

Project Title: Fishing Technology and Conservation Engineering to Reduce Bycatch

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Overview: The Conservation Engineering project of the AFSC conducts an ongoing program of cooperative research with Alaska fishing groups to improve fishing gear and methods to achieve bycatch reduction, measure mortalities from all kinds of bycatch and address the effects of fishing gear on seafloor habitats. The program combines its scientific techniques and direct observation tools with the gear and fishing expertise of industry partners to design and test solutions to these issues. Funding is needed for fishing vessel costs, freight, travel, field personnel costs and supplies necessary to pursue these opportunities. Partner organizations include the North Pacific Fisheries Research Foundation, The Groundfish Forum, Alaska Pacific University, Alaska Seafood Cooperative, Dantrawl, NET Systems, and United Catcher Boats. Other projects may be pursued with individual fishermen or gear designers. This project contributes to NOAA Fishery Research Goal 2, Objective 2.1, 2.4, and 2.6 and Goal 5, Objectives 5.1 and 5.2, and the AFSC 2015 Annual Guidance Memo priority #8 – bycatch reduction.

Research Description: Conservation Engineering scientists of the AFSC perform research in cooperation with industry partners to improve fishing gear and methods for bycatch reduction. These studies follow a cycle of: a) meetings and informal discussions with industry experts on how to use fish behavior and gear performance information to reduce bycatch, b) observations of relevant fish behavior in the field, c) design and physical testing of net modifications, d) field tests of prototypes, including bycatch performance and relevant fish behavior, e) design and field test new and improved trawl cameras and instrumentation and f) analysis of data and presentation of results and their application back to the next cycle.

Each of these activities address issues that put substantial limitations on subject fisheries, having been identified by fishermen as areas where the proposed technologies could make significant improvements. Government participation requires funding for fishing vessel costs, travel, shipping, supplies and overtime at sea to conduct trials. Limited AFSC funds will require Conservation Engineering scientists to exploit a mix of funding sources, including national programs for Cooperative Research (NCRP), Bycatch Reduction Engineering (BREP) and Reducing Effects of Fishing. Each year's projects are scalable and pursued to the extent that funding is provided by those programs. Because availability of BREP funding to federal researchers has been shifted to a grant program for non-federal researchers, *CE will have to rely more heavily on Cooperative Research funding.*

Below is a prioritized list in order of importance and level of funding required for Cooperative research projects within the CE group:

Develop alternative trawl designs to effectively capture pollock concentrated against the seafloor while reducing bycatch and damage to benthic fauna: Current regulations require the Alaska pollock fishery to use pelagic trawls for all pollock fishing. During some periods of the pollock fishery, pollock concentrate against the seafloor and,

to capture them, fishermen put pelagic trawls, designed for midwater capture, onto the seafloor. Concerns over the potential negative habitat and bycatch effects of this practice have been raised during Council consideration of Essential Fish Habitat and Bering Sea Canyons issues. Experience from trawling before the current regulations requiring pelagic trawls were put into place indicated that smaller opening nets may have less salmon bycatch and require substantially less fuel to deploy, while still effectively catching pollock. Also, recent tests with footropes raised slightly off the seafloor indicate the potential to reduce effects on seafloor habitats relative to the continuous, heavy footropes (generally chains) required on pelagic trawls. Research in 2012 showed that pollock could be effectively captured with a conventional bottom trawl equipped with such a raised footrope. In 2013, we made observations of pollock reactions to sweeps, which will be used to optimize gear configurations ahead of the trawls. In 2014, we assessed the seafloor effects of a raised-footrope pollock trawl in Bering Sea habitats where pollock are commonly fished. CE cooperative research remaining for 2015 and beyond includes work with industry to adapt the prototype footropes tested in 2014 for regular commercial use and full scale tests of the resulting designs to confirm commercial effectiveness. We will work with industry partners to develop an experimental design and gain approval for an exempted fishing permit for a study late in 2015.

Develop devices to reduce halibut bycatch in pollock trawls:

Capture of near-seafloor pollock also raises concerns over increased halibut bycatch. Halibut populations in the North Pacific are being watched closely due to shrinking size at age. Additionally, last year the IPHC cut the TAC by 11% overall. While a raised footrope should prevent some halibut capture, more complete exclusion is necessary and will be pursued by developing a halibut excluder for the pollock fisheries, using designs like those CE has cooperatively developed for flatfish and cod fisheries. A similar device has been recently tested for reducing rockfish bycatch in Pacific Coast hake fisheries and new devices are being developed for Bering Sea use. We have tentatively arranged for a factory trawler to use this excluder during the 2015 pollock A season, when halibut bycatch is problematic, and to allow one of our scientists to attach cameras and sonars to monitor the net configuration, and record fish behavior and escaping fish. **This opportunity will require \$5 – 8K of funding for travel and field salary for that scientist during the second quarter.**

Develop crab pot modifications to reduce bycatch: bycatch issues in the directed crab fishery are due to multiple species occurring in the same fishing areas, (i.e. blue king crab overlaps with both red king crab and Tanner crab around the Pribilof Islands, snow and Tanner crab also occur in the same areas as well). The Alaska Bering Sea Crabbers are very interested in starting to look at these bycatch issues. The AFSC CE project has devised a multi-staged project starting in 2015 with developing cameras and instrumentation to be used on the crab pots to begin to look at the behavior of the different species in and around the crab pots. These devices may include time lapse video system and pot entrance logging. Once we understand the crab behavior we can then begin work with crab pot manufactures and crab fisherman on how design alternative pots to reduce bycatch.

Develop devices to reduce salmon bycatch in pollock fisheries: Salmon bycatch is a critical issue facing one of the largest and most valuable fisheries of the United States, the Alaska pollock fishery. There is a strict cap on the number of salmon that can be taken in the pollock fishery and boats actively avoid fishing in areas where salmon by catch is a problem. Several tools are being applied to reduce salmon bycatch, including allocation of bycatch at the vessel level by coops, near-real-time monitoring of bycatch rates, leading to targeted closures and the development of salmon excluders, devices that allow salmon to escape from trawl nets while pollock are retained. Since 2001, the AFSC Conservation Engineering project has collaborated on the development of salmon excluders with United Catcher Boats and the North Pacific Fisheries Research Foundation, with support from several other fishing companies, trawl manufacturers and related organizations. A new design, tested in late 2012 improved chum salmon escape. These tests used new camera systems, developed at AFSC, to evaluate escapes. Fieldwork for a project to transition salmon excluder technology to the Gulf of Alaska pollock fleet, in cooperation with the Alaska Groundfish DataBank was conducted in 2013 and 2014. A new EFP is coming this year. Both the excluders and testing techniques required significant adaptation for the Gulf of Alaska due to the smaller, lower-powered vessels operating in that fishery. AFSC CE plays a largely supporting role in these projects, assisting with monitoring equipment and analysis.

Develop devices to reduce salmon bycatch in Gulf of Alaska bottom trawl fisheries: The Council recently established tight limits on salmon bycatch in the bottom trawl fisheries of the Gulf of Alaska. This has generated significant interest in development and testing of salmon excluder designs for these trawls. While the basic principles of the excluders for the pollock fishery may apply, this development project will need to account for the much smaller size of those nets and less well-known behavior of the target species for those fisheries. In 2014, CE established a contract with Alaska Groundfish DataBank (AGDB) to obtain video of relevant fish behavior in commercial trawls. Also, some excluder concepts were tested in model scale at the Newfoundland flume tank. In 2015, we will continue to support that effort, hopefully being able to move to designing and installing prototype excluders into commercial nets and observing fish reactions to the modified gear.

Develop and demonstrate a device to monitor midwater operation of trawls in commercial fisheries.

There are cases where management may want to prevent bottom contact in certain areas. For example, in discussions about the Bering Sea canyons, some areas with coral could be identified for protection beyond that provided under current pelagic trawl and performance regulations. Such closures would likely be particularly restrictive for the Bering Sea rockfish fishery, primarily targeting Pacific Ocean perch (POP). Coral protection could be achieved if fishing could be limited to gear that never touches the seafloor. However, there is currently no practical way to monitor compliance with such a restriction. We propose to develop, build, and test a device to reliably and consistently monitor the clearance between a trawl and the seafloor to provide a prototype instrument to industry. Such a device would need to operate for more than a month while semi

permanently attached to the trawl. It would need to be simple to recover the data and must reliably record the clearance between the lowest point of the fishing gear and the seafloor. We have identified a self-logging acoustic altimeter that holds promise for this and have been working with the Alaska Seafood Cooperative (ASC) to have a vessel deploy the prototype. FishNext Research has obtained funding from the NMFS Bycatch Reduction Engineering Program to work with CE and ASC to conduct tests of this device and footrope mounted cameras to examine seafloor interactions in Fall 2014 and Summer 2015. We will also initiate planning for follow-on research to test whether catches from off-bottom fishing differ substantially from bottom trawling especially for bycatch of low quota species, such as shortraker and rougheye/black spot rockfishes.

Continued design and development of trawl camera and instrumentation systems:

most bycatch studies have required the use of trawl mounted camera and sonar imaging systems to assess modifications of the gear and the reaction of marine species to that gear. The AFSC CE project has been an international leader in the development of compact and rugged systems specifically suited for bycatch studies and observations of fishing gear during commercial operations. This year work continues on improving the use of compact extreme low light analog video systems and the development of systems using higher resolution digital cameras. The AFSC digital stereo cameras will be implemented and evaluated for bycatch studies and an effort is underway to reduce the size, cost and complexity of future stereo systems. With the availability of new smaller and cheaper embedded PCs the AFSC recording sonar imaging systems (Didson and imagenix) will be upgraded to improve operational efficiency during field studies.

Summary: While there are a number of projects cited here, many of them will be led by industry collaborators with CE personnel providing different kinds of limited support. A short research cruise is planned to conduct gear trials and behavior observations where needed to move concepts forward in ways that would not be feasible on vessels during commercial fishing. This plan envisions a lower activity level relative to previous years by a reduced CE staff due to temporary staff transitions in the group and represents the level needed to keep CE as a participant in these ongoing projects. This funding request is affected by the lack of significant funding from other external grants, which have supplemented our cooperative efforts in recent years.

Note on timing of funding:

For several years now, funding from proposals to the NCRP program has arrived too late in the year to fully fund field research efforts, particularly vessel time, in the fiscal year in which it is received. If a large contract needs to be established, procurement requirements have allowed work in the last month of the fiscal year at best, which introduces additional administrative problems for travel, salary and shipping expenses. The CE project has successfully dealt with this issue by a combination of establishing multi-year charters and funding some vessel time each year for the following year. One such contract ended in 2014 and funding was established in a grant with the Pacific States Marine Fisheries Commission for 10 days of vessel time in 2015 from its 2014 allocation. We are requesting similar funding for our 2015 field work in order to follow up on the listed

projects for continuation of work in 2016. Lack of such funding will severely constrain or prevent field research by this on-going project in 2016.

Also, as mentioned above, some research opportunities occur in seasons that do not fit the recent timing of allocation of AFSC's NCRP funding. The opportunity for halibut excluder tests require a very small amount of funding in January or February during the pollock A season. For that, we have access to two weeks of work on a pollock factory processor and a significant advancement toward developing a useful excluder. A similar opportunity was cancelled last year by the delay in obtaining NCRP funding, delaying this development by at least a year. Unfortunately, travel and salary requires current fiscal year funding. We hope that arrangements can be made to make this small amount available in time to access this opportunity.

Performance Indicators:

1. Completion of research aboard a chartered research vessel in the May - September period.
2. Participation in collaborative fishery tests of fishing gear improvements, including salmon bycatch reduction methods.
3. Use of excluders and gear modifications in the fisheries.

Deliverables:

1. Conduct presentations and discussions with Alaska trawl captains and net manufacturers to explain results of 2014 research and solicit participation in planning of 2015 studies.
2. A report of 2015 cooperative research activities and results will be provided to industry and management by December 2015.
3. Reports of the results of individual projects will be prepared and distributed to collaborating groups.
4. New smaller compact underwater camera system and recording sonar imaging systems (Didson and imagenix) will be upgraded to improve operational efficiency during field studies.

V. Budget:

Vessel charter	85 K
Fuel for charter	40 K
Overtime salary for fieldwork	12 K
Travel	12 K
Contracts	10 K
Freight	15 K
Supplies	<u>17 K</u>
Total funds requested	191 K

Partial funding over a minimum \$100K could be used to fund only some of these projects. This level of funding is for a 10 day charter given CE has no other sources of external money for 2015.