RECREATIONAL FISHING EFFORT ESTIMATION IMPROVEMENT WORKSHOP

JUNE 4-6, 2024

HILTON NEW ORLEANS RIVERSIDE
NEW ORLEANS, LOUISIANA

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Red Snapper Fishing Effort Estimation Improvement Workshop
Gulf States Marine Fisheries Commission
Hilton New Orleans Riverside
New Orleans, Louisiana
June 4-6, 2024

1.0 INTRODUCTION

As part of the Inflation Reduction Act (IRA) funding to the National Oceanic and Atmospheric Administration (NOAA), $10.65MM has been allocated to be used to improve estimates of recreational fishing effort and discards of reef fish, specifically red snapper, in the Gulf of Mexico. To develop workplans and budgets for these projects, the Gulf States Marine Fisheries Commission (GSMFC) is holding three workshops in 2024. This report details the background, technologies, and conclusions discussed at the first IRA workshop on June 4-6, 2024.

1.1 PURPOSE AND OBJECTIVES

The purpose of the workshop was to develop a workplan and proposed budget to fund projects that would provide estimates of fishing effort from private recreational vessels that could be used to validate and/or replace existing approaches, and which could be implemented in 2025/26. Specific objectives included the following:

Review existing literature on fishing effort validation studies across the U.S. and abroad, and identify novel methods used, potential biases, measures of success, and applicability for use in U.S. recreational fisheries.

Identify parallel disciplines and non-traditional methods that may be borrowed to estimate fishing effort, including their applicability for use in U.S. recreational fisheries.

Discuss surveys and methods already being tested or implemented in the Southeast Region and identify strengths, weaknesses, and potential biases.

Identify geographic areas in the Southeast region where more intense effort validation research could be focused, giving special consideration to locations where:

Fishing effort is readily observed and measurable, such as areas where effort is highly concentrated or constrained by geographic choke points and therefore more conducive to direct observational studies.

Large fishing effort survey coverage gaps potentially exist, such as areas with potentially high or unknown concentrations of effort from private access sites.

Areas where fishing effort validation work is already being conducted and may be expanded.

Areas where multiple overlapping surveys indicate the potential presence of bias but the source is poorly understood.

Provide recommendations for priority research studies that can be completed with a high probability of success in Financial Year (FY) 25 or FY26.

For areas where the Marine Resource Information Program overlaps with other recreational surveys, identify methods to verify the potential presence of bias and quantify the magnitude in each survey, and identify methods to locate and understand the sources of potential bias in each survey.

For areas where there is no overlapping survey, identify methods to verify the potential presence of bias and quantify the magnitude, and identify methods to account for it in the future and correct for it in past data.

Begin development of a Request for Proposals that includes project objectives, priorities, and criteria for reviewing, ranking, and selecting proposals for future funding. The call should focus on proposals that will provide estimates of fishing effort from private recreational vessels that can be used to validate and/or replace existing approaches, and which can be implemented in 2025/26.

1.2 PARTICIPANTS

1.2.1 In-Person Attendees

Anson, Kevin	Alabama Department of Conservation and Natural Resources
Bland, Kevin	Louisiana Department of Wildlife and Fisheries
Bray, Gregg	Gulf States Marine Fisheries Commission
Bruger, Catherine	Ocean Conservancy
Cathey, Andrew	NOAA Fisheries, Southeast Fisheries Science Center
Cheshire, Rob	NOAA Fisheries, Southeast Fisheries Science Center
Colson Leaning, Dustin	Environmental Defense Fund
Conrad, Michele	Ocean Conservancy
Cowan, Michaela	Texas Parks and Wildlife Department
Dolsky, Gavin	Air Hygiene
Donaldson, Dave	Gulf States Marine Fisheries Commission
Garner, Steve	NOAA Fisheries, Southeast Fisheries Science Center
Gigli, Eric	Mississippi Department of Marine Resources
Gloeckner, Dave	NOAA Fisheries, Southeast Fisheries Science Center
Harris, Lizzie	Texas Parks and Wildlife Department
Helies, Frank	NOAA Fisheries, Southeast Regional Office
Hill, Matt	Mississippi Department of Marine Resources
Hollensead, Lisa	Gulf of Mexico Fishery Management Council
Hopper, Tiffany	Texas Parks and Wildlife Department
Horton, Chris	Congressional Sportsmen Foundation
Howell, Evan	NOAA Fisheries, Office of Science and Technology
Karp, Brian	CI Solutions
Kochan, David	Florida Fish and Wildlife Conservation Commission
Larkin, Michael	NOAA Fisheries, Southeast Regional Office
Lazarre, Dominque	NOAA Fisheries, Southeast Regional Office
Lynch, Stephen	MITRE Corporation
Mareska, John	Alabama Department of Conservation and Natural Resources
McClair, Genine	Florida Fish and Wildlife Conservation Commission
Moncrief, Trevor	Mississippi Department of Marine Resources
Nutall, Matthew	NOAA Fisheries, Southeast Fisheries Science Center
Petersen, Andrew	Bluefin Data Inc
Powell, Dalton	Gulf States Marine Fisheries Commission
Sauls, Beverly	Florida Fish and Wildlife Conservation Commission

Smith, Nicole	Louisiana Department of Wildlife and Fisheries
Strelcheck, Andy	NOAA Fisheries, Southeast Regional Office
Zhang, Adrian	Louisiana Department of Wildlife and Fisheries

1.2.2 Virtual Attendees

Adams, Rachel
Alhale, Sydney
Andrews, Rob
Banks, Kesley
Bhuthimethee, Mary
Binion-Rock, Samantha
Blanchet, Harry
Bogdan, Jennifer
Bowen, Chris
Branson, Ross
Brennan, Ken
Burris, Rick
Byrd, Julia
Calay, Shannon
Carrigan, Abby
Cermak, Bridget
Coffill-Rivera, Manuel
Collier, Chip
Cross, Tiffanie
Crosson, Scott
Curtis, Judd
DeJohn, Frank
Didden, Jason
Duca, Chelsea
Dukes, Amy
Dyar, Ben
Eguia, Leonardo
Emory, Meaghan
Fisher, Mark
Fitzgerald, Brett
Giuliano, Angela
Gordan, Zander
Gordon, Maryellen
Green, Matthew
Griffin, Aimee
Guyas, Martha
Hart, Hannah
Head, Marie
Hensley, Chris
Hessong, Ryan
Huber, Jeanette
Hutt, Clifford
Hyman, Alexander
Johnson, Brad
Jones, Christian
Kean, Samantha
Keppler, Blaik
Khan, Christin
Kittle, Christine
Lee, Max
Lindsey, Ty
Lovell, Sabrina
Lowther, Alan
Luers, Dan
Malinowski, Richard
Matter, Vivian
McCawley, Jessica
McGirl, Maria
Moore, Jeff
Moore, Robert
Neer, Julie
Papacostas, Katherine
Pausina, Randy
Petersen, Andrew
Pierdinock, Michael
Poland, Stephen
Potter, Caroline
Ramsay, Chloe
Raynor, Jen
Records, David
Reinhardt, Jamie
Robertson, Charlie
Rosenberg, Ashford
Sagarese, Skyler
Salmon, Brandi
Sartwell, Tim
Schieble, Chris
Schuiteboer, Mary
Schwaab, Ali
Silvennoinen, Jasmine
Spurgin, Kali
Sweetman, CJ
Topping, Tara
Van Deventer, Michelle
Walsh, Jason
Walter, John
White, Geoff
Wilms, Olivia
Wilms, Sean
Withers, Meg
Woody, Matthew
Zales, Bob

2.0 DAY 1 – JUNE 4

2.1 OVERVIEW OF CURRENT SURVEY PROGRAMS

The Southeastern U.S. has the largest concentration of saltwater recreational fishing with 4.5 million anglers taking a total of 36 million trips annually. To manage marine fish stocks, recreational landings data have been collected for several decades using complementary survey approaches. The catch rate is collected through dockside interviews, allowing for species identification and biologic measurements, with general agreement among dockside surveys. Fishing effort is collected through multiple survey methods depending on the agency conducting the survey, leading to large differences in survey estimates. The effort estimate has the largest impact on the magnitude of the estimated total catch.

The NOAA Fisheries Marine Recreational Information Program (MRIP) Fishing Effort Survey is a household mail survey administered from Maine to Mississippi using the US Postal Service (USPS) list of residential addresses matched to the National Saltwater Angler Registry. It collects recreational trip information for specific, two-month periods. It is used to estimate private angler effort from shore and private boat modes in conjunction with dockside interviews to allocate effort by area fished and adjust for off-frame effort.

NOAA Fisheries also uses a weekly telephone survey administered from Maine to Mississippi to collect for-hire trip activity during specific one-week periods. This survey is used to estimate the for-hire fishing effort.

Texas uses the Texas Creel Survey which was initiated in 1974 and is the only survey approach in Texas. It includes dockside intercepts to collect data for catch and effort and a roving survey to count trailers and empty wet-slips. The results are expanded by relative site pressure from roving surveys. The fishing effort is collected in six-month intervals based on low-use and high-use seasons.

Louisiana used to participate in the NOAA Fisheries general survey, but as of 2014, the LA Creel Survey was initiated as a replacement for the MRIP. This survey was certified by NOAA Fisheries as being statistically sound for the state of Louisiana. It uses a phone and mail survey to collect effort data from private anglers and for-hire captains, targeting licensed saltwater anglers and offshore permit holders. It also includes dockside surveys to determine compliance rate to inform estimation expansion. Through this survey, weekly effort estimates are produced which allow for near real-time monitoring.

Both Alabama and Mississippi participate in the NOAA Fisheries MRIP general survey, but specialized surveys targeting red snapper, greater amberjack, and gray triggerfish were developed in 2014 and 2015, respectively. The surveys are mandatory logbook programs. Alabama anglers use web-based reporting which is coupled with dockside validations surveys to produce expanded estimates. Mississippi has a similar requirement where one person from a boat party must register and declare a trip in advance and complete landings reports before another trip can be declared. Estimates are expanded using a dockside survey. Both states are testing the LA Creel survey design as a potential effort methodology in 2024.

Florida initiated specialized surveys in 2015 targeting managed reef species. Originally, the survey was the Gulf Reef Fish Survey, but it was expanded to both coastlines as the State Reef Fish Survey (SRFS) in 2020. It is a USPS mail survey sent to anglers with State Reef Fish Angler designations and collects information on reef fish angler trips over the most recent month. Dockside intercept data are used to account for effort by anglers that are not included in the mail survey, either due to non-compliance, youth exemptions, or catching reef fishes incidentally while targeting other species for which the designation is not required.

In geographic regions where multiple survey methods overlap, a common occurrence is a large disparity between the state and federal expanded recreational fishing effort estimations with little to no overlap. This lack of agreement between the estimates leads to uncertainty in the accuracy of the current survey methods.

2.2 STATE PRESENTATION - FLORIDA

Approximately 1.4 million individual saltwater licenses are sold each year. Of these licenses, over 600,000 have the State Reef Fish Angler designation. The fishery can target multiple fish species in each trip due to the diversity of the ecosystem. Due to having two coastlines, fishing effort is distributed across two federal jurisdictions, as well as different state boundaries. The Florida Keys of Monroe County are between the two jurisdictions, and the current MRIP survey applies all fishing effort from Monroe County to the Gulf of Mexico. A method that can better separate the fishing effort of Monroe County would provide a better estimate for the contribution in the Gulf.

Since the survey was expanded statewide, the SRFS and MRIP effort estimates differ among the Gulf and Atlantic coasts, with greater differences between the two surveys on the Gulf coast compared to the Atlantic. This difference is potentially caused by the different approaches each survey uses to estimate effort among the two coasts. The SRFS collects information on area fished (Gulf vs. Atlantic, and state vs. EEZ) directly from the mail survey of fishing effort, whereas MRIP allocates total effort among the two coasts based on intercept survey data. There are 1,596 public access points according to the MRIP site register, and NOAA Fisheries estimates approximately 40% of effort in Florida originates from private access points that are not included in dockside intercept surveys.

The fishing effort across Florida distributes differently based on the geographic region. Northern Florida has high peaks of fishing effort in the summer and low effort in the winter. Fishing effort in Central Florida is distributed over a longer period of time. Southern Florida receives high tourism in the winter and the effort is high throughout the year. Some fisheries in Florida are also subject to pulse fisheries, with high concentrations of anglers targeting popular shellfish (spiny lobster, bay scallops) and finfish during short season openings. .

When using remote sensing technologies, there is a challenge in attempting to discern the different types of recreational boating activities. There would be a need for some direct observation to verify the remote sensing work.

The distribution of private fishing trips could potentially mirror the distribution of for-hire trips. The fishing effort in the Atlantic stays relatively close to the coast in the south and disperses in the north. Due to the broad, shallow continental shelf in the Gulf Coast, reef fish species are more dispersed which leads to a wide area for fishing effort. The effort in the panhandle is more concentrated due to the accessibility of the deep water.

On the Atlantic coast of Florida, there are 18 distinct inlets that serve as egress points to the ocean. These inlets are utilized for other surveys where observers count boats leaving and interview them once they return. The northwest panhandle has a similar geography of six egress points into the Gulf which can be surveyed for a total effort estimation. The western peninsula does not have clearly defined access points which requires a different approach for estimating effort. Most of the effort in the Florida Keys is on the eastern side, but it is expanding as boats and maps improve and allow people to fish in other areas.

2.3 STATE PRESENTATION - ALABAMA

Alabama has approximately 53 miles of coastline with the Gulf and 350 square miles of territorial seas. Thus, there are only two coastal counties. Baldwin County has higher numbers of condominiums and private residences with boat docks compared to Mobile County. There are three access points to the Gulf, but the majority of offshore fishing effort passes through Mobile Pass and Perdido Pass.

Approximately 140,000 saltwater licenses and 72,000 Reef Fish Endorsements were sold in 2023. The Reef Fish Endorsement began in 2020 and is required for all anglers over 16 years of age to target or possess any of the 31 species of reef fish designated by the Gulf of Mexico Fishery Management Council's Fishery Management Plan for the Reef Fish Resources of the Gulf of Mexico.

Most of the fishing effort occurs from April to October. There are 38 public boat launches according to MRIP, but the total number of private boat launches, marinas, and boat docks is currently unknown.

There are two effort surveys conducted by the state of Alabama. Snapper Check, which began in 2014, underwent MRIP certification in 2017 to be used in management of red snapper. The other survey is a pilot telephone survey, begun in 2024, of Alabama licensed recreational anglers to better estimate shore and private vessel effort. Snapper Check consists of a dockside survey of public access sites to confirm vessels with red snapper, gray triggerfish, or greater amberjack. There is also a mandatory reporting requirement for vessel owners and operators who land these three species in Alabama. The number of landing reports are then adjusted with an inverse proportion of the observed vessels to the number of reporting vessels.

According to Snapper Check, the number of private angler fishing trips launching from private access points is between 40% to 50%. It is unclear what is contributing to this rise. A few potential factors were the increasing number of private access points or a greater accessibility for red snapper in Alabama.

The new telephone survey closely follows the methods of the LA Creel survey. It includes weekly calls to randomly selected Alabama licensed anglers to gather fishing effort from the prior week. The survey also attempts to identify areas where the majority of fishing occurred. The goal is to provide weekly effort estimates, similar to Louisiana.

Alabama had explored the use of video cameras with artificial intelligence (AI) capabilities to count vessels returning to port. One camera was installed at Perdido Pass to provide a total count for each day. Perdido Pass was selected because it is the most frequently used and would be the easiest location to implement this system. One challenge is that this system cannot differentiate vessels between fishing and non-fishing activity. The technology is also fallible if video transmission is lost. To verify the video counts, additional interviews similar to the dockside surveys were conducted on the water. However, this method of validation of fishing effort is costly and labor intensive.

2.4 STATE PRESENTATION - MISSISSIPPI

Mississippi has approximately 100,000 licensed saltwater anglers. A license is required for all recreational saltwater fishing activity for those over 16 years of age.

There are approximately 100 public access points comprised of public ramps and piers. However, 25% to 30% of offshore fishing trips were taken from private access points. In order to access the offshore, reef fish species, boats must transit through the passes between the barrier islands, Cat Island, Ship Island, Horn Island, and Petit Bois Island. The majority of this boat traffic goes through the passes on either side of Horn Island, Dog Keys Pass and Horn Island Pass.

For reef fish and other targeted species, the majority of fishing effort is concentrated around the state-deployed fish havens (FH), specifically FH-1, FH-2, and FH-13. As a result of this concentration, the fishery tends to focus on red snapper.

The methods to log the fishing effort have consisted of MRIP, Tails n' Scales, MS Creel, post-season surveys, and the MS Effort survey. Most survey findings showed little effort outside of the red snapper season. Tails n' Scales is the current, mandatory electronic reporting survey. MS Creel is a pilot program in 2024 similar to the LA Creel survey. The MS Effort survey was a pilot program in 2019. The MS Effort survey indicated that the highest response rate of 26.7% came from conducting the survey through phone interviews.

Due to the comparatively lower number of license holders and the fishing effort concentrating in January, February, May, and June, the sample sizes are smaller in the effort estimations. The spread of the comparatively lower fishing effort across 100 public access points can lead to dockside intercept surveys with no data for a daily observation.

2.5 STATE PRESENTATION - LOUISIANA

Louisiana uses the LA Creel Effort Survey to estimate weekly landings. To generate an estimate for fishing effort, the program employs a phone and email survey for licensed anglers. The licenses are divided into five effort regions: North, Southwest, Southeast, Out-of-State, and Recreational Offshore Landing Permit (ROLP). The majority of fishing effort comes from the southeast region.

The survey consists of a random draw of 1,600 licensed private anglers, 300 from each sector except the ROLP component where 400 are selected. In the red snapper season, 800 anglers from the ROLP are surveyed weekly. Lately, the survey has returned that 40% of fishing trips came from private access points. In addition, around 50% of the surveys are completed with the majority of responses to the survey coming through the phone interview portion. This proportion of response methods is influenced by the different requirements for the licenses. The ROLP requires an email address while the standard license does not have this requirement.

There are approximately 137 active access points throughout Louisiana. The easiest access to offshore fishing is through the southeast, particularly Venice, Louisiana. One challenge presented by the geography of the state is the marshes in the southeast. The lack of centralized launch points means dockside intercept surveys in the region are hindered. Without consistent bottleneck areas, the use of existing remote sensing efforts would be impractical. The state is currently contracting a research study to quantify catch rates in private locations, but progress has been slow.

2.6 STATE PRESENTATION - TEXAS

The recreational fishery in Texas is divided into eight bay ecosystems. There are 367 miles of coastline and 3,359 miles of shoreline. The total area managed is four million acres of saltwater in addition to the economic exclusive zone (EEZ). It is also a multi-species fishery. In 2022, it was estimated there were 1.7 million licensed and unlicensed saltwater anglers. There are over 1.4 million anglers with any of the 20 saltwater fishing licenses.

In the survey area, there are approximately 25 ramps heavily used as gulf access points. In order to reach offshore waters, there are five major passes that see more use than several others. The variation of the ecology, bathymetry, and geography across the coastline leads to different angling trends. For example, legal sizes of red snapper can be caught closer to the coast in the south, but similar sizes would require offshore fishing into the EEZ in the north. In addition, the infrastructure in the rural areas can lead to a challenge in monitoring boat ramps that are close geographically but require longer drives on the roads.

Texas employs the Texas Creel Survey which samples from 260 unique ramps, of which 105 are private ramps. Approximately 17,000 trips are surveyed per year. The creel survey collects the trip length and the number of anglers per vessel. This effort estimate is compiled with a rove survey in which trailers and empty boat slips are counted at boat launch areas. In addition, the state generates private effort estimates through self-reporting in the My Texas Hunt Harvest app (MTHH).

Some considerations for novel methods of estimating effort come with their own challenges. In the case of shore-based cameras, there are five major passes with less commonly used areas, but the distance across these passes, like the 1.5 miles between the jetties at Galveston Channel, can be an issue. One concern with the cameras is also vandalism or tampering from the public. In addition, satellite imagery or unmanned aerial surveys would improve accessibility of remote areas, but with four million acres to cover and the EEZ, this could lead to large data sets that would need to be processed. Using the MTHH, it is validated by creel surveys, but the data is reliant on angler response rates. In order to help with integration, the app is rebranding to My Texas Hunt and Fish.

2.7 USING PERMITS FOR SURVEY AND ESTIMATION PURPOSES

By matching the general population to the National Saltwater Angler Registry (NSAR) or another registry that lists addresses of permitted anglers, the efficiency of surveys sampling fishing households increases. Surveys of the general population also attempt to capture fishing effort by unlicensed participants. Adding a mandatory reporting requirement could potentially increase the volume of data collected.

Using permits to better target fishery participants lends itself to probability and census sampling approaches. Probability sampling has a lower reporting burden relative to census approaches, but the cost increases as sampling increases. The census approach can improve precision of the data collected, but it carries a high reporting burden that underestimates total effort unless there is total compliance. The need to measure and account for non-compliance in order to quantify total effort makes the census approach more costly compared to probability sampling. Combining the census approach with probability sampling like dockside surveys helps provide unbiased estimates. The ultimate decision on which approach or combination to pursue would depend on coverage concerns.

One consideration if this method is adopted is that permits do not have total coverage. For example, a federal permit may not include anglers that fish only in state waters. Another consideration is this system would interact with ongoing surveys and add complexity and more data that would need accounting. Additionally, there could be practical or legal constraints to the scope of the permits.

2.8 SMARTPASS – RECREATIONAL FISHERIES MONITORING

Cameras are situated at coastal passes, ports, or boat ramps. The program includes a video review platform to assist human review or AI training. AI can then detect, track, and potentially classify vessels to estimate pass entry and exits. Per examples, the shorter the distance for the camera to track, the better the resolution and accuracy of the software. By pairing this shorter-range camera with another aimed at a longer view, the boat counts crossing the camera can be validated by a human reviewer to determine boat activity. Currently, the system uses human review with AI assistance. To power the system, it uses the available shore power, but it has the capability to expand into solar power. To prevent loss of data when power or connectivity is lost, a backlog is created.

Constant connectivity is helpful for the system, but the costs associated with satellite internet could hinder feasibility. An additional challenge is when the vision of the camera is impeded by fog, nighttime or low-light conditions, or something physically blocking it. To account for the different lighting and weather conditions, three algorithms are switched on depending on the time of day or weather. Another consideration is the potential for fouling of the cameras from the environment. A technician is needed at regular intervals to clean and maintain the equipment. Furthermore, the distance from the camera to a vessel must also be considered. Initial testing showed the best performance of the algorithm at a distance of <1200 feet. Lastly, the cost of implementation and algorithm development increase with the scale and scope of the program.

2.9 EAST FLORIDA INLET MONITORING

A camera and AI assisted program was launched in 2021 in the northeast of Florida, due to the distinct inlets, to reduce the need for human observers for boat counts during red snapper season. Setting up these systems requires some work upfront such as partnering with agencies, locating sites that will allow cameras to be installed, and choosing locations that have reliable electricity and network connection that are easily accessible. The system also needs to be weatherproofed. Water intrusion, corrosion, and salt spray will need to be accounted for in these camera systems, and regular maintenance is needed to keep them clean and functional.

In the 2022 red snapper season, a comparison of human real-time boat counts versus human review of footage with AI assistance found that human real-time observers consistently undercounted with an average error between 4 and 8 percent. Comparing the counts from just the algorithm to the human review of footage, the algorithm undercounted consistently

with an average error between 7 and 10 percent. Thus, human review of boat traffic footage allows for a more accurate report.

Some potential areas where the system could be expanded are in the use of thermal cameras in case of low-light as well as further training of the algorithm. In addition, supplementing the camera observations with human observation at remaining inlets could expand boat counts to a total effort estimate. Furthermore, the boat counts could be adjusted by using the existing dockside intercept surveys to record additional information regarding boating activity and times. Also, the camera system boat counts could be paired with the Automatic Identification System (AIS) for private fishing vessels to estimate a total boat count. One issue with this expansion is the AIS can be spoofed to read as a different type of vessel.

2.10 GAIA - REMOTE SENSING WITH SATELLITE IMAGERY

The Geospatial Artificial Intelligence for Animals (GAIA) focused on detecting whale populations using high resolution satellite imagery. The satellite provides a few images during ideal weather conditions. With advancements in satellite resolution, cloud computing, and machine learning, large volumes of images could be processed and individual species could be distinguished in the images.

The algorithm was trained on high resolution images and would flag points on the image for human review. With this method, processing time for each image was reduced to 10 seconds compared to manual, human review of 3.5 hours per 100 km^2.

Some challenges with the satellite technology include the number of images available as well as the legal considerations. There are two satellites in orbit with this capability, and other agencies with higher priority can alter the queue of requests for images, so an image was available every two to four days. Restrictions on sampling area are also a challenge. The Office of General Counsel needs to be consulted for further applications of the technology to boat counts. Additionally, since the images are provided by multiple agencies, the data could be withheld if there are security concerns.

2.11 OPEN OCEAN PROJECT

The project was led by Global Fishing Watch, a non-profit organization focused on increasing transparency on human activity at sea, in an effort to map all human industrial activity at sea. With AIS data, inferences about vessel type and apparent fishing effort can be made. However, AIS is not able to capture all activity. To capture the full scale of industrial-sized fishing vessels, AIS was coupled with satellite-based detection methods such as synthetic aperture radar (SAR).

Using an algorithm trained on 11 variables, they were able to classify vessels as fishing or non-fishing vessels. With a probability model to account for vessel movement, they matched AIS broadcasts to the satellite-based radar detections to determine vessels that were likely or unlikely to broadcast AIS. This same method is now being applied to detect smaller fishing vessels.

In order to detect smaller vessels, data would rely on optical cameras on other satellites which are blocked by clouds and the weather. There are developments in-progress to account for cloud cover. These other satellites are also more expensive to access compared to the SAR data. Additionally, the satellites pass over an area at a specific time in their orbits, so the timing of images is fixed. Furthermore, AIS data is processed with a 72-hour delay.

3.0 DAY 2 – JUNE 5

3.1 UNMANNED AERIAL SURVEYS

The unmanned aircraft includes a camera, processer, and communications link. The aircraft has approximately eight hours of endurance and can cover 5,000 to 8,000 acres of the Gulf. The aircraft has to be operated during daytime weather conditions. Constant communication and command are required for operation. If there is a loss of communication, the aircraft returns to the launch point.

The system can rely on a single camera, which reduces the range. It can include multiple IR cameras and processors, which have unknown operation performance over open ocean. An acoustic system is preferred, but it carries the risk of multiple false negatives. Radar results in false positive readings.

With operation over people, legal requirements stipulate the vehicle must be light and cannot injure people. Since this application would be counting boats, the Code of Federal Regulations might be more flexible. Operating near the shores, the regulation falls under the Federal Aviation Administration (FAA) purview, potentially requiring coordination with agencies. An additional consideration is that the system is visual or acoustic based, so adverse weather could cut the flight short. Furthermore, the aircraft can safely withstand wind speed gusts of 15 to 25 miles per hour.

In remote areas, the unmanned aircraft could be feasible, but a manned aircraft would be more effective in populated areas due to the less restrictive regulations.

3.2 SAILDRONE

The unmanned sailing vessels (USVs) have been used by the U.S. Coast Guard and U. S. Navy for surveillance and reconnaissance purposes. The USVs can endure survey missions that span months. The USVs are powered by wind and solar energy. The mid-size and largest USVs include diesel electric generators to power propulsion and additional sensors. The mid-size USV, the Voyager, includes a pan-tilt-zoom camera, Radar, and AIS transceiver. The camera has an ideal range of six to seven nautical miles and the Radar has an ideal range of eight to twelve nautical miles. To transmit the collected data, the Voyager is equipped with satellite communications, specifically Starlink and Iridium. Additionally, the USVs can be piloted with GPS programming. Furthermore, the sensors feed into a machine learning algorithm to quickly process data and differentiate the types of maritime vessels.

With the combination of images, GPS mapping, and AIS, images can be matched to AIS categories and marked with GPS. In order to cover a larger area, multiple USVs will be required to sail around. For a Voyager USV with surface detection technology, it would cost between 5,000 and 8,000 dollars per day. Also, the minimum distance the vessels can operate from the shore would need to be verified with regulations and legal teams. In addition, since the USVs are collecting and transmitting data, GSMFC would need further assistance analyzing it.

3.3 CITIZEN SCIENCE GROUP DISCUSSION

Developing an app for anglers to self-report data is likely to be the cheapest option explored. However, potential incentives, such as rewards or benefits, to retain users might be needed to keep engagement high. Recruitment and retention for citizen science are challenges that would need to be addressed. One goal could be to make the public feel like they are doing something good with these self-reporting apps. Another option would be to make the app like a game that keeps engaging users.

Coupling data from citizen science with the information collected from dockside surveys could give a better idea of fishing trends. An app would also capture activity from private launch points. The data requested from the public could be expanded beyond fishing to overall boating, but it must be balanced by what anglers would be willing to provide before

they feel overwhelmed. Coordination of development through social media marketing and interviewing anglers on what would motivate participation could help get anglers to download, use, and keep using the app.

Finally, the data collected would not be a survey method, but it could inform the absolute magnitude of fishing effort. Data from an app would also need validation similar to how TX Creel is being used to validate the My Texas Hunt Fish app.

3.4 PLACER.AI

The service is a location analytics platform that anonymously gathers location data from a suite of cellphone apps that allow users to volunteer their location. Placer.AI is targeting including approximately 8% of all cell phone users through the applications they get location data from. The data spans from January 1, 2017 to three days before the present day. Using a proprietary algorithm, census data, and location data to extrapolate population numbers, Placer.AI can provide numbers of visitors to a location as well as demographic, ethnographic, and psychographic information and trends. The extrapolations are consistent within 93% and 98% accuracy. These estimates can also be applied to private docks and boat launches. Also, visitor behavior can be predicted.

As a consideration, due to the anonymity of the data, the lists of angler addresses cannot be provided to Placer.AI to apply to the data sets. However, the data sets can be downloaded for the agencies to process. Additionally, the data does not include children under 18 years of age. Lastly, Placer.AI would need to investigate capabilities to provide estimates of traffic through passes and other aquatic areas.

Many of the workshop attendees had additional questions after the presentation was concluded and in response GSMFC staff held a second meeting with Placer.AI staff. Their staff confirmed that creating polygons at choke points on the water is possible and they demonstrated a few examples. They did confirm there is no way to monitor directionality of traffic, just presence of a cell phone user within the polygon or point of interest (POI). Low cell phone signal would inhibit their ability to collect data from app users and which is different from gps data. Placer.AI does provide estimates of precision with their expanded estimates and the standard margin of error is 8-10%. They also confirmed that if panel counts within the POI are too low they will not show results. They stated they require roughly 50 panelists within the POI to extrapolate expanded estimates. For the most part Placer.AI does not share the apps they collect data from but did offer that Life360 is one app they are able to receive data from. Placer.AI realizes that people are continuously adding and removing apps from their devices so they are constantly seeking to modify their suite of apps to ensure 8% coverage of the population.

3.5 DISCUSSION

It was agreed that the focus of new research should be on vessel counts with potential expansion of the methods or exploring the new technologies. Dr. Stephen Lynch from MITRE provided some technical insight as to what MITRE's expertise and capabilities are. The group discussed that MITRE could be mobilized as technical advisors but RFP funding would be needed to contract with them. MITRE is a non-profit organization that serves as an advisor to Federal agencies. As of April 2023, the Department of Commerce became a co-sponsor of MITRE's Center for Enterprise Modernization FFRDC and established a 5-year Indefinite Delivery, Indefinite Quantity Contract that provides streamlined access for all DOC's bureaus to MITRE's FFRDC expertise and capabilities.

Interest in Placer.AI was high. The data correlated with accepted trend data agencies had collected themselves. As discussion progressed, Placer.AI came to be seen more as a tool for validation or part of a larger solution. Participants also thought Placer.AI could provide useful metrics for activity at boat ramps that would help us further understand fishing effort activity as it relates to time of year and weather conditions. Due to the regulatory problems, unmanned aerial vehicles were ruled out.

Since the workshop was focused on improvement of existing methods, each state listed their favored technologies. Mississippi favored Placer.AI as well as camera monitoring. Land-based cameras could cover the majority of boat

launches, but the barrier islands would lack the infrastructure to support that system. Louisiana could also implement cameras in some areas, and Saildrone could cover other areas. Camera studies would only be able to count vessels departing or returning and would likely need to be coupled with dockside surveys that would distinguish the percentages of private, charter and commercial vessels for more accurate estimates of recreational effort. Placer.AI would be unreliable in the southern portion of the state. Texas favored the tool of citizen science, but it needs validation and participation. Prior experience with camera systems and the challenge of a large-scale deployment of these systems gave pause. Placer.AI would also need to be layered with the TX Creel Survey to validate it. Alabama could cover three passes with camera systems, but determining which vessels are fishing would need to be supplemented with dockside surveys. Placer.AI seemed to provide data that could supplement estimates. Florida found the satellite imagery could be a universal, passive method that would cover the entire Gulf. It could be layered with other mapping and research to provide additional value.

Potential ways to combine or augment the explored technologies were discussed. Radar could be added to the camera systems as a passive measurement. Models could be developed based on the data collected to predict angler behavior. The use of the satellite images could be a piece of validation for other methods.

As discussion ended for the day, it was suggested that each participant prioritize research goals and be mindful that funding for the projects was not guaranteed to continue indefinitely beyond the IRA funds for this series of workshops.

4.0 DAY 3 – JUNE 6

4.1 DISCUSSION

The main focus of this discussion was on what needed to be asked in the request for proposals (RFPs) and to develop the questions that need answers. The RFPs would also need to focus on goals to allow for new approaches to be suggested. The new approaches would act as comparisons with the existing surveys. Of the technologies presented, camera systems, USVs, satellite imaging, and tracking algorithms like Placer.AI showed the most promise. Texas would continue to develop the MTHH to get more information for the creel surveys and validate estimates.

The discussion around camera studies suggested the highest priority would be focusing on areas with specific inlets where vessel traffic navigates through. This is most evident in Alabama and Mississippi. There are locations along the Florida coast to also explore camera studies but it would likely not be a methodology that could be used to validate statewide recreational fishing effort. The participants agreed camera studies would be focused on vessel counts so having a dockside survey that could partition effort based on the proportions of recreational and commercial fishing vessels along with just non-fishing vessels would be necessary. Camera studies that utilized hardware that helps overcome obstacles such as larger distances for monitoring, bad weather, and collecting video at night should be prioritized. The group also agreed that camera studies that utilize AI-assisted vessel counting as opposed human video review should be prioritized. Since camera studies would rely on hardware mounted on land it was stated that any proposal should seek to work with state management agencies to successfully find and locate approved locations for deploying cameras and other necessary hardware.

Discussions about the potential uses of satellite imagery were focused on the potential benefits of larger-scale Gulf-wide studies but also recognized that the coverage and timing of available imagery along with the costs for acquisition and analysis might make this approach more exploratory at this time. Workshop attendees agreed that there were many unanswered questions regarding coverage and availability of satellite imagery. There was a great deal of interest though in potentially designing research that could integrate vessel counts through satellite imagery with modeling work that would utilize other data such as weather, sea conditions, economic values that might be predictors of fishing activity. If successful research like this could also be beneficial for helping improving the accuracy of released catch data as well.

Since the funding for these projects will end once the IRA funds are exhausted, the technologies were ranked by priority. The camera systems ranked highly because of prior development and they could be implemented quickly in geographical

regions (i.e., AL, MS, portions of LA, the FL panhandle, and FL east coast inlets) that can support them. Due to the size of Florida, it would need a more comprehensive solution using satellite imagery or some other combination of methods that could capture the fishing effort of both coasts entirely in order to validate statewide fishing surveys that allocate effort among the two coasts. This amount of data processing and technology integration would overwhelm the department, so outsourcing this process was preferable. In a future RFP, one company would conduct the camera study, investigating the potential applications of Forward Looking InfraRed (FLIR) and radar, and coordinate with multiple state agencies to see if the technology can be scaled up across the region.

Regarding the satellite imaging, a wider area could be captured and the information lends itself to a predictive modeling approach. The technology is already being applied in similar capacities to current needs and could provide a passive look at the daily fishing effort dynamic on a large scale. Such an approach has the added benefit of providing an improved understanding of the spatial distribution of fishing effort. Gaining a better understanding of the concentrations of fishing effort across nearshore and offshore fish habitats (i.e. artificial reef, natural reef, and unclassified bottom) and how that effort varies across various species-specific fishing seasons also ties in well with the second IRA workshop to identify methods to improve estimates of the magnitude of discards. A feasibility study in Florida for a remote sensing study, potentially utilizing satellite, to see if it has the capability to produce fishing vessel count data that may be used in a model to accurately predict fishing effort could be solicited through the RFP.

The group discussed unmanned aerial and on water drones. Saildrones have the technological capabilities to help provide clarity on the number of vessels operating offshore but the price to deploy these vessels is extremely large and likely prohibitive for the type of research at our disposal. The aerial drones also seemed capable of providing some useful data but the legal challenges for operating them over specific areas of the Gulf of Mexico seemed extremely complicated. Workshop attendees believed this was the least favorable new approach based on the information presented.

There were mixed views on the potential benefit of citizen science self-reporting applications. The tools themselves are easy to develop and are accessible to anyone that owns a mobile device there is concern about not understanding the representativeness of the respondent population using a device. Many spoke of attrition due to respondent burden or lack of understanding regarding how the data are being used. Several proponents suggested that providing an incentive to be engaged in reporting is helpful and that can be accomplished by providing access to other useful information (i.e., weather data) but also by providing summary reports back to the end user that might be coveted as they look back in time at the fishing reports they have submitted. Another potential benefit of this type of research is the relatively low cost to develop in comparison with other novel approaches.

The general consensus was that Placer.AI or other similar technologies could be used to supplement other data sources or as a validation tool. Instead of including location tracking in the RFP process, it would be viewed as a benefit instead of a requirement. Focus would instead be placed on the camera and satellite studies.

The RFP process would need further refining and review panels later. Experts in the chosen research fields could join in a debrief once the projects concluded to see the findings. Results could also be added to a publication or a publicly available compendium. Updates of findings would be circulated with the quarterly MRIP reports.

At the conclusion, public comments were heard. A representative of BlueFin Data felt the solution would be a mixture of technologies requiring an iterative process as the technology was developed. Working with the fishery and technologists would benefit this process. A representative of Ocean Conservancy recommended the RFPs include the reasons why the research is important. They also recommended the process include outreach and communication with the stakeholders. A final assessment at the end that explores surveys and new management, tying back to validated fishing assessments, would be needed. Written comments can be found in Appendix A.

4.1 CONCLUSIONS AND RECOMMENDATIONS

- Video camera studies using AI video review have potential in areas where vessels are forced through smaller land masses that can be monitored. The greatest likelihood of success are in Alabama and Mississippi waters for state-wide monitoring efforts.

- Satellite imagery has the potential for large-scale vessel counting but accessibility and timing of images needs clarity before developing large-scale research projects.

- Cell phone application data analysis companies (i.e. Placer.AI) could be another useful comparison of activity at vessel access points and close to shore choke points and might be helpful for investigating non-sampling errors in traditional probability-based surveys

- The steering committee would begin work on a Request for Proposals (RFP) that would solicit proposals for both key areas of focus (validating recreational effort and improving released catch data [workshop 2 being held July 30-August 1, 2024])

- The RFP will highlight these potential new approaches for collecting and assessing recreational fishing effort but are not limited to these approaches. The steering committee should encourage any research that utilizes any additional approach that helps validate recreational fishing effort.

- The RFP will provide guidance on a clear purpose and need, how proposals should be structured and submitted, how proposal will be evaluated and a timeline for submission.

- The steering committee should work toward having the RFP published as close to October 1, 2024 as possible.

APPENDIX A

WRITTEN COMMENTS

Being honest and based on my many years of involvement in similar workshops, etc over the years, this one appears to me to be very similar to all the others. For whatever reason NMFS seems hell bent on developing tech to find ways to improve the original mrfss/mrip/fes rather than accept the fact that those systems cannot be improved to address the real problem with pri rec data which is the inability to identify those rec anglers who fish in the eez (numbers), then collect real data from those anglers as to what they harvest, discard, and their opinions on discard mortality. All the discussion on sat views for vessels, cell pings for vessels, counting trailers, etc still does not identify a rec fishing vessel vs a rec playing vessel. There is still no way to ID those who fish vs not.

My question is, why is the nmfs so opposed to a very simple required fed or state permit for those wanting to fish in the eez. This is the basic problem, not being able to ID those folks, which is the key to any data collection. If you know how many fishers there, then you can develop a simple web based and/or smart phone system that would be required for those permitted fishers (similar to the vsel app for hire charters used). Such a system used by rec fishers (all have some type of smart phone) would then be able to provide what day they fish, when they dept to go fishing, when they arr back from fishing, (the vessel owner/operator would be required to log such data and submit), how many anglers fished, how much time they fished, what they harvested and discarded, and how far offshore they fished. To many of us this type system is pretty much already available so that all nmfs would need to do is create the app. All would be required to report their activity within a reasonable number of days, those who would be captured in a dockside or phone follow up survey not filing a report would be warned, continued not filing be fined, excessive not filing fishing privileges suspended. You could even add confiscation of vessels for constant abusers. Once the word gets out on the punishments for noncompliance, the rest will comply.

In our view, the vast majority of rec anglers would support such a system and would comply with the requirements. I can't imagine the cost of a system like this would be anywhere near the cost of the tech y'all have discussed. Clearly this is not rocket science as the NMFS continues to try to make it. Even a basic web based system where an angler could log into their own page and file the info asked would be better than the elaborate systems being discussed. My suggestion is get back to basics, work with the tech that is currently available, and keep things simple.

Thanks

Bob

Capt Bob Zales, II
Executive Director
Southeastern Fisheries Association

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end of report