Annual Catch Limit Specifications and Accountability Measures for Pacific Islands Coral Reef Ecosystem Fisheries in 2014 to 2018

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Abstract

NMFS proposes to specify an annual catch limit (ACL) and accountability measures (AM) for each coral reef ecosystem stock and stock complex of management unit species (MUS) in American Samoa, Guam, the Northern Mariana Islands, and Hawaii. The ACLs and AMs would be applicable in fishing years 2014 which begin January 1 and end December 31, annually. The purpose of the action is to comply with provisions of the fishery ecosystem plans (FEP) for American Samoa, the Mariana Archipelago, and Hawaii which require NMFS to specify an ACL for each stock and stock complex in western Pacific coral reef ecosystem fisheries and implement AMs that prevent ACLs from being exceeded, and correct or mitigate overages of ACLs if they occur.

Given the number of individual coral reef ecosystem stocks and stock complexes in each island area, individual species were aggregated into higher taxonomic groups, generally at the family level. A range of ACL specifications was developed for each taxonomic group based on an analysis of catch data, estimated biomass data, and in consideration of the ratio of estimated catch-to-estimated biomass for each taxonomic group. In general, the ACL specification for each taxonomic group is proposed to be set equal or less than to the level of catch associated with the following options: 1) no action – maintain the ACL at 75th percentile of the entire catch history for the taxonomic group in each island area; or 2) updated time series using the 75th percentile of the entire catch time series. However, species of special management interest, as determined by the Western Pacific Fishery Management Council (Council), were removed from the taxonomic groupings. Separate ACL specifications are proposed for those stocks and set to five percent of each stock's estimated biomass. Additionally, for two individual stocks for which estimates of maximum sustainable yield (MSY) are available, the proposed ACL specification would be set equal to MSY. The proposed ACL specifications were recommended by the Council and were developed in accordance with the approved ACL mechanism described in each FEP, and in consideration of the best available scientific, commercial, and other information.

Currently, near-real time processing of catch information cannot be achieved in any western Pacific coral reef fishery. Therefore, in-season AMs to prevent an ACL from being exceeded (e.g., fishery closures in federal waters) are not possible at this time. For this reason, the AM being proposed for all coral reef ecosystem fisheries is a post-season accounting of the catch each fishing year and evaluation of whether an ACL has been exceeded. Consistent with regulations implementing western Pacific FEPs, if landings of a stock or stock complex exceed the specified ACL in a fishing year, the Council would take action in accordance with 50 CFR 600.310(g) to correct the operational issue that caused the ACL overage, which may include a recommendation that NMFS implement a downward adjustment to the ACL for that stock complex in the subsequent fishing year, or other measures, as appropriate.

1. Background Information

Fisheries for coral reef ecosystem management unit species (CREMUS) in federal waters of the exclusive economic zone (EEZ; generally 3-200 nmi) around the U.S. Pacific Islands are governed by one of four fishery ecosystem plans (FEP) developed by the Western Pacific Fishery Management Council (Council) and implemented by the National Marine Fisheries Service (NMFS) under the authority of the Magnuson-Stevens Fishery Conservation and Management Act (Magnuson-Stevens Act). Three of the FEPs are archipelagic-based and include the American Samoa Archipelago FEP, the Hawaii Archipelago FEP, and the Mariana Archipelago FEP, which covers federal waters around Guam and the Commonwealth of the Northern Mariana Islands (CNMI). The fourth FEP covers federal waters of the U.S. Pacific remote island areas (PRIA) which include Palmyra Atoll, Kingman Reef, Jarvis Island, Baker Island, Howland Island, Johnston Atoll, and Wake Island. For each FEP, federal regulations at 50 CFR §665 defines CREMUS to include all coral reef associated species, families or subfamilies which spend the majority of their non-pelagic (post settlement) life stages within waters less than or equal to 50 fathoms (300 feet) in total depth. CREMUS do not include species defined in other sections of 50 CFR §665 as bottomfish, crustacean, precious coral or pelagic management unit species (MUS).

Federal requirements for coral reef ecosystem fisheries of the western Pacific include a prohibition on the use of destructive and non-selective gear methods, vessel identification and gear marking requirements. A special coral reef ecosystem fishing permit (SCERFP) and logbook reporting is also required for harvesting certain CREMUS defined in federal regulations as Potentially Harvested Coral Reef Taxa, and for fishing with new gear methods, or fishing in designated low-use MPAs. Federal requirements also direct NMFS to specify an annual catch limit (ACL) and accountability measures (AM) for each coral reef ecosystem stock and stock complex[1], as recommended by the Council, and considering the best available scientific, commercial, and other information about the fishery for that stock or stock complex.

Overview of the ACL Specification Process

In accordance with the Magnuson-Stevens Act and the FEPs, there are three required elements in the development of an ACL specification. The first requires the Council's Scientific and Statistical Committee (SSC) to calculate an acceptable biological catch (ABC) that is set at or below the stock or stock complex's overfishing limit (OFL). The OFL is an estimate of the catch level above which overfishing is occurring. ABC is the level of catch that accounts for the scientific uncertainty in the estimate of OFL and other scientific uncertainty. To determine the appropriate ABC, the ACL mechanism described in the FEPs includes a five-tiered system of acceptable biological catch control rules that account for varying levels of scientific data available for a given fishery.

[1] The Magnuson-Stevens Act defines the term "stock of fish" to mean a species, subspecies, geographic grouping, or other category of fish capable of management as a unit. Federal regulations at 50 CFR §660.310(c) defines "stock complex" to mean a group of stocks that are sufficiently similar in geographic distribution, life history, and vulnerabilities to the fishery such that the impact of management actions on the stocks is similar.

When calculating an ABC for a stock or stock complex, the SSC must first evaluate the information available for the stock and assign the stock or stock complex into one of the five tiers. The SSC must then apply the control rule assigned to that tier to determine ABC. For data poor stocks like CREMUS where only catch data are available and OFL is unknown, ABC is calculated by the SSC based on the Tier 5 ABC control rule (Tier 5: Data poor, Ad hoc Approach to Setting ABCs) which directs the SSC to multiply the average catch from a time period when there is no quantitative or qualitative evidence of declining abundance ("Recent Catch") by a factor based on a qualitative estimate of relative stock size or biomass (B) in the year of management. When it is not possible to analytically determine B relative to the biomass necessary to produce the maximum sustainable yield (MSY) from the fishery, or B_{MSY}, the process allows for an approach based on informed judgment, including expert opinion and consensus-building methods. Table 1 provides a summary of the Council's default ABC control rule for data poor stocks.

Table 1. Tier 5 ABC Control Rule (Data poor, Ad hoc Approach to Setting ABCs)

If estimate of B is above B_{MSY}	ABC = 1.00 x Recent Catch
If estimate of B is above minimum stock size threshold (MSST), but below B_{MSY}	ABC = 0.67 x Recent Catch
If estimate of B is below MSST (i.e., overfished)	ABC = 0.33 x Recent Catch

The ACL process also allows the SSC to utilize any other information deemed useful to establish ABC and may recommend an ABC that differs from the results of the default ABC control rule calculation based on factors such as data uncertainty, recruitment variability, declining trends in population variables, and other factors determined relevant by the SSC. However, the SSC must explain its rationale.

The second element requires the Council to determine an ACL that may not exceed the SSC recommended ABC. The process includes methods by which the ACL may be reduced from the ABC based on social, economic, and ecological considerations, or management uncertainty (SEEM). An ACL set below the ABC further reduces the probability that actual catch will exceed the OFL and result in overfishing.

The third and final element in the ACL process is the inclusion of AMs. There are two categories of AMs, in-season AMs and AMs that make adjustments to an ACL if it is exceeded. In-season AMs prevent an ACL from being exceeded and may include, but are not limited to, closing the fishery, closing specific areas, changing bag limits, or other methods to reduce catch. An annual catch target (ACT) may also be used in the system of AMs so that an ACL is not exceeded. An ACT is the management target of the fishery and accounts for management uncertainty in controlling the actual catch at or below the ACL.

If the Council determines that an ACL has been exceeded, the Council may recommend as an AM, that NMFS reduce the ACL in the subsequent fishing year by the amount of the overage. In determining whether an overage adjustment is necessary, the Council would consider the magnitude of the overage and its impact on the affected stock's status. Additionally, if an ACL is exceeded more than once in a four-year period, the Council is required to re-evaluate the ACL process, and adjust the system, as necessary, to improve its performance and effectiveness. Figure 1 illustrates the relationship between the terms used in this section.

For more details on the specific elements of the ACL specification mechanism and process, see Amendment 1 to the PRIA FEP, Amendment 2 to the American Samoa Archipelago FEP, Amendment 2 to the Mariana FEP, Amendment 3 to the Hawaii Archipelago FEP, and the final implementing regulations at 50 CFR §665.4 (76 FR 37285, June 27, 2011).

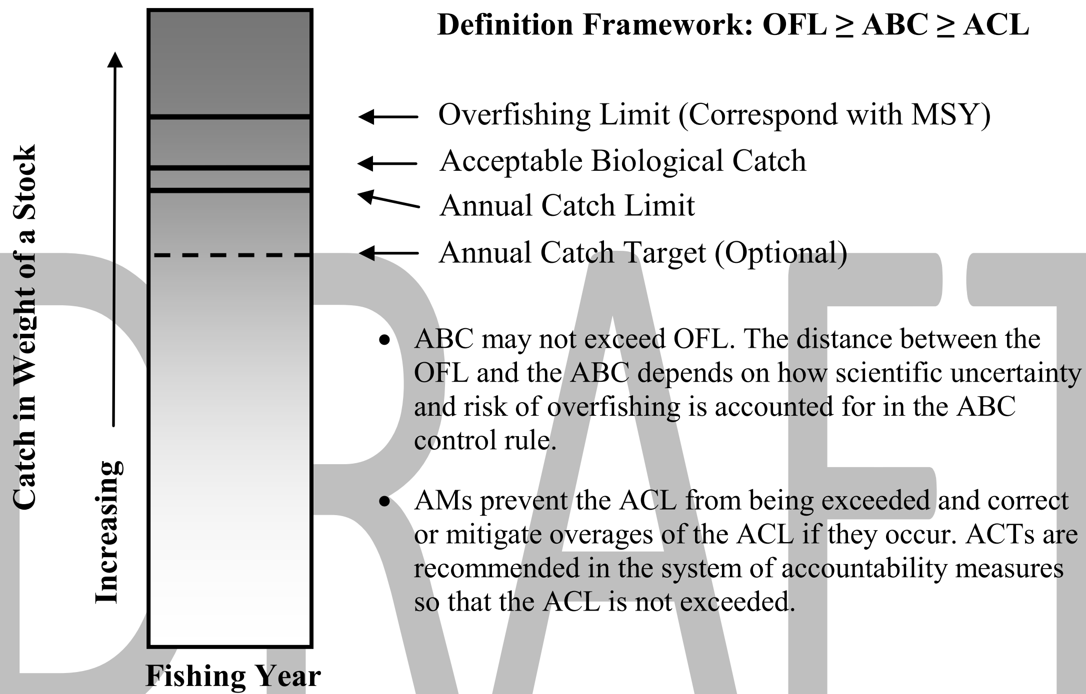

Figure 1. Relationship between OFL, ABC, ACL, and ACT

NMFS/Council Estimation of OFL

While each FEP describes procedures for establishing limits and reference point values based on standardized values of catch per unit effort (CPUE) and effort (E) which serve as proxies for relative biomass (B_{MSY}) and fishing mortality (F_{MSY}), respectively, neither the Council nor NMFS have determined reference point values for any CREMUS. Previous efforts by the Council through Hawhee (2007) demonstrated that there are still significant issues with standardizing CPUE and E for CREMUS, many of which are caught by multiple gear methods. Often times the data were too variable to discern any trends and the conclusions that could be made were questionable.

No action and alternative to update the time series and use the 75th percentile: Using the only the catch data to derive limits does not provide any estimate of overfishing.The 75th percentile method does not generate any estimate of MSY from which OFL can be derived. Therefore, OFL has not been estimated for any individual CREMUS in any island area. Estimates of MSY are available for two CREMUS; akule and opelu in Hawaii (Weng and Sibert 2000); however, these estimates were not used as proxy OFL values because they were not conducted through a formal NMFS stock assessment and did not undergo a peer-review process set by the Council and NMFS. Thus, uncertainty in the estimates is unquantified. For this reason, all CREMUS meet the Tier 5 criteria for level of data as described in the Council's ACL process and are considered data poor stocks.

SSC's Calculation of ABC

At its 113th meeting, the SSC received a presentation on three options for the respecification of ABCs. First option was a "**No action alternative"** which would maintain the same ABC based on ABC = 1 x 75th percentile of the entire catch time series. The second option was **"Update ABCs with recent data"** which would update the ABCs with recent data using the same control rule ABC = 1 x 75th percentile of the entire catch time series.

Option 1: No Action – Under this option the ABCs will be maintained at 2012-2013 levels. Previous ABC specification covers the following time period for the different State and Territories: 1) American Samoa (1990-2008); 2) Guam (1985-2008); 3) CNMI (2000-2008); 4) Hawaii (1948-2007). The ABC was based on a modified Tier 5 Control Rule using the 1.00 x 75th percentile of the entire catch time series rather than 1.00 x median of recent catch. Details of the previous ABC specification can be found at (CITE PREVIOUS ACL SPECIFICATION DOCUMENT). Briefly, the SSC determined at its 107th meeting that the catch trends over the available time series were extremely variable and not conducive to allowing the SSC to select a stable portion of the time series. The SSC also did not express support for an approach based on measures of central tendency (i.e., a statistical distribution that is usually measured by the arithmetic mean, mode or median) because of the high probability (50%) of exceeding this catch in any given year. Instead, the SSC recommended using the 75th percentile of the entire catch history for each taxonomic grouping as the definition of "Recent Catch" because the 75th percentile is a non-parametric approach compared to arithmetic and geometric mean. That is, the percentile approach is a distribution free method and does not rely on assumptions that the data are drawn from a given probability distribution. The SSC further noted that utilizing means would be inappropriate since catches (in this case the only available data) tend to assume central tendencies and normality which are mostly violated in cases where there is large variability.

At its 108th meeting, the SSC revisited the issue, but maintained its recommendation to use the 75th percentile because non-parametric measures are a better way to summarize data with considerable inter-annual variability (Chambers et al., 1983; Cleveland et al., 1993). While the median (50th percentile) would also be a robust measure of the long-term trend in such data, using the median of the catch time series would not be practical because the catch set equal to the 50th percentile would be reached 50% of the time. This is far too sensitive for catch data with significant inter-annual variations and impractical for management. The 75th percentile (the upper bound of the inter-quartile range) would result in fewer false triggering events resulting from inter-annual random fluctuations in the catch data series. The values associated with each of the metrics considered by the SSC for each major taxonomic group are listed in Table 2-5 below and measured in pounds (lb).

Option 2: Update ABCs with recent data – under this option the ABCs will be updated using the same metric are option 1 but with updated data to 2012. The catch data covers the following time period for the each State/Territories: 1) American Samoa (1990-2012); 2) Guam

(1985-2012); 3) CNMI (2000-2012); 4) Hawaii (1966-2012). At the Joint Archipelagic Plan Team Meeting on April 24, 2013, the Hawaii team members raised the issue of using the entire catch time series. They recommended truncating the time series to start in 1966 to 2012 because the data collection and reporting changed starting 1966. The catch reporting is standardized during this time period.

Estimation of Relative Stock Size

To qualitatively estimate stock status (B) relative to B_{MSY} for each CREMUS group, the SSC relied on an analysis of estimated catch-to-biomass presented in Luck and Dalzell (2010) which synthesized the available catch data time series for each taxonomic group with its corresponding biomass estimates as reported by NMFS Pacific Islands Fisheries Science Center (PIFSC), Coral Reef Ecosystem Division (CRED) through their Reef Assessment and Monitoring Program between 2007 and 2010 (Williams, 2010).[2] Within each island area, catch-to-biomass comparisons were conducted at three scales: (1) major populated islands; (2) lesser populated or unpopulated islands: and (3) both locations combined (i.e., whole archipelago). The analysis found that the percentage of biomass exploited was minor for most reef fish families, ranging from 22.5% (mullets around Guam) to less than 1% (most other reef fish families in all island areas). The report noted, however, that carangids (jacks), kyphosids (rudderfish) and lethrinids (emperors) tend to have the highest exploitation rates (>50% around Guam and populated islands of the CNMI) but acknowledged that this may be caused by an under-representation in visual surveys and included several references to support this position. When catch-to-biomass comparisons were viewed throughout the geographic range of a species for each island area (whole archipelago), estimated exploitation rates did not exceed 10% for any taxonomic group, including carangids, kyphosids and lethrinids. While Luck and Dalzell (2010) and Williams (2010) acknowledged issues with their respective data, these reports are likely to be among the best data available for assessing reef population status in the majority of US Pacific coral reef areas.

The SSC also considered a temporal analysis of size frequency for dozens of representative CREMUS taxa in American Samoa, Guam and CNMI which were obtained from catch data as well as from fishery independent underwater visual census surveys (WPFMC 2011). A regression analysis was done on each size frequency time series to test for significant trends. To make this trend analysis more meaningful, results of the trends from the catch were compared to results from the underwater census surveys to determine fishing impacts on fish size for each species. Any significant increase in size in the catch and increase in the underwater census surveys was assumed to represent sustainable fishing with no impact on the population. On the other extreme end, a significant decrease in size from catch and decrease from those observed underwater was assumed to indicate substantial impact on the population due to fishing. In American Samoa, most of the species showed significant increases in fish sizes for species caught in the fishery. There were no significant trends (although regression lines were mostly constant to slightly decreasing) for those same species observed in the underwater census

[2] For safety reasons, NMFS CRED visual surveys are restricted to depths shallower than 30m which may result in underestimates in biomass particularly for species with significant deep water distributions such as carangids. Additionally, the impacts of survey divers on fish behavior are difficult to quantify and may also result in underestimates of biomass. Problematic species include emperors, jacks and soldier fishes (Jennings and Polunin 1995, Kulbicki 1988, and Watson and Harvey, 2007).

surveys. In Guam and CNMI, of those species analyzed, only four species showed a significant increase while 30 showed no significant trend (mostly constant over time). Fourteen showed significant decrease in size over time. No significant trends were seen on the same species from the underwater census surveys.

Based on these analyses which are described in WPFMC (2011) and presented at the 107th SSC and discussed again at the 108th meeting, the SSC noted that stock biomass for the coral reef ecosystem taxonomic groups throughout their range (i.e., whole archipelago) is likely to be above B_{MSY}. Therefore, SSC recommended multiplying the level of catch associated with the 75th percentile for each taxonomic group by 1.0 as provided for under the default Tier 5 ABC control rule with the caveat that the ABC for species of special management interest (i.e., bumphead parrotfish, humphead wrasse and reef sharks) be calculated independently. Although crustaceans and mollusks were not included in the analysis conducted by Luck and Dalzell (2010), the ratio of catch-to-biomass throughout the range of these stock complexes is expected to be similar to those of other coral reef taxonomic groups, and B is likely to be above B_{MSY} for these taxa as well. Therefore, multiplying the level of catch associated with the 75th percentile for these taxa by 1.0, as provided for under the Tier 5 ABC control rule, is also appropriate.

<u>Calculation of ABC for Species with MSY and Species of Special Management Interest</u>
For species for which estimates of MSY are available (i.e. Hawaii akule and opelu), and species of special management interest to the Council (i.e., bumphead parrotfish, humphead wrasse and reef sharks), the SSC recommended alternative methods be used to calculate ABC as the level of information available for these taxa do not allow for a straight forward application of the Tier 5 control rule applied to the taxonomic family groupings.

For Hawaii akule and opelu, which have estimates of MSY by Weng and Sibert (2000), the SSC recommended that ABCs be set equal to the MSY for each stock which are 651,292 lb and 393,563 lb, respectively. During the period 2007-2011, the average annual catch of akule was 221,431 lb or 34% of MSY while the average annual catch of opelu over the same period was 184,533 lb or 47% of MSY. Additionally, it is well documented that both akule and opelu are small coastal pelagic species with fast growth rates, short life spans and high natural mortality rates (Dalzell et al., 1996). As such, they are highly resilient to fishing pressure. The SSC believes it is appropriate to set ABC = MSY because these species are relatively short lived (akule 1+ year and opelu 5 years) with high turn-over and because catches of akule have only occasionally exceeded MSY and catches of opelu are well below MSY. Therefore, B is likely to be above B_{MSY}.

For species of special management interest (bumphead parrotfish, humphead or Napoleon wrasse, and reef sharks), the SSC at its 108th meeting noted that these species occur infrequently in NOAA CRED RAMP surveys and have low overall catch. Therefore, data paucity precludes the utility of the Tier 5 control rule. For reef sharks and humphead wrasse, the SSC recommended setting ABC for each taxa at five percent of the biomass estimated by NOAA PIFSC CRED tow-board diver surveys. However, for bumphead parrotfish, only density data is available and limited to Pagan Island, CNMI (1.61 individuals/per km²), and the American Samoa islands of Tau (1.08 individual/per km²) and Tutuila (0.41 individuals/per km²) (NMFS unpublished data). Density estimates for each archipelago were converted to hectares (ha) and expanded based on total area of hard bottom habitat between 0 and 30 m (Mariana Archipelago: 24,289 ha; American Samoa: 7,790 ha) as estimated by Williams (2010). Expanded densities were then converted to biomass in kg using the average length (94 cm) and the CRED allometric conversion factors (a_value: 0.0183; b_value: 3.0421). Biomass was then converted back to pounds and ABC was set to 5% of this estimated biomass.

Table 2. Values of potential ABCs based on the two options compared to the estimated biomass and average catches from (2008-2012) for American Samoa CREMUS

	American Samoa CREMUS Grouping	Total Estimated Biomass (lb)	Option 1: No Action	Option 2: Updated data	Mean Catch (lb) 2008-2012
Top 90%	Acanthuridae – surgeonfish	2,222,908	19,516	17,300	13,260
	Lutjanidae – snappers	1,134,641	18,839	13,100	14,430
	Selar crumenophthalmus – atule or bigeye scad	N/A	8,396	7,600	3,058
	Mollusks – turbo snail; octopus; giant clams	N/A	16,694	16,500	7,293
	Carangidae – jacks	276,540	9,490	9,600	4,475
	Lethrinidae – emperors	559,821	7,350	10,200	10,480
	Scaridae – parrotfish[1]	1,832,548	8,145	9,800	7,324
	Serranidae – groupers	474,838	5,600	7,100	4,202
	Holocentridae – squirrelfish	78,286	2,585	2,500	2,097
	Mugilidae – mullets	N/A	2,857	2,400	1,168
	Crustaceans – crabs	N/A	2,248	2,100	4,711
Bottom 10%	Remaining 10% combined[2]	>2 million	18,910	7,500	5,537
Species of Special Management Interest	*Bolbometopon muricatum* – bumphead parrotfish	4,699	235	235	0
	Cheilinus undulatus – Humphead (Napoleon) wrasse	362,685	1,743	1,743	0
	Reef Sharks	66,973	1,309	1,309	25

[1] For ACL specifications, family Scaridae does not include *Bolbometopon muricatum* (bumphead parrotfish)
[2] For ACL specifications, family bottom 10% does not include *Cheilinus undulatus* (humphead or Napoleon wrasse) or reef sharks

Table 3. Values of potential ABCs based on the 2 options compared to the estimated biomass and average catches from (2008-2012) for Guam CREMUS

	Mariana CREMUS Grouping (Guam)	Total Estimated Biomass (lb)	Option 1: No Action	Option 2: Updated data	Mean Catch (lb) 2008-2012
Top 85%	Acanthuridae – surgeonfish	1,483,179	70,702	66,000	41,420
	Carangidae – jacks	65,210	45,377	32,100	42,822
	Selar crumenophthalmus – atulai or bigeye scad	N/A	56,514	61,400	7,312
	Lethrinidae – emperors	183,065	38,720	35,600	17,056

	Mariana CREMUS Grouping (Guam)	Total Estimated Biomass (lb)	Option 1: No Action	Option 2: Updated data	Mean Catch (lb) 2008-2012
	Scaridae – parrotfish[1]	1,586,650	28,649	27,700	12,870
	Mullidae – goatfish	103,302	25,367	19,100	9,880
	Mollusks – turbo snail; octopus; giant clams	N/A	21,941	21,000	13,083
	Siganidae – rabbitfish	N/A	26,120	21,000	10,132
	Lutjanidae – snappers	286,014	17,726	17,300	10,679
	Serranidae – groupers	359,400	17,958	17,400	10,020
	Mugilidae – mullets	N/A	15,032	14,500	2,850
	Kyphosidae – chubs/rudderfish	23,824	13,247	11,100	7,258
	Crustaceans – crabs	N/A	5,523	6,900	2,353
	Holocentridae – squirrelfish	148,521	8,300	7,500	2,699
	Algae	N/A	5,329	1,500	639
	Labridae – wrasses[2]	472,974	5,195	4,300	1,757
Bottom 15%	Other CREMUS (Remaining 15% combined)	>3.4 million	83,214	70,300	22,920
Species of Special Management Interest	*Bolbometopon muricatum* – bumphead parrotfish	15,931 Marianas	797 Marianas	797 Marianas	0
	Cheilinus undulatus – Humphead (Napoleon) wrasse	230,302	1,960	1,960	795
	Reef sharks	35,178	6,942	6,942	1,113

[1] For ACL specifications, family Scaridae does not include *Bolbometopon muricatum* (bumphead parrotfish)
[2] For ACL specifications, family Labridae does not include *Cheilinus undulatus* (humphead or Napoleon wrasse)

Table 4. Values of potential ABCs based on the two options compared to the estimated biomass and average catches from (2008-2012) for CNMI CREMUS

	Mariana CREMUS Grouping (CNMI)	Total Estimated Biomass (lb)	Option 1: No Action	Option 2: Updated data	Mean Catch (lb) 2008-2012
Top 90%	Lethrinidae – emperors	290,557	27,466	33,400	26,837
	Carangidae – jacks	472,124	21,512	22,200	17,225
	Acanthuridae – surgeonfish	3,535,142	6,884	9,100	7,260
	Selar crumenophthalmus – atulai or bigeye scad	N/A	7,459	14,400	13,196
	Serranidae – groupers	922,895	5,519	6,400	4,094
	Lutjanidae – snappers	1,816,674	3,906	5,000	3,900
	Mullidae – goatfish	922,895	3,670	4,400	2,133
	Scaridae – parrotfish[1]	1,568,870	3,784	5,500	4,102
	Mollusks – turbo snail; octopus; giant clams	N/A	4,446	5,900	1,620
	Mugilidae – mullets	N/A	3,308	3,600	1,394
	Siganidae – rabbitfish	N/A	2,537	3,100	5,285
Bottom 10%	Remaining 10% (combined)[2]	>3.4 million	9,820	10,900	7,724
Species of	*Bolbometopon muricatum* –	15,931	797	797	0

Special Management Interest	bumphead parrotfish	Marianas	Marianas	Marianas	
	Cheilinus undulatus – Humphead (Napoleon) wrasse	40,184	2,009	2,009	85
	Reef Sharks	111,997	5,600	5,600	0

1 For ACL specifications, family Scaridae does not include *Bolbometopon muricatum* (bumphead parrotfish)

2 For ACL specifications, bottom 10% does not include *Cheilinus undulatus* (humphead or Napoleon wrasse) or reef sharks

Table 5. Values of potential ABCs based on the three options compared to the estimated biomass and average catches from (2008-2012) for Hawaii CREMUS

	Hawaii CREMUS Grouping	**Total Estimated Biomass (lb)**	**Option 1: No Action**	**Option 2: Updated data**	**Mean Catch (lb)** 2008-2012
Top 90%	*Selar crumenophthalmus* – akule or bigeye scad[1]	N/A	651,292	651,300	362,594
	Decapterus macarellus – opelu or mackerel scad[1]	N/A	393,563	393,600	
	Carangidae – jacks[2]	130,521,134	193,423	461,000	320,956
	Mullidae – goatfish	12,017,286	125,813	79,500	55,805
	Acanthuridae – surgeonfish	104,285,468	80,545	89,100	111,034
	Lutjanidae – snappers[3]	33,557,777	65,102	3,800	44,879
	Holocentridae – squirrelfish	7,049,398	44,122	44,700	61,905
	Mugilidae – mullets	N/A	41,112	15,500	9,773
	Mollusks – turbo snails; octopus; giant clams	N/A	28,765	31,400	35,553
	Scaridae – parrotfish	76,936,076	33,326	37,400	64,646
	Crustaceans – crabs	N/A	20,686	25,300	30,871
Bottom 10%	Remaining 10% (combined)	>58 million	142,282	146,900	120,563
Species of Special Management Interest	Reef Sharks	2,231,321	111,566	111,600	0

1 ABC and ACL is based on estimate of MSY by Weng and Sibert (2000)

2 Carangidae includes the BMUS, kahala (*Seriola dumerili*) since this species is not included in NMFS bottomfish stock assessments, and is a reef associated species.

3 Lutjanidae includes the BMUS, taape (*Lutjanus kasmira*) since this species is not included in NMFS bottomfish stock assessments, and is a reef associated species.

Regarding AMs, the Council at its 157th meeting may recommend a post-season evaluation of the catch relative to the recommended ACL for each coral reef ecosystem stock and stock complex. If landings of a stock or stock complex exceed the specified ACL in a fishing year, the Council would take action in accordance with 50 CFR 600.310(g) to correct the operational issue that caused the ACL overage, which may include a recommendation that NMFS implement a downward adjustment to the ACL for that stock complex in the subsequent fishing year, or other measures, as appropriate.

2.2 ACL Alternatives for Coral Reef Ecosystem MUS in 2014

2.2.1 Alternative 1: No Action (Status Quo)

Under this alternative, **NMFS would not revise the ACL for 2014 on any CREMUS in any island area and AMs from the 2012 level**. This will maintain the ACLs at values associated with the 1x75th percentile of the catch time series based on the modified ABC control rule for Tier 5.

Pros: This alternative minimizes the administrative burden in re-specifying new ACLs. The impact analysis had already been conducted and the process had already been vetted through various advisory groups and agencies. This would also minimize public confusion associated with the published numbers. The estimate of catch limits will remain to be very precautionary since it was soley based catch information despite availability of other information like biomass. This, in effect, will result in the conservation of stock since the limit would restrict the fishery at a low level. The Council is already in the process of revising the ACL specification following the approved control rules realizing that the current ACLs are under estimated. Also majority of the fishery occurs in State/Territorial waters and has minimum impact on the federal stocks. Based on the evaluation of the Plan Team, the overages are artifact of data collection: 1) the low number of interviews from creel surveys skewed the expansion upwards; and 2) improvements in the Hawaii catch reporting due to implementation of civil fines increased the number of people reporting catches therefore increasing the catch numbers.

Cons: This alternative will continue to constrain the catches of coral reef fishermen. The catches in 2012 for certain CREMUS categories had exceeded its respective ACLs triggering the Accountability Measures and the Council would continue to make recommendation to address the overage. The catches in the succeeding years will continue to be exceeded due to the underestimation of the catch limits. Since stock status is officially unknown for most of these species/species groups the overage may be indicative of overfishing.

2.2.2 Alternative 2: Set ACLs equal to the new ABCs

Under this alternative, the **ACL for each CREMUS taxonomic group would be set at the value associated with the ABC set by the SSC**. This alternative would revise the ACLs based on the SSC's recommended ABC's from either option 2 (1x75th percentile of catch time series with updated information). This alternative when paired with option 1 of the SSC is technically alternative 1 above.

Pros: The improvements in the ACL would depend on the SSC's selection of the appropriate ABCs for each CREMUS complex. Setting the ACLs equal to the new ABC would potentially provide a larger catch for the fishermen. This is due to the level of catch is no longer reduced to account for management uncertainties. The current catches for most of the CREMUS complex are low relative to the existing limits. In the case of alternative 2 – ABC option 2, utilizing the most current data and applying the same ABC control rule allowed for an increase for some CREMUS complex and at the same time a decrease in others.

Cons: Setting ACLs equal to the new ABCs could be considered as a high risk situation due to absence of a management buffer between ACLs and ABCs. In the case of this alternative paired with ABC option 2, utilizing the most current data with the same control rule of 1x75th percentile, this would result in ACLs that are almost similar to the existing ACLs with only minute difference with the addition of new data (2009-2012). Some of the results are even lower than the current ACLs therefore would continue to constrain the catches of fishermen.

Table 6. ACL alternatives (in lb) for American Samoa CREMUS in 2014

American Samoa CREMUS Grouping	**Alt. 1** *Status Quo*	**Alt. 2** *ACL = ABC*	**Recent Ave. Catch** *2008-2012*
Acanthuridae – surgeonfish	19,516	17,300	13,260
Lutjanidae – snappers	18,839	13,100	14,430
Selar crumenophthalmus – atule or bigeye scad	8,396	7,600	3,058
Mollusks – turbo snail; octopus; giant clams	16,694	16,500	7,293
Carangidae – jacks	9,490	9,600	4,475
Lethrinidae – emperors	7,350	10,200	10,480
Scaridae – parrotfish[1]	8,145	9,800	7,324
Serranidae – groupers	5,600	7,100	4,202
Holocentridae – squirrelfish	2,585	2,500	2,097
Mugilidae – mullets	2,857	2,400	1,168
Crustaceans – crabs	2,248	2,100	4,711
Remaining 10% combined[2]	18,910	7,500	5,537
American Samoa Species of Special Management Interest	**Alt. 1** *Status Quo*	**Alt. 2** *Estimated Biomass*	**Recent Ave. Catch** *2008-2012*
Bolbometopon muricatum – bumphead parrotfish	235	235	0
Cheilinus undulatus – Humphead wrasse	1,743	1,743	0
Reef Sharks	1,309	1,309	25

[1] For ACL specifications, family Scaridae does not include *Bolbometopon muricatum* (bumphead parrotfish)

[2] For ACL specifications, bottom 10% does not include *Cheilinus undulatus* (humphead or Napoleon wrasse) or reef sharks

Table 7. ACL alternatives (in lb) for Guam CREMUS in 2014

Guam CREMUS Grouping	**Alt. 1** *Status Quo*	**Alt. 2** *ACL = ABC*	**Recent Ave. Catch** *2008-2012*
Acanthuridae – surgeonfish	70,702	66,000	41,420
Carangidae – jacks	45,377	32,100	42,822
Selar crumenophthalmus – atule or bigeye scad	56,514	61,400	7,312
Lethrinidae – emperors	38,720	35,600	17,056
Scaridae – parrotfish1	28,649	27,700	12,870
Mullidae – goatfish	25,367	19,100	9,880
Mollusks – turbo snail; octopus; giant clams	21,941	21,000	13,083
Siganidae – rabbitfish	26,120	21,000	10,132
Lutjanidae – snappers	17,726	17,300	10,679
Serranidae – groupers	17,958	17,400	10,020
Mugilidae – mullets	15,032	14,500	2,850
Kyphosidae – chubs/rudderfish	13,247	11,100	7,258
Crustaceans - crabs	5,523	6,900	2,353
Holocentridae – squirrelfish	8,300	7,500	2,699
Algae	5,329	1,500	639
Labridae – wrasses2	5,195	4,300	1,757
Other CREMUS (Remaining 15% combined)	83,214	70,300	22,920

Guam CREMUS Grouping	Alt. 1	Alt. 2	Recent Ave. Catch
	Status Quo	*ACL = ABC*	*2008-2012*
Guam Species of Special Management Interest	**Alt. 1**	**Alt. 2**	**Recent Ave. Catch**
	Status Quo	*Estimated Biomass*	*2008-2012*
Bolbometopon muricatum – bumphead parrotfish	797	797	0
Cheilinus undulatus – Humphead wrasse	1,960	1,960	795
Reef Sharks	6,942	6,942	1,113

[1] For ACL specifications, family Scaridae does not include *Bolbometopon muricatum* (bumphead parrotfish)
[2] For ACL specifications, family Labridae does not include *Cheilinus undulatus* (humphead or Napoleon wrasse)

Table 8. ACL alternatives (in lb) for CNMI CREMUS in 2014

CNMI CREMUS Grouping	Alt. 1	Alt. 2	Recent Ave. Catch
	Status Quo	*ACL = ABC*	*2008-2012*
Lethrinidae – emperors	27,466	33,400	26,837
Carangidae – jacks	21,512	22,200	17,225
Acanthuridae – surgeonfish	6,884	9,100	7,260
Selar crumenophthalmus – atulai or bigeye scad	7,459	14,400	13,196
Serranidae – groupers	5,519	6,400	4,094
Lutjanidae – snappers	3,906	5,000	3,900
Mullidae – goatfish	3,670	4,400	2,133
Scaridae – parrotfish[1]	3,784	5,500	4,102
Mollusks – turbo snail; octopus; giant clams	4,446	5,900	1,620
Mugilidae – mullets	3,308	3,600	1,394
Siganidae – rabbitfish	2,537	3,100	5,285
Remaining 10% (combined)[2]	9820	10,900	7,724
CNMI Species of Special Management Interest	**Alt. 1**	**Alt. 2**	**Recent Ave. Catch**
	Status Quo	*Estimated Biomass*	*2008-2012*
Bolbometopon muricatum – bumphead parrotfish	797	797	0
Cheilinus undulatus – Humphead wrasse	2,009	2,009	85
Reef Sharks	5,600	5,600	0

[1] For ACL specifications, family Scaridae does not include *Bolbometopon muricatum* (bumphead parrotfish)
[2] For ACL specifications, bottom 10% does not include *Cheilinus undulatus* (humphead or Napoleon wrasse) or reef sharks

Table 9. ACL alternatives (in lb) for Hawaii CREMUS in 2014

Hawaii CREMUS Grouping	Alt. 1	Alt. 2	Recent Ave. Catch
	Status Quo	*ACL = ABC*	*2008-2012*
Selar crumenophthalmus – akule or bigeye scad*	651,292	651,300	362,594
Decapterus macarellus opelu or mackerel scad*	393,563	393,600	
Carangidae – jacks[1]	193,423	461,000	320,956
Mullidae – goatfish	125,813	79,500	55,805
Acanthuridae – surgeonfish	80,545	89,100	111,034
Lutjanidae – snappers[2]	65,102	3,800	44,879
Holocentridae – squirrelfish	44,122	44,700	61,905
Mugilidae – mullets	41,112	15,500	9,773

Hawaii CREMUS Grouping	**Alt. 1**	**Alt. 2**	**Recent Ave. Catch**
	Status Quo	*ACL = ABC*	*2008-2012*
Mollusks – turbo snails; octopus; giant clams	28,765	31,400	35,553
Scaridae – parrotfish	33,326	37,400	64,646
Crustaceans – crabs	20,686	25,300	30,871
Remaining 10% (combined)	142,282	146,900	120,563
Hawaii Species of Special Management Interest	**Alt. 1**	**Alt. 2**	**Recent Ave. Catch**
	Status Quo	*ACL = ABC*	*2008-2012*
Reef Sharks	111,566	111,566	0

* Indicates ACL values based on estimate of MSY by Weng and Sibert (2000)

1 Carangidae includes the BMUS, kahala (*Seriola dumerili*) since this species is not included in NMFS bottomfish stock assessments and is a reef associated species.

2 Lutjanidae includes the BMUS, taape (*Lutjanus kasmira*) since this species is not included in NMFS bottomfish stock assessments and is a reef associated species.