WESTERN PACIFIC REGIONAL FISHERY MANAGEMENT COUNCIL

Marine Planning and Climate Change Committee 7th Meeting

Council Office, 1164 Bishop St, Ste. 1400, Honolulu, and by Teleconference

April 10 and 11, 2018 (Tuesday and Wednesday) 1 to 4 p.m. (HST)

DRAFT REPORT

April 10 (T) Hawai'i and American Samoa / April 11 (W) Guam and CNMI

1. **Welcome**

Kitty Simonds, executive director pf the Western Pacific Regional Fishery Management Council (WPFMC), welcomed the Marine Planning and Climate Change Committee (MPCCC) and thanked them for participating. She noted the importance of the Council's annual Stock Assessment and Fisheries Evaluation (SAFE) reports, which are shared with Congress.

2. Roll Call and Approval of Agenda

Lorilee Crisostomo, MPCCC chair, conducted a roll call of Committee members. The following members were present (* denotes by teleconference): Ryan Okano (for Bruce Anderson, Hawaii); Timmy Bailey (Hawaii); Lorilee Cirsostomo (Guam); Carl Domignuez, (Guam)*; Vince Leon Guerrero (Guam)*; John Marra (NOAA); Lynn McNutt (Kauai – arrived 2:30 p.m.)*; Thomas Oliver (NOAA); Richard Salas (Commonwealth of the Northern Mariana Islands (CNMI) – arrived 3 p.m.)*; Craig Severance (ex-officio MPCCC member/Council's Social Science Planning Committee chair); Eileen Shea (USA)*; Kim McGuire (American Samoa)*; Susan White (USFWS)*; and Phoebe Woodworth-Jefcoats (NOAA).

Absent were committee members Rose Ada-Hocog (CNMI); Leo Asuncion Jr. (Hawaii), Ernest Chargualaf (Guam), Augustin Kapat (CNMI) and Ray Tulafono (American Samoa).

Also present were Thomas Remington (Council contractor), Edwin Reyes (Guam Coastal Management Program) and Rebecca Walker (NOAA) as well as Council staff and island coordinators*.

Shea moved to approve agenda. Severance seconded.

3. **Island Area Updates including Climate Change Survey Results and Future Community Outreach and Other Members Updates**

a. American Samoa

American Samoa had no survey to report at this time.

b. Hawaii

Bailey said he wasn't here for last meeting and was unaware of the survey that was to be conducted.

Sylvia Spalding, Council staff, provided a background.

Bailey said he would not be representing the National Park Service (NPS) but he would provide an observation report on Maui now and follow up with a written report later. Maui hasn't seen sunshine the last few months. The Wildlife program has seen increased fuels for fires, which are being closely monitored. NPS has to mitigate these fuel hazards and have incorporated MOUs with neighboring ranches. Grazing is occurring from sea level up to the 3,000-foot elevation. In-house fire fuel reduction has included spraying of non-native pine trees, which may take away nesting habitat for seabirds. A fire in 2006 may have increased these pines along with more than normal wet season in last 15 years after a drought. Changing climate with wetter seasons has increased fuels not only for fire but also as more feed for ungulates. So the ungulates are reproducing, e.g., axis deer have doubled population in last four years. The rat population has also increased the last two years due to increased fuels and seeding. Rats are predators affecting nesting birds, particularly their eggs mainly. Gooseling mortality of nene is high due to wet and stormy weather. Invasive vegetation has also increased. Cultural concerns are vegetation on archaeological sites. On the positive side, water is flowing where water mixes with the ocean and the springs and streams are flowing. The monitoring station at the 4,000-foot level is being moved. The downside to this is 25 years of data trends is being interrupted. Invasive fish and limu seem to be more abundant. Sand mining is also an issue but not a climate issue, and they are working to put a moratorium on that.

Okano, with Hawaii State Division of Aquatic Resources, Department of Land and Natural Resources (DLNR), had two questions. First, what is response of deer if grass goes down?

Bailey said the deer will move from protected areas down to farms, agricultural areas, yards and highways, which cause an increase in traffic.

Okano asked, why, in the past few years, did the limu (ogo particularly) go down?

Bailey said harvesting or other environmental impacts. They notice an increase of certain species and certain non-native fish such as roi. But he couldn't answer as far as ogo.

Okano reported from DLNR. Because Hawaii suffered from coral bleaching a couple of years ago, it has centered efforts to address that. The coral bleach plan makes reefs more resilient and able to recover in a better way. A lot of the actions are spatial. The bleaching plan is incorporated as part of the 30x30 actions. The 30x30 is 30 percent of nearshore reefs will be effectively managed by 2030. There is no hardline definition of effective management.

Simonds suggested that nearshore assessments would ideally be completed first.

Okano said West Hawaii is effectively managed and discussed another success story as well.

c. Guam

Leon Guerrero gave update on Guam that addressed recent activities such as Firebreak Maintenance training to minimize firebreaks encroaching to ongoing reforestation sites, Ocean Planning Team Kick-off meeting, Guam Coral Reef Symposium, Environmental Law Conference focusing on climate change impacting marine, village crab festival, and Guam Mariana Regional Ecosystem Advisory Committee (REAC) meeting along with train-the-trainers on climate indicators.

Dominguez reported on the Guam climate survey. Two-thirds of the respondents were female; one-third was male; and a few were undetermined. The majority of those surveyed were in the late 20s to early 30s, and another bunch was in 40s to 50s year range. Education wise, about a third had bachelor or master's degrees; a third had some college; and a third was high school graduates or had some education. The survey was conducted by a student in Micronesian studies.

Crisostomo added that they surveyed the non-fishing community for the purpose of finding out where those folks are at and how MPCCC could better serve the fishing community. Although the survey was online and emails were sent inviting people to participate, Guam received fewer survey responses utilizing social media versus handing out hard copies to people to take the survey on the spot. Guam will report on future activities at the next meeting depending on funding. They are going to work on a draft PowerPoint (PPT) presentation for community outreach, but they prefer to have a handout instead. They need more resource materials when requested to go out to do outreach to community. She asked how PPT was decided upon.

Spalding recalled it was a recommendation from Wil Castro, who previously was the Guam representative on the MPCCC.

d. CNMI

Jack Ogumoro, Council island coordinator in the CNMI, said hopefully the CNMI Committee members will come online to report on activities that have been funded by local and federal governments. He can put together a report and submit it later today or early tomorrow morning. One activity is the TASI watch program by Micronesia Island Nature Alliance. They received funding from the MPC to do a similar program like the Hawaii Makai watch. They will use funds to hire several rangers to go around the swimming sites to talk about dos and don'ts to have a clean environment. The other is a project on Rota to educate high school students in the art of traditional canoe building and traditional fishing practices. As far as the survey, that may take some time unless members of committee from CNMI get on it.

e. Federal Agencies

Woodworth-Jefcoats provided an update from NOAA Pacific Islands Fisheries Science Center (PIFSC) for the period since the last MPCCC meeting in April 2017. PIFSC is entering the second year of five-year plan on climate science. They had an internal workshop for PIFSC, NOAA Pacific Islands Regional Office (PIRO) and the Council. Crisostomo, Severance,

Spalding and Council staff Asuka Ishizaki and Marlowe Sabater participated in it. The purpose was to match tools between scientists and managers and identify gaps.

Oliver said the regional climate action plan and workshop was the largest activity to occur and the report is available online.

f. Ex-officio member

Spalding briefed members of Severance being a new, ex-officio member to the committee. He chairs the Council's Social Science Planning Committee and is on the Council's Scientific and Statistical Committee (SSC).

Severance reported about a study conducted at the University of Hawaii at Hilo. He shared the draft paper with the MPCCC. Severance was involved with some of the early interviews and planning of East side of the Big Island with student interns to co-produce knowledge between scientists and managers. It included a lot of Hawaiian cultural values. There were two take home messages. First, people in the game work and think at different scales. Some are locally oriented, and others are oriented at larger scales, which can cause a mismatch. Managers have been in the game for a while. They tend to rely on people they know and trust for new information. They don't have time and access to academic publications or even cultural sides. Severance said to think of these as intercultural communication barriers. When people make friends and develop trust, they can make crossovers, but it is complicated by difference in scales. He encouraged the committee to review the paper. It is old school relationship building.

4. Projections of Risk and Vulnerability to Fisheries Infrastructure, Coastal Planning and Disaster Preparedness

Marra, of NOAA National Centers for Environmental Information (NCEI), gave his presentation. He said much of his report comes from a study recently completed, "State of Environmental Conditions in Hawaii and the US Affiliated Pacific Islands under a Changing Climate: 2017," for which he was the lead coordinating co-author. This report describes the current state of environmental conditions in terms of a set of foundational measures or *indicators* of change. This information about the trends and patterns in physical, biological, chemical, and ecological observations under a changing climate is intended to facilitate communication among and inform decisions of a broad spectrum of public and private sector stakeholders.

Much like the Council's pelagic and archipelagic SAFE reports, there are indicators. The document looks at inter-annual more than on a year-to-year basis. It looks at key indicators by regions and at eight to 10 stations, e.g., tide stations. Indicators can be a climate variable or a response to a particular action. There was a two-year process to have co-production to narrow it down to eight important indicators that are important, can get information on and regionally important.

Marra reviewed the eight indicators of environmental change. He said C02 is a given. It will keep going up until we eat fewer hamburgers, drive less, use less heaters and coolers, and cut down fewer trees. The other seven are surface temperature, rainfall, surface winds and tropical cyclones, sea level, sea surface temperature (SST), ocean acidification and ocean chlorophyll concentration.

Regarding surface temperature, Marra said we will see extreme heat events that will cause health issues and agricultural damage. We will see hotter days and less cool nights. By 2055, it will be about 3.6° F (2° C) warmer than what we are used to. This affects fishing especially when you add humidity, as we add moisture.

Regarding rainfall, he said too much or too little rain is no good. Trends vary from place to place and are highly localized because of El Nino, the Pacific Decadal Oscillation (PDO), etc. We know there will be more moisture so there will be extremes when it rains. When it is wet, it wetter than before; when it is dry, it is drier. Future projections indicate extreme rainfall should be on the rise over the next 30 to 50 years.

Regarding surface winds and tropical cyclones, Marra said we care about these indicators because rough seas make it hard to run a boat, impact mooring and berthing at docks and affect infrastructure. Currently, in some places wind speeds are increasing and in others decreasing. What does the future hold? There may not be more tropical cyclones, but they may be more intense, especially in the southwest Pacific basin.

Regarding sea level, Marra said we care about this indicator for many reasons. An obvious one is flooding or erosion. He said acceleration in sea level rise is seen globally. However, regional and local sea level trends may differ significantly from the global average rate of 3.3 mm (0.13 inches) per year over multiyear to multidecadal timescales. A lot has to do with El Nino and La Nina. For Guam it's a difference of a foot. Vertical land motion, earthquakes, etc. affect sea level. Some locations are tidally denominated. We haven't seen dramatic changes in magnitude. But we are seeing dramatic changes in flood frequency, e.g., king tides. What does the future hold? They are looking for doubling of rates by 2050 globally. Flood frequency in the Pacific will increase by about 45 days/year under the intermediate (1.0 m global rise) scenario. By 2100 a rise of 0.5 m (1.6 feet) is very likely, and a rise of 2.0 m (6.6 feet) is plausible. Hawaii and other tropical Pacific Islands call for an additional 20 percent to 30 percent above the global mean. What are impacts to fishing? Frequent flood events, when coinciding with high waves, would increase incident of impacts to pilings, harbors, wharves, mooring and berthing. Marra said the dominant loss of pier is buoyancy that pops them out of the foundation. He said vulnerability assessments of ports, piers and harbors will differ.

Marra said SST is going up and will continue to do so. We will see annual bleaching of coral reefs in some areas, like the central equatorial Pacific, as early as 2030 and in almost all reefs by 2050.

Marra said ocean acidification is increasing and will continue to do so. Thirty years of Aloha station measurements show a roughing 8.7 percent increase. By 2050 all corals will be in waters that are less than suitable for them. Marra said, reefs that aren't killed won't grow in height and will become less robust. Fewer reefs mean less buffering from storms.

He concluded his presentation with a takeaway slide that reviewed the predictions for increasing temperatures, rising sea levels, changes to marine ecosystem and threat to lives, livelihoods and cultures. Mounting threats to food and water security, infrastructure, health and safety are expected to lead to increasing human migration, making it increasingly difficult for pacific Islands to sustain the region's many unique customs, beliefs and languages.

Simonds noted unusual happenings in the swordfish fishery that fishes October to May up north. This year in January the fishermen interacted with 26 turtles which had not happened in 10 to 20 years.

Marra noted that this is second La Nina in a row.

Woodworth-Jefcoats said PIFSC staff is working on that turtle question.

` Simonds noted the need for better communication, so fishermen know whether to move.

Marra said his interpretation is that when there is more there is more and when there is less there is less. He would predict more occurrences of odd events, but when you even them out, no change may be apparent.

Simonds said the SSC also suggested that scientists look at where the fish are at as well as where the turtles are at.

Severance asked why chlorophyll was dropped as an indicator.

Marra said it's included as an indicator but he didn't focus on it because he was focusing on fishing and not fish.

Bailey asked, regarding SST, what is bottom depth that is no longer sea surface?

Oliver said he good proxy is down to 20 to 30 meters unless you have upwelling. In pelagic areas without strong stratification, the depth would be deeper.

Bailey asked, if sea level is rising, wouldn't coral go deeper?

Marra said the whole ocean is getting warmer. SST is a proxy.

Oliver said the issue is heat over a threshold. Light is also important.

Marra agreed. He said, in Samoa, the heat increase is in the air and in the water.

Okano asked if any good might happen due to climate change to our islands/region?

Marra said certain habitat will improve but increased invasive species might go along with that.

Oliver said some folks try to spin the positive. On mainland, crops can grow in areas that used to be cold. But in general it is disruptive.

Marra said it will probably be good for turtle, sponge, jelly fish and some algae.

Woodworth-Jefcoats noted that the tropics are also a warmer place and an unknown.

Marra reiterated that both light as well as temperature must be considered. You might have warmer temperatures but no more light.

Oliver said coral in Samoa are used to warmer water, but they can't jump here to Hawaii.

Marra asked if anyone doing vulnerability studies on harbor.

Simonds said she sees planning stages on different lists.

Oliver said the Honolulu City and County talked about infrastructure. He thought it included port infrastructure but wasn't specific to it.

Okano asked about hardening of the coast line as a response to sea level rise.

Marra said, when you harden the surface, you will probably flush the beach away. On the North Shore [of Oahu] you might lose Pipeline [surfing spot]. Water might still come up through groundwater rising. Hardening the coast line might be justified in some cases, e.g., highway or power plant to protect. But over the long term there are effects, so one might look at alternatives.

5. 2017 Fishery Ecosystem Plan Stock Assessment and Fishery Evaluation Reports

a. Marine Planning Sections of Pelagic and Archipelagic Reports

Walker presented the marine planning section of the SAFE reports. She has been doing this section of the report the last couple of years. She reviewed the Council and monument management areas and the aquaculture management facilities in the region. The aquaculture facility in Hawaii closed after the gear was loss. It was noted that the cage was one of the best fish aggregation devices (FADs) as far as fishermen were concerned. The National Marine Fisheries Service (NMFS) is close to publishing an environmental impact statement (EIS) for an aquaculture program. As for alternative energy facilities, nothing has changes since last year. Offshore energy proposals are currently looking at specific areas in the Bureau of Ocean and Energy Management (BOEM) call area around Oahu. At the Regional Planning Board (RPB) meeting, the BOEM representative said it will be seven years. Walker noted that the Hawaii Interisland cable doesn't seem to be going anywhere and asked if she should take it out.

Oliver suggested taking it out but adding a note on why.

Severance noted that there was not a fair representation of participants at the round robin meetings BOEM held in Hawaii. One issue was identifying koa that are protected by secrecy.

Walker reviewed Department of Defense (DOD) activity changes since last year, noting there were two big ones. She said Divert Activities in the CNMI will be scratched and she will add a note why. She asked Ogumoro if he had an update on the Garaphan anchorage.

Ogumoro said the MOU has not been renewed.

Walker said the Garapan military pre-positioned ships anchorage is in the report because of longstanding Council concerns of habitat impacts due to the chains. Regarding Farallon de Medinilla (FDM), three agencies are involved. Another big acitivity is the Hawaii–Southern California Training and Testing, which mostly concerns marine mammal issues. As for the Long

Range Strike Weapon Systems Evaluation Program (WSEP), she will also remove it from the reports and note why.

McNutt said they keep extending their dates and range and shut up the area more and more. It is an issue.

Walker said she will keep it then.

Walker presented an update on the RPB. The Pacific Island RPB met in Honolulu on Feb. 14 and 15, 2018. The RPB's American Samoa Ocean Planning Team has developed a Regional Ocean Plan, which is in review. Guam and CNMI kick off meetings are scheduled. Goals for 2018 are to finalize the American Samoa Ocean Plan; continue planning in Guam and the CNMI including coastal and marine spatial planning training; transfer data portal prototype to a permanent site and identify data gaps; and increase funding.

Shea asked, where is the data portal now and where will the permanent site be?

Walker said it is now at naval postgraduate school and the Pacific Islands Ocean Observing System (PacIOSS) has been identified as the final site.

Marra said the PacIOOS is really probably Asia Pacific Research Data Center.

Shea suggested inclusion of a one-pager that details what the selection criteria are and not just provide that criteria detail per individual project. She also wanted to reinforce that when we talk about the climate sections of the SAFE reports, that all of the climate indicators in Marra's report are in the SAFE reports.

Oliver said rainfall and winds are not. He thought the sea level rise projections Marra uses might be good. Currently the SAFE reports focus on El Nino.

Shea suggested them as place holder for tomorrow, as we had talked about adding winds.

Marra said they have done winds above gale force for the four areas.

Oliver said they haven't been included but will be easy to include.

Shea said El Nino and La Nina have come up several times and the definition of climate change includes these events. We want to make sure that annual information is out there to help people plan.

Oliver said that, particularly this year, we have looked at anomalies. What we haven't done is forecasting to the next year.

Shea said forecasts are available. This committee and SAFE report shouldn't lose sight of that.

Marra said he sees the SAFE reports as what happened this year rather than forecasts. He noted that Spalding has forwarded the forecasts to the group.

Severance said, on another point, rainfall may significantly influence populations of opelu and akule and bait for fishermen and locations of ahi for small boat fishermen. Wind impacts bottomfish fishery days.

Remington said he will talk a little about that tomorrow. It's its own section of the SAFE reports currently, chapter 3.

At 3:20 p.m., the chair announced that the first part of the meeting agenda had ended and they would continue the second part of the agenda tomorrow.

April 11 (W) Hawai'i and American Samoa / April 12 (Th) Guam and CNMI

Crisostomo conducted a roll call of Committee members. The following were present (* denotes by teleconference): Ada-Hocog (CNMI)*; Bailey (Hawaii); Cirsostomo (Guam); Edwin Reyes (for Domignuez/Guam)*; Marra (NOAA); McNutt (Kauai)*; Oliver (NOAA); Salas (CNMI)*; Severance (ex-officio, chair, Council's Social Science Planning Committee); Shea (USA)*; McGuire (American Samoa)*; and Woodworth-Jefcoats (NOAA).

Committee members who were absent included Bruce Anderson (Hawaii), Leo Asuncion Jr. (Hawaii), Ernest Chargualaf (Guam), Augustin Kapat (CNMI), Vince Leon Guerrero (Guam), Ray Tulafono (American Samoa) and Susan White (USFWS).

Also present were Remington (Council contractor) and Sue White (EarthTrust)* as well as Council staff and island coordinators.

b. Climate Section of Pelagic Report

Woodworth-Jefcoats presented the climate section of the draft 2017 Pelagic SAFE report. She noted that, since the Plan Team didn't want to make chapter longer, no new indicators were added. She said she has been discussing what an indicator is with Seema Balwami, Pacific Islands Regional Coordinator, NOAA National Environmental Satellite, Data, and Information Service (NESDIS), who had worked with the Council on the climate and fisheries train-the-trainer workshops throughout the region in 2017. They looked at what is being done throughout nation on how to convey indicators, e.g., story lines to connect them. They will be doing that for next year (2018) but not this year (2017).

Woodworth-Jefcoats reviewed each indicator. In 2017, the CO_2 level recorded at Station ALOHA (A Long-Term Oligotrophic Habitat Assessment; 22° 45'N, 158° 00'W) was at an all-time high in the time series. The trend for oceanic pH measured at station ALOHA showed a linear decrease in pH (increase in acidity). The 2016 average 8.08 pH. Photos were shown of impacts of pH on shellfish. Regarding the Oceanic Nino Index (ONI), she explained the El Nino and La Nina, which are known to have impacts on Pacific fisheries. She also explained the PDO, which can be thought of as a long-lived, multidecadal El Nino South Oscillation (ENSO) cycle, with fishery impactaions realted to ocean temperature and productivity. She said no impacts/correlation to the Hawaii longline fishery has been shown yet.

McNutt said there have been some impacts in the Northwestern Hawaiian Islands (NWHI).

Shea said isn't there some change in movement of tuna with ENSO cycle.

Woodworth-Jefcoats said she would look into it.

McNutt suggested they look also at North and South extent, which may be moving fishery.

Severance says the warm pool cycle shift affects the fishery.

Shea asked that a list be made of things that should be added.

Woodworth-Jefcoats said it is listed at end of climate section in the chapter.

Oliver said for Samoa look at the footprint of fleet and the footprint of area covered.

Marra said they did report on impact on two recent La Ninas.

Spalding discussed past Committee actions and sent the Committee and Council actions from 2017 to Committee members by email.

Severance noted fluctuations in albacore stocks study.

Woodworth-Jefcoats continued to review the climate indicators in the draft 2017 Pelagic SAFE report. The occurrence, strength and energy of tropical cyclones were mostly well below average. The SST is showing a steady increase of 0.01°C per year, with the 2017 average being an anomaly at 22.2°C (72°F).

Lynn said and Severance noted the area north of Hawaii and said that is same as the swordfish and loggerhead area.

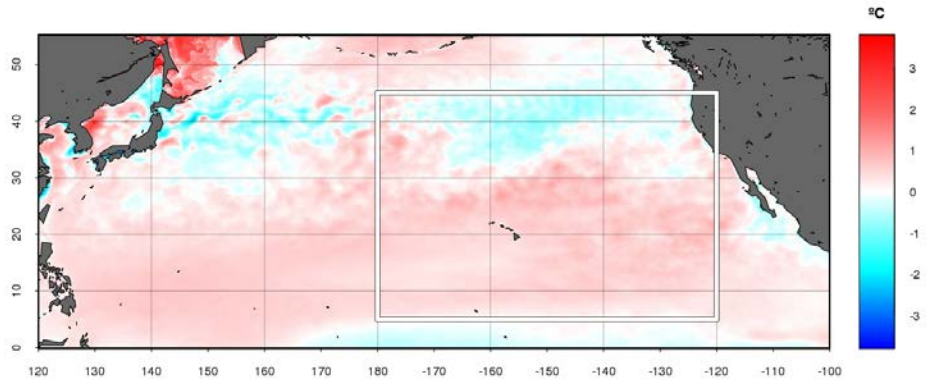


Fig. 1 2017 Anomaly - SST

Woodworth-Jefcoats reviewed the trends for the temperature at 300 meters depth, which is targeted by the deep-set bigeye tuna fishery as it relates to the specific temperature preferences

of bigeye tuna. The 2017 average was 10.12°C (50.22°F), which is within the bigeye temperature preference.

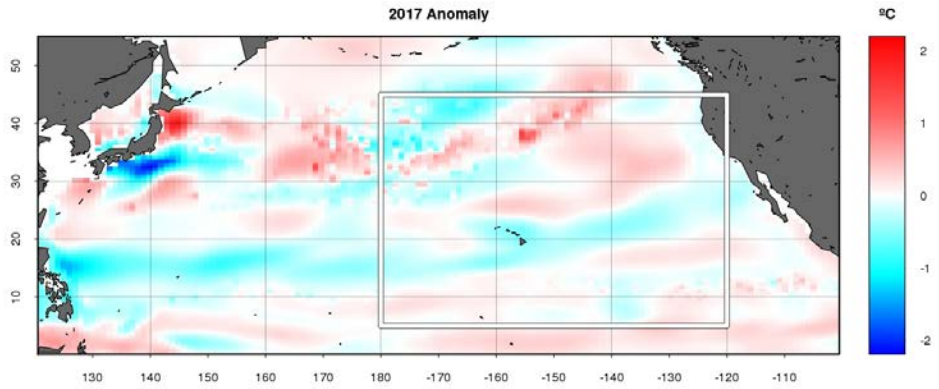


Fig. 2 Temperature at 300 m Depth

McNutt said the northeast area shows up again and suggested that NASA records be obtained.

Severance asked where the data comes from.

Woodworth-Jefcoats explained that current as well as surface temperature affects the depth at 300 meters.

McNutt said this is reason to add storm tracks as well as dominant storms.

Marra said they track tradewinds in their report.

McNutt said it is ex-tropical winds and said they did it in Berring Sea. The indicator was pressure and then tracked off meteorological charts. She said, once you locate the center of the storm you can get the winds.

Marra said Dave Atkinson and student did ex-tropical storms.

McNutt said she worked on those in Alaska befire she came to Hawaii. She suggested that Atkinson should be funded to look at the transition zone.

Shea said it's a good suggestion for a future study.

Woodworth-Jefcoats went on to review the 2017 ocean color, which indicates productivity, i.e., the amount of plant life in the ocean. The records go back to 2003. She is working with NOAA OceanWatch for a longer time series. There is no trend in monthly chlorophyll. For the North Pacific Subtropical Frontal Zone and Transition Zone Chlorophyll Front, the climatology goes back to 1982. It looks like fronts in 2017 were more north and more south than average. They mark the outer edge of the subtropical gyre, which is expected to expand due to climate and may make the fishery shift further from Hawaii and add to safety concerns.

McNutt asked if the vessels would land differently.

Woodworth-Jefcoats said five boats now land in California.

McNutt said they should keep eye on whether fish are Hawaii or West Coast.

Severance said the SSC has taken note of it.

Woodworth-Jefcoats reviewed the fish community size structure indicator. Fish were bigger than average in 2017. There was a big peak of bigeye tuna in 2017. Swordfish were also bigger than normal relative to average. There was no trend in the median weight of bigeye or swordfish. Research suggests that, as water warms, size structure would decline and is reason they are tracking this indicator. Bigeye weight per-unit-effort in 2017 shows a weak recruitment pulse in second half of the year. As for the recruitment index for bigeye tuna, researchers have found that a peak in small bigeye is followed by a peak in larger bigeye. They saw a big peak in 2013. Woodworth-Jefcoats said the data providers are noted in the chapter. Access to the satellite data is through oceanwatch.pifsc.noaa.gov/indicators-longline.html. The only data not freely available are those tied to the fishery. She concluded her presentation by reviewing observational and research needs and a look to future.

Shea asked if there was anything striking in this year's data to highlight at the beginning of the report.

Phoebe said no storms in the central Pacific.

Shea said with La Nina maybe it is a super neutral period.

Severance said, regarding the bigeye recruitment pulse, the grid was changed in State [of Hawaii] data and there was a big recruitment pulse and is one reason bigeye status has improved. So it might be worth seeing how Pacific wide recruitment pulse relates to the Hawaii pulse.

Woodworth-Jefcoats said a paper looking at that is under review or on the way to review, for the whole region and for region 2. They showed no relationship between here and the Inter-American Tropical Tuna Commission (IATTC, Eastern Pacific) recruitment but did between here and the Western and Central Pacific Ocean (WCPO) as a whole.

White (Earth Trust) said it would be worthwhile to have this meeting archived.

Severance and Shea suggested some ways to enhance the draft 2017 Pelagic SAFE report, noting that the Plan Team didn't want to have the chapter any longer.

c. Climate Sections of Archipelagic Reports

Oliver presented the Climate Sections of the draft 2017 Archipelagic SAFE reports. He explained the grids used are same as were used in the previous Archipelagic SAFE reports but the graphs have been improved. Regarding SST, the data range has been expanded to the 1980s (start of satellite era). 2017 had an average SST of 26°C (78.8°F), which is a significant increase of plus 0.48°C, i.e., a positive anomaly. A new indicator included in this year's reports is coral

thermal stress exposure, which comes from the NOAA Coral Reef Watch program. The metric used is degree heating week (DHW), which shows when bleaching and mass mortality are expected. The data goes back to 2013; next year it will go back to the 1980s. 2017 had minor heating. The last major DHW event was in 2014-2015.

Shea said she liked the addition and it goes along the storyline idea.

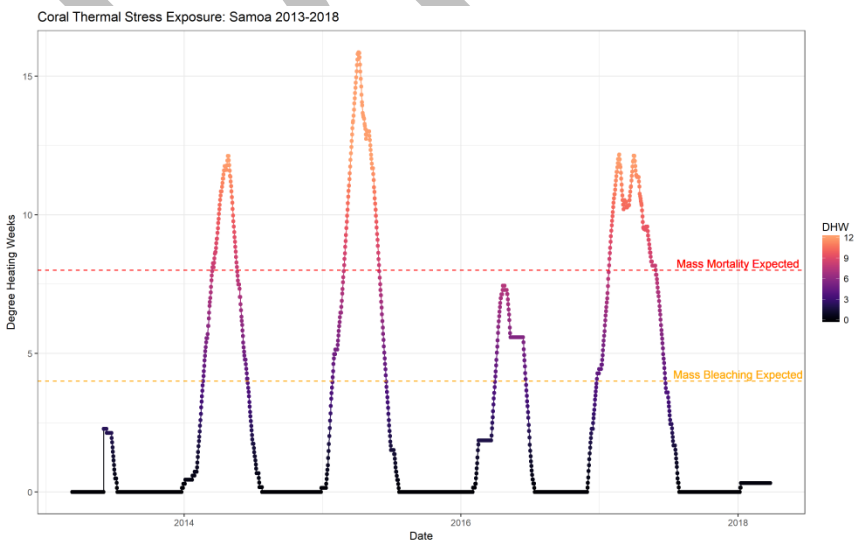
Oliver said it shows that 2016 was a significant year. 1996 and 2014 also showed bleaching but not much mass mortality. But 2015 did. He then reviewed the Ocean Color – Chlorophyll A indicator, which is a new addition to the Archipelagic SAFE reports. He said they were previously concerned with reliability of the data near the coast. But at the scale of these grids there is important information that can be gleaned. There was some higher productivity on windward shores of Maui and Big Island, but overall it was neutral year.

Severance asked for depth range of the satellite.

Oliver said signals shallower than 30 meters are buffered out. He then covered the Sea Level Rise indicator. Honolulu harbor shows clear rise over last century.

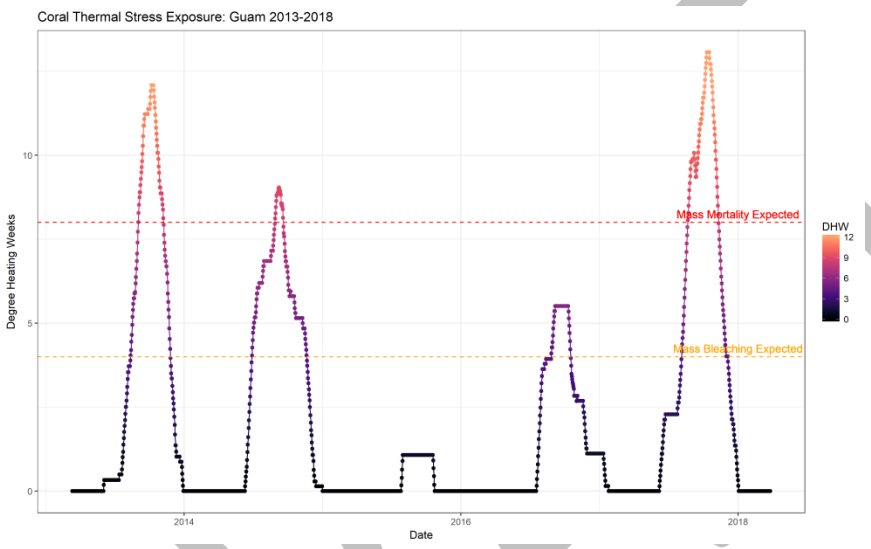
Marra noted that Honolulu had a lot of king tides in the last year and Hilo had double that of Honolulu.

Oliver said they could add Hilo. He then went on to SST in American Samoa, noting that, in future reports, it might be worth shrinking the grid and so something similar to what they do for the Pacific Remote Island Areas (PRIAs), i.e., constrain the grids around certain islands, such as Rose and Swains. Oliver covered American Samoa Coral Thermal Stress Exposure, noting the last major event was in 2014-2016. In 2017 major event DHW was >8. Samoan corals have higher thresholds for bleaching. The graph shows exposure and not response of the reefs. Oliver said there was no significant trend in the American Samoa Ocean Color-Chlorophyll Chlorophyl A indicator. Local sea level rise at Pago Pago is increasing and projected to increase, with the trend at 2.21 mm/year with an increase of 0.73 feet predicted in 100 years. He also explained that there is a data break due to an earthquake.



Marra said they have corrected the data in American Samoa and in Guam too.

Oliver said he would note it. He then proceeded to go over the indicators in the Mariana Archipelago (Guam and CNMI). For SST, the average in 2017 was 28.9°C (84.0°F), which is a positive anomaly of 0.49°C and is some of hottest temperatures recorded. 2017 saw a major Coral Thermal Stress Exposure event with a DHW>8, which was the highest bleaching relevant stress in the Mariana Archipelago. The Chlorophyll A indicator showed greater productivity in the Northern Islands. It was a hot but not terribly productive year. Sea Level Rise has a break in the data where an earthquake occurred. The data shows a rate increase of 5.04 mm/year or 1.65 feet in 100 years, but the error of confidence large.



Marra said he would talk with Oliver off line on how to correct for the data break.

Oliver next went over the PRIA climate indicators. The SST shows lot of variability due to El Nino cycling. No significant warming trend. But if time series restricted during El Nino, it shows that warm pool is experiencing higher and higher maximum.

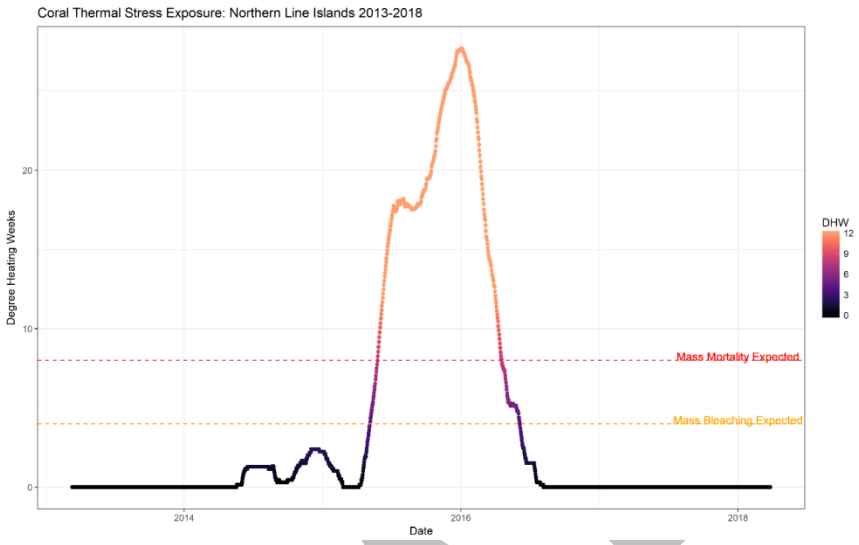
Woodworth-Jefcoats said El Ninos are getting stronger.

Oliver said the western warm pool is warming. So it shows a stronger El Nino.

Marra said there may be a paper or two out there. The time series are not long enough but the models show that.

Oliver discussed the bleaching event at Jarvis. He said they focused on that question in a paper, back to 1900, showing hotter El Ninos. He showed the DHW in the Northern Line Islands (part of the PRIAs) in 2015-2016 as high and prolonged. He said it broke this metric for this region and led to scales of bleaching and mortality that hadn't been seen previously. During height areas went down to less than 1 percent coverage. Good news is the algae that grew have been grazed out. 2017 saw no heating. As for the Chlorophyll A indicator, they didn't see a productivity boost after El Nino as is usually seen. Regarding Sea Level Rise, both Johnston and Wake show significant increasing trends. As for accessing the climate data in the Archipelagic

SAFE reports, OceanWatch will be expanding to include them at oceanwatch.pifsc.noaa.gov. Data can also be found at coralreefwatch.nooa.gov. Oliver concluded his presentation by reviewing the Observational and Research needs, noting they are same as Woodworth-Jefcoats explained for the Pelagic SAFE report, plus extending DHW time series.



Marra note that all the indicators are physical indicators and asked whether we want to start thinking about impact indicators that we can measure.

Woodworth-Jefcoats said the fish indicators are based on fish that is landed.

Oliver said we have data but to summarize to make it useful is an ongoing process. We have reef report cards coming out this year.

Woodworth-Jefcoats said a challenge with fish indicators is teasing the climate and fishing and other random impacts.

Shea asked if there is any value at looking at research and data needs that we'd like additional work done to analyze biological data in a manner that is consistent with climate indicators.

Remington said it would be great if we used same time series in chapters 2 and 3. His work so far [for chapter 3] has been exploratory.

Woodworth-Jefcoats said the language in all of the chapters note this but he could be beefed up.

Spalding said she forwarded to the committee its recommendations from last year and the ensuing Council action and some of that relates to this.

Oliver noted the vast majority of reef taxa have moved from the category requiring an annual catch limit (ACL) and is shifting the Council's action away from the near shore. He asked

how we can be most relevant. These indicators were set to focus on ecosystem as a whole. If bottomfish is now the focus maybe it is different.

Severance said that species in the ecosystem component bin still have to be monitored. The Council was specifying ACLs for a ridiculous number of species. We have looked at more culturally landed and important species. They are good indicators for all of the species, so they are useful to make that connection.

Oliver asked again how the indicators could be made most relevant to the Council's current focus, for example, looking at bottomfish habitat.

Severance said it is worth discussing. He suggested we may want to add but not give up any indicators. He said maybe this topic could be put on the SSC agenda.

Oliver said maybe they could look at the ACL tables and think about the taxa that are the current focus.

d. Potential Ecosystem Indicators for Nearshore Fisheries

Remington presented his report on potential ecosystem indicators for nearshore fisheries, which will be included as chapter 3 of the 2017 SAFE reports. He reviewed the goals of chapter 3 and summarized the December 2016 Data Integration Workshop. He said he analyzed commercial reef fishery against SST and found no trend detected even when a lag of one to three years integrated. He said he could in the future look at monthly analysis. When the taxa groups were studied, the only significant relationship was commercial weke with SST in main Hawaiian Islands (MHI). Meanwhile, MHI akule and precipitation showed no relationship.

Marra suggested that Remington should go to gridded rainfall instead of rainfall data from the National Weather Service, i.e., satellite rainfall. He said they have tools that allow them to scrape that. He said he could talk to Remington about it.

Remington said he hoped to use same time series as chapter 2.

Woodworth-Jefcoats asked whether precipitation or run off was important.

Oliver said probably both. Runoff has nutrients. He suggested perhaps using a multivariate approach.

Marra questioned the use of SST and not ONI. He said, for Hawaii it would stink but for the other areas it may be significant.

Bailey said the cultural indicator from generational knowledge is we have two seasons, dry and wet. Some years there might be 14 30-day series. Other years there might be only 9 or 11 or 12. The basis is the moon phase and not precipitation. Two associated fish are aku and opelu.

Marra said that is important. You might want to seek seasonal and not annual average.

Bailey said the months and years are not related to the Roman calendar. The trends will be according to nature and not to Roman calendar. You might have four 29-day months of dry weather. We say aku April to September.

Remington mentioned studying carrying capacity with a two-year lag from participation.

Oliver said it would be cool to map the moon calendar and translate the perspectives.

Bailey said the sad thing is they are timing it to Roman calendar.

Remington said moon phase was on workshop list, but got a lower ranking.

Oliver mentioned a Wang and Sibert study that covers a 1964 to 1992 time series. He said maybe there was a PDO change because your graph for that time period shows a match.

Remington said he had presented to the SSC and it was thought maybe the participants in the fishery changed.

Severance said one high liner was a net fisherman with a spotter plane. The catch-per-unit-effort (CPUE) is very different for that method than waiting for the right noon to jig. The University of Hawaii at Hilo has small data set. When we get heavier rainfall, it's not only a mud line but also a phytoplankton bloom that appears offshore. Groundwater discharge contributes no phytoplankton. Also fishing effort is timed to the moon.

Remington said turbidity, productivity and other variables are involved.

Shea said the conversation on traditional ways of knowing and Roman calendar has a tremendous potential for a paper to inform others why this is a complex challenge. She said El Nino is in traditional chants.

McNutt seconded that comment.

Marra said Marshall Island conversation was similar on drought. Are we talking about drier dry or not so wet? There was a more nuanced sense of drought.

McNutt noted a book on the Berring Sea done by Smithsonian: *The Earth Is Faster Now.*

Shea said this conversation on chapters 2 and 3 together can continue in the future and become more frequent. This is an opportunity for two chapters to become richer in context and understanding.

Oliver said we can come up with different ways to model,

Remington mentioned monthly summaries of catch data are available if more than three fishermen, depending on which taxa. MHI opelu has a stable CPUE. Notable outliers are 1952 and 1978-70.

Severance said that reporting is now better than earlier in time series. He suggested Remington might also investigate the change from bag netting and feeding koa to drifting with lights or anchored with flies.

Remington said he did work on analyzing gear. Another variable was chlorophyll versus commercial reef fish. There was a negative trend detected for the entire fishery. As productivity went up, CPUE went down. Looking at taxa, the strongest relationship was taape (blue-striped snapper). Akule also had a statistical significance. He then reviewed precipitation, SST and chlorophyll-A analysis with the Guam and CNMI fisheries. He said the analysis was with catch and not CPUE.

Oliver said it could be they just didn't want to go fishing. We see repeated negative relationship with chlorophyll A that could be related to fishability (as catch, not CPUE). When temperature is higher, the chlorophyll is lower.

Woodworth-Jefcoats asked if there were any fishery independent fish abundance data.

Remington said yes for three to four years and they are not annual, i.e., they are separated by three to four years. The sample size is low.

Severance said the data is depth limited and from the PIFSC Coral Reef Ecosystem Division.

Remington then went over the analysis of the American Samoa fisheries with SST. Scaridae (parrotfish) showed a negative relationship; Mullidae (goatfish) and SST showed a positive relationship.

Marra asked if he was using the same grid as chapter 2.

Remington said no, it might be smaller.

Marra said he might want even smaller.

Remington concluded his presentation by reviewing the potential correlations and considerations on ways to move forward as well as recommendations from the SSC to use a structural equation model and the Council.

Woodworth-Jefcoats and Oliver said they didn't agree on the use of a structural equation model as there are a lot of environmental variables in the stock assessment.

Oliver said, for example, scientists said they noted PDO in stock assessments but they have not incorporated it.

Severance said the SSC has been on record saying environmental data should be included.

Marra noted that Labrador versus the Gulf Stream had an effect on location and could be used for forecasting. He recommended that Remington be careful about what should be

correlated so as to not mix apple and oranges. He suggested looking at something super focused with a rich data set for a spot.

McNutt asked if he used running means.

Remington said yes, the MHI data wasn't standardized until a certain time so he broke it down into different series. He tried to find a correlate and couldn't. It's a first prod to establish a standard procedure. He did the archipelagic only. The SSC recommended using a structural equation model.

Marra suggested work be done on univariate.

Oliver suggested Remington search for bars of relevancy to find univariates.

Remington said he used multivariate to tease out potential univariates.

Marra asked how much he looked at literature.

Remington said a lot of the reports are not published but rather internal reports.

Woodworth-Jefcoats suggested looking at related variables, e.g., moon phase and sea level height.

Remington was asked if he could use the 2017 data to integrate into the next year's chapter 3.

Remington agreed that is the model to strive for. Even to have the exact time series. And also since chapter 2 explains, chapter 3 wouldn't have to be redundant in those explanations.

6. Public Comment

Crisostomo asked for public comments.

White said that Earth Trust is an environmental organization with advocacy. It needs the data. As fascinating as the data are, what we need is the anthropogenic factors causing bleaching and ocean acidification. While it is fascinating to know the variables, it needs to know the effect on fish recruitment. Her focus is dolphins. Where would they need to move to? That is the data they would need.

Oliver said, if that is what she is looking for, there is a cetacean group at the PIFSC. That website would provide updates on publications about impacts on dolphins.

White said they are looking at the food chain up.

Spalding noted that chapter 2 has protected species and socioeconomic areas as well that may be integrated into chapter 3 over time.

7. Committee Discussion and Recommendations

Reyes said it was his first time setting on the committee and he congratulated the scientists on their presentations on the data. From a planning standpoint, he said to look at the cumulative impacts of policy.

There was a discussion on the allocation of tuna.

Guam said it would share its survey with Committee.

McNutt will send some papers on using storylines.

Spalding will send maps of jurisdictional areas to the committee members and the draft of report that will be presented to Council.

Members agreed to the following recommendations:

1) ***Recommends that the 2017 climate change sections of the SAFE reports include the following:***

    a. ***All indicators that were previously recommended, i.e., wind, extra-tropical storms and rainfall, or a note on why they are not included.***

    b. ***A caveat explaining problems with fishery and environmental data sets, e.g., quality, transitions on ways they are done, expansion factors, breaks, etc. in all chapters 1, 2 and 3.***

2) ***Recommends for the 2018 climate change sections of the SAFE report***

    a. ***Storylines be included that link the indicators.***

    b. ***For future research, monitoring changes in the area northeast of Hawaii.***

3) ***Recommends continuing interaction between the evolution of chapters 2 and 3 in the context of understanding and predicting changes in stocks that can be used in management.***

4) ***Recommends the Council investigate whether harbor vulnerability studies have been conducted in the Western Pacific Region and if they are lacking to write to the appropriate federal and/or local agencies requesting that the studies be conducted.***

8. New Business

No new business was brought up to address.

Crisostomo thanked members for their participation. Meeting was adjourned.