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.

**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, and e) analysis 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 salaries. Limited AFSC funds require Conservation Engineering scientists to exploit a mix of funding sources, including national programs for Cooperative Research, Reducing Effects of Fishing, and regional programs such as the North Pacific Research Board. Each year’s projects are scalable and pursued to the extent that funding is provided by those programs.

**2014 Research**

Cooperative research for conservation engineering included a combination of projects continued from previous years and a project initiated with this year’s funding. Ongoing projects include: Devices to reduce salmon bycatch in pollock fisheries, alternative trawl and footrope designs to effectively capture pollock concentrated against the seafloor while reducing bycatch and damage to benthic fauna, developing devices to reduce salmon bycatch in Gulf of Alaska bottom trawl fisheries, and developing devices to reduce halibut bycatch in pollock fisheries. A new project was started to develop and demonstrate a device to monitor midwater operation of trawls in commercial fisheries.

**Develop alternative trawl designs to effectively capture pollock concentrated against the seafloor while reducing bycatch and damage to benthic fauna:** Research in 2012
and 2013 demonstrated the feasibility of modified footropes to radically reduce the contact footprint of pollock trawls when used on the seafloor. It also prepared for our 2014 tests of whether such alternative pollock groundgears actually reduce seafloor contact and damage to structure-forming organisms by 1) test deployments of camera and sonar arrays to assess the condition of seafloor and benthos, and 2) identification of an experimental site with appropriate seafloor fauna. In 2014, an 18 day cruise aboard a chartered pollock trawler, funded by a combination of this NCRP project and NPRB project 1319, performed an experiment to determine the seafloor effects of a range of alternative pollock trawl footropes. Seven different groundgear arrangements were each towed twice, forming a pattern of 14 parallel tow tracks. Our camera/sonar array was then towed perpendicularly across this pattern 10 times. The DIDSON sonar imagery showed the tracks of the trawls, allowing determination of which seafloor areas were affected by which groundgears and video imagery from two cameras will allow the condition of the seafloor and associated organisms to be assessed. Handling of the alternative pollock trawl footropes indicated that these could be successfully handled on a commercial fishing vessel, a key concern of some industry partners. Analysis of the imagery is being conducted by our collaborators at Alaska Pacific University. Industry partners for this research are United Catcher Boats and the At-Sea Processors Association.

**Develop devices to reduce salmon bycatch in pollock fisheries:** Development of salmon excluders for pollock fisheries has continued, primarily through testing of new devices under exempted fishing permits, managed by our industry collaborators, under the North Pacific Fisheries Research Foundation. AFSC participation in tests has primarily been through developing, providing and supporting new camera systems for monitoring escape rates of pollock and salmon and aiding in analysis and presentation of results. We also participated in developing a new EFP for this research and vessel selection for subsequent field work.

**Develop devices to reduce halibut bycatch in pollock trawls:** Part of better managing the capture of near-seafloor pollock is reducing halibut bycatch. This bycatch is greatest during the pollock A season (January – March). While a vessel offered no-cost testing of such a device in the winter seasons of 2013 and 2014, cooperative research funding was not available in time to take advantage of these opportunities. Components of a prototype excluder have been procured and arrangements could again be made for such work. However, if that opportunity is again available, a small amount (<$10,000) of 2015 funding will still need to identified by the end of the first quarter to support travel and field salary for scientist participation.

**Develop devices to reduce salmon bycatch in Gulf of Alaska bottom trawl fisheries:** Because of increased management scrutiny and regulation of salmon bycatch by Gulf of Alaska bottom trawlers, we initiated an effort with that group to begin development and testing of salmon excluders for those fisheries. Contracted ride-along trips provided video of fish behavior in GOA bottom trawls, a necessary first step for excluder development. Arrangements for further work have been continued with 2014 funds. Our principal collaborator on this project is the Alaska Groundfish DataBank, an organization representing the Kodiak trawl fleet.
Develop and demonstrate a device to monitor midwater operation of trawls in commercial fisheries.

There are cases where management may want to prevent on-bottom trawling 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, which has been effective for catching POP in some areas. However, there is currently no practical way to monitor compliance with such a restriction. Bering Sea trawlers targeting non-pollock species came to the CE program in late 2013 with the need to develop such a monitoring technology. A suitable device was procured with 2013 funding, a prototype mounting designed, and a vessel identified to use this package during the Bering Sea POP fishery, which occurs in November. CE personnel were not able to participate in this field test, due to delay of 2014 funds for travel and field salary, so the device was installed by vessel personnel. Unfortunately, an erroneous setup of this new instrument went undetected until the device was returned after the season. (This would have been quickly identified if CE personnel were aboard). Therefore, success of this project was limited to proving the durability of the instrument and effectiveness of the mounting at protecting it during commercial operations.

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 vessel time for the year following when it was received. A substantial portion of our 2014 funding was spent on establishing approximately 10 days of vessel time for work in 2015. However, this year’s charter funding, primarily used for the near-seafloor pollock work, was partially done with 2013 funds.

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. For that, we had access to two weeks of work on a pollock factory processor and a significant advancement toward developing a useful excluder. A similar opportunity had been cancelled in 2013 by the delay in obtaining NCRP funding and this was repeated in 2014. Unfortunately, travel and salary require current fiscal year funding. We hope that future arrangements can be made to make this small amount available in time to access this opportunity. Likewise, the seafloor clearance work relates to the eastern Bering Sea Pacific Ocean perch fishery, which occurs in November, precluding field participation of
federal personnel. This year’s failure of this research component might have been avoided with such direct participation.