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NOAA FISHERIES

PACIFIC ISLANDS FISHERIES SCIENCE CENTER

The Pacific Islands Fisheries Science Center (PIFSC) conducts research in a wide variety of programs that may be of interest to the Western Pacific Fishery Management Council (Council). This report is organized around the research divisions of the PIFSC as a series of highlights.

Report to the Western Pacific Fishery Management Council

June 2015

PROTECTED SPECIES DIVISION

Malnourished Monk Seal Pups Rehabilitated and Returned to the Northwestern Hawaiian Islands

In a big success story for Hawaiian monk seals this March, Mele (KF04) and Pua (TF90), two malnourished and underweight monk seal pups were returned home to the Northwestern Hawaiian Islands (NWHI) after six months of rehabilitative care. The pups were observed in an emaciated state during the PIFSC Hawaiian Monk Seal Research Program (HMSRP) 2014 summer field camp season in the NWHI and at the end of the season transported to The Marine Mammal Center's Ke Kai Ola Hawaiian Monk Seal Hospital in Kona, Hawaii. During their rehabilitation at the Hospital they more than quadrupled their body weight. On March 18, along with field staff and a veterinarian, the pups flew on a Coast Guard C130 to Midway where they were transferred to Kure Atoll on the F/V *Kahana.* Mele and Pua were released at Kure on March 25 with help from our State of Hawaii, Department of Land and Natural Resources (DLNR) partners. Data from satellite tags show the rehabbed pups are exploring their new surroundings. This release not only gives a second chance to these two individual pups, it adds to the recovery potential of this population since these two females are likely to survive and contribute to future generations of monk seals. This effort demonstrates not only the value of focused interventions, but the effectiveness of partner agencies working together to make the program a success.

What a transformation! When found emaciated in the Northwestern Hawaiian Islands these monk seal pups had slim chance of survival (top left). After 6 months of rehabilitative care at The Marine Mammal Center's Ke Kai Ola Hawaiian Monk Seal Hospital in Kona, Hawaii (top center), they were airlifted on a U.S. Coast Guard C-130 to Midway Island fat and healthy (top right). They are now free and foraging in the wild around Kure Atoll. A successful operation made possible by the help of our able and enthusiastic partners.

International Collaboration for the Conservation of Monk Seals

In April the Hawaiian Monk Seal Research Program convened an International Collaboration for the Conservation of Monk Seals. HMSRP staff hosted fellow scientists from Greece, Spain and Portugal who work with monk seal populations in the eastern Mediterranean and along the Atlantic coast of Europe and northern Africa. After sharing greetings of “aloha” (and “hola”, “geia sas” and “ola”), the multi-national group spent one week at the NOAA Daniel K. Inouye Regional Center (NOAA IRC) sharing information about respective research and monk seal recovery challenges, successes, and new technologies. There were conference-style presentations covering topics from behavioral differences between species to programmatic differences and tips on sampling or translocating animals. And there were hands-on demonstrations including field trips and necropsy training with Hawaiian monk seals. After an intellectually taxing yet stimulating week on Oahu, the team went over to Molokai for a physically demanding week of field experience. They conducted population surveys and deployed CritterCams to record the foraging behaviors of two Hawaiian monk seals. The ICCMS was a big success. The transfer of knowledge benefited all researchers involved and will help advance the recovery of both monk seal species.

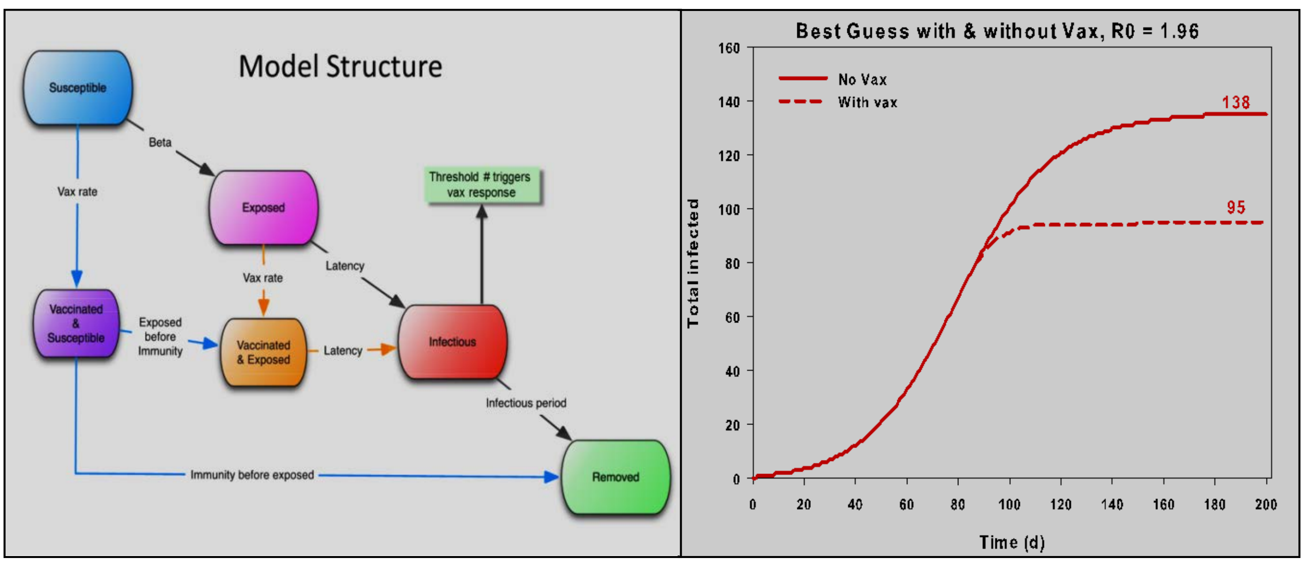
To learn about Mediterranean monk seals, visit this link:

http://mediterraneanmonkseal.org/?p=1159&lang=en

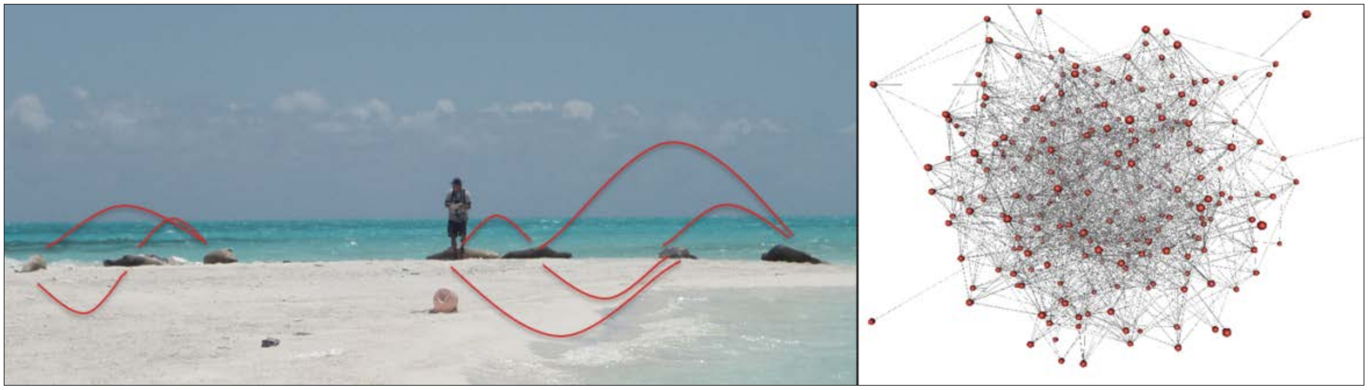
They come from many countries and speak in several mother tongues, but monk seal scientists the world over are all fluent in Hawaii’s sign language.

Vaccination Planning Aims to Mitigate Risk to Hawaiian Monk Seals in the Event of Disease Outbreak

The Hawaiian Monk Seal Research Program is taking proactive steps to prepare for worst case scenarios and protect the endangered monk seal population in the face a disease outbreak. While no exposure to morbillivirus has been detected in Hawaiian monk seals, the devastating effect of these pathogens on marine mammal populations demands that we prepare for an outbreak in this rare species. To support informed design of a vaccination plan to protect monk seals, HMSRP scientists developed a Susceptible-Exposed-Infected-Removed (S-E-I-R) epidemiological model to simulate plausible outbreak trajectories and evaluate possible vaccination interventions. Model results demonstrated that prophylactic vaccination has the greatest potential to protect monk seals against the threat of a morbillivirus outbreak. This information is being used to develop a vaccination strategy to protect the monk seal population. As part of the planning process, our first vaccination drill will be held in July. The goals will be to test out the response, communication and data collection protocols, estimate the number of seals that could be vaccinated in a select two-day period, and identify gaps in the response system that can be addressed to improve future preparedness. These efforts will help us be ready to mitigate disaster before it strikes.



Many variables enter the S-E-I-R epidemiological model to simulate disease outbreak in a monk seal population and estimate the impact of varied vaccination scenarios (left panel). The modeling suggest that with a disease such as morbillivirus (epidemiological reproductive rate R0 of 1.96), many animals could be saved from infection through vaccination efforts (right panel).



Based on field observations of possible monk seal connections (symbolized by red lines in the left photo) and their strengths, we were able to estimate the contact network (right) for a typical monk seal population. High contact rates between seals give concern for disease spread. Contact rates help parameterize the epidemiological model that can be used to simulate a disease outbreak and develop a proactive risk mitigation strategy.

ECOSYSTEMS SCIENCE DIVISION

Decade-long Decline in Productivity and Shift in Phenology in the North Pacific Transition Zone Indicate Changes in a Key Habitat for Large Pelagics

The North Pacific Transition Zone (NPTZ) spans the North Pacific between latitudes of 30^{o} N and 40^{o} N, bounded by the subtropical and subarctic gyres. It serves as an important forage and migration habitat for a diverse assemblage of tunas, billfishes,

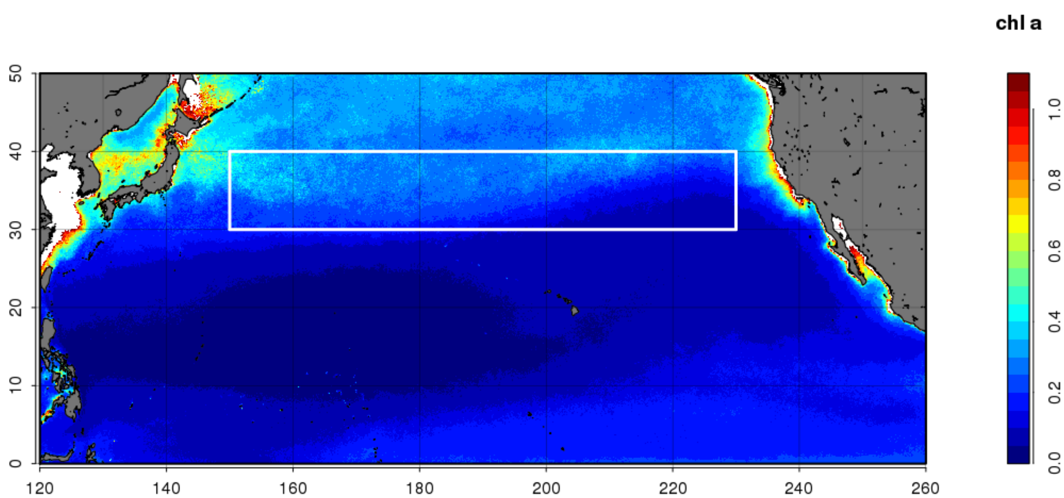


Figure 1. The study region indicated by the white box, 150° E – 130° W longitude and 30°– 40° N latitude. This box defines the oceanic portion of the North Pacific Transition Zone (NPTZ) beyond coastal influences. Color scale indicates chlorophyll-*a* concentration (mg/m^{-3}).

seabirds, sea turtles, and marine mammals and serves as a fishing ground for many fleets including the Hawaii-based longline fishery for swordfish.

Our previous work projecting the impacts of climate change on marine ecosystems has noted that the NPTZ is expected to become more subtropical over the next several decades. Thus it is a region we have been monitoring with in situ observations collected during research ship expeditions and remotely-sensed oceanographic data from satellites. In this study we used ocean color data from two sensors, SeaWiFS during 1998–2007 and Modis during 2003–2014, to generate a time series of surface Chlorophyll-*a* concentration (mg/m^{-3}) covering 1998–2014 (Fig. 2). Chlorophyll concentration is an index of primary biological productivity.

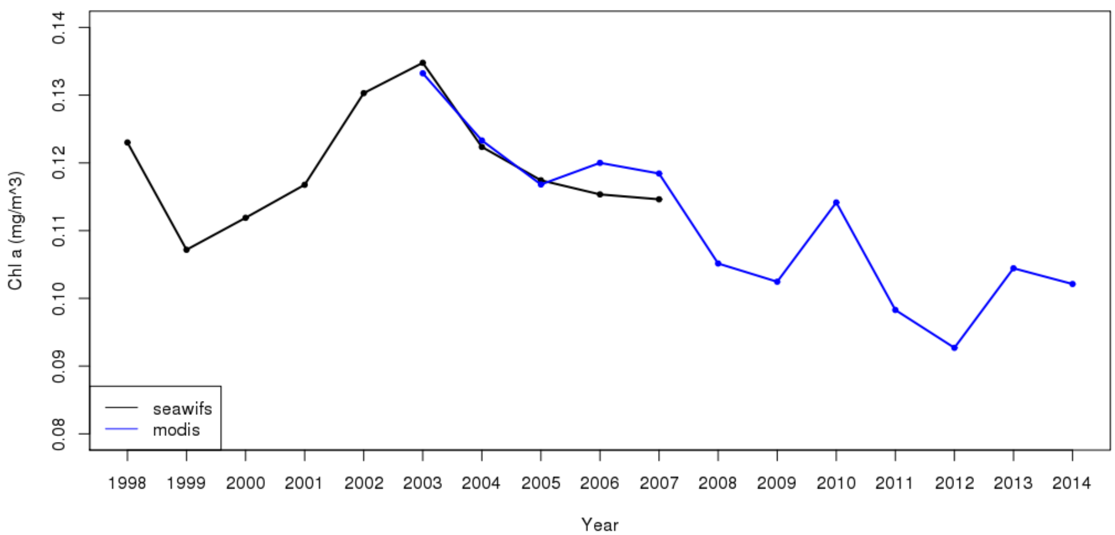


Figure 2. Annual median surface chlorophyll in the NPTZ (from SeaWiFS and Modis, 1998-2014) has declined over the past decade.

The Modis data were transformed with a log-log regression of Modis on SeaWiFS using the 9 km and 8-day data over the period 2003–2007 where the data sets overlap. Annual medians match up well during the overlap period (Fig. 2). Over the entire 1998–2014 interval, the 18-year time series documents an 18% decline in median annual NPTZ surface chlorophyll (Fig. 2). However, closer inspection shows that the decline does not occur over the entire time period. Rather, during the period of about 1998–2007 there is interannual variation but no trend while during about 2008–2014 there is a significant declining trend (Fig. 2).

Median 8-day composites were used to examine seasonal chlorophyll patterns in these two periods at finer temporal resolution (Fig. 3). There is a pronounced seasonality with higher chlorophyll observed in winter and spring compared to summer and fall (Fig. 3).

Most of the decline in chlorophyll in the 2008–2014 period relative to the 1998–2007 period is seen in the winter and spring (Fig. 3). Further there is a shift in the timing of the maximum chlorophyll from the 11th 8-day period (days 80–88) to the 9th 8-day period (days 64–72) or 16 days earlier (Fig. 3).

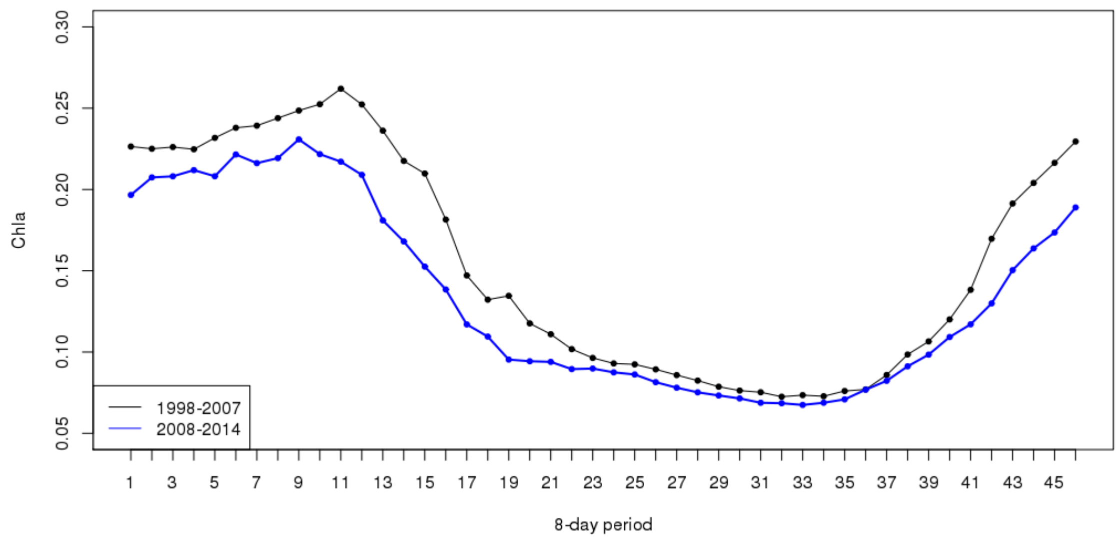


Figure 3. The seasonal pattern of median surface chlorophyll in the NPTZ in 8-day periods for 1998–2007 (black) and 2008–20014 (blue).

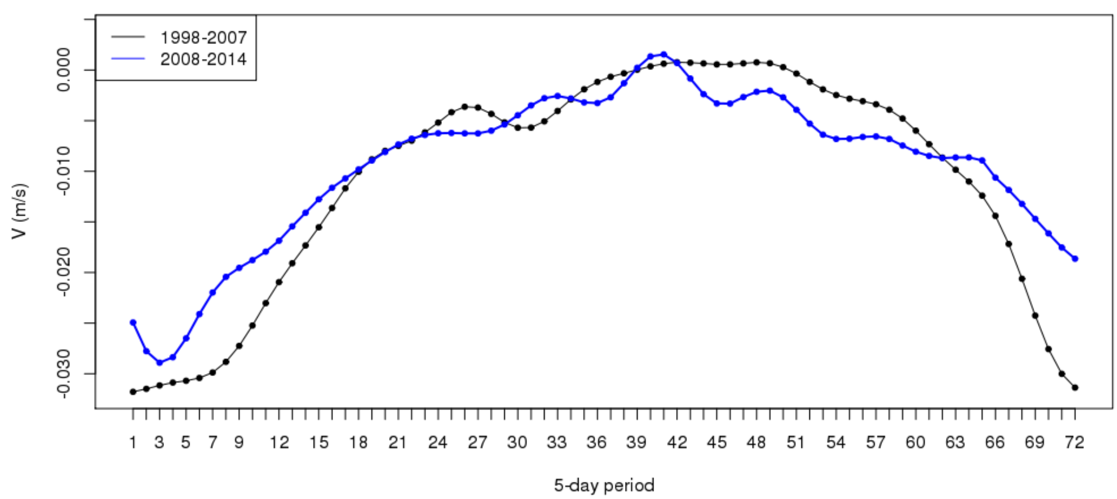


Figure 4. The seasonal pattern of mean southward velocity (v) in the NPTZ in 5-day periods for 1998-2007 (black) and 2008-2014 (blue).

It has been hypothsized that nutrient input to the NPTZ, especially in winter and spring, comes from southward transport of nutrient-rich surface waters of the subartic gyre. Mean southward velocity (v) measured from satellite wind and sea surface height data for 5-day composites averaged over the periods 1998–2007 and 2008–2014 shows stronger southward transport during the winter and spring consistent with seasonally higher chlorophyll levels (Figs. 3,4). Further, southward velocity during winter and spring was weaker during 2008–014 compared to 1998–2007 consistent with the hypothesis of reduced nutrient input and, consequently, observed lower cholorphyll during the 2008–2014 period (Figs. 3,4).

The recent decline in winter and spring chlorophyll levels by as much as 25%, along with a lower and 2-week earlier chlorophyll maximum suggest more subtropical conditions in the NPTZ. Whether this represents a more permanent manifestation of climate change or simply decadal variation will not be apparent for another decade or two but given the likelihood of higher trophic level responses to changes in chlorophyll concentration the situation warrants continued monitoring. Higher trophic level responses have yet to be documented.

Survey of the North Pacific Subtropical Frontal Zone, an Area Used by Tuna, Swordfish and Other Species for Foraging and Migration

In April the NOAA Ship *Oscar Elton Sette* conducted a transect through the frontal zone along the 159°W meridian, from 26.5° – 32.5° N. Data were gathered to assess the physical, chemical, and biological oceanography of this region. Vertical profiles of temperature, salinity, density, dissolved oxygen, and fluorescence were collected down to 1,000 m every quarter degree of latitude from 27.25° – 32.5°N, 159°W. Water samples were also collected at ten depths between 200 m and the surface for analysis of total chlorophyll, chlorophyll-*a*, nutrients, and chloropigment. From the profile and water sample data collected, the subtropical temperature front can be seen at approximately 29.25°N (Fig. 1) and the transition zone chlorophyll front at approximately 31°N (Fig. 2). These fronts migrate north and south throughout the year, both seasonally and in response to phenomena such as changing ENSO phases. This year's survey is particularly timely as the North Pacific is experiencing both a weak El Niño and a particularly strong positive phase of the Pacific Decadal Oscillation.

This frontal region is a known foraging and migration corridor for not only tuna and swordfish, but also a wide range of other marine animals including sea turtles and albatross. Mid-water trawl and acoustic survey data were collected along the survey transect to gain understanding of the micronekton prey supporting these predators.

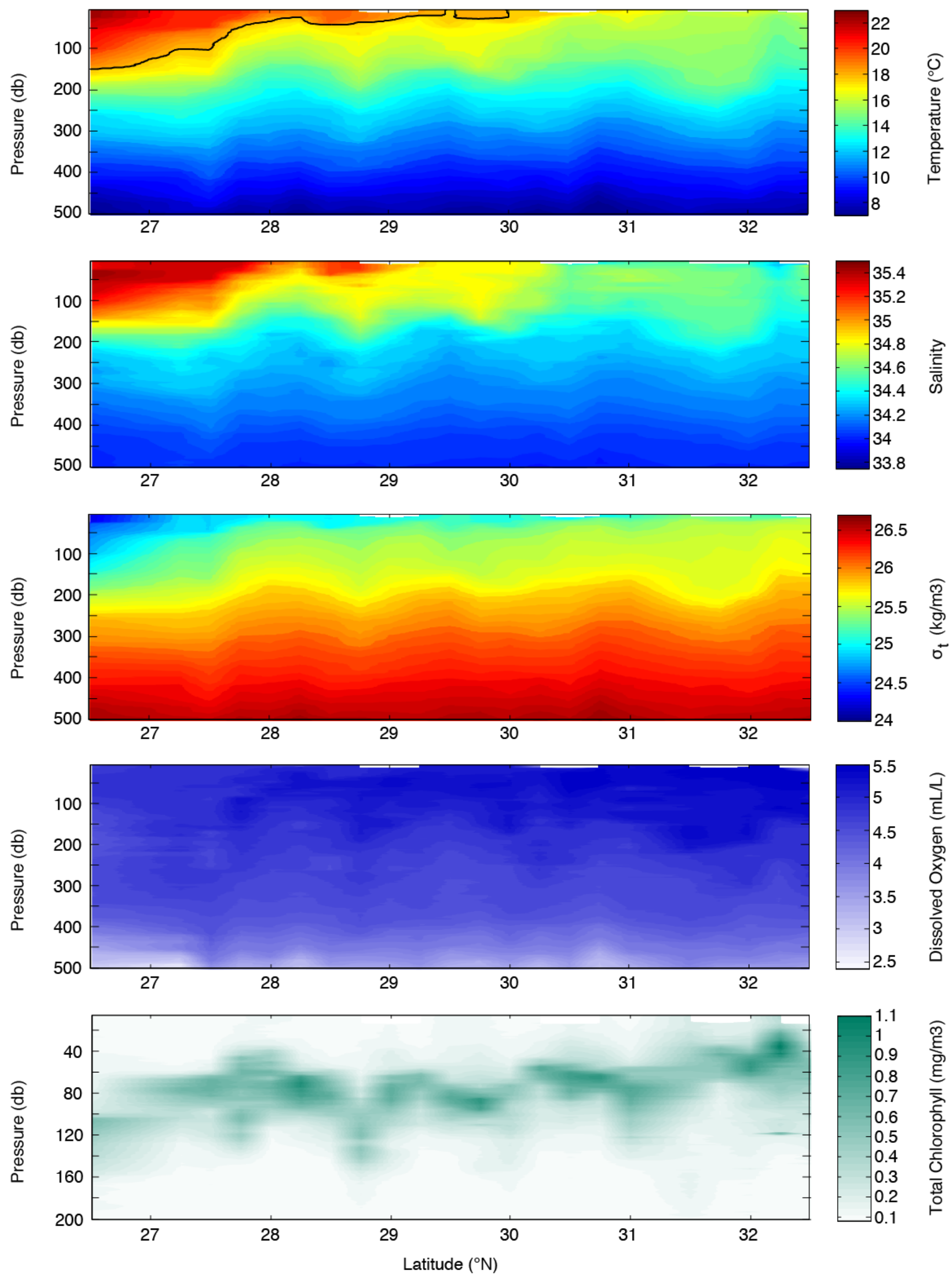


Figure 1. Transects of temperature, salinity, density, dissolved oxygen, and total chlorophyll. The 18°C contour marking the surface subtropical front is shown in the temperature transect.

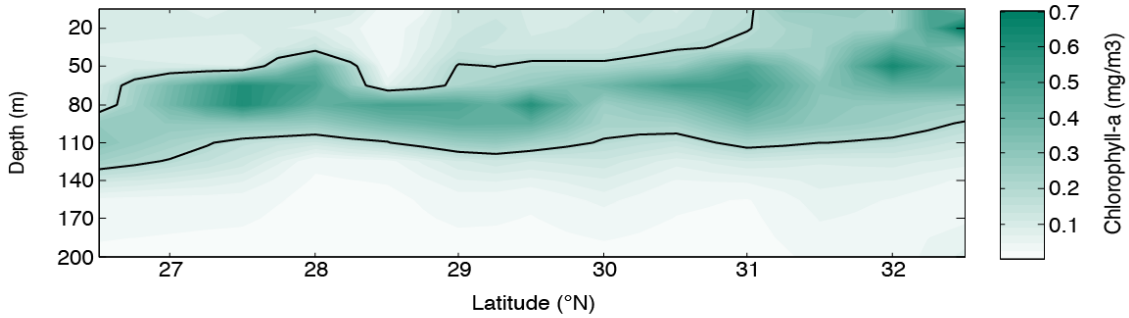


Figure 2. Chlorophyll-*a* concentration as measured from water samples. The 0.2 mg m^{-3} contour marking the surface transition zone chlorophyll front is shown.

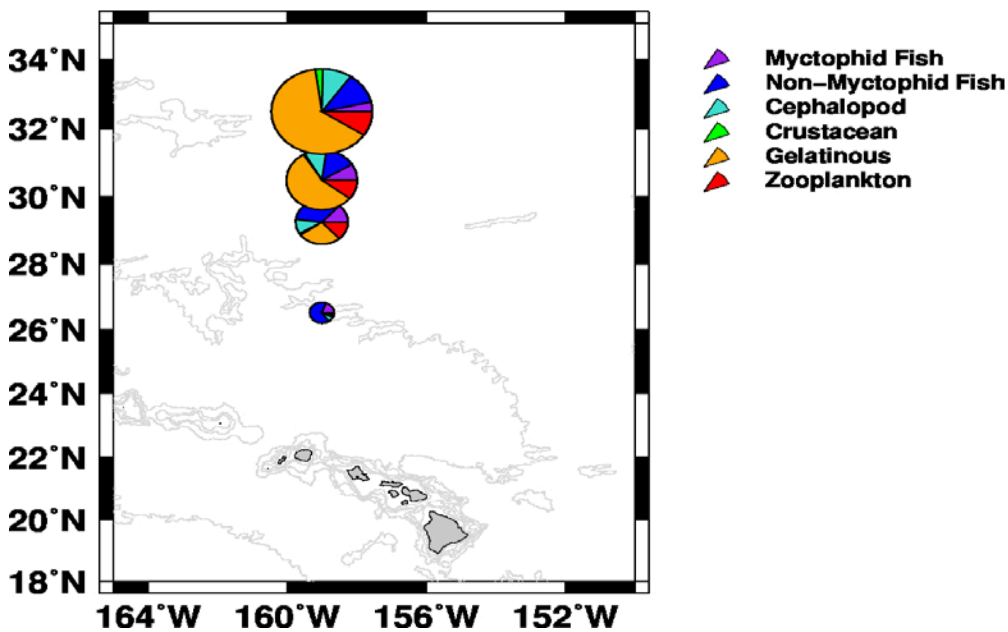


Figure 3. Preliminary Cobb midwater trawl analysis showing the catch composition at 4 latitudinal stations as partitioned by wet weight of 6 taxonomic groupings of zooplankton: myctophid fish, non-myctophid fish, cephalopods, crustaceans, gelatinous species, and others. The diameter of the circle is linearly proportional to the total biomass of the trawl catch. The data were averaged across replicates where available. Centroids of pie charts are placed at the longitude and latitude where trawling operations took place. Figure by Don Kobayashi.

Trawl biomass was greatest north of the frontal region and decreased southward into the North Pacific subtropical gyre. Correspondingly, composition of the trawl catch changed from predominately gelatinous zooplankton to predominately non-myctophid fish (Fig. 3). Additionally, biomass in the deep scattering layer (not sampled by the mid-water trawl) appears to decrease southward across the frontal region as well (Fig. 4).

Recent work by PIFSC researchers suggests that this region may be particularly sensitive to climate variability and change, and that some of these changes may already be unfolding. The data collected on this *Sette* survey build on over a decade of similar data collected in the region. This growing time series will help us improve our understanding of this commercially and ecologically important ecosystem.

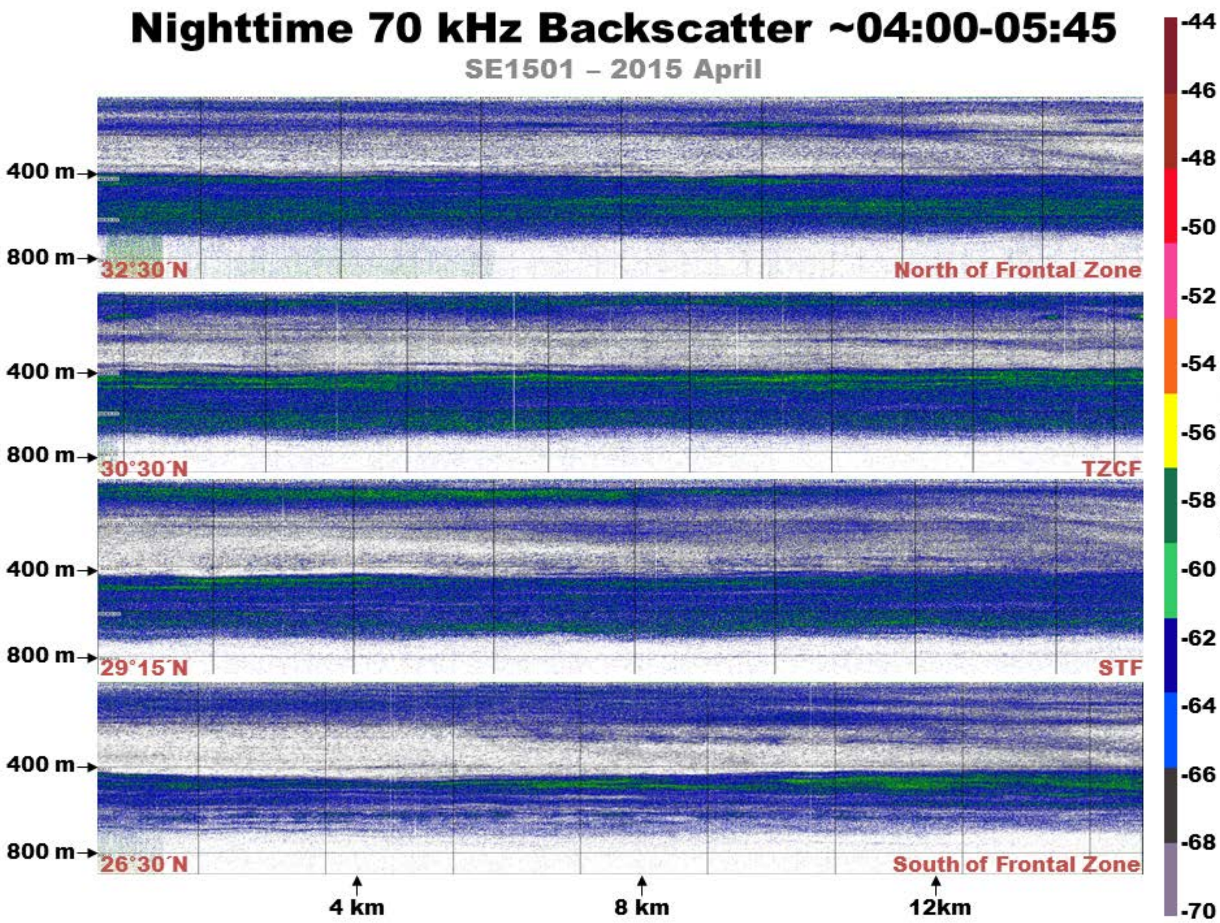


Figure 4. Preliminary composite of EK60-measured acoustic backscatter at 70 kHz, showing both the deep and shallow scattering layers across the subtropical frontal zone at the locations where trawling was conducted. Trawl tows targeted the shallow scattering layer. Figure by Réka Domokos-Boyer.

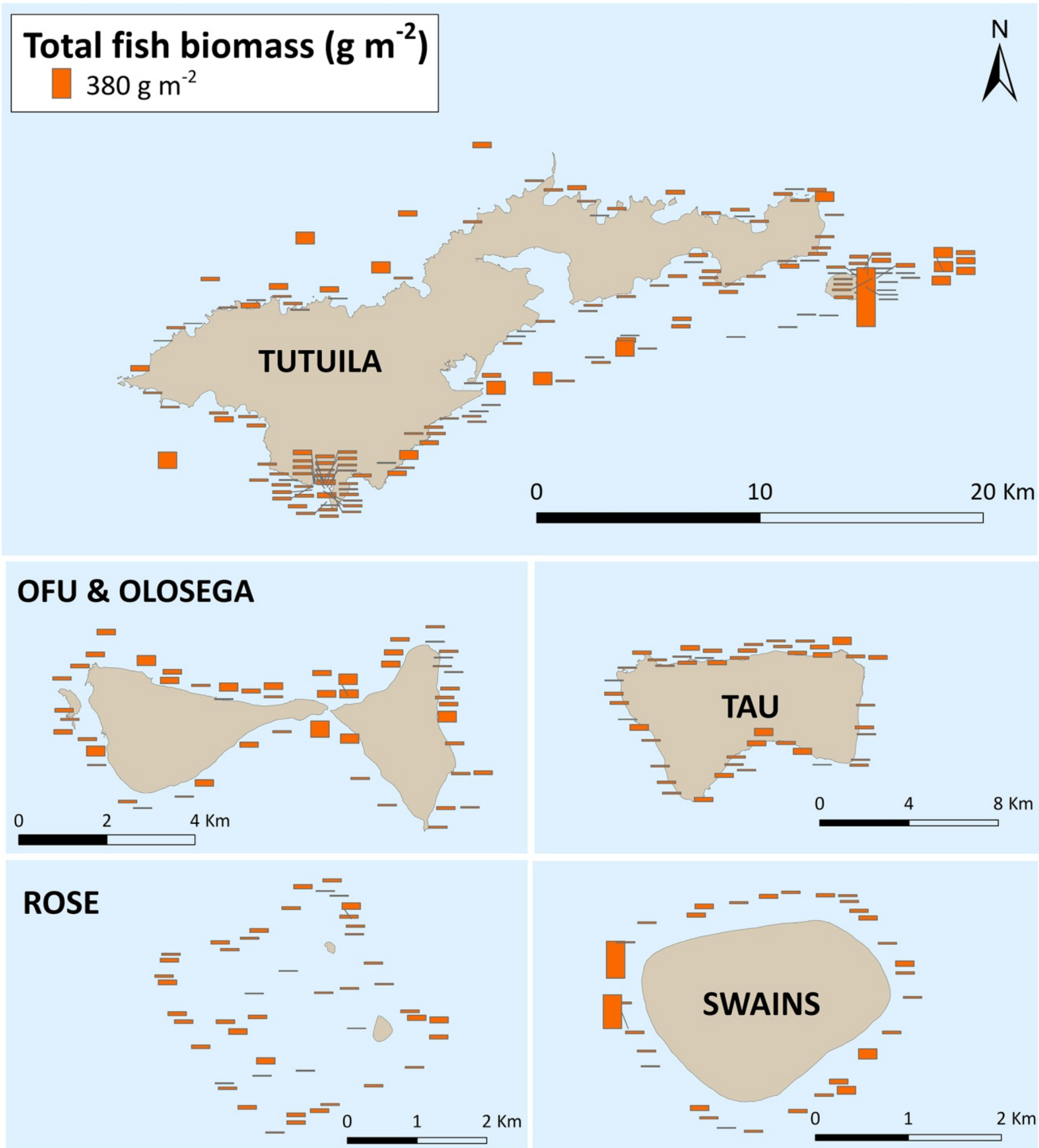
2015 Reef Assessment and Monitoring Survey Conducted in American Samoa and the Pacific Remote Island Areas

On Sunday, May 3rd the NOAA ship *Hi'ialakai* returned to Pearl Harbor from the 103-day long American Samoa Reef Assessment and Monitoring Program expedition. The ship and the Coral Reef Ecosystem Division (CRED) staff aboard visited the U.S. Pacific Remote Island Areas (Johnston and Palmyra Atolls; Kingman Reef; and Howland, Baker and Jarvis Islands) as well as American Samoa (Ofu, Olosega, Tau, Swains and Tutuila Islands and Rose Atoll). CRED staff conducted research and monitoring activities to advance our understanding of benthic organisms, fish, oceanography and climate change.

Across American Samoa, the mission completed more than 60 towed-diver surveys covering over 130 km of coastline, 325 fish surveys, and 180 benthic surveys. The Ocean and Climate Change team deployed four climate monitoring stations around Tutuila, and four around Ofu-Olosega and Ta'u. Each station contained arrays of subsurface temperature recorders (STRs), calcification accretion units (CAUs), autonomous reef monitoring structures (ARMS), and bioersion monitoring units (BMUs). The mission objectives included observation of coral bleaching, local warm water temperatures, and the number and distribution of corallivorous crown-of-thorns sea stars (COTS).

Grey reef sharks were among the species recorded during fish surveys at Kingman Reef.

Bleaching of scleractinian corals, observed on an average of 10% of colonies, was reported in shallow (3-6 m) reef habitats of Tutuila Island—particularly within Fagatele and Fagasa Bays—and along the southwest coast of the island.



One product of the 2015 ASRAMP expedition was an assessment of total fish biomass density around the islands of American Samoa.

How an Ecosystem Approach Can be Used to Address Climate Change

The Pacific Islands Fisheries Science Center's Coral Reef Ecosystem Program, in collaboration with scientists from 16 international institutions, recently published a paper in the journal *Marine Policy* that discusses how coastal fisheries management can incorporate considerations of climate change.

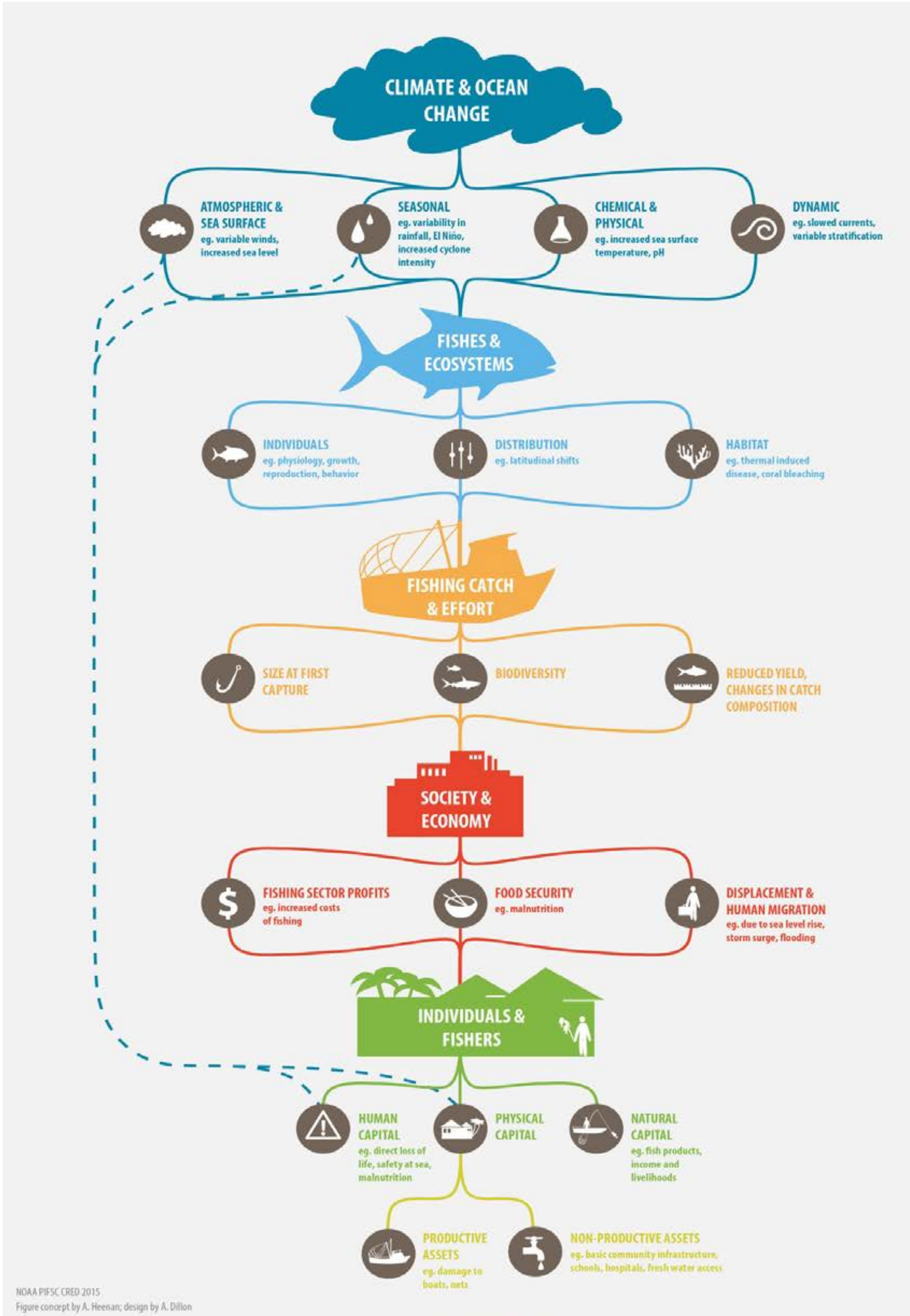
The projected impacts of climate change and ocean acidification on fishes, fisheries and societies in the Asia-Pacific region are being documented with increasing frequency. These impacts will directly and indirectly affect both natural and human capital. As depicted in the accompanying graphic, there are many potential pathways for climate driven impacts on fisheries systems. Projected changes in climate and ocean properties (top tier of graphic) in response to increased CO_2 emissions will directly affect human and natural capital (bottom tier). Changes in these aspects of the ocean will affect fishes and their related ecosystems (second tier) which will amplify through the fishery system, affecting aspects of fishing catch and effort (third tier). This will in turn have national level societal and economic repercussions (forth tier), in addition to influencing the natural and physical capital of individuals and fishing related communities (bottom tier).

The risks posed by climate change need to be assessed in concert with efforts to address pre-existing threats to tropical fisheries—such as overfishing, habitat degradation, pollution, eutrophication, and invasive species. What is needed is an approach to management that can more effectively deal with these pre-existing stresses, while reducing the vulnerability to longer-term climate impacts. The challenges inherent in achieving this management approach is demanding, particularly in the Asia-Pacific, where coastal fisheries are characterized by a lack of data, limited human capacity for effective management, and weak governance.

This paper focuses on an ecosystem approach to fisheries management (EAFM), which is now widely accepted as a potential solution to the current deficiencies in existing management efforts. The activities required to harness the full potential of an EAFM as an adaptation to climate change and ocean acidification include:

- provision of the necessary expertise to inform all stakeholders about the risks to fish habitats, fish stocks and catches due to climate change,
- promotion of trans-disciplinary collaboration,
- facilitating the participation of all key stakeholders,
- monitoring the wider fisheries system for climate impacts,
- enhancing resources and capacity to implement an EAFM.

By using an “ecosystem approach” to address climate and ocean change, developing countries will build resilience to the ecological and fisheries effects of climate change, and will also address the habitat degradation and overfishing that damages the productivity of coastal fisheries.

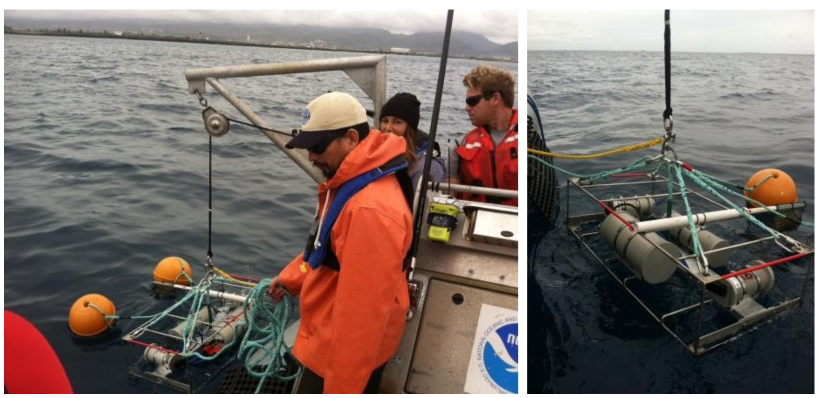


Potential pathways for climate-driven impacts involve several tiers of fisheries systems, including fish populations and ecosystems, the fishing industry and fishing communities, and society.

SCIENCE OPERATIONS DIVISION

Field-testing of Modular Optical Underwater Survey Systems (MOUSS)

In preparation for the upcoming 2015 multi-platform bottomfish research survey in the main Hawaiian Islands, members of the Science Operations - Advanced Sampling Technologies Program (ASTP) outfitted and field tested 3 modular optical underwater survey systems (MOUSS). As the MOUSS is slated to replace the bottom camera bait station (BotCam) as the Center's main optical stereo-video sampling gear, the primary aim of the tests was to verify the field-worthiness of the systems and the quality of imagery collected. A secondary objective of the field tests was to determine whether smaller vessels are able to launch and recover the MOUSS systems. Given that cooperative bottomfishing vessels are the intended platform for future MOUSS sampling, it was deemed necessary to use a small vessel for the tests. The vessel used for MOUSS field testing was a 19 foot NOAA safe boat outfitted with a pinch puller. In March and April 2015, the ASTP team conducted 2 successful field trials during which MOUSS systems were deployed and imagery collected. The success of the MOUSS field trials was a key step in moving forward with this new sampling technology.



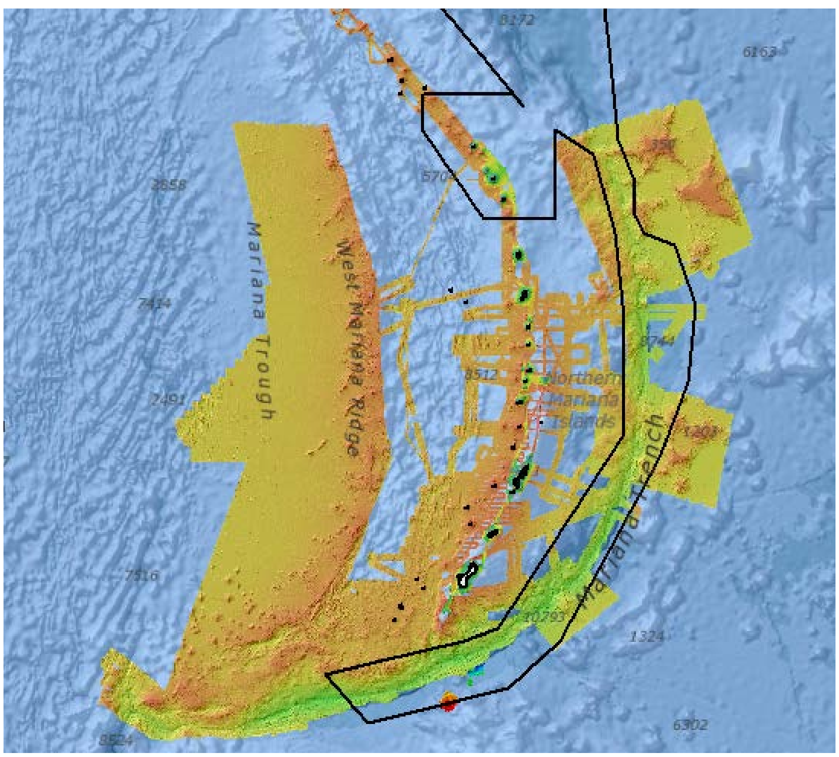
MOUSS system setup and deployment were field-tested during March and April 2015 using a 19-foot NOAA Safe Boat.

Images of fish were successfully collected during the MOUSS trials.

Marianas Trench Marine National Monument Pilot Mapping Project

In recent months the Marianas Trench Marine National Monument (MTMNM) Pilot Mapping Project team has focused on a variety of tasks, including the following:

- Continued data compilation and development of the following datasets:
    - o 2010–2014 cetacean surveys (satellite tags, biopsies, species observations and survey tracklines),
    - o Cetacean Program HARP deployments,
    - o NOAA Shipboard Computer System (SCS) information (ship tracks, ocean observations, logged events, etc.), and
    - o Multibeam data.
- Addressed cross-database connection issues in collaboration with ITS personnel
- Established InPort metadata management plan for project applications and data, and
- Addressed project management and outreach tasks including coordinating outreach efforts with territorial partners



Coverage of available multibeam bathymetric data in the vicinity of the MTMNM. Data sources include the CRED multibeam synthesis, Pacific Islands Benthic Habitat Mapping Center high-resolution nearshore data, CCOM/JHC multibeam data, and Drazen deep water multibeam data.

Monuments Science Research Planning Workshop Slated for American Samoa

The PIFSC Monument Science program developed plans for a two-day (May 26-27, 2015) workshop in Tutuila, American Samoa that will include the following activities:

- Discussion of research priorities and knowledge gaps for sustainable fisheries, protected species and marine ecosystem science for the American Samoa Archipelago, and
- Identification of viable research strategies to address gaps and priorities, and that will contribute to existing baseline data on the linkages between biological, geophysical, and human components of the American Samoa Ecosystem.

After the main two-day workshop, a one-day meeting (May 28, 2015) will be held to review and evaluate proposed research projects to be conducted using the NOAA Ship *Oscar Elton Sette* which will be deployed to American Samoa waters in early 2016.

FISHERIES RESEARCH AND MONITORING DIVISION

Information on Marine Mammals Listed in Hawaii State Fish Catch Reports under "Catch Lost to Predators" is Summarized

Preliminary summaries of data on marine mammals named by fishers as predators responsible for reported losses of fish catch were summarized from a variety of Commercial Fish Catch Reports submitted by fishers to the State of Hawaii. The revision of reporting forms by the Hawaii Division of Aquatic Resources (DAR) in 2002 made it possible to collect this data. The analysis of the time series from 2003 to 2014 was a collaboration between DAR and FRMD. The full report is available at http://www.pifsc.noaa.gov/library/pubs/DR-15-006.pdf.

For this analysis there was no assurance that the data were comprehensive, or that the types of mammals named by the fishers were accurately identified. Further, in many cases only a broad category was specified, such as "dolphin" or "porpoise." Technically, there are no porpoises in Hawaiian waters, so this category probably represents dolphins. This summary was requested by the Scientific Review Group (SRG) for Pacific Marine Mammals and by the Take Reduction Team for False Killer Whales. The treatment of the data here was cursory. The apparent distribution, time trends, seasonality, and prevalence of gears reflected in these summaries are nominal. The patterns observed have not been evaluated with respect to several important factors including the extent of fishing activity by each fishing method.

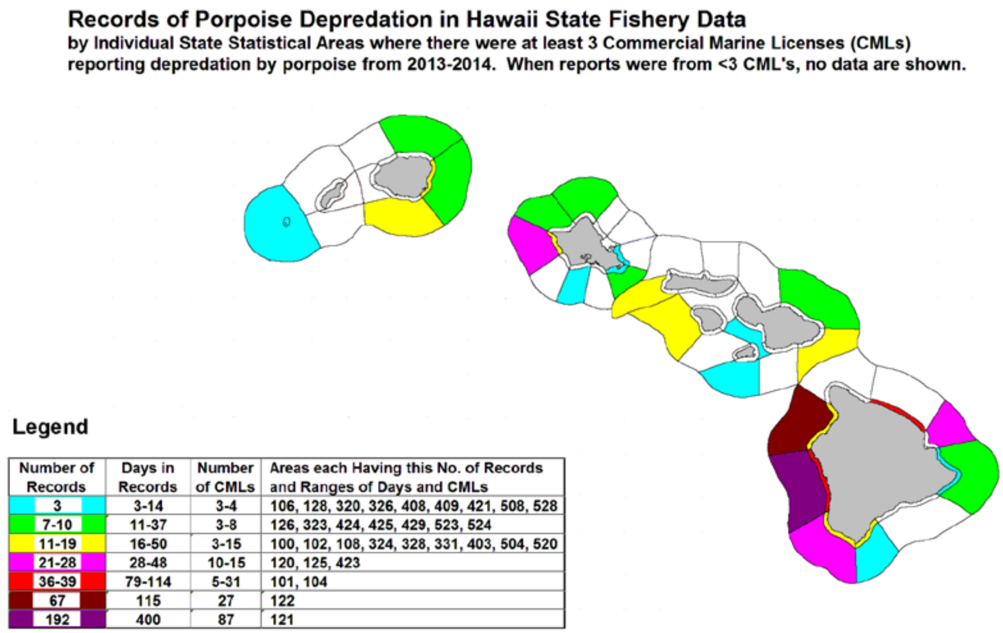
Only summaries that are an aggregation of data on a particular taxon of marine mammal predators from at least 3 Commercial Marine License (CML) holder reports are considered by the State of Hawaii to be non-confidential. No summary information was summarized for the report that did not meet this criterion.

After 2002 revised report forms included a requirement to list on a daily basis catch lost to predators, along with area fished and method used, and to identify the predators and total number of fish lost in a summary line at the end of each report. In many cases fishers listed multiple predators in the summary line. So reports frequently included separate data for many days of fishing, but had one line of data on the predators responsible for the losses. A typical summary line for predators appears as follows (with fictitious data):

Number Lost to Predators: Sharks **3** Unknown **25** Other **Dolphin, Yellowfin** / **34**

Number Number Predator Name Number

Thus the number of days in each record that apply to each named predator could not be estimated unambiguously from the data available for this paper. Still, the amounts of loss given for the predators were typically more than listed on any given day, and in many cases the recorded predation must have involved more than one day of fishing. All of the days when losses occurred in a report (days in records) were summarized along with the number of records (reports) in this paper, to give an upper limit to the number of days fishing that could have involved depredation by each predator. The numbers of records (reports) pertinent to each predator were less ambiguous than the number of days. Records for monthly reports were enumerated as unique CML and day fished combinations for the last day in the month in which catch was reported lost. Records more frequent than one per month (Trip Reports) were identified by trip begin and end dates and enumerated as unique CML and day fished combinations for the last day in the report in which catch was reported lost. Other days with losses in each report were summarized for the count of "days in record."



Number of Records	Days in Records	Number of CMLs	Areas each Having this No. of Records and Ranges of Days and CMLs
3	3-14	3-4	106, 128, 320, 326, 408, 409, 421, 508, 528
7-10	11-37	3-8	126, 323, 424, 425, 429, 523, 524
11-19	16-50	3-15	100, 102, 108, 324, 328, 331, 403, 504, 520
21-28	28-48	10-15	120, 125, 423
36-39	79-114	5-31	101, 104
67	115	27	122
192	400	87	121

Figure 2. Quantity of Hawaii state fish catch records by area reporting loss of catch to "porpoises".

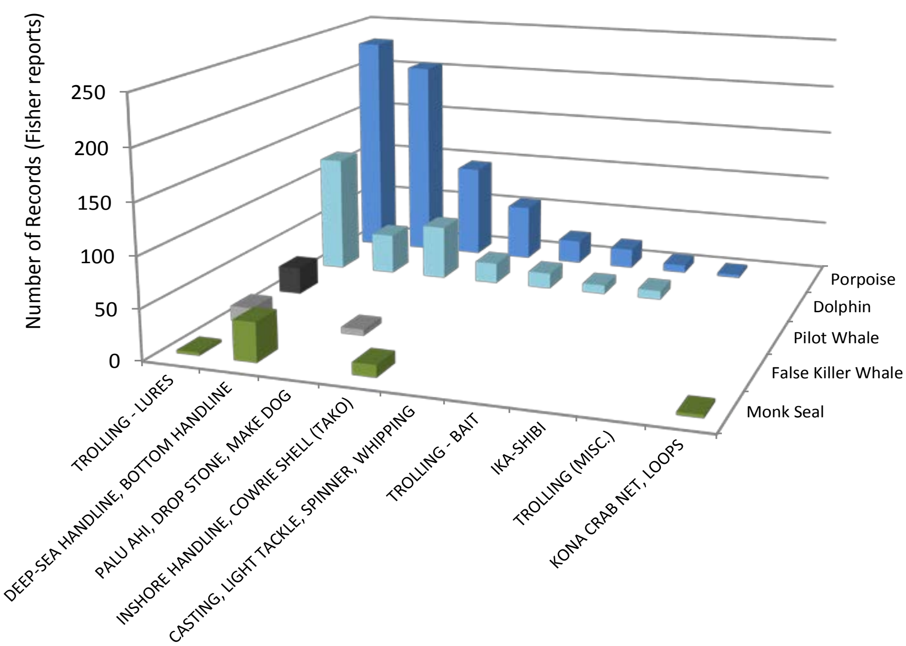


Figure 1. Number of records (fisher reports) during 2003–2014 providing information on loss of catch to predation by marine mammals for fisher-identified categories of marine mammals, aggregated by fishing method. In each case, the number of records represents information from at least 3 CML holders.

Six marine mammal predator taxa were named by at least 4 CMLs. From least to most common these were: pigmy killer whale, false killer whale, pilot whale, monk seal, dolphin, and porpoise. No further information can be revealed about the least common species, but data and illustrations were provided on the other five taxa with respect to trends in numbers of records over time, seasonality of records, fishing methods, and areas of occurrence (see the full report). Example summaries from the report are provided below for the number of depredation records by area where the predator named on the record was "porpoise" (the most frequent taxa, Figure 1) and for the number of depredation records for 5 taxa by fishing method (Figure 2).

Summary of Reef Fish and Bottomfish Research Workshops in Guam and CNMI

The PIFSC Stock Assessment Program recently organized Research Workshops on Reef Fish and Bottomfish in the Pacific Island territories of Guam and the Commonwealth of the Northern Mariana Islands, held April 20 and 21, respectively. The purpose of these Research Workshops was to bring together scientists, agency staff, cooperating fishers, and anyone else involved with conducting research or managing reef fish and bottomfish in the Territories to:

(1) Discuss research currently being conducted on insular fish stocks;
(2) Identify any research that can be used to inform and improve the science used to manage the fisheries exploiting these stocks;
(3) Discuss potential collaborations and future research.

Both workshops were well-attended with over 20 participants at each workshop including:

- Territorial resource management agency staff (DAWR in Guam; DLNR/DFW and BECQ in CNMI)
- University scientists (University of Guam)
- Cooperating fishers (Guam Fishermen's Cooperative, Pacific Islands Fisheries Group)
- PIFSC scientists from Scientific Operations, Insular Fisheries Monitoring, Life History, and Stock Assessment groups
- Western Pacific Regional Fishery Management Council staff
- PIRO Habitat Conservation Division territorial staff
- Biosampling contractors

Workshop participants provided up to 10 presentations that described research being conducted on reef fish and bottomfish, ranging from collaborative life history sampling to fishery monitoring to reef surveys. Each presentation was followed by group discussion on how the science could be improved and applied for management purposes. The workshop was successful in bringing together staff from various sectors to openly communicate about insular fish research.

Collaborative efforts were identified at each workshop and participants were encouraged to pursue these efforts. Participants at both workshops provided positive feedback on the workshop and its overall goals, and agreed that similar collaborative discussions should be encouraged in the future. The outcomes of the workshops were collaborative in nature; therefore, no workshop reports are planned for distribution.

Annual Biosampling Data Summaries for 2014 Provided to Council Staff and FEP Members

The Pacific Islands Region Commercial Fisheries Biosampling Program (CFBS) currently includes pilot studies in American Samoa, Guam and the Commonwealth of the Northern Mariana Islands (CNMI). The field sampling research on Saipan is conducted by contractors and PIFSC staff, working with fish vendors; on Guam by PIFSC staff and the Guam Fishermen's Cooperative; and on Tutuila by PIFSC contractors in collaboration with the American Samoa Department of Marine & Wildlife Resources and local fishermen.

The CFBS collects data from an opportunistic sample of the commercial catch by geartype, from as close to the fisherman's catch level as the market and fishery will support. For American Samoa and the CNMI, it is mainly a sample of the catch from the night spear fishery that has been supportive, from the fishermen level (American Samoa) and from the vendor level (Saipan). Guam is the only location where a fairly broad sample of the catch from both fishermen and the market is available in one place, because of the existence of the Guam Fishermen's Coop. Thus, the three CFBS pilot studies sample different sectors of commercial fisheries and different gear sectors within each local fishery.

In April 2014, staff of the Western Pacific Fisheries Information Network (WPacFIN) provided regional biosampling summary data to the Council's Fisheries Ecosystem Plan (FEP) Team. The annual summaries covered data collected since the surveys began at each location (covering 2010–2013 for Guam and American Samoa; 2011–2013 for CNMI). The reports included a detailed summary of the amount of fishing effort sampled by CFBS (number of trips) by mode of access (Boat-Based or Shore-Based) and fishing method, along with the number of hours fished, number of fishers, number of fish or invertebrates sampled and the total weight measured and estimated. Species-level summaries included the number of each species sampled, as well as the sampled and estimated weight by species, access mode and fishing method.

The summary CFBS data were recently updated and the annual data for 2014 were provided to FEP members and Council staff on March 24, 2015. Tables 1-3 provide a summary of the reported data for 2010-2014, including the 2014 annual data

In these summaries the “total weight estimated” by species is not the aggregate weight of each species caught in the whole fishery, but is the estimated weight of all the fish of that species sampled, including fish not actually weighed during the CFBS field survey. The weight of fish not actually weighed has been calculated from their measured length and a weight-length curve derived through this research project on each island, and is the estimated weight of fish sampled. The CFBS program does not endeavor to estimate the total weight landed in each area, even for gears the program is able to sample with relatively high frequency. Its goal instead is to develop good length-weight data, to sample length-frequencies by gear and species, and to collect biological samples (e.g., otoliths, other tissues) from a few species each year for use in life history research.

Summary of Regional Commercial Fisheries Biosampling Data: 2011-2014 *(only 2 samples during 2010)*				
	Island Area = Saipan (some landings from Rota & other banks)			
Parameters	**2011**	**2012**	**2013**	**2014**
Fishermen-Trips	528	524	699	550
Gears/Methods	3	4	5	5
Method(s)	Spearing (Snorkle), Hook/Line, Bottomfishing (small amount)	Spearing (Snorkle), Hook/Line, Bottomfishing, Atulai	Spearing (Snorkle), Hook/Line, Bottomfishing, Atulai (increasing amount from 2012), Talaya	Spearing (Snorkle), Hook/Line, Atulai, Bottom, Gillnet
Number of Species Sampled	135	161	177	150
% Sample/Weighed Individually (% number fish)	92%	38%	33%	20%
Weight Sampled (Lbs)	20,798	14,356	20,297	5,919
Total Weight Estimated (Lbs)	22,052	22,488	36,388	20,933
% Sampled/Estimated by Weight	94%	64%	56%	28%
Estimated Lbs. Top 10 Species Sampled *(list includes any species that made it into the top 10 during any of the first 4 years)*				
Acanthurus lineatus	1,839	1,487	1,956	576
Naso lituratus	1,908	1,789	2,060	1,643
Siganus argenteus	1,069	592	1,395	1,197
Naso unicornis	2,550	1,448	2,877	1,984
Mulloidichthys flavolineatus	364	525	516	617
Parupeneus barberinus	601	547	838	1,035
Lethrinus atkinsoni	622	316	501	478
Scarus rubroviolaceus	1,905	1,192	2,760	936
Scarus ghobban	570	448	823	1,207
Chlorurus sordidus	445	97	492	723
Siganus spinus	113	342	397	738
Lethrinus obsoletus	307	273	435	400
Selar crumenophthalmus	0	88	1,498	407
Panulirus penicillatus	157	0	1,452	94

Summary of Regional Commercial Fisheries Biosampling Data: 2010-2014					
	Island Area = Tutuila, American Samoa				
Parameters	**2010**	**2011**	**2012**	**2013**	**2014**
Fishermen-Trips	14	205	667	619	346
Gears/Methods	1	3	4	3	3
Method(s)	Spearing (Snorkle)	Spearing, Atule-Mixed, Bottomfishing	Spearing, Bottomfishing, Trolling, Atule Mix	Spearing, Bottomfishing, Trolling	Spearing, Bottomfishing, Bottom/Troll Mix
Number of Species Sampled	53	185	243	212	166
% Sample/Weighed Individually (% number fish)	88%	56%	44%	37%	35%
Weight Sampled (Lbs)	620	11,350	32,665	29,763	12,162
Total Weight Estimated (Lbs)	700	15,304	47,953	48,092	78,756
% Sampled/Estimated by Weight	88%	74%	68%	62%	15%
Estimated Lbs. Top 10 Species Sampled *(list includes any species that made it into the top 10 during any of the first 4 years)*					
Acanthurus lineatus	274	3,944	12,382	13,662	65,021
Naso lituratus	35	372	1,238	1,547	824
Sargocentron tiere	18	286	766	541	202
Scarus oviceps	36	495	704	494	455
Lutjanus kasmira	0	288	666	1,270	257
Lethrinus rubrioperculatus	0	508	1,384	1,479	175
Myripristis berndti	16	160	350	261	175
Chlorurus japanensis	32	573	2,096	1,457	952
Ctenochaetus striatus	11	266	1,038	1,027	918
Scarus rubroviolaceus	64	1,417	3,076	2,648	1,304
Acanthurus nigricans	9	139	271	369	160
Naso unicornis	49	982	2,912	2,424	1,156
Panulirus sp.	0	389	1,653	93	493
Panulirus penicillatus	0	580	1,107	1,996	557

Summary of Regional Commercial Fisheries Biosampling Data: 2010-2014					
	Island Area = Guam				
Parameters	**2010**	**2011**	**2012**	**2013**	**2014**
Fishermen-Trips	139	242	298	270	318
Gears/Methods	4	8	10	7	2
Method(s)	Spearing (w/wo SCUBA), Bottomfishing, Trolling, Gillnet	Spearing (w/wo SCUBA), Bottomfishing, Trolling, Talaya, Gillnet, Spin casting, Hook/Line	Spearing (w/wo SCUBA), Bottomfishing, Trolling, Talaya, Gillnet, Spin casting, Jigging, Surround, Hook/Line	Spearing (w/wo SCUBA), Bottomfishing, Trolling, Talaya, Gillnet, Hook/Line	Spearing (w/wo SCUBA)
Number of Species Sampled	145	182	178	169	175
% Sample/Weighed Individually (% number fish)	100%	100%	68%	60%	64%
Weight Sampled (Lbs)	4,790	26,507	17,475	9,602	13,868
Total Weight Estimated (Lbs)	4,790	26,507	25,638	17,230	20,970
% Sampled/Estimated by Weight	100%	100%	68%	56%	66%
Estimated Lbs. Top 10 Species Sampled *(list includes any species that made it into the top 10 during any of the first 4 years)*					
Naso unicornis	1,158	6,682	9,121	5,901	5,087
Naso lituratus	355	1,107	1,761	1,075	953
Hipposcarus longiceps	308	1,286	1,030	731	1,553
Scarus rubroviolaceus	229	942	339	252	536
Scarus altipinnis	193	1,066	999	444	682
Acanthurus lineatus	139	297	334	200	151
Lethrinus rubrioperculatus	109	560	394	327	655
Monotaxis grandoculis	99	643	659	381	496
Scarus schlegeli	87	335	252	267	187
Acanthurus nigricauda	70	549	274	157	124
Siganus argenteus	59	242	283	209	124
Epinephelus fasciatus	42	167	188	268	349
Lethrinus obsoletus	20	99	110	157	178
Myripristis berndti	17	171	275	184	150
Siganus spinus	0.3	3	22	89	92

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