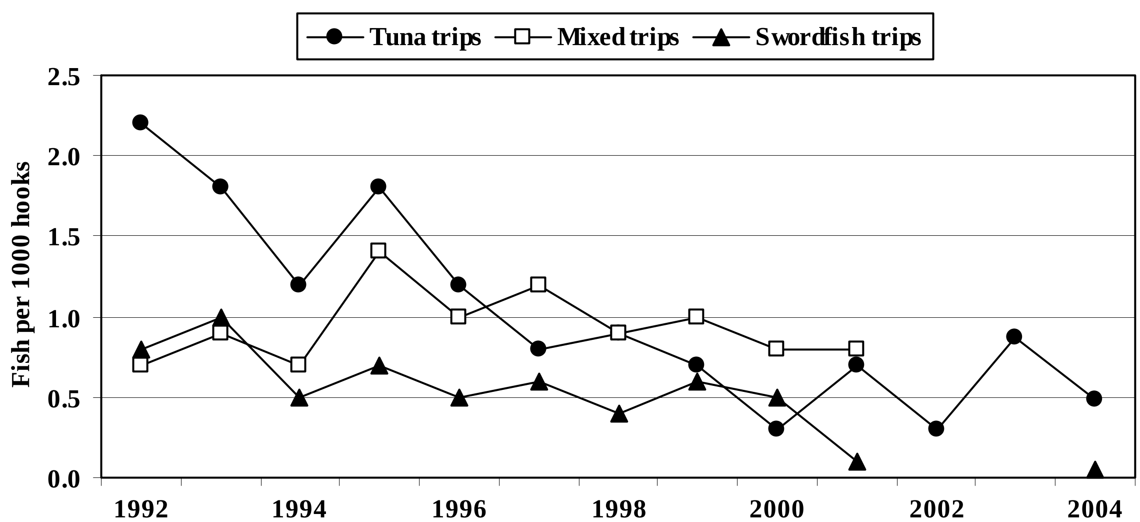


Figure 33b. Hawaii longline striped marlin CPUE by trip type, 1992-2004



Interpretation: Blue and striped marlin were caught incidentally by the longline fishery. Therefore, catch rates for these two species were significantly lower than CPUE for target species such as swordfish and bigeye tuna. There were differences in marlin CPUE among trip types. Blue marlin CPUE was higher on mixed-target trips. The highest blue marlin CPUE on mixed trips occurred between 1994 and 1997; catch rates remained stable at slightly lower levels from 1998 thorough 2001. Striped marlin CPUE was usually higher on tuna-target trips and appeared to be on the decline.

Source and Calculation: Longline CPUE was compiled from NMFS longline logbook data and summarized on date of haul. CPUE was based on number of blue or striped marlin caught (kept + released) divided by the number of hooks set for each trip type. Trip target information was collected from an interview with the longline captain or, if the captain could not be contacted, NMFS staff categorized the trip based on the vessels' fishing history and gear configuration.

	Blue marlin			Striped marlin		
Year	**Tuna trips**	**Mixed trips**	**Swordfish trips**	**Tuna trips**	**Mixed trips**	**Swordfish trips**
1991	**Poor species identification precluded quantification in 1991**					
1992	0.4	0.6	0.2	2.2	0.7	0.8
1993	0.4	0.5	0.3	1.8	0.9	1.0
1994	0.3	1.3	0.2	1.2	0.7	0.5
1995	0.5	1.2	0.7	1.8	1.4	0.7
1996	0.4	0.8	0.2	1.2	1.0	0.5
1997	0.4	1.2	0.4	0.8	1.2	0.6
1998	0.3	0.6	0.3	0.9	0.9	0.4
1999	0.2	0.5	0.2	0.7	1.0	0.6
2000	0.2	0.5	0.2	0.3	0.8	0.5
2001	0.3	0.5	0.0	0.7	0.8	0.1
2002	0.2	-	-	0.3	-	-
2003	0.2	-	-	0.9	-	-
2004	0.2	-	0.0	0.5	-	0.1
Average	**0.3**	**0.8**	**0.2**	**1.0**	**0.9**	**0.5**
SD	**0.1**	**0.3**	**0.2**	**0.6**	**0.2**	**0.3**

Figure 34a. Hawaii longline mahimahi CPUE by trip type, 1991-2004.

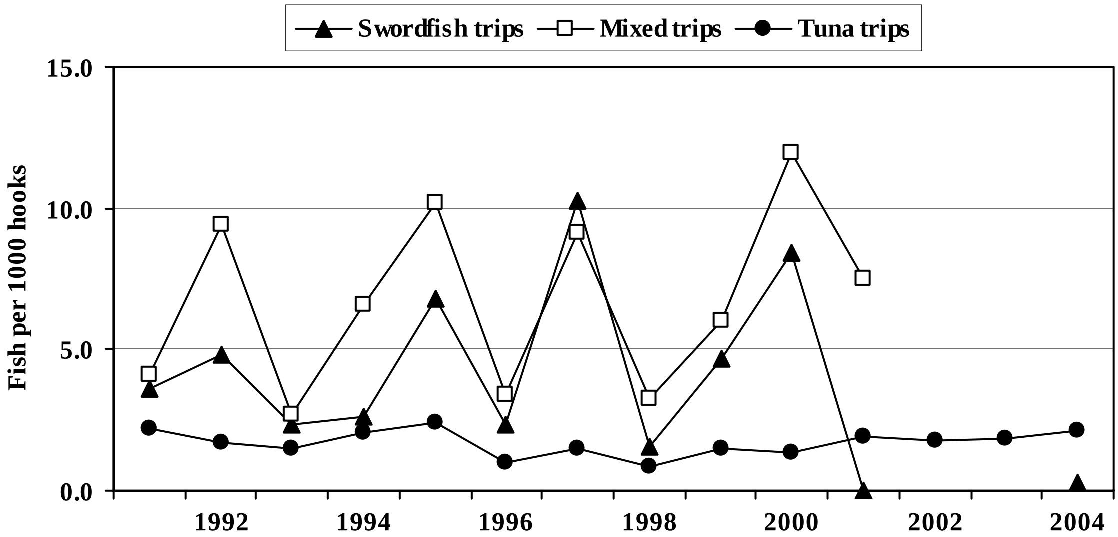
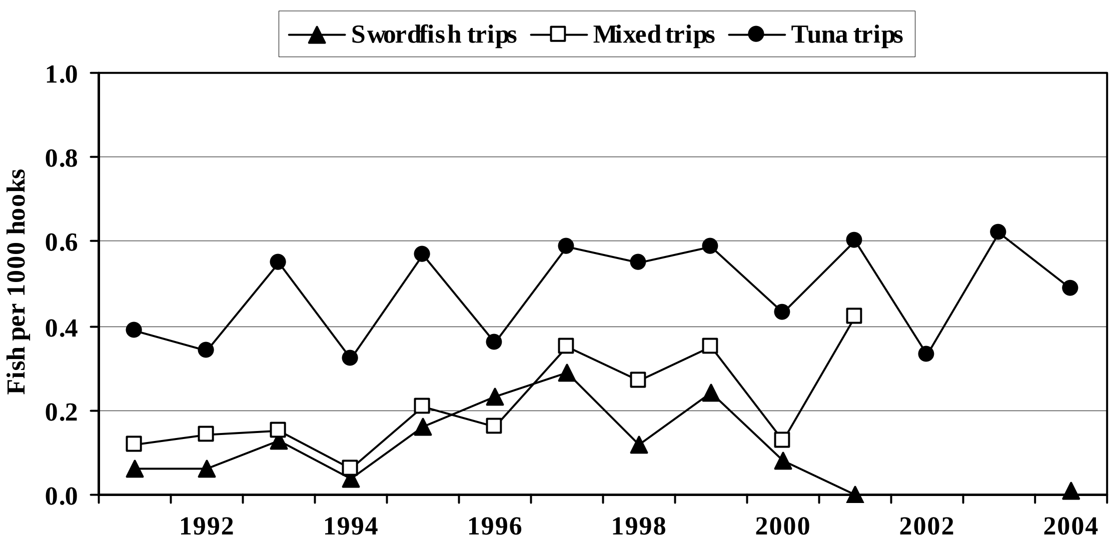


Figure 34b. Hawaii longline ono (wahoo) CPUE by trip type, 1991-2004.



Interpretation: Mahimahi and ono were caught incidentally by the longline fishery. There were substantial differences in mahimahi CPUE among trip types and considerable annual variation in CPUE within each trip type. Mahimahi CPUE was higher on swordfish and mixed-target trips. The highest mahimahi CPUE was by mixed trips at 12.0 in 2000. Ono CPUE was higher on tuna trips throughout 1991-2004. Ono CPUE for this trip type showed inter-annual variation with no clear trend.

Source and Calculation: Longline CPUE was compiled from NMFS longline logbook data and summarized on date of haul. CPUE was based on number of mahimahi or ono caught (kept + released) divided by the number of hooks set for each trip type. Trip target information was collected from an interview with the longline captain or, if the captain could not be contacted, NMFS staff categorized the trip based on the vessels' fishing history and gear configuration.

	Mahimahi			Ono		
Year	**Tuna trips**	**Mixed trips**	**Swordfish trips**	**Tuna trips**	**Mixed trips**	**Swordfish trips**
1991	2.2	4.1	3.6	0.4	0.1	0.1
1992	1.7	9.4	4.8	0.3	0.1	0.1
1993	1.5	2.7	2.3	0.6	0.2	0.1
1994	2.0	6.6	2.6	0.3	0.1	0.0
1995	2.4	10.2	6.8	0.6	0.2	0.2
1996	1.0	3.4	2.3	0.4	0.2	0.2
1997	1.5	9.1	10.2	0.6	0.4	0.3
1998	0.8	3.3	1.5	0.6	0.3	0.1
1999	1.5	6.0	4.7	0.6	0.4	0.2
2000	1.3	12.0	8.5	0.4	0.1	0.1
2001	1.9	7.5	0.0	0.6	0.4	0.0
2002	1.8	-	-	0.3	-	-
2003	1.9	-	-	0.6	-	-
2004	2.1	-	0.3	0.5	-	0.0
Average	**1.6**	**7.0**	**4.0**	**0.5**	**0.2**	**0.1**
SD	**0.4**	**3.2**	**3.3**	**0.1**	**0.1**	**0.1**

Figure 35a. Hawaii longline moonfish CPUE by trip type, 1991-2004.

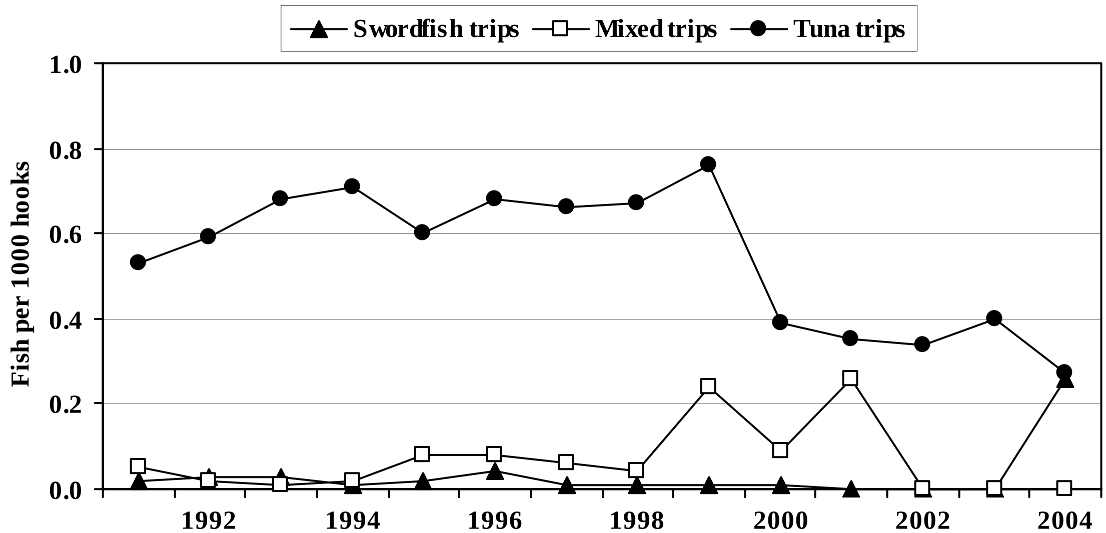
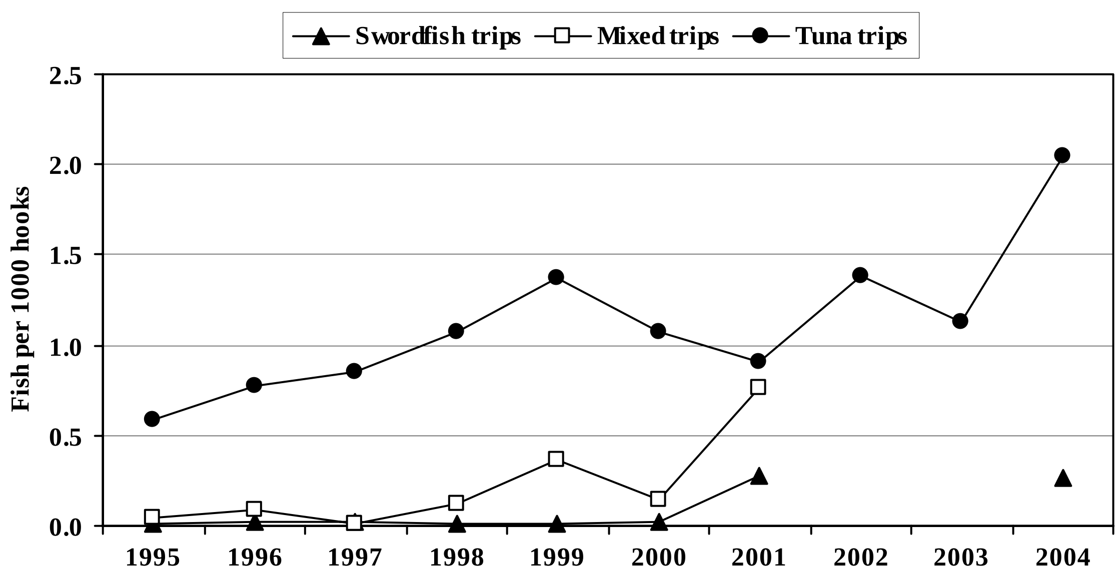


Figure 35b. Hawaii longline pomfret CPUE by trip type, 1995-2004.

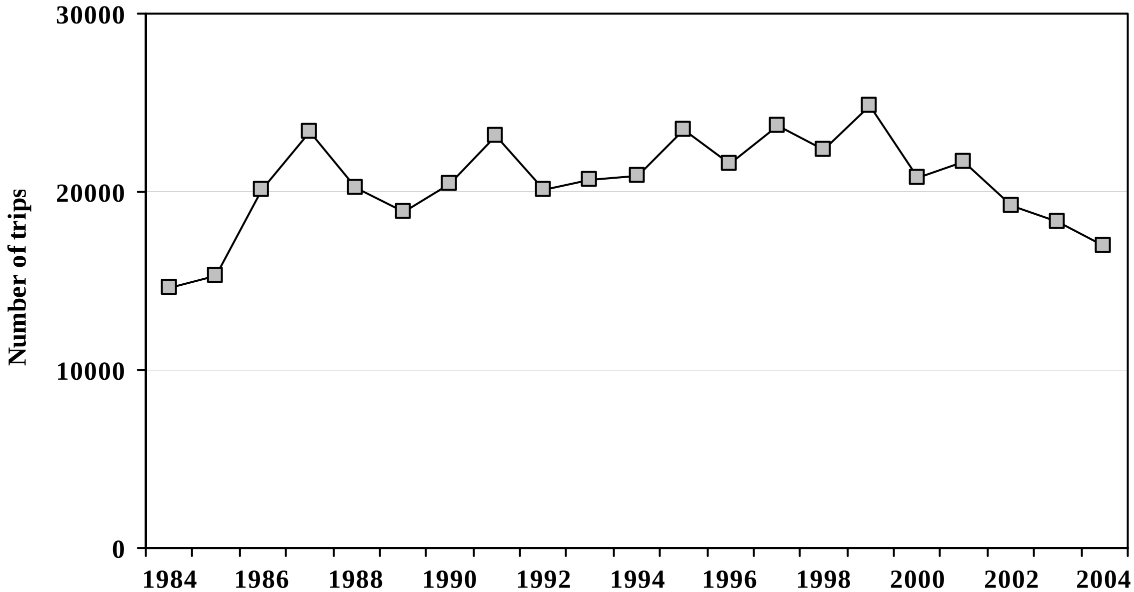


Interpretation: Moonfish and pomfrets were caught incidentally by the longline fishery. There were substantial differences in moonfish and pomfret CPUE among the different trip types. CPUE for both moonfish and pomfret was higher on tuna-target trips

Source and Calculation: Longline CPUE was compiled from NMFS longline logbook data and summarized on date of haul. CPUE was based on number of moonfish or pomfrets caught (kept + released) divided by the number of hooks set for each trip type. Trip target information was collected from an interview with the longline captain or, if the captain could not be contacted, NMFS staff categorized the trip based on the vessels' fishing history and gear configuration.

	Moonfish			Pomfret		
Year	Tuna trips	Mixed trips	Swordfish trips	Tuna trips	Mixed trips	Swordfish trips
1991	0.5	0.1	0.0	-	-	-
1992	0.6	0.0	0.0	-	-	-
1993	0.7	0.0	0.0	-	-	-
1994	0.7	0.0	0.0	-	-	-
1995	0.6	0.1	0.0	0.6	0.0	0.0
1996	0.7	0.1	0.0	0.8	0.1	0.0
1997	0.7	0.1	0.0	0.9	0.0	0.0
1998	0.7	0.0	0.0	1.1	0.1	0.0
1999	0.8	0.2	0.0	1.4	0.4	0.0
2000	0.4	0.1	0.0	1.1	0.1	0.0
2001	0.4	0.3	0.0	0.9	0.8	0.3
2002	0.3	-	-	1.4	-	-
2003	0.4	-	-	1.1	-	-
2004	0.3	-	0.3	2.1	-	0.3
Average	**0.5**	**0.1**	**0.0**	**1.1**	**0.2**	**0.1**
SD	**0.2**	**0.1**	**0.1**	**0.4**	**0.3**	**0.1**

Figure 36. Number of Main Hawaiian Islands troll trips, 1984-2004.

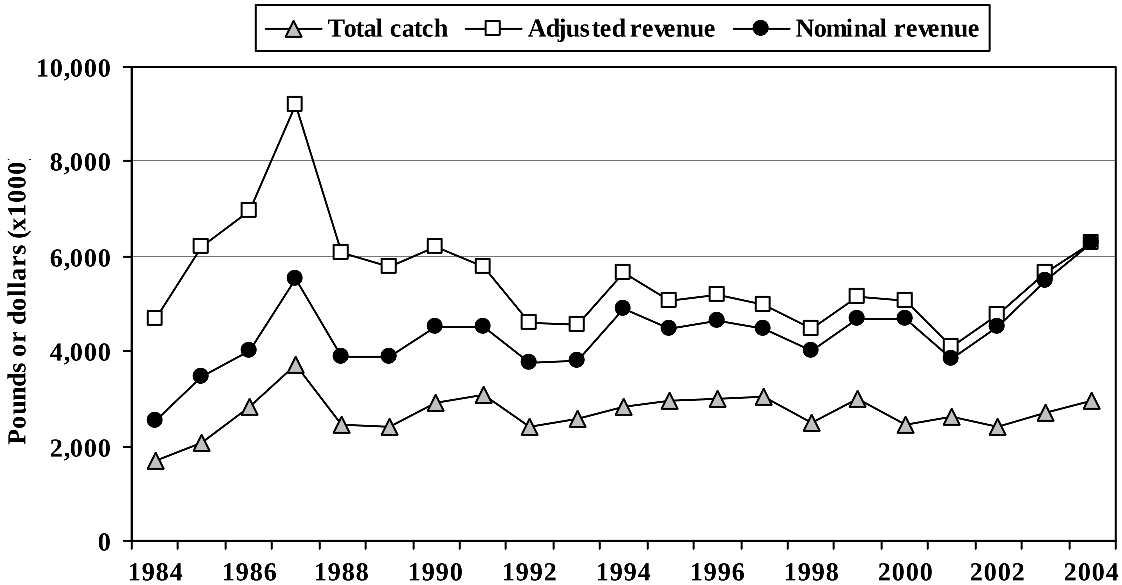


<u>Interpretation</u>: Main Hawaiian Islands (MHI) troll trips rose rapidly from 1984 to 1987 increased gradually to peak at 24,884 trips in 1999. MHI troll trips declined thereafter to a preliminary estimate of 17,014 trips in 2004.

<u>Source and Calculations</u>: The number of MHI troll trips was counted from HDAR Commercial Fish Catch data. A MHI troll trip is defined as a unique commercial marine license number returning on a unique day using the specific gear code and fishing in the areas as defined for the MHI troll fishery in the introduction of this module. Since there was no way to determine the difference between a zero catch trip report (unsuccessful fishing trip(s)) or a no fishing trip report, the trip count calculation did not include zero catch/no fishing trip reports.

Year	MHI troll trips
1984	14,556
1985	15,291
1986	20,139
1987	23,391
1988	20,202
1989	18,924
1990	20,468
1991	23,184
1992	20,109
1993	20,647
1994	20,905
1995	23,527
1996	21,611
1997	23,674
1998	22,403
1999	24,884
2000	20,830
2001	21,699
2002	19,173
2003	18,356
2004	17,014
Average	**20,523.2**
SD	**2,687.3**

Figure 37. Main Hawaiian Islands troll catch and revenue, 1984-2004.



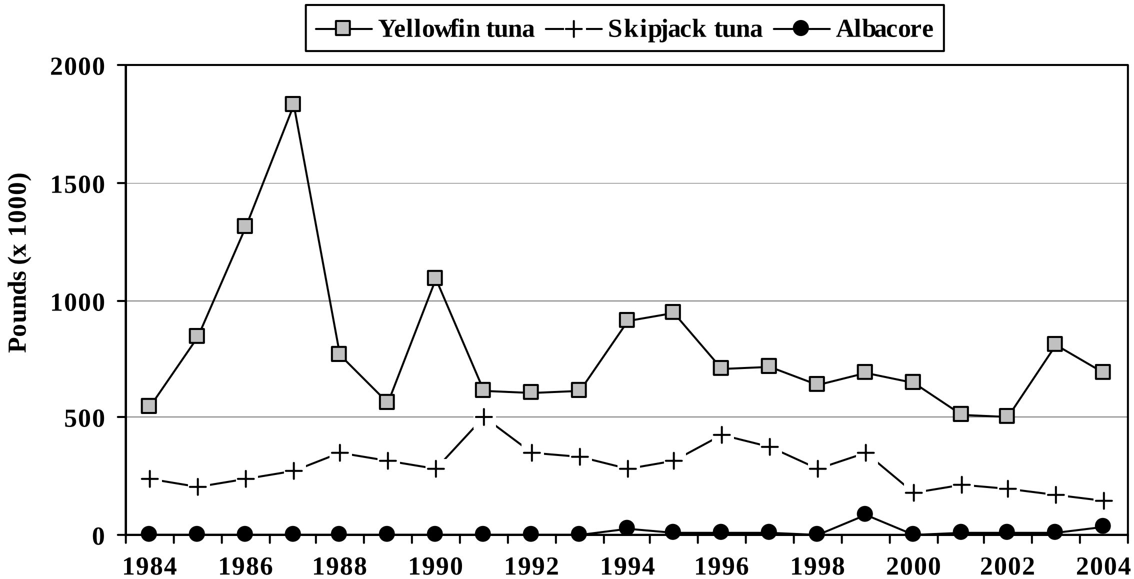
Interpretation: The MHI troll catch grew from 1.7 million pounds in 1984 to a peak of 3.7 million pounds in 1987, then decreased to 2.4 million pounds the following year. Catch remained relatively stable thereafter with total catch at 3.0 million pounds in 2004.

The pattern for MHI troll inflation-adjusted ex-vessel revenue was similar to catch showing an increase in the early 1980s, a peak of $9.2 million in 1987, followed by a drop the following year, and a long period of stability through 2000. Revenue increased from $4.1 million in 2001 to $6.3 million in 2004.

Source and Calculations: Total catch and nominal revenue for the MHI troll fishery were derived from HDAR Commercial Fish Catch and Marine Dealer data. The total catch and nominal revenue values were obtained by adding the catch and revenue values for all species caught by the MHI troll fishery. The adjusted revenue is calculated by dividing the nominal revenue by the Honolulu CPI for the respective year then multiplying the result by the current Honolulu CPI.

Year	Total catch (1000 lbs)	Adjusted revenue ($1000)	Nominal revenue ($1000)	Honolulu CPI
1984	1,680	$4,670	$2,538	103.5
1985	2,050	$6,210	$3,479	106.8
1986	2,840	$6,980	$4,009	109.4
1987	3,710	$9,180	$5,536	114.9
1988	2,450	$6,070	$3,875	121.7
1989	2,400	$5,770	$3,899	128.7
1990	2,900	$6,200	$4,494	138.1
1991	3,100	$5,790	$4,497	148.0
1992	2,390	$4,620	$3,762	155.1
1993	2,580	$4,540	$3,816	160.1
1994	2,830	$5,670	$4,897	164.5
1995	2,970	$5,070	$4,471	168.1
1996	2,990	$5,190	$4,650	170.7
1997	3,020	$4,980	$4,487	171.9
1998	2,470	$4,460	$4,011	171.5
1999	3,000	$5,150	$4,685	173.3
2000	2,460	$5,050	$4,673	176.3
2001	2,610	$4,110	$3,844	178.4
2002	2,390	$4,770	$4,515	180.3
2003	2,690	$5,660	$5,475	184.5
2004	2,970	$6,307	$6,307	190.6
Average	**2,690.5**	**$5,545.1**	**$4,377.1**	
SD	**425.3**	**$1,110.8**	**$799.5**	

Figure 38. Main Hawaiian Islands troll tuna catch, 1984-2004.

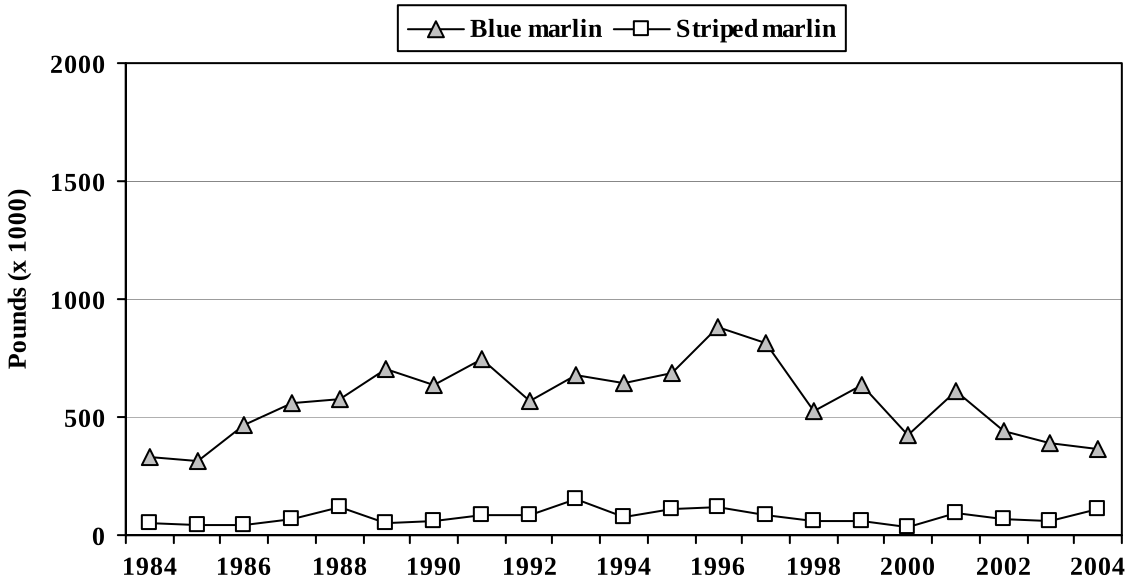


<u>Interpretation:</u> The MHI troll tuna catch was composed predominantly of yellowfin tuna. Yellowfin tuna catch increased dramatically from the mid 1980s, dropped in the late 1980s and remained relatively stable thereafter. Skipjack tuna was the second largest component of the MHI troll catch. Skipjack tuna catches were relatively stable though they have been somewhat lower during the past three years. Small quantities of bigeye tuna, albacore, and other tunas were also caught by this fishery.

<u>Source and Calculations:</u> The tuna catch statistics for the MHI troll fishery were derived from HDAR Commercial Fish Catch and Marine Dealer data. The MHI troll fishery tuna catch was calculated by totaling tuna catch by species for each data set, comparing the results and using the higher value of the two data summaries.

	MHI troll tuna catch (1000 pounds)					
Year	**Yellowfin tuna**	**Skipjack tuna**	**Bigeye tuna**	**Albacore**	**Other tunas**	**Total tunas**
1984	547	241	6	4	11	808
1985	844	207	6	1	4	1,062
1986	1,308	241	10	0	8	1,567
1987	1,828	277	11	1	19	2,136
1988	764	351	10	1	16	1,141
1989	559	318	11	1	14	904
1990	1,089	278	15	1	18	1,401
1991	615	504	11	2	13	1,145
1992	606	347	9	3	15	980
1993	616	332	4	3	9	964
1994	914	283	6	22	15	1,263
1995	949	318	10	10	9	1,295
1996	707	424	4	5	6	1,146
1997	712	376	6	7	6	1,107
1998	636	278	5	4	10	933
1999	687	347	7	87	7	1,124
2000	649	181	6	4	6	845
2001	514	216	9	10	5	754
2002	503	195	100	8	4	810
2003	805	169	145	8	5	1,132
2004	691	147	70	36	5	949
Average	**787.7**	**287.1**	**21.9**	**10.3**	**9.7**	**1,117.5**
SD	**310.1**	**88.8**	**36.8**	**19.5**	**4.8**	**310.3**

Figure 39. Main Hawaiian Islands troll billfish catch, 1984-2004.

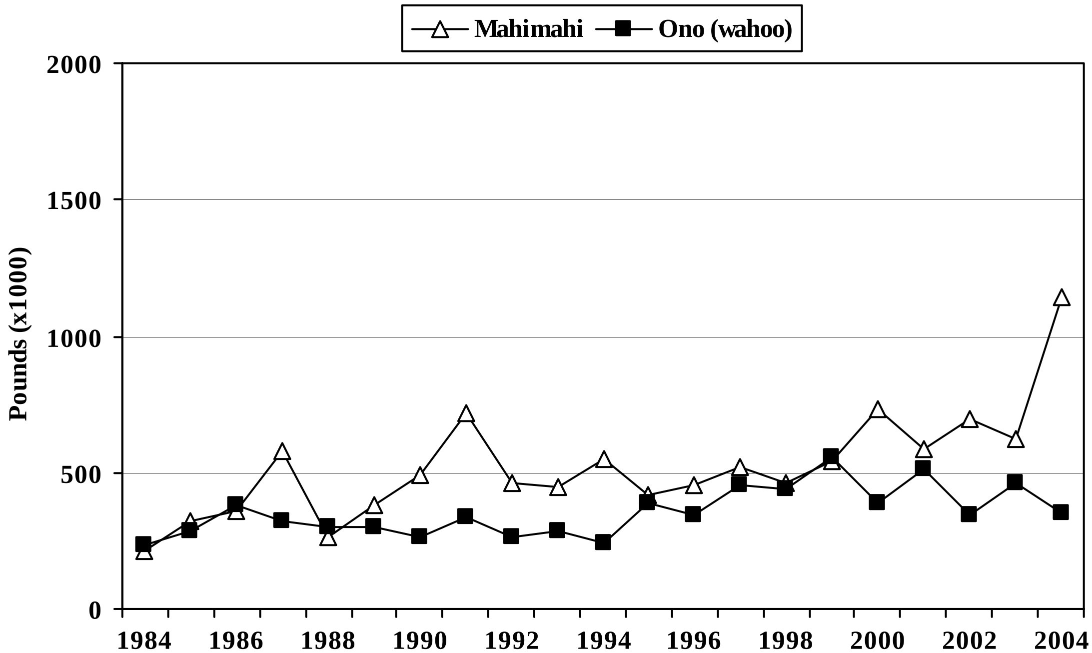


Interpretation: MHI troll catch for billfish was composed primarily of blue marlin. Blue marlin catches increased from about 300 thousand pounds in the mid 1980s to approximately 900 thousand pounds in 1996 and declined slowly subsequently. In contrast to the longline fishery, the striped marlin catch in this fishery was quite low. The MHI troll fishery also had small catches of other billfish, e.g., including short-nosed spearfish, sailfish, and swordfish.

Source and Calculations: The billfish catch statistics for the MHI troll fishery were derived from HDAR Commercial Fish Catch and Marine Dealer data. MHI billfish catch was calculated by totaling billfish catch by species for each data set, comparing the results and using the higher value of the two data summaries.

	MHI troll billfish catch (1000 pounds)				
Year	Blue marlin	Striped marlin	Other billfish	Swordfish	Total billfishes
1984	332	51	34	1	418
1985	311	39	24	1	375
1986	463	40	29	0	533
1987	557	66	42	1	666
1988	575	118	41	2	736
1989	704	52	47	2	805
1990	638	59	33	1	732
1991	749	89	52	1	890
1992	565	83	35	0	683
1993	675	150	44	0	870
1994	648	76	46	1	770
1995	684	114	57	1	856
1996	885	119	37	1	1,042
1997	814	83	36	1	935
1998	527	57	41	1	626
1999	635	62	71	1	769
2000	423	30	34	1	489
2001	610	94	51	1	756
2002	443	64	22	5	533
2003	387	63	27	1	478
2004	362	108	60	1	531
Average	**570.9**	**77.0**	**41.1**	**1.2**	**690.2**
SD	**158.3**	**31.2**	**12.3**	**0.9**	**181.1**

Figure 40. Main Hawaiian Islands troll catch of other pelagic PMUS, 1984-2004.

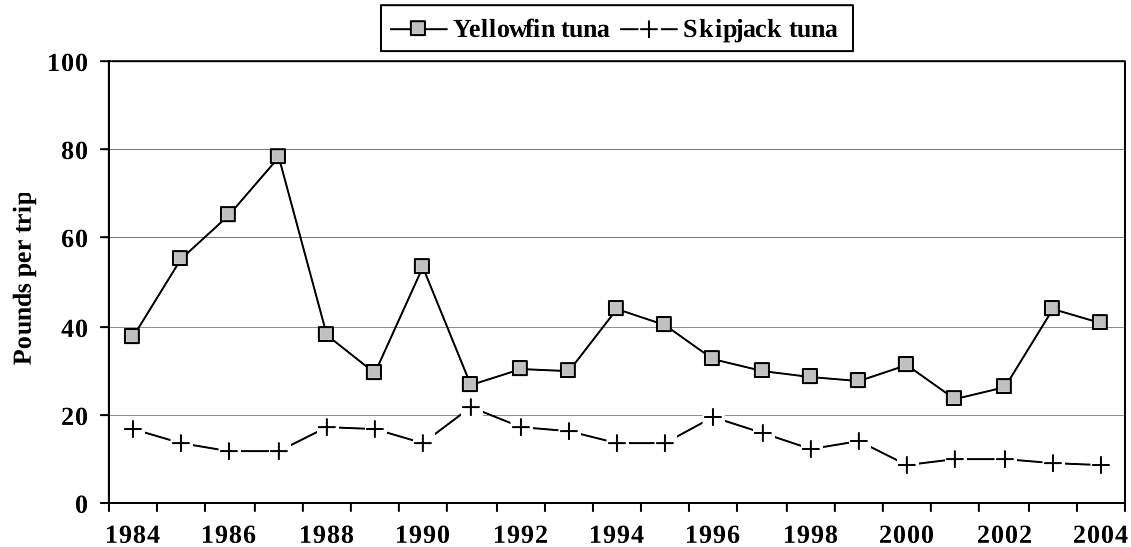


Interpretation: Mahimahi and ono comprised most of the MHI troll catch of other pelagic PMUS. Mahimahi catches were usually higher than those for ono. A record 1.1 million pounds were caught by the MHI troll fishery in 2004. Ono catch was stable from 1984 through 1994 then rose slowly to peak near 600 thousand pounds in 1999. Ono catches showed interannual variation afterwards.

Source and Calculations: The other pelagic catch statistics for the MHI troll fishery were derived from HDAR Commercial Fish Catch and Marine Dealer data. Other pelagic catch by the MHI troll fishery was calculated by totaling other pelagic catch by species for each data set, comparing the results and using the higher value of the two data summaries.

	MHI troll other pelagic catch (1000 pounds)			
Year	**Mahimahi**	**Ono (wahoo)**	**Sharks**	**Total other pelagics**
1984	210	236	2	449
1985	323	287	2	612
1986	358	381	3	742
1987	579	324	3	907
1988	264	298	6	569
1989	379	298	14	691
1990	491	262	16	768
1991	718	337	12	1,067
1992	461	262	8	731
1993	444	286	13	744
1994	546	245	9	800
1995	419	388	8	815
1996	451	347	7	806
1997	517	451	5	974
1998	464	442	6	912
1999	545	558	6	1,109
2000	731	387	5	1,122
2001	584	516	4	1,104
2002	695	346	3	1,043
2003	621	461	0	1,082
2004	1,140	349	2	1,491
Average	**521.0**	**355.4**	**6.4**	**882.7**
SD	**198.9**	**89.1**	**4.4**	**237.3**

Figure 41. Main Hawaiian Islands troll tuna catch per trip, 1984-2004.

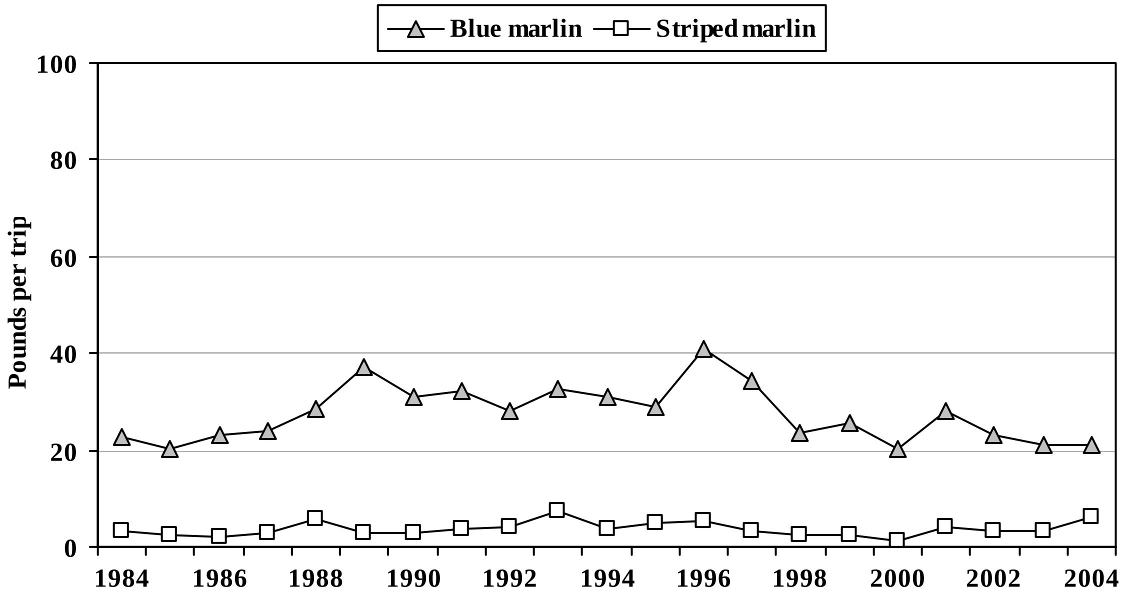


Interpretation: MHI troll yellowfin tuna CPUE peaked near 80 pounds in 1987 and trended downward thereafter although CPUE was above 40 pounds per trip in the last two years. Skipjack tuna CPUE was relatively stable over the 20-year period with CPUE at 9 pounds in 2004.

Source and Calculations: The MHI troll tuna CPUE was complied from HDAR Commercial Fish Catch and Marine Dealer data. MHI troll CPUE was measured as pounds per trip. MHI troll catch and effort were calculated using the conditions described in the introduction. Since there was no way to determine the difference between a zero catch (unsuccessful fishing trip(s)) report or a no fishing report, the MHI troll tuna CPUE calculation did not include zero catch/no fishing trip reports. Yellowfin tuna and skipjack tuna catches were divided by the number of MHI troll trips.

MHI troll tuna CPUE (pounds per trip)		
Year	**Yellowfin tuna**	**Skipjack tuna**
1984	38	17
1985	55	14
1986	65	12
1987	78	12
1988	38	17
1989	30	17
1990	53	14
1991	27	22
1992	30	17
1993	30	16
1994	44	14
1995	40	14
1996	33	20
1997	30	16
1998	28	12
1999	28	14
2000	31	9
2001	24	10
2002	26	10
2003	44	9
2004	41	9
Average	**38.6**	**13.9**
SD	**14.1**	**3.6**

Figure 42. Main Hawaiian Island troll marlin catch per trip, 1984-2004.

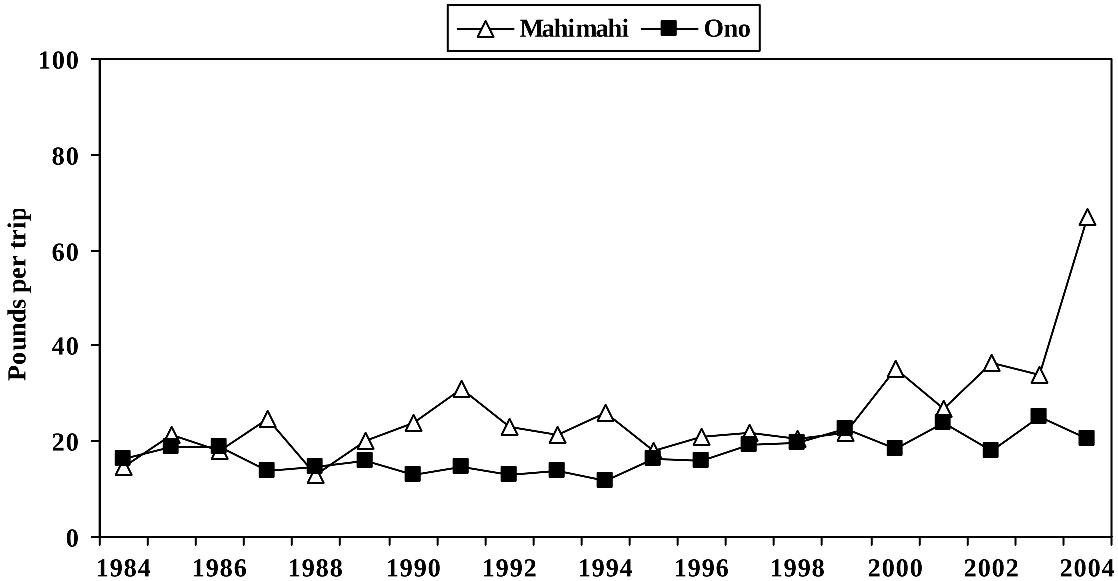


Interpretation: Blue marlin CPUE peaked in 1989 and 1996 when catch rates were about 40 pounds per trip. CPUE for blue marlin appeared to be slightly higher from the late-1980s to the mid-1990s. Striped marlin CPUE was substantially lower and peaked at only 7 pounds in 1993. CPUE for striped marlin also seemed to be stable.

Source and Calculations: The MHI troll marlin CPUE was complied from HDAR Commercial Fish Catch and Marine Dealer data. MHI troll CPUE was measured as pounds per trip. MHI troll catch and effort were calculated using the conditions described in the introduction. Since there was no way to determine the difference between a zero catch (unsuccessful fishing trip(s)) report or a no fishing report, the MHI troll marlin CPUE calculation did not include zero catch/no fishing trip reports. Blue marlin and striped marlin catches were divided by the number of MHI troll trips.

MHI troll marlin CPUE (pounds per trip)		
Year	**Blue marlin**	**Striped marlin**
1984	23	3
1985	20	3
1986	23	2
1987	24	3
1988	28	6
1989	37	3
1990	31	3
1991	32	4
1992	28	4
1993	33	7
1994	31	4
1995	29	5
1996	41	6
1997	34	3
1998	24	3
1999	26	3
2000	20	1
2001	28	4
2002	23	3
2003	21	3
2004	21	6
Average	**27.5**	**3.8**
SD	**5.8**	**1.5**

Figure 43. Main Hawaiian Island troll mahimahi and ono catch per trip, 1984-2004.

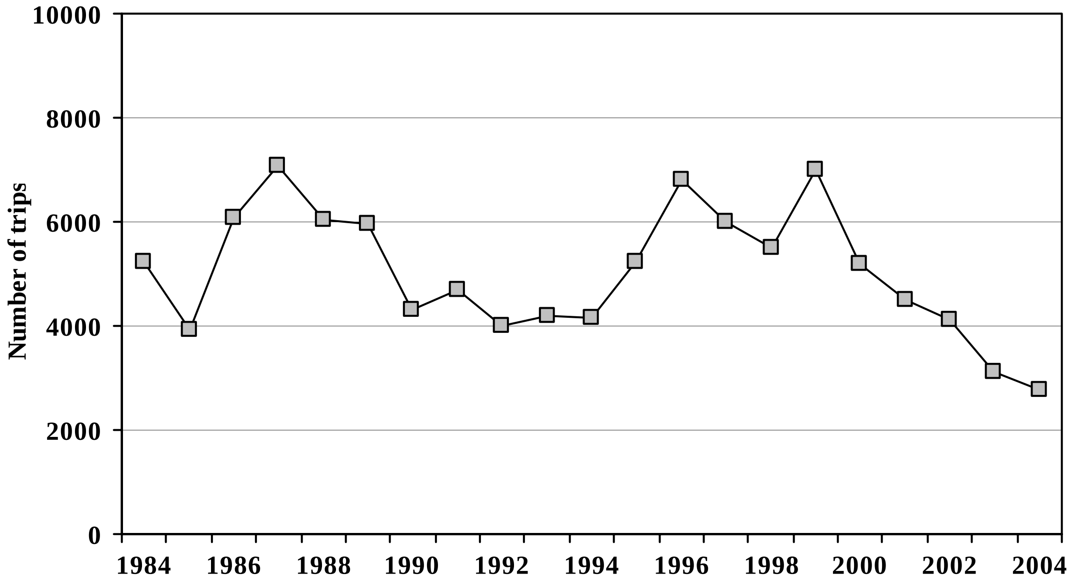


Interpretation: Mahimahi CPUE was slightly higher and more variable than that for ono. Mahimahi CPUE was a record 67 pounds per trip in 2004 while ono CPUE was highest at 24 pounds in 2001. CPUE for both species were on a upward trend from the mid-1990s.

Source and Calculations: The MHI troll mahimahi and ono CPUE was complied from HDAR Commercial Fish Catch and Marine Dealer data. MHI troll CPUE was measured as pounds per trip. MHI troll catch and effort were calculated using the conditions described in the introduction. Since there was no way to determine the difference between a zero catch (unsuccessful fishing trip(s)) report or a no fishing report, the MHI troll mahimahi and ono CPUE calculation did not include zero catch/no fishing trip reports. Mahimahi and ono catches were divided by the number of MHI troll trips.

MHI troll mahimahi and ono CPUE (pounds per trip)		
Year	**Mahimahi**	**Ono**
1984	14	16
1985	21	19
1986	18	19
1987	25	14
1988	13	15
1989	20	16
1990	24	13
1991	31	15
1992	23	13
1993	22	14
1994	26	12
1995	18	16
1996	21	16
1997	22	19
1998	21	20
1999	22	22
2000	35	19
2001	27	24
2002	36	18
2003	34	25
2004	67	21
Average	**25.7**	**17.3**
SD	**11.3**	**3.7**

Figure 44. Number of Main Hawaiian Islands handline trips, 1984-2004.

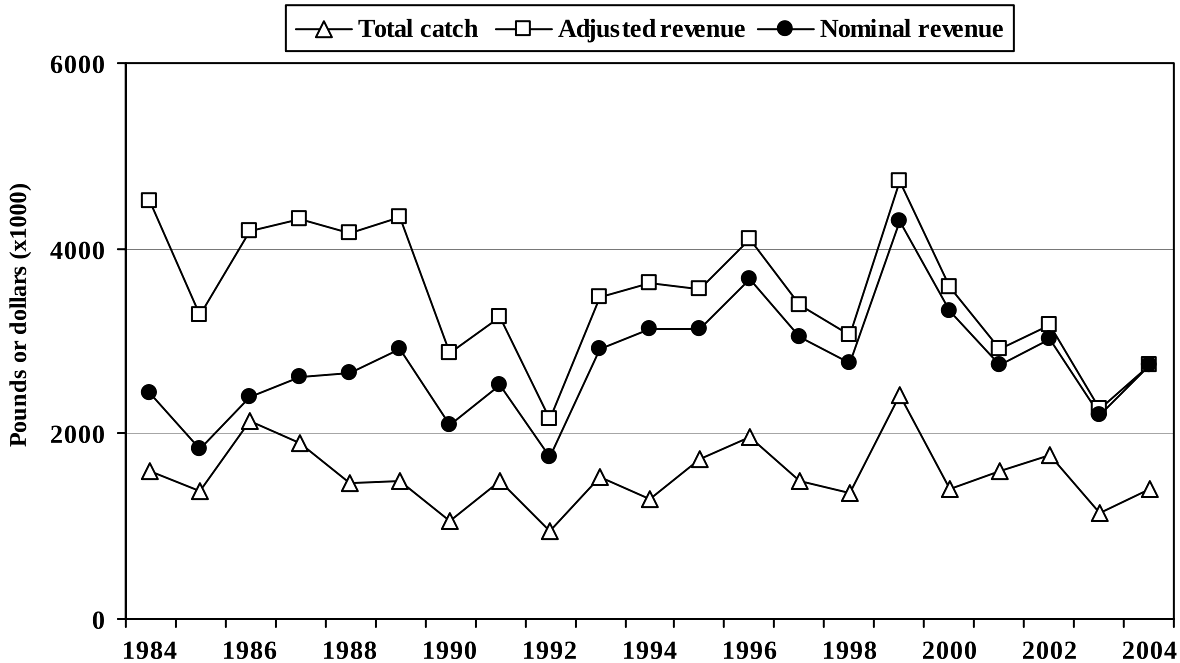


Interpretation: The number of Main Hawaiian Islands (MHI) handline trips activity appeared to have four to six year cycles of high and low activity. The number of MHI handline trips was high in the late 1980s and late 1990s and low during the early to mid 1990s and into the early 2000s with a preliminary estimate of about 2,800 trips in 2004.

Source and Calculations: The number of MHI handline trips was counted from HDAR Commercial Fish Catch data. A MHI handline trip is defined as a unique commercial marine license number returning on a unique day using the specific gear code and fishing in the areas as defined for the MHI handline fishery in the introduction of this module. Since there was no way to determine the difference between a zero catch trip report (unsuccessful fishing trip(s)) or a no fishing trip report, the trip count calculation did not include zero catch/no fishing trip reports.

Year	MHI handline trips
1984	5,248
1985	3,929
1986	6,087
1987	7,069
1988	6,032
1989	5,947
1990	4,300
1991	4,688
1992	3,981
1993	4,209
1994	4,157
1995	5,230
1996	6,801
1997	6,010
1998	5,481
1999	7,004
2000	5,188
2001	4,503
2002	4,119
2003	3,120
2004	2,787
Average	**5,042.4**
SD	**1,216.8**

Figure 45. Main Hawaiian Island handline catch and revenue, 1984-2004.



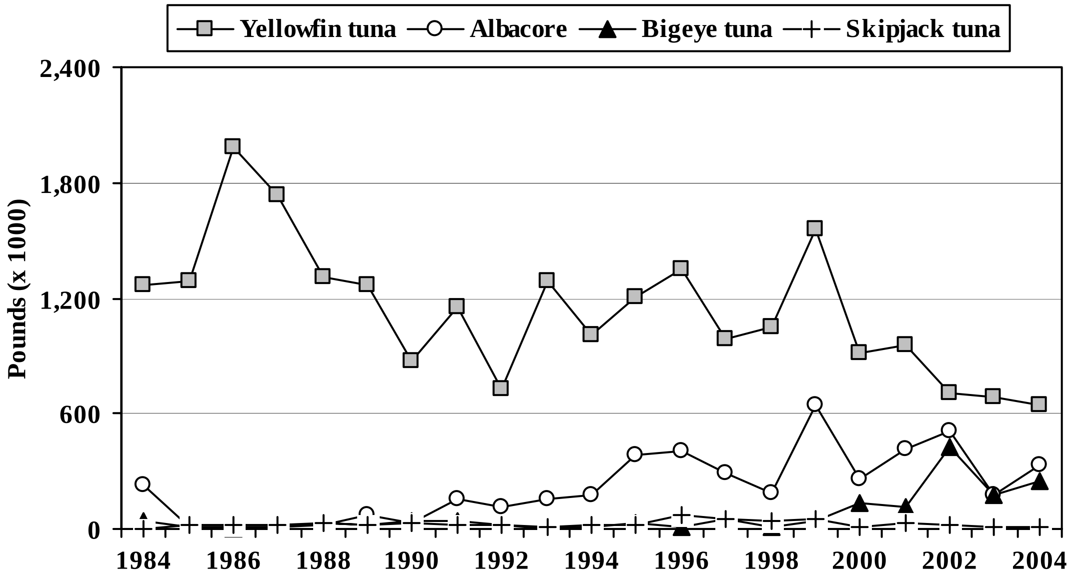
Interpretation: The MHI handline total ranged from 950,000 pounds in 1992 to 2.4 million pounds in 1999. MHI handline catches varied substantially with no clear trend over the 20-year period. Handline catch increased 22% to 1.4 million pounds in 2004.

The MHI handline ex-vessel revenue trended downward from $4.7 million in 1999 to $2.3 million in 1993 and increased 20% to $2.7 million in 2004.

Source and Calculations: Total catch and nominal revenue for the MHI handline fishery were derived from HDAR Commercial Fish Catch and Marine Dealer data. The total catch and nominal revenue values were obtained by adding the catch and revenue values for all species caught by the MHI handline fishery. The adjusted revenue is calculated by dividing the nominal revenue by the Honolulu CPI for the respective year then multiplying the result by the current Honolulu CPI.

Year	Total catch (1000 lbs)	Adjusted revenue ($1000)	Nominal revenue ($1000)	Honolulu CPI
1984	1,590	$ 4,510	$ 2,449	103.5
1985	1,390	$ 3,280	$ 1,836	106.8
1986	2,140	$ 4,180	$ 2,399	109.4
1987	1,910	$ 4,320	$ 2,606	114.9
1988	1,470	$ 4,160	$ 2,654	121.7
1989	1,490	$ 4,330	$ 2,922	128.7
1990	1,060	$ 2,880	$ 2,084	138.1
1991	1,480	$ 3,260	$ 2,532	148.0
1992	950	$ 2,160	$ 1,754	155.1
1993	1,530	$ 3,480	$ 2,924	160.1
1994	1,290	$ 3,630	$ 3,135	164.5
1995	1,730	$ 3,560	$ 3,139	168.1
1996	1,960	$ 4,100	$ 3,669	170.7
1997	1,480	$ 3,380	$ 3,044	171.9
1998	1,370	$ 3,070	$ 2,759	171.5
1999	2,410	$ 4,730	$ 4,301	173.3
2000	1,410	$ 3,590	$ 3,320	176.3
2001	1,600	$ 2,920	$ 2,732	178.4
2002	1,770	$ 3,180	$ 3,011	180.3
2003	1,150	$ 2,270	$ 2,195	184.5
2004	1,400	$ 2,735	$ 2,735	190.6
Average	**1,551.4**	**3,510.7**	**2,771.4**	
SD	**347.7**	**714.2**	**589.5**	

Figure 46. Main Hawaiian Island handline tuna catch, 1984-2004.

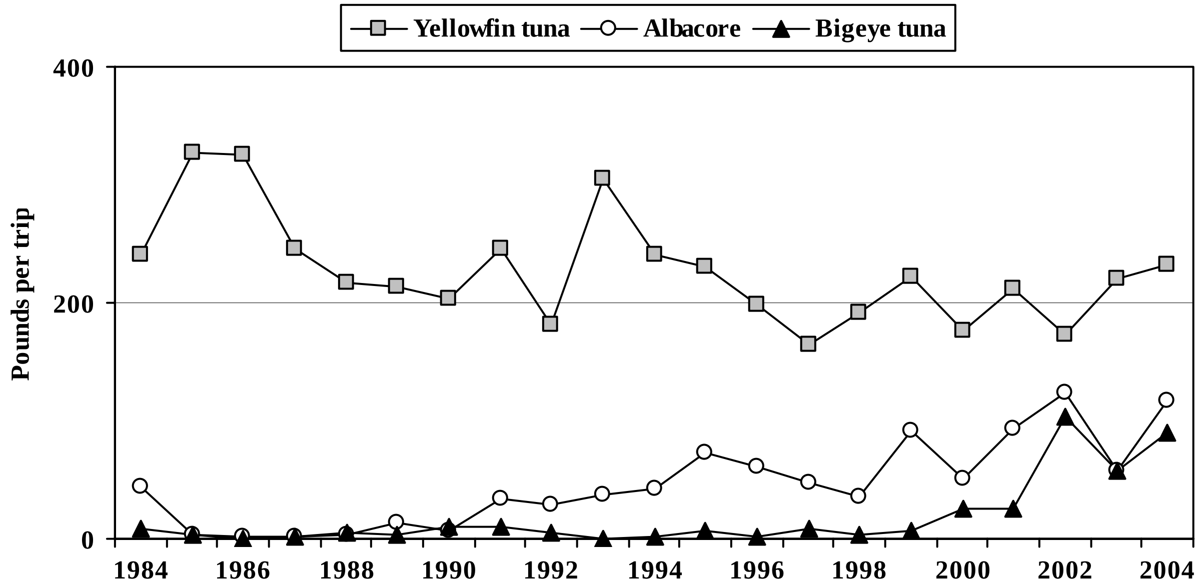


Interpretation: Yellowfin tuna was the dominant component of the MHI handline catch with a peak at 2 million pounds in 1986 and a record low of 650,000 pounds in 2004. Albacore catch peaked at 640,000 pounds in 1999 while bigeye tuna catch was a record 430,000 pounds in 2002. In general, annual yellowfin tuna catches were trending downward while albacore and bigeye tuna catches have been increasing. Small catches of billfish, mahimahi, and ono by the handline fishery represented about 10% of the total catch.

Source and Calculations: The tuna catch statistics for the MHI handline fishery were derived from HDAR Commercial Fish Catch and Marine Dealer data. The MHI handline fishery tuna catch was calculated by totaling tuna catch by species for each data set, comparing the results and using the higher value of the two data summaries.

	MHI handline tuna catch (1000 lbs)					
Year	**Yellowfin tuna**	**Albacore**	**Bigeye tuna**	**Skipjack tuna**	**Other tunas**	**Total**
1984	1,264	230	42	2	2	1,540
1985	1,287	15	11	16	1	1,330
1986	1,984	11	2	24	1	2,023
1987	1,734	12	6	25	5	1,782
1988	1,310	18	28	29	9	1,395
1989	1,266	78	19	20	11	1,393
1990	876	31	41	26	7	981
1991	1,154	157	45	19	6	1,380
1992	722	116	19	21	7	885
1993	1,283	154	2	14	5	1,458
1994	1,003	176	10	21	3	1,213
1995	1,207	380	33	17	6	1,642
1996	1,352	409	11	69	4	1,845
1997	986	287	52	56	3	1,384
1998	1,052	191	15	38	3	1,298
1999	1,559	642	46	52	2	2,302
2000	916	260	133	13	2	1,324
2001	952	417	117	28	3	1,518
2002	711	507	427	18	2	1,665
2003	687	179	180	12	0	1,058
2004	647	328	248	13	1	1,237
Average	**1,140.6**	**219.0**	**70.8**	**25.3**	**3.9**	**1,459.7**
SD	**346.8**	**177.2**	**103.9**	**16.2**	**2.8**	**337.5**

Figure 47. Main Hawaiian Island handline tuna catch per trip, 1984-2004.

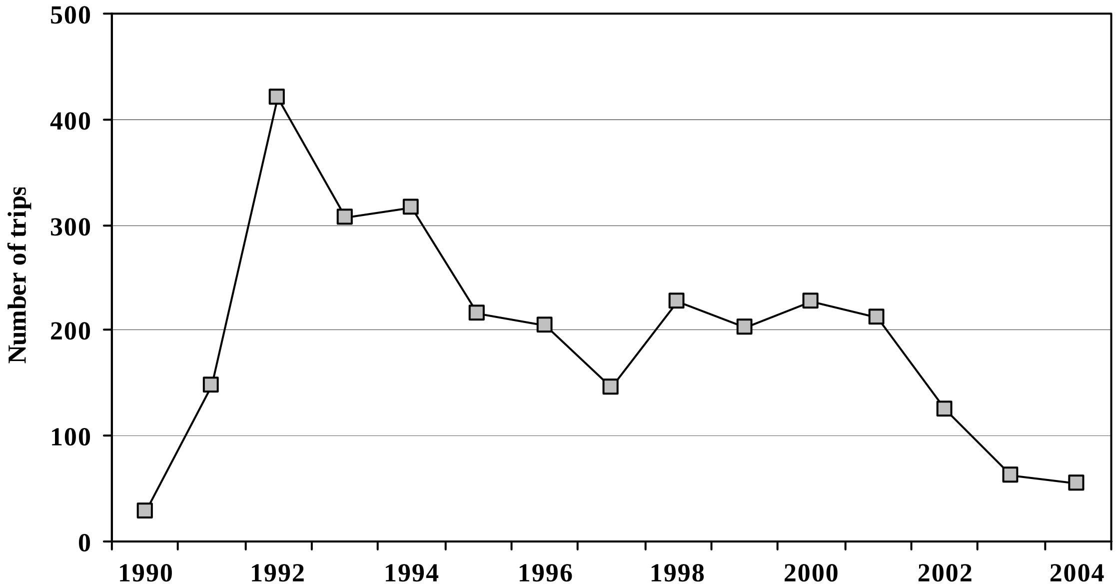


Interpretation: MHI handline yellowfin tuna CPUE averaged 230 pounds per trip and spiked above 300 pounds on three occasions (1985, 1986, and 1993) over the 20-year period. Yellowfin tuna CPUE fluctuated but exhibited no obvious trend. Albacore CPUE was 95 pounds; close to its record attained last year. Bigeye tuna CPUE was at a record 34 pounds in 2002. Albacore and bigeye tuna have shown a general increase from 1998.

Source and Calculations: The MHI handline tuna CPUE was complied from HDAR Commercial Fish Catch and Marine Dealer data. MHI handline CPUE was measured as pounds per trip. MHI handline catch and effort were calculated using the conditions described in the introduction. Since there was no way to determine the difference between a zero catch (unsuccessful fishing trip(s)) report or a no fishing report, the MHI handline tuna CPUE calculation did not include zero catch/no fishing trip reports. Yellowfin tuna and skipjack tuna catches were divided by the number of MHI handline trips.

	MHI handline catch per trip (pounds)			
Year	**Yellowfin tuna**	**Albacore**	**Bigeye tuna**	**Total**
1984	241	44	8	303
1985	328	4	3	354
1986	326	2	0	351
1987	245	2	1	271
1988	217	3	5	244
1989	213	13	3	250
1990	204	7	9	246
1991	246	33	10	315
1992	181	29	5	238
1993	305	37	1	364
1994	241	42	2	310
1995	231	73	6	331
1996	199	60	2	289
1997	164	48	9	246
1998	192	35	3	250
1999	223	92	7	345
2000	177	50	26	272
2001	211	93	26	356
2002	173	123	104	429
2003	220	57	58	367
2004	232	118	89	501
Average	**227.1**	**45.9**	**17.8**	**315.8**
SD	**45.7**	**36.9**	**29.3**	**67.8**

Figure 48. Number of offshore tuna handline trips, 1990-2004.

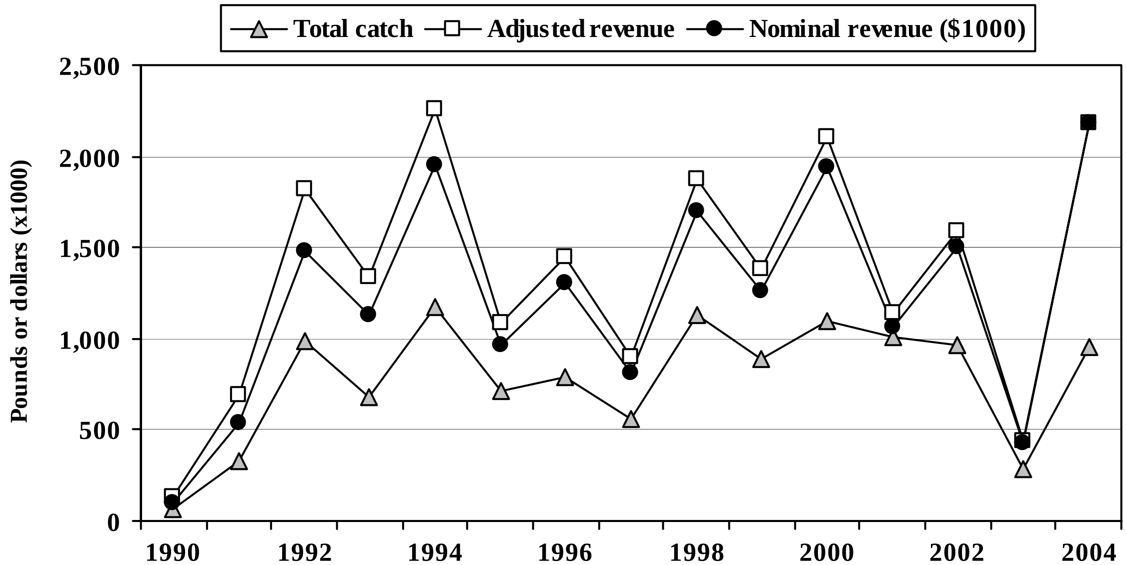


<u>Interpretation:</u> The offshore tuna handline fishery made 55 trips in 2004, slightly less than the previous year. Trips by offshore tuna handline vessels peaked at 420 trips in 1992 and declined afterwards.

<u>Source and Calculations:</u> The number of offshore tuna handline trips was counted from HDAR Commercial Fish Catch data. A offshore tuna handline trip is defined as a unique commercial marine license number returning on a unique day using the specific gear code and fishing in the areas as defined for the offshore tuna handline fishery in the introduction of this module. Since there was no way to determine the difference between a zero catch trip report (unsuccessful fishing trip(s)) or a no fishing trip report, the trip count calculation did not include zero catch/no fishing trip reports.

Year	Offshore handline trips
1990	29
1991	148
1992	420
1993	307
1994	316
1995	216
1996	204
1997	145
1998	228
1999	202
2000	228
2001	212
2002	125
2003	62
2004	55
Average	193.1
SD	105.3

Figure 49. Offshore tuna handline catch and revenue, 1990-2004.

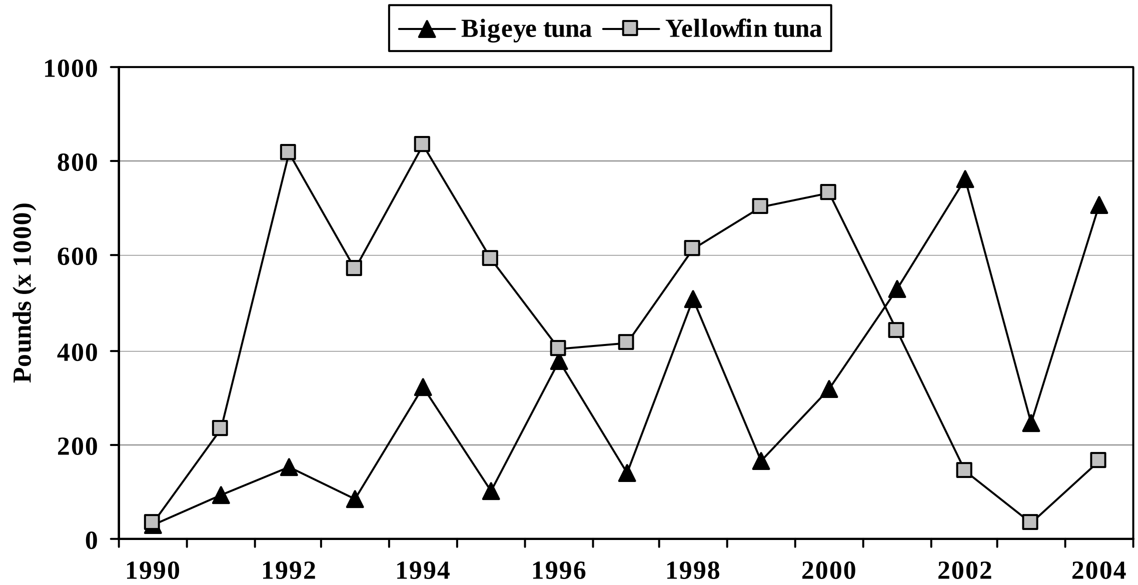


Interpretation: The preliminary offshore handline fishery catch and revenue was 950,000 pounds worth $2.1 million in 2004, up more than three-fold and almost five-fold, respectively. Catch and revenue grew rapidly in the early 1990s and was highly variable thereafter.

Source and Calculations: Total catch and nominal revenue for the offshore tuna handline fishery were derived from HDAR Commercial Fish Catch and Marine Dealer data. The total catch and nominal revenue values were obtained by adding the catch and revenue values for all species caught by the offshore tuna handline fishery. The adjusted revenue is calculated by dividing the nominal revenue by the Honolulu CPI for the respective year then multiplying the result by the current Honolulu CPI.

Year	Total catch (1000 lbs)	Adjusted revenue ($1000)	Nominal revenue ($1000)	Honolulu CPI
1990	70	$ 130	$ 97	138.1
1991	330	$ 690	$ 533	148.0
1992	990	$ 1,820	$ 1,477	155.1
1993	680	$ 1,340	$ 1,125	160.1
1994	1,170	$ 2,260	$ 1,947	164.5
1995	710	$ 1,090	$ 964	168.1
1996	790	$ 1,450	$ 1,302	170.7
1997	560	$ 900	$ 811	171.9
1998	1,130	$ 1,880	$ 1,696	171.5
1999	890	$ 1,380	$ 1,256	173.3
2000	1,100	$ 2,100	$ 1,944	176.3
2001	1,010	$ 1,140	$ 1,069	178.4
2002	960	$ 1,590	$ 1,504	180.3
2003	290	$ 440	$ 427	184.5
2004	950	$ 2,181	$ 2,181	190.6
Average	775.3	1,359.4	1,222.2	
SD	333.5	639.0	596.7	

Figure 50. Offshore tuna handline catch, 1990-2004.



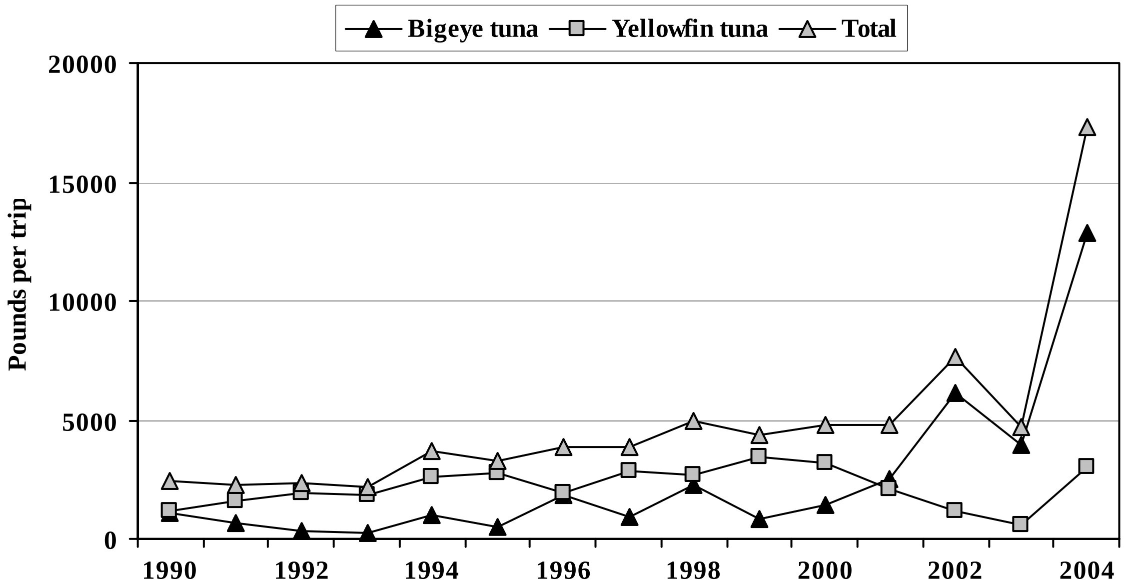
Interpretation: Bigeye tuna catch was the largest component of the offshore handline catch (75%) followed by yellowfin tuna (17%), and small catches of mahimahi. Yellowfin tuna was the largest component of the catch until 2001 when it was replaced by bigeye tuna. In general, bigeye tuna catch has been on a increasing trend. This may reflect better species identification by fishermen (small bigeye tuna and yellowfin tuna can be very difficult to distinguish

Most of the tunas caught by the offshore handline fishery are smaller than the MHI handline fishery. The yellowfin tuna catch reported in the HDAR commercial fish catch data may actually be bigeye tuna; knowledgeable observers have reported that the small tunas caught by this fishery (up to 70%) are predominantly bigeye tuna (David Itano, pers. comm.). As standard practice, tuna catch reported by fishermen as "ahi" are coded by the HDAR Fisheries Statistics Unit as yellowfin tuna. Therefore, the total tuna catch by the offshore handline fishery may be more accurate than the catch for individual species. HDAR is making an effort to help educate fishermen and fish dealers correctly ID small tunas.

Source and Calculations: The catch statistics for the offshore tuna handline fishery were derived from HDAR Commercial Fish Catch and Marine Dealer data. The offshore tuna handline fishery catch was calculated by totaling catch by species for each data set, comparing the results and using the higher value of the two data summaries.

	Offshore handline catch (1000 pounds)			
Year	**Bigeye tuna**	**Yellowfin tuna**	**Mahimahi**	**Total**
1990	31	35	0	66
1991	94	232	5	331
1992	151	816	21	987
1993	85	571	23	679
1994	324	834	18	1,175
1995	102	591	20	714
1996	375	401	17	793
1997	138	415	9	563
1998	508	613	13	1,134
1999	164	703	20	888
2000	317	734	46	1,096
2001	530	442	36	1,007
2002	762	142	21	956
2003	244	36	10	293
2004	708	166	35	945
Average	**302.1**	**448.7**	**19.6**	**762.9**
SD	**231.9**	**274.7**	**12.2**	**342.5**

Figure 51. Offshore tuna handline catch per trip, 1990-2004.



<u>Interpretation:</u> Record total and bigeye tuna CPUE were observed for the offshore handline in 2004 reaching 17,000 and 13,000 pounds, respectively. Generally, the catch rate bigeye increased though the 1990s while yellowfin tuna CPUE has been variable with no clear pattern.

<u>Source and Calculations:</u> The offshore tuna handline tuna CPUE was complied from HDAR Commercial Fish Catch and Marine Dealer data. Offshore tuna handline CPUE was measured as pounds per trip. Offshore tuna handline catch and effort were calculated using the conditions described in the introduction. Since there was no way to determine the difference between a zero catch (unsuccessful fishing trip(s)) report or a no fishing report, the offshore tuna handline tuna CPUE calculation did not include zero catch/no fishing trip reports. Yellowfin tuna and skipjack tuna catches were divided by the number of offshore tuna handline trips.

	Offshore handline catch per trip (pounds)			
Year	**Bigeye tuna**	**Yellowfin tuna**	**Mahimahi**	**Total**
1990	1,052	1,217	2	2,414
1991	634	1,569	31	2,230
1992	359	1,942	49	2,357
1993	276	1,858	76	2,215
1994	1,024	2,638	56	3,703
1995	473	2,738	94	3,287
1996	1,840	1,966	82	3,873
1997	954	2,862	65	3,862
1998	2,227	2,688	57	4,956
1999	814	3,482	101	4,406
2000	1,388	3,218	201	4,825
2001	2,498	2,084	169	4,764
2002	6,096	1,136	168	7,680
2003	3,935	581	161	4,677
2004	12,873	3,018	636	17,273
Average	**2,429.6**	**2,199.8**	**130.0**	**4,834.7**
SD	**3,282.9**	**840.0**	**151.3**	**3,724.7**

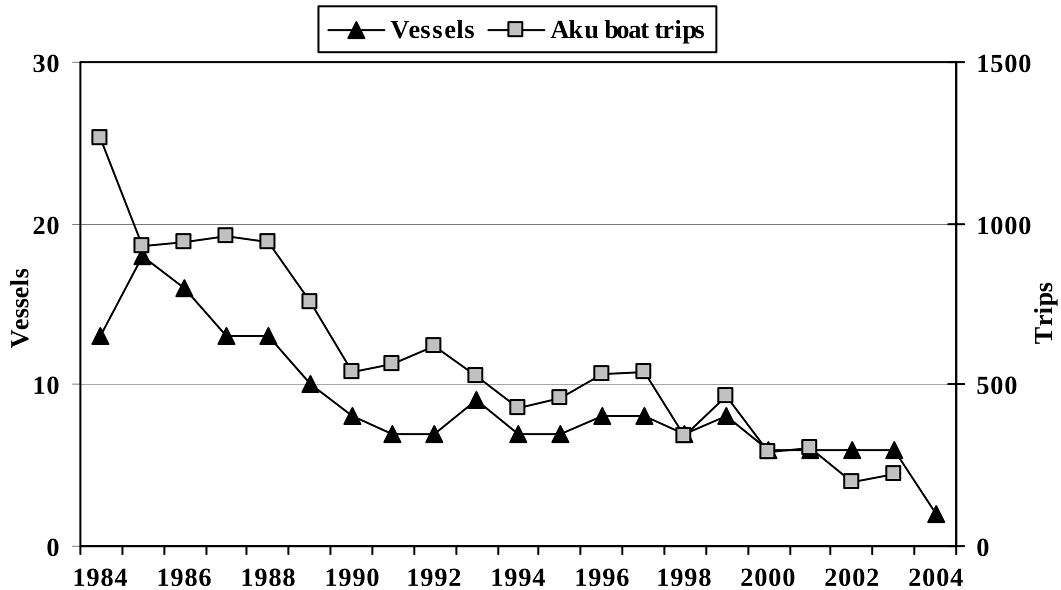
Table 8. Average weight by species for the troll and handline catch, 1987-2004.

SPECIES	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	Average	S.D.
TUNAS																				
Albacore	33	64	55	58	53	53	55	53	22	42	40	21	48	48	42	38	46	44	**45.3**	**11.6**
Bigeye tuna	14	34	24	25	29	28	22	30	18	24	19	21	24	28	20	30	20	41	**25.1**	**6.4**
Skipjack tuna	7	7	11	7	9	6	7	9	7	12	11	5	7	11	11	10	6	6	**8.3**	**2.2**
Yellowfin tuna	32	32	44	41	34	27	44	37	30	42	34	28	31	48	39	42	31	28	**35.8**	**6.5**
BILLFISH																				
Blue marlin	215	181	188	248	197	215	182	233	204	195	175	201	211	238	181	223	186	186	**203.3**	**21.7**
Striped marlin	66	64	68	76	63	70	67	67	61	65	68	58	55	61	50	42	49	52	**61.2**	**8.7**
Swordfish	126	124	107	97	122	75	139	95	110	86	96	85	88	171	129	119	138	153	**114.4**	**25.9**
OTHER PMUS																				
Mahimahi	21	18	21	20	15	14	14	14	16	16	16	18	18	15	15	16	16	18	**16.7**	**2.3**
Ono (wahoo)	24	25	25	25	23	26	24	27	24	23	21	25	27	25	24	26	22	24	**24.4**	**1.6**

Interpretation: Except for mean weight for bigeye tuna and swordfish, the average weight for fish caught by troll and handline gear in 2004 was about the same compared the previous year. Mean weight for bigeye tuna increased by 21 pounds while the mean weight for swordfish was up by 15 pounds in 2004. Blue marlin had the biggest mean weight of all species for troll and handline caught fish at 186 pounds.

Source and Calculations: The average weights were calculated from HDAR commercial fish catch reports. Total weight caught was divided by the total number caught. Catch by the troll and handline fishery is usually landed whole, however, average weight calculations were based on reported weight and may include catch that was processed, i.e., headed and gutted, gilled and gutted.

Figure 52. Hawaii aku boat (pole and line) vessel and trip activity, 1984-2004.

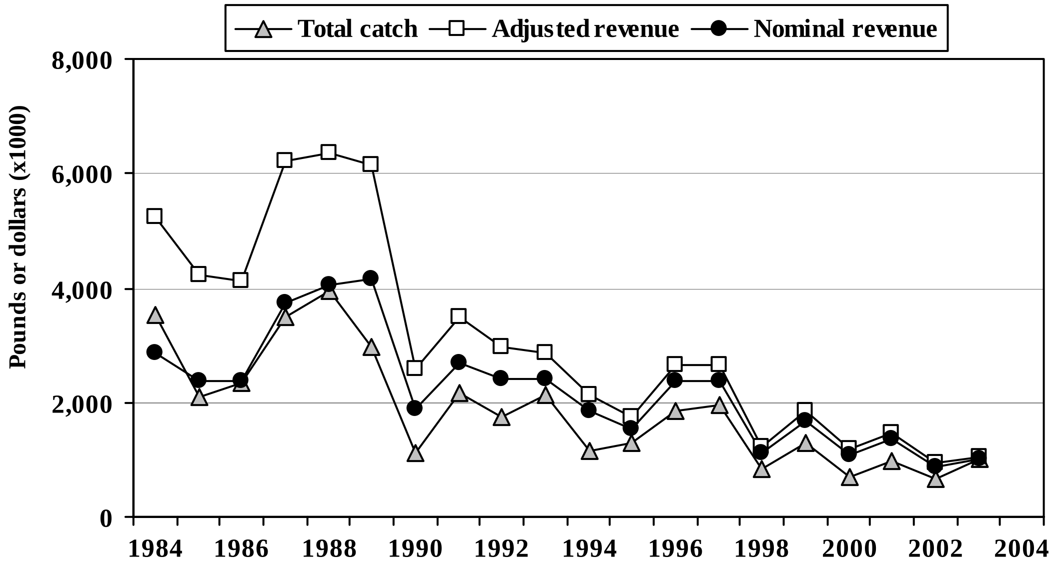


Interpretation: The vessel and trip activity of the aku boat fishery has been in decline over the 20-year period with only two aku boat vessels fishing in 2004. The steep decline that occurred in the 1980s was primarily attributed to the closure of the tuna cannery. Attrition of vessels, many which were built in the 1940s, and poor skipjack tuna catches also contributed to the long-term decline in this fishery. The trip activity for the aku boat fishery in 2004 was not available due to confidentiality standards.

Source and Calculations: The number of aku boat vessels and trips were counted from HDAR commercial aku boat Fish Catch data. The number of aku boat vessels was determined by counting the number of unique vessel names. A unique combination of commercial marine license number, landing month and day that included zero catch trips was used to define a aku boat trip.

Year	Vessels	Aku boat trips
1984	13	1,264
1985	18	927
1986	16	943
1987	13	958
1988	13	945
1989	10	757
1990	8	541
1991	7	561
1992	7	621
1993	9	528
1994	7	425
1995	7	460
1996	8	530
1997	8	540
1998	7	341
1999	8	466
2000	6	290
2001	6	301
2002	6	197
2003	6	223
2004	2	-
Average	**8.8**	**590.9**
SD	**3.8**	**288.4**

Figure 53. Hawaii aku boat (pole and line) catch and revenue, 1984-2004.

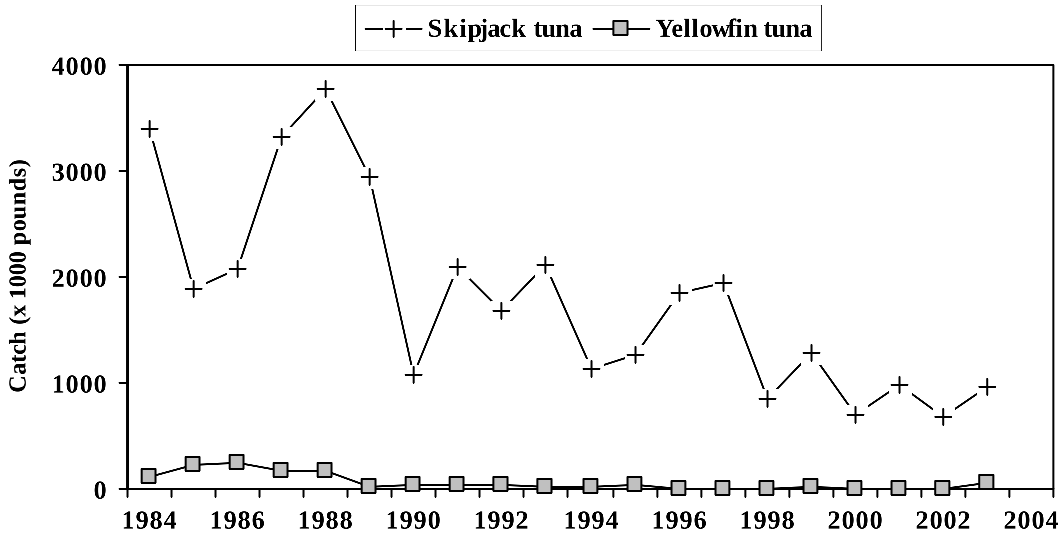


Interpretation: Since there were only two aku boats operating in 2004, catch and revenue by this fishery was not available due to confidentiality standards. Aku boat catch and revenue peaked in 1988, then decreased sharply in 1990, and continued to decline slowly thereafter.

Source and Calculations: Total catch and nominal revenue for the aku boat fishery were derived from HDAR Commercial Marine Dealer data. The total catch and nominal revenue values were obtained by adding the catch and revenue values for all species caught by the aku boat fishery. The adjusted revenue is calculated by dividing the nominal revenue by the Honolulu CPI for the respective year then multiplying the result by the current Honolulu CPI.

Year	Total catch (1000 lbs)	Adjusted revenue ($1000)	Nominal revenue ($1000)	Honolulu CPI
1984	3,530	$ 5,250	$ 2,851	103.5
1985	2,110	$ 4,220	$ 2,367	106.8
1986	2,350	$ 4,120	$ 2,366	109.4
1987	3,500	$ 6,220	$ 3,751	114.9
1988	3,940	$ 6,360	$ 4,063	121.7
1989	2,960	$ 6,140	$ 4,146	128.7
1990	1,120	$ 2,590	$ 1,873	138.1
1991	2,150	$ 3,480	$ 2,706	148.0
1992	1,730	$ 2,970	$ 2,415	155.1
1993	2,140	$ 2,880	$ 2,415	160.1
1994	1,160	$ 2,130	$ 1,835	164.5
1995	1,290	$ 1,760	$ 1,550	168.1
1996	1,840	$ 2,670	$ 2,389	170.7
1997	1,950	$ 2,650	$ 2,393	171.9
1998	840	$ 1,230	$ 1,106	171.5
1999	1,310	$ 1,840	$ 1,674	173.3
2000	710	$ 1,180	$ 1,094	176.3
2001	990	$ 1,460	$ 1,365	178.4
2002	680	$ 930	$ 880	180.3
2003	1,020	$ 1,040	$ 1,005	184.5
2004	-	-	-	190.6
Average	**1,870.0**	**$ 3,060.0**	**$ 2,210.0**	
SD	**980.0**	**$ 1,780.0**	**$ 970.0**	

Figure 54. Hawaii aku boat (pole and line) fishery catch, 1984-2004.

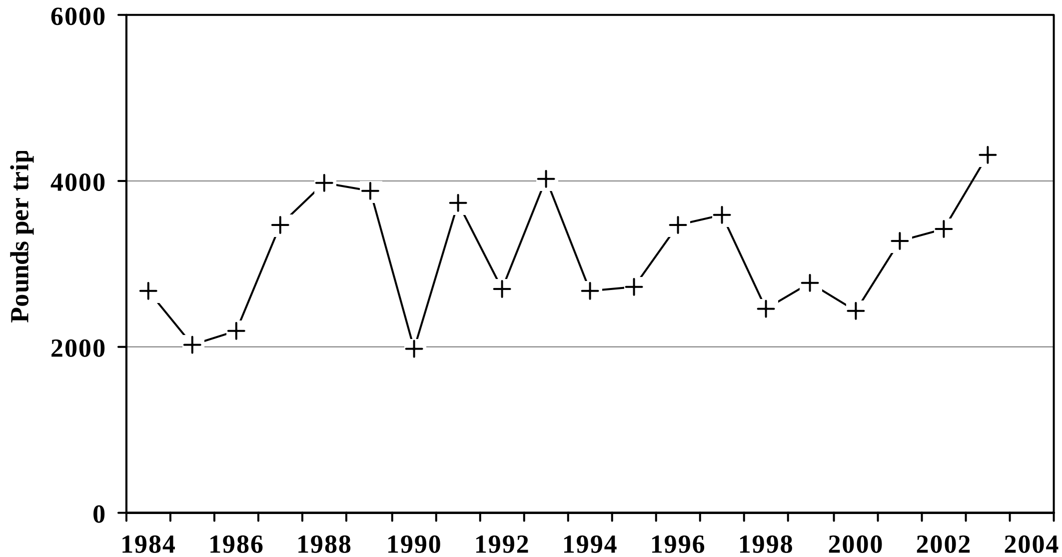


Interpretation: Since there were only two aku boat vessels operating in 2004, the catch for this fishery was not available due to confidentiality standards. The aku boat fishery catches primarily skipjack tuna (aku); this single species typically represented over 95% of the total catch. There were small catches of yellowfin tuna also. Skipjack tuna catch varied annually with a overall downward trend throughout the 20-year period. Part of the reason for the decline in catch from this fishery was the closure of the tuna cannery in 1985. After the closure of the cannery, the aku boat fishery was left with only the fresh fish market.

Source and Calculations: The tuna catch statistics for the aku boat fishery were derived from HDAR Commercial Aku Boat Fish Catch and Marine Dealer data. The aku boat catch was calculated by totaling catch by species.

	Akuboat catch (x 1000 pounds)				
Year	**Skipjack tuna**	**Yellowfin tuna**	**Other tunas**	**Mahimahi**	**Total**
1984	3,387	119	16	5	3,527
1985	1,881	227	6	0	2,114
1986	2,075	251	17	7	2,351
1987	3,328	173	0	2	3,503
1988	3,768	168	0	4	3,940
1989	2,938	21	2	1	2,962
1990	1,073	39	4	0	1,116
1991	2,102	44	1	0	2,146
1992	1,682	36	4	14	1,735
1993	2,121	10	3	3	2,137
1994	1,133	19	6	0	1,159
1995	1,256	34	0	0	1,291
1996	1,842	2	0	0	1,844
1997	1,942	0	0	5	1,947
1998	842	3	0	0	845
1999	1,291	21	0	0	1,312
2000	704	2	1	0	707
2001	986	4	0	0	990
2002	672	4	1	0	677
2003	960	50	0	1	1,018
2004	-	-	-	-	-
Average	**1,799.2**	**61.3**	**3.0**	**2.2**	**1,866.1**
SD	**935.4**	**79.8**	**5.0**	**3.5**	**984.1**

Figure 55. Hawaii aku boat (pole and line) fishery total catch per trip, 1984-2004.



Interpretation: Since there were only two aku boat vessels operating in 2004, the CPUE for this fishery was not available due to confidentiality standards. The aku boat skipjack tuna catch per trip was 4,300 pounds per trip in 2003. Aku boat CPUE appeared to be on a upward trend from 2000.

Source and Calculations: The aku boat fishery CPUE statistics were derived from the HDAR Commercial Aku Boat Fish Catch data and measured as catch (in pounds) per trip. Catch per trip was calculated by dividing the pounds values by the total number of aku boat trips during that year (Figure 51).

	Aku boat CPUE (pounds per trip)	
Year	**Skipjack tuna**	**Total catch**
1984	2,680	2,790
1985	2,029	2,280
1986	2,201	2,493
1987	3,474	3,657
1988	3,988	4,169
1989	3,882	3,913
1990	1,984	2,062
1991	3,746	3,826
1992	2,708	2,794
1993	4,018	4,048
1994	2,667	2,726
1995	2,731	2,806
1996	3,475	3,479
1997	3,596	3,606
1998	2,468	2,477
1999	2,770	2,816
2000	2,429	2,438
2001	3,274	3,289
2002	3,411	3,437
2003	4,305	4,565
2004	-	-
Average	**3,091.8**	**3,183.6**
SD	**710.0**	**708.4**

Appendix 4

Commonwealth of the Northern Mariana Islands

Introduction

The Northern Mariana Islands pelagic fishery occurs primarily from the island of Farallon de Medinilla south to the island of Rota. The fishery is characterized using data in the Commercial Purchase Data Base. The collection system for the data is dependent upon first-level purchasers of local fresh fish to accurately record all fish purchases by species categories on specially designed invoices. Staff from the Department of Lands and Natural Resources, Division of Fish and Wildlife (DFW) routinely distributes and collects invoice books from 30 participating local fish purchasers on Saipan. Purchasers include practically all fish markets, stores, restaurants, hotels and roadside vendors ("fish-mobiles").

The current commercial purchase database collection system only documents landings on Saipan. The establishment of a data collection system for the islands of Tinian and Rota are in the process. It is believed that the commercial purchase database landings include around 80% of all commercial landings on Saipan. There is also a subsistence fishery on Saipan were profit making is made by selling a small portion of their catch to cover fishing expense. Usually fishermen selling their catch going “door to door” which results in around 30% of the unreported commercial landings do this.

Although the Saipan data collection system has been in operation since the mid-1970s, only data collected since 1983 are considered accurate enough to be used. It is assumed that data in this report are credible.

This database lacks information concerning fishing method, location, and effort because previous data generated from Creel Survey are believed to be unreliable.

Summary

Trolling is the primary fishing method utilized in the pelagic fishery. The pelagic fishing fleet, other than charter boats, consists primarily of vessels less than 24 ft in length which usually has a limited 20-mile travel radius from Saipan.

In the past charter vessels generally retain their catches, selling half or more to local markets. However in recent times, charter vessels rarely sell any of their landings. No logbook system is in effect.

The primary target and most marketable species for the pelagic fleet are skipjack tuna. Yellowfin tuna and mahimahi are also easily marketable species but are seasonal. During their seasonal runs, these fish are usually found close to shore and provide easy targets for the local fishermen. In addition to the economic advantages of being near shore and their relative ease of capture, these species are widely accepted by all ethnic groups. This has kept market demand fairly high due to the continuing immigrant population growth on Saipan (over half of the population on Saipan is nonnative).

Table 1.—CNMI Consumer Price Indices (CPIs)

Year	CPI	CPI Adjuste Factor
1983	140.90	1.93
1984	153.20	1.77
1985	159.30	1.70
1986	163.50	1.66
1987	170.70	1.59
1988	179.60	1.51
1989	190.20	1.43
1990	199.33	1.36
1991	214.93	1.26
1992	232.90	1.16
1993	243.18	1.12
1994	250.00	1.09
1995	254.48	1.07
1996	261.98	1.04
1997	264.95	1.02
1998	264.18	1.03
1999	267.80	1.01
2000	273.23	0.99
2001	271.01	1.00
2002	271.55	1.00
2003	268.92	1.01
2004	**271.28**	**1.00**

Calculation: The Commonwealth of the Northern Mariana Islands' Consumer Price Index is computed by the CNMI Department of Commerce using the Laspeyres' formula.

Table 2. NMI 2004 Commercial Pelagic Landings, Revenues and Price

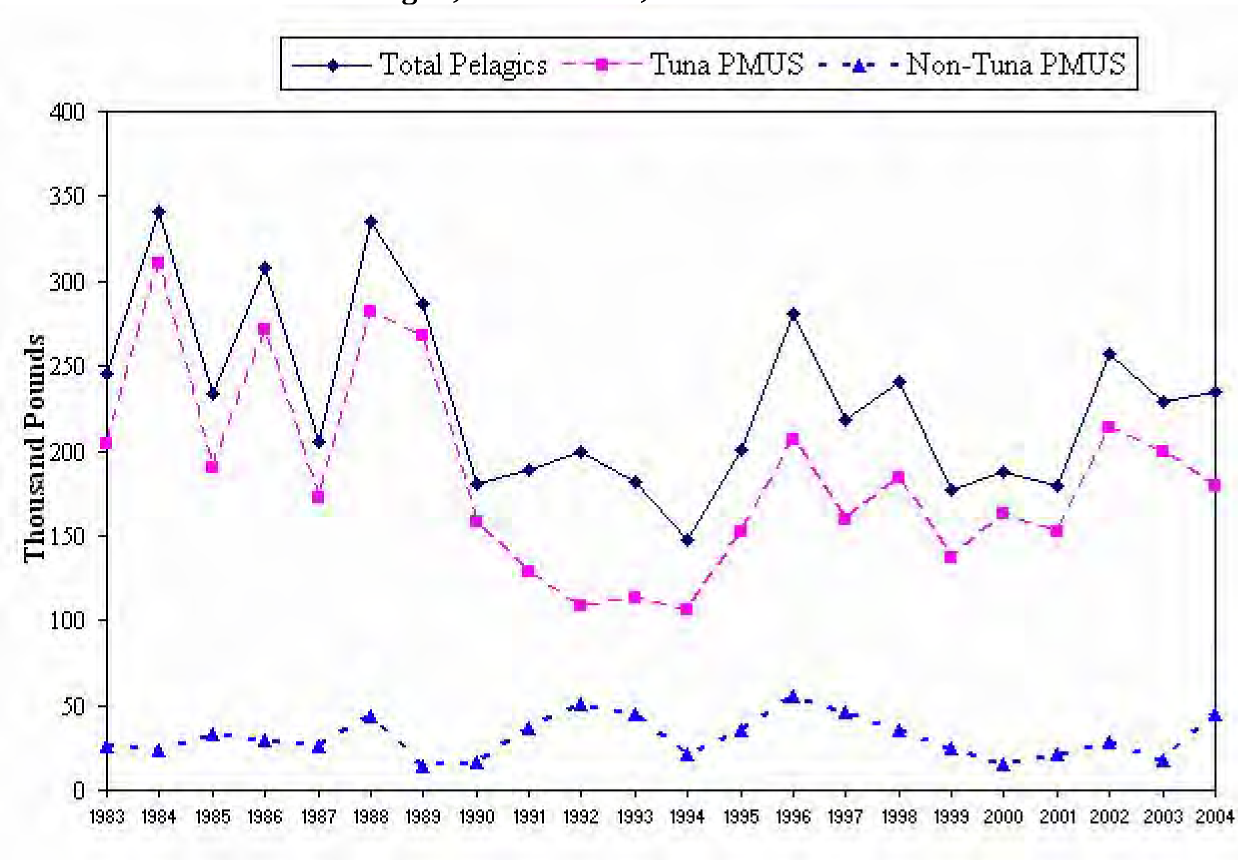
Species	Landing (Lbs)	Value ($)	Avg Price ($/Lb)
Skipjack Tuna	146,491	285,822	1.95
Yellowfin Tuna	26,877	53,711	2.00
Saba (kawakawa)	5,455	9,565	1.75
Tuna PMUS	**178,823**	**349,098**	**1.90**
Mahimahi	34,989	74,738	2.14
Wahoo	6,854	16,266	2.37
Blue Marlin	2,001	2,669	1.33
Sailfish	433	871	2.01
Sickle Pomfret (w/woman)	514	1,295	2.52
Non-tuna PMUS	**44,791**	**95,840**	**2.08**
Dogtooth Tuna	7,381	12,910	1.75
Rainbow Runner	4,105	8,124	1.98
Barracuda	165	317	1.91
Troll Fish (misc.)	116	201	1.73
Non-PMUS Pelagics	**11,768**	**21,552**	**1.84**
Total Pelagics	**235,382**	**466,490**	**1.95**

Interpretation: Skipjack landings decreased 9.7% or more than 24,000 pounds in 2004. Skipjack tuna continues to dominate the pelagic landings, comprising around 67 % of the (commercially receipted) industry's pelagic catch. Yellowfin tuna and mahi ranked second and third in total landings during 2004. Mahi landings surpassed wahoo landings for 2004, increasing to 387%. Yellowfin landings also increased 5%. Increase in yellowfin landings in 2002 is partly due to landings from the Northern Islands and by a longline experiment conducted by a fishing company. Skipjack tunas are easily caught in near shore waters throughout the year. Mahimahi is seasonal with peak catch usually from February through April. Yellowfin season usually runs from April to September. The overall pelagic catch increased by 4% in 2004.

The highest average price of identified pelagic species was $2.52/lb for Sickle Pomfret. The lowest priced species is blue marlin. The average price per pound for Skipjack tuna, the species with the greatest landings, remained around $1.95/lb.

Recorded Blue Marlin landings for 2004 are 2,001 pounds. The low ex-vessel price may be partially related to the manner in which the fish is kept prior to sale. Blue Marlin is rarely a target by commercial fishermen except during fishing tournaments and by Charter boats.

**Figure 1. NMI Annual Commercial Landings:
All Pelagics, Tuna PMUS, and Non-Tuna PMUS**



Source and Calculation: Annual summaries for each species are from the Commercial Purchase Data Base invoices.

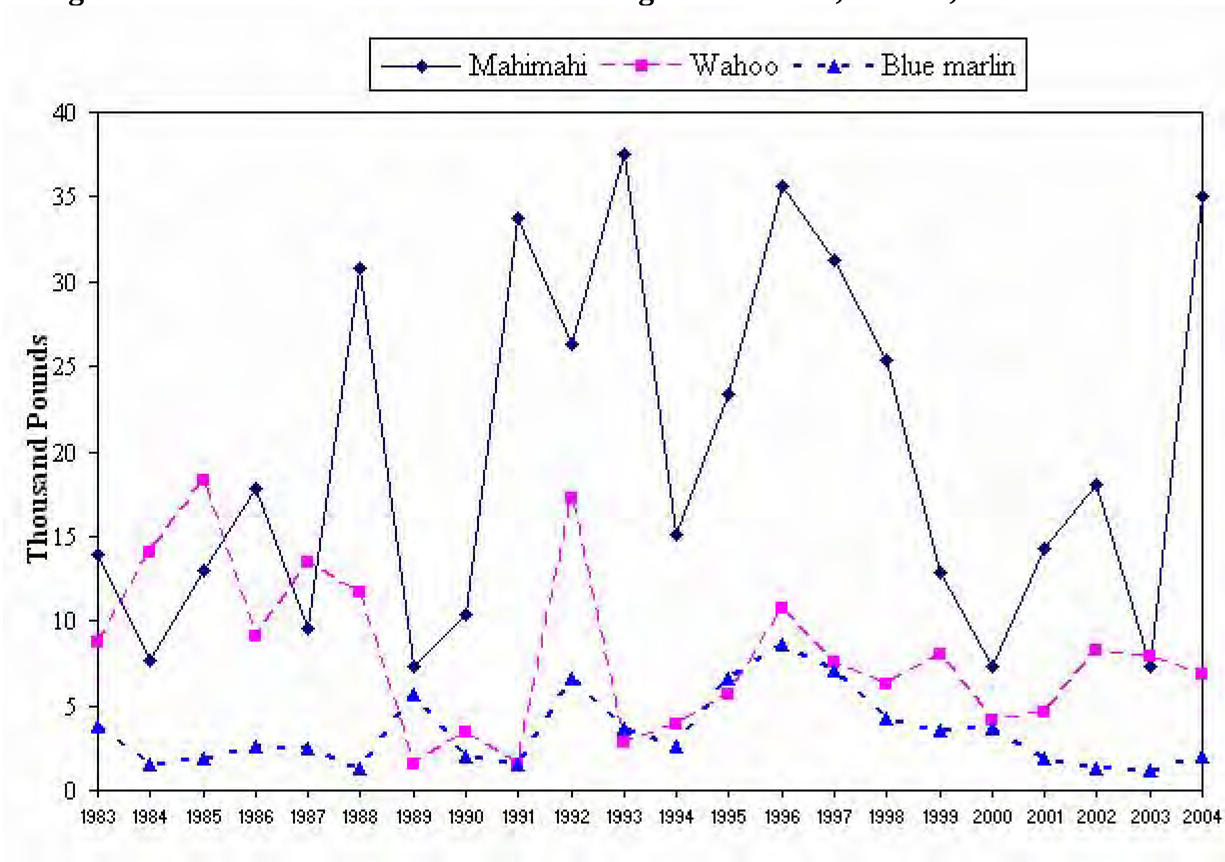
Interpretation: Total weight of pelagics landed in 2004 increased 3% from 2003 level. This is partly due to tuna landings increasing by 9% and the landings recorded in the "Non-Tuna PMUS" category increasing significantly by 27,000 pounds or 158% from 2003 figures.

Source and Calculation: All pelagics, tuna and Non-Tuna PMUS landings were summed from the Commercial Purchase Data Base.

Total Commercial Landings (Lb)

Year	All Pelagics	Tuna PMUS	Non-Tuna PMUS
1983	245,985	204,692	26,544
1984	341,136	310,424	23,244
1985	234,178	189,809	33,143
1986	307,459	271,279	29,626
1987	205,068	171,957	25,450
1988	334,523	281,872	43,805
1989	286,784	267,811	14,595
1990	180,450	158,430	15,936
1991	188,561	128,848	36,975
1992	199,228	108,314	50,159
1993	181,328	113,207	44,518
1994	147,329	105,942	21,657
1995	200,180	152,756	35,759
1996	281,277	206,247	55,712
1997	218,873	159,626	46,049
1998	240,263	184,450	35,979
1999	177,031	136,907	24,768
2000	187,295	162,747	15,551
2001	179,181	152,144	21,198
2002	256,982	213,565	27,876
2003	228,416	198,843	17,346
2004	**235,382**	**178,823**	**44,791**
Average	229,860	184,486	31,395
Standard Deviation	53,201	56,990	12,133

Figure 2. NMI Annual Commercial Landings: Mahimahi, Wahoo, and Blue Marlin.



Interpretation: Mahimahi landings increased 376% in 2004. It is noteworthy that the NMI and Guam mahimahi catches have been fluctuating similarly since 1987, which may indicate a strong biological influence in local landing patterns.

From 1983 to 1988, wahoo landings were somewhat consistent and did not fall below 7,000 lbs., but in 1989 landings notably declined by 86% and remained at depressed levels until the dramatic increase in landings during 1992. Following the near-record 1992 landings, the 1993 wahoo landings again decreased by 84%, falling below the mean. Wahoo landings in 2001 increased by 362 pounds or 11% over the 2000 landings. Wahoo landings continued to increase in 2002 by 80% then drop slightly in 2003 and continued to decline by 14% in 2004.

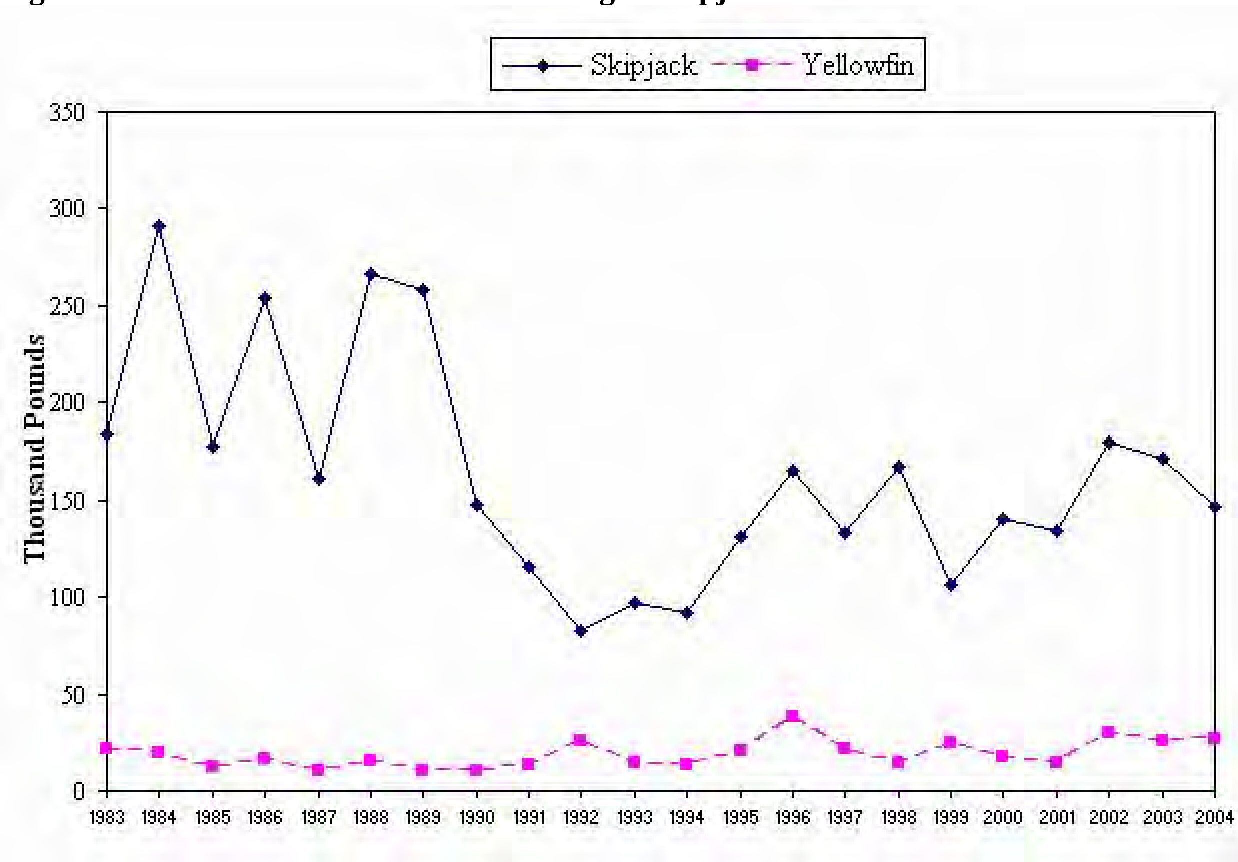
The Blue Marlin landing increased 77% from the 2003 figures. Blue marlin is rarely a target by the commercial fishermen except for charter boats and during fishing tournaments. If blue marlins are landed, they are often kept by the fishermen and therefore rarely ever recorded in the Commercial Purchase Data Base.

Source and Calculation: The annual commercial landings of the three major PMUS species (mahimahi, wahoo and blue marlin) were summed directly from the Commercial Purchase Data Base.

Total Commercial Landings (Lb)

Year	Mahimahi	Wahoo	Blue Marlin
1983	13,939	8,760	3,787
1984	7,614	14,087	1,544
1985	12,955	18,251	1,860
1986	17,796	9,062	2,654
1987	9,502	13,404	2,460
1988	30,799	11,697	1,309
1989	7,320	1,571	5,704
1990	10,439	3,462	2,034
1991	33,756	1,521	1,568
1992	26,257	17,172	6,603
1993	37,545	2,779	3,687
1994	15,063	3,863	2,635
1995	23,321	5,722	6,619
1996	35,655	10,783	8,593
1997	31,277	7,580	7,068
1998	25,375	6,299	4,201
1999	12,882	8,063	3,541
2000	7,324	4,097	3,608
2001	14,229	4,550	1,924
2002	18,042	8,212	1,261
2003	7,357	7,950	1,130
2004	**34,989**	**6,854**	**2,001**
Average	19,702	7,988	3,445
Standard Deviation	10,528	4,699	2,166

Figure 3. NMI Annual Commercial Landings: Skipjack and Yellowfin Tuna.



Interpretation: Historically, skipjack landings exhibited an alternating two-year cycle from 1983 to 1988 and comprised more than 73% by weight of the total pelagic landings each year from 1983 to 1989 (data taken from Table 1 and Fig. 3). Skipjack tuna landings declined after that, reaching record lows from 1990 through 1994. In 1993 and 1994 skipjack landings showed signs of stabilizing at about half of their respective eleven and twelve year means, while the nearly 32,000 pounds increase in 1995 landings attained 61% of the 1983-1990 averages of 174,020 pounds. Skipjack landings for the year 2002 increased by 25% or over 43,000 pounds. In 2003 Skipjack landings dipped 4% possibly due to a series of bad weather and declined in 15% in 2004.

Schools of skipjack tuna have historically been common in near shore waters, providing an opportunity to catch numerous fish with a minimum of travel time and fuel costs. Skipjack is readily consumed by the local populace, primarily as sashimi.

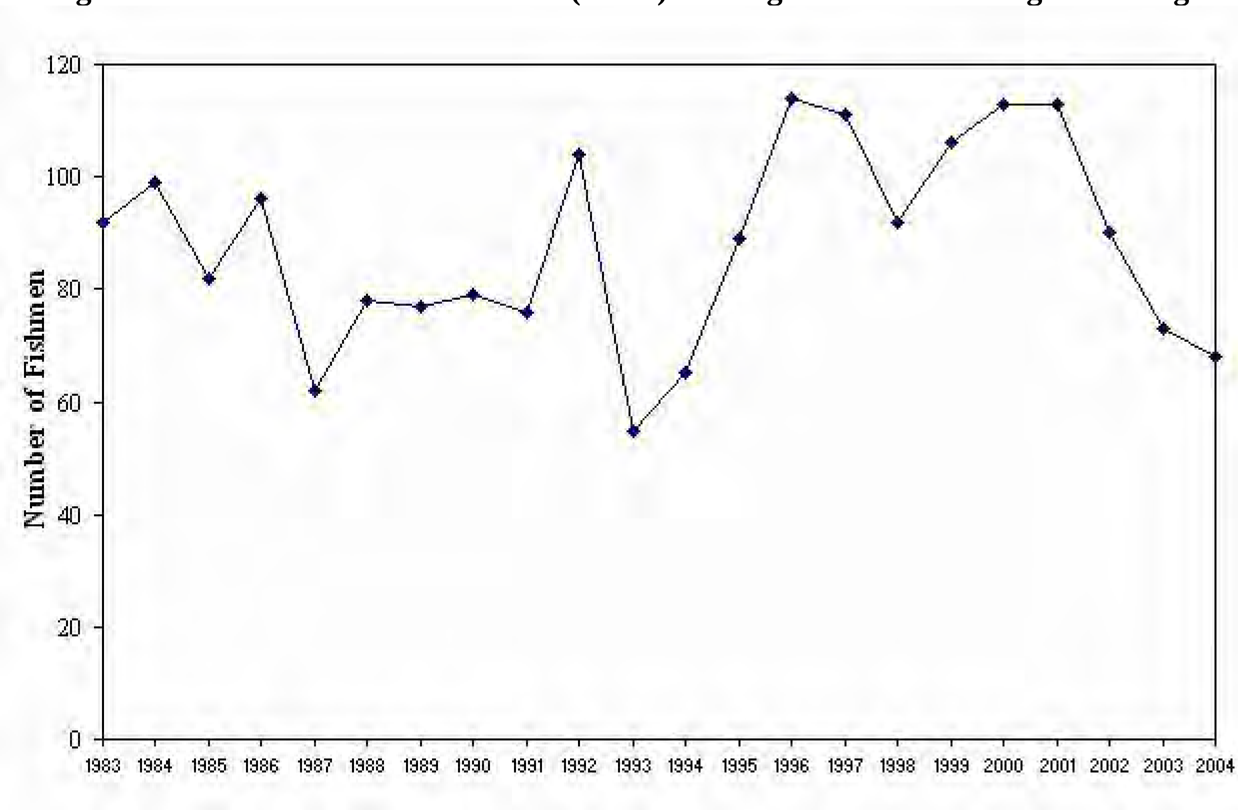
Although more highly prized than skipjack, yellowfin tuna are not as common, and therefore not landed as often. The average fish size tends to be smaller when compared with yellowfin tuna from other geographic areas. The total landings for yellowfin tuna increased in 2002 by 51% from the 2001 figures. This increase is partly due to landings from the Northern Islands bottom fishing fleet and a long lining experiment by one fishing company whom recently applied and received a federal long lining permit. However due to the high cost associated with lonlining, permit holder did not continue longlining in 2003, therefore causing a decrease in landings by 13% for 2003 and then increased 3% in 2004.

Source and Calculation: Landings were summed directly from the Commercial Purchase Data Base.

Total Commercial Landings (Lb)

Year	Skipjack	Yellowfin
1983	183,411	21,281
1984	290,843	19,580
1985	177,344	12,466
1986	254,362	16,917
1987	161,504	10,454
1988	266,497	15,375
1989	257,703	10,109
1990	147,962	10,468
1991	115,802	13,042
1992	82,280	25,687
1993	97,268	14,898
1994	92,212	13,445
1995	131,377	20,918
1996	165,037	38,043
1997	133,446	21,352
1998	167,114	14,570
1999	106,297	24,419
2000	140,389	17,673
2001	133,769	14,543
2002	179,966	30,017
2003	171,574	26,042
2004	**146,491**	**26,877**
Average	163,757	19,008
Standard Deviation	57,897	7,218

Figure 4. Number of NMI Fishermen (Boats) Making Commercial Pelagic Landings



Interpretation: The number of fishers (boats) making commercial pelagic landings was relatively constant from 1988-91 compared to earlier years, but a record high number was recorded for 1992. Part of the increase in 1992 was attributable to the influx of new fishing boats as a result of money obtained by leasing property. In addition, it was discovered that some fishermen were using several different boats, thus artificially inflating the total number of boats making pelagic landings.

Many of the 1992's "new" fishermen, with their new boats, are believed to have left the fishery during 1993. It has been suggested that the increase from 1994 to 1997 might be due to the re-entry of repaired and refurbished boats from the 1992 fleet.

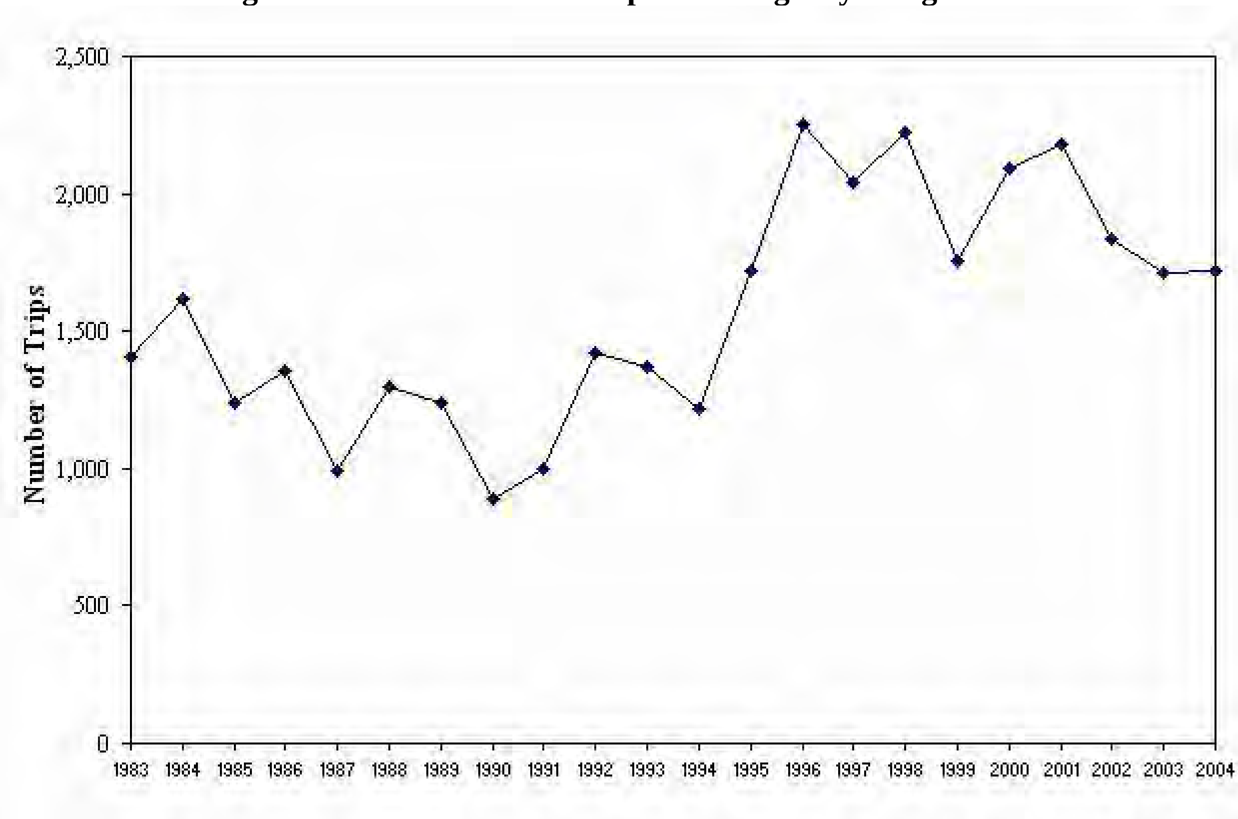
The number of fishermen making pelagic landings decreased 20% from 113 in 2001 to 90 in 2002. Data indicates a continued decline of 23% in 2003 and a 7% drop in 2004. The decrease is partly due to vendors whom own multiple fishing boats entering all their landings on a single receipt and at times combining monthly total landings onto a single receipt. Other factors that may have influenced a drop in fishermen making pelagic landings are the bad weather that plagued the Marianas throughout 2003 and early 2004. The continued increase in fuel price also has affected many fishing boat in the CNMI.

Source and Calculation: Each invoice from the Commercial Purchase Data Base records the fisherman's name from which the fish were purchased. The number of fishermen who sold any pelagic species was calculated directly from the data invoices.

Fishermen Landing any Pelagic Species

Year	Num. of Fishmen
1983	92
1984	99
1985	82
1986	96
1987	62
1988	78
1989	77
1990	79
1991	76
1992	104
1993	55
1994	65
1995	89
1996	114
1997	111
1998	92
1999	106
2000	113
2001	113
2002	90
2003	73
2004	**68**
Average	88
Standard Deviation	18

Figure 5. NMI Number of Trips Catching Any Pelagic Fish.



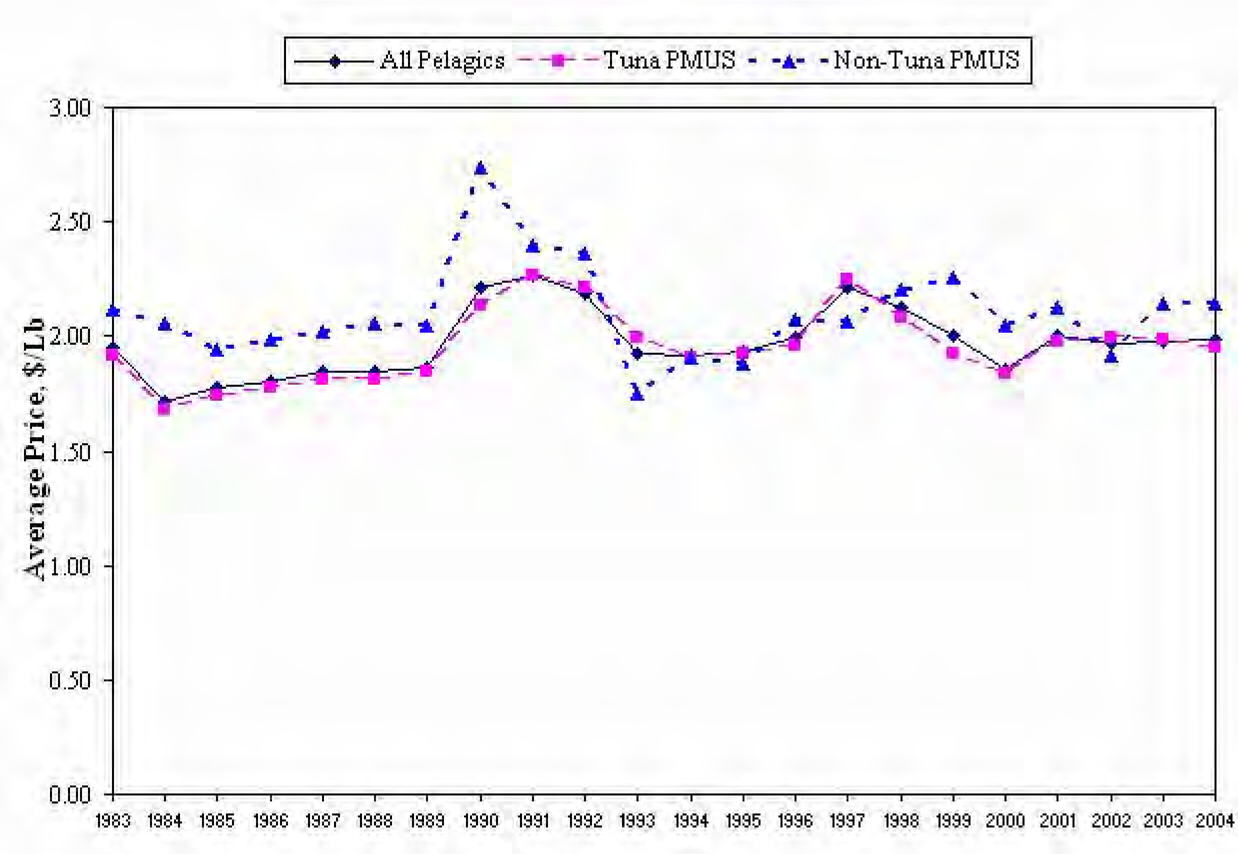
Interpretation: The number of pelagic trips decreased in 2002 by 16% from 2,179 to 1835 and continued to decline in 2003 by 6% and remained near that level for 2004. Several typhoons hit the Marianas region, which attributed to decline in fishing trips. The number of pelagic trips rose in 1998, the decrease in 1999 figures may be caused by the refusal of vendors to participate in the Ticket System.

Source and Calculation: The total trips for all pelagic species were summed from the Commercial Purchase Data Base. Trips were calculated based on the assumptions that no fisherman makes more than one trip per day, and that all sales from a single trip are made on a single day.

NMI Numbers Of Trips Catching Any Pelagic Fish

Year	Num. of Trip
1983	1,408
1984	1,621
1985	1,240
1986	1,356
1987	992
1988	1,298
1989	1,242
1990	888
1991	999
1992	1,419
1993	1,372
1994	1,218
1995	1,721
1996	2,249
1997	2,042
1998	2,223
1999	1,759
2000	2,095
2001	2,178
2002	1,835
2003	1,715
2004	**1,723**
Average	1,572
Standard Deviation	414

Figure 6. NMI Average Inflation-Adjusted Price of All Pelagics, Tuna PMUS, and Non-Tuna PMUS



Interpretation: The inflation-adjusted average price of tuna was stable from 1983 until 1989, when an obvious rise was observed. The 1990-92 rise in price corresponds with the notable decrease in Skipjack tuna landings (Fig. 3) during the same period of time. In 1994 commercially receipted tunas commanded a lower price than in recent years. However, considering the inflation-adjusted prices from 1983 to 1996, it would appear that tuna prices have, on the whole, kept pace with inflation. The average price of tuna has continued to decrease since 1997. The inflation-adjusted average price of tuna increased by 7% from 2000 to 2001 and increased less than 1% for 2002. However inflation adjusted average price for tuna decreased 4% in 2003 and then increased 2% in 2004.

The average for the inflation-adjusted price of "Non-Tuna PMUS" increased to $2.14 or 11% in 2003 and remained the same for 2004.

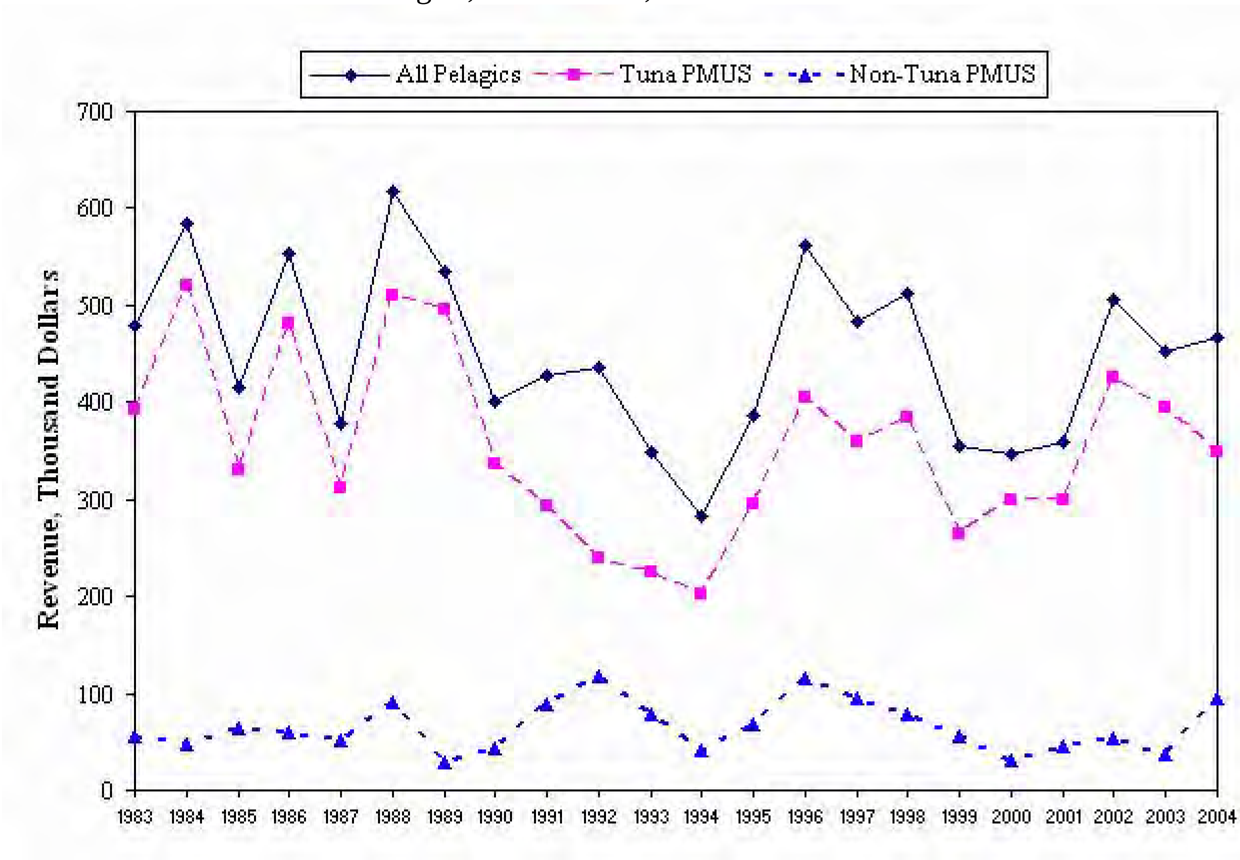
Although in 2001 there was a loss of the large Korean tourist market in the CNMI, there appears to be no substantial loss to revenue. This may be attributed to a redirection of the market toward the local community.

Source and Calculation: The unadjusted average price is calculated by dividing the total revenues generated by the total weight sold. The inflation adjustment is made using the 1998 NMI Consumer Price Index (CPI) as the basis by which calculations of previous years' prices are made.

Inflation-Adjusted Average Price ($/Lb)

Year	All Pelagics		Tuna PMUS		Non-Tuna PMUS	
	Unadjusted	Adjusted	Unadjusted	Adjusted	Unadjusted	Adjusted
1983	1.01	1.95	0.99	1.91	1.09	2.11
1984	0.97	1.71	0.95	1.68	1.16	2.06
1985	1.04	1.77	1.02	1.74	1.14	1.94
1986	1.09	1.80	1.07	1.77	1.20	1.99
1987	1.16	1.84	1.14	1.81	1.27	2.02
1988	1.22	1.85	1.20	1.81	1.36	2.06
1989	1.30	1.86	1.29	1.85	1.43	2.05
1990	1.63	2.22	1.57	2.13	2.01	2.74
1991	1.80	2.26	1.80	2.27	1.90	2.39
1992	1.88	2.18	1.91	2.22	2.04	2.36
1993	1.72	1.92	1.78	1.99	1.56	1.75
1994	1.76	1.92	1.75	1.91	1.75	1.90
1995	1.81	1.93	1.80	1.93	1.76	1.88
1996	1.92	2.00	1.88	1.96	1.99	2.07
1997	2.17	2.21	2.20	2.25	2.03	2.07
1998	2.07	2.13	2.02	2.08	2.14	2.20
1999	1.98	2.00	1.91	1.93	2.24	2.26
2000	1.87	1.85	1.86	1.84	2.07	2.05
2001	2.00	2.00	1.97	1.97	2.12	2.12
2002	1.97	1.97	1.99	1.99	1.92	1.92
2003	1.96	1.98	1.96	1.98	2.12	2.14
2004	**1.98**	**1.98**	**1.95**	**1.95**	**2.14**	**2.14**
Average	1.65	1.97	1.64	1.95	1.75	2.10
Standard Deviation	0.40	0.15	0.40	0.16	0.39	0.21

Figure 7. NMI Annual Commercial Inflation-Adjusted Revenues for
All Pelagics, Tuna PMUS, and Non-Tuna PMUS



Interpretation: The erratic fluctuations of the inflation-adjusted revenues for Tunas and for All Pelagics prior to 1990 is most likely due to the annual variations in skipjack tuna landings (see Fig. 3) which completely dominated the tuna category and the "All Pelagic" category.

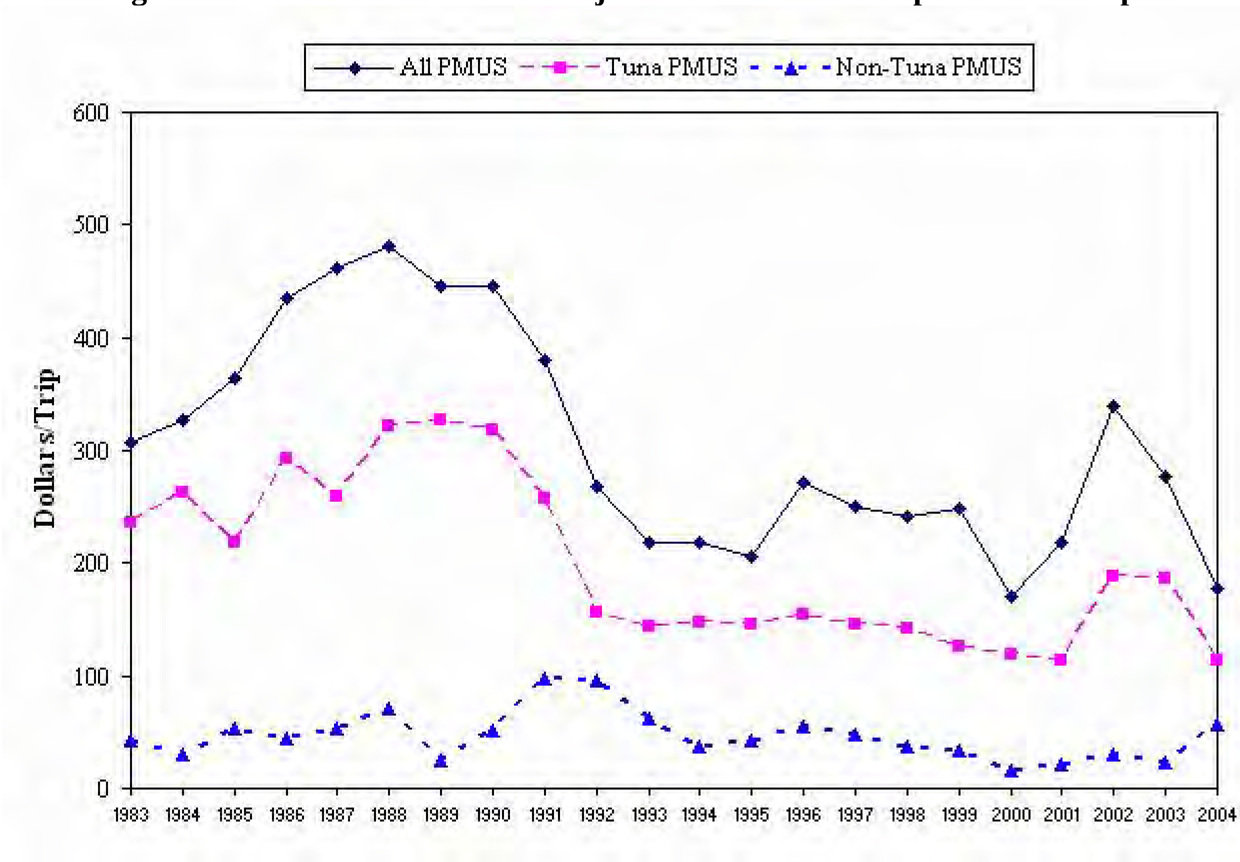
In 2003 the tunas' inflation-adjusted revenues decreased 8% from the 2002 figures and continued to decline to 11% for 2004. This is due to the decrease in landings of Skipjack tuna, which this year comprised only of 67% of the total pelagic landings compared to 2003 where it comprised 87% of the total pelagic landings. In 2003 a drop of 31% occurred for the "Non-Tuna PMUS" inflation-adjusted revenues however 2004 data indicates an increase of 158% compared to the previous year. This is due to the mahimahi landings increasing by 387%.

Source and Calculation: Annual revenue in dollars was summed separately for all pelagic fish, tunas and Non-Tuna PMUS. Inflation-adjusted revenues were calculated using the Consumer Price Index, with 1998 as a base by which previous years' nominal prices are adjusted.

Inflation-Adjusted Commercial Revenues ($)

Year	All Pelagics		Tuna PMUS		Non-Tuna PMUS	
	Unadjusted	Adjusted	Unadjusted	Adjusted	Unadjusted	Adjusted
1983	159	307	202,800	391,404	29,059	56,084
1984	185	327	294,077	520,516	27,044	47,868
1985	214	364	193,920	329,664	37,882	64,399
1986	262	435	289,681	480,870	35,488	58,910
1987	290	461	195,793	311,311	32,344	51,427
1988	318	480	338,348	510,905	59,701	90,149
1989	312	446	345,839	494,550	20,917	29,911
1990	327	445	248,144	337,476	32,102	43,659
1991	302	381	232,077	292,417	70,235	88,496
1992	231	268	206,950	240,062	102,133	118,474
1993	195	218	201,350	225,512	69,592	77,943
1994	200	218	185,381	202,065	37,818	41,222
1995	193	207	275,080	294,336	62,920	67,324
1996	261	271	388,691	404,239	110,939	115,377
1997	245	250	351,492	358,522	93,306	95,172
1998	234	241	372,142	383,306	77,011	79,321
1999	246	248	261,394	264,008	55,404	55,958
2000	172	170	302,473	299,448	32,186	31,864
2001	219	219	300,154	300,154	44,987	44,987
2002	339	339	425,961	425,961	53,468	53,468
2003	275	278	390,100	394,001	36,764	37,132
2004	**177**	**177**	**349,098**	**349,098**	**95,840**	**95,840**
Average	243	307	288,679	354,992	55,325	65,681
Standard Deviation	54	98	74,168	91,644	26,794	25,956

Figure 8. NMI Annual Inflation-Adjusted Revenue Per Trip for PMUS trips



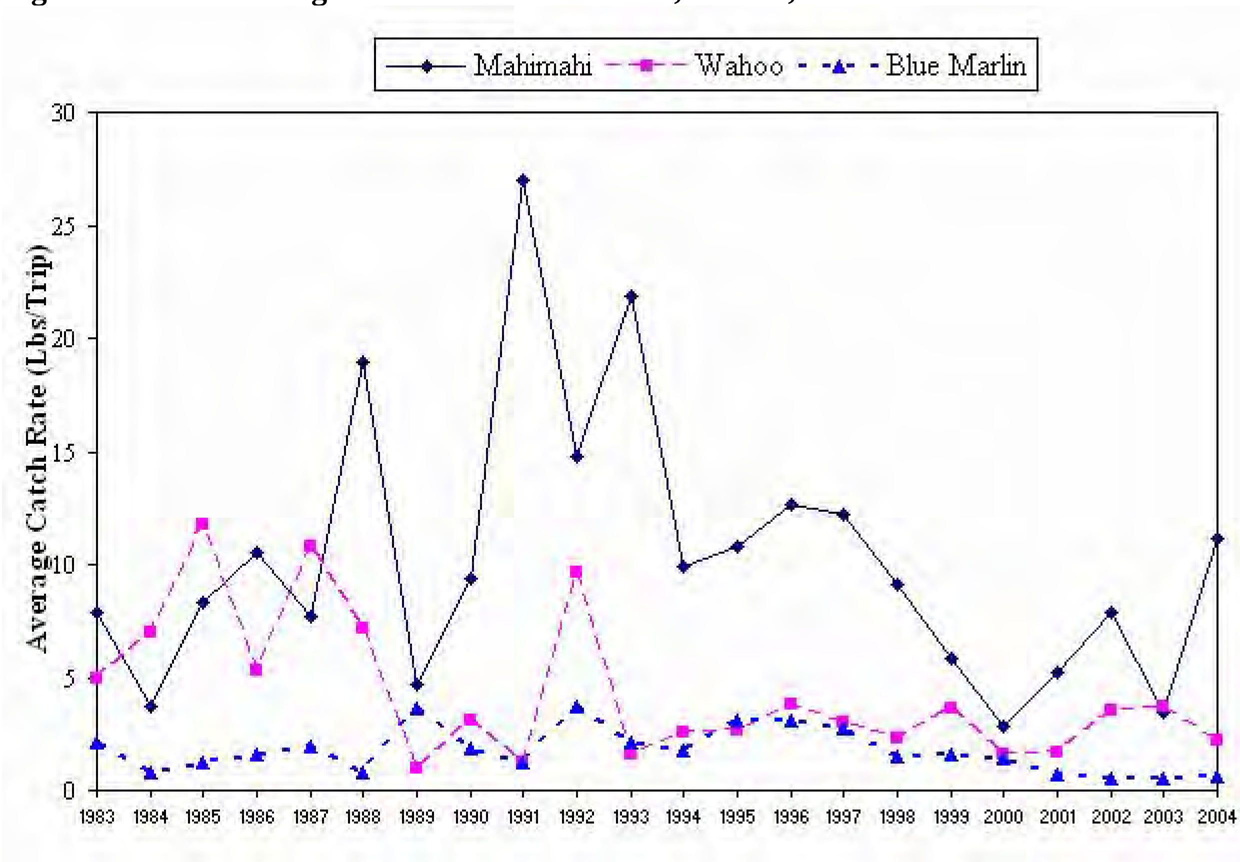
Interpretation: The inflation-adjusted revenue per trip for "All Species" decreased 4% in 2003 and 29% for 2004. "Non-Tuna PMUS" decreased 26% in 2003 however 2004 revenue increased significantly to 157% or 57$/per trip. This is the highest it has been for the past 10 years which is above the 22 year mean. "Tunas" remained relatively stable in 2003 at 186 $/Trip but dropped significantly to 114 $/Trip in 2004.

Source and Calculation: Values were obtained by selecting, from the Commercial Purchase Data Base, all trips which landed at least one PMUS, and then calculating a) the average revenue of all species combined, b) the average revenue of Non-Tuna PMUS only, and c) the average revenue of tuna only.

Commercial Adjusted Revenues Per Trip ($/Trip)

Year	All PMUS		Tuna PMUS		Non-Tuna PMUS	
	Unadjusted	Adjusted	Unadjusted	Adjusted	Unadjusted	Adjusted
1983	141.00	272.13	122.00	235.46	22.00	42.46
1984	163.00	288.51	148.00	261.96	17.00	30.09
1985	158.00	268.60	128.00	217.60	31.00	52.70
1986	197.00	327.02	176.00	292.16	27.00	44.82
1987	192.00	305.28	163.00	259.17	34.00	54.06
1988	252.00	380.52	213.00	321.63	47.00	70.97
1989	241.00	344.63	228.00	326.04	17.00	24.31
1990	265.00	360.40	233.00	316.88	38.00	51.68
1991	271.00	341.46	204.00	257.04	77.00	97.02
1992	211.00	244.76	135.00	156.60	83.00	96.28
1993	182.00	203.84	128.00	143.36	55.00	61.60
1994	170.00	185.30	135.00	147.15	35.00	38.15
1995	168.00	179.76	136.00	145.52	39.00	41.73
1996	192.00	199.68	148.00	153.92	53.00	55.12
1997	186.00	189.72	143.00	145.86	47.00	47.94
1998	179.00	184.37	138.00	142.14	36.00	37.08
1999	160.00	161.60	125.00	126.25	33.00	33.33
2000	134.00	132.66	121.00	119.79	16.00	15.84
2001	132.00	132.00	113.00	113.00	21.00	21.00
2002	221.00	221.00	189.00	189.00	30.00	30.00
2003	209.00	211.09	185.00	186.85	22.00	22.22
2004	**149.00**	**149.00**	**114.00**	**114.00**	**57.00**	**57.00**
Average	189.68	240.15	155.68	198.70	38.05	46.61
Standard Deviation	40.69	77.32	37.46	72.82	18.31	21.55

Figure 9. NMI Trolling Catch Rate of Mahimahi, Wahoo, and Blue Marlin



Interpretation: The mahimahi catch rate drop significantly 57% from 2002, which also fell 67% below the twenty-year mean. It may also be biological because it appears that the trolling catch rates of Guam and the NMI have fluctuated similarly over the last twenty-two years. In 2004, mahimahi catch rate rebounded a surprising 226% or 11.17 lbs./trip. 2003 catch rate was 3.37lbs/trip.

Prior to the 1989 record low, wahoo catch rates rivaled those for mahimahi. Wahoo catch rates have generally never regained those historical levels. The 2002 catch rate increased 114% from 2001, and again increased 4% for 2003. This year however it declined to 2.19 lbs/trip or 41%.

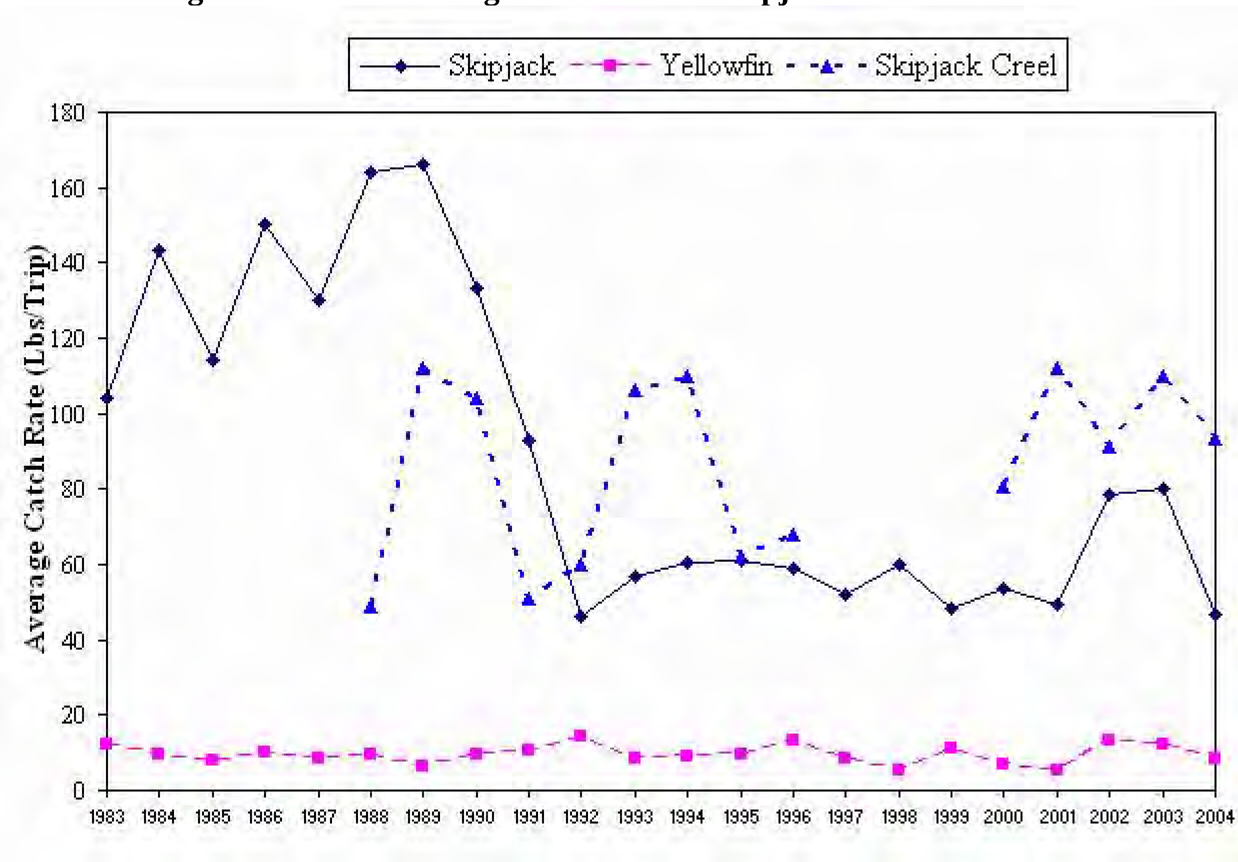
Blue Marlin catch rates increased 21% from 2003 level. Blue marlins are not a marketable species and are rarely a target by fishermen except during fishing tournaments. When landed, it is rarely sold to vendors participating in the Commercial Purchase Data Collection Program; therefore it would not be recorded in the Commercial Purchase Data Base used to generate these reports. During the 2000 Saipan International Fishing Derby a 996-pound blue marlin was landed.

Source and Calculation: Annual catch rates for selected species were obtained by calculating the average weight per trip for each year. Trips were assumed to be one day in length and each commercial invoice assumed to represent one trip.

Trolling Catch Rate (Lb/Trip)

Year	Mahimahi	Wahoo	Blue Marlin
1983	7.92	4.98	2.15
1984	3.76	6.95	0.76
1985	8.36	11.77	1.20
1986	10.50	5.35	1.57
1987	7.66	10.81	1.98
1988	18.98	7.21	0.81
1989	4.71	1.01	3.67
1990	9.40	3.12	1.83
1991	27.03	1.22	1.26
1992	14.80	9.68	3.72
1993	21.89	1.62	2.15
1994	9.89	2.54	1.73
1995	10.84	2.66	3.08
1996	12.68	3.84	3.06
1997	12.25	2.97	2.77
1998	9.13	2.27	1.51
1999	5.86	3.67	1.61
2000	2.80	1.56	1.38
2001	5.23	1.67	0.71
2002	7.87	3.58	0.55
2003	3.43	3.71	0.53
2004	**11.17**	**2.19**	**0.64**
Average	10.28	4.29	1.76
Standard Deviation	6.05	3.13	0.98

Figure 10. NMI Trolling Catch Rates of Skipjack and Yellowfin Tuna.



Interpretation: Catch rates for Skipjack tuna decreased dramatically commencing in 1990. The 1992 through 1997 catch rates have appeared to stabilize around the six-year mean of 55.7lb/trip. The Creel Survey data on skipjack tuna catch rates show a very different pattern from the Commercial Purchase data. Creel survey catch rates show catch rates oscillating between 50 and 100 lb/trip both before and after 1991 whereas, the Commercial Purchase data indicate sustained high catch rates before, and low catch rates after 1991. Reason for pattern remains obscure despite several attempts to clarify. Catch rate based on the Commercial Purchase Data Base for 2003 of 80 lbs/trip is an increase of 3% in comparison with the 2002 catch rate of 78. 2004 catch rates declined 41% or 47 lbs/trip. Skipjack tuna is the preferred species in the troll fishery of the NMI because of their relative ease of capture and local popularity. Previous discussions have suggested that non-tuna PMUS may be increasing in value and a slight shift in target troll fish may be occurring. Catch rates of yellowfin tuna per trip more than doubled from 1998 levels. However, 2000 catch rates declined by 39% and continued to decline 21% in 2001. Yellowfin catch rates in 2002 increased by 59% partly due to landings from the Northern Islands Bottom fishing feet and a longline experiment with gear less than 1 mile long conducted by a fishing company whom recently applied and received a federal longline permit. In 2003 Yellowfin catch rates remain relatively stable at 12 lbs/trip despite bad weather that plagued through the Marianas nearly the entire 2003. 2004 yellowfin catch rates fell to 9 lbs/trip or 25%.

Source and Calculation: Data were summarized from the Commercial Purchase Data Base, which provides average pounds caught per trip. Annual catch rates for selected species were obtained by calculating the average weight per trip for each year. Trips were assumed to be one day in length and each commercial invoice represents one trip. Creel skipjack CPUE was calculated by dividing the sum of skipjack weight from all trolling trip interviews by the number of trolling trips interviewed.

Trolling Catch Rate (Lb/Trip)

Year	Skipjack	Yellowfin	Skipjack Creel
1983	104	12	
1984	144	10	
1985	114	8	
1986	150	10	
1987	130	8	
1988	164	9	49
1989	166	7	112
1990	133	9	104
1991	93	10	51
1992	46	14	60
1993	57	9	106
1994	61	9	110
1995	61	10	62
1996	59	14	68
1997	52	8	
1998	60	5	
1999	48	11	
2000	54	7	81
2001	49	5	112
2002	78	13	91
2003	80	12	110
2004	**47**	**9**	**94**
Average	89	10	86
Standard Deviation	42	2	24

Offshore Daytime Creel Survey Bycatch Summary
Based on the Interview Catch Data in Year 2000-2004
Method: Trolling

		Number Caught					Trip		
	Species	Released	Dead/Injd	Both	All	BC%	With BC	All	BC%
Non Charter							2	797	0.25
	Mahimahi	3		3	899	0.33			
	Yellowfin Tuna		1	1	694	0.14			
	Total			4	1593	0.25			
	Compared With All Species			4	20,435	0.02			
Charter							0	112	0.00
	Compared With All Species			0	543	0.00			

Interpretation: With the assistance of NMFS staff, the implementation of an Offshore Day Time Creel Survey program began on April 2000. One of the main purposes of reimplementing the Offshore Creel Survey was to address the issue of bycatch.

A summary report from the year 2000 to 2004 by both non-charter and charter boats indicate less than 1% or 4 out of 20,435 of the total pelagic species landed is released. The only two species reported as bycatch was Mahimahi and Yellowfin Tuna. 3 out of 899 Mahimahi or .33% landed was released. And 1 out of 694 Yellowfin Tuna or .14% landed was released. Charter boats had no bycatch reported.

Bycatch in the CNMI has been believed in the past not to exist, which is further supported by the results of the Offshore Creel Survey. The CNMI will continue sampling in order to monitor this issue however it is a common practice by fishermen to keep all species caught regardless of size, species or condition.

Source: Offshore Daytime Creel Survey Expansion Program.

Appendix 5

International Pelagic Fisheries

The U.S Pacific Island Exclusive Economic Zones managed by the Council are surrounded by large and diverse fisheries targeting pelagic species. The International Module contains reported catches of pelagic species in the entire Pacific Ocean by fleets of Pacific Island nations and distant water fishing nations (DWFN) and information from a Stock Assessment and Fishery Evaluation (SAFE) report that includes the most recent assessment information in relation to status determination criteria. The spatial distribution of catch is illustrated in 2004 for the purse seine fishery and 2003 for longline and pole-and-line fisheries. Fishery trends in the Pacific Ocean for the purse seine, longline and pole-and-line fisheries.

The 2004 purse-seine fishery in the WCPFC Convention Area (WCP-CA)

Vessels

The majority of the WCP-CA purse seine catch is taken by the four main DWFN fleets (Japan, Korea, Chinese-Taipei and USA), which currently number around 120 vessels. However, there has been an increasing contribution from the growing number of Pacific Islands fleets (60 vessels in 2004), with balance from the Philippines and a variety of other fleets, including several new distant-water entrants into the tropical fishery (e.g. China and New Zealand).

Catch

The purse seine fishery has accounted for around 55–60% of the WCP–CA total catch by volume since the early 1990s, with annual catches in the range 790,000–1,260,000 mt. The provisional 2004 purse-seine catch of 1,263,161 mt was the highest on record and maintained the catch in excess of 1,200,000 mt for the past three years. The purse seine skipjack catch for 2004 (1,059,061 mt – 84%) was the highest on record, although the yellowfin catch for 2004 (179,310 mt – 14%) was the lowest since 1996. The estimated purse seine bigeye catch for 2004 (24,790 mt – 2%) continues the declining trend in catches since the record 1999 catch (38,327 mt), primarily due to the gradual reduction in fishing effort on drifting FADs over recent years.

Chinese-Taipei has been the highest producer in the tropical purse seine fishery since 1996. The 2004 provisional catch estimate (198,240 mt) for this fleet was similar to the level taken in 2003, but the catch decreased by 50,000 mt compared to 2002, mainly due to several vessels changing flag at the end of 2002. Catches by the Japanese and Korean purse seine fleets have been stable for most of this time series. The number of domestic vessels from Pacific-island states continued to grow in 2004 and is now at its highest level ever. This category is made up of vessels fishing under the Federated States of Micronesia (FSM) Arrangement and domestically-based purse seine vessels operating in Papua New Guinea (PNG) and Solomon Islands waters. The increase in annual catch by the FSM Arrangement fleet since 2000 corresponds to the increase in vessel numbers, and coincidently, mirrors the decline in US purse seine catch and vessel numbers over this period.

Fleet distribution

Catch distribution in tropical areas of the WCP–CA is strongly influenced by El Nino–Southern Oscillation Index (ENSO) events, with fishing effort typically distributed further to the east during El Nino years and a contraction westwards during La Nina periods. The WCP–CA experienced an ENSO-transitional (or neutral) period during 2001, an El Nino period during 2002 into the first quarter of 2003, and then a return to an ENSO-transitional (neutral) period for the remainder of 2003. The ENSO-neutral state continued into the first half of 2004 and then moved to a weak El Nino state in the second half of 2004. There was a significant westwards shift in purse seine effort during 2003 (compared to previous years) and fishing activity was again concentrated in the western areas (PNG, FSM and the Solomon Islands) during 2004.

Table 1. Total reported purse seine catch (metric tonnes) of skipjack, yellowfin and bigeye tuna in the Pacific Ocean. Source: WCPFC Yearbook 2004.

Year	Skipjack	Yellowfin	Bigeye	Total
1967	115,859	68,869	1,757	186,485
1968	67,229	93,647	4,801	165,677
1969	51,076	117,521	1,141	169,738
1970	58,052	148,708	3,136	209,896
1971	111,536	115,703	5,235	232,474
1972	51,468	176,056	4,837	232,361
1973	62,547	211,100	4,420	278,067
1974	95,046	211,199	2,943	309,188
1975	138,767	198,415	7,902	345,084
1976	153,453	232,182	18,526	404,161
1977	124,691	203,415	12,749	340,855
1978	215,413	173,002	19,690	408,105
1979	198,764	202,001	14,128	414,893
1980	213,498	178,743	24,099	416,340
1981	214,054	231,157	19,190	464,401
1982	274,324	189,743	12,190	476,257
1983	380,086	192,729	14,017	586,832
1984	391,189	251,098	17,915	660,202
1985	358,876	317,480	13,000	689,356
1986	433,773	370,874	10,397	815,044
1987	439,098	420,034	12,392	871,524
1988	584,165	376,462	9,755	970,382
1989	577,720	441,215	14,747	1,033,682
1990	677,717	442,443	18,334	1,138,494
1991	831,860	450,176	18,628	1,300,664
1992	824,196	482,630	27,492	1,334,318
1993	672,424	459,382	23,802	1,155,608
1994	801,980	425,867	45,829	1,273,676
1995	856,781	403,381	57,187	1,317,349
1996	841,447	356,107	82,838	1,280,392
1997	819,035	495,095	102,365	1,416,495
1998	1,086,383	521,700	69,052	1,677,135
1999	1,053,304	499,250	89,875	1,642,429
2000	1,070,552	456,471	126,594	1,653,617
2001	986,304	597,215	90,039	1,673,558
2002	1,148,626	601,870	86,497	1,836,993
2003	1,255,500	592,937	82,137	1,930,574
2004	1,252,944	446,831	94,730	1,794,505
Average	512,888	325,071	33,273	871,232
STD Deviation	394,625	156,303	35,435	571,618

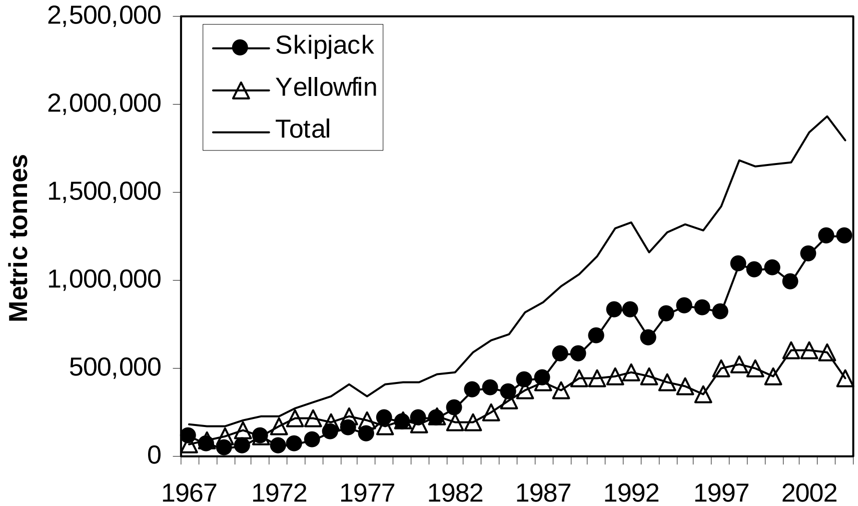


Figure 1. Total purse seine catch of skipjack and yellowfin tuna in the Pacific Ocean, 1967–2004. Source: WCPFC Yearbook 2004.

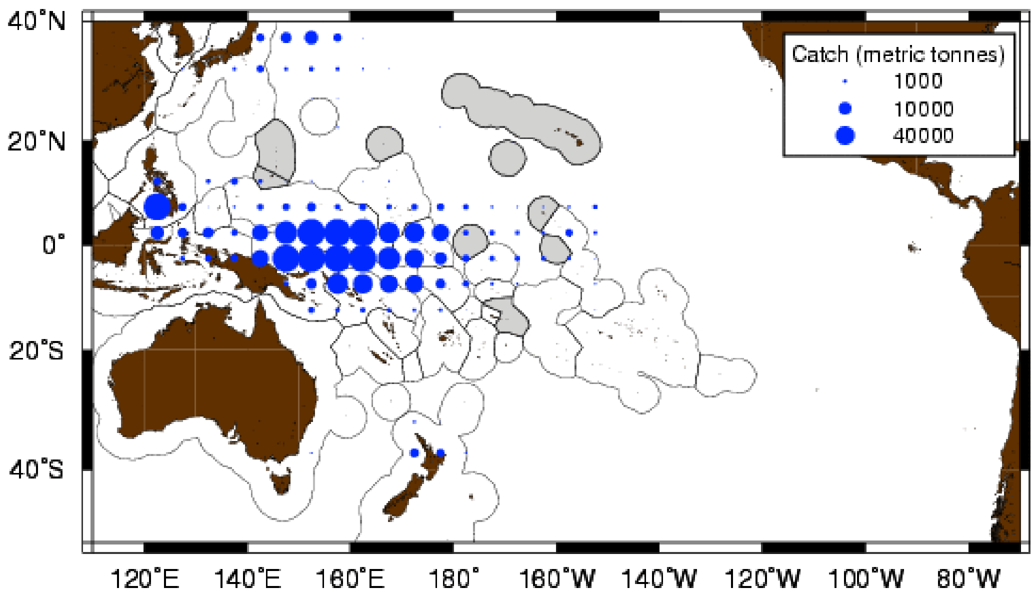


Figure 2. Distribution of total purse seine WCP-CA skipjack catch in 2004. Source: SPC public domain data.

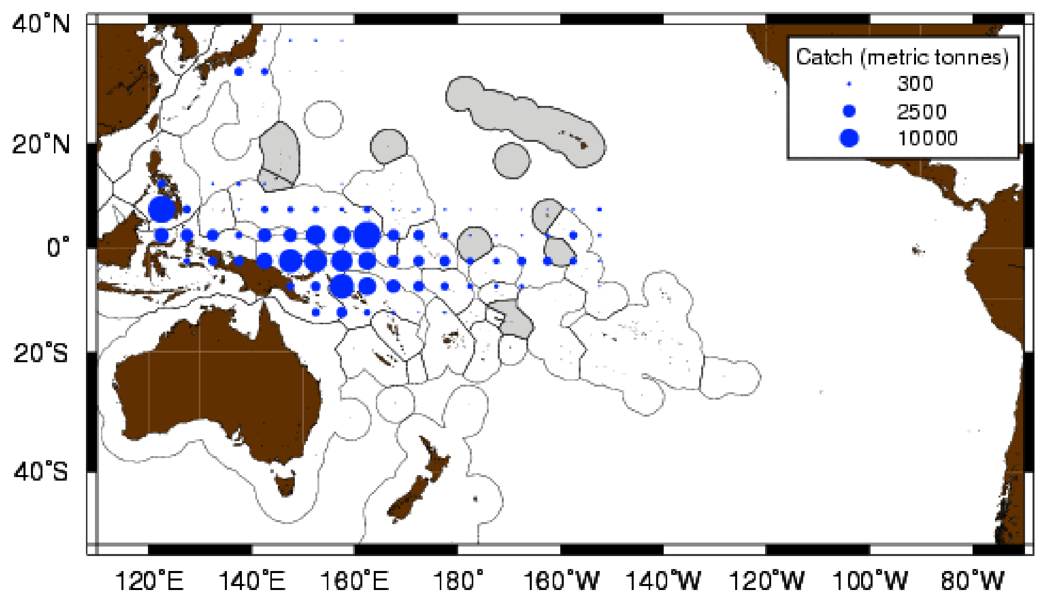


Figure 3. Distribution of total purse seine WCP-CA yellowfin catch in 2004. Source: SPC public domain data.

The 2004 longline fishery in the WCP-CA

Vessels

The diverse longline fleet in the WCP-CA was composed of roughly 5,000 vessels in 2004. The fishery involves two main types of operation –

- large **distant-water** freezer vessels (typically >250 GRT) which undertake long voyages (months) and operate over large areas of the region. These vessels may target either tropical species (e.g. yellowfin, bigeye tuna) or subtropical species (e.g. albacore , swordfish). Some voluntary reduction by one major fleet (Japan distant-water) has occurred in recent years;
- smaller **offshore** vessels (typically <100 GRT) which are usually **domestically-based**, with ice or chill capacity, and serving fresh or air-freight sashimi markets. These vessels operate mostly in tropical areas.

Catch

The provisional WCP–CA longline catch (225,786 mt) for 2004 was around 26,000 mt lower that the highest on record, which was attained in 2002 (231,968 mt). The WCP–CA albacore longline catch (65,865 mt – 30%) in 2004 was lower than in recent years and primarily due to a drop in catches by a number of key fleets targeting albacore. The provisional bigeye catch (84,394 mt – 37%) for 2004 was the second highest on record, and the yellowfin catch (70,757 mt – 31%) was the lowest since 1999. The yellowfin catch (61,384 mt) in 1999 was the lowest for nearly 30 years, and is understood to be related to the age class showing poor recruitment into the purse seine fishery in 1996.

The most significant change in the WCP–CA longline fishery over the past 5 years has been the growth of offfshore albacore fisheries, which went from taking 22% of the total South Pacific albacore longline catch in 1999, to accounting for over 45% of the catch in the past three years (i.e. 2002–2004). The clear shift in effort by some vessels in the Chinese-Taipei distant-water longline fleet to targeting bigeye in the eastern equatorial waters of the WCP–CA has resulted in a reduced contribution to the overall albacore catch in recent years and a significant increase in bigeye catches. During the 1990s, this fleet consistently took less than 2,000 mt of bigeye tuna each year, but in 2002 the bigeye catch went up to 8,741 mt, and by 2004 it was up to 16,888 mt.

Fleet distribution

Effort by the large-vessel, distant-water fleets of Japan, Korea and Chinese-Taipei is widespread as sectors of these fleets target bigeye and yellowfin for the frozen sashimi market, and albacore in the more temperate waters for canning. Activity by the foreign-offshore fleets from Japan, mainland China and Chinese-Taipei are restricted to the tropical waters, targeting bigeye and yellowfin for the fresh sashimi market; these fleets have limited overlap with the distant-water fleets. The substantial "offshore" effort in the west of the region is primarily by the Indonesian and Chinese-Taipei domestic fleets targeting yellowfin and bigeye. Domestic fleets in the South Pacific have grown in recent years; the most significant examples are the increases in the American Samoan, Fijian and French Polynesian fleets and the recent establishment of the Cook Islands fleet. Some vessels in the distant-water Chinese-Taipei longline fleet are now targeting bigeye in the eastern equatorial areas of the WCP–CA.

Table 2. Total reported longline catch (metric tonnes) of PMUS in the Pacific Ocean. Source: WCPFC Yearbook 2004 and SPC public domain data.

Year	Albacore	Yellowfin	Bigeye	Striped Marlin	Black Marlin	Blue Marlin	Swordfish	Total
1962	50,990	68,260	79,256	22,507	2,229	18,797	11,216	253,255
1963	44,566	74,646	107,344	26,602	2,342	19,032	11,414	285,946
1964	38,312	64,969	75,607	39,524	1,876	13,989	8,615	242,892
1965	39,420	64,852	57,552	32,794	2,375	11,084	9,665	217,742
1966	63,990	75,039	65,513	27,351	2,172	10,497	11,615	256,177
1967	73,468	45,722	67,270	31,827	1,825	9,702	12,041	241,854
1968	57,038	61,955	60,373	39,418	1,883	9,469	11,477	241,613
1969	43,459	67,013	82,116	25,564	2,073	10,348	14,358	244,930
1970	52,481	68,124	67,689	35,416	1,605	12,686	10,329	248,330
1971	51,642	64,940	66,602	30,975	2,127	8,058	9,410	233,754
1972	55,216	77,110	85,462	20,922	1,884	9,334	9,102	259,031
1973	63,542	73,515	91,062	18,603	1,935	9,964	9,604	268,224
1974	46,895	64,680	78,748	18,559	1,620	8,946	8,693	228,142
1975	37,008	79,056	99,356	15,181	1,845	7,962	9,124	249,532
1976	46,739	91,995	122,804	16,197	1,056	8,694	11,350	298,835
1977	55,172	105,035	140,335	9,325	936	8,523	10,927	330,253
1978	46,288	118,743	121,034	9,973	1,624	10,090	10,930	318,682
1979	40,714	116,538	112,621	15,694	1,950	10,439	11,189	309,146
1980	46,480	133,419	120,855	17,594	1,652	10,988	17,714	348,703
1981	51,250	101,124	94,980	20,840	2,067	13,409	22,791	306,461
1982	46,011	94,975	98,569	20,980	2,277	13,401	19,248	295,460
1983	40,297	94,556	101,455	14,480	1,916	10,997	20,730	284,431
1984	35,904	80,603	92,823	11,726	1,524	13,298	16,366	252,243
1985	41,702	87,016	117,586	12,494	1,234	11,589	18,849	290,470
1986	45,684	85,416	149,166	17,322	1,250	14,278	20,905	334,022
1987	37,254	92,886	159,254	20,241	1,896	18,196	25,506	355,233
1988	43,600	98,828	121,692	18,264	2,752	15,858	24,332	325,325
1989	32,102	82,121	123,817	12,520	1,515	13,125	16,542	281,742
1990	35,539	105,732	164,100	9,072	1,880	12,157	15,226	343,706
1991	40,883	88,097	150,221	10,518	2,180	14,539	18,265	324,703
1992	50,015	88,487	146,625	8,753	2,103	14,400	19,091	329,474
1993	60,779	88,301	128,378	10,359	1,707	15,603	19,065	324,192
1994	65,028	100,174	134,730	10,372	1,834	17,389	15,754	345,280
1995	62,257	98,650	111,546	11,233	1,370	17,685	14,053	316,794
1996	63,151	90,893	90,507	8,196	864	13,329	15,477	282,418
1997	75,071	89,509	110,371	9,314	1,554	14,583	15,788	316,190
1998	85,659	77,860	120,423	6,093	1,827	13,868	14,987	320,718
1999	78,000	69,503	101,686	5,455	1,682	12,741	14,412	283,479
2000	77,502	97,630	108,585	4,780	2,178	9,606	18,344	318,625
2001	88,612	99,930	132,582	4,496	1,514	11,489	19,913	358,536
2002	82,924	93,412	151,539	4,041	1,344	9,859	20,016	363,136
2003	84,402	93,480	129,485	6,346	814	14,842	23,599	352,969
Average	54,215	86,067	108,136	16,951	1,769	12,496	15,191	294,825
STD deviation	15,615	17,382	28,764	9,676	424	3,020	4,767	41,382

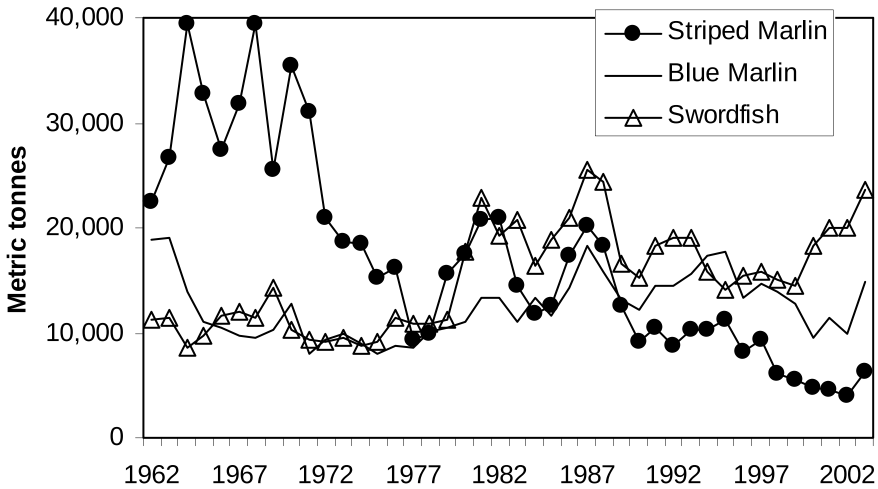


Figure 4. Reported longline tuna catches in the Pacific Ocean. Source: SPC public domain data.

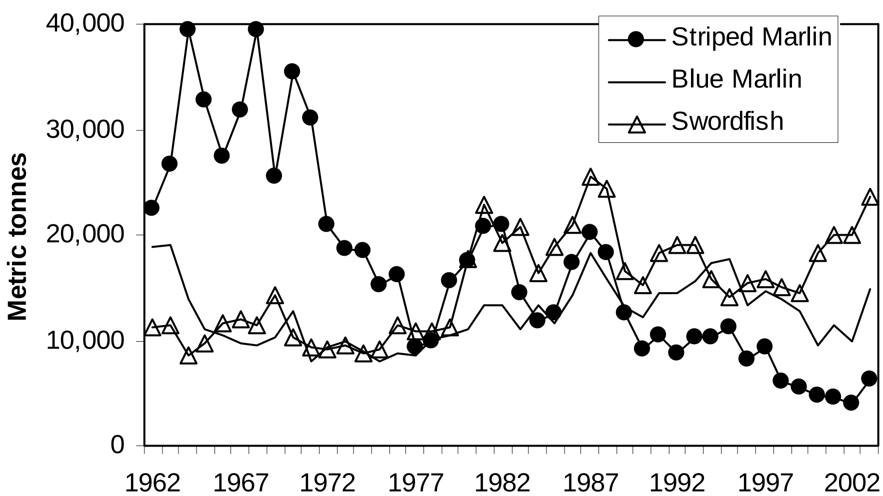


Figure 5. Reported longline billfish catches in the Pacific Ocean. Source: SPC public domain data.

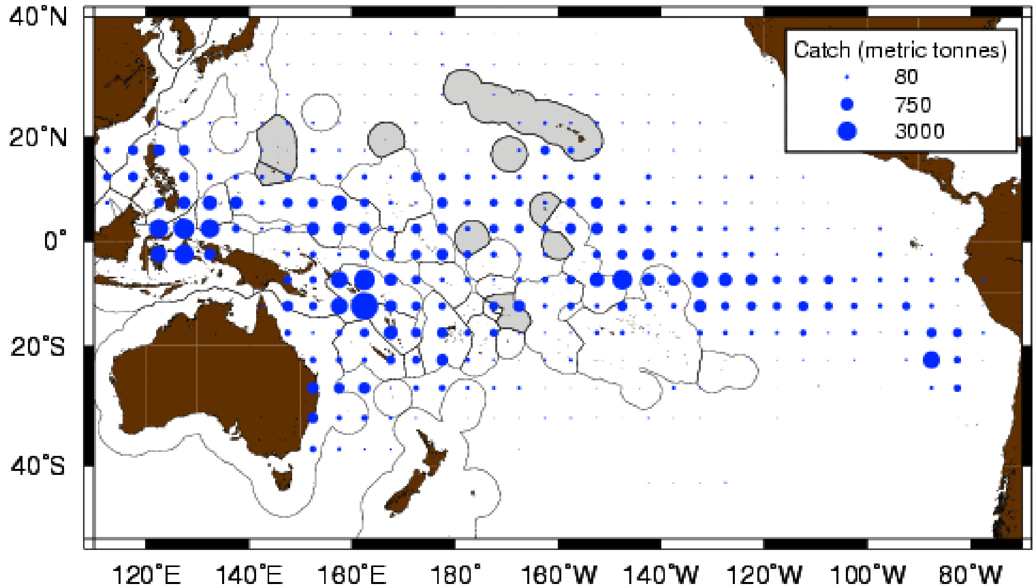


Figure 6. Distribution of longline catches of yellowfin tuna reported in 2003. Source: SPC public domain data.

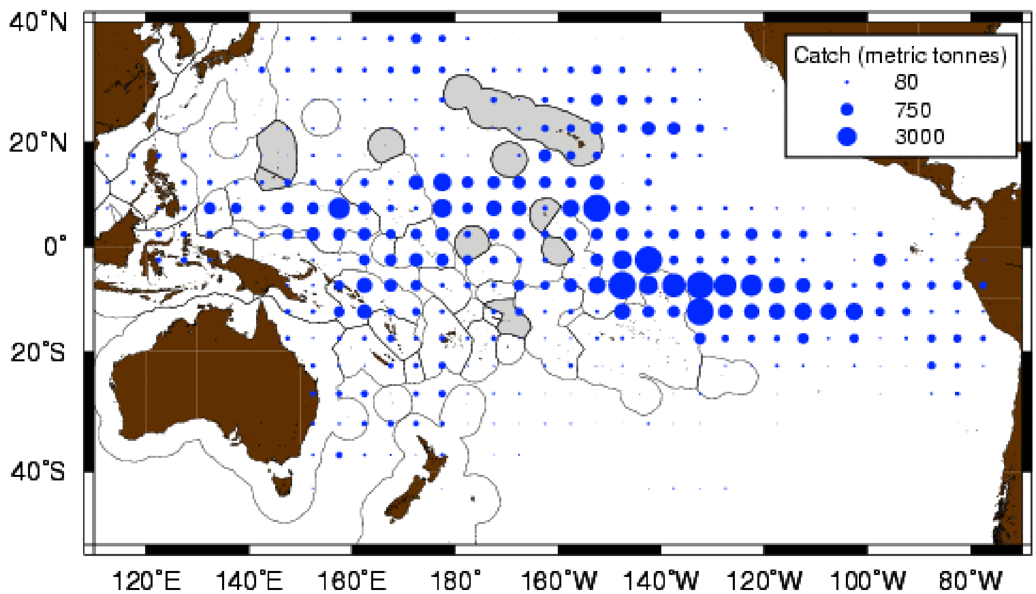


Figure 7. Distribution of longline catches of bigeye tuna reported in 2003. Source: SPC public domain data.

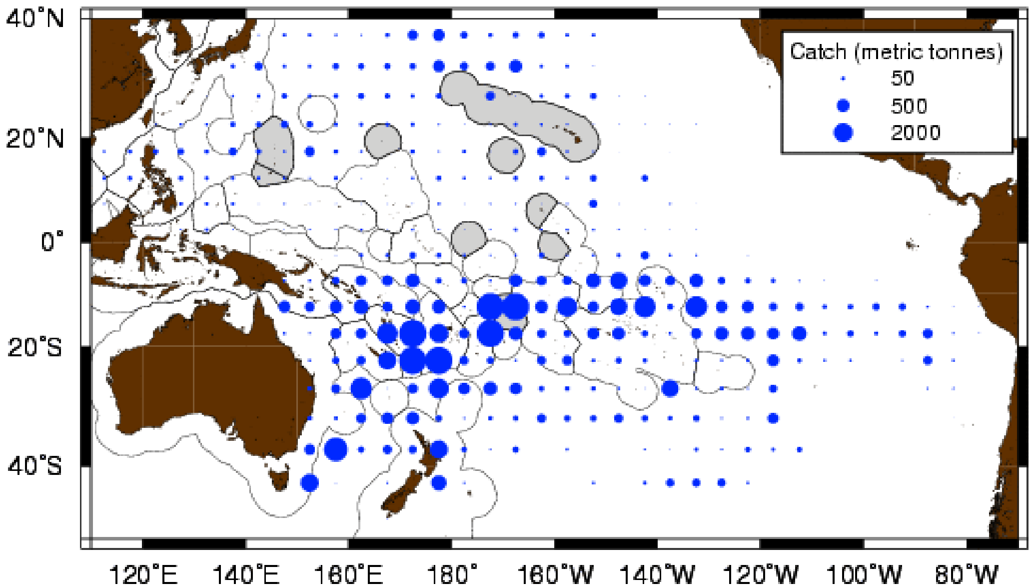


Figure 8. Distribution of longline catches of albacore tuna reported in 2003. Source: SPC public domain data.

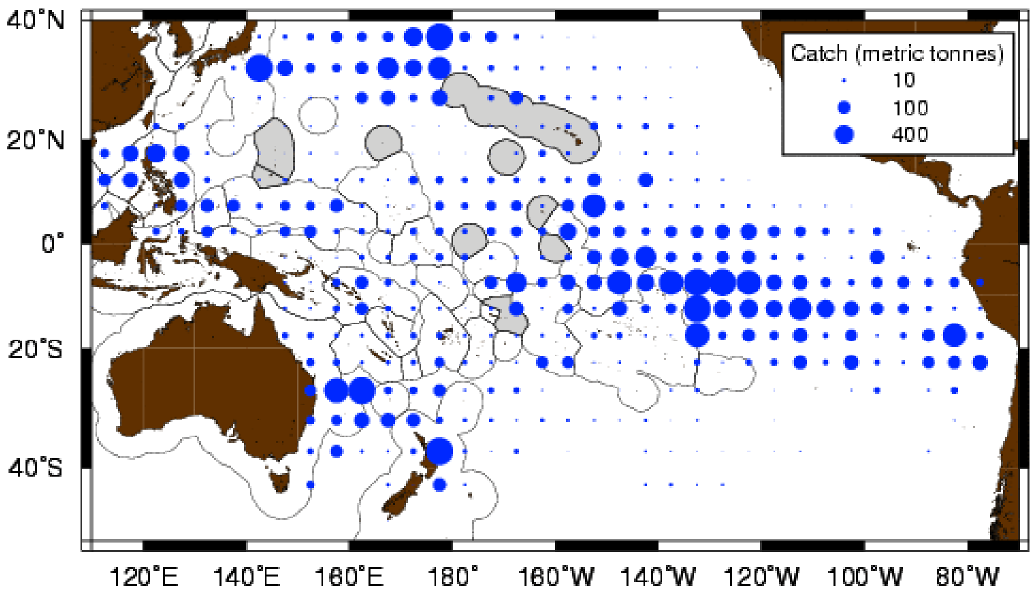


Figure 9. Distribution of longline catches of swordfish reported in 2003. Source: SPC public domain data.

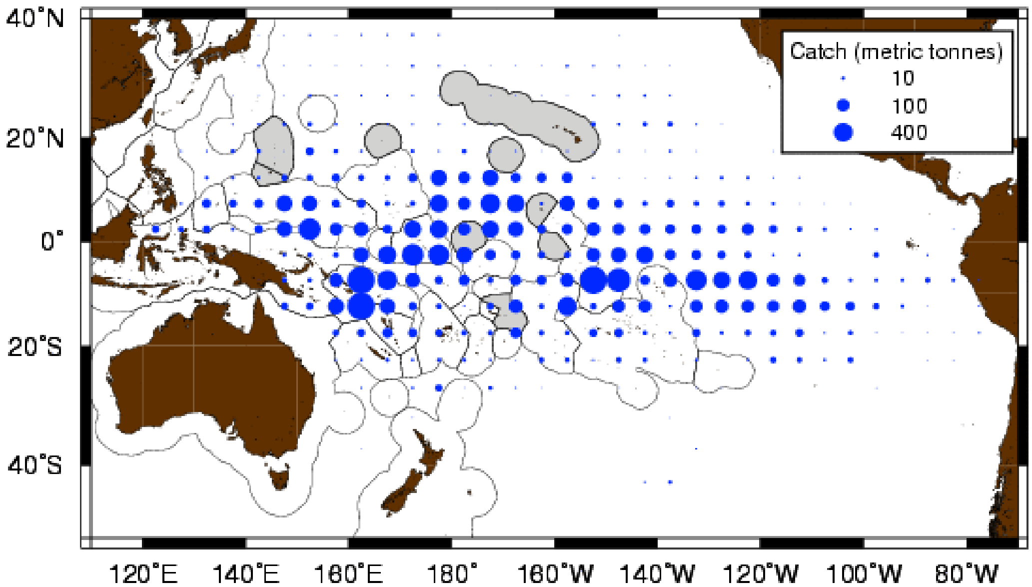


Figure 10. Distribution of longline catches of blue marlin reported in 2003. Source: SPC public domain data.

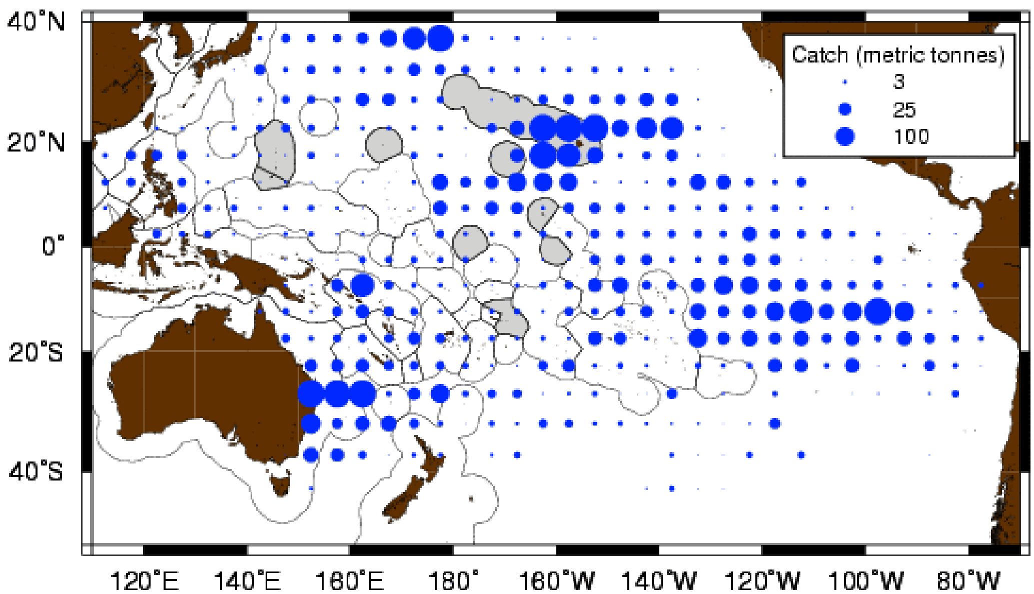


Figure 11. Distribution of longline catches of striped marlin reported in 2003. Source: SPC public domain data.

The 2004 pole-and-line fishery in the WCP-CA

Vessels

The pole-and-line fleet was composed of approximately 1,400 vessels in the 2004 fishery. Most of the vessels operated in the domestic fisheries in Indonesia and Japan. Over 100 vessels operate in Pacific Island countries and there are 160 vessels in the Japanese distant-water fleet.

Catch

The 2004 catch estimates for most pole-and-line fleets operating in the WCP–CA have yet to be provided, although the total catch estimate is expected to be similar to the level of recent years (i.e. 270,000–300,000 mt). Skipjack tends to account for the vast majority of the catch (84% in 2003), while albacore, taken by the Japanese coastal and offshore fleets in the temperate waters of the North Pacific (12% in 2003), yellowfin (4% in 2003) and a small component of bigeye (1% in 2003) make up the remainder of the catch. The Japanese distant-water and offshore (152,748 mt in 2003) and the Indonesian fleets (122,820 mt in 2003) typically account for most of the WCP–CA pole-and-line catch. The Solomon Islands fleet (10,797 mt in 2003) continues to recover from low catch levels experienced in recent years (only 2,778 mt in 2000), but its catch is still far from the level (of over 20,000 mt annually) experienced during the 1990s.

Fleet distribution

The WCP–CA pole-and-line fishery has several components:

- the year-round tropical skipjack fishery, mainly involving the distant water fleet of Japan and the domestic fleets of Indonesia, Solomon Islands and French Polynesia
- seasonal sub-tropical skipjack fisheries in the home waters of Japan, Australia, Hawaii and Fiji; and
- a seasonal albacore/skipjack fishery east of Japan (largely an extension of the Japan home-water fishery).

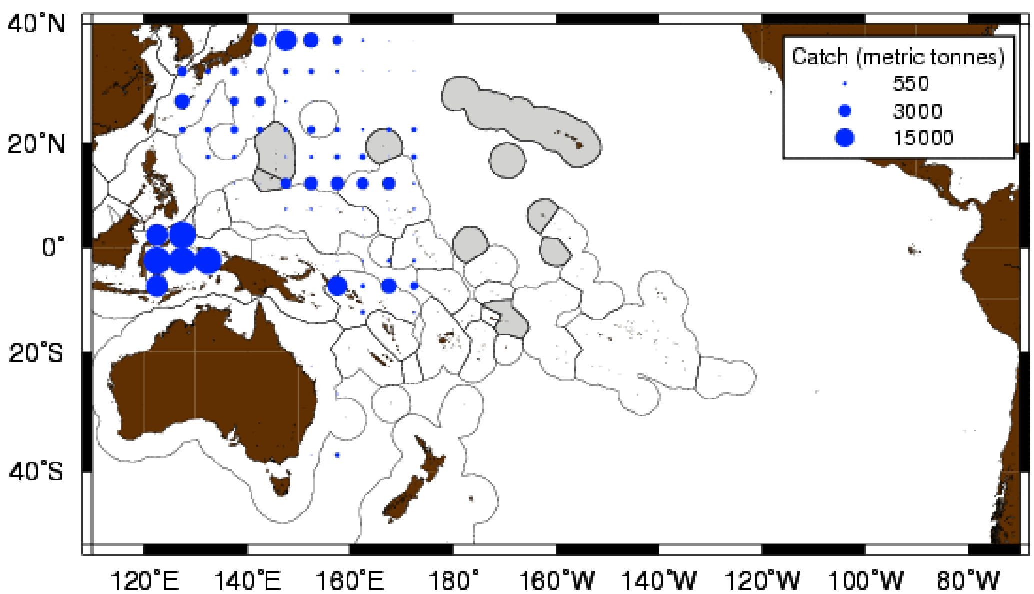


Figure 12. Distribution of pole-and-line catch of skipjack reported in 2003. Source: SPC public domain data.

Table 3. Total reported pole-and-line catch (metric tonnes) of skipjack in the Pacific Ocean. Source: WCPFC Yearbook 2004.

Year	Skipjack
1970	205,343
1971	192,625
1972	179,382
1973	262,352
1974	296,831
1975	232,119
1976	287,838
1977	302,162
1978	337,449
1979	292,204
1980	338,683
1981	300,198
1982	266,004
1983	304,149
1984	382,358
1985	250,956
1986	338,616
1987	264,699
1988	305,356
1989	292,647
1990	225,416
1991	284,114
1992	228,545
1993	274,443
1994	234,625
1995	271,989
1996	233,131
1997	253,945
1998	289,629
1999	295,313
2000	288,078
2001	228,906
2002	224,642
2003	247,707
2004	245,834
Average	270,237
STD deviation	44,146

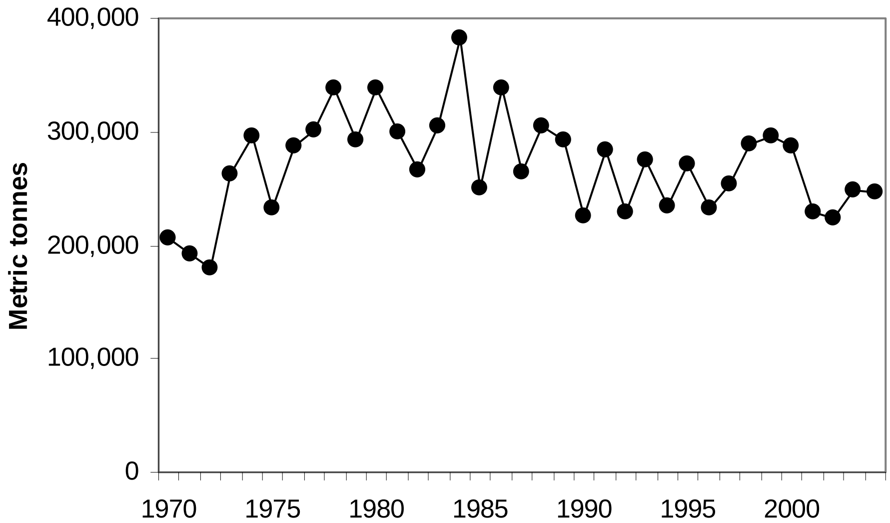


Figure 13. Reported pole-and-line catch (metric tonnes) of skipjack in the Pacific Ocean. Source: WCPFC Yearbook 2004.

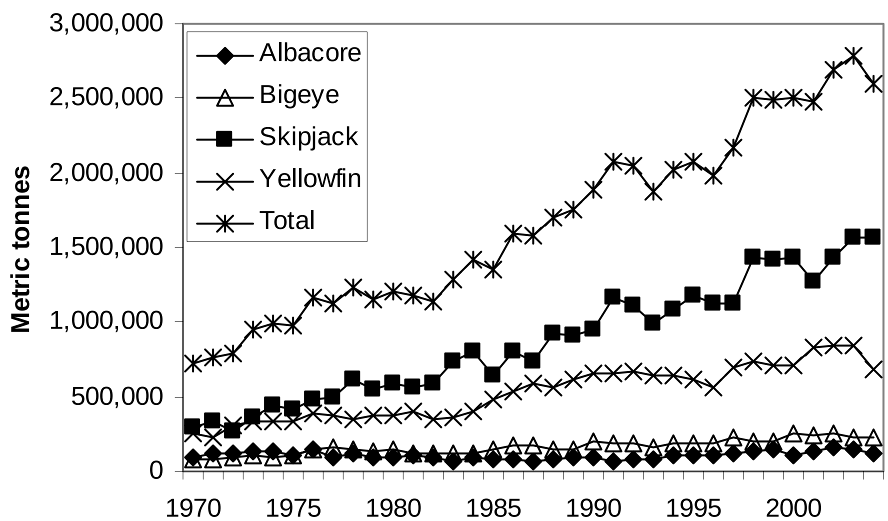


Figure 14. Estimated total annual catch of tuna species in the Pacific Ocean. Source: WCPFC Yearbook 2004.

Table 4. Estimated annual catch (metric tonnes) of tuna species in the Pacific Ocean. Source: WCPFC Yearbook 2004.

Year	Albacore	Bigeye	Skipjack	Yellowfin	Total
1970	96,724	75,181	297,796	256,757	726,458
1971	119,701	75,866	339,202	222,283	757,052
1972	121,686	95,665	269,073	302,660	789,084
1973	140,165	101,136	367,493	337,961	946,755
1974	133,893	87,350	437,798	338,186	997,227
1975	102,415	113,371	417,851	339,434	973,071
1976	145,213	148,717	488,232	384,791	1,166,953
1977	95,867	161,850	491,233	380,367	1,129,317
1978	122,369	147,760	620,756	347,395	1,238,280
1979	92,375	133,605	546,837	380,147	1,152,964
1980	98,304	151,391	589,073	370,714	1,209,482
1981	100,522	121,535	556,568	403,706	1,182,331
1982	92,720	119,475	583,199	348,018	1,143,412
1983	72,508	124,516	731,679	356,036	1,284,739
1984	91,623	119,261	805,334	401,462	1,417,680
1985	85,762	140,827	647,189	484,398	1,358,176
1986	75,280	168,659	807,078	536,129	1,587,146
1987	68,194	180,186	741,553	588,626	1,578,559
1988	77,246	141,762	922,626	557,686	1,699,320
1989	89,918	149,620	907,906	611,609	1,759,053
1990	87,545	195,114	948,856	655,153	1,886,668
1991	64,857	181,326	1,163,561	660,699	2,070,443
1992	78,403	183,486	1,116,780	668,352	2,047,021
1993	76,323	161,483	994,824	636,956	1,869,586
1994	108,379	193,488	1,081,961	636,217	2,020,045
1995	102,041	183,030	1,178,106	612,269	2,075,446
1996	103,170	188,141	1,128,564	568,786	1,988,661
1997	124,650	225,835	1,124,100	698,840	2,173,425
1998	128,873	203,959	1,438,525	734,571	2,505,928
1999	150,561	206,581	1,416,247	713,596	2,486,985
2000	113,330	251,657	1,427,718	706,912	2,499,617
2001	133,090	237,124	1,274,259	835,071	2,479,544
2002	156,855	254,505	1,431,672	847,796	2,690,828
2003	141,394	227,751	1,564,477	845,567	2,779,189
2004	124,966	226,151	1,560,860	680,746	2,592,723
Average	106,198	162,210	869,114	527,140	1,664,662
STD deviation	25,194	49,381	392,507	179,774	615,598

Stock status and WPRFMC reference points

This section contains a brief review of the stock status for several pelagic species and the status of these stocks in relation to WPRFMC reference points. Stock assessments are presented annually at the Scientific Committee (SC) of the WCPFC and at the International Scientific Committee for Tuna and Tuna-like Species in the North Pacific Ocean (ISC). In August 2005, the SC reviewed assessments for bigeye, skipjack and yellowfin in the WCPO and South Pacific albacore. In addition, recent assessments from previous fora are available for Pacific blue marlin, North Pacific blue shark and swordfish (Table 5 and 6). Stock status for the four tuna species are summarized from the SC species summary statements (http://www.spc.int/oceanfish/Html/WCPFC/SC1/scientific_committee.htm#Report and http://www.spc.int/oceanfish/Html/WCPFC/SC1/pdf/SC1_GN_WP_1.pdf), which also contains additional information on recent developments in the fishery, sizes of fish and trends in catch per unit effort (CPUE), recruitment, biomass and fishing mortality. In March 2005, the fifth meeting of the ISC reviewed assessments for North Pacific albacore and summary statements from the meeting are available (http://isc.ac.affrc.go.jp/).

Amendment 10 of the WPRFMC Pelagic FMP provided new specifications of overfishing criteria and control rules that trigger Council action based on the status of pelagic stocks. Amendment 10 defined Maximum Sustainable Yield (MSY) as a control rule that specifies the relationship of Fishing Mortality (*F*) to Biomass (B) and other indicators of productive capacity under a MSY harvest policy. Because fisheries must be managed to achieve optimum yield, not MSY, the MSY control rule is a benchmark control rule rather than an operational one. However, the MSY control rule is useful for specifying the “objective and measurable criteria for identifying when the fishery to which the plan applies is overfished” that are required under the MSA. The National Standard Guidelines (50 CFR 600.310) refer to these criteria as “status determination criteria” and state that they must include two limit reference points, or thresholds: one for *F* that identifies when overfishing is occurring and a second for *B* or its proxy that indicates when the stock is overfished (Figure 15). The status determination criterion for *F* is the maximum fishing mortality threshold (MFMT). Minimum stock size threshold (MSST) is the criterion for *B*. If fishing mortality exceeds the MFMT for a period of one year or more, overfishing is occurring. If stock biomass falls below MSST in a given year, the stock or stock complex is overfished. A Council must take remedial action in the form of a new FMP, an FMP amendment, or proposed regulations when it has been determined by the Secretary of Commerce that overfishing is occurring, a stock or stock complex is overfished, either of the two thresholds is being approached, or existing remedial action to end previously identified overfishing has not resulted in adequate progress.

Table 5. Schedule of completed and anticipated stock assessments for WPRFMC PMUS

Albacore Tuna (S. Pacific)	2005	Swordfish (N. Pacific)	2004
Albacore Tuna (N. Pacific)	2004	Wahoo	
Other tuna relatives (*Auxis* sp.)		Yellowfin Tuna (WCPO)	2005
(*allothunnus* sp., *Scomber* sp.)		Kawakawa	
Bigeye Tuna (WCPO)	2005	Bluefin Tuna (Pacific)	2004
Black Marlin		Common Thresher Shark	
Blue Marlin	2002	Pelagic Thresher Shark	
Mahimahi		Bigeye Thresher Shark	
Oilfishes		Shortfin Mako Shark	
Opah		Longfin Mako Shark	
Pomfrets		Blue Shark (N. Pacific)	2006
Sailfish		Silky Shark	
Shortbill Spearfish		Oceanic Whitetip Shark	
Skipjack Tuna (WCPO)	2005	Salmon Shark	
Striped Marlin	2006		

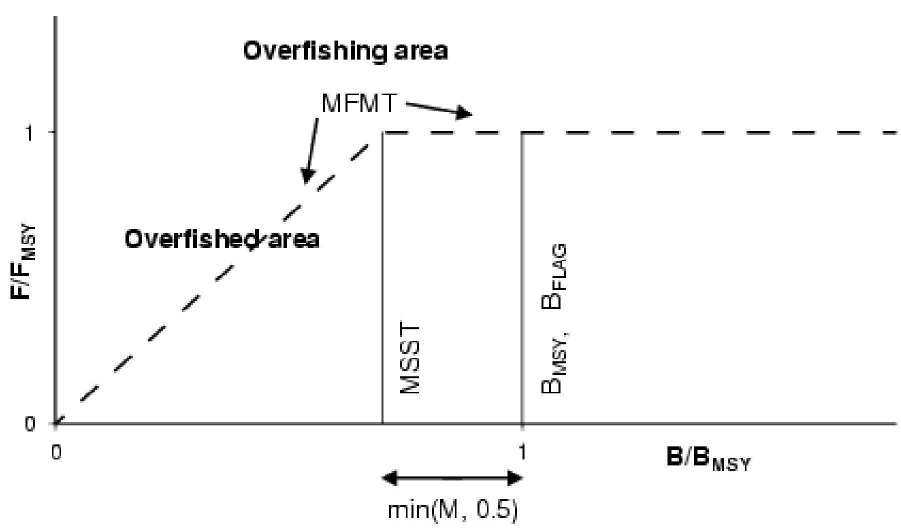


Figure 15. Specification of reference points MFMT and MSST in the WPRFMC Pelagic FMP.

Skipjack tuna in the WCP-CA

Stock status: A stock assessment was undertaken for skipjack during 2005 and is the first since 2003. The 2005 stock assessment indicates that for the skipjack stock in the WCP-CA overfishing is not occurring ($F_{current}$ / F_{MSY} < 1), that the stock is not in an overfished state ($B_{current}$ / B_{MSY} > 1), and that exploitation is modest relative to the stock's biological potential (Figure 16, Table 6).

Management implications: The catches in 2004 were the highest on record. These high catches are sustainable unless recruitment falls persistently below the long-term average. However, any increases in purse seine catches of skipjack may result in a corresponding increase in fishing mortality for yellowfin and bigeye tunas.

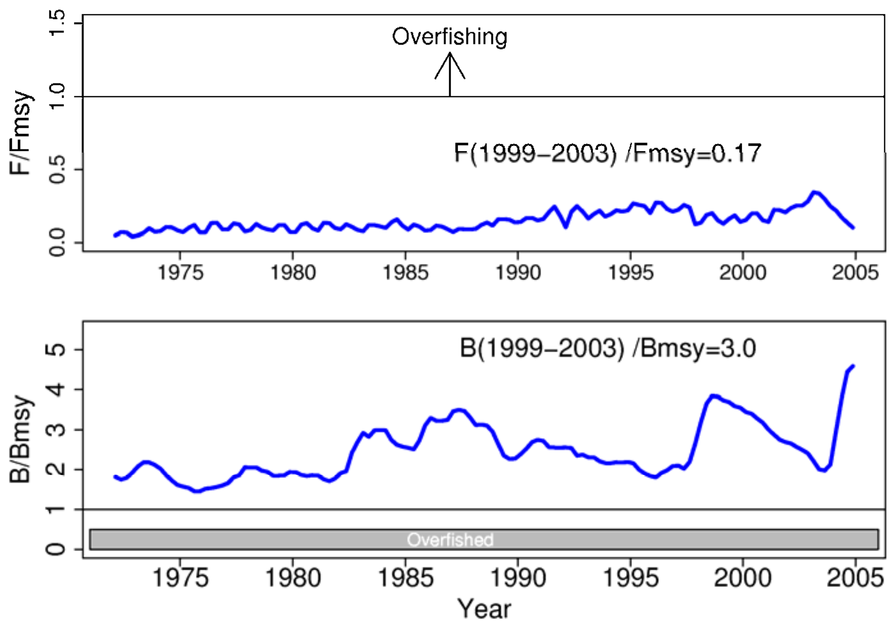


Figure 16. Ratios of F/F_{MSY} (top) and B/B_{MSY} (bottom) for skipjack tuna in the WCP-CA. The horizontal line at 1.0 in the F/F_{MSY} figure indicates an overfishing reference point. The shaded area in the B/B_{MSY} figure indicates an overfished reference point .

Yellowfin tuna in the WCP-CA

Stock status: The 2005 stock assessment is more pessimistic than the 2004 assessment as a result of methodological improvements in the interpretation of catch rate data and the relative abundance of yellowfin tuna across regions. Overfishing is probably occurring in the yellowfin stock in the WCP-CA ($F_{current}$ / F_{MSY} >1 in the point estimates from the base case and all sensitivity analyses), but the stock is probably not in an over-fished state ($B_{current}$ / B_{MSY} > 1, except in sensitivity analyses involving continuous increases in fishing efficiency, Figure 17, Table 6). The assessment indicates that the equatorial regions are the most highly impacted, while fishery impacts in the peripheral temperate regions are not large.

Management implications: The Scientific Committee of the WCPFC recommended that fishing mortality for yellowfin tuna be reduced from $F_{current}$ in order to maintain the stock at sustainable levels. Spatial patterns of fishing impacts remain uncertain, but fishing impacts in the western equatorial WCP-CA have been increasing over recent years and more urgent management actions may be required for this area.

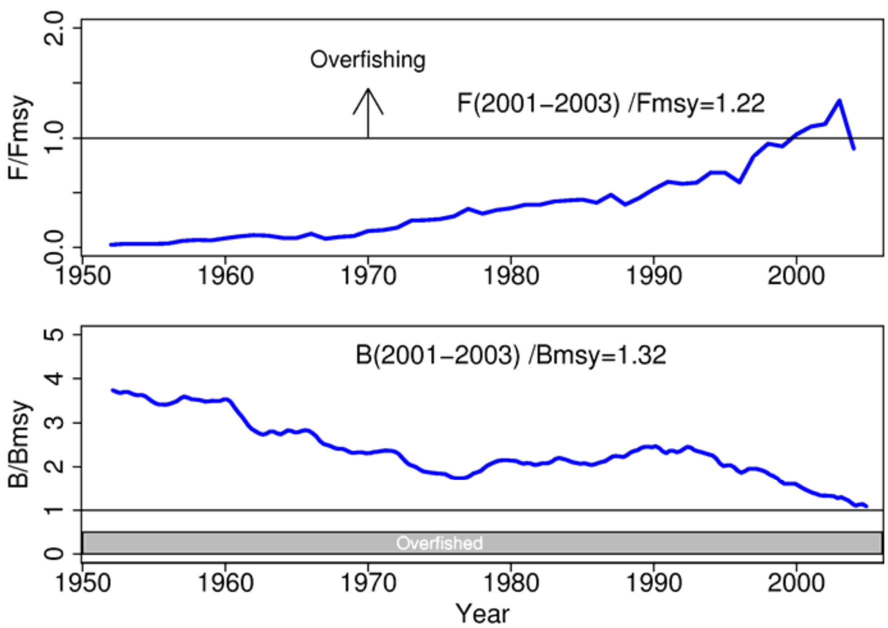


Figure 17. Ratios of F/F_{MSY} (top) and B/B_{MSY} (bottom) for yellowfin tuna in the WCP-CA. The horizontal line at 1.0 in the F/F_{MSY} figure indicates an overfishing reference point. The shaded area in the B/B_{MSY} figure indicates an overfished reference point (MSST).

Bigeye tuna in the WCP-CA

Stock status: The 2005 stock assessment is generally consistent with the result of the 2004 assessment, although the point estimates of the reference points are slightly more pessimistic (Table 6). In particular, while the 2004 assessment indicated that overfishing was possibly occurring ($F_{current}$ /F_{MSY} ~ 1), the 2005 assessment indicates that overfishing is likely occurring ($F_{current}$ / F_{MSY} > 1 for the base case and three of five sensitivity analyses, Figure 19). Both assessments indicate that the stock is presently not in an overfished state ($B_{current}$ /B_{MSY} > 1) because of high levels of estimated recruitment since 1990. The assessment indicates that the equatorial regions are the most highly impacted, while fishery impacts in the peripheral temperate regions are not large.

4.8 **Management implications**: The Scientific Committee recommended that fishing mortality for bigeye tuna is reduced from $F_{current}$. If future recruitment declines to levels closer to the long-term average, a further decrease in total catch and effort is likely to be necessary in order to maintain the stock at sustainable levels. Spatial patterns of fishing impacts remain uncertain, but some areas in the equatorial WCP-CA are more heavily impacted and in these areas more urgent management actions may be required.

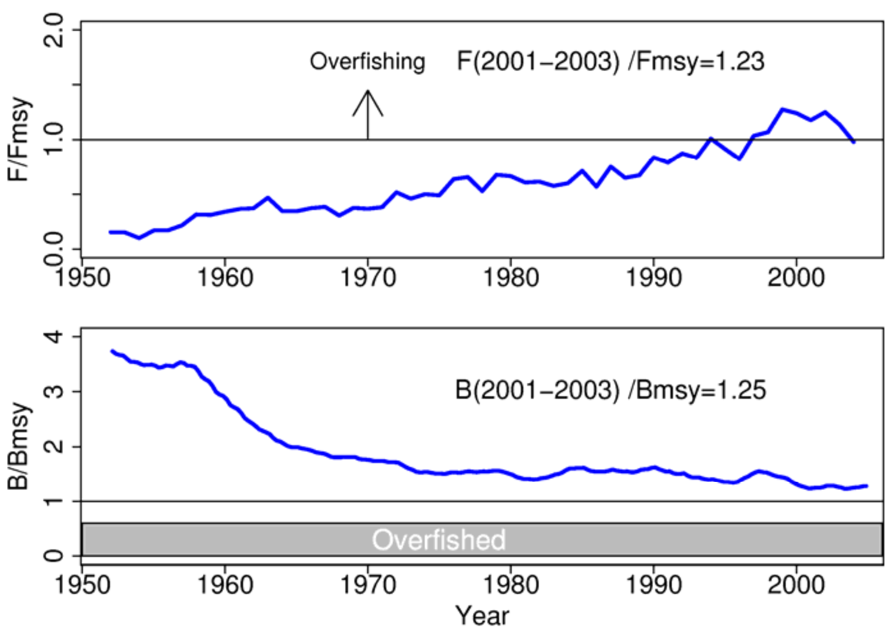


Figure 18. Ratios of F/F_{MSY} (top) and B/B_{MSY} (bottom) for bigeye tuna in the WCP-CA. The horizontal line at 1.0 in the F/F_{MSY} figure indicates an overfishing reference point. The shaded area in the B/B_{MSY} figure indicates an overfished reference point.

South Pacific albacore

Stock status: A stock assessment was undertaken during 2005 and is the first since in 2003. An examination of catch trends in 2005 indicated that total catches of albacore were relatively stable over the period from 1960 to 1995 but that they have increased in recent years. The key conclusions of the stock assessment were similar to 2003, i.e. that overfishing is not occurring ($F_{current}$ / F_{MSY} <1) and that the stock is not in an overfished state ($B_{current}$ / B_{MSY} >1, Figure 20, Table 6). Overall, fishery impacts on the total biomass are low (10%), although considerably higher impacts occur for the portion of the population vulnerable to longline.

Management implications: Current catch levels from the South Pacific albacore stock appear to be sustainable and yield analyses suggest increases in fishing mortality and yields are possible. However, given that the longline fleets harvest only the oldest members of the stock, any significant increase in effort would reduce CPUE to low levels with only moderate increases in yields. CPUE reductions may be more severe in areas of locally concentrated fishing effort.

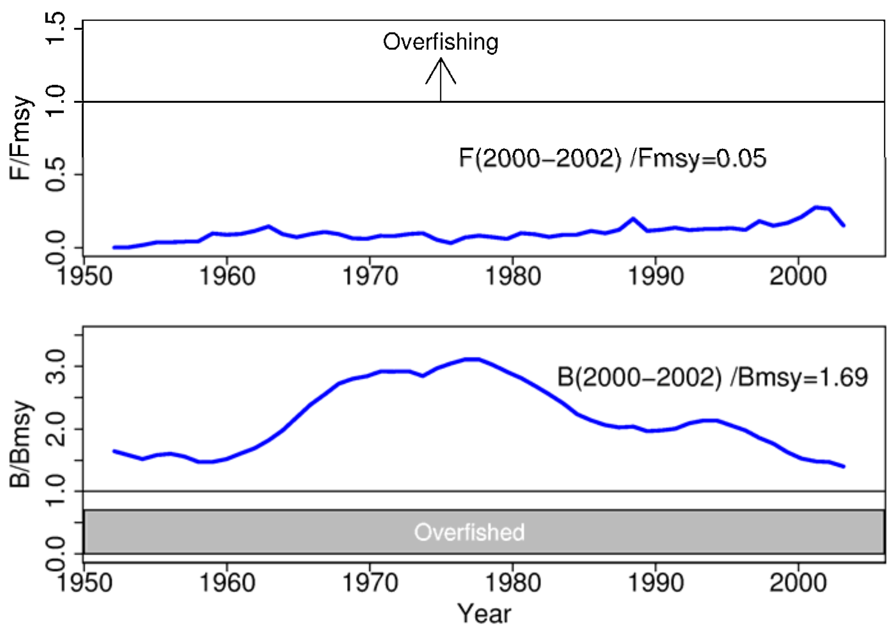


Figure 19. Ratios of F/F_{MSY} (top) and B/B_{MSY} (bottom) for South Pacific albacore. The horizontal line at 1.0 in the F/F_{MSY} figure indicates an overfishing reference point. The shaded area in the B/B_{MSY} figure indicates an overfished reference point.

Stock status – North Pacific albacore (NPALB)

A primary focus of the 2004 North Pacific Albacore (NPALB) Workshop was assessing the albacore stock using the age-structured model, VPA-2BOX. Stock assessment results indicated that the point estimate of the 2004 stock biomass is roughly 429,000 mt with 80% confidence limits ranging from roughly 329,000 to 563,000 mt. The 2004 level of spawning stock biomass of 165,000 t (24% less than SSB_{MSY} relative to $F_{30\%}$) is largely reflective of a very strong 1999 year-class that eventually became a major contributor in 2004 as part of 'mature' (spawning) biomass. However, subsequent recruitment declined to levels more typical of the extended historical time series, which translated to reduced levels of forecasted SSB, particularly, assuming 'high F' scenarios within the overall uncertainty analysis. This, coupled with a current fishing mortality rate (F_{2003}) that is high relative to commonly used reference points, may be cause for concern regarding the stock status of North Pacific albacore. Future conditions are less well-known, but if F continues at assumed levels, it is unlikely that SSB will rebuild to SSB_{MSY} levels within a 5-year time horizon.

Stock status – Pacific bluefin tuna

A complicating factor in a 2004 Pacific bluefin stock assessment was that some of the fishery statistics are substandard. MULTIFAN-CL and ADAPT VPA assessments show similar biomass trends, though some combinations of various size weightings of the MULTIFAN-CL analysis result in different long-term trends. Biomass was high in the mid 1950s, 1979, and mid-1990s. Recruitment has fluctuated with a large pulse in 1994 and very low recruitment in 1992. Changes in biomass and spawning stock biomass have been driven by recruitment. Yield per recruit estimates from the ADAPT modeling showed recent fishing mortality (F) exceeding Fmax. The status of the stock may be characterized as: 1) biomass appears to have recovered from a record low level in the late 1980s to a more intermediate level in recent years, largely due to better than average recruitment during the 1990s; 2) the SSB has generally declined since 1995 despite good recruitment and will likely continue to decline if recent fishing mortality rates continue; 3) recent fishing mortality is greater than Fmax, which has both economic implications and is an indicator of biological concern; and 4) the high fishing mortality on young fish (ages 0–2) and older fish (ages 6+) may be cause for concern with respect to maintaining a sustainable fishery in future years. Implications of the stock status include: 1) no further increases in fishing mortality (F) for any of the fisheries taking PBF; and 2) reduce the uncertainty associated with the assessment results by undertaking improvement in the data collection, data analyses, and assessment models used.

Stock status – north Pacific swordfish

Assessments of north Pacific swordfish in 2004 included: 1) several different analyses for standardizing CPUE – generalized linear model (GLM) and habitat-based both showing declining CPUE trend, with greater decreases in the northwest Pacific Ocean and 2) a MULTIFAN-CL modeling effort – difficulty with size sampling protocols that ignore small fish (e.g., in Japan) complicate the analysis; overall impact of the fishery is minor at worst; use of a simulation data set to test MULTIFAN-CL indicated a significant tendency to overestimate natural mortality (M) and thus underestimate stock levels.

Conclusions reached by the ISC Swordfish Working Group on the status of swordfish in the North Pacific are: 1) GLM and habitat-based standardization of CPUE based data from Japanese longline vessels show declining trends mainly driven by declines in CPUE in the northwestern portion of the study area; 2) a MULTIFAN-CL assessment also detected such a decline in the northwestern region of the fishery; and 3) in all MULTIFAN-CL model runs, the model showed fisheries as playing no more than a modest role in causing declines in abundance.

Table 6. Estimates of stock status in relation to overfishing and overfished reference points for WPRFMC PMUS.

Stock	Overfishing reference point	Is overfishing occurring?	Approaching Overfishing (2 yr)	Overfished reference point	Is the stock overfished?	Approaching Overfished (2 yr)	Assessment results	Natural mortality[1]	MSST
Skipjack Tuna (WCPO)	$F/F_{MSY}=0.17$	No	No	$B/B_{MSY}=3.0$	No	No	Langley et al. 2005	$>0.5\ yr^{-1}$	$0.5\ B_{MSY}$
Yellowfin Tuna (WCPO)	$F/F_{MSY}=1.22$	Yes	Not applicable	$B/B_{MSY}=1.32$	No	No	Hampton et al. 2005a	$0.8\text{-}1.6\ yr^{-1}$	$0.5\ B_{MSY}$
Albacore Tuna (S. Pacific)	$F/F_{MSY}=0.05$	No	No	$B/B_{MSY}=1.69$	No	No	Langley & Hampton 2005	$0.3\ yr^{-1}$	$0.7\ B_{MSY}$
Albacore Tuna (N. Pacific)		Unknown			Unknown			$0.3\ yr^{-1}$	$0.7\ B_{MSY}$
Bigeye Tuna (WCPO)[2]	$F/F_{MSY}=1.23$	Yes	Not applicable	$B/B_{MSY}=1.25$	No	No	Hampton et al. 2005b	$0.4\ yr^{-1}$	$0.6\ B_{MSY}$
Blue Marlin (Pacific)	$F/F_{MSY}=0.50$	No	Unknown	$B/B_{MSY}=1.4$	No	Unknown	Kleiber et al. 2002	$0.2\ yr^{-1}$	$0.8\ B_{MSY}$
Swordfish (N. Pacific)[3]	$F/F_{MSY}=0.33$	No	Unknown	$B/B_{MSY}=1.75$	No	Unknown	Kleiber & Yokawa 2004	$0.3\ yr^{-1}$	$0.7\ B_{MSY}$
Blue Shark (N. Pacific)	$F/F_{MSY}=0.01$	No	Unknown	$B/B_{MSY}=1.9$	No	Unknown	Kleiber et al. 2001	Unknown	
Other Billfishes		Unknown			Unknown			Unknown	
Other Pelagic Sharks		Unknown			Unknown			Unknown	
Other PMUS		Unknown			Unknown			Unknown	

[1] Estimates based on Boggs et. al 2000
[2] Assssment results based on natural mortality fixed at $0.2\ yr^{-1}$

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Appendix 6

Marine Recreational Fisheries of the Western Pacific Region

Introduction

Fishing, either for subsistence or recreation continues to be an extremely important activity throughout the Western Pacific Region in the four major populated island areas of the Western Pacific Region, Hawaii, American Samoa, Guam and the Commonwealth of the Northern Mariana Islands (CNMI). Fish consumption in Micronesia and Polynesia typically averages about 130 lb/per capita/yr (Dalzell et al 1996) and even in more culturally diverse Hawaii, fish consumption is almost three times the US national average at about 42 lb/person/yr (Dalzell & Paty 1996).

Recreational fisheries in the Western Pacific Region

In Hawaii, recreational shoreline fishing was more popular than boat fishing up to and after WW II. Boat fishing during this period referred primarily to fishing from traditional canoes (Glazier 2000). All fishing was greatly constrained during WW II through time and area restrictions, which effectively stopped commercial fishing and confined recreational fishing to inshore areas (Brock 1947). Following WWII, the advent of better fishing equipment and new small boat hulls and marine inboard and outboard engines led to a growth in small vessel-based recreational fishing.

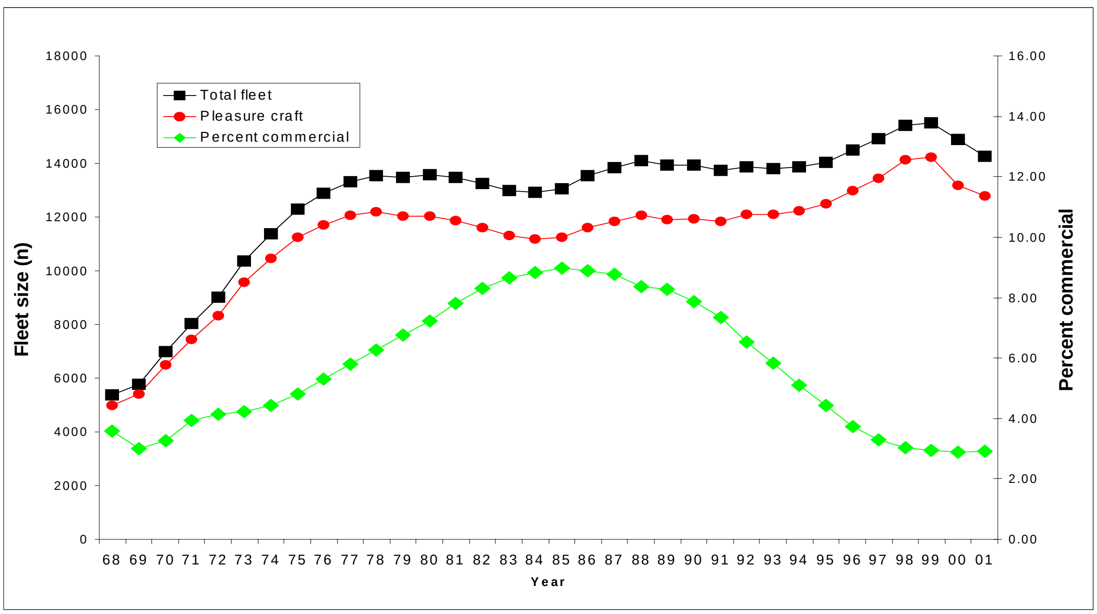

Figure 1. Annual number of small vessel fleet registrations in Hawaii. Figure shows total fleet size, and percentage of vessels being registered for commercial fishing (Source: Hawaii Division of Boating and Ocean Resources)

A major period of expansion of small vessel recreational fishing occurred between the late 1950s and early 1970s, through the introduction of fibreglass technology to Hawaii and the further refinement of marine inboard and outboard engines (Figure 1). By the early 1960s there were an estimated 5,300 small boats in the territory being used for recreational fishing. By the 1980s the number of recreational or pleasure craft had risen to almost 13,000 vessels and to about 15,000 vessels in the 1990s. There are presently some 26 fishing clubs in Hawaii, and a variety of different recreational fishing tournaments organized both by clubs and independent tournament organizers. Hawaii also hosts between 150 to 200 boat based fishing tournaments, about 30 of which are considered major competitions, with over 20 boats and entry fees of ≥$100. This level of interest in recreational fishing is sufficient to support a local fishing magazine, Hawaii Fishing News, which besides articles of interest to recreational fishermen, includes a monthly roundup of the fishing activity and conditions at the major small boat harbors in the State. Further, a directory of the State's small boat harbors and launching ramps is published annually by Hawaii Ocean Industry and Shipping news (see December 2002/January 2003 issue).

Elsewhere in the region, recreational fishing is less structured. In Guam fishing clubs have been founded along ethnic lines by Japanese and Korean residents. These clubs had memberships of 10-15 people, along with their families. Four such clubs were founded in Guam during the past 20 years, but none lasted for more than a 2-3 years (Gerry Davis, Guam DAWR pers. comm.). These was also a Guam Boating Association comprising mostly fishermen, with several hundred members. This organization functioned as a fishing club for about 10 years and then disbanded. Some school groups and the boy scouts have formed fishing clubs focused on rod and reel fishing, and there is still one spearfishing club that has only a handful of members, but appears to be still be active. There are also some limited fishing tournaments on Guam, including a fishing derby for children organized by the local Aquatic and Wildlife Resources Division (Anon 2000).There are few fishing clubs in the in the Northern Mariana Islands. The Saipan Sportfishing Association (SSA) has been in existence for at least 16 years, and is the sponsor of the annual Saipan International Fishing Tournament, which is usually held in August or September. In 1997, the SSA listed approximately 40 members. There is also a Tinian Sportfishing Association, but the status of this club is unknown at this time.

The founding of the American Samoa Game Fishing Association in 1974 in Pago Pago led to fishing tournaments being held on a regular basis in the territory (Tulafono 2001). A total of 64 tournaments, averaging two to three tournaments per year and 10 to 20 vessels in each competition, were conducted in Pago Pago between 1974 and 1998. However interest in fishing tournaments waned during the late 1990s, with only three vessels participating in the last tournament held in 1998. The reason for this decline was not entirely clear, but may be related to the expansion of the longline fishery in American Samoa and the shift from commercial trolling to longlining. According to Tulafono, fishermen were more interested in earning income and it was time consuming to switch from longline to troll gear for a weekend of tournament fishing. Tulafono (2001) noted that tag and release programs, which are gaining popularity with recreational and charter-vessel fishermen elsewhere in the U.S., would not be popular in

American Samoa. In common with many Pacific islands, fish were caught to keep for food in American Samoa, and fish landings and their distribution through the community were important in order to meet social obligations. Releasing fish would be considered a failure to meet these obligations (Tulafono 2001).

There is also some recreational fishing activity at some of the Pacific Remote Island Areas (PRIAs), namely at Midway, Wake, Johnston and Palmyra Islands. There are no resident populations at Howland & Baker and Jarvis Islands and fishing activity at these locations is likely minimal. There was a tourist facility at Midway until 2002, which operated a charter boat fishery targeting primarily pelagic fish at Midway Atoll. The company operated five vessels using for charter fishing at Midway: three 22-26 ft catamarans for lagoon and nearshore fishing operations and two 38 ft sportfishing vessels used for blue water trolling. In addition there were approximately seven small vessels maintained and used by Midway residents for recreational fishing. Of this total, three vessels engaged primarily in offshore trolling for PMUS including yellowfin tuna, ono and marlin. All vessels fishing at Midway were required to file a float plan prior to a fishing trip and complete the "Midway Sports Fishing Boat Trip Log" upon completion of each trip. The US Fish and Wildlife Service was responsible for compiling these catch data.

At Palmyra Atoll, an island privately owned by The Nature Conservancy, a 22 ft catamaran is used for offshore trolling and four small boats operated within the lagoon used for bonefish angling. There are several craft used for recreational fishing at the two military bases on Johnson and Wake Islands. These include eight Boston whalers, two cabin cruisers and a landing craft at Johnson, and two landing craft and two small vessels at Wake.

Recreational fisheries in the Western Pacific Region

Estimates of recreational catch for the Western Pacific are given in Table 1. The data for Guam, Northern Mariana Islands and American Samoa are based on the proportion of catches landed for sale and catches retained and not sold, in all landings sampled by creel surveys in each area. The ratio of unsold to sold catch in the samples was used in conjunction with the total catch estimate expanded from the creel survey data. This was adjusted downwards based on the creel surveys by the ratio of landings by vessels retaining 100 % of their catch to the total unsold catch. This accounts for that fraction of the catch not sold by commercial fishing vessels. The volume of fish landed by vessels retaining all their catch was labeled the nominal recreational catch. A similar exercise is conducted by the Honolulu Laboratory to generate recreational catch figures for Hawaii.

Table 1. Estimated recreational fish catches in the four principal island groups of the Western Pacific Region

Location	Year	Total catch (lbs)	Unsold catch (lb)	Nominal recreational catch (lb)	Recr. catch as % of total catch	Recr. fishing trips
American Samoa	2004	8,925,935	12,935	11,805	0.1%	272
Guam	2004	1,525,231	679,981	571,567	37.4%	9,741
Hawaii	2004	42,580,000	NA	18,290,000	42.9%	729,779
NMI	2004	403,750	36,600	35,005	8.7%	700

Charter vessel sportsfishing

Tables 2-6 present summaries of the charter vessel sportsfishing in the Western Pacific. Most charter fishing in Hawaii is focused on catching blue marlin, which in 2004 formed about 50 % of the total annual charter vessel catch by weight (Table 3). Although commercial troll vessels also take blue marlin, these only form about a quarter of their catch, with the majority of the target species being yellowfin, mahimahi, aku and ono (Table 3). Unlike other parts of the US, there is little recreational fishery interest in catching sharks in Hawaii.

Guam has a charter fishing sector, which unlike Hawaii caters for both pelagic and bottomfish fishing. Until recently the troll charter fishery was expanding, but, over the past three years the number of vessels involved, and level of fishing, has decreased in response to lower tourist volume from Japan due to the Asian economic recession in the late 1990s. Nonetheless, although compromising only 5 % of Guam's commercial troll fleet, the Guam troll charter industry accounts for 11% of the troll catch and 25 and 20% of the Guam blue marlin and mahi mahi catch respectively. (See Guam module in this volume). The Guam bottomfish charter fishery has continued to increase despite the drop in tourist volume from Japan, and accounts for about 10% of Guam's bottomfish fishing effort. The primary catch of the bottomfish charter fishery are goatfish and triggerfish, which are mostly released.

Charter fishing in NMI is limited, with about ten boats operating on Saipan, and a few vessels on Tinian conducting occasional fishing charters. Tourism is not a significant component of the American Samoa economy, and hence there is little charter fishing activity. There are few vessels suitable for charter-type operations and the American Samoa government does not actively promote tourism and sportfishing as the local infrastructure for this is limited (Tulafono 2001).

Table 2. Estimated catches by pelagic charter fishing vessels in Guam, Hawaii and Northern Mariana Islands in 2004

Location	Catch (lb)	Effort (trips)	Species
Guam	106,643	1,553	blue marlin, skipjack, mahimahi, wahoo
Hawaii	553,063	11,982	mahimahi, yellowfin, wahoo, blue marlin
Northern Mariana Is	6,639	225	mahimahi, yellowfin, skipjack, wahoo

Charter vessel fishing in the Western Pacific Region has elements of both recreational and commercial fishing. The primary motivation for charter patrons is recreational fishing, with the possibility of catching large game fish such as blue marlin. The charter vessel skipper and crew receive compensation in the form of the patrons fee, but are also able to dispose of fish on local markets, as is the case in Hawaii. The catch composition of charter vessel catch versus conventional commercial trolling in Hawaii, reflects the different targeting in the two fisheries. Blue marlins are the dominant feature of charter vessels in Hawaii, while in Guam (Tables 3 & 4), composition of the charter cath is being broadly similar to the mix of species in the commercial troll catches

Table 3. Comparison of species composition of landings made by Hawaii pelagic charter vessels versus commercial troll vessels, 2004

Species	Charter vessels		Commercial trollers	
	Landings	Percent	Landings	Percent
Mahimahi	183,588	33.19%	860,873	38.31%
Blue marlin	156,817	28.35%	180,338	8.03%
Yellowfin tuna	77,211	13.96%	542,883	24.16%
Wahoo	52,591	9.51%	342,183	15.23%
Skipjack	33,577	6.07%	190,498	8.48%
Striped marlin	16,825	3.04%	31,161	1.39%
Shortnosed spearfish	14,301	2.59%	11,551	0.51%
Others	18155	3.28%	130881	5.82%
Total	553,063	100.00%	2,247,042	100.00%

Table 4. Comparison of species composition of landings made by Guam pelagic charter vessels versus commercial troll vessels, 2004

Species	Charter vessels		Commercial trollers	
	Landings (lb)	Percent	Landings (lb)	Percent
Mahimahi	33,625	31.53%	163,584	27.80%
Blue marlin	23,859	22.37%	24,409	4.15%
Skipjack tuna	17,384	16.30%	144,455	24.55%
Wahoo	15,433	14.47%	101,558	17.26%
Yellowfin tuna	11,048	10.36%	91,180	15.50%

Others	5,294	4.96%	63,202	10.74%
Total Pelagics	106,643	100.00%	588,388	100.00%

In Hawaii there is considerable variation in charter vessel catches between the various islands (Table 5), with the largest charter vessel fishery based on the island of Hawaii. In 2004, charter vessel catches on the island of Hawaii accounted for nearly half of the total charter vessel landings within the state, with Oahu and Maui County charter vessels forming most of the remaining charter vessel catch.

Table 5. Charter vessel catches in Hawaii by island, 2004

Island	Catch	Percent	Trips	Percent	CPUE (lb/trip)
Hawaii	236,963	42.85%	4755	39.68%	49.83
Kauai	64,892	11.73%	979	8.17%	66.28
Maui County	82,759	14.96%	3124	26.07%	26.49
Oahu	168,449	30.46%	3124	26.07%	53.92
Total	553,063	100.00%	11982	100.00%	46.16

* DAR confidentiality protocols prevent reporting 2004 charter vessel activity for Molokai and Lanai separately, and these are aggregated with data for Maui, reported collectively as Maui County

Most charter vessel fishing on the island of Hawaii is conducted from Kona's small boat harbor at Honokohau, and about two thirds of the charter vessel catch comprises blue marlin (Table 6). Elsewhere, mahimahi dominate charter vessel landings, with blue marlin comprising between 2% and 30% of catches. Other important species in the charter vessel catches, depending on location, comprise yellowfin, wahoo, spearfish and skipjack.

Table 6. Composition of charter vessel catches in the Main Hawaiian Islands, 2004

Hawaii			**Kauai**		
Species	Landings (lb)	Percent	Species	Landings (lb)	Percent
Blue marlin	113,017	47.69%	Skipjack	20,085	30.95%
Yellowfin tuna	40,938	17.28%	Mahimahi	14,701	22.65%
Mahimahi	35,376	14.93%	Yellowfin tuna	13,725	21.15%
Wahoo	23,412	9.88%	Wahoo	7,806	12.03%
Striped marlin	4,147	1.75%	Blue marlin	4,088	6.30%
Skipjack	3,203	1.35%	Striped marlin	2,622	4.04%
Others	16,872	7.12%	Others	1,867	2.88%
Total	236,963	100.00%	Total	64,892	100.00%
Oahu			**Maui**		
Species	Landings (lb)	Percent	Species	Landings (lb)	Percent
Mahimahi	93,066	55.25%	Mahimahi	40,446	48.87%
Blue marlin	26,084	15.48%	Blue marlin	13,628	16.47%
Yellowfin tuna	20,685	12.28%	Wahoo	12,345	14.92%
Wahoo	9,028	5.36%	Others	9,059	10.95%
Skipjack	8,521	5.06%	Striped marlin	3,651	4.41%
Striped marlin	6,406	3.80%	Yellowfin tuna	1,863	2.25%
Others	4,659	2.77%	Skipjack	1,768	2.14%
Total	168,449	100.00%	Total	82,759	100.00%

Recreational Fishing Data Collection in Hawaii

The Hawaii Marine Recreational Fishing Survey Project

Mike Nelson (HDAR) and Maury Osborn, (NMFS Office of Science and Technology) assisted by Walter Ikehara (HDAR), developed a cooperative agreement with NMFS to initiate the Hawaii Marine Recreational Fishing Survey (HMRFS) in 2001. NMFS and HDAR contributed joint funding for intercept surveys and charter boat surveys on the islands of Oahu, Hawaii, and Maui. NMFS also funded the Random Digit Dialing household telephone survey via their national contractor beginning in January 2001. The HMRFS project commenced in July 2001, with Walter Ikehara as the HDAR coordinator and Mike Nelson as survey manager. Four surveyors were hired in the first year (July 2001 - June 2002) and began surveys of private boat and charter boat fishermen in late 2001. In December 2002 Dr. Matthew Parry took over as the HMRFS survey manager. The HMRFS continued to expand its efforts in 2003 and 2004 and now consists of 11 surveyors (3 on Oahu, 2 on Maui, and 3 on Hawaii, 2 on Kauai, and 1 on Molokai) and 1 data worker. The HMRFS expanded in 2004 to surveying Kauai and Molokai.

The MRFSS program uses a triple survey approach that has been developed over the 20+ years of its history. For each two-month survey period (wave) a random sample of households is called by telephone to determine how many have done any fishing in the ocean, their mode of fishing (private boat, rental boat, charter boat, or shoreline), what methods were used, and how much effort (number of trips and hours) was expended. Concurrently, surveyors are sent out to boat launch ramps, small boat harbors, and shoreline fishing sites to interview fishermen to fill out intercept survey forms. The intercept survey collects data on fishing area, fishing methods, trip/effort, species caught, and lengths and weights of fish. The sites are randomly selected, but stratified by fishing pressure so that the sites with the highest pressures are likely to be surveyed more often. In addition the charter boat operators are surveyed by a separate survey. This additional survey of the charter fleet serves the same function as the random digit dialing household survey and is necessary because out of town fishers that charter vessels wouldn't be covered by randomly calling the Hawaiian populace. The telephone and charter survey data are used to estimate total statewide fishing effort and the intercept surveys provide detailed catch and trip information. Data from the three surveys are combined and expanded by computer to yield statewide estimates of total effort and catch by species, mode, and county. For more information on the MRFSS program and survey methods, please go to the MRFSS web site (http://www.st.nmfs.gov/st1/recreational/).

MRFSS weight estimates are calculated by multiplying the estimated number harvested in a cell (year/wave/state/mode/area/species) by the mean weight of the measured fish in that cell. Sometimes we have an estimate of harvest but no mean weight, either because

- the harvest is all reported by the anglers (B1), or

- because for some reason the interviewers couldn't weigh any fish (fish too big, already gutted and gilled, etc.).

If a cell is missing a mean weight OR the variance of the mean weight = 0 (e.g. only 2 weights & they are same), and if we have at least two fish measured in the state (all fishing areas and modes combined),

- We substitute the mean for the whole state for that wave.
- We need two measured fish to get a variance estimate.

After state substitution, if the mean weight is still missing,

- We use the mean from the whole subregion for that wave.
- The "two fish rule" still applies.
- Hawaii is only state in subregion, hence if state pooling results in missing mean weight then we give up (as below) and leave a missing weight estimate.

After subregional substitution, if the mean weight is STILL missing, we give up and leave a missing weight estimate. At that point,

- It is up to the user to determine whether to substitute, and
- What substitution is most appropriate to use (a mean from the preceding and following waves, the whole year, same wave over years, whole Atlantic & Gulf coast, some complicated regression model, whatever).
- We don't make those decisions because the information needs and sensitivity of the data vary among species.

The phenomenon of missing weights is more widespread with rarely caught species and with large fish (i.e. tunas). The existence and/or extent of missing weights for your query can be examined by requesting data at the cell level: (by year/wave/state/by mode/by area/by species (time series)).

Results

A synopsis of the results of the HMRFS project for the year 2003 is shown in Tables 7 and 8 and Figures 2 - 6, which also show the 2002 data points. The total recreational catch for Hawaii was estimated to be 18,938,550 lbs, of which about 96% in terms of weight was caught from boats (Table 1). In terms of numbers of fish, about 80% of the catch came from boat-based recreational fishing, with 20% from shore line fishing Interestingly, in 2003 pelagics comprise the largest volume of fish landed by weight by shoreline fishing. Most of this volume of shoreline pelagic catch was mahimahi. Pelagic fish are caught from shore in Hawaii, particularly in locations where there is a steep drop-off. The HMRFS project also gives some insights into the volume of bycatch in recreational fishing. Live discards from pelagic fishing are small ranging from zero for shore-based fishing to one percent for boat based fishing. The discard rate for pelagic fish taken from boats was quite high in 2003, amounting to about 41% of all fish caught. By contrast, relatively little (about 4%) of the other species catch from boat-based fishing was discarded, with an overall discard rate of about 18%. The discard rate for shore based fishing was much higher, with about 45% of pelagic fish and 62% of other species being discarded.

The contributions by the six major pelagic fishes caught by boat-based recreational fishing are shown in Figures 2 and 3. Skipjack was the most commonly caught pelagic taken by recreational fishermen in terms of numbers in 2002 and dominated catches in 2003. Other important components of the boat based recreational catch in 2003 were yellowfin tuna, wahoo and mahimahi. Skipjack made a more modest contribution to the recreational boat catch by weight in 2003 with yellowfin tuna dominating catches. As might be expected the yellowfin CPUE was considerably higher in 2003 compared with 2002 (Figure 6). The CPUEs of wahoo, skipjack and mahi were all higher in 2002 compared with 2003. By contrast blue marlin and striped marlin CPUEs were lower in 2003 compared to the previous year. Recreational fishing activity in 2002 ranged from between 55,000 to 133,000 recreational trips per two month period (Figure 5), with a peaks in fishing activity between May and August, and between November to December.

Table 7. Hawaii recreational catch in weight from boat-based and shoreline fishing, 2003

Fish	**Catch (lb)**	
	Boat fishing	**Shoreline fishing**
Pelagics	17,199,469	515,371
Other species	1,013,591	210,119
Total	18,213,060	725,490

Table 8. Hawaii recreational catch and live discards by number, 2003

	Boat			**Shoreline**		
	Catch	**Discards[1]**	**%**	**Catch**	**Discards[1]**	**%**
Pelagics	831,284	341,264	41.1	34,344	15,369	44.7
Other species	1,397,031	57,335	4.1	883,700	551,385	62.3
Total	2,228,315	398,599	17.9	918,044	556,754	60.6

1. Discard category may include fishes that are filleted and identified by fishermen

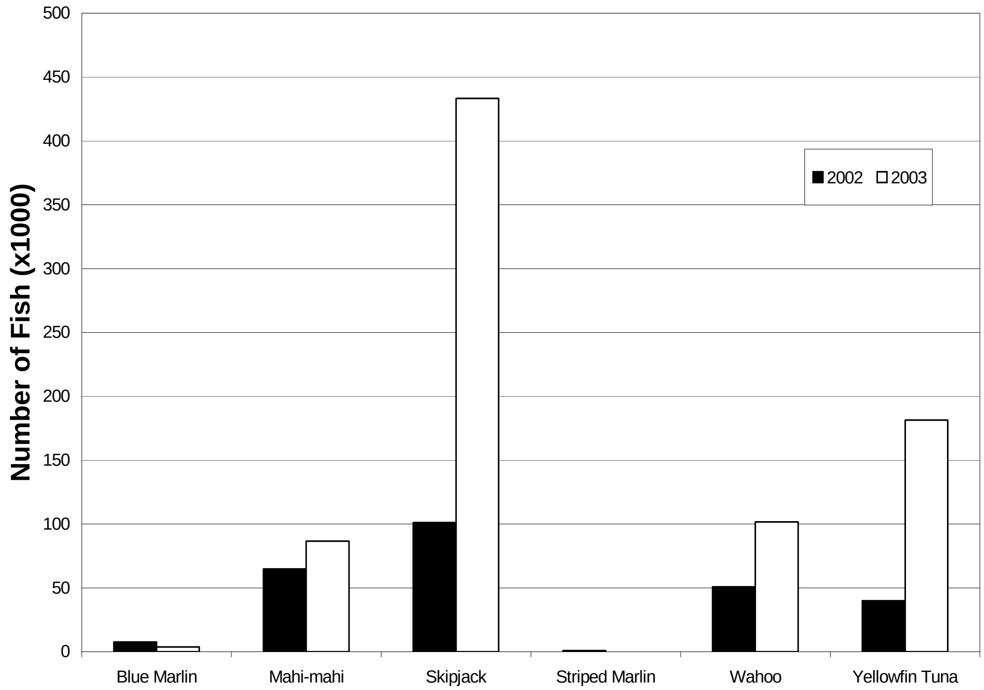

Figure 2. Estimated recreational private boat catch of PMUS by number, 2002 & 2003.

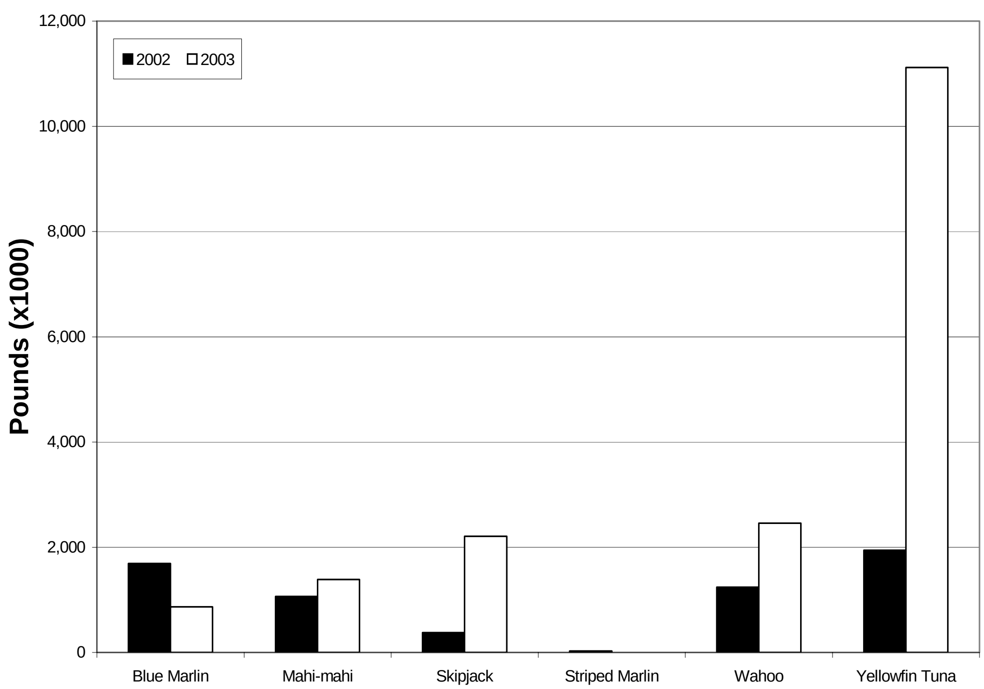

Figure 3. Estimated recreational private boat catch of PMUS by weight, 2002 & 2003.

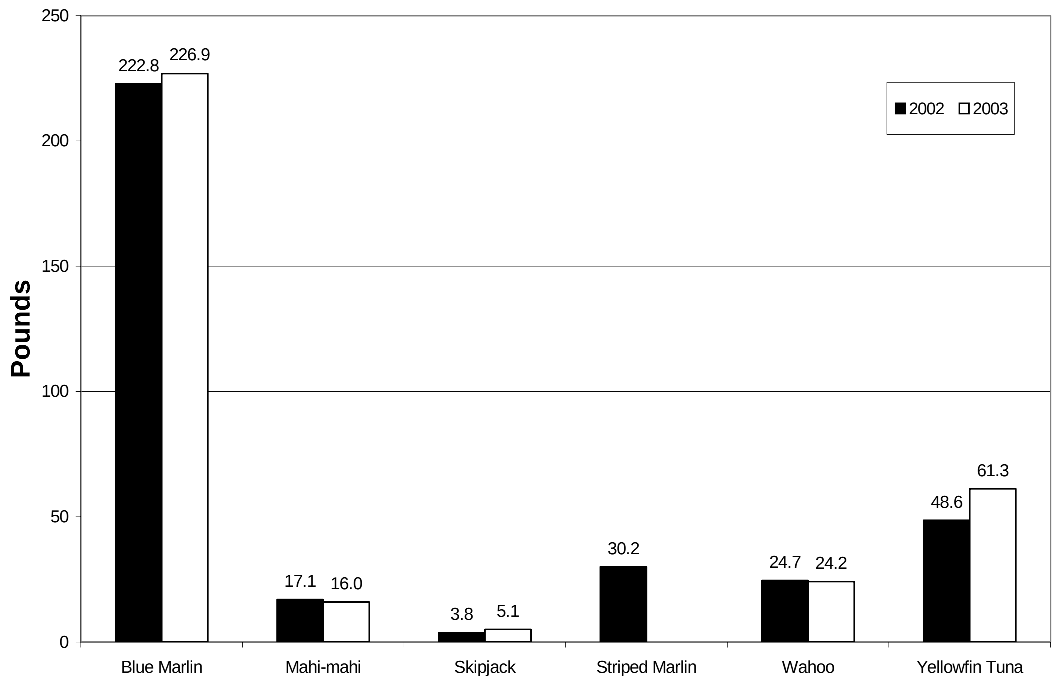

Figure 4. Average weight of PMUS catch taken by recreational private boats, 2002 & 2003.

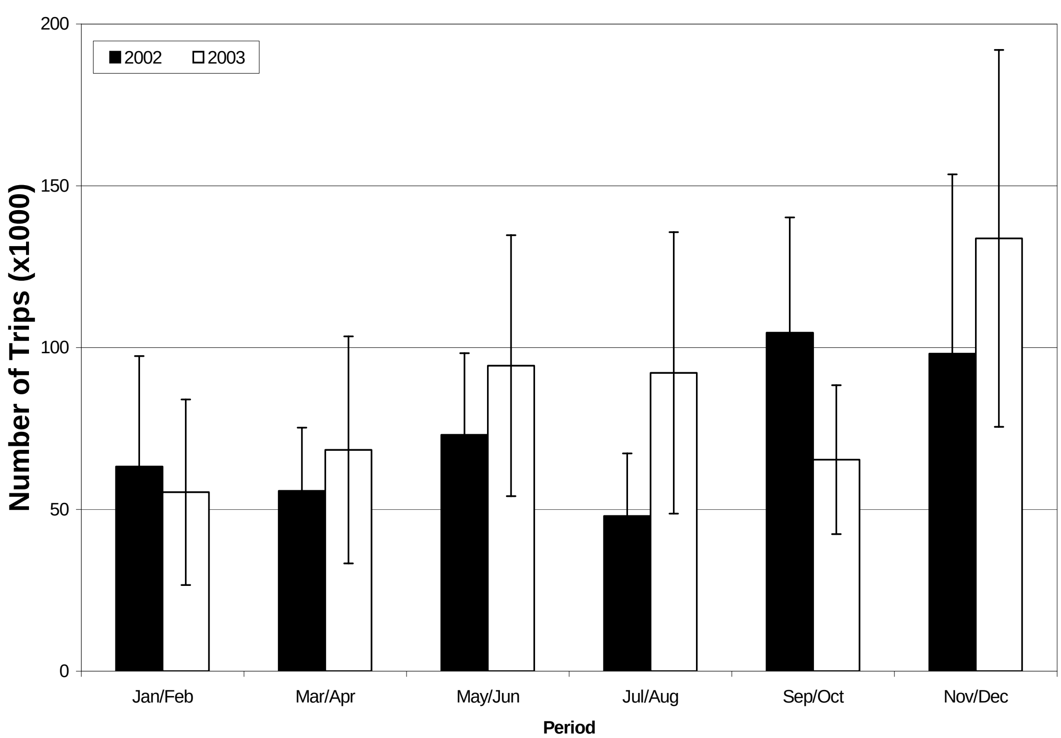

Figure 5. Recreational boat trips for all waters within EEZ boundary

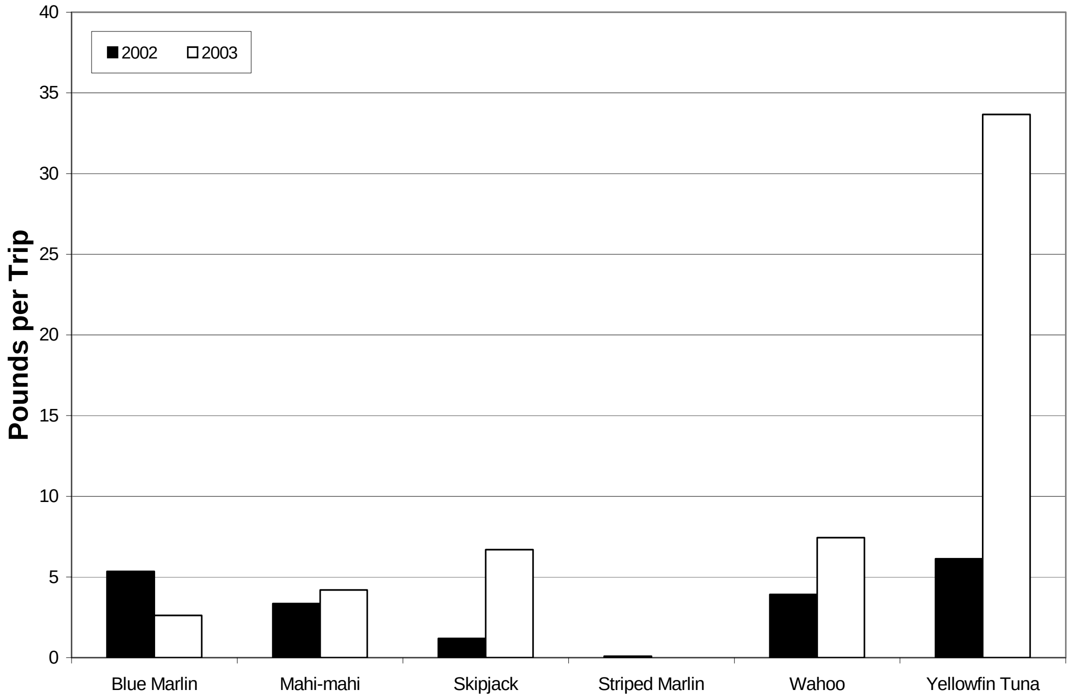

Figure 6. CPUE for PMUS in waters between 3 miles offshore and EEZ boundary

The NMFS/Council Pelagic Fisheries Research Program Recreational Fisheries Meta Data Project

The Recreational Meta Data Project was initiated to document and compile into database formats sources of Hawaii's pelagic recreational and sports fishing information from the past 50 years. Recreational fishery data has not been routinely collected in the State of Hawaii over the past 50 years, although there are several sources of information including previous recreational and small fishing boat surveys, boating registration data, angling club records, fishing tournament records, newspapers, and fishermen logbooks. Much of the existing literature is unpublished or "gray literature", and difficult for fishery scientists and researchers to obtain. This project has collected over 80 papers and reports and incorporated them as part of the database files. Further, the data tabulated therein has been re-entered into spreadsheet files so as to make them available to other researchers.

The project has also received information on 27 different fishing tournaments from 7 different angling and boat clubs and expects to obtain information covering an additional four more tournaments. Several of these tournaments are well documented and the project has amassed annual information covering over 40 years of catch and effort in Hawaiian waters. The number of boats participating in different tournaments has ranged from 6 to 260 boats. The majority of tournament catch is caught by fishing in association with Fish Aggregating Devices (FADs), which may provide valuable feedback to the Hawaii Division of Aquatic Resources (HDAR) in monitoring the success of its FAD deployment program, Pervious attempts by HDAR to monitor FAD performance through voluntary recreational fishery reporting have been unsuccessful.

Information on effort, catch, and tournament totals reflect the unique nature of each tournament's reporting procedures. Most tournaments do not differentiate between bigeye tuna (*Thunnus obesus)* and yellowfin tuna (*T. albacares*) and these species are listed simply as "ahi". Marlin reports can also be comprised of one or more billfish species, and skipjack tuna *(Katsuwonus pelamis*) may or may not be included in the radio logs and weigh in slips. The potential for constructing weight frequency charts from tournament radio logs to monitor size trends in tournament catches was investigated, but was confounded by the practice of rounding estimated weights in conjunction with species identification problems. Despite these limitations, this information does provide insight into hook up rates, catch composition, and average weight of catch. Time series catch rate data from a single tournament are also useful in elucidating cyclical peaks in species catch abundance. Although catching a thousand pound marlin continues to be a major goal of most tournament participants, catches of mahimahi (*Coryphaena hippurus*) and ahi are the mainstay of the tournament catches in Hawaii.

The project terminated in 2004 and the following two reports are currently in preparation:

1. Pelagic fishing tournaments, clubs and organizations throughout the State of Hawaii, 2003.

2. Recreational metadata: using tournament data to describe a poorly documented pelagic fishery.

Both reports will be published in the University of Hawaii's School of Oceanography and Earth Science and Technology (SOEST) technical report series in 2005.

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Appendix 7

Pelagic fisheries production from the Pacific West Coast States

Introduction

The following tables include time series for pelagic fisheries production along the US West Coast between 1984 and 2004. The 1997 annual report discusses these trends in some detail and these explanations remain current.

Table 1. Annual West Coast highly migratory species landings (mt) by species

Year	Albacore	Yellowfin	Skipjack	Bigeye	Bluefin	Swordfish	Common Thresher	Big-eye Thresher	Pelagic Thresher	Shortfin Mako	Blue shark
1984	12,657	35,063	31,251	126	635	2,890	1,279	9	57	160	2
1985	7,301	15,025	2,977	7	3,254	3,418	1,190	<.05	95	149	1
1986	5,243	21,517	1,361	29	4,731	2,530	974	<.05	48	312	2
1987	3,160	23,201	5,724	50	823	1,803	562	2	20	403	2
1988	4,908	19,520	8,863	6	804	1,636	500	1	9	322	3
1989	2,214	17,615	4,505	1	1,019	1,357	504	<.05	17	255	6
1990	3,030	8,509	2,256	2	925	1,236	357	1	31	373	20
1991	1,676	4,178	3,407	7	104	1,029	584	0	32	219	1
1992	4,885	3,350	2,586	7	1,087	1,546	292	<.05	22	142	1
1993	6,151	3,795	4,539	26	559	1,771	275	1	44	122	0
1994	10,686	5,056	2,111	47	916	1,700	330	<.05	37	128	12
1995	6,528	3,038	7,037	49	714	1,161	270	5	31	95	5
1996	14,173	3,347	5,455	62	4,688	1,191	319	1	20	96	1
1997	11,292	4,774	6,070	82	2,251	1,448	319	35	32	132	1
1998	13,785	5,799	5,846	53	1,949	1,378	326	2	11	98	3
1999	9,629	1,353	3,759	105	179	1,992	320	10	5	6	0
2000	9041	1148	780	87	312	2652	295	5	3	80	1
2001	11,183	655	58	53	196	2195	373	2	2	46	2
2002	10,028	544	236	10	11	1697	315	0	0	82	42
2003	16,643	465	349	35	36	2126	294	5	4	69	<1
2004	14,469	488	307	22	38	1185	115	5	2	54	<1

Table 2. Annual value ($) of West Coast highly migratory landings by species

Year	Albacore	Yellowfin	Skipjack	Bigeye	Bluefin	Swordfish	Common Thresher	Pelagic Thresher	Bigeye Thresher	Shortfin Mako	Blue Shark
1984	26,146,708	56,409,588	37,467,700	264,792	1,395,492	17,701,329	2,485,275	11,649	71,349	287,733	3,572
1985	12,214,354	18,206,638	2,826,414	25,900	4,127,982	19,538,942	2,660,903	843	140,433	283,043	3,319
1986	8,895,672	25,475,289	1,367,387	129,108	6,618,473	18,256,026	2,412,160	277	95,181	611,399	1,886
1987	7,085,992	33,183,108	5,982,568	244,701	2,902,340	15,405,478	1,638,772	2,560	30,721	989,632	2,566
1988	12,280,116	34,161,742	12,618,821	33,772	4,445,064	13,007,930	1,310,935	1,097	13,328	868,676	2,923
1989	4,873,362	24,112,994	5,086,365	3,004	1,684,134	10,579,050	1,202,991	191	31,313	707,408	4,631
1990	6,911,021	10,485,225	2,361,619	10,928	1,433,788	8,811,042	786,534	2,067	42,599	909,368	15,834
1991	3,349,988	4,721,908	3,130,649	50,650	137,612	7,497,271	1,145,001	0	28,944	491,477	892
1992	13,214,373	4,412,452	1,606,563	51,444	1,360,230	8,709,765	521,922	693	17,108	266,344	2,056
1993	13,001,721	6,440,417	3,498,178	238,527	841,129	10,062,551	520,120	509	32,498	248,651	681
1994	22,293,343	4,947,988	1,916,462	336,130	1,834,094	10,504,630	632,555	46	37,579	270,088	17,572
1995	12,377,227	3,260,929	5,125,387	268,465	1,129,006	7,013,279	510,733	9,389	26,730	177,076	2,994
1996	28,583,043	3,388,536	4,185,411	273,321	4,238,678	6,363,798	634,493	1,635	18,591	174,621	616
1997	20,529,493	5,254,042	5,639,463	370,331	2,896,450	6,297,358	609,285	64,543	35,781	232,737	287
1998	19,068,271	5,976,102	5,322,183	277,238	3,058,769	6,052,792	574,795	2,635	9,513	173,349	6,094
1999	17,515,551	1,468,743	2,748,208	639,668	961,423	8,309,539	616,407	18,424	5,876	109,767	83
2000	17,154,639	1,294,388	483,242	579,384	577,095	11,772,245	587,702	2,738	4,636	132,970	909
2001	20,687,195	465,558	33,633	320,855	473,821	8,696,689	595,542	2,767	8,428	75,780	1,501
2002	14,291,939	588,677	128,425	87,304	43,512	6,320,439	517,715	N.A.	N.A.	124,522	18,598
2003	24,424,823	450,925	159,961	262,768	75,396	7,797,738	476,067	2,907	3,463	113,689	714
2004	27,345,860	447,555	109,254	147,696	53,613	4,824,309	196,360	2,500	4,060	97,280	972

[1]Real values are current values adjusted to eliminate the effects of inflation by dividing current values by the current year GDP implicit price deflator, with a base year of 1999.

Table 3. Pacific coast commercial landings of highly migratory species by state, 1984-2004

	Landings (mt)										
Year	**Albacore**	**Yellowfin**	**Skipjack**	**Bigeye**	**Bluefin**	**Swordfish**	**Common Thresher**	**Pelagic Thresher**	**Bigeye Thresher**	**Shortfin Mako**	**Blue Shark**
Washington											
1984	67	N.A.	0	N.A.	0	0	0	N.A.	N.A.	N.A.	<.05
1985	172	N.A.	0	N.A.	0	0	0	N.A.	N.A.	N.A.	<.05
1986	845	N.A.	0	N.A.	0	0	82	N.A.	N.A.	N.A.	<.05
1987	529	N.A.	0	N.A.	0	0	65	N.A.	N.A.	N.A.	<.05
1988	1,900	N.A.	0	N.A.	0	2	6	N.A.	N.A.	N.A.	<.05
1989	855	N.A.	0	N.A.	0	0	3	N.A.	N.A.	N.A.	0
1990	1,225	N.A.	0	N.A.	0	0	<.05	N.A.	N.A.	N.A.	0
1991	428	N.A.	<.05	N.A.	0	0	<.05	N.A.	N.A.	N.A.	<.05
1992	1,864	N.A.	<.05	N.A.	0	0	1	N.A.	N.A.	N.A.	<.05
1993	2,167	N.A.	0	N.A.	0	1	<.05	N.A.	N.A.	N.A.	<.05
1994	5,377	N.A.	0	N.A.	0	0	<.05	N.A.	N.A.	N.A.	0
1995	3,413	N.A.	0	N.A.	0	<.05	5	N.A.	N.A.	N.A.	<.05
1996	4,969	N.A.	0	N.A.	0	0	4	N.A.	N.A.	N.A.	<.05
1997	3,775	N.A.	0	N.A.	0	0	2	N.A.	N.A.	N.A.	<.05
1998	6,517	N.A.	0	N.A.	0	0	6	N.A.	N.A.	N.A.	<.05
1999	2,074	N.A.	0	N.A.	12	4	65	N.A.	N.A.	N.A.	0
2000	3,185	N.A.	0	N.A.	0	0	0	N.A.	N.A.	N.A.	<0.5
2001	4,152	N.A.	0	N.A.	0	0	0	N.A.	N.A.	N.A.	0
2002	5,358	N.A.	0	N.A.	0	0	0	N.A.	N.A.	N.A.	0
2003	0	N.A.	0	N.A.	0	0	0	N.A.	N.A.	N.A.	0
2004	8,310	N.A.	0	N.A.	0	0	0	N.A.	N.A.	N.A.	0
Oregon											
1984	737	<.05	0	N.A.	0	0	0	N.A.	N.A.	0	0
1985	692	0	0	N.A.	0	0	2	N.A.	N.A.	0	0
1986	1,116	<.05	<.05	N.A.	0	0	424	N.A.	N.A.	0	0
1987	1,038	0	0	N.A.	<.05	0	92	N.A.	N.A.	0	0
1988	1,799	0	0	N.A.	0	0	81	N.A.	N.A.	0	0
1989	490	0	0	N.A.	0	0	<.05	N.A.	N.A.	0	0
1990	943	0	0	N.A.	0	0	<.05	N.A.	N.A.	0	<.05
1991	571	0	0	N.A.	0	0	0	N.A.	N.A.	0	<.05
1992	1,764	0	0	N.A.	0	0	1	N.A.	N.A.	0	<.05
1993	2,157	0	0	N.A.	0	0	<.05	N.A.	N.A.	0	<.05
1994	2,131	0	0	N.A.	0	0	0	N.A.	N.A.	0	<.05
1995	2,283	<.05	<.05	N.A.	<.05	3	1	N.A.	N.A.	0	<.05
1996	4,059	<.05	0	N.A.	<.05	16	<.05	N.A.	N.A.	0	1
1997	4,158	<.05	<.05	N.A.	1	6	<.05	N.A.	N.A.	0	<.05
1998	4,808	0	0	N.A.	3	35	<.05	N.A.	N.A.	1	2
1999	2,064	<.05	0	N.A.	6	6	1	N.A.	N.A.	<.05	<.05
2000	3,972	0	0	N.A.	0	0	0	N.A.	N.A.	0	1
2001	4,058	0	0	N.A.	0	0	0	N.A.	N.A.	0	2
2002	1,979	0	0	N.A.	0	0	0	N.A.	N.A.	0	<0.5
2003	4,139	0	0	N.A.	0	0	0	N.A.	N.A.	0	<1
2004	4,807	0	0	N.A.	0	0	0	N.A.	N.A.	0	<0.5
California											
1984	11,854	35,063	31,251	126	635	2,890	1,279	9	57	160	2
1985	6,437	15,025	2,977	7	3,254	3,418	1,188	<.05	95	149	1
1986	3,282	21,517	1,361	29	4,731	2,530	468	<.05	48	312	2
1987	1,592	23,201	5,724	50	823	1,803	405	2	20	403	2
1988	1,209	19,520	8,863	6	804	1,634	414	1	9	322	3
1989	870	17,615	4,505	1	1,019	1,357	501	<.05	17	255	6
1990	862	8,509	2,256	2	925	1,236	356	1	31	373	20
1991	677	4,178	3,407	7	104	1,029	584	0	32	219	1
1992	1,257	3,350	2,586	7	1,087	1,546	291	<.05	22	142	1
1993	1,827	3,795	4,539	26	559	1,770	275	1	44	122	<.05
1994	3,177	5,056	2,111	47	916	1,700	330	<.05	37	128	12
1995	832	3,038	7,037	49	714	1,159	264	5	31	95	5
1996	5,146	3,347	5,455	62	4,687	1,175	316	1	20	96	<.05
1997	3,358	4,774	6,070	82	2,250	1,442	317	35	32	132	<.05
1998	2,459	5,799	5,846	53	1,946	1,343	319	2	11	97	1
1999	5,491	1,353	3,759	105	161	1,982	253	10	5	62	<.05
2000	1,884	1,148	780	87	312	2,612	250	3	5	80	<0.5
2001	2,972	642	57	53	196	2,194	360	2	2	46	0
2002	2,692	544	236	10	9.7	1,697	315	N.A.	N.A.	82	41
2003	1,711	465	349	35	36	2,126	294	4	5	68	0
2004	1,352	488	307	22	38	1,185	114	2	5	53	0

Table 4. Pacific coast real commercial ex-vessel revenues (1999)[1] from highly migratory species by state, 1984-2004

					Revenues ($)						
Year	Albacore	Yellowfin	Skipjack	Bigeye	Bluefin	Swordfish	Common Thresher	Pelagic Thresher	Bigeye Thresher	Shortfin Mako	Blue Shark
Washington											
1984	137,861	N.A.	0	N.A.	0	0	0	N.A.	N.A.	N.A.	11
1985	292,000	N.A.	0	N.A.	0	0	0	N.A.	N.A.	N.A.	183
1986	1,348,513	N.A.	0	N.A.	0	0	303,270	N.A.	N.A.	N.A.	170
1987	1,160,514	N.A.	0	N.A.	0	0	298,466	N.A.	N.A.	N.A.	580
1988	4,666,429	N.A.	0	N.A.	0	13,526	31,385	N.A.	N.A.	N.A.	65
1989	1,730,680	N.A.	0	N.A.	0	0	10,541	N.A.	N.A.	N.A.	0
1990	2,693,806	N.A.	0	N.A.	0	0	33	N.A.	N.A.	N.A.	0
1991	818,179	N.A.	17	N.A.	0	0	287	N.A.	N.A.	N.A.	52
1992	5,014,569	N.A.	82	N.A.	0	0	655	N.A.	N.A.	N.A.	39
1993	4,603,209	N.A.	0	N.A.	0	5,907	953	N.A.	N.A.	N.A.	34
1994	10,609,267	N.A.	0	N.A.	0	0	102	N.A.	N.A.	N.A.	0
1995	6,429,656	N.A.	0	N.A.	0	328	16,541	N.A.	N.A.	N.A.	16
1996	9,515,982	N.A.	0	N.A.	0	0	11,619	N.A.	N.A.	N.A.	44
1997	7,000,641	N.A.	0	N.A.	0	0	10,922	N.A.	N.A.	N.A.	10
1998	8,962,842	N.A.	0	N.A.	0	0	19,243	N.A.	N.A.	N.A.	71
1999	3,637,282	N.A.	0	N.A.	27,772	9,445	144,232	N.A.	N.A.	N.A.	0
2000	5,837,871	N.A.	0	N.A.	0	0	0	N.A.	N.A.	N.A.	9
2001	7,951,774	N.A.	0	N.A.	0	0	0	N.A.	N.A.	N.A.	0
2002	7,441,030	N.A.	0	N.A.	0	0	0	N.A.	N.A.	N.A.	0
2003	0	N.A.	0	N.A.	0	0	0	N.A.	N.A.	N.A.	0
2004	15,891,469	N.A.	0	N.A.	0	0	0	N.A.	N.A.	N.A.	0
Oregon											
1984	1,367,247	277	0	N.A.	0	0	0	N.A.	N.A.	0	0
1985	1,204,367	0	0	N.A.	0	0	3,064	N.A.	N.A.	0	0
1986	1,891,052	173	4	N.A.	0	0	874,406	N.A.	N.A.	0	0
1987	2,319,249	0	0	N.A.	9	0	214,998	N.A.	N.A.	0	0
1988	4,444,898	0	0	N.A.	0	0	180,477	N.A.	N.A.	0	0
1989	1,142,060	0	0	N.A.	0	0	19	N.A.	N.A.	0	0
1990	2,167,028	0	0	N.A.	0	0	664	N.A.	N.A.	0	69
1991	1,166,314	0	0	N.A.	0	0	0	N.A.	N.A.	0	73
1992	4,554,091	0	0	N.A.	0	0	1,228	N.A.	N.A.	0	99
1993	4,350,334	0	0	N.A.	0	0	498	N.A.	N.A.	0	130
1994	4,103,617	0	0	N.A.	0	0	0	N.A.	N.A.	0	93
1995	4,332,302	336	9	N.A.	454	25,141	1,681	N.A.	N.A.	0	192
1996	7,801,152	9	0	N.A.	1,203	125,422	234	N.A.	N.A.	0	438
1997	7,567,729	536	424	N.A.	3,332	51,790	199	N.A.	N.A.	0	209
1998	6,665,217	0	0	N.A.	15,783	263,820	114	N.A.	N.A.	2,726	5,628
1999	3,782,057	198	0	N.A.	38,117	46,955	2,588	N.A.	N.A.	787	48
2000	7,487,569	0	0	N.A.	0	0	1,190	N.A.	N.A.	0	529
2001	7,544,089	0	0	N.A.	0	0	0	N.A.	N.A.	0	1,211
2002	2,951,707	0	0	N.A.	0	0	0	N.A.	N.A.	0	244
2003	6,125,406	0	0	N.A.	0	0	0	N.A.	N.A.	0	677
2004	9,006,482	0	0	N.A.	0	0	0	N.A.	N.A.	0	871
California											
1984	24,641,599	56,409,311	37,467,700	264,792	1,395,492	17,701,329	2,485,275	11,649	71,349	287,733	3,561
1985	10,717,987	18,206,638	2,826,414	25,900	4,127,982	19,538,942	2,657,839	843	140,433	283,043	3,136
1986	5,656,107	25,475,116	1,367,383	129,108	6,618,473	18,256,026	1,234,483	277	95,181	611,399	1,716
1987	3,606,229	33,183,108	5,982,568	244,701	2,902,331	15,405,478	1,125,308	2,560	30,721	989,632	1,986
1988	3,168,789	34,161,742	12,618,821	33,772	4,445,064	12,994,405	1,099,073	1,097	13,328	868,676	2,858
1989	2,000,622	24,112,994	5,086,365	3,004	1,684,134	10,579,050	1,192,430	191	31,313	707,408	4,631
1990	2,050,187	10,485,225	2,361,619	10,928	1,433,788	8,811,042	785,836	2,067	42,599	909,368	15,765
1991	1,365,494	4,721,908	3,130,632	50,650	137,612	7,497,271	1,144,714	0	28,944	491,477	767
1992	3,645,713	4,412,452	1,606,481	51,444	1,360,230	8,709,765	520,038	693	17,108	266,344	1,918
1993	4,048,179	6,440,417	3,498,178	238,527	841,129	10,056,643	518,669	509	32,498	248,651	517
1994	7,580,459	4,947,988	1,916,462	336,130	1,834,094	10,504,630	632,452	46	37,579	270,088	17,479
1995	1,615,269	3,260,593	5,125,378	268,465	1,128,552	6,987,810	492,511	9,389	26,730	177,076	2,785
1996	11,265,909	3,388,527	4,185,411	273,321	4,237,475	6,238,375	622,640	1,635	18,591	174,621	135
1997	5,961,123	5,253,506	5,639,039	370,331	2,893,118	6,245,568	598,164	64,543	35,781	232,737	67
1998	3,440,213	5,976,102	5,322,183	277,238	3,042,986	5,788,972	555,437	2,635	9,513	170,623	395
1999	10,102,663	1,468,544	2,748,208	639,668	895,534	8,253,140	469,587	18,424	5,876	108,980	35
2000	3,829,200	1,294,388	483,242	579,384	576,439	11,770,080	485,073	2,736	4,636	136,698	294
2001	5,191,333	445,861	32,878	320,753	472,785	8,695,855	584,636	2,767	8,428	75,572	0
2002	3,899,203	588,677	128,245	87,304	33,148	6,320,439	517,427	N.A.	N.A.	124,522	18,351
2003	2,600,649	450,925	159,961	262,768	73,863	7,796,022	475,014	2,907	3,463	113,502	0
2004	2,447,909	447,555	109,254	147,696	53,483	4,824,134	195,373	2,500	4,060	97,141	0

<u>Appendix 8</u>

NMFS Pacific Island Fisheries Science Center 2003 Publications

At the Pacific Island Fisheries Science Center (PIFSC), scientists assess and investigate the dynamics of various tuna and billfish species in the central Pacific Ocean as well as Pacific island resources such as bottomfish, lobster, deep sea shrimp, and other fishery resources associated with deep-sea seamounts. This work contributes to basic fisheries science and supports the Western Pacific Regional Fishery Management Council. PIFSC scientists conduct research and recovery work on the threatened green sea turtle and the endangered Hawaiian monk seal and increasingly have focused on issues concerning fisher-protected species interactions. Staff scientists study the effects of environmental changes and human activities on fisheries and marine animal habitats and ecosystems and there is a new research emphasis oriented towards coral reef ecosystems.

This research collectively supports two primary goals of NMFS: to build sustainable fisheries and to recover protected species. These goals support the Magnuson-Stevens Fishery Conservation and Management Act, the Marine Mammal Protection Act, and the Endangered Species Act. Geographic areas of study are wide ranging, from the mid-Pacific pelagic oceanic environment, to the Northwestern Hawaiian Islands and the main Hawaiian Islands, to other central and western Pacific islands, including American Samoa, Guam, and the Northern Mariana Islands. Key programs include ecosystem and environment, stock assessment, fish biology and ecology, fishery management and performance, and protected species.

The following list of publications (both formal and informal) summarizes the basic science and statistics work pertaining to pelagic fisheries and related issues conducted by PIFSC over the past year.

Publications

Balazs, G. H., and M. Chaloupka.
2004. Thirty-year recovery trend in the once depleted Hawaiian green sea turtle stock. Biol. Conserv. 117:491-498.

Balazs, G. H., and M. Chaloupka.
2004. Spatial and temporal variability in somatic growth of green sea turtles (*Chelonia mydas*) resident in the Hawaiian Archipelago. Mar. Biol. 145:1043-1059.

Caretta, J. V., K. A. Forney, M. M. Muto, J. Barlow, J. Baker, and M. Lowry.
2004. U.S. Pacific Marine Mammal Stock Assessments: 2003. U.S. Dep. Commer., NOAA Tech. Memo. NOAA-TM-NMFS-SWFSC-358, 291 p.

Chaloupka, M., D. Parker, G. Balazs.

2004. Modelling post-release mortality of loggerhead sea turtles exposed to the Hawaii-based pelagic longline fishery. Mar. Ecol. Prog. Ser. 280:285-293.

Craig, P., D. Parker, R. Brainard, M. Rice, and G. Balazs.
2004. Migrations of green turtles in the central South Pacific. Biol. Conserv. 116:433-438.

DeMartini, E. E.
2004. Habitat and endemism of recruits to shallow reef fish populations: selection criteria for no-take MPAs in the NWHI coral reef ecosystem reserve. Bull. Mar. Sci. 74(1):185-205.

DeMartini, E. E., and A. M. Friedlander.
2004. Spatial patterns of endemism in shallow-water reef fish populations of the Northwestern Hawaiian Islands. Mar. Ecol. Prog. Ser. Vol. 271:281-296.

Johanos, T. C., and J. D. Baker.
2004. The Hawaiian monk seal in the Northwestern Hawaiian Islands, 2001. U.S. Dep. Commer., NOAA Tech. Memo. NOAA-TM-NMFS-PIFSC-1, 134 p.

Littnan, C. L., J. D. Baker, F. A. Parrish, and G. J. Marshall.
2004. Effects of video camera attachment on the foraging behavior of immature Hawaiian monk seals. Mar. Mammal Sci. 20(2):345-352.

Mundy, B. C., and F. A. Parrish.
2004. New records of the fish genus Grammatonotus (Teleostei: Perciformes: Percoidei: Callanthiidae) from the central Pacific, including a spectacular species in the Northwestern Hawaiian Islands. Pac. Sci. 58(3):403-417.

Parrish, F. A., and R. C. Boland.
2004. Habitat and reef-fish assemblages of banks in the Northwestern Hawaiian Islands. Mar. Biol. 144:1065-1073.

Polovina, J. J., G. H. Balazs, E. A. Howell, D. M. Parker, M. P. Seki, and P. H. Dutton.
2004. Forage and migration habitat of loggerhead (*Caretta caretta*) and olive ridley (*Lepidochelys olivacea*) sea turtles in the central North Pacific Ocean. Fish. Oceanogr. 13:(1)36-51.

Preskitt, L. B., P. S. Vroom, and C. M. Smith.
2004. A rapid ecological assessment (REA) quantitative survey method for benthic algae using photoquandrats with SCUBA. Pac. Sci. 58(2):201-209.

Robson, B. W., M. E. Goebel, J. D. Baker, R. R. Ream, T. R. Loughlin, R. C. Francis, G. A. Antonelis, and D. P. Costa.
2004. Separation of foraging habitat among breeding sites of a colonial marine predator, the northern fur seal (*Callorhinus ursinus*). Can. J. Zool. 82:20-29.

Vroom, P. S., and I. A. Abbott.
2004. *Acrosymphyton brainardii* sp. nov. (Gigartinales, Rhodophyta) from French Frigate Shoals, northwestern Hawaiian Islands. Phycologia 43(1), 68-74.

Vroom, P. S., and I. A. Abbott.
2004. *Scinaia huismanii* sp. nov. (Nemaliales, Rhodophyta): an addition to the exploration of the marine algae of the Northwestern Hawaiian Islands. Phycologia 43(4), 445-454.

Work, T. M., G. H. Balazs, R. A. Rameyer, and R. A. Morris.
2004. Retrospective pathology survey of green turtles *Chelonia mydas* with fibropapillomatosis in the Hawaiian Islands, 1993-2003. Dis. Aquat. Org. 62:163-176.

Yochem, P. K., R. C. Braun, B. Ryon, J. D. Baker, and G. A. Antonelis.
2004. Contingency plan for Hawaiian monk seal unusual mortality events. U.S. Dep. Commer., NOAA Tech. Memo. NOAA-TM-NMFS-PIFSC-2, 195 p.

Administrative Reports

Curran, D., and J. Kendig (editors).
2004. Research, fishery monitoring, and other activities at the Pacific Islands Fisheries Science Center related to tuna and tuna-like species during May 1, 2003 -April 30, 2004–A Report of the 55th Tuna Conference. Pacific Islands Fish. Sci. Cent., Natl. Mar. Fish. Serv., NOAA, Honolulu, HI 96822-2396. Pacific Islands Fish. Sci. Cent. Admin. Rep. H-04-07, 26 p.

Hamm, D. C., N. T. S. Chan, and C. J. Graham (editors).
2004. Fishery statistics of the western Pacific, Volume 19. Pacific Islands Fish. Sci. Cent., Natl. Mar. Fish. Serv., NOAA, Honolulu, HI 96822-2396. Pacific Islands Fish. Sci. Cent. Admin. Rep. H-04-08.

O’Malley, J. M.
2004. Trap-weight influence on catches of Hawaiian spiny lobster (*Panulirus marginatus*) and scaly slipper lobster (*Scyllarides squammosus*) from the Northwestern Hawaiian Islands. Pacific Islands Fish. Sci. Cent., Natl. Mar. Fish. Serv., NOAA, Honolulu, HI 96822-2396. Pacific Islands Fish. Sci. Cent. Admin. Rep. H-04-06, 12 p.

Stewart, B. S., and P. K. Yochem.
2004. Use of marine habitats by Hawaiian monk seals (*Monachus schauinslandi*) from Kure Atoll: Satellite-linked monitoring in 2001-2002. Pacific Islands Fish. Sci. Cent., Natl. Mar. Fish. Serv., NOAA, Honolulu, HI 96822-2396. Pacific Islands Fish. Sci. Cent. Admin. Rep. H-04-01C, 109 p.

Stewart, B. S., and P. K. Yochem.
2004. Use of marine habitats by Hawaiian monk seals (*Monachus schauinslandi*) from Laysan Island: Satellite-linked monitoring in 2001-2002. Pacific Islands Fish. Sci. Cent., Natl. Mar. Fish. Serv., NOAA, Honolulu, HI 96822-2396. Pacific Islands Fish. Sci. Cent. Admin. Rep. H-04-02C, 127 p.

Stewart, B. S.
2004. Foraging ecology of Hawaiian monk seals (*Monachus schauinslandi*) at Pearl and Hermes Reef, Northwestern Hawaiian Islands: 1997-1998. Pacific Islands Fish. Sci. Cent., Natl. Mar. Fish. Serv., NOAA, Honolulu, HI 96822-2396. Pacific Islands Fish. Sci. Cent. Admin. Rep. H-04-03C, 57 p.

Stewart, B. S., and P. K. Yochem.
2004. Dispersion and foraging of Hawaiian monk seals (*Monachus schauinslandi*) near Lisianski and Midway Islands: 2000-2001. Pacific Islands Fish. Sci. Cent., Natl. Mar. Fish. Serv., NOAA, Honolulu, HI 96822-2396. Pacific Islands Fish. Sci. Cent. Admin Rep. H-04-04C, 94 p.

Stewart, B. S.
2004. Geographic patterns of foraging dispersion of Hawaiian monk seals (*Monachus schauinslandi*) at the Northwestern Hawaiian Islands. Pacific Islands Fish. Sci. Cent., Natl. Mar. Fish. Serv., NOAA, Honolulu, HI 96822-2396. Pacific Islands Fish. Sci. Cent. Admin Rep. H-04-05C, 25 p.

Abstracts

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2004. Potential factors influencing vital rates of the endangered Hawaiian monk seal in the main Hawaiian Islands. [Abstr.] 18th Annual Meeting of the Society for Conservation Biology, New York City, New York, July 30 to August 2, 2004.

Balazs, G. H., and M. Chaloupka.
2004. Recovery trend over 32 years at the Hawaiian green turtle rookery of French Frigate Shoals: will remote cameras monitor nesting seasons of the future? [Abstr.] Third Scientific Symposium of the Northwestern Hawaiian Islands, Hawaii Convention Center, November 2-4, 2004.

Bennett, P. A., U. Keuper-Bennett, M. Chaloupka, and G. H. Balazs.
2004. Population dynamics of Hawaiian green turtles at Honokowai, West Maui, Hawaii. [Abstr.] Proceedings of the 25th Annual Symposium on Sea Turtle Biology and Conservation, Savannah, Georgia, January 25, 2005.

Boland, R., B. Zgliczynski, J. Asher, A. Hall, K. Hogrefe, and M. Timmers.
2004. Estimating the "overfishing" of marine debris by pairing debris removal efforts and accumulation rates. [Abstr.] Third Scientific Symposium of the Northwestern Hawaiian Islands, Hawaii Convention Center, November 2-4, 2004.

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2004. Modelling the behavior of green sea turtle population dynamics in the Hawaiian Archipelago using long-term studies. [Abstr.] Proceedings of the Twenty-fifth Annual Symposium on Sea Turtle Biology and Conservation, Savannah, Georgia, January 18-22, 2005.

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2004. Modelling post-release mortality of pelagic loggerhead sea turtles exposed to the Hawaii-based pelagic longline fishery. [Abstr.] Proceedings of the Twenty-fifth Annual Symposium on Sea Turtle Biology and Conservation, Savannah, Georgia, January 18-22, 2005.

Hansen, L., P. Zarate, O. Chassin, G. Balazs, L. Sarti, and P. Dutton.
2004. Stock structure and gene flow among green turtle nesting populations in the eastern Pacific based on microsatellite analysis. [Abstr.] Proceedings of the 25th Annual Symposium on Sea Turtle Biology and Conservation, Savannah, Georgia, January 25, 2005.

Howell, E. A., D. R. Kobayashi, and J. J. Polovina.
2004. Incorporating satellite remotely sensed environmental data into a Generalized Additive Model (GAM) to predict bigeye tuna CPUE at Palmyra Atoll. [Abstr.] Oral presentation at conference “Active and Passive Remote Sensing of the Oceans,” SPIE’s Fourth International Asia-Pacific Environmental Remote Sensing Symposium: Remote Sensing of the Atmosphere, Ocean, Environment, and Space, November 8-12, 2004, Waikiki Beach Marriott Resort, Honolulu, Hawaii.

Howell, E. A., D. R. Kobayashi, and J. J. Polovina.
2004. Palmyra revisited: using a Generalized Additive Model to predict bigeye CPUE at the Palmyra Fishing Grounds. [Abstr.] 55th Annual Tuna Conference, May 24-27, 2004, Lake Arrowhead, California.

Kenyon, J. C., R. E. Brainard, R. K. Hoeke, F. A. Parrish, and C. B. Wilkinson.
2004. Towed-diver surveys, a method for mesoscale spatial assessment of benthic reef habitat: a case study at Midway Atoll in the Hawaiian Archipelago. [Abstr.] For presentation at the Coastal Zone Asia Pacific Conference 2004, Brisbane, Australia, September 5-9, 2004. Sponsored by Australian Government National Oceans Office and Department of the Environment.

Lammers, M. O., R. E. Brainard, and W. W. L. Au.
2004. Diurnal trends in the mid-water biomass community of the Northwestern Hawaiian Islands observed acoustiscally. [Abstr.] For Conference of the Acoustical Society of America, San Diego, California, November 2004.

Littnan, C. L.
2004. At-sea movements, foraging areas, and habitat use of Hawaiian monk seals in the main Hawaiian Islands. [Abstr.] 18th Annual Meeting Society for Conservation Biology, July 30 to August 2, 2004, New York, New York.

Miller, J. E., S. Ferguson, J. Rooney, B. Appelgate, J. R. Smith, and R. E. Brainard.
2004. NOAA partnerships for seafloor habitat mapping in the Pacific Islands Region. [Abstr.] 2004 Western Pacific Geophysics Meeting, Hawaii Convention Center, Honolulu, Hawaii, August 16-20, 2004.

Miller, J. E., R. E. Hoeke, S. Ferguson, M. Parke, B. Appelgate, J. R. Smith, and S. Bevacqua.
2004. Bathymetric atlas and website for the Northwestern Hawaiian Islands. [Abstr.] Northwestern Hawaiian Islands Third Scientific Symposium, Honolulu, Hawaii, November 2-4, 2004.

Moffitt, R. A., R. E. Brainard, R. Hoeke, A. E. Strong, W. Skirving, J. Sibert, D. Foley.
2004. Oceangraphic atlas of the Pacific: an accessible interface to the marine environmental data. [Abstr.] 55th Annual Tuna Conference, May 24-27, 2004, Lake Arrowhead, California.

Noah, M. D., G. S. Schorr, and J. R. Stephenson.
2004. Impacts on the shallow water benthic habitat caused by derelict fishing gear, Pearl and Hermes Atoll, Northwestern Hawaiian Islands. [Abstr.] PACON 2004 New Technologies, New Opportunities, Waikiki Beach Marriott Resort, Honolulu, Hawaii, May 30 to June 4, 2004.

Polovina, J. J., and E. A. Howell.
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Pooley, S. G., and M. Pan.
2004. Economic research on the NWHI – and historical perspective. [Abstr.] Third Northwestern Hawaiian Islands Science Symposium, Hawaii Convention Center, November 2-4, 2004.

Rooney, J., J. Miller, S. Ferguson, J. Chojnacki, M. Moews, B. Appelgate, M. Parke, and R. E. Brainard.
2004. Characterization of Pacific Island benthic habitats – putting the pieces together. [Abstr.] AGU 2004 Western Geophysics Meeting, Honolulu, Hawaii, August 16-20, 2004.

Ryon, B., and C. Littnan.
2004. Hawaiian monk seals: Research, management, and conservation of an endangered species. [Abstr.] Poster presentation at public meeting: Hanauma Bay Marine Conservation Evening, March 6, 2004.

Stephenson, J. R., and G. S. Schorr.
2004. Derelict fishing gear in the coral reef ecosystem of the Northwestern Hawaiian Islands. [Abstr.] Coastal and Estuarine Habit Restoration, Seattle, Washington, September 12-15, 2004.

Walsh, W. A.
2004. Recent progress in studies of logbook data quality for billfishes in the Hawaii-based longline fishery. [Abstr.] 55th Annual Tuna Conference, May 24-27, 2004, Lake Arrowhead, California.

Appendix 9

The Pelagic Fisheries Research Program

The Pelagic Fisheries Research Program (PFRP) was established in 1992 after the Magnuson Fishery Conservation and Management Act (1976) was amended to include "highly migratory fish." The PFRP was created to provide scientific information on pelagic fisheries to the Council for use in development of fisheries management policies

The PFRP is located at the Joint Institute for Marine and Atmospheric Research (JIMAR), under the University of Hawaii's School of Ocean and Earth Science and Technology (SOEST). The first PFRP projects were established in late 1993, and work on these projects began in 1994. In order for the Council to determine "optimum use" of these valuable fishery resources, information is required from a broad spectrum of research disciplines, e.g., biology, genetics, statistics, socio-cultural. The PFRP has funded more than 75 research projects and solicits for new research proposals as federal funding permits. Most project investigators are affiliated with regional research institutes, such as the National Marine Fisheries Service (NMFS), Secretariat of the Pacific Community (SPC), and other universities.

PFRP Projects receiving funding in calendar year 2004:

A=Administration, S=Statistics & Modeling, E=Economics, O=Oceanography, B=Biology, C=Socio-cultural, P=Protected Species

1. A - JIMAR Visiting Scientist Program
2. A - Pelagic Fisheries Research Program, Management Portion
3. S - Pelagic Fisheries Research Program, Modeling Portion
4. B - Describing the Vertical Habitat of Bigeye and Albacore Tunas and Post Release Survival for Marlins in the Central Pacific Longline Fisheries with Pop-Up Archival Transmitting Tags
5. C - A Sociological Baseline of Hawaii's Longline Fishery
6. E - Modeling Longline Effort Dynamics and Protected Species Interaction
7. O - Trophic Structure and Tuna Movement in the Cold Tongue-Warm Pool Pelagic Ecosystem of the Equatorial Pacific
8. P - A General Bayesian Integrated Population Dynamics Model for Protected Species
9. P - Integrated Statistical Model for Hawaiian Albatross Populations
10. P - Development of a Hierarchical Model to Estimate Sea Turtle Rookery Contributions to Mixed Stocks in Foraging Habitats
11. S - Mixed Resolution Models for Investigating Individual to Population Scale Spatial Dynamics
12. S - Causes of Rapid Declines in World Billfish Catch Rates
13. B - Instrumented Buoys as Autonomous Observatories of Pelagic Ecosystems
14. B - Investigation of Aggregation Behavior of FAD-Associated Small Yellowfin Tuna and Size Dependant Vertical Stratification

15. B - Fishery Dynamics in the Samoan Archipelago
16. C - An Analysis of Archaeological and Historical Data on Fisheries for Pelagic Species in Guam and the Northern Mariana Islands
17. E - Spatial Modeling of the Tradeoff between Sea Turtle Take Reduction and Economic Returns to the Hawaii Longline Fishery
18. C - Human Dimensions Analysis of Hawaii's Ika-Shibi Fishery
19. P - Diet Dynamics and Trophic Relations of Laysan and Black-footed Albatrosses
20. S - Evaluation of Data Quality for Catches of Several Pelagic Management Unit Species by Hawai'I-based Longline Vessels and Exploratory Analyses of Historical Catch Records from Japanese Longline Vessels
21. P - Comparing Sea Turtle Distributions and Fisheries Interactions in the Atlantic and Pacific
22. S - Addition of Multi-species Capability, Sex Structure and other Enhancements to the Length-based, Age-structured Modeling Software MULTIFAN-CL

PFRP Publications List for FY 2004

Publications in Refereed Journals

Bolker, B., T. Okuyama, K. Bjorndal, and A. Bolten, 2003. Stock estimation for sea turtle populations using genetic markers: accounting for sampling error of rare genotypes. Ecological Applications, 13(3): 763-775.
Gillis T.E., C.D. Moyes and G.F. Tibbits, 2003. Sequence mutations in teleost cardiac troponin C that are permissive of high Ca^{2+} affinity of site II. *Am. J. Physiol*. 284: C1176-C1184, 2003.

Leary S.C., C.N. Lyons, A.G. Rosenberger, J.S. Ballantyne, J. Stillman and C.D. Moyes, 2003**.** Fiber-type differences in muscle mitochondrial profiles. *Am. J. Physiol.* 285: R817-R826, 2003.

McClelland, G.B., C.S. Kraft, D. Michaud, J.C. Russell, C.R. Mueller and C.D. Moyes, 2004. Leptin and the control of respiratory gene expression in muscle. *Biochiim. Biophys. Acta*, 1688: 86-93.

Moyes, C.D, 2004. Controlling muscle mitochondrial content. *J. Exp. Biol*., 206: 4385-439.

Moyes C.D., and D.L. Hood, 2003. Origins and consequences of mitochondrial variation. *Ann. Rev. Physiol.* 65:177-201.

Pradhan, N.C. and P.S. Leung, 2004. Modeling entry, stay, and exit decisions of the longline fishers in Hawaii. *Marine Policy,* 28:311-324.

Pradhan, N.C., K.R. Sharma and P.S. Leung, 2003. Analyzing technological and economic Interrelationships in Hawaii’s longline fishery. *Marine Resource Economics*, 18:167-193.

Sharma, K.R., N.C. Pradhan, and P.S. Leung, 2003. Technological and economic interrelationships in Hawaii's troll and handline fisheries. *North American Journal of Fisheries Management*, 23:869-882.

Ward, P., R. A. Myers, and W. Blanchard. 2004. Fish lost at sea: the effect of soak time and timing on pelagic longline catches. Fishery Bulletin 102:179–195

Other Papers, Reports, and Manuscripts Submitted

Bigelow, K., M. Musyl, and F. Poisson. Manuscript detailing the effects of current vectors on predicting catenary depths for over 600 longline sets instrumented with TDRs. (manuscript in prep).

Bolker, Ben, and Toshinori Okuyama. Using ecological covariates to strengthen sea turtle mixed stock analysis. Presentation at the 24th Annual Symposium on Sea Turtle Biology and Conservation, San Jose, Costa Rica 22-29 February 2004 (runner-up student prize awarded to Toshinori Okuyama).

Bolker, B., T. Okuyama, K. Bjorndal, and A. Bolten, 2003. Accounting for sampling error of rare genotypes in sea turtle stock estimation. Page 252 in: J.A. Seminoff, compiler. Proceedings of the 22nd Annual Symposium on Sea Turtle Biology and Conservation. NOAATechnical Memorandum NMFS-SEFSC-503.

Brill, R. and M. Musyl. Movements and habitat preferences of swordfish in the Pacific Ocean. (manuscript in prep).

Brill, R.W. K.A. Bigelow, M.K. Musyl, K.A. Fritsches, and E.J. Warrant. Bigeye tuna behavior and physiology: their relevance to stock assessments and fishery biology. ICCAT SCRS Report. (submitted)

Dalziel, A.C., S.E. Moore, C.D. Moyes. Control Of Mitochondrial Enzyme Content In the Muscles of High Performance Fish. Submitted to *Am J Physiol* March 2004. (Fish samples were collected during PFRP cruises and PFRP support is acknowledged)

Gillis T.E., C.D. Moyes and G.F. Tibbits. Sequence mutations in teleost cardiac troponin C that are permissive of high Ca^{2+} affinity of site II. *Am. J. Physiol.* (in press 2003).

Hoyle, Simon D., and Maunder, Mark N. A Bayesian integrated population dynamics model to analyze data for protected species. *Animal Biology and Conservation.* (in press)

Humphreys, Robert L., Michael Musyl and Edward E. DeMartini. SC/04/SWO-WG/02 Biological Research Conducted During 2002-2003 in Support of Swordfish Stock Assessment

Leung, PingSun, Cai, J., Pooley, Samuel. G., and Pan, Minling, 2004. Linkages of Fishing Sectors to Hawaii's Economy and Economic Impacts of Hawaii's Longlining Regulations (under review)

Malte, H., C. Larsen, M.K. Musyl, and R.W. Brill. Differential heating and cooling rates in bigeye tuna (*Thunnus obesus*); a model of non-steady state heat exchange. *American Journal of Physiology*. (submitted).

Moyes, C.D., N. Fragoso, M. Musyl, and R. Brill. Evaluating predictors of post-release survival of large pelagics. In preparation for submission to *Science* 6/04 (Funded in whole by PFRP)

Musyl, M. and R. Brill. Post release mortality and movements in blue shark identified with PSATs. (manuscript in prep).

Nielsen, A., K. Bigelow, J. Sibert, M. Musyl, et al. Manuscript detailing results of PSAT-GPS double tagging studies with incorporation of SST into the Kalman filter. (manuscript in prep).

Pan, Minling, 2003. Quantitative Measurement of Fishing Capacity for the Western Pacific Fisheries (under review).

Pan, Minling, and Samuel G. Pooley, 2004. Tuna Price in Relation to Economic Factors and Sea Surface Temperature (submitted for publication).

Pan, Minling, and SMS Research Inc., 2004. Fishery Input-Output Model & Methodology I/O paper (working paper – prepared for JIMAR publication)

Pradhan, N.C. and P.S. Leung. Modeling trip choice behavior of the longline fishers in Hawaii. *Fisheries Research* (forthcoming).

Pradhan, N.C. and P.S. Leung. A Poisson and negative binomial regression model of sea turtle interactions in Hawaii's longline fishery. *Ecological Economics* (under review).

Swimmer, Y., R. Arauz, M. Musyl, J. Ballestero, L. McNaughton, and R. Brill, 2004. Survivorship and dive behaviour of olive ridley sea turtles after their release from longline fishing gear off Coasta Rica. (manuscript in preparation).

Conference Presentations

Allen, Stewart, and Amy Gough. Progress on the Sociological Baseline of Hawaii-Based Longline Fishery Project. Presentation at the PFRP Principal Investigators Meeting, Honolulu, Hawaii, December 9-11, 2003.

Allen, Stewart, and Amy Gough. Sociological baseline of Hawaii's longline industry. Poster presentation for the JIMAR Program Review, March 4-5, 2004.

Allen, Stewart, and Amy Gough. Monitoring Environmental Justice Issues of Fishery Regulations. Paper accepted for presentation at Fourth World Fisheries Congress, Vancouver, B.C., May 2-6, 2004.

Bolker, Ben. Bayesian Hierarchical Methods for Mixed Stock Analysis of Sea Turtles. Presentation at the PFRP Principal Investigators Meeting, Honolulu, Hawaii, December 9-11, 2003.

Brill, Richard, and Michael Musyl. Use of pop-up satellite archival tags (PSATS) to determine the movements and post release survivability of swordfish, marlins, sharks and tunas in the central North Pacific Ocean. In: Proceedings of the 54th Annual Tuna Conference. Lake Arrowhead, California, May 13-16. 2003.

Brill, R. and Y. Swimmer. 2003. Laboratory Experiments Aimed at Reducing Pelagic Longline Interactions with Marine Turtles. In: Proceedings of the 54th Annual Tuna Conference. Lake Arrowhead, California, May 13-16. 2003.

Brill, Richard, and Michael Musyl. Fishery Interaction and Movements of Swordfish as Determined with PSATs. Presentation at the PFRP Principal Investigators Meeting, Honolulu, Hawaii, December 9-11, 2003.

Brill, R.W. K.A. Bigelow, M.K. Musyl, K.A. Fritsches, and E.J. Warrant. Bigeye tuna behavior and physiology: Their relevance to stock assessments and fishery biology. Invited presentation at the Second World Meeting on Bigeye Tuna, Madrid, Spain. March 2004.
Curran, Daniel, Jennifer Schulz, Paul Dalzell, and Stewart Allen. History and importance of fish aggregating devices in Hawaii's recreational tournament fisheries. In: Proceedings of the 54th Annual Tuna Conference. Lake Arrowhead, California, May 13-16. 2003.

Dagorn, Laurent, Kim Holland, and David Itano. Movement Patterns of Tunas in a Network of FADs around Oahu. Presentation at the PFRP Principal Investigators Meeting, Honolulu, Hawaii, December 9-11, 2003.

Graham, Brittany, Kim Holland, Brian Popp, V. Allain, Robert Olson, F. Galvan, B. Fry, and Dean Grubbs. Tuna trophic dynamics in the western and central tropical Pacific. In: Proceedings of the 54th Annual Tuna Conference. Lake Arrowhead, California, May 13-16. 2003.

Graham, Brittany, Valerie Allain, Brian Fry, Robert Olson, Felipe Galvan Magana, and Brian Popp. Trophic Structure and Tuna Movement in the Cold Tongue-Warm Pool Pelagic Ecosystem of the Equatorial Pacific. Presentation at the PFRP Principal Investigators Meeting, Honolulu, Hawaii, December 9-11, 2003.

Grubbs, Dean, and Kim Holland. Yellowfin and bigeye tuna in Hawai'i: Dietary overlap, prey diversity and the trophic cost of associating with natural and man-made structures. In: Proceedings of the 54th Annual Tuna Conference. Lake Arrowhead, California, May 13-16. 2003.

Hawn, Donald R., Michael P. Seki, and Robert Nishimoto. Investigating the life history of opah and monchong in the north Pacific. In: Proceedings of the 54th Annual Tuna Conference. Lake Arrowhead, California, May 13-16. 2003.

Hawn, Donald, Michael Seki, Robert Nishimoto, Evan Howell, and Jeffrey Polovina. Status of Research on the Biology and Ecology of Opah, Lampris guttatus. Presentation at the PFRP Principal Investigators Meeting, Honolulu, Hawaii, December 9-11, 2003.

Holland, Kim, Laurent Dagorn, and David Itano. Temporal characteristics of FAD-associated behavior of tuna. In: Proceedings of the 54th Annual Tuna Conference. Lake Arrowhead, California, May 13-16. 2003.

Holland, K., D. Grubbs, B. Graham, D. Itano and L. Dagorn. The biology of FAD-associated tuna: Temporal dynamics of associated and feeding ecology. Presentation at the 16th Standing Committee on Tuna and Billfish Meeting (SCTB 16), July 9-16, 2003, Mooloolaba, Australia.

Holland, Kim, and Laurent Dagorn. Fish aggregating devices as autonomous observatories of pelagic ecosystems: A research project. Poster presentation for the JIMAR Program Review, March 4-5, 2004.

Hoyle, Simon D. Modeling dolphins. Presentation to SWFSC methods working group.
Hoyle, Simon D. Statistical and simulation modeling of population dynamics for management - 3 examples. Presentation at University of Arizona.

Hoyle, Simon D., and Mark N. Maunder. A Bayesian integrated population dynamics model to analyze data for the eastern Pacific Ocean spotted dolphin. Presentation at the EURING technical meeting in Radolfzell, Germany, October 2003.

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Appendix 10

GLOSSARY

TERM	DEFINITION
Alia	Samoan fishing catamaran, about 30 feet long, constructed of aluminum or wood with fiberglass. Used for various fisheries including trolling, longline, and bottomfishing
AP	Advisory Panel. Appointed industry/government/educational representatives functioning in an advisory capacity to the Council.
AS	American Samoa. Includes the islands of Tutuila, Manua, Rose and Swains Atolls.
ASDPW	Department of Public Works, American Samoa. Also, DPW.
Bycatch	Fish caught in a fishery but discarded or released, except in a recreational fisheries catch and release program.
Commercial	Commercial fishing, where the catch is intended to be sold, bartered, or traded.
CNMI	Commonwealth of the Northern Mariana Islands. Also, Northern Mariana Islands, Northern Marianas, and NMI. Includes the islands of Saipan, Tinian, Rota, and many others in the Marianas Archipelago.
CPUE	Catch-Per-Unit-Effort. A standard fisheries index usually expressed as numbers of fish caught per unit of gear per unit of time, eg., number of fish per hook per line-hour or number of fish per 1,000 hooks. The term catch rate is sometimes used when data are insufficiently detailed to calculate an accurate CPUE.
DAWR	Division of Aquatic & Wildlife Resources, Territory of Guam.
DBEDT	Department of Business, Economic Development & Tourism, State of Hawaii.
DFW	Division of Fish & Wildlife, Northern Mariana Islands.
DLNR	Department of Land & Natural Resources, State of Hawaii. Parent agency for Division of Aquatic Resources (HDAR).
DMWR	Department of Marine & Wildlife Resources, American Samoa. Also, MWR.
EEZ	Exclusive Economic Zone, refers to the sovereign waters of a nation, recognized internationally under the United Nations Convention on the Law of the Sea as extending out 200 nautical miles from shore. Within the U.S., the EEZ typically is between three and 200 nautical miles from shore.
ESA	Endangered Species Act. An Act of Congress passed in 1966 that establishes a federal program to protect species of animals whose survival is threatened by habitat destruction, overutilization, disease etc.
FAD	Fish Aggregating Device; a raft or pontoon, usually tethered, and under which, pelagic fish will concentrate.
FDCC	Fishery Data Coordinating Committee, WPRFMC.
FFA	Forum Fisheries Agency. An agency of the South Pacific Forum, which comprises the independent island states of the South Pacific, Australia and New Zealand. The FFA formed to negotiated access agreements between FFA member countries and distant water fishing nations such as Japan and the USA.
FMP	Fishery Management Plan.
Guam	A U.S. territory in the Marianas Archipelago. South of and adjacent to the Commonwealth of Northern Marianas Islands.

Hawaii	U.S. state. See MHI, NWHI. Composed of the islands, atolls and reefs of the Hawaiian Archipelago from Hawai'i to Kure Atoll, except Midway Islands. Capitol - Honolulu.
HDAR	Hawaii Division of Aquatic Resources. Also, DAR.
HIMB	Hawaii Institute of Marine Biology, University of Hawaii.
HURL	Hawaii Undersea Research Lab.
JIMAR	Joint Institute of Marine and Atmospheric Research, University of Hawaii.
IATTC	Inter-American Tropical Tuna Commission.
Ika-shibi	Hawaiian term for nigh tuna handline fishing method. Fishing for tuna using baited handlines at night with a nightlight and chumming to attract squid and tuna.
Incidental Catch	Fish caught that are retained in whole or part, though not necessarily the targeted species. Examples include monchong, opah and sharks.
Interaction	Catch of protected species, which is required to be released. Examples: Hawaiian monk seals, marine turtles and albatrosses.
Logbook	Journal kept by fishing vessels for each fishing trip; records catch data, including bycatch and incidental catch. Required in the federally regulated longline and crustacean fisheries in the Hawaiian EEZ.
Longline	Fishing method utilizing a horizontal mainline stretching from several hundred yards to many miles in length, suspended for the surface by floats, to which droppers with baited hooks are attached.
Longliner	Fishing vessel specifically adapted to use the longline fishing method.
MFCMA	Magnuson Fishery Conservation and Management Act of 1976. Also, Magnuson-Stevens Fishery Conservation and Management Act of 1996. Sustainable Fisheries Act.
MHI	Main Hawaiian Islands (comprising the islands of Hawai'i, Mau'i, Lana'i, Moloka'i, Kaho'olawe, O'ahu, Kauai', Ni'ihau and Ka'ula).
MSY	Maximum Sustainable Yield.
NMFS	National Marine Fisheries Service, National Oceanic and Atmospheric Administration, Department of Commerce. Also NOAA Fisheries.
NOAA	National Oceanic and Atmospheric Administration, Department of Commerce.
NWHI	Northwestern Hawaiian Islands. All islands in the Hawaiian Archipelago, other than the Main Hawaiian Islands (MHI).
OFP	Oceanic Fisheries Program of the South Pacific Commission.
OY	Optimum Yield.
Palu-ahi	Hawaiian term for day tuna handline fishing. Fishing for tuna using baited handlines and chumming with cut bait in a chum bag or wrapped around a stone. Also, drop-stone, make-dog, etc.
PAO	Pacific Area Office, National Marine Fisheries Service. Also, NMFS/PAO.
Pelagic	The pelagic habitat is the upper layer of the water column from the surface to the thermocline. The pelagic species include all commercially targeted highly migratory species such as tuns, billfish and some incidental-catch species such as sharks, as well as coastal pelagic species such as akule and opelu.
PFRP	Pacific Pelagic Fisheries Research Program, JIMAR, University of Hawaii. Also PPFRP.

PMUS	Pacific Pelagic Management Unit Species. Also, PPMUS. Species managed under the Pelagics FMP.
Pole-and-Line	Fishing for tuna using poles and fixed leaders with barbless lures and chumming with live baitfish. Poles can be operated manually or mechanically. Also, fishing vessels called baitboats or aku-boats (Hawaii).
Protected	Refers to species which are protected by federal legislation such as the Endangered Species Act, Marine Mammal Protection Act, and Migratory Bird Treaty Act. Examples: Black-footed and Laysan albatrosses, marine turtles, dolphins.
PT or PPT	Pelagic Plan Team. Advisory body to the Council composed of scientists and fishermen who monitor and manage the fisheries under the jurisdiction of the Pelagics FMP.
Purse seine	Fishing for tuna by surrounding schools of fish with a very large net and trapping them by closing the bottom of the net.
Recreational	Recreational fishing for sport or pleasure, where the catch is not sold, bartered or traded.
SAFE	Stock Assessment and Fishery Evaluation, NMFS.
Sanctuary	Protected area. Commercial/recreational fishing may be restricted.
Secretary	When capitalized and used in reference to fisheries within the U.S. EEZs, it refers to the U. S. Secretary of Commerce.
Small pelagics	Species such as akule (big-eye scad - *Selar* spp.) And opelu (mackerel scad - *Decapterus* spp). These fish occur mainly in shallow inshore waters but may also be found in deeper offshore waters. Not part of the PMUS.
SPC	South Pacific Commission. A technical assistance organization comprising the independent island states of the tropical Pacific Ocean, dependant territories and the metropolitan countries of Australia, New Zealand, USA, France and Britain.
SPR	Spawning Potential Ratio. A term for a method to measure the effects of fishing pressure on a stock by expressing the spawning potential of the fished biomass as a percentage of the unfished virgin spawning biomass. Stocks are deemed to be overfished when the SPR<20%.
SSC	Scientific & Statistical Committee, an advisory body to the Council comprising experts in fisheries, marine biology, oceanography, etc.
Trolling	Fishing by towing lines with lures or live-bait from a moving vessel.
USCG	U.S. Coast Guard, 14th District, Department of Transportation.
USFWS	U.S. Fish & Wildlife Service, Department of Interior. Also, FWS.
VMS	Vessel Monitoring System. A satellite based system for locating and tracking fishing vessels. Fishing vessels carry a transponder which can be located by overhead satellites. Two-way communication is also possible via most VMS systems.
WPacFIN	Western Pacific Fishery Information Network, NMFS.
WPRFMC	Also, the Council. Western Pacific Regional Fishery Management Council. One of eight nationwide fishery management bodies created by the Magnuson Fisheries Conservation and Management Act pf 1976 to develop and manage domestic fisheries in the U.S. EEZ. Composed of American Samoa, Guam, Hawaii, and Commonwealth of Northern Mariana Islands.