1.2 GUAM FISHERY DESCRIPTIONS

1.2.1 Bottomfish Fishery

Bottomfishing in Guam is a combination of recreational, subsistence, and small-scale commercial fishing. It can be separated into two distinct fisheries separated by depth and species composition. The shallow water complex (< 500 ft.) comprises the largest portion of the total bottomfish harvest and effort, and primarily includes: reef-dwelling snappers of the genera *Lutjanus*, *Aphareus*, and *Aprion*; groupers of the genera *Epinephelus*, *Variola*, and *Cephalopholis*; jacks of the genera *Caranx* and *Carangoides*; Holocentrids (*Myripristis* spp. and *Sargocentron* spp.); emperors of the genera *Lethrinus* and *Gymnocranius*; and Dogtooth Tuna (*Gymnosarda unicolor*). The deep-water complex (>500 ft.) consists primarily of groupers of the genera *Hyporthodus* and *Cephalopholis*, jacks of the genera *Caranx* and *Seriola*, and snappers of the genera *Pristipomoides*, *Etelis*, and *Aphareus*. In recent years, deep water species have made up a significant portion of the total expanded bottomfishing catch.

Many people that participate in the bottomfish fishery are either subsistence or part-time commercial fishermen, operate boats less than 25 feet in length, and target primarily the shallow water bottomfish complex. It is not uncommon to intercept fishermen combining bottomfishing with other methods such as trolling, spearing, and jigging to maximize their catch. High demand has made it profitable to sell locally caught bottomfish, although overhead costs including fuel and gear may be significant factors for in determining a fisherman's selection of fishing method. The demand for local bottomfish, when combined with environmental pressures, however, may cause stress to local bottomfish stocks.

The majority of bottomfishing around Guam takes place on offshore banks, though practically no information exists on the condition of the reefs on offshore banks. On the basis of anecdotal information, most of the offshore banks are in good condition due to their isolation. According to Myers (1997), less than 20 percent of the total coral reef resources harvested in Guam are taken from the exclusive economic zone (EEZ), primarily because the reefs are often associated with less accessible offshore banks. As such, finfish make up most of the catch in the EEZ. Most offshore banks are deep, remote, and subject to strong currents. Generally, these banks are only accessible during calm weather in the summer months (May to August/September). Galvez Bank is the closest and most accessible and, consequently, fished most frequently. In contrast, other banks (White Tuna and Santa Rosa, Rota) are remote and generally are fished only during exceptional weather conditions (Green 1997). Local fishermen report that up to ten commercial boats, with two to three people per boat, and some recreational boats, make use of the banks when the weather is good (Green 1997).

At present, the banks are fished using two methods: bottomfishing by hook and line and jigging at night for bigeye scad (*Selar crumenophthalmus*; Myers 1997). In recent years, the estimated annual catch in these fisheries has ranged from 14 to 22 metric tons of shallow bottomfish and 3 to 15 metric tons of bigeye scad (Green 1997). The shallow water component accounted for nearly 68 percent (35,002 to 65,162 lb) of the aggregate bottomfish landings in fiscal years 1992–1994 (Myers 1997). Catch composition of the shallow water bottomfish complex (and coral reef species) is dominated by lethrinids, with a single species (*Lethrinus rubrioperculatus*) alone accounting for 28 percent of the total catch. Other important components of the bottomfish catch include lutjanids, carangids, other lethrinids, and serranids. Holocentrids, mullids, labrids,

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scombrids, and balistids are minor components of the shallow water bottomfish complex. It should be noted that at least two of these species (*Aprion virescens* and *Caranx lugubris*) are also found in deeper waters, and as a result comprise a portion of the catch of the deep-water fishery.

Species that are commonly taken in the shallow-bottom fishery of Guam are: *Aphareus furca, Aprion virescens, Lutjanus kasmira, L. fulvus, Carangoides orthogrammus, Caranx lugubris, C. melampygus, C. ignobilis, Selar crumenophthalmus, Cephalopholis argus, C. spiloparaea, C. urodeta, Epinephelus fasciatus, Gymnocranius* spp., *Lethrinus atkinsoni, L. erythracanthus, L. olivaceus, L. rubrioperculatus, L. xanthochilus, Gymnosarda unicolor, Sargocentron* spp., *Myripristis* spp., *Variola albimarginata,* and *V. louti*.

Species that are commonly taken in the deep-bottom fishery of Guam are: *Aphareus rutilans, Aprion virescens, Caranx lugubris, Seriola dumerilii, Cephalopholis igarashiensis, C. sonnerati, Hyporthodus octofasciatus, Etelis carbunculus, E. coruscans,* and *Pristipimoides* spp.

1.2.1.1 Fishermen Observations

Fishers from Guam met with the Council's Advisory Panel on Tuesday, February 9, 2021, to discuss their observations on fisheries during 2020. While the COVID-19 pandemic's impact was felt in all the territories, its arrival during March 2020 placed restrictions to fishing activity mostly in the Mariana Archipelago with a lockdown implemented on Guam. It was not until the latter half of 2020 were all fishing restrictions eased. Fishermen reported a banner year for deep water bottomfish with a number of young boaters trying deep bottomfish fishing for the first time. Fishers attributed this to a longer period of calmer weather allowing them more opportunities to fish. Onaga were caught in all sizes, but opakapaka were in the 8 to 9 lb range and caught in larger numbers. Sharks were also noticeable above 100 fathoms, particularly tiger and silvertip sharks. Sales of bottomfish were affected by the pandemic with hotels not purchasing fish, but restaurants that continued operations were able to purchase bottomfish.

1.2.2 Ecosystem Component (formerly Coral Reef) Fishery

Shore-based fishing accounts for most of the fish and invertebrate harvest from coral reefs around Guam. The coral reef fishery harvests more than 100 species of fish, including members of the families Acanthuridae, Carangidae, Gerreidae, Holocentridae, Kyphosidae, Labridae, Lethrinidae, Lutjanidae, Mugilidae, Mullidae, Scaridae, and Siganidae (Hensley and Sherwood 1993). There are several pulse fisheries for juvenile fish that can be major components of the coral reef fishery, but totals in these can vary year to year. These include juvenile rabbitfish (manahak and lesso'), juvenile jacks (i'e), and juvenile goatfish (ti'ao).

Species that are commonly taken in the coral reef fishery of Guam are: *Naso unicornis, N. lituratus, Acanthurus xanthopterus, A. lineatus, A. triostegus*, *Caranx melampygus*, *C. papuensis* (i'e), *Selar crumenophthalmus, Gerres acinaces, Myripristis* spp., *Sargocentron* spp., *Neoniphon* spp., *Kyphosus cinerascens*, *K. vaigiensis*, *Cheilinus undulatus*, *Cheilinus* spp., *Halichoeres* spp., *Lethrinus harak, L. obseletus, L. atkinsoni, Gnathodentex aurolineatus, Lutjanus fulvus, L. monostigma, L. bohar, L. argentimaculatus, Mulloidichthys flavolineatus, M. vanicolensis* (ti'ao), *Parupeneus multifasciatus*, *P. barberinus, P. cyclostomus, Ellechelon vaigiensis, Moolgarda engeli, M. seheli, Chlorurus spilurus, C. frontalis, Scarus psittacus*, *S. altipinnis, S. rubrioviolaceus, S. ghobban, S. schlegeli, Siganus spinus,* and *S. argenteus* (manahak, lesso).

Hook and line is the most common method of fishing for coral reef fish in Guam. In 2019, hook and line fishing accounted for around 62% of fishers and 67% of gear. Throw net (talaya) is the second most common method, accounting for about 16% of fishers and 15% of gear. Other methods include gill net, snorkel spearfishing, SCUBA spearfishing, surround net, drag net, hooks and gaffs, and gleaning.

Guam has continued to experience high levels of commercial activity targeting reef fish. This has primarily been performed by recent migrants from the Federated States of Micronesia. The fishers are generally hired by retail shops to fish six days per week; there have been as many as eight or nine of these stores open at a time. Gathering commercial sales data from these vendors has been difficult due to vendor anxiety surrounding the reason data is being collected and the lack of perceived benefit to the vendor for reporting sales. There have been several instances during data collection where the vendors were not able to comfortably communicate in English. Data collected from these vendors is of limited value, as fish are not identified to species level, and are frequently labeled simply as "reef fish". In 2020, there was one vendor reporting sales. In order to improve this situation, the Council, Division of Aquatic and Wildlife Resources (DAWR), and PIFSC partnered to increase vendor participation in the data collection program through the Territory Science Initiative. Extensive training, follow-ups, education, and outreach efforts were conducted to vendors and fishermen to increase participation in data collection.

In 2018, the Council drafted an Amendment 5 to the Mariana Archipelago FEP that reclassified a large number MUS as ECS (WPRFMC 2018). The final rule was published in the *Federal Register* in early 2019 (84 FR 2767, February 8, 2019), and reduced the number of MUS from 227 species/families to 13 in the Mariana Archipelago FEP. All former CREMUS and CMUS 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 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 1.2.6.3 and 2.1.3).

1.2.3 Fishery Data Collection System

Guam currently has three fishery-dependent collection programs which can be described as long-term data collection programs with different approaches for gathering important information on fishery harvest methods performed by fishermen. The three programs are the offshore data program and the commercial fishery program. The Sportfish Restoration Grant from the U.S. Fish and Wildlife Service (USFWS) provides the significant portion of the funding for these programs. Training of the fishery staff to collect information is rigorous, and year-end totals are calculated by an expansion process done with in collaboration with NMFS PIFSC. Identification of fish to the species level is the goal of Guam's fishery staff.

The boat-based creel survey is a long-term program that collects participation, effort, and catch data from fishermen. Collaboration with PIFSC has resulted in a reproducible computer database program that can analyze the data to produce various types of trends that describe status of both charter and non-charter fisheries in federal and local waters. The commercial receipt book program is an important source of information for fish that enter the commercial market;

however, obtaining information from dealers has been sporadic, occasionally with less than three dealers providing data. In order to improve this situation, the Council, DAWR, and PIFSC partnered to increase vendor participation in the data collection program through the Territory Science Initiative (TSI).

Oram et al. (2011) and Jasper et al. (2016) describe the fishery data collection process for the offshore program on Guam. In general, DAWR staff collect fishery information through a series of random-stratified surveys for participation (i.e. accounting for fishing effort) and catch interviews (i.e. accounting for catch composition, size frequency, and CPUE). These data are transcribed into the WPacFIN database, and the annual catch estimates are expanded from the effort and CPUE information. Monthly commercial vendor reports are tallied at the end of the year and adjusted based on the coverage estimates provided by the vendor and/or the data collection program staff.

1.2.4 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.

1.2.4.1 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 Guam boat-based creel survey meta-data

Year	# Sample Days	# Catch Interviews	
		Regular	Opportunistic
1982	46	469	8
1983	47	431	34
1984	53	531	0
1985	66	812	0
1986	49	522	0
1987	48	612	0
1988	48	949	0

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Year	# Sample Days	# Catch Interviews	
		Regular	Opportunistic
1989	48	931	2
1990	48	1,028	0
1991	48	1,019	1
1992	48	1,110	0
1993	52	1,119	0
1994	55	1,168	0
1995	96	1,613	4
1996	96	1,608	0
1997	96	1,358	0
1998	96	1,581	0
1999	96	1,367	3
2000	96	1,246	1
2001	96	908	6
2002	84	610	1
2003	78	446	0
2004	95	530	1
2005	97	552	0
2006	96	556	0
2007	96	500	0
2008	96	571	2
2009	96	803	0
2010	96	902	0
2011	96	645	0
2012	74	371	0
2013	96	561	1
2014	90	635	9
2015	97	651	13
2016	93	900	2
2017	92	820	10
2018	89	795	11
2019	93	786	3
2020	96	345	1
10-year avg.	**92**	**651**	**5**
10-year SD	**6**	**176**	**5**
20-year avg.	**92**	**644**	**3**
20-year SD	**6**	**168**	**4**

1.2.4.2 Commercial Receipt Book Statistics

Calculations:

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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 Guam commercial receipt book meta-data

Year	# Vendors	# Total Invoices Collected	# BMUS Vendors	# BMUS Invoices Collected
1982	*	*	*	*
1983	3	2,312	*	*
1984	3	2,587	3	48
1985	*	*	*	*
1986	*	*	*	*
1987	*	*	*	*
1988	*	*	*	*
1989	*	*	*	*
1990	4	2,803	3	72
1991	3	2,512	*	*
1992	3	2,737	*	*
1993	3	2,664	*	*
1994	*	*	*	*
1995	3	1,565	*	*
1996	6	1,965	3	27
1997	7	2,923	4	41
1998	4	3,591	3	69
1999	5	3,410	3	177
2000	3	3,868	3	174
2001	3	4,155	3	286
2002	3	3,498	*	*
2003	*	*	*	*
2004	3	3,107	*	*
2005	3	2,649	*	*
2006	4	2,589	*	*
2007	*	*	*	*
2008	*	*	*	*
2009	*	*	*	*
2010	*	*	*	*
2011	*	*	*	*
2012	*	*	*	*
2013	*	*	*	*

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Year	# Vendors	# Total Invoices Collected	# BMUS Vendors	# BMUS Invoices Collected
2014	8	1,355	*	*
2015	9	1,361	*	*
2016	8	1,661	*	*
2017	11	1,996	4	104
2018	10	1,748	4	56
2019	6	1,199	*	*
2020	*	*	*	*
10-year avg.	**6**	**1,429**	*****	*****
10-year SD	**4**	**315**	*****	*****
20-year avg.	**4**	**2,037**	*****	*****
20-year SD	**3**	**833**	*****	*****

* Confidential (less than three vendors)

1.2.5 Fishery Summary Dashboard Statistics

The Fishery Summary Dashboard Statics section consolidates fishery-dependent information comparing the most recent year with short-term (recent 10-year) and long-term (recent 20-year) 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*

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

Table 3. Annual indicators for Guam bottomfish fisheries describing performance and comparing 2020 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 (lb)**		
All gears (BMUS only)	All BMUS from creel survey data	**17,199[▼31%]**	**17,199[▼37%]**
	All BMUS from commercial purchase data	**No trends available due to confidentiality**	**No trends available due to confidentiality**
	Catch-per-unit-effort (from boat-based creel surveys)		
Bottomfishing (BMUS only)	Bottomfishing lb/trip	**13[▼24%]**	**13[▼28%]**
	Bottomfishing lb/gr-hr	**0.8498[▼26%]**	**0.8498[▼32%]**

Fishery	Fishery statistics	Short-term (10 years)	Long-term (20 years)
Bottomfish	**Total estimated catch (lb)**		
	Fishing effort (from boat-based creel surveys)		
Bottomfishing (BMUS only)	Estimated total bottomfishing trips	**42[▼18%]**	**42[▼30%]**
	Estimated total bottomfishing gear hours	**626[▼33%]**	**626[▼35%]**
	Fishing participants (from boat-based creel surveys)		
Bottomfishing (BMUS only)	Estimated number of bottomfishing vessels	**35[▼10%]**	**35[▼22%]**
	Estimated average number of fishermen per bottomfishing trip	**3[no change]**	**3[no change]**
	Bycatch		
BMUS	# fish caught	**302[▼43%]**	**302[▼52%]**
	# fish discarded/released	**0 [▼100%]**	**0[▼100%]**
	% bycatch	**0[▼100%]**	**0[▼100%]**

Table 4. Annual indicators for Guam ECS fisheries describing performance and comparing 2020 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 (lb)**		
Prioritized ECS	*Naso unicornis* from creel survey data	**954[▼65%]**	**954[▼85%]**
	Siganus spinus from creel survey data	**1,640[▲369%]**	**1,640[▲310%]**
	Siganus spinus from commercial purchase data	**NA[▼100%]**	**NA[▼100%]**
	Lethrinus harak from creel survey data	**790[▼79%]**	**790[▼79%]**
	Chlorurus frontalis from creel survey data	**1,824[▼249%]**	**1,824[▼179%]**
	Epinephelus fasciatus from creel survey data	**1,355[▼5%]**	**1,355[▼41%]**
	Caranx melampygus from creel survey data	**134[▼95%]**	**134[▼96%]**
	Lethrinus olivaceus from creel survey data	**899[▲4%]**	**899[▼46%]**
	Lutjanus fulvus from creel survey data	**200[▼59%]**	**200[▼56%]**
	Scarus rubroviolaceus from creel survey data	**NA[▼100%]**	**NA[▼100%]**

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1.2.6 Catch Statistics

The following section summarizes the catch statistics for bottomfish, the top ten landed species, and nine prioritized species in Guam as decided by DAWR. 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 the ECS and bottomfish fisheries.

1.2.6.1 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 each type of data collection (boat-based creel and the commercial purchase reports).

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

Year	Boat-Based Creel Survey Estimates	Shore-Based Creel Survey Estimates	Total Creel Survey Estimates	Commercial Landings
1982	20,677	NA	20,677	*
1983	36,150	NA	36,150	*
1984	14,655	NA	14,655	3,445
1985	38,960	4	38,964	*
1986	16,404	386	16,790	*
1987	24,279	12	24,291	*
1988	33,986	3,092	37,078	*
1989	44,799	76	44,875	*
1990	33,816	2,812	36,628	4,277
1991	31,546	6,849	38,395	*
1992	36,316	3,264	39,580	*
1993	39,073	1,184	40,257	*
1994	40,719	387	41,106	*
1995	27,194	1,279	28,473	*
1996	40,498	2,053	42,551	1,251
1997	21,255	313	21,568	1,957
1998	22,296	330	22,626	4,576
1999	40,773	117	40,890	20,940
2000	58,640	768	59,408	12,184

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Year	Boat-Based Creel Survey Estimates	Shore-Based Creel Survey Estimates	Total Creel Survey Estimates	Commercial Landings
2001	43,696	175	43,871	10,554
2002	20,366	741	21,107	*
2003	29,506	2	29,508	*
2004	25,233	20	25,253	*
2005	29,087	129	29,216	*
2006	33,414	1,764	35,178	*
2007	22,576	194	22,770	*
2008	31,103	168	31,271	*
2009	35,029	302	35,331	*
2010	23,928	223	24,151	*
2011	52,230	680	52,910	*
2012	17,518	454	17,972	*
2013	27,277	471	27,748	*
2014	20,687	1,303	21,990	*
2015	10,782	305	11,087	*
2016	24,479	512	24,991	*
2017	14,653	239	14,892	4,002
2018	28,364	1,116	29,480	3,029
2019	28,849	1,136	29,985	*
2020	17,198	1	17,199	8,501
10-year avg.	**24,204**	**622**	**24,825**	*****
10-year SD	**11,006**	**409**	**11,163**	*****
20-year avg.	**26,799**	**497**	**27,296**	*****
20-year SD	**9,425**	**475**	**9,502**	*****

*Confidential (less than three vendors).
"NA" = No data available.

1.2.6.2 Expanded Catch Estimates by Fishing Method

Catch information is provided for the top boat-based fishing methods that comprise most of the annual BMUS catch in Guam.

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 (lb) for all species and BMUS only using Guam expanded boat-based creel survey data for bottomfishing gears

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Year	Bottomfish		Spearfishing (Snorkel)		Spearfishing (SCUBA)	
	All	BMUS	All	BMUS	All	BMUS
1982	41,329	20,677	420	NA	NA	NA
1983	50,415	36,150	1,355	NA	4,399	NA
1984	57,412	14,525	14,108	87	5,460	43
1985	88,047	36,660	18,737	481	12,761	76
1986	34,515	14,904	12,545	10	5,145	92
1987	44,459	23,510	12,448	261	7,474	198
1988	67,038	32,204	24,712	1,717	10,649	50
1989	79,973	43,732	30,931	46	13,985	9
1990	61,401	32,827	28,871	NA	22,273	393
1991	60,753	31,113	27,898	49	37,027	339
1992	78,174	33,303	35,162	179	25,226	1,938
1993	107,130	37,092	39,435	NA	22,848	293
1994	105,283	40,310	37,554	NA	27,244	247
1995	101,075	25,125	40,554	60	74,735	1,246
1996	129,708	38,618	67,446	255	91,810	698
1997	109,345	20,779	37,363	82	41,920	177
1998	99,601	21,618	56,442	272	68,198	314
1999	122,930	39,717	45,200	168	80,859	263
2000	115,837	56,095	42,403	282	116,072	1,052
2001	123,975	43,119	74,369	NA	65,105	535
2002	55,447	19,092	21,712	39	34,766	347
2003	82,224	29,057	22,649	NA	40,093	77
2004	61,874	23,268	33,601	130	50,442	1,726
2005	62,651	27,838	15,036	256	27,934	896
2006	89,865	32,132	12,796	1,178	4,129	NA
2007	57,750	20,363	18,516	357	11,316	1,835
2008	59,639	30,872	29,715	124	24,647	NA
2009	89,997	34,369	22,669	305	28,947	NA
2010	56,164	22,958	23,635	233	1,775	NA
2011	88,694	50,576	26,483	NA	67,431	26
2012	40,214	17,518	23,986	NA	12,204	NA
2013	42,602	14,425	20,816	NA	2,771	NA
2014	69,299	18,011	28,088	274	32,316	NA
2015	29,395	10,253	22,371	NA	30,654	NA
2016	51,475	23,872	28,985	376	21,517	NA
2017	46,715	14,096	17,045	88	9,854	NA
2018	57,904	27,022	23,051	130	65,998	672
2019	44,208	28,448	13,557	18	15,532	NA

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Year	Bottomfish		Spearfishing (Snorkel)		Spearfishing (SCUBA)	
	All	BMUS	All	BMUS	All	BMUS
2020	33,444	16,914	8,459	25	2,848	NA
10-year avg.	**50,395**	**22,114**	**21,284**	**91**	**26,113**	**70**
10-year SD	**16,812**	**10,984**	**6,218**	**126**	**22,437**	**201**
20-year avg.	**62,177**	**25,210**	**24,377**	**177**	**27,514**	**306**
20-year SD	**22,454**	**9,691**	**12,970**	**263**	**20,839**	**554**

"NA" = No data available.

1.2.6.3 Top and Prioritized ECS 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, Guam DAWR selected nine species that were reclassified as ECS that are still of priority to Guam DAWR 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 Guam from boat-based creel survey data in 2020

Common Name	Scientific Name	Catch (lb)
Longfin emperor	*Lethrinus erythropterus*	1,793
Yellowlip emperor	*Lethrinus xanthochilus*	1,447
Bigeye trevally	*Caranx sexfasciatus*	1,376
Assorted reef fish	Assorted reef fish	1,371
Orangespine unicornfish	*Naso lituratus*	1,283
Yellow spotted jack	*Carangoides orthogrammus*	1,280
Bigeye scad (atulai)	*Selar crumenophthalmus*	906
Whmargin lyretail grouper	*Variola albimarginata*	837
Emperors (misc.)	Lethrinidae spp.	705
Honeycomb grouper	*Epinephelus merra*	621

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

Table 28b. Top ten landed ECS in Guam from estimated commercial landings data in 2020

Common Name	Scientific Name	Catch (lb)
Reef fish	Actinopterygii (class)	7982
Mafute (emperor)	Lethrinidae (family)	5129
Bigeye scad (atulai)	*Selar crumenophthalmus*	1281
Jacks (misc.)	Carangidae (family)	938
Grouper (misc.)	Serranidae (family)	901
Bottomfish (misc.)	Percoidei (suborder)	826

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Uku (gray snapper)	Aprion virescens	781
Surgeonfish (misc.)	Acanthuridae (family)	522
Parrotfish (misc.)	Scaridae (family)	351
Amberjack (misc.)	*Seriola dumerili*	280

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

Table 8a. Catch (lb) from boat-based expansion data for prioritized species in Guam ECS fisheries

Year	*Naso unicornis*	*Siganus spinus*	*Lethrinus harak*	*Chlorurus frontalis*	*Epinephelus fasciatus*	*Caranx melampygus*	*Lethrinus olivaceus*	*Lutjanus fulvus*	*Scarus rubroviolaceus*
1982	NA	NA	NA	NA	335	490	43	8	NA
1983	10	NA	NA	16	1,505	670	NA	109	NA
1984	383	NA	NA	NA	669	96	174	NA	NA
1985	1,177	NA	296	502	3,313	2,961	765	100	175
1986	305	NA	33	572	610	512	458	95	288
1987	227	66	21	517	1,482	1,286	77	103	138
1988	1,219	84	127	2,409	3,967	869	214	192	1,906
1989	4,402	422	1,185	105	2,046	1,451	397	1,269	892
1990	4,648	670	2,628	2	1,348	2,861	3,757	202	628
1991	6,683	570	2,022	225	2,827	1,936	744	2,024	2,395
1992	15,510	418	1,544	3,157	2,126	735	1,484	1,018	1,594
1993	5,335	2,103	2,263	181	5,950	2,087	353	617	1,126
1994	6,089	426	3,098	832	2,342	2,606	5,470	3,108	809
1995	23,433	2,133	3,268	1,874	7,747	5,038	1,628	1,514	1,262
1996	40,676	935	6,523	1,221	6,017	8,961	2,700	1,853	983
1997	18,354	1,541	6,151	197	4,581	3,843	2,073	704	457
1998	26,540	1,464	3,293	2,478	8,678	2,913	586	749	708
1999	23,985	2,096	4,185	1,114	6,348	2,985	2,309	477	495
2000	34,700	646	4,188	78	3,607	4,846	4,081	920	1,941
2001	17,222	989	4,705	508	3,590	2,822	3,615	625	940
2002	12,329	1,012	3,675	158	2,030	4,179	11,890	172	49
2003	8,643	740	4,108	1,911	9,998	3,376	629	504	830
2004	18,734	24	5,669	30	3,608	5,622	2,700	238	NA
2005	12,089	71	5,451	956	1,446	4,460	1,161	104	814
2006	1,283	192	1,960	268	2,766	6,357	257	297	159

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Year	*Naso unicornis*	*Siganus spinus*	*Lethrinus harak*	*Chlorurus frontalis*	*Epinephelus fasciatus*	*Caranx melampygus*	*Lethrinus olivaceus*	*Lutjanus fulvus*	*Scarus rubroviolaceus*
2007	4,848	18	1,354	98	2,616	1,365	799	616	4,175
2008	10,882	1,341	1,023	1,915	1,894	5,349	179	424	375
2009	6,588	101	6,741	1,165	2,003	3,134	1,870	694	NA
2010	4,291	NA	4,164	847	2,061	1,751	1,454	495	178
2011	2,341	NA	6,954	NA	2,246	1,218	1,319	1,018	NA
2012	93	15	4,781	431	1,073	1,000	414	791	NA
2013	3,269	158	7,195	551	1,962	9,524	113	324	785
2014	5,950	344	8,231	115	1,590	5,394	2,729	773	NA
2015	2,064	235	2,550	NA	1,917	371	741	324	NA
2016	2,226	614	2,132	332	1,114	3,669	375	144	453
2017	711	79	2,289	32	1,632	2,162	356	793	NA
2018	4,578	NA	503	1,752	672	855	756	134	30
2019	5,375	418	1,909	178	756	1,654	905	367	NA
2020	954	1,640	790	1,824	1,355	134	899	200	NA
10-year avg.	**2,756**	**350**	**3,733**	**522**	**1,432**	**2,598**	**861**	**487**	**127**
10-year SD	**1,900**	**471**	**2,686**	**657**	**501**	**2,767**	**706**	**307**	**257**
20-year avg.	**6,224**	**400**	**3,809**	**654**	**2,316**	**3,220**	**1,658**	**452**	**439**
20-year SD	**5,307**	**482**	**2,294**	**677**	**1,925**	**2,332**	**2,522**	**259**	**917**

"NA" = No data available.

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Calculations: Catch tallied from commercial purchase data for species identified as priority ECS (Appendix A). From the prioritized ECS list, only *Siganus spinus* is included because there are no specific species codes for the other eight prioritized species in the Guam commercial coding system, which tends to aggregate data into larger groups such as taxonomic family.

Table 29b. Catch (lb) from commercial purchase data for *Siganus spinus* in Guam

Year	*Siganus spinus*
1980	NA
1981	NA
1982	NA
1983	26
1984	32
1985	116
1986	8
1987	NA
1988	NA
1989	NA
1990	419
1991	11
1992	18
1993	NA
1994	NA
1995	NA
1996	131
1997	84
1998	1,895
1999	3,450
2000	NA
2001	15
2002	891
2003	170
2004	48
2005	NA
2006	62
2007	81
2008	NA
2009	NA
2010	NA
2011	77
2012	NA
2013	145

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Year	*Siganus spinus*
2014	1,088
2015	572
2016	2,377
2017	10,941
2018	6,262
2019	614
2020	NA
10-year avg.	**2,208**
10-year SD	**3,432**
20-year avg.	**1,167**
20-year SD	**2,647**

"NA" = No data available.

1.2.7 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 the bottomfishing (handline gear), spearfishing (snorkel), and spearfishing (SCUBA). CPUE is reported as both pounds per gear hour and pounds per fishing trip in the boat-based fishery.

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

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

BMUS - lb/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.

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

Year	Bottomfish				Spearfish (Snorkel)				Spearfish (SCUBA)			
	All		BMUS		All		BMUS		All		BMUS	
	lb/trip	lb/gr-hr	lb/trip	lb/gr-hr	lb/trip	lb/gr-hr	lb/trip	lb/gr-hr	lb/trip	lb/gr-hr	lb/trip	lb/gr-hr
1982	27	2.9804	17	1.7678	7	2.4557	NA	NA	0	0.0000	NA	NA
1983	23	2.9477	20	2.3322	7	1.6667	NA	NA	18	5.8928	NA	NA
1984	28	3.1113	17	2.0308	39	2.3189	8	0.6667	24	4.9721	1	0.3333
1985	27	2.4127	17	1.4869	48	4.5320	6	0.5238	25	6.5827	2	0.5556
1986	23	2.3213	24	1.7770	43	4.1517	1	0.2000	20	4.3467	3	0.5000
1987	23	2.5543	18	1.7063	28	5.4609	4	0.8462	30	6.6600	3	0.5333
1988	21	2.0470	13	1.1149	35	6.0494	34	8.5000	20	7.4436	2	0.8000
1989	20	2.0972	15	1.5016	26	3.0735	1	0.1875	31	5.9778	1	0.2857
1990	21	1.9714	16	1.4451	22	3.6592	NA	NA	46	11.2994	6	1.0000
1991	19	2.1711	16	1.7610	24	4.4477	1	0.1250	47	14.4258	5	0.9705
1992	17	1.8832	11	1.0764	24	3.5194	3	0.5000	24	8.0667	10	2.1277
1993	19	1.8407	18	1.6922	21	3.3678	NA	NA	58	19.1070	5	1.2709
1994	26	2.4099	21	1.7297	25	3.6202	NA	NA	55	15.0625	4	0.8738
1995	13	0.9952	11	0.8471	31	3.7368	3	0.2500	89	17.2943	10	1.4909
1996	18	1.1629	16	1.2204	33	4.2093	3	1.0000	76	11.1851	7	0.4564
1997	14	0.9523	11	0.7171	25	3.0947	10	4.0000	81	14.5710	4	0.5385
1998	14	1.0103	10	0.7897	21	2.9303	5	0.3170	98	15.8821	2	0.2828
1999	16	1.0965	17	1.2082	17	2.0771	7	3.5000	100	14.8138	2	0.3077
2000	18	1.3369	19	1.2652	21	2.7212	24	24.0000	90	13.9828	4	0.4444
2001	20	1.6460	15	1.2636	56	4.6910	21	1.3125	69	10.9794	4	0.3947
2002	17	1.3706	14	1.1609	21	3.0062	1	0.0833	58	6.9565	12	1.2778
2003	21	1.5561	16	0.9489	40	5.0514	NA	NA	108	13.1981	3	0.2222
2004	24	1.9106	20	1.4692	28	3.4182	2	0.1111	81	9.1358	11	1.0323
2005	27	2.1847	31	2.2326	20	2.5622	6	1.1000	61	5.5541	13	0.5200

Year	Bottomfish				Spearfish (Snorkel)				Spearfish (SCUBA)			
	All		BMUS		All		BMUS		All		BMUS	
	lb/trip	lb/gr-hr	lb/trip	lb/gr-hr	lb/trip	lb/gr-hr	lb/trip	lb/gr-hr	lb/trip	lb/gr-hr	lb/trip	lb/gr-hr
2006	31	2.1537	26	1.4301	24	2.3030	16	1.0159	13	2.6939	NA	NA
2007	30	2.2159	16	1.1718	31	3.2893	4	0.4211	100	8.0000	25	1.5625
2008	21	1.7548	17	1.2500	38	3.0544	2	0.1765	35	4.4894	NA	NA
2009	29	2.1263	25	1.8459	23	2.7082	2	0.1628	63	7.0000	NA	NA
2010	17	1.2138	13	0.8260	19	2.4203	1	0.2000	2	0.4444	NA	NA
2011	37	2.7082	29	2.1370	41	5.1745	NA	NA	140	11.5052	1	0.1667
2012	21	2.0613	18	1.6227	58	7.6230	NA	NA	70	10.0000	NA	NA
2013	19	1.5329	16	1.1190	28	2.2838	NA	NA	10	3.5294	NA	NA
2014	24	1.3286	13	0.9106	35	2.3940	4	0.5000	33	8.6087	NA	NA
2015	16	1.2879	15	1.1425	33	3.0245	NA	NA	58	2.6977	NA	NA
2016	21	1.4899	17	1.1526	27	2.7552	4	0.2917	68	4.7859	NA	NA
2017	19	1.3687	11	0.7040	16	1.9180	2	0.1622	43	5.3438	NA	NA
2018	26	0.5106	21	0.3699	41	3.6643	3	0.1111	97	7.1759	29	1.7959
2019	20	1.6701	19	1.4515	17	1.4503	1	0.1250	45	2.9945	NA	NA
2020	14	1.1790	13	0.8498	9	1.0738	1	0.5000	76	4.7789	NA	NA
10-yr avg	**22**	**1.5137**	**17**	**1.1460**	**31**	**3.1361**	**3**	**0.2817**	**64**	**6.1420**	**15**	**0.9813**
10-yr SD	**6**	**0.5456**	**5**	**0.4737**	**14**	**1.8596**	**1**	**0.1650**	**34**	**2.8936**	**14**	**0.8146**
20-yr avg.	**23**	**1.6635**	**18**	**1.2529**	**30**	**3.1933**	**5**	**0.4182**	**62**	**6.4936**	**12**	**0.8715**
20-yr SD	**6**	**0.4797**	**5**	**0.4493**	**12**	**1.4568**	**6**	**0.3894**	**34**	**3.2840**	**10**	**0.5908**

"NA" = No data available.

1.2.8 Effort Statistics

This section summarizes the effort trends in the Guam 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 Guam boat-based fishery for all species and BMUS only

Year	Bottomfish				Spearfish (Snorkel)				Spearfish (SCUBA)			
	All		BMUS		All		BMUS		All		BMUS	
	Trips	Gr-hrs	Trips	Gr-hrs	Trips	Gr-hrs	Trips	Gr-hrs	Trips	Gr-hrs	Trips	Gr-hrs
1982	97	869	74	715	5	15	NA	NA	1	1	NA	NA
1983	89	683	66	566	6	24	NA	NA	13	40	NA	NA
1984	124	1,118	39	328	20	336	1	12	12	57	1	3
1985	217	2,391	139	1,635	19	203	4	42	36	139	3	9
1986	103	1,024	41	543	14	145	1	5	8	38	1	6
1987	114	1,041	72	758	20	101	3	13	11	50	3	15
1988	173	1,776	137	1,542	33	190	2	8	25	67	2	5
1989	187	1,790	127	1,307	24	204	3	16	24	123	1	4
1990	157	1,660	108	1,219	18	107	NA	NA	17	70	1	6
1991	152	1,316	92	852	20	109	2	16	27	89	5	24
1992	152	1,368	98	1,013	30	205	1	6	48	146	3	14
1993	164	1,700	81	842	38	242	NA	NA	29	87	4	15
1994	185	2,028	105	1,282	37	251	NA	NA	32	116	5	21
1995	302	3,860	127	1,613	56	464	1	12	56	287	8	56
1996	277	4,173	97	1,284	62	482	2	6	48	327	5	75
1997	238	3,554	75	1,183	41	328	1	3	27	150	2	13
1998	315	4,311	125	1,551	96	700	4	66	40	246	6	50
1999	285	4,039	112	1,549	51	428	1	2	43	290	9	65
2000	200	2,676	92	1,345	47	366	1	1	41	265	8	72
2001	197	2,337	95	1,161	22	261	1	16	29	182	4	38
2002	150	1,861	73	878	29	202	1	12	11	92	2	18
2003	107	1,411	55	905	22	175	NA	NA	13	106	2	23
2004	112	1,432	60	837	17	138	2	27	11	97	3	31
2005	121	1,510	69	946	24	186	2	10	7	76	1	25
2006	104	1,519	61	1,123	19	198	2	32	5	25	NA	NA

Year	Bottomfish				Spearfish (Snorkel)				Spearfish (SCUBA)			
	All		BMUS		All		BMUS		All		BMUS	
	Trips	Gr-hrs	Trips	Gr-hrs	Trips	Gr-hrs	Trips	Gr-hrs	Trips	Gr-hrs	Trips	Gr-hrs
2007	84	1,126	55	745	13	121	2	19	2	25	1	16
2008	104	1,226	57	792	26	322	3	34	6	47	NA	NA
2009	146	1,979	76	1,019	28	233	4	43	3	27	NA	NA
2010	165	2,287	96	1,460	27	207	4	20	1	5	NA	NA
2011	101	1,373	62	840	15	118	NA	NA	4	49	1	6
2012	53	530	32	353	8	61	NA	NA	3	21	NA	NA
2013	60	763	31	437	12	148	NA	NA	3	9	NA	NA
2014	92	1,625	46	604	17	205	1	8	3	12	NA	NA
2015	73	887	34	432	17	184	NA	NA	4	86	NA	NA
2016	106	1,506	62	927	25	241	2	24	22	313	NA	NA
2017	115	1,573	69	1,073	31	256	2	19	4	32	NA	NA
2018	99	5,010	54	3,053	19	215	2	45	16	216	3	49
2019	127	1,525	76	1,016	20	217	1	8	6	91	NA	NA
2020	73	849	42	626	17	149	1	2	3	48	NA	NA
10-year avg.	**90**	**1,564**	**51**	**936**	**18**	**179**	**1**	**11**	**7**	**87**	**NA**	**6**
10-year SD	**23**	**1,208**	**15**	**746**	**6**	**57**	**1**	**14**	**6**	**95**	**1**	**15**
20-year avg.	**109**	**1,616**	**60**	**961**	**20**	**192**	**2**	**16**	**8**	**78**	**1**	**10**
20-year SD	**34**	**902**	**18**	**547**	**6**	**58**	**1**	**14**	**7**	**77**	**1**	**15**

"NA" = No data available.

1.2.9 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 can also be used as an indicator for 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	Bottomfish		Spearfish (Snorkel)		Spearfish (SCUBA)	
	All	BMUS	All	BMUS	All	BMUS
1982	58	47	4	NA	1	NA
1983	51	41	5	NA	4	NA
1984	75	33	13	1	6	1
1985	97	66	9	3	21	3
1986	62	27	12	1	7	1
1987	71	42	14	3	8	2
1988	92	76	22	2	14	1
1989	100	70	20	3	18	1
1990	87	58	17	NA	9	1
1991	96	65	19	2	19	4
1992	88	62	23	1	29	3
1993	116	53	25	NA	20	4
1994	122	71	32	NA	22	4
1995	170	82	39	1	30	5
1996	148	68	44	2	28	3
1997	126	51	31	1	18	2
1998	153	72	54	4	20	4
1999	152	69	44	1	16	6
2000	107	61	35	1	21	5
2001	131	73	18	1	16	3
2002	104	58	24	1	9	2
2003	80	48	21	NA	9	2
2004	83	47	16	2	5	2
2005	78	42	16	2	6	1
2006	72	45	18	2	4	NA

Year	Bottomfish		Spearfish (Snorkel)		Spearfish (SCUBA)	
	All	**BMUS**	**All**	**BMUS**	**All**	**BMUS**
2007	58	41	11	2	2	1
2008	78	44	19	3	3	NA
2009	98	49	25	4	3	NA
2010	103	61	22	4	1	NA
2011	72	44	14	NA	3	1
2012	46	29	8	NA	2	NA
2013	48	28	12	NA	3	NA
2014	69	39	12	1	3	NA
2015	60	26	15	NA	2	NA
2016	75	41	18	2	10	NA
2017	85	54	26	2	2	NA
2018	67	37	16	2	7	3
2019	84	52	13	1	3	NA
2020	62	35	14	1	3	NA
10-year avg.	**67**	**39**	**15**	**1**	**4**	**0**
10-year SD	**13**	**9**	**5**	**1**	**2**	**1**
20-year avg.	**78**	**45**	**17**	**2**	**5**	**1**
20-year SD	**20**	**11**	**5**	**1**	**4**	**1**

"NA" = No data available.

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 32b. Estimated number of fishermen per trip for bottomfishing gears in the Guam boat-based fishery for all species and BMUS only

Year	Bottomfish		Spearfish (Snorkel)		Spearfish (SCUBA)	
	All	**BMUS**	**All**	**BMUS**	**All**	**BMUS**
1982	2	2	3	NA	1	NA
1983	2	2	2	NA	1	NA
1984	3	3	4	3	2	1
1985	3	3	4	3	2	1
1986	3	2	3	1	3	2
1987	2	2	2	1	2	2
1988	3	3	3	2	2	1
1989	3	3	3	2	3	3
1990	3	3	4	NA	3	4

Year	Bottomfish		Spearfish (Snorkel)		Spearfish (SCUBA)	
	All	**BMUS**	**All**	**BMUS**	**All**	**BMUS**
1991	3	3	3	3	3	4
1992	3	3	4	1	3	3
1993	3	3	3	NA	4	4
1994	3	3	3	NA	4	4
1995	4	3	3	2	4	5
1996	5	3	3	1	4	6
1997	6	4	3	5	4	4
1998	4	3	3	4	4	5
1999	4	3	3	2	4	4
2000	4	3	3	2	4	4
2001	3	2	3	2	4	5
2002	3	2	3	2	4	4
2003	3	3	4	NA	4	4
2004	4	3	3	6	4	4
2005	3	2	3	3	3	5
2006	3	2	3	3	3	NA
2007	4	3	3	2	4	4
2008	3	2	3	3	3	NA
2009	3	2	3	3	4	NA
2010	3	3	3	3	3	NA
2011	3	3	4	NA	4	3
2012	3	3	3	NA	5	NA
2013	3	3	4	NA	3	NA
2014	3	3	4	4	3	NA
2015	4	4	4	NA	7	NA
2016	3	3	3	2	5	NA
2017	2	2	3	3	5	NA
2018	4	3	4	4	5	3
2019	3	3	4	5	7	NA
2020	3	3	4	6	6	NA
10-year avg.	**3**	**3**	**4**	**2**	**5**	**1**
10-year SD	**1**	**0**	**0**	**2**	**1**	**1**
20-year avg.	**3**	**3**	**3**	**3**	**4**	**2**
20-year SD	**0**	**1**	**0**	**2**	**1**	**2**

"NA" = No data available.

1.2.10 Bycatch Estimates

This section focuses on MSA § 303(a)(11), which requires that all FMPs establish a standardized reporting methodology to assess the amount and type of bycatch occurring in the fishery, and 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 establish SBRMs.

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 observed catch and bycatch in the Guam BMUS fishery

Year	BMUS			Non-BMUS			BMUS + Non-BMUS		
	# Caught	# Discard or Release	% Bycatch	# Caught	# Discard or Release	% Bycatch	# Caught	# Discard or Release	% Bycatch
1982	1,062	0	0.00	535	0	0.00	1,597	0	0.00
1983	940	0	0.00	567	0	0.00	1,507	0	0.00
1984	590	0	0.00	2,757	0	0.00	3,347	0	0.00
1985	1,830	0	0.00	3,010	0	0.00	4,840	0	0.00
1986	546	0	0.00	1,078	0	0.00	1,624	0	0.00
1987	1,313	0	0.00	1,206	0	0.00	2,519	0	0.00
1988	1,399	0	0.00	1,603	0	0.00	3,002	0	0.00
1989	2,028	0	0.00	1,534	0	0.00	3,562	0	0.00
1990	1,542	0	0.00	1,328	0	0.00	2,870	0	0.00
1991	1,366	0	0.00	1,417	0	0.00	2,783	0	0.00
1992	1,046	0	0.00	1,481	0	0.00	2,527	0	0.00
1993	946	0	0.00	1,947	0	0.00	2,893	0	0.00
1994	1,663	0	0.00	2,067	0	0.00	3,730	0	0.00
1995	1,449	0	0.00	3,536	0	0.00	4,985	0	0.00
1996	1,281	0	0.00	3,963	0	0.00	5,244	0	0.00
1997	983	0	0.00	3,359	0	0.00	4,342	0	0.00
1998	993	0	0.00	4,145	0	0.00	5,138	0	0.00
1999	1,081	0	0.00	3,857	0	0.00	4,938	0	0.00
2000	1,090	6	0.55	2,815	526	18.69	3,905	532	13.62
2001	1,023	16	1.56	2,873	607	21.13	3,896	623	15.99
2002	629	2	0.32	1,875	351	18.72	2,504	353	14.10
2003	497	20	4.02	1,391	171	12.29	1,888	191	10.12

Year	BMUS			Non-BMUS			BMUS + Non-BMUS		
	# Caught	# Discard or Release	% Bycatch	# Caught	# Discard or Release	% Bycatch	# Caught	# Discard or Release	% Bycatch
2004	586	0	0.00	1,218	122	10.02	1,804	122	6.76
2005	616	0	0.00	1,090	66	6.06	1,706	66	3.87
2006	1,140	27	2.37	1,048	118	11.26	2,188	145	6.63
2007	417	7	1.68	955	132	13.82	1,372	139	10.13
2008	572	3	0.52	1,085	118	10.88	1,657	121	7.30
2009	860	0	0.00	1,991	77	3.87	2,851	77	2.70
2010	890	0	0.00	1,698	29	1.71	2,588	29	1.12
2011	707	0	0.00	1,421	45	3.17	2,128	45	2.11
2012	309	0	0.00	615	37	6.02	924	37	4.00
2013	293	0	0.00	929	44	4.74	1,222	44	3.60
2014	658	6	0.91	1,794	163	9.09	2,452	169	6.89
2015	366	0	0.00	1,054	70	6.64	1,420	70	4.93
2016	641	2	0.31	1,033	45	4.36	1,674	47	2.81
2017	766	0	0.00	1,547	26	1.68	2,313	26	1.12
2018	406	2	0.49	1,115	27	2.42	1,521	29	1.91
2019	865	3	0.35	982	44	4.48	1,847	47	2.54
2020	302	0	0.00	510	16	3.14	812	16	1.97
10-yr avg.	**531**	**1**	**0.21**	**1,100**	**52**	**4.57**	**1,631**	**53**	**3.19**
10-yr SD	**207**	**2**	**0.29**	**377**	**40**	**2.09**	**532**	**41**	**1.63**
20-yr avg.	**627**	**4**	**0.63**	**1,311**	**115**	**7.77**	**1,938**	**120**	**5.53**
20-yr SD	**237**	**7**	**1.02**	**526**	**136**	**5.40**	**697**	**139**	**4.14**