

2023 American Samoa Fisher Observations Data Summary and Analysis

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FISHERIES



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About this report

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Cover photo: Rod and reel fishing at Faleasao Harbor on the Northwest coast of Ta‘ū island, American Samoa in June 2023. Alia vessels docked in the background. Photo credit: NOAA Fisheries. Photographer Mia Iwane.

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Background

History and purpose

The fisher observations is led by Hawai'i fishermen Clay Tam and Roy Morioka to document on-the-water observations for fisheries across the U.S. Pacific Islands Region. Their goal was to provide context to fisheries-dependent data presented in the Annual Stock Assessment and Fishery Evaluation (SAFE) reports and add local and traditional ecological knowledge to science and management processes in the region. By publishing these data reports and documenting fisher observations over time, we hope to better understand fishery and ecosystem linkages, uncover trends, and validate observations made by people who fish in the U.S. Pacific Islands Region.

Previous work

In 2021, fishers on the Western Pacific Regional Fishery Management Council's (Council) Advisory Panel from American Samoa, the Commonwealth of the Northern Mariana Islands, Guam, and Hawai'i met each quarter and provided updates on social, economic, ecological, and management aspects of pelagic and archipelagic fisheries around their islands. These data were presented in their respective pelagic and archipelagic SAFE reports for 2020 (WPRFMC, 2021c, p. 196, 2021b, p. 77, 2021a, p. 85). In 2022, the Council collected fisher observations for 2021 which were published in two Pacific Islands Fisheries Science Center (PIFSC) data reports (Ayers et al., 2022b, 2022a). Additional fisher observations collected from quarterly Advisory Panel meetings along with findings from the annual meeting were summarized in the 2021 pelagic (WPRFMC, 2022d, p. 159) and archipelagic (WPRFMC, 2022a, p. 160, 2022c, p. 70, 2022b, p. 159) SAFE reports. 2022 fisher observations collected during Advisory Panel meetings and were summarized in 2022 pelagic (WPRFMC, 2023d, p. 159) and archipelagic SAFE reports (WPRFMC, 2023a, p. 36, 2023c, p. 159, 2023c, p. 160, 2023b, p. 160). Fisher observations were also collected during 2023 Advisory Panel meetings and will be summarized in 2023 pelagic and archipelagic SAFE reports.

2024 American Samoa fisher observations meeting

The Council met on Tuesday, January 29, 2024, from 6:30–8pm (Samoa Standard Time) to review observations collected in 2023 from American Samoa fishers. The meeting was attended by nine American Samoa fishers, two Council staff, and two social scientists from the National Oceanic and Atmospheric Administration (NOAA) Pacific Islands Fisheries Science Center (PIFSC). The meeting was facilitated by Roy Morioka and Clay Tam, with notes taken by a Council staff member and two PIFSC social scientists. Facilitators used the same streamlined interview guide used in 2022 (see Appendix). They began the meeting by welcoming the group, introducing participants, and inviting fishers to share their 2023 fishing experiences.

Data collection and data analysis

Sampling protocol

Via their social networks, Advisory Panel invited members of the American Samoa fishing community to attend the meeting and contribute their observations for the year. Advisory Panel members are often proficient using one or more gear types, have many years of fishing experience, and are well-informed of changes that occur in the fishery. For the 2023 American Samoa annual fisher observations meeting, as in previous years, they tried to secure participation and gather data from current or past 'highliners' with different fishery specializations, whether it was individuals that target archipelagic species using shoreline or spearfishing gear, venture from shore to fish from kayaks, or small boats that target different management unit species (MUS) such as ecosystem component species (ECS)¹, bottomfish (BMUS)², and pelagics (PMUS)³. Reference the Stock Assessment and Fishery Evaluation Report for the American Samoa Fishery Ecosystem Plan and the U.S. Pacific Island Pelagic Fisheries Ecosystem Plan more information on these species (WPRFMC, 2023a, pp. 10–14, 2023d, pp. 33–34).

Highliners are those who have more fishery knowledge than less experienced fishers, more years fishing, and thus may offer deeper insights about unusual events and trends. Participants at the 2023 meeting included five Advisory Panel members and four members of the American Samoa fishing community.

¹ ECS species frequently targeted in American Samoa include redlip parrotfish, bluespine unicornfish, blue-banded surgeonfish, redtail parrotfish, spiny lobster, orangespine unicornfish, bridled parrotfish, dark-capped parrotfish, bigeye bream, yellowlip emperor, et al.

² BMUS species in American Samoa include bluelined squirrelfish, fringelip mullet, green spiny lobster, clams, day octopus, and one-blotch grouper.

³ PMUS species frequently targeted in American Samoa include albacore tuna, yellowfin tuna, skipjack tuna, bigeye tuna, blue marlin, wahoo, swordfish, spearfish, moonfish, barracudas, pomfret, and oilfish.

Participation and carryover from previous annual meetings

In 2022, American Samoa did not hold an annual meeting due to COVID-19, but in 2023, eight fishers attended. In 2024, nine fishers attended; one third (33%) of these fishers had also attended the 2023 meeting.

Data collection

Council staff and PIFSC social scientists took detailed notes during the January 2024 meeting, collecting direct quotes where possible. The meeting was not video- or audio-recorded because we felt that recording could potentially inhibit participation or candor for fishers participating in the discussion. If note takers could not record verbatim quotes, main ideas were still reported from meeting attendees. All meeting note versions were combined and proofed into a main document, taking care to remove any identifying information from meeting attendees.

Data analysis

Using the main notes document, we coded responses using thematic categories, starting with the four SEEM⁴ categories: Social, Economic, Ecological, and Management Uncertainty (Hospital et al., 2019). SEEM categories were chosen to code responses because they can be used to provide context and complement the acceptable risk of overfishing (P*) when setting Annual Catch Limits (ACL) or establishing an Annual Catch Target (ACT) under an Acceptable Biological Catch (ABC) (Hospital et al., 2019, p. 2). We also used subthemes (generated topically or thematically to succinctly describe main ideas) from the main SEEM categories to add detail. Using themes and subthemes to organize and analyze qualitative data is often referred to as qualitative data analysis (Miles and Huberman, 1994). This process was also used in previous fisher observations data reports (Ayers et al., 2022b, 2022a, 2023c, 2023b, 2023a). Findings from the American Samoa meeting are organized using the SEEM categories and additional subthemes, including management unit species categories, in tables below.

⁴ A Council working group developed the SEEM process to create a framework that could quantify social, economic, ecological, and management uncertainty for annual catch limit (ACL) specification or the establishment of an annual catch target (ACT).

Results

Social

In conversations about 2023 issues affecting their fishery, American Samoa fishers referenced fishing infrastructure issues such as a need for improvements to boat ramps and upgrades for alia vessels to enhance small-boat commercial fishing opportunities. Fishers also mentioned that they have been using a new fishing technique called 'micro-jigging' to catch large pelagic fish such as dogtooth tuna. A few American Samoa fishers learned the technique and have taught others in their fishing community. Despite some of the issues facing their fishery, they were grateful to be able to go fishing and share their catch with others in the community. See full results in Table 1.

Table 1. Social aspects of American Samoa fisher observations

Themes/subthemes (counts)	Quote(s)
Fishing infrastructure (3) - Boat ramps (2) - Upgrades to alia vessels	<p>"I think also something that's being addressed by [the] department [American Samoa Department of Marine & Wildlife Resources] right now, but has been maybe an issue is the condition to the boat ramps, and that's something that the local agency has been working to address using some of the available funds such as the SF [Sustainable Fisheries] money that has come through the, the quota transfers with the Hawai'i Longline Association (HLA) folks in Hawai'i. But those you know, there's been a couple projects we were able, with SF money to, for instance, the sport fish dock that was originally built with the sport fish fund. And they wouldn't allow the commercial boats, just because of the regulations, the way they were, but we were able to get that changed. Also, the dock extension for that same dock, that was also SF funds that the council kicked in for a feasibility study. And also, to hire the contractor to do the design for that extension. Unfortunately, it went to the contractor and now I don't know what happened, but the contractor is suing the government or something. So it's just...unfortunately, some of these well-intentioned projects just haven't come to fruition. yet. So hopefully, some of these things are resolved sooner than later. (<i>Fishing infrastructure, Boat ramps</i>)</p> <p>"Ramps are a big part of a fisherman's need." (<i>Fishing infrastructure, Boat ramps</i>)</p>

Themes/subthemes (counts)	Quote(s)
	<p>“I worked with [the Council] on a proposal for an alia upgrade, also through the sustainable fisheries fund. Install fish finding equipment, upgrade to electric reels, build custom holds. I feel like something like that which was active last year but didn’t get quite done, getting that done would be a huge deal. Maybe a trailer.” <i>(Fishing infrastructure, Upgrades to alia vessels)</i></p>
Technology (3) - New fishing techniques • Micro-jigging, dogtooth tuna	<p>“I just wanted to add another observation. New fishing methods. These masters [names a couple fishermen] they’ve been doing a lot of jigging and micro-jigging which is one of the hottest topics now. Bait and hook hasn’t really been working lately. So fishers are switching to jigging. So that was the next bet.” <i>(Technology, New fishing techniques, Micro-jigging)</i></p> <p>“Micro-jigging, they’re bringing up dogtooths, tunas. Those two are the masters. They’re picking it up from [names two fishermen]. Everyone’s buying jigs, there’s a huge fishery coming up for them. Something that has been a hot topic, everyone is buying new jigs, trying new stuff. <i>(Technology, New fishing techniques, Micro-jigging, dogtooth tuna)</i>”</p> <p>“I just want to echo what [another fisher] was talking about. [A friend] taught me jigging, that’s why I switched. I used to love using skipjack as bait, but lately it’s been slow. But then I was introduced by [a friend] and I practice, and I figured out my spots and that’s where I start hitting, catching the dogtooth [tuna]. But at the same time when I drop my bait, it’s not the same. Like [another fisher] said, the fish move around, and I agree with that. I jig, I try to pay and there’s nothing and I move closer to shore, shallower areas. And that’s where I start hitting good fish again. I really think that climate change is changing where fish go.” <i>(Technology, New fishing techniques, Micro-jigging, dogtooth tuna)</i></p>
Customary exchange (1)	<p>“Any problem we always look on the bright side, we can still get out to get fish, I can always come out to get fish, bring it back for families, communities.” <i>(Customary exchange)</i></p>

Economic

During conversations with fishers, economic issues—particularly market conditions—pervaded discussions. Fishers mentioned a lack of ice, particularly flake ice that is ideal for preserving the quality of fish needed to secure good prices at local markets. They also lamented efforts that failed to address the issue in the past or how they were well-intentioned but did not work. Other fishers described a lack of fresh fish and a lack of markets for alia-caught bottomfish. They described how local markets are full of frozen fish caught elsewhere. Fishers discussed how scattered, decentralized roadside markets make it difficult to get consistent fish prices, and several markets will not accept bottomfish caught by alia fishers. Some fishers felt that these issues underscore the need for a centralized market hub to sell fish and ensure consistent prices for prospective commercial sellers. Others felt that abundant fisheries on outer islands should be developed and brought to markets on larger, more populated islands, an idea that was objected to by at least one outer island fisher. Fishers also described how longline ‘bycatch’ makes its way to markets, but that a lot of pelagic catch is primarily caught on FADs in areas further away from American Samoa. Fishers perceived that much of the pelagic catch in markets stems from purse seine vessels that offload to the cannery. Referencing outer island fisheries, fishers that live on Manu‘a and Aunu‘u mentioned selective targeting plus some take of undersized fish. Others called attention to some fishers taking an abundance of ECS species like parrotfish and shipping them to markets on Tutuila. For full results, see Table 2.

Table 2. Economic aspects of American Samoa fisher observations

Themes/subthemes (counts)	Quote(s)
Market conditions (18)	<p>“A couple of things I wanted to chime in with. So one thing is, I think that there is a lack of flake ice here and you know the fisherman all for the most part fish with party ice. And you know, the double hull alia vessels that’s the preference here with most of the fishermen.</p>
- Lack of ice (3) <ul style="list-style-type: none">• BMUS	<p>The vast majority of the boats that make trips use the double hull vessels. And I know they’re comfortable with the design, but one of the limitations here is the lack of hold for the fish caught. And so, especially with the larger fish, they usually end up just kind of hanging out on the boat, putting a party ice on as best they can, but especially in a hot place like here, right on the equator, that ice doesn’t last very long. So things like that affects the quality of the fish.” (<i>Market conditions, Lack of ice</i>)</p>
- Lack of fresh fish (2) <ul style="list-style-type: none">• BMUS	
- Lack of markets for alia bottomfish (2)	
- Need centralized fish market (2)	
- Bringing outer island fish to market (2)	
- Lack of pelagic fish in markets	<p>“You know, you get the fish. Get it as fast as you can to the restaurant. Break it down, it’s already you know,</p>

Themes/subthemes (counts)	Quote(s)
<ul style="list-style-type: none"> • PMUS - Longline bycatch <ul style="list-style-type: none"> • PMUS - Roadside sales <ul style="list-style-type: none"> • Price fluctuations, ECS, parrotfish, triggerfish, snappers, lobster - Good prices <ul style="list-style-type: none"> • PMUS, yellowfin tuna - Lower population, less pressure on fish <ul style="list-style-type: none"> • ECS, parrotfish - Selective targeting - Selling undersized fish on Aunu'u 	<p>pretty brown, pretty burnt. And you know, we don't have the same demand for like the sashimi quality fish like say in Hawai'i, but I think that's one, one thing that would be nice, if there was more flake ice available for fishermen. And unfortunately, there's been a couple projects that address that, and the council actually invested quite a bit of money. A substantial amount actually, on both ice and fuel facilities for the territory. It's just it wasn't carried out properly and it went to waste. They basically rusted away without hardly ever being used. It's sad." (<i>Market conditions, Lack of ice</i>)</p> <p>"C coolers and ice too. There's only a few bottomfish boats that I know of, because there's really no market. When they go out, they would troll on the way to their fishing spots, then they would be forced to go back in because of the ice and stuff. They are forced to sell to the only store that will take their fish." (<i>Market conditions, Lack of ice, BMUS</i>)</p> <p>"Another thing I noticed is that there's really a lack of available fish in the local stores here. Really, you only see frozen [pieces]. You'll get like pieces of fish that was purchased from the big pelagic boats. All you get is reef fish, hardly ever see any kind of bottom fish here unfortunately unless you know one of the few folks you know have a line on some fresh bottomfish. That would be something I'd be interested in doing." (<i>Market conditions, Lack of fresh fish, BMUS</i>)</p> <p>"My own opinion is that there is a market, but we don't have enough fish. The only fish we are getting from Apia [Samoa] does not have a long shelf life. My generation, people, we look for bottomfish, but they don't last for a long time. I mean, we have the market, but you have to know where to look. In Manu'a they have a lot of fish, but mostly they fish for themselves." (<i>Market conditions, Lack of fresh fish, BMUS</i>)</p> <p>"There are a lot of people who want to buy bottomfish, but only a few boats that go out. They go out to their fishing spots using only their knowledge of landmarks, they are pretty proficient fishermen, but the use of GPS or chart monitor is difficult. The good news is they have their sons they're trying to train. Spending money on ice</p>

Themes/subthemes (counts)	Quote(s)
	and gas and coming with a cooler of bottomfish, that's the only store that will take it. If they sell by the side of the road, it will take them a long time to break even. If you have to spend so long to break even, you need to make a little money to make a living. That's just one of the things that I know of." (<i>Market conditions, Lack of markets for alia bottomfish, BMUS</i>)
	"There seems to be a disconnect that there seems to be people who want to go fishing for bottomfish, but apparently there's not a big enough market. I would disagree with that. I think it's a matter of someone guaranteeing there's a market. To encourage them to take that risk away. It seems like that is such a waste. There are so many needy people. The government should be able to guarantee a market, that you know, at fair prices. For the guys who go out to bottomfish, there should be a market for that." (<i>Market conditions, Lack of markets for alia bottomfish, BMUS</i>)
	"And we always hear from the folks out in Manu'a, how good fishing out there is. And I think it would be nice if we had some kind of infrastructure to help those folks out in Manu'a. Transport their fish over here to the markets on Tutuila. I know they don't have as big a market over there and like we've heard from the fishermen from there that have come to our previous council meetings and AP meetings. They tell us that they basically end up giving away all their fish to family and community. So I think if there was some way that we could piggyback off of the government's two vessels that go out there and maybe have some large insulated bins for the fishermen out there to put their fish on and maybe a flake ice machine that you can pack it in. That might be a good way for them to ship fish over here to someone or somebody that owns a fish market to sell..." (<i>Market conditions, Bringing outer island fish to market</i>)
	"If they wanted to bring fish from Manu'a here, that would be bad. The ice, fuel that was what it was for, to bring over to Tutuila to sell, but it didn't work out. Then we talk about the super alia, that was the purpose. It can travel to Manu'a, we can load it up with coolers and they can bring it back to Tutuila, we're still waiting for

Themes/subthemes (counts)	Quote(s)
	the super alia, the ice machine, the fuel failed. What can we do? I don't know. Right now, the Department of Commerce is handling the super alia thing, they are not fishermen. The Department of Commerce should not handle any fish, that should be the Department of Wildlife." (<i>Market conditions, Bringing outer island fish to market</i>)
	"There's some that will set up a tent anywhere on the side of the road, but if there was a stationary area where all the fishermen could come from the east side could come to the west side to make it easier for people to centralize in one area to purchase the fish. Maybe a little hut and an ice machine? But there's a guy on the east side, he sells octopus every day. So yeah I see him, he stays in the area and he's trying to keep it consistent. These guys are trying to make a living, but the prices are sometimes too high." (<i>Markets, Need centralized fish market</i>)
	"So I'm going to continue to speak on market conditions since I'm a vendor, not a fisherman. They may not be specific to last year, but they crossover with previous years as well. [Another fisher] had talked about risk for bottomfish market, I think that's something our government should probably roll up in that \$4.4 million dollar hub for fishermen. [A fisher from Hawai'i] came down to certify the store that [names another fisher] runs. I'm not sure if he buys from the alia fleet, I'm pretty sure he just buys from the longline boats." (<i>Market conditions, Need centralized fish market, BMUS</i>)
	"The purse seine fleets that operates out of American Samoa, generally speaking, it has good fish, but most of the catch is not in American Samoa. That's just geography, American Samoa is too far south for the tropical tuna FADs. Most of fish are on Kiribati, Tuvalu, Tokelau, the high seas. Purse seiners keep fish on board in the coolers. They keep miscellaneous catch like wahoo. This sometimes finds its way to the canneries, but we don't sell. Sometimes the canneries want it, but there's usually a local market for that. The American Samoa market is more likely to be for the albacores." (<i>Lack of pelagic fish in markets, PMUS</i>)

Themes/subthemes (counts)	Quote(s)
	<p>"I'm thankful for the purse seiners and longline for their miscellaneous fish, that's how we get our fish. It's still not enough, but we get some from the purse seiners and longline, when they sell their bycatch." (<i>Market conditions, Longline bycatch, PMUS</i>)</p>
	<p>"My guys that go out fishing, they go out beyond the reef and they'll dive. In one good night they'll get more than 100lbs of fish. Bottomfish, parrotfish, triggerfish, snappers, lobsters, and stuff. But what I see on the side of the road is that the guy selling the fish is not consistent. They bring in different kinds of fish and then the prices fluctuate depending on who is jumping out of the car. The price goes up. So I don't go buy fish anymore. Like a double price you know." (<i>Market conditions, Roadside sales, Price fluctuations, ECS, parrotfish, triggerfish, snappers, lobster</i>)</p>
	<p>"Not a big market [on Manu'a]. You can get a big slab of yellowfin really cheap. There's not a lot of restaurants in Manu'a." (<i>Good prices, PMUS, yellowfin tuna</i>)</p>
	<p>"Cost of living spiked last couple months of the year and there's not many people in Manu'a. A lot of fishermen in Manu'a slaughtering the population and shipping it over. I see beautiful parrotfish sleeping at night, so population plays a big role on the fish." (<i>Market conditions, ECS, Parrotfish</i>)</p>
	<p>"And another thing is that fishermen are highly selective based on the market. I'm noticed that in the past year as well. Fishermen are not catching certain fish for a reason, because they can't sell it." (<i>Markets, Selective targeting</i>)</p>
	<p>"There's no limit size of fish, but I've noticed, I'm witnessing under sized fish selling along the side of the road." (<i>Market conditions, Selling undersized fish on Aunu'u</i>)</p>
Fuel prices (1)	<p>"Infrastructure wise it's not good, the wharf is really bad. Fuel is limited. Can only get \$20 per boat per week. We rely on kayaks 30% of the time. It's a good workout for me." (<i>Market conditions, Fuel costs</i>)</p>

Ecological

Biological

Biological issues mentioned by American Samoa fishers included the amount of coral reef fish (ECS) present around Manu'a, an abundance of Spanish mackerel present when micro-jigging around Tutuila, and the potential for overfishing for ECS around Aunu'u, which is causing fish to scatter or dive deeper for safety. Fishers also described good-sized catches for masi masi, yellowfin tuna, and skipjack; a large amount of good-size yellowfin tuna and marlin were caught during the Buds and Suds tournament. Depredation remained an issue in American Samoa, just as in other jurisdictions. One fisher estimated that up to 85% of their catch is predated by sharks. Fishers also mentioned that they noticed fish moving around more and ECS species diving deeper to avoid being caught. See Table 3 for full results.

Table 3. Biological aspects of American Samoa fisher observations

Themes/subthemes (counts)	Quote(s)
Amount of fish (4) <ul style="list-style-type: none">- ECS (2)• Overfishing for ECS on Aunu'u- Spanish mackerel (2)- emperorfish	<p>"Yes. My guys when they go over to Manu'a they say it's like Hanauma Bay. When they see the fish, they see dollar signs." (<i>Juvenile and adult recruitment, Amount of fish, ECS</i>)</p> <p>"I just want to add something that has been bothering me lately. I'm talking about Aunu'u itself, around the reef, our area, spearfishing. Not only the climate change, but I believe the other reason the fish are scared or diving deeper is that it's getting over fished by other fishermen. There are not a lot of us who live there who fish. I've seen other alias with other night fishermen. Not only at nighttime, in daytime too. I'm trying to convince them to talk to the village council to talk to someone to protect our area." (<i>Amount of fish, Overfishing for ECS on Aunu'u</i>)</p> <p>"I live in Manu'a 100%, but I moved to Pago and I realized I do not catch Spanish mackerel in Manu'a, but I catch a lot in Tutuila. I catch a lot of emperors. I do not like catching them. When I see them, I move spots." (<i>Amount of fish, Spanish mackerel, emperor fish</i>)</p>
	<p>"I do a lot of micro-jigging and Spanish mackerel are always smashing, cutting my line. I try to cook them, it's pretty good. I remember bringing a whole cooler of Spanish for this bottomfish group that goes out I thought I would donate to them to use for bait." (<i>Amount of fish, Spanish mackerel</i>)</p>

Themes/subthemes (counts)	Quote(s)
Size of fish (3) - PMUS (3) • yellowfin tuna (3) • masi masi (2), • skipjack • marlin	<p>“Every time we go out fishing we have some good catch. The last time we went out we had masi masi, yellowfin, skipjack, some good size. Whatever we catch we bring in and share with family and friends. Maybe 19 pounds, no more than 20 pounds. The last yellowfin 60 pounds. Then we have to cut it up and share. (<i>Size of fish, PMUS, masi masi, yellowfin tuna, skipjack</i>)</p> <p>“They went out last Saturday, I saw 110lb yellowfin tuna, some masi masi. Got to be in it to win it.” (<i>Size of fish, PMUS, masi masi, yellowfin tuna</i>)</p> <p>“I wanted to add something to trolling. Last year was one of the biggest haul-ins for the Buds and Suds tournament, we had 7,300 lbs in 3 days. One boat 25 yellowfin 40-60 pounds. Something is definitely going on. Ever since I worked there, I haven’t seen that volume of fish. 13 marlins. 15 boats competing from Western Samoa, Apia. November, after Thanksgiving, the third week of November. It was one of the best tournaments I’ve seen in a while. A small boat hauling in 25 averaging 40-60 pounds, it was a good day for them.” (<i>Size of fish, PMUS, marlin, yellowfin tuna</i>)</p>
Depredation (2)	<p>“Another one is shark predation. 85% of their catch goes to sharks. With the new shark law going into place, they’re asking what they can do about it because a lot of their efforts are lost to sharks. So, I’m trying to figure out what we can do to help them with their livelihood as fishermen.” (<i>Depredation, Shark depredation</i>)</p> <p>“So now some of the old practices that were done back in the days, before the laws came into place, was catching a shark and have it dangled by the boat. When the shark shows up the only thing that could be done was shark dangling, when the shark senses its own blood in the waters it will chase them away. This is one thing that causes me to think about how we can help the fishermen with shark predation. Last couple of years one of the major issues is shark depredation.” (<i>Depredation, Shark depredation</i>)</p>

Themes/subthemes (counts)	Quote(s)
Changes in spatial distribution patterns (2) - ECS • parrotfish, unicornfish, surgeonfish	<p>“When I go free diving, spearfishing, I can see how different the fish act. They dive much deeper now. Parrotfish, unicornfish, surgeonfish and so forth. Before it was easy to catch right at the shore, right where the waves were breaking.” (<i>Changes in spatial distribution, ECS, parrotfish, unicornfish, surgeonfish</i>)</p> <p>“Learned that fish don’t stay in the same spot. They move around.” (<i>Changes in spatial distribution</i>)</p>

Physical/Oceanographic

Fishers noted several impacts from El Niño, including coral bleaching and warmer water temperatures that made it harder to find fish when trolling and bottomfishing. Fishers also mentioned that hurricane season was their favorite time to go fishing as it coincides with more light or calm wind days. Aunu'u fishers noted impacts from climate change, including sea level rise, coral bleaching, and brown algae—which used to be more prevalent. Fishers also referenced favorable currents that resulted in good fishing conditions. See Table 4.

Table 4. Physical/Oceanographic aspects of fisher observations

Themes/subthemes (counts)	Quote(s)
El Niño (3) - Coral bleaching (2) - BMUS, ECS	<p>“It really affects us, especially the ending of last year and beginning of this year. The branching corals was really healthy last year, but the branching corals in the last quarter have been turning white compared to last year in December, now it's changing really fast.” (<i>El Niño, Coral bleaching</i>)</p> <p>“A scuba diver myself, the currents are a lot stronger than before, there's coral bleaching going on, we're observing deeper corals that are bleaching that shouldn't be. There's one indicator, a branching coral, they'll probably bleach first, like a sore eye you'll pick them out like that. The bleaching is verifying the hot temperatures that we've got going on.” (<i>El Niño, Coral bleaching</i>)</p> <p>“I go fishing 3-4 times a week. I do different types of fishing. Trolling, bottomfishing, and spearfishing. Depends on the tide. With the bottomfish, when it's really hot I have to move closer inland so I can catch nice groupers, snappers, trevally. I used to go to my favorite spots, but I have to look for some different spots to do bottomfishing. Starting in April it was really hot.” (<i>El Niño, BMUS, ECS</i>)</p>
Wind/weather conditions (2) - Tides - BMUS	<p>“This is actually the best time for fishing, the hurricane months. This is the time when the catch is good. The tide goes way out. And then in the early evening the tide comes back in.” (<i>Wind/weather conditions, Tides</i>)</p> <p>“Last couple weeks the ocean has been very calm. Nice fishing. I hope it stays the same for guys that go out and bottomfish.” (<i>Wind/weather conditions, BMUS</i>)</p>
Climate change (2)	<p>“For myself as a fisherman, I love to fish. On Aunu'u, the sea level rising pretty much changed all the fishing. The heat we are receiving with climate change, it's pretty intense.” (<i>Climate change</i>)</p> <p>“This year was challenging because of the swells and the sea level rising with the climate change itself. I'm seeing coral bleaching, brown algae. I used to see soldier fish and goat fish, now because of the algae I don't see it growing much anymore.” (<i>Climate change</i>)</p>

Themes/subthemes (counts)	Quote(s)
Currents (2)	<p>“The current is much stronger now and the swells too. I have to look at the tide, the weather update from Windy.com or the local weather station and that's where I have to really plan if I'm going spearfishing. The swells are getting stronger.” (<i>Currents</i>)</p> <p>“Really hot. Hurricane season, small windows to catch fish. More good current going around.” (<i>Currents</i>)</p>

Management Uncertainty

No comments related to this theme in 2024.

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Appendix. Interview Guide

ANNUAL FISHERMEN'S ASSESSMENT OF THE 2022 FISHING SEASON

ISLAND OR REGION FISHED:

NAME (optional):

- a) NUMBER OF TRIPS MADE:** Same, more, or less than previous seasons, and why? (e.g., available fish days due to weather conditions, availability of crewmembers, vessel issues, vehicle or trailer issues, absence or abundance of preferred targeted species, depredation concerns, etc.) Include all conditions (+ or -) that affected your ability to make trips.
- b) AT SEA CONDITIONS EXPERIENCED DURING TRIPS** (Changes in weather forecasted, current, wind, water temperature, murky waters, changes in bottom structure, other.)
- c) TARGETED SPECIES FOR THE SEASON** and your assessment of these trips. Good, excellent, bad or typical as compared to previous seasons. (provide species and your experience)
- d) DEPREDATION EXPERIENCES BY ALL PREDATORS** (Sharks, kahala, other)
- e) MARKET CONDITIONS:**
- f) OTHER:** Situations beyond your control that affected your ability to optimally fish during the 2023 season.