Project Title: Fishing Technology and Conservation Engineering to Reduce Bycatch
Contact: Dr. Craig S. Rose

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 and has 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 will require Conservation Engineering scientists to exploit a mix of funding sources, including national programs for Cooperative Research, Bycatch Reduction Engineering 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.

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 tows targeting that species. During some periods of the pollock fishery, these fish concentrate against the seafloor and, to capture them, fishermen put these nets, designed for midwater capture, onto the seafloor. Before the current regulations requiring pelagic trawls were put into place, experience indicates that smaller opening nets may have less salmon bycatch and require substantially less fuel to deploy. 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. We also made observations of pollock reactions to sweeps, which will be used to optimize gear configurations ahead of the trawls. Continued development requires research to address issues of halibut bycatch and effects on seafloor habitat. While the raised footrope does prevent some halibut capture, more complete exclusion will be pursued by developing a halibut excluder for pollock fisheries, using designs like those CE has cooperatively developed for flatfish and cod fisheries. We will also assess the seafloor effects of a raised-footrope pollock trawl in Bering Sea habitats where pollock are commonly fished. These experiments will use methods similar to those used in our development of improved sweeps for flatfish trawlers. Finally, full scale tests of the resulting designs will be needed to confirm commercial effectiveness. As these will require capture of commercial quantities of fish, some charter costs will be recovered through sale of the catch.

Further improve 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. 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. Tests of a new design to reduce chum salmon bycatch have just been completed and analysis of these results will indicate its effectiveness and what further improvements will be needed. These tests used new camera systems, developed at AFSC, to evaluate escapes. Also, a permit necessary to begin work to transition salmon excluder technology to the Gulf of Alaska, was only recently arranged, delaying that project into 2013.

Goals for 2013 continue to include improving exclusion rates for chum salmon (now around 10-15%) and transitioning excluder devices into Gulf of Alaska pollock fisheries where more stringent limitations on salmon bycatch have recently been enacted. Both the excluders and testing techniques will require significant adaptation for the Gulf of Alaska due to the smaller, lower-powered vessels operating in that fishery. A workshop is planned at the fishing gear testing facility in St. Johns Newfoundland, where industry experts will test and fine-tune a range of trawl designs to provide alternative escape opportunities expected to improve salmon escapement. These designs will be field tested during pollock fisheries. AFSC scientists will participate in these tests, including extended use of video for evaluating escapes.

Survival of pollock escaping through trawl meshes: Alaska pollock fisheries depend on a pollock population consisting of many year classes. Pollock of commercial size are often mixed with smaller individuals, which trawl mesh sizes are designed to selectively release. However, the proportion of those surviving is unknown, even though it could have important effects on projections of stock status in the following years. One study of

pollock escape survival was completed in Kodiak in 1998. However, it was so resource-intensive to retain and hold such fish that mortality estimates ranged from 32 to 64% due to sample size limitations. New technologies and methods are now available to improve such a study, such as more advanced observation and triggering tools and the Reflex Action Mortality Predictor (RAMP) method for predicting delayed mortalities. Initial steps would be to conduct pilot tests of recapture methods, observation of escaping fish and holding methods. We propose to initiate such work in 2013, providing a foundation for proposals for a full-scale experiment.

Provide underwater video systems to fishermen and other researchers to facilitate development of fishing gear improvements: We propose continuing to provide underwater video systems for use by the fishing industry, allowing them to directly evaluate their own modifications to fishing gear. Beyond their direct use, exposure to NMFS systems has motivated many companies to procure similar systems for dedicated use on their vessels. Either way, the goal of better understanding of fishing gear operation and quicker development of improvements is being realized. Delivery, training and maintenance have been managed by contractors in the ports of Dutch Harbor and Kodiak with established contacts with the fishing industry. New systems, successfully tested in late 2012, are smaller, much less expensive, and easier to use. These will be deployed into the loaner pool in 2013.

Performance Indicators:

1. Completion of research aboard a chartered research vessel in the May - August 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 a workshop with Alaska trawl captains and net manufacturers to explain results of 2012 research and solicit participation in planning of 2013 studies.
2. A report of cooperative research activities and results will be provided to industry and management by December 2013.
3. Reports of the results of individual projects will be prepared and distributed to collaborating groups.

V. Budget:

Vessel charter	70 K
Fuel for charter	36 K
Additional salary for fieldwork	20 K
Travel	16 K
Freight	12 K
Supplies	28 K
Total funds requested	182 K

Partial funding over a minimum $100K could be used to fund only some of these projects.