

**NOAA**
FISHERIESOffice of
Sustainable
Fisheries

Bycatch Reduction Engineering Program: Awardee Abstracts

International Seafood Sustainability Foundation - \$140,020

Acoustic discrimination to avoid purse seine catches of undersized Yellowfin tuna.

The project aims to develop acoustic technology to reduce the catch of small, undersized yellowfin tuna. Purse seine fishers use long- and short-range sonars and echo-sounders to evaluate school size and position at sea to assist in making a set. If the acoustic equipment used by fishers had the ability to discriminate the species and sizes of tunas present in a tuna aggregation, fishers could avoid areas and sets where undesirable species and sizes of tunas represent the majority of an aggregation. To properly interpret the acoustic information from the fish it is necessary to know the acoustic properties of the species present at sea. The key objective of the project is obtaining fundamental acoustic information of yellowfin tuna. This information will be combined with information already obtained for bigeye and skipjack tuna to help discrimination between these species and thus enable more selective fishing. The project will share the findings with tuna purse seine fishers and acoustic equipment manufacturers to implement this new knowledge within the algorithms used to estimate fish quantity and composition. The scientific community can use the information to conduct studies on yellowfin tuna using acoustic observations. A workshop to present the results and discuss them with scientists and buoy manufacturers will be organized at the end of the project.



University of Missouri - \$195,000

*Quantifying and reducing post-release mortality of shortfin mako sharks (*Isurus oxyrinchus*) captured as bycatch in the Atlantic coast pelagic long-line fisheries.*

This project will attempt to quantify post-release mortality of mako sharks captured as bycatch in pelagic long-line (PLL) fisheries and identify factors associated with increased post-release mortality. This will be accomplished by working with PLL fishers to attach 50 pop-up satellite archival tags to mako sharks. For each release the project team will record gear soak time, placement of the hook in the shark's mouth, any injuries, condition of the shark upon capture, handling of the shark prior to release, behavior upon release, shark size, and water temperature. Tags will be programmed to detach from sharks and transmit basic data 30 days post-release. Tags will automatically detach and transmit data prior to 30 days if it is determined that the shark has died (based on several days of constant depth readings). Known-fate survival models will be used to calculate post-release mortality. Additionally, data on gear, capture, and handling will be included in known-fate models to identify the effect of these on survival probabilities. Predictions from models could be used to identify capture and handling techniques that maximize post-release survival.

Natural Resources Consultants, Inc. - \$100,874

Testing gear modifications to avoid bycatch in Bering Sea Pacific cod and halibut pot fisheries.

This project intends to reduce king and snow crab bycatch in Pacific cod and halibut pot fisheries by developing and testing pot modifications most effective in not allowing crab to enter pots. Initially, the project team will host an industry gear committee meeting to determine what gear modifications to test. Laboratory experiments will test modified pot designs prior to field testing. Cooperating industry will test the most promising pot designs in active fisheries. Findings will be shared with resource managers, commercial fishers, and pot manufacturers through written documentation (technical reports, magazine articles, etc.), presentations at North Pacific Fishery Management Council meetings, harvest management meetings, and trade association meetings.

Gulf of Maine Research Institute - \$127,329

Improving the selectivity of the ultra-low opening trawl (ULOT) to reduce bycatch of Atlantic cod.

This project will test the ability of a modified ultra-low opening trawl (ULOT) net to avoid Atlantic cod while catching legal-sized flatfish (e.g. yellowtail flounder) in the Northeast multispecies groundfish fishery. The modified trawl will be trialed in two phases on the F/V Lisa Ann III, a fully accountable vessel in the Maximized Retention Electronic Monitoring Program, using on-board cameras and electronic self-reporting for the majority of data-collection. Comparative field trials of the modified trawl to the standard trawl will be performed and the applicant will evaluate change in cod catch, effect on catch of alternative groundfish species, and size selectivity of the modified and standard trawls. The modified trawl net will be trialed during commercial fishing activity by the F/V Lisa Ann III for an entire year and evaluate the efficiency and usability of the net during normal fishing operations. Project partners will evaluate the benefit to fishermen with respect to effective utilization of alternative (non-cod) groundfish species allocations and project outcomes will be presented through word-of-mouth, peer reviewed publications, articles published through industry publications, and/or presentation at workshops.

Maine Department of Marine Resources - \$198,018

Assessing the feasibility of Time Tension Line Cutter use in fixed gear fisheries to reduce entanglement risk for the endangered North Atlantic right whale.

The project will complete the development of the new, low-cost Time Tension Line Cutter prototype and distribute it to the fishing industry for field testing and feedback. The goal is to understand its potential for wide-scale use in fixed-gear fisheries. This project seeks to reduce bycatch of the North Atlantic right whale by redeveloping the low-cost Time Tension Line Cutter with fishing industry input. The line cutter prototype will be field tested with a small sample of volunteer fishermen. Prior to distribution to volunteer fishermen, the line cutter will undergo initial threshold testing, which will provide a baseline for later comparison to data collected in the field and ensure the device can be fished safely. The units will be refined based on input from the initial small-scale pilot testing effort. Additional units will be manufactured for deployment in a large-scale field test in different areas of the coast in both Maine and the offshore Area 3 lobster fleet to maximize the variety of conditions under which these units will be fished. Data collected will include information about sea and weather conditions, area fished, gear configurations, and performance during fishing operations. The units will again be inspected and refined to address concerns and make improvements in cooperation with the fishermen who fished the units and project stakeholders. The suggestions, observations, and test results will be included in a design file of the units and summarized in a final report.

Massachusetts Division of Marine Fisheries - \$176,572

Bycatch reduction of red hake in the Southern New England silver hake trawl fishery.

The project proposes to develop selective trawl gear that reduces bycatch and catch of stocks in recovering statuses. Specifically, reduction of red hake bycatch in the Southern New England whiting fishery by comparing a standard whiting trawl design with and without a large mesh belly panel modification. To validate the effectiveness of the modification, the applicant will compare catches from fishing trials and observe the whiting and red hake behaviors around the trawl mouths and footropes with underwater cameras on a standard and experimental trawl design. Fieldwork will target red hake and whiting on two, six-day trips on the F/V Gabby G. Thirty-two alternate haul pairs will be conducted. Comparative catch analyses will be conducted for important species using recommended software and techniques. If successful, the project team will develop a low-cost modification to standard whiting gear. A more selective catch means fewer discards and discard mortalities of unwanted fish, such as flatfish and red hake. The final report, database, images, video, and additional information collected during this project will be provided to NOAA Fisheries, New England Fishery Management Council, and other interested parties. Any gear designs developed or used during the study will be freely distributed as requested.

Cornell University - \$75,169

Advancing bycatch reduction technology in New England small mesh multispecies fisheries-outreach and technology transfer of the large mesh belly panel.

The goal of the project is to work with the fishing industry to implement an economical bycatch reduction technology to reduce the bycatch of Northeast groundfish catch share species and stocks that are overfished and where overfishing is occurring. This project will coordinate with fishermen, gear suppliers, and fisheries managers to perform a comprehensive program that will improve fishing practices and allow fishermen fuller utilization of quotas (squid and whiting) by offering outreach and financial assistance for use of the large mesh belly panel to reduce bycatch of George's Bank yellowtail flounder and Northern windowpane flounder. The project team will collaborate with commercial fishermen and project partners to apply past experience in providing bycatch reduction technology transfer, namely through a voucher program, and by conducting industry surveys and performing outreach and education. This work plan will complete the final phase of bringing the large mesh belly panel from experimental gear status to full acceptance by fishery managers and industry.

FishNext Research - \$199,679

Reducing bycatch using real-time video and active release in Alaskan pollock and Pacific whiting fisheries.

This project proposes to develop a completely new class of bycatch reduction technology for two of America's highest volume trawl fisheries: Alaska pollock and Pacific whiting (hake) off Oregon and Washington. Bycatch reduction devices for trawls work by allowing selective release of bycatch species while retaining target species during fishing operations. A lack of real-time information on specifically what fish are in the net has limited device development to passive devices that rely solely on fish behavior, size, or shape to separate species and sizes. Recent emergence of practical systems to transmit real-time video from trawl nets to the vessel during routine fishing (e.g., Simrad FX80) has opened the possibility of active selection, (i.e., devices that respond to the presence or absence of bycatch species). The potential for such a device depends on developing two capabilities: 1) the ability to effectively detect bycatch species from the available video, and 2) the ability to shift trawl configurations or other stimuli to achieve selective bycatch escape. Such a tool could greatly improve bycatch avoidance for a range of fisheries. Successful completion of the project will remove the remaining barriers to using existing real-time video capabilities to avoid bycatch through active catch selection and selective release. This will help the pollock and hake catch share fisheries in harvesting their allotted quotas without exceeding bycatch limits. Development and demonstration in these fisheries can then be applied to other trawl fisheries.

Sea Mammal Education Learning Technology Society - \$225,000

Developing and testing innovative ropeless lobster fishing gear to reduce bycatch of North Atlantic right whales.

This project will continue development and testing to prove reliability of lineless or ropeless acoustic trigger modem lift bag crab/lobster gear fishing systems, test system deployment and recovery in representative marine fishing environments, and examine the economics of Sea Mammal Education Learning Technology Society innovative ropeless gear. Fishermen will conduct the trials. This project will support commercial fishermen in the New England lobster fishery during the upcoming fishing season on the use of this technology with boat-based support and collaboration. At the completion of the project, the project team will educate and present findings to collaborators, partners, fishermen, and local communities.

Pacific States Marine Fisheries Commission - \$165,000

Development and testing of a rockfish bycatch reduction device for the Pacific hake fishery: A collaborative study between fishing industry and gear researchers.

This study will start by conducting a collaborative workshop to discuss and identify gear modifications that can enhance the performance of an existing bycatch reduction device design that fishers and gear researchers believe can reduce rockfish bycatch. Next, sea trials will measure the gears' selectivity performance. Fish retention and escapement rates will be quantified using a recapture net. Mean size selection curves will be modelled to estimate length escapement probabilities for rockfish and Pacific hake. Gear trials will be held over 12 charter days aboard a Pacific hake vessel. Developing techniques that can reduce the constraints that rockfish bycatch can cause in the Pacific hake fishery would have significant positive impacts to fishers, coastal communities, and the resource. Following the completion of the project, a report will be provided to the Pacific Fishery Management Council, fishing industry members and representatives, and the scientific community.

Hawaiian Fresh Seafood - \$98,392

Improving post-hooking survival of marine turtles and sharks: designing and testing a cost effective line-cutter prototype for use in the Hawaii longline fishery.

The project will build upon previous NOAA Fisheries work and a pilot to design, manufacture, and test a remote line cutting device capable of releasing incidentally caught sea turtles and sharks in the Hawaii longline fishery while still in the water and with minimal to no trailing gear. A protocol for using the device will be developed during initial testing and training modules will be conducted with the captains and crew of Hawaii permitted longline vessels. The results of the design, manufacturing, and testing will be the subject of a short documentary that will be used to disseminate the information to the rest of the Hawaii longline fleet, to NOAA Fisheries scientists and managers, as well as the general public. The direct impact of this project will be to reduce the impact of longline fishing on sea turtle and shark species of concern, to test, promote and teach more responsible fishing practices, and to contribute to the current understanding of post release mortality of turtle and shark bycatch in the Hawaii longline fishery.

Coastal Monitoring Associates - \$119,746

Low-cost timed release for rope-less traps in the U.S. West Coast dungeness crab and spiny lobster fisheries where humpback, grey, and blue whale entanglement is a threat.

The project will develop and demonstrate proof-of-concept for a rope-less fishing system. The focus will be on development of a low-cost underwater release system, while also evaluating the potential to integrate a real-time satellite-based geolocation capability. If successful, the system, termed the Timed Release for Rope-less Traps, will provide a cost effective ability to deploy, mark, identify and recover fishing traps while minimizing entanglement exposure to whales. The project team's emphasis will be on working directly with the fishing and regulatory communities to find the right balance of risk reduction, reliability and cost-effectiveness.

New England Aquarium - \$125,000

Whale release ropes as a large whale bycatch mitigation option in the lobster fishery.

The project will: a) further evaluate whale release ropes of 1,700 pound-force and provide information to the fishing industry of the best approaches for using the ropes in waters deeper than 300 feet; and b) further our understanding of possible entanglement scenarios by modeling different gear configurations and integrating the use of the 1,700 pound-force rope option. To carry out the first objective, the project team will use a modified version of OrcaFlex software (used by the oil and gas industry) to estimate tensions exhibited on endlines when hauling in waters deeper than 300 feet. The team will integrate gear modifications (including a groundline extension, anchors, and tapered rope strengths) to examine approaches for reducing tension that would make the gear modification more practical for fishermen. This will be achieved through combining modeling with OrcaFlex and at-sea testing with offshore lobster fishermen. For the second objective, the team will use the Virtual Whale Entanglement Simulator to assess whether there are any differences in outcomes to a whale during an entanglement due to whale release rope gear modification method or changes in gear configuration. When this project is complete, guidelines will be provided to the fishing industry on best practices that will enable them to use 1,700 pound-force ropes or sleeves in their fishery without increasing the risk of gear loss while hauling their gear.

Eric Gilman LLC - \$98,900

Demonstration of practicality and safety of alternative branchline weighting designs that reduce seabird catch risk in the Hawaii pelagic longline deep-set fishery.

The project will identify a branchline weighting design that places weights closer to hooks and increases the baited hook sink rate that is practical and safe for use in the Hawaii deep-set longline fishery in order to reduce seabird catch risk. The project team will meet with Hawaii longline captains and crew to brainstorm alternative, innovative, branchline designs that place weight at or closer to the hook than the predominant conventionally employed design used in this fishery, that are practical to construct, and that are likely to be practical and safe to employ. Based on the outcomes of the scoping activity, the team will select the two most promising candidate branchline weighting designs and conduct a preliminary assessment to determine their practicality of storage by setting and coiling branchlines into bins. A Hawaii-based longline vessel will be chartered to use one or both of the modified branchline weighting designs during one fishing trip. The project team will disseminate findings to relevant stakeholders locally and globally.

University of Mississippi - \$125,250

Shark bycatch reduction in tuna/swordfish fisheries: the potential for using ultra-high molecular weight polyethylene leaders to encourage shark "bite-offs" in the Gulf of Mexico.

The project aims to determine the potential for replacing monofilament fishing leaders with ultra-high molecular weight polyethylene leaders in the tuna/swordfish fishery (and perhaps other fisheries). The project team will investigate optimum leader construction using the leaders. Once determined, the team will assess the potential for tuna to accept these leaders in fishery-independent testing offshore of Venice, Louisiana. In addition, research vessel longlining in nearshore waters will be used where there are healthy shark populations to determine the potential of the leaders to result in shark "bite-offs". Finally, the new leaders will be tested aboard commercial tuna/swordfish vessels in the Gulf of Mexico. This project could provide a simple, inexpensive means for reducing shark bycatch. Changing leader material may result in continued target species capture, significantly less mortality of bycaptured sharks and, in time, an increase in shark populations. The new leader technology will be available to fishers and requires only changing leader material.

Wild Fish Conservancy - \$171,050

Evaluation of an experimental commercial pound net for stock-selective harvest and ecological monitoring of endangered Chinook salmon in the lower Columbia River, Oregon.

The project proposes further testing of pound net traps for selective harvest and ecological monitoring in lower Columbia salmon fisheries. Specifically, objectives are to 1) construct and monitor the performance of a substantially modified pound net trap in a currently untested location within the lower Columbia River, Oregon; and 2) determine the effectiveness of the trap in targeting hatchery-reared Chinook and coho salmon stocks while reducing protected species bycatch mortality. A second experimental pound net will be constructed in a new location of the lower Columbia River and evaluated through a test fishing period in which catch composition, bycatch, immediate survival, and post-release survival of endangered salmon are monitored. If the gear proves effective in capturing hatchery-origin Chinook and coho salmon with improved survival of salmon bycatch relative to previously tested gears, a viable selective gear may be implemented throughout the lower Columbia Basin and beyond, benefiting wild salmon recovery, Southern Resident killer whales, and coastal fisheries in both Washington and Oregon. No in-water work will be conducted unless and until the Endangered Species Act Section 7 consultation, as appropriate, has been completed.