1 FISHERY PERFORMANCE

1.1 FISHERY DESCRIPTIONS

The Samoa Archipelago is a remote chain of 13 islands of varying sizes and an atoll, located 14° south of the equator near the International Date Line. The islands lie between 13° and 14° latitude south and 169° and 173° longitude west, about 480 km (300 mi) from west to east, covering an area of 3,030 sq. km (1,170 sq. miles). With its tropical setting and its latitudinal range lying within the known limits of coral growth, coral reefs fringe the islands and atolls in the archipelago. The archipelago is approximately 4,200 km south of Hawaii in the central South Pacific Ocean. The archipelago is divided into two political entities: Independent Samoa and American Samoa. The Independent Samoa has two large islands, Upolu and Savaii, and eight islets. American Samoa is comprised of five volcanic islands (Tutuila, Aunu'u, Ofu, Olosega, and Ta'u), one low-island (Swains Island), and a coral atoll (Rose Atoll). The five volcanic islands that are part of the American Samoa territory are very steep with mountainous terrain and high sea cliffs and of various sizes. Tutuila Island, the largest (137 km^2) and most populated island, is the most eroded with the most extensive shelf area and has banks and barrier reefs. Aunuu is a small island very close to Tutuila. Ofu and Olosega (together as 13 km^2) are twin volcanic islands separated by a strait which is a shallow and narrow break in the reef flat between the islands. Tau is the easternmost island (45 km^2) with a more steeply sloping bathymetry.

The Samoa archipelago was formed by a series of volcanic eruptions from the "Samoan hotspot" (Hart et al., 2000). Based on the classic hotspot model, Savaii Island (the westernmost) in Samoa would be the oldest and Tau island (the easternmost) in American Samoa the youngest of the islands in the archipelago. Geological data indicate that Savaii is about four to five million years old, Upolu in Samoa about two to three million years old, Tutuila about 1.5 million years old, Ofu-Olosega about 300,000 years old, and Tau about 100,000 years old. Swains and Rose are built on much older volcanoes, they but are not part of the Samoan volcanic chain (Hart et al., 2004). The geological age and formation of Rose Atoll is not well known, and Swains is part of the Tokelau hot-spot chain which is anywhere from 59 to 72 million years old (Neall and Trewick, 2008; Konter et al., 2008). There are numerous banks in the archipelago, the origins of which are not well known. The South Bank near Tutuila Island, for instance, is of another geological origin.

American Samoa experiences occasional cyclones due to its geographic location in the Pacific. Cyclones occur on one- to 13-year intervals, with the six strong occurrences happening over the last 30 years (Esau in 1981; Tusi in 1987; Ofa in 1990; Val in 1991; Heta in 2004; Olaf in 2005). The territory had two tsunamis in the last 100 years due to its proximity to the geologically active Tonga Trench.

It is in this geological and physical setting that the Samoans have established their culture over the last 3,500 years. For three millennia, the Samoans have relied on the ocean for their sustenance. Fish and fishing activities constitute an integral part of the "fa'a samoa", or the Samoan culture. Fish are also used for chiefly position entitlements and other cultural activities during the "*fa'a lalave*" or ceremonies.

1.1.1 Bottomfish Fishery

Deep, zooxanthellate, scleractinian coral reefs that have been documented in the Pacific often occur around islands in clear tropical oceanic waters (Lang, 1974; Fricke and Meischner, 1985; Kahng and Maragos, 2006). These mesophotic coral ecosystems are found at depths of 30-40 m up to 150 m and have been exploited by bottomfishing fishermen mainly targeting snappers, emperors, and groupers. Bottomfishing utilizing traditional canoes by the indigenous residents of American Samoa has been a subsistence practice since the Samoans settled on the Tutuila, Manua, and Aunu'u islands. It was not until the early 1970s that the bottomfish fishery developed into a commercial scheme utilizing motorized boats. The bottomfish fishery of American Samoa was typically comprised of commercial overnight bottomfish handlining using skipjack as bait on 28 to 30-foot-long aluminum/plywood "alia" (a term used for larger boats in Samoa). Imported bottomfish from the independent state of Samoa help satisfy demand, however the imports weaken the local bottomfish fishery. A government-subsidized program, called the Dory Project, was initiated in 1972 to develop the offshore fisheries into a commercial venture, and resulted in an abrupt increase in the size of the fishing fleet and total landings. In 1982, a fisheries development project aimed at exporting high-priced deep-water snappers to Hawaii initiated another notable increase in bottomfish landings and revenue. Between 1982 and 1988, the bottomfish fishery accounted for as much as half of the total commercial landings (by weight).

American Samoa's bottomfish fishery was a relatively larger size between 1982 and 1985 when it was new and expanding. In 1988, a decline in bottomfish fisheries occurred as many skilled and full-time commercial fishermen converted to trolling. Additionally, profits and revenue in bottomfishing suffered from four separate hurricanes; Tusi in 1987, Ofa in February of 1990, Val in December of 1991, Heta in January of 2004, and the 2009 tsunami. The gradual depletion of newly discovered banks and migration of many fishermen into other fishing vendors resulted in the decline of landings through the mid-1980s. Fuel prices have gradually risen in the past four years causing yet another strain on the bottomfish fisheries. The average price of bottomfish has also declined due to the shift in demand from local to imported bottomfish that complete closely with local prices. In 2004, 60 percent of coolers imported from the independent state of Samoa on the Lady Naomi Ferry were designated for commercial sale; data from the Commercial Invoice System show that half of these coolers were filled with bottomfish.

Beginning in 1988, the nature of American Samoa's fisheries changed dramatically with a shift in importance from bottomfishing to trolling. In the past eight years, the dominant fishing method has been longlining (by weight). Bottomfishing has been in decline for years, but it was dealt a final devastating blow by the impacts of the 2009 tsunami. A fishery failure was declared, and the U.S. Congress allocated $1 million to revive the fishery. This fund has been used to repair boats damaged by the tsunami, maintain the floating docks used by the alia boats, and build a boat ramp. In 2013, the American Samoan government also implemented a subsidy program that provided financial relief associated the rising fuel prices, and the fuel price has become notably lower since then.

1.1.2 Ecosystem Component Fishery

Traditional coral reef fishing in the lagoons and shallow reef areas has included methods such as gleaning and using bamboo poles with lines and baits or with a multi-pronged spear attached.

The deep water and pelagic fisheries have traditionally used wooden canoes, hand-woven sennit lines with shell hooks and stone sinkers, and lures made of wood and shell pieces.

Presumably, the change from traditional to present-day fishing methods started with Western contact in the 18th century. Today the fisheries in American Samoa can be broadly categorized in terms of habitat and target species as either pelagic fisheries, bottomfish fisheries in mesophotic reefs, or nearshore coral reef fisheries. For creel monitoring program purposes, fisheries are either subsistence (i.e. primarily shore-based and mostly for personal consumption) or commercial (i.e. primarily boat-based and mostly sold). Bottomfishing is a combination of mesophotic reef fishing (i.e., spearfishing) and/or pelagic fishing (i.e. trolling). The coral reef fishery involves gleaning, spearfishing (snorkel or free dive from shore or using boat), rod-and-reel using nylon lines and metal hooks, bamboo pole, throw nets, and gillnets. SCUBA spearfishing was introduced in 1994, restricted for use by native American Samoans in 1998, and finally banned in 2002 following recommendations by biologists from the DMWR and local scientists.

In 2018, the Council drafted an Amendment 4 to the American Samoa FEP that reclassified a large number MUS as Ecosystem Component Species (ECS; WPRFMC, 2018). The final rule was posted in the Federal Register in early 2019 (84 FR 2767). This amendment reduces the number of MUS from 205 species/families to 11 in the American Samoa FEP. All former coral reef ecosystem management unit species (CREMUS) were reclassified as ECS that do not require ACL specifications or accountability measures but are still to be monitored regularly to prioritize conservation and management efforts and to improve efficiency of fishery management in the region. All existing management measures, including reporting and record keeping, prohibitions, and experimental fishing regulations apply to the associated ECS. If an ECS stock becomes a target of a Federal fishery in the future, NMFS and the Council may consider including that stock as a MUS to actively manage that stock. These species are still regularly monitored via other means (see Sections 1.5.3 and 2.1.3).

1.2 FISHERY DATA COLLECTION SYSTEM

American Samoa has been regularly conducting fishery-dependent monitoring since 1982 for the boat-based fishery. The boat-based fishery is mostly trolling for tuna, skipjacks, and trevally, and bottomfishing mostly targets snappers, emperors, and groupers. Boat-based data collection involve two runs: first is the participation run used to determine the number of boats/fisherman out to fish and identify the type of gear being used; second is the interview run where the fishermen are interviewed for the effort and economic data while also measuring the length and weight of each fish identified to the species level.

1.2.1 Boat-Based Creel Survey

The boat-based data collection focuses mostly on the main docks in Fagatogo and Pago Pago, and on opportunistically surveying sites like Aunuu, Auasi, and Asili. Boat-based data collection is also being conducted in Manu'a. Boat-based data collection in both Ofu-Olosega and Tau is opportunistic since there is no set schedule for boats to go out and land their catches.

The survey follows a random stratified design. The stratification is by survey area, weekday/weekend, and time of day. The survey is divided into two phases: 1) participation run; and 2) catch interview phase. The participation run attempts to estimate the amount of participation by counting the number of boats "not on the dock" or the presence of trailers. The catch interview phase occurs after the participation run that documents catch composition, CPUE, length-weight information, catch disposition, and some socio-economic information. The data is transcribed weekly into the WPacFIN database. Catch expansion is done on an annual scale through a simple expansion algorithm using expanded effort and CPUE. For more details of the boat-based creel survey see Oram et al. (2011).

1.2.2 Commercial Receipt Book System

Entities that sell any seafood products are required by law to report their sales to DMWR (ASCA § 24.0305). This is done through a receipt book system collected on the fifth day of every month. Information required to be reported are: (a) the weight and number of each species of fish or shellfish received; (b) the name of the fisherman providing the fish or shellfish; (c) boat name and registration number, if applicable; (d) the name of the dealer; (e) the date of receipt; (f) the price paid per species; (g) the type of fishing gear used; (h) whether the fish or shellfish are intended for sale in fresh, frozen, or processed form; (i) which fish or shellfish were taken within/outside of territorial waters; and (j) other statistical information the department may require.

1.2.3 Boat Inventory

An annual boat inventory is being conducted to track down fishing boats and determine their ownership. This will provide information on how many boats are potentially available to engage in the fishery.

1.3 META-DATA DASHBOARD STATISTICS

The meta-data dashboard statistics describe the amount of data used or available to calculate the fishery-dependent information. Creel surveys are sampling-based systems that require random-stratified design applied to pre-scheduled surveys. The number of sampling days, participation runs, and catch interviews would determine if there are enough samples to run the expansion algorithm. The trends of these parameters over time may infer survey performance. Monitoring the survey performance is critical for explaining the reliability of the expanded information.

Commercial receipt book information depends on the number of invoices submitted and the number of vendors participating in the program. Variations in these meta-data affect the commercial landing and revenue estimates.

1.3.1 Creel Survey Meta-Data Statistics

Calculations:

Sample days: Count of the total number of unique dates found in the boat log sampling date data in boat-based creel surveys.

Catch Interviews: In boat-based creel surveys, count of the total number of data records found in the interview header data (number of interview headers). This is divided into two categories, interviews conducted during scheduled survey days (Regular) and opportunistic interviews (Opportunistic), which are collected on non-scheduled days.

Table 1. Summary of American Samoa boat-based creel survey meta-data

Year	# Sample Days	# Catch Interviews	
		Regular	Opportunistic
1989	160	514	0
1990	160	331	21
1991	134	281	4
1992	127	244	4
1993	140	285	8
1994	209	516	5
1995	239	638	8
1996	222	654	3
1997	226	1,135	1
1998	229	1,067	1
1999	207	887	0
2000	206	729	0
2001	205	441	2
2002	194	376	0
2003	220	503	0
2004	239	506	5
2005	238	340	0
2006	238	325	7

Year	# Sample Days	# Catch Interviews	
		Regular	Opportunistic
2007	251	485	6
2008	225	303	11
2009	165	174	9
2010	188	168	2
2011	240	203	1
2012	269	285	14
2013	262	245	0
2014	236	254	26
2015	233	247	26
2016	224	165	47
2017	222	139	33
2018	215	176	11
2019	218	166	12
10-year avg.	**231**	**205**	**17**
10-year SD	**22**	**47**	**15**
20-year avg.	**224**	**312**	**11**
20-year SD	**24**	**151**	**13**

1.3.2 Commercial Receipt Book Statistics

Calculations:

Vendors: Count of the number of unique buyer codes found in the commercial purchase header data from the Commercial Receipt Book, BMUS vendors are only from vendors that landed BMUS species.

Invoices: Count of the number of unique invoice numbers found in the commercial header data from the Commercial Receipt Book, BMUS vendors are only from vendors that landed BMUS species.

Table 2. Summary of American Samoa commercial receipt book meta-data from 1998-2019

Year	# Vendors	# Invoices Collected	# BMUS Vendors	# BMUS Invoices Collected
1992	11	445	8	51
1993	17	695	11	88
1994	21	1,425	13	145
1995	39	2,410	16	193
1996	17	1,755	8	83
1997	18	1,763	2	5
1998	22	1,741	6	17
1999	19	1,525	8	63

Year	# Vendors	# Invoices Collected	# BMUS Vendors	# BMUS Invoices Collected
2000	19	1,169	7	61
2001	32	1,372	13	158
2002	27	1,076	9	127
2003	31	1,263	13	123
2004	28	937	14	118
2005	68	1,000	14	93
2006	60	1,201	13	109
2007	65	1,355	10	135
2008	47	1,020	11	100
2009	45	806	14	114
2010	34	620	9	54
2011	30	776	7	28
2012	30	827	11	28
2013	34	777	4	19
2014	42	1,126	9	37
2015	45	1,577	6	53
2016	50	1,395	6	18
2017	58	1,372	6	21
2018	62	1,342	3	16
2019	64	1,392	6	35
10-year avg.	**45**	**1,120**	**7**	**31**
10-year SD	**12**	**323**	**2**	**13**
20-year avg.	**44**	**1,120**	**9**	**72**
20-year SD	**15**	**260**	**3**	**46**

1.4 FISHERY SUMMARY DASHBOARD STATISTICS

The Fishery Summary Dashboard Statics section consolidates all fishery-dependent information comparing the most recent year with short-term (recent 10 years) and long-term (recent 20 years) average (shown bolded in [brackets]). Trend analysis of the past 10 years will dictate the trends (increasing, decreasing, or no trend). The right-most symbol indicates whether the mean of the short-term and long-term years were above, below, or within one standard deviation of the mean of the full time series.

Legend Key:

- *increasing trend in the time series*
- *decreasing trend in the time series*
- *no trend in the time series*
- *above 1 standard deviation*
- *below 1 standard deviation*
- *within 1 standard deviation*

e.g. 10,000 [**1,000**] – *point estimate of fishery statistic* [% ***difference from short/long term average***]

Table 3. Annual indicators for American Samoa bottomfish fisheries describing performance comparing 2019 estimates with short- (10-year) and long-term (20-year) averages

Fishery	Fishery statistics	Short-term (10 years)	Long-term (20 years)
Bottomfish	**Total estimated catch (lbs.)**		
All gears (BMUS only)	All BMUS from creel survey data	**11,093[▼9%]**	**11,093[▼24%]**
	All BMUS from commercial purchase data	**1,402[▲4%]**	**1,402[▼34%]**
	Catch-per-unit-effort (from boat-based creel surveys)		
Bottomfishing (BMUS only)	Bottomfishing lbs./trip	**33[▼39%]**	**33[▼43%]**
	Bottomfishing lbs./gr-h.	**0.0206[▼52%]**	**0.0206[▼59%]**
	Fishing effort (from boat-based creel surveys)		
Bottomfishing (BMUS only)	Estimated total bottomfishing trips	**57[no change]**	**57[▼11%]**
	Estimated total bottomfishing gear hours	**78,900[▼56%]**	**78,900[▼58%]**
	Fishing participants (from boat-based creel surveys)		
Bottomfishing (BMUS only)	Estimated number of bottomfishing vessels	**6[▼44%]**	**6[▼54%]**
	Estimated average number of fishermen per bottomfishing	**3[no change]**	**3[no change]**

	trip		
	Bycatch		
Bottomfishing (BMUS only)	# fish caught	**771[▼57%]**	**771[▼73%]**
	# fish kept	**771[▼57%]**	**771[▼73%]**
	# fish released	**0[no change]**	**0[no change]**

Table 4. Annual indicators for American Samoa ECS fisheries describing performance comparing 2019 estimates with short- (10-year) and long-term (20-year) averages

Fishery	Fishery statistics	Short-term (10 years)	Long-term (20 years)
ECS	**Total estimated catch (lbs.)**		
Prioritized ECS	*Sargocentron tiere* from creel survey data	**29[▲53%]**	**29[▲222%]**
	Sargocentron tiere from commercial purchase data	**0[no change]**	**0[no change]**
	Cernimugil crenilabis from creel survey data	**159[▲354%]**	**159[▲783%]**
	Cernimugil crenilabis from commercial purchase data	**0[no change]**	**0[no change]**
	Parulirus penicilatus from creel survey data	**0[▼100%]**	**0 [▼100%]**
	Parulirus penicilatus from commercial purchase data	**1,207 [▲8%]**	**1,207[▼12%]**
	Clams from creel survey data	**0[no change]**	**0[no change]**
	Clams from commercial purchase data	**0[no change]**	**0[no change]**
	Octopus cyanea from creel survey data	**0[no change]**	**0[no change]**
	Octopus cyanea from commercial purchase data	**0[no change]**	**0[no change]**
	Epinephelus malanostigma from creel survey data	**145[▲110%]**	**145[▲326%]**
	Epinephelus malanostigma from commercial purchase data	**0[no change]**	**0[no change]**

1.5 CATCH STATISTICS

The following section summarizes the catch statistics for bottomfish, a one-year snapshot of the top ten landed species, and the top six prioritized species (and species groups) in American Samoa as determined by DMWR. The six species are the bluelined squirrelfish (*Sargocentron tiere*), fringelip mullet (*Cernimugil crenilabis*), green spiny lobster (*Parulirus penicillatus*), clams, day octopus (*Octopus cyanea*), and one-blotch grouper (*Epinephelus melanostigma*). Estimates of catch are summarized from the creel survey and commercial receipt book data collection programs. Catch statistics provide estimates of annual harvest from the different fisheries. Estimates of fishery removals can provide proxies for the level of fishing mortality and a reference level relative to established quotas. This section also provides detailed levels of catch for fishing methods and the top species complexes harvested in bottomfish fisheries in addition to the top ten landed species and top five prioritized species.

1.5.1 Catch by Data Stream

This section describes the estimated total catch from the boat-based creel survey programs as well as the commercial landings from the commercial receipt book system. The difference between the creel total and the commercial landings is assumed to be the non-commercial component. However, there are cases where the commercial landing may be higher than the estimated creel total of the commercial receipt book program. In this case, the commercial receipt books can capture fishery data better than the creel surveys.

Calculations: Estimated landings are based on a pre-determined list of species (Appendix A) identified as BMUS regardless of the gear used, for all data collection (boat-based creel surveys and the commercial purchase reports).

Table 5. Summary of American Samoa BMUS total catch (lbs.) from expanded boat-based creel surveys and the commercial purchase system for all gear types

Year	Boat-Based Creel Survey Estimates	Commercial Landings
1989	26,719	
1990	9,471	
1991	11,062	
1992	8,050	1,895
1993	9,675	3,464
1994	24,195	2,375
1995	22,246	5,112
1996	22,477	1,082
1997	26,812	419
1998	10,501	851
1999	12,687	3,197
2000	13,850	3,693
2001	30,064	3,447
2002	23,621	1,448

Year	Boat-Based Creel Survey Estimates	Commercial Landings
2003	12,971	2,511
2004	11,000	3,233
2005	8,226	2,490
2006	3,051	2,203
2007	10,913	4,001
2008	22,095	3,171
2009	34,388	3,035
2010	7,044	1,084
2011	14,083	711
2012	2,099	1,161
2013	5,732	882
2014	13,984	3,140
2015	21,528	2,047
2016	19,307	1,131
2017	14,791	1,131
2018	11,957	838
2019	11,093	1,402
10-year avg.	**12,162**	**1,353**
10-year SD	**5,681**	**692**
20-year avg.	**14,590**	**2,138**
20-year SD	**8,228**	**1,058**

1.5.2 Expanded Catch Estimates by Fishing Method

Catch information is provided for boat-based fishing methods that contribute most of the annual catch for American Samoa.

Calculations: The creel survey catch time series are the sum of the estimated weight for selected gear in all strata for all species and all BMUS species.

Table 6. Total catch time series estimates (lbs.) for all species and BMUS only using American Samoa expanded boat-based creel survey data for bottomfishing gears

Year	Bottomfishing		Bottom-Troll Mixed		Spearfishing	
	All	BMUS	All	BMUS	All	BMUS
1989	20,556	12,075	42,483	14,022	40,828	584
1990	8,308	4,754	11,829	4,651	1,441	0
1991	14,439	7,328	14,004	3,734	833	0
1992	14,941	8,050	0	0	0	0
1993	18,535	7,984	5,277	1,647	734	0
1994	52,382	22,395	8,812	1,674	32,996	0
1995	20,900	11,442	37,078	10,699	6,531	2

Year	Bottomfishing		Bottom-Troll Mixed		Spearfishing	
	All	BMUS	All	BMUS	All	BMUS
1996	39,932	18,110	13,626	4,348	6,369	19
1997	37,784	21,621	10,131	4,870	85,169	320
1998	10,759	7,280	6,542	3,102	77,443	119
1999	15,009	9,896	8,142	2,616	63,509	176
2000	25,104	12,045	3,888	1,746	42,922	60
2001	53,374	28,692	3,756	1,373	9,841	0
2002	47,689	22,852	1,774	768	8,562	0
2003	28,119	12,364	1,599	607	5,557	0
2004	29,591	9,526	3,517	1,470	4,405	0
2005	17,911	6,723	4,066	1,500	416	2
2006	12,028	2,539	1,169	494	2,589	19
2007	36,093	10,228	1,273	580	19,249	105
2008	54,674	21,495	1,809	575	8,030	25
2009	81,909	34,113	1,175	275	17,208	0
2010	16,307	6,917	272	83	60,110	44
2011	29,834	12,973	5,355	1,091	33,210	19
2012	13,515	1,834	1,646	259	15,950	1
2013	27,126	5,240	1,853	437	31,784	51
2014	32,471	13,165	4,006	801	17,695	4
2015	43,173	20,110	5,715	1,197	25,756	203
2016	28,363	14,435	15,300	4,398	7,272	474
2017	29,940	12,697	8,594	1,980	8,759	114
2018	18,763	11,145	3,550	658	6,140	121
2019	18,497	10,547	2,773	482	8,202	41
10-year avg.	**25,799**	**10,906**	**4,906**	**1,139**	**21,488**	**107**
10-year SD	**8,555**	**4,902**	**4,137**	**1,204**	**16,045**	**136**
20-year avg.	**32,224**	**13,482**	**3,655**	**1,039**	**16,683**	**64**
20-year SD	**16,592**	**8,095**	**3,288**	**927**	**14,876**	**108**

1.5.3 Top and Prioritized Species in Boat-Based Fishery Catch

Catch time series can act as indicators of fishery performance. Variations in the catch can be attributed to various factors, and there is no single explanatory variable for the observed trends. A one-year reflection of the top ten harvested species (by weight) is included to monitor which ECS are being caught the most annually. Additionally, DMWR selected six species/groups that were reclassified as ECS that are still of priority for regular monitoring, and complete catch time series of these species are included in the report as well.

Calculations: Catch tallied from the boat-based expanded species composition data combining gear types for all species excluding BMUS, prioritized ECS, and pelagic MUS species.

Table 7a. Top ten landed ECS in American Samoa from boat-based creel survey data in 2019

Common Name	Scientific Name	Catch (lbs.)
Humpback snapper	*Lutjanus gibbus*	2,933
Redlip parrotfish	*Scarus rubroviolaceus*	2,101
Blue-banded surgeonfish	*Acanthurus lineatus*	1,135
Redtail parrotfish	*Chlorurus japanensis*	887
Steephead parrotfish	*Chlorurus microrhinos*	719
Spotted grouper	*Epinephelus maculatus*	602
Bluespine unicornfish	*Naso unicornis*	556
Bigeye barracuda	*Sphyraena forsteri*	504
Bigeye trevally	*Caranx sexfasciatus*	434
Giant trevally	*Caranx ignoblis*	384

Calculations: Catch tallied from commercial receipt data combining gear types for all species excluding BMUS, prioritized ECS, and pelagic MUS species.

Table 7b. Top ten landed ECS in American Samoa from estimated commercial landings data in 2019

Common Name	Scientific Name	Catch (lbs.)
Blue-banded surgeonfish	*Acanthurus lineatus*	19,275
Reef fishes (unknown)	Multi-genera ulti-species	13,052
Striped bristletooth	*Ctenochaetus striatus*	9,621
Parrotfishes	*Scarus* spp.	8,248
Unicornfishes	*Naso* spp.	5,961
Squirrelfishes	*Sargocentron* spp.	1,782
Inshore groupers	Multi-species	1,349
Bottomfishes (unknown)	Multi-genera multi-species	848
Emperors	Multi-genera multi-species	619
Humpback snapper	*Lutjanus gibbus*	499

Calculations: Catch tallied from boat-based expanded species composition data for species identified as priority ECS (Appendix A).

Table 8a. Catch (lbs.) from boat-based expansion data for prioritized species in American Samoan ECS fisheries

Year	*Sargocentron tiere*	*Cernimugil crenilabis*	*Parulirus penicilatus*	Clams (multi-species)	*Octopus cyanea*	*Epinepheus melanostigma*
1989	0	0	4,212	0	0	0
1990	0	0	186	0	0	0
1991	0	0	146	0	0	0
1992	0	0	0	0	0	0
1993	0	0	47	0	0	0

Year	*Sargocentron tiere*	*Cernimugil crenilabis*	*Parulirus penicilatus*	Clams (multi-species)	*Octopus cyanea*	*Epinepheus melanostigma*
1994	0	0	1,375	0	0	0
1995	0	0	269	0	0	0
1996	0	0	379	0	0	0
1997	0	0	4,885	0	0	0
1998	0	0	3,924	0	0	0
1999	0	0	2,065	0	0	0
2000	0	0	1,762	0	0	0
2001	0	0	1,544	0	0	0
2002	0	0	753	0	0	0
2003	0	0	910	0	0	0
2004	0	0	560	0	0	0
2005	0	0	29	0	0	0
2006	0	0	225	0	0	0
2007	0	3	1,618	0	0	0
2008	0	0	1,113	0	0	0
2009	0	0	2,759	0	0	0
2010	0	0	14,305	0	0	0
2011	0	0	3,135	0	0	0
2012	0	0	566	0	0	0
2013	79	4	1,727	0	0	13
2014	9	0	140	0	0	52
2015	0	0	7	0	0	52
2016	18	42	249	0	0	71
2017	32	0	1,042	0	0	174
2018	20	143	148	0	0	182
2019	29	159	0	0	0	145
10-yr avg.	**19**	**35**	**2,132**	**0**	**0**	**69**
10-yr SD	**25**	**63**	**4,391**	**0**	**0**	**73**
20-yr avg.	**9**	**18**	**1,630**	**0**	**0**	**34**
20-yr SD	**19**	**47**	**3,117**	**0**	**0**	**61**

Calculations: Catch tallied from commercial purchase data for species identified as priority ECS (Appendix A).

Table 8b. **Catch (lbs.) from commercial purchase data for prioritized species in American Samoan ECS fisheries**

Year	*Sargocentron tiere*	*Cernimugil crenilabis*	*Parulirus penicillatus*	Clams (multi-species)	*Octopus cyanea*	*Epinepheus melanostigma*

Year	*Sargocentron tiere*	*Cernimugil crenilabis*	*Parulirus penicillatus*	Clams (multi-species)	*Octopus cyanea*	*Epinepheus melanostigma*
1996	0	0	3,104	0	0	0
1997	0	0	4,262	0	0	0
1998	0	0	3,088	0	0	0
1999	0	0	2,255	0	0	0
2000	0	0	808	0	0	0
2001	0	0	1,105	0	0	0
2002	0	0	762	0	0	0
2003	0	0	779	0	0	0
2004	0	0	506	0	0	0
2005	0	0	3,238	0	0	0
2006	0	0	5,380	0	0	0
2007	0	0	1,649	0	0	0
2008	0	0	1,417	0	0	0
2009	0	0	680	0	0	0
2010	0	0	1,464	0	0	0
2011	0	0	974	0	0	0
2012	0	0	621	0	0	0
2013	0	0	899	0	0	0
2014	0	0	1,292	0	0	0
2015	0	0	989	0	0	0
2016	0	0	2,203	0	0	0
2017	0	0	767	0	0	0
2018	0	3	743	0	0	0
2019	0	0	1,207	0	0	0
10-yr avg.	**0**	**0**	**1,116**	**0**	**0**	**0**
10-yr SD	**0**	**1**	**463**	**0**	**0**	**0**
20-yr avg.	**0**	**0**	**1,374**	**0**	**0**	**0**
20-yr SD	**0**	**1**	**1,137**	**0**	**0**	**0**

1.6 CATCH-PER-UNIT-EFFORT (CPUE) STATISTICS

This section summarizes the estimates for CPUE in the boat-based fisheries both for all species and for BMUS only. The boat-based fisheries include bottomfishing (handline gear), spearfishing (snorkel), and bottom-trolling mixed that comprise a majority of the total bottomfish catch. Trolling is primarily a pelagic fishing method but also catches coral reef fishes including jacks and gray jobfish. CPUE is reported as both pounds per gear hour and pounds per trip in the boat-based methods.

Calculations**:** CPUE is calculated from interview data by gear type using ∑catch /(∑number of gears used*∑number of hours fished) or ∑catch /∑trips for boat-based data. If the value is blank (i.e., zero), then there was no interview collected for that method. Landings from interviews without fishing hours or number of gears are excluded from the calculations.

All - lbs./trip: All catch and trips are tallied from landings by gear level, including non-BMUS species.

All - lbs./gr-hr.: All catch and trips are tallied from trips with data on the number of gears used and numbers of hours fished, including non-BMUS species.

BMUS - lbs./trip: Only BMUS catch and trips that landed BMUS species are tallied from landings by gear level.

BMUS - lbs./gr-hr.: Only BMUS catch and trips that landed BMUS are tallied from trips with data on the number of gears used and numbers of hours fished.

Table 9. CPUE (lbs./gear hour and lbs./trip) for bottomfishing gears in the American Samoa boat-based fishery for all species and BMUS only

Year	Bottomfishing				Bottom-Troll Mixed				Spearfishing			
	All		BMUS		All		BMUS		All		BMUS	
	Lbs/trip	Lbs/gr-hr	Lbs/trip	Lbs/gr-hr	Lbs/trip	Lbs/gr-hr	Lbs/trip	Lbs/gr-hr	Lbs/trip	Lbs/gr-hr	Lbs/trip	Lbs/gr-hr
1989	159	0.2302	103	0.1495	326	0.1380	107	0.0454	332	0.1785	66	0.3127
1990	127	0.2174	83	0.1602	248	0.2777	95	0.1066	170	0.6667		
1991	121	0.0965	69	0.0563	219	0.2875	81	0.1390	358	3.1822		
1992	139	0.1543	80	0.0962								
1993	124	0.0713	62	0.0414	255	1.5938	100	0.6271	70			
1994	125	0.0652	53	0.0297	193	0.3537	30	0.0644	247	0.5960		
1995	121	0.1422	67	0.0805	160	0.1387	49	0.0454				
1996	143	0.1528	61	0.0670	283	0.6608	72	0.2150				
1997	139	0.1073	79	0.0625	151	0.4480	63	0.1852	294	0.3541	10	0.1275
1998	175	0.2757	116	0.1825	35	0.7292			393	5.4514		
1999	151	0.3533	103	0.2546	103	8.5833			186	1.7909		
2000	122	0.3825	61	0.2166	36	3.0000	5	0.4167				
2001	140	0.1705	76	0.0921					164	0.7038		
2002	81	0.0607	40	0.0295					177	0.5193		
2003	105	0.0903	50	0.0435	157	1.2897	61	0.3948	179	1.2443		
2004	77	0.0160	32	0.0126	151	0.3251	73	0.1499	154	1.7406		
2005	97	0.1513	53	0.1008	138	0.3220	53	0.1233	30	3.0000		
2006	81	0.0561	32	0.0250	97	0.3619	41	0.1529	86	0.5759	4	
2007	147	0.0360	50	0.0122	87	0.2859	49	0.1918	104	0.0484	4	0.0106
2008	191	0.0444	82	0.0188	107	0.2796	32	0.0826	106	0.1010	2	0.0097
2009	320	0.0540	135	0.0227	278	0.5162	65	0.1206	330	0.3756		
2010	190	0.1005	94	0.0463	507	7.6818	308	4.6667	246	0.0721	17	0.5156
2011	194	0.0908	89	0.0417	292	0.4920	68	0.1200	326	0.1544	10	0.1852
2012	54	0.0586	61	0.2374	227	0.7094	55	2.1905	123	0.6262	0	

Year	Bottomfishing				Bottom-Troll Mixed				Spearfishing			
	All		BMUS		All		BMUS		All		BMUS	
	Lbs/trip	Lbs/gr-hr	Lbs/trip	Lbs/gr-hr	Lbs/trip	Lbs/gr-hr	Lbs/trip	Lbs/gr-hr	Lbs/trip	Lbs/gr-hr	Lbs/trip	Lbs/gr-hr
2013	81	0.0303	34	0.0144	162	0.3994	49	0.1616	247	0.1246	5	0.0262
2014	135	0.0566	68	0.0279	109	0.2346	15	0.0325	136	0.0603	1	0.0059
2015	109	0.0292	51	0.0136	140	0.0082	31	0.0019	147	0.1382	14	0.0677
2016	87	0.0128	41	0.0061	166	0.0817	46	0.0260	49	0.0427	9	0.0455
2017	91	0.0158	36	0.0061	145	0.0397	58	0.0349	45	0.0129	3	0.0010
2018	65	0.0336	35	0.0184	75	0.2469	19	0.0755	32	0.0200	2	0.0057
2019	66	0.0445	33	0.0206	138	0.6283	27	0.1248	30	0.0214	2	0.0162
10-year avg.	**107**	**0.0473**	**54**	**0.0433**	**196**	**1.0522**	**68**	**0.7434**	**138**	**0.1273**	**6**	**0.0966**
10-year SD	**48**	**0.0282**	**22**	**0.0660**	**118**	**2.2218**	**82**	**1.4531**	**99**	**0.1733**	**6**	**0.1577**
20-year avg.	**122**	**0.0767**	**58**	**0.0503**	**167**	**0.9390**	**59**	**0.5037**	**143**	**0.5043**	**6**	**0.0808**
20-year SD	**62**	**0.0813**	**26**	**0.0639**	**104**	**1.7637**	**63**	**1.1186**	**91**	**0.7419**	**5**	**0.1465**

1.7 EFFORT STATISTICS

This section summarizes the effort trends in the American Samoa bottomfish fishery. Fishing effort trends provide insights on the level of fishing pressure through time. Effort information is provided for the top boat-based fishing methods that comprise most of the annual catch.

Calculations: Effort estimates (in both trips and gear hours) are calculated from boat-based interview data. Trips are tallied according the interview data in boat-based creel surveys. Gear hours are generated by summing the data on number of gears used*number of hours fished collected from interviews by gear type. For the boat-based estimates, data collection started in 1982.

All - Trips: All trips tallied by gear type.

All - Gear-hrs: Gear hours tallied by gear type.

BMUS - Trips: Trips that landed BMUS tallied by gear type.

BMUS - Gear-hrs: Gear hours tallied by gear type for trips landed BMUS with data on both number of gears used and numbers of hours fished

Table 10. Effort (trips and gear hours) for bottomfishing gears in the American Samoa boat-based fishery for all species and BMUS only

Year	Bottomfishing				Bottom-troll Mixed				Spearfishing			
	All		BMUS		All		BMUS		All		BMUS	
	Trips	Gr-hrs	Trips	Gr-hrs	Trips	Gr-hrs	Trips	Gr-hrs	Trips	Gr-hrs	Trips	Gr-hrs
1989	30	20,713	28	19,199	34	80,388	34	80,388	40	74,501	3	630
1990	19	11,137	16	8,322	15	13,410	15	13,410	8	2,040		
1991	32	40,255	29	35,313	19	14,442	14	8,159	2	225		
1992	26	23,374	24	19,981								
1993	38	66,215	33	49,600	3	480	3	480	1			
1994	40	76,900	37	66,424	9	4,900	8	3,726	4	1,656		
1995	23	19,600	19	15,744	25	28,768	22	23,912				
1996	37	34,656	34	30,960	10	4,284	8	2,660				
1997	46	59,631	45	56,994	14	4,730	14	4,730	31	25,756	5	400
1998	17	10,764	17	10,764	2	96			2	144		
1999	15	6,408	14	5,644	1	12			4	416		
2000	10	3,192	9	2,544	1	12	1	12				
2001	37	29,016	35	28,028					9	2,100		
2002	44	57,988	44	57,988					7	2,380		
2003	83	64,246	82	64,246	10	504	10	504	7	442		
2004	103	470,932	92	219,492	20	9,295	19	9,295	3	266		
2005	56	23,184	53	19,240	29	10,797	28	10,797	1	10		
2006	88	110,040	56	59,748	12	3,230	12	3,230	7	323	1	
2007	127	483,840	121	468,920	13	3,939	11	2,805	71	140,933	10	3,483
2008	105	433,752	102	419,640	10	3,838	10	3,838	35	35,721	6	1,450
2009	109	639,990	107	633,992	8	4,312	8	4,312	27	23,564		
2010	42	79,124	36	72,540	1	66	1	66	94	304,382	2	64
2011	55	111,412	52	103,734	18	10,152	16	8,484	58	118,650	1	54
2012	99	86,450	14	3,003	5	1,122	2	42	55	9,776	1	

Year	Bottomfishing				Bottom-troll Mixed				Spearfishing			
	All		BMUS		All		BMUS		All		BMUS	
	Trips	Gr-hrs	Trips	Gr-hrs	Trips	Gr-hrs	Trips	Gr-hrs	Trips	Gr-hrs	Trips	Gr-hrs
2013	75	198,830	36	82,800	11	3,936	8	1,764	68	129,479	6	992
2014	75	171,950	68	162,690	12	5,593	12	5,593	53	119,583	2	338
2015	122	413,565	116	401,448	27	423,016	25	401,265	26	27,606	4	798
2016	63	372,810	62	369,316	46	70,725	46	70,725	35	37,960	7	1,320
2017	73	404,550	72	404,550	18	57,256	13	20,300	35	106,500	9	24,120
2018	58	106,930	57	106,930	16	3,990	11	2,754	46	72,760	10	4,004
2019	58	78,900	57	78,900	7	1,539	7	1,539	41	54,495	5	432
10-year avg.	**72**	**202,452**	**57**	**178,591**	**16**	**57,740**	**14**	**51,253**	**51**	**98,119**	**5**	**3,212**
10-year SD	**22**	**132,937**	**26**	**144,666**	**12**	**124,118**	**12**	**118,438**	**19**	**79,638**	**3**	**7,059**
20-year avg.	**74**	**217,035**	**64**	**187,987**	**13**	**30,666**	**12**	**27,366**	**34**	**59,347**	**3**	**1,853**
20-year SD	**30**	**189,618**	**31**	**184,360**	**11**	**91,882**	**11**	**87,127**	**26**	**74,485**	**4**	**5,230**

1.8 PARTICIPANTS

This section summarizes the estimated participation in each fishery. The information presented here can be used in the impact analysis of potential amendments in the FEPs associated with the bottomfish fisheries. The trend in participation over time can also be used as an indicator of fishing pressure.

Calculations: For boat-based data, the estimated number of unique vessels is calculated by tallying the number of vessels recorded in the interview data via vessel registration or name.

All: Total unique vessels by gear type.

BMUS: Unique vessels from trips that landed BMUS by gear type.

Table 11a. Estimated number of unique vessels for bottomfishing gears in the Guam boat-based fishery for all species and BMUS only

Year	Bottomfishing		Bottom-Troll Mixed		Spearfishing	
	All	BMUS	All	BMUS	All	BMUS
1989	20	19	14	14	4	1
1990	9	8	9	8	2	0
1991	17	16	10	7	1	0
1992	13	13	0	0	0	0
1993	18	17	7	5	1	0
1994	17	16	10	10	5	0
1995	19	17	20	20	1	0
1996	21	20	15	13	0	0
1997	19	18	13	13	4	3
1998	13	13	6	4	2	0
1999	17	16	5	4	1	0
2000	16	15	6	6	1	0
2001	17	16	3	3	6	0
2002	15	15	2	2	3	0
2003	14	14	4	4	4	0
2004	21	21	7	6	3	0
2005	13	12	5	5	1	0
2006	20	14	1	1	2	1
2007	21	19	6	4	3	3
2008	18	16	8	8	3	2
2009	14	14	4	4	3	0
2010	11	8	1	1	5	1
2011	8	7	5	5	2	1
2012	11	6	4	2	2	1
2013	13	10	5	3	3	2
2014	11	10	6	6	4	1

Year	Bottomfishing		Bottom-Troll Mixed		Spearfishing	
	All	**BMUS**	**All**	**BMUS**	**All**	**BMUS**
2015	14	14	10	9	4	2
2016	15	15	10	10	3	2
2017	11	11	8	7	6	3
2018	9	9	6	5	3	3
2019	6	6	3	3	5	2
10-year avg.	**11**	**10**	**6**	**5**	**4**	**2**
10-year SD	**3**	**3**	**3**	**3**	**1**	**1**
20-year avg.	**14**	**13**	**5**	**5**	**3**	**1**
20-year SD	**4**	**4**	**3**	**2**	**1**	**1**

Calculations: For boat-based data, the estimated number of fishermen per trip is calculated by filtering interviews that recorded the number of fishers, and then ∑fishers/∑trips. A blank cell indicates insufficient data to generate an estimate of average fishers.

All: Average fishers from all trips by gear type.

BMUS: Average fishers from trips that landed BMUS by gear type.

Table 11b. Estimated number of fishermen per trip for bottomfishing gears in the American Samoa boat-based fishery for all species and BMUS only

Year	Bottomfishing		Bottom-Troll Mixed		Spear	
	All	**BMUS**	**All**	**BMUS**	**All**	**BMUS**
1989	3	3	4	4	5	6
1990	2	2	3	3	4	
1991	3	3	3	3	5	
1992	2	2				
1993	2	2	3	3	5	
1994	2	2	3	3	4	
1995	3	2	2	3		
1996	3	3	3	2		
1997	3	3	3	3	5	3
1998	3	3	3		6	
1999	2	2	3		4	
2000	3	3	3	3		
2001	3	3			3	
2002	3	3			5	
2003	3	3	3	3	4	
2004	3	3	3	3	6	
2005	3	3	3	3	5	

Year	Bottomfishing		Bottom-Troll Mixed		Spear	
	All	**BMUS**	**All**	**BMUS**	**All**	**BMUS**
2006	3	4	3	3	4	6
2007	3	3	3	3	5	5
2008	3	3	3	3	4	5
2009	4	4	4	4	6	
2010	3	4	3	3	6	5
2011	3	3	3	3	7	9
2012	2	3	5	3	5	
2013	3	3	4	4	6	6
2014	3	3	3	3	6	7
2015	3	3	3	3	5	5
2016	3	3	3	3	5	4
2017	6	6	7	4	7	14
2018	3	3	3	2	5	5
2019	3	3	3	3	5	4
10-year avg.	**3**	**3**	**4**	**3**	**6**	**7**
10-year SD	**1**	**1**	**1**	**1**	**1**	**3**
20-year avg.	**3**	**3**	**3**	**3**	**5**	**6**
20-year SD	**1**	**1**	**1**	**0**	**1**	**3**

1.9 BYCATCH ESTIMATES

This section focuses on Magnuson-Stevens Fishery Conservation and Management Act (MSA) § 303(a)(11), which requires that all fishery management plans (FMPs) establish a standardized reporting methodology to assess the amount and type of bycatch occurring in the fishery. Additionally, it is required to include conservation and management measures that, to the extent practicable, minimize bycatch and bycatch mortality. The MSA § 303(a)(11) standardized reporting methodology is commonly referred to as a ‘‘Standardized Bycatch Reporting Methodology’’ (SBRM) and was added to the MSA by the Sustainable Fisheries Act of 1996 (SFA). The Council implemented omnibus amendments to FMPs in 2003 to address MSA bycatch provisions and established SBRMs at that time.

Calculations: The number caught is the sum of the total number of BMUS individuals found in the raw data including bycatch. The number kept is the total number of BMUS individuals in the raw data that are not marked as bycatch. The number released is number caught minus the number kept. Percent bycatch is the sum of all released divided by the number caught.

Table 12. Time series of bycatch estimates in the American Samoa BMUS fishery

Year	# Caught	Kept	Released	% Bycatch
1992	1,803	1,803	0	0
1993	1,534	1,534	0	0
1994	5,447	5,447	0	0
1995	2,397	2,397	0	0
1996	3,940	3,940	0	0
1997	2,910	2,910	0	0
1998	998	998	0	0
1999	3,213	3,213	0	0
2000	3,386	3,386	0	0
2001	3,499	3,499	0	0
2002	3,362	3,362	0	0
2003	3,778	3,778	0	0
2004	2,970	2,970	0	0
2005	1,807	1,807	0	0
2006	1,573	1,573	0	0
2007	2,752	2,752	0	0
2008	4,616	4,616	0	0
2009	11,080	11,080	0	0
2010	2,902	2,902	0	0
2011	4,229	4,229	0	0
2012	775	775	0	0
2013	1,031	1,031	0	0
2014	2,219	2,219	0	0
2015	3,602	3,602	0	0

Year	# Caught	Kept	Released	% Bycatch
2016	888	888	0	0
2017	926	926	0	0
2018	630	630	0	0
2019	771	771	0	0
10-year avg.	**1,797**	**1,797**	**0**	**0**
10-year SD	**1,273**	**1,273**	**0**	**0**
20-year avg.	**2,840**	**2,840**	**0**	**0**
20-year SD	**2,266**	**2,266**	**0**	**0**