Program Title:

Gear Trials Program

Third Component of the CFRF Challenge Grant Program for Conservation Engineering Projects – Winter Flounder Bycatch Reduction

Funded through NOAA Award NA09NMF4720414

Final Program Summary Report

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Executive Summary:

The CFRF Gear Trials Program comprised the third phase of the CFRF Challenge Grant Program for Conservation Engineering Projects – Winter Flounder Bycatch Reduction funded under NOAA Award NA09NMF4720414. The Gear Trials Program component focused on assisting industry with utilizing and testing further two gear types, the large mesh belly panel and the 12” drop chain sweep that had been proven effective in reducing winter flounder bycatch in the small mesh squid fishery in the southern New England winter flounder stock area. The CFRF Gear Trials Program consisted of: 1) a voucher portion to provide financial assistance in purchasing one or both of these new gear types by active fishermen in the small mesh fisheries in the southern New England winter flounder stock area, and 2) an added research component to further test the effectiveness of these gear types in another small mesh fishery, the whiting fishery. Under the voucher program, 63 fishing vessel owners based in the states of RI, MA, CT, and NY applied to receive either one or both vouchers for their fishing vessels. From these applications, 119 vouchers were issued [35 for the small 12” drop chain sweep; 24 for the large 12” drop chain sweep; and 60 for the large mesh belly panel]. Of the 119 vouchers issued, 109 were used by the end of the program. Fishermen feedback regarding the performance of the gear was exceedingly positive with some 85% of respondents saying they would continue to use the gear. Through the added research component, 36 paired tows conducted over 6 days at sea using two commercial fishing vessels were completed to test the two gear types in the whiting small mesh fishery. Results from this proof of concept level work indicated whiting catch was retained in both the experimental nets and control net. When all tows were combined, winter flounder escapement of 25% in the drop chain and 44% in the large mesh belly panel net was observed. When all flounders (including winter flounder) were pooled, there was a significant difference in the catch between the control net and net with the 12” drop chain sweep that yielded a 66.1% reduction in total flounders. The large mesh belly panel significantly reduced the catch of all combined flounders by 61.7%.

Description of Program:

In 2012, the Commercial Fisheries Research Foundation (CFRF) commenced the Gear Trials Program – Reduction of Winter Flounder Bycatch (Gear Trials Program), the third phase of its overall Challenge Grant Program for Conservation Engineering Projects – Winter Flounder Bycatch Reduction (Challenge Grant Program) funded under NOAA Award NA09NMF4720414. The Gear Trials Program focused on assisting industry with utilizing and testing further two gear types, the large mesh belly panel and the 12” drop chain sweep that had been proven effective in reducing winter flounder bycatch in the small mesh squid fishery in the southern New England winter flounder stock area. As stated in the original proposal submitted for NOAA Award NA09NMF4720414, this third component of the Challenge Grant Program was designed to focus on providing direct financial assistance to fishermen seeking to utilize and test for
themselves proven conservation gear technologies to reduce winter flounder bycatch. In the overall plan for the Challenge Grant Program, some funding was set aside for an implementation phase in the fishing fleet after new gear technologies had been proven through both proof of concept and full proposal testing phases of research. The ultimate expected outcome would be the reduction of winter flounder bycatch in small mesh fisheries resulting from the utilization of new conservation gear technologies by industry members.

The Gear Trials Program was actually structured into two components: 1) a voucher program to provide financial assistance in purchasing one or both of these new gear types by active fishermen in the small mesh fisheries in the southern New England winter flounder stock area; and 2) an added research component to further test the effectiveness of these gear types in another small mesh fishery, the whiting fishery. Through the voucher component, fishing vessel owners could apply for and, if approved, receive vouchers covering the complete costs for purchasing one or both gear types. Once installed on their fishing vessels, participating captains/crew members were asked to report back their qualitative observations about how effective each gear type was in reducing winter flounder bycatch in their particular fishing situations. The added research component was conducted by a team of scientists and fishermen working together to complete additional tows in the field, testing the two gear types in the whiting fishery. In this way, the two components of the Gear Trials Program provided additional qualitative and quantitative information about how these gear types performed in various fishing situations and another small mesh fishery besides the squid fishery.

The Gear Trials Program spanned the time frame of 2012 through June 2015, and was implemented directly by the CFRF in partnership with the Cornell Cooperative Extension Marine Program (CCE) based on Long Island, New York. It was aimed at building on the previous research that had demonstrated the effectiveness of these gear types in reducing winter flounder bycatch in the small mesh squid fishery.

**Major Goals and Objectives:**

The major goal of the Gear Trials Program was to build on the previous promising research results for both the large mesh belly panel and 12” drop chain sweep by providing industry members with an opportunity to try these gear types in a wider range of applications. This work supported an overall strategy of the CFRF to develop a suite of tools for fishing vessel captains to have as options to deploy to diminish unwanted bycatch of winter flounder in the southern New England winter flounder stock area.

The specific objectives of the program were to:

1. Provide financial assistance to fishing vessel owners as an incentive for them to utilize one or both of two promising gear types - large mesh belly panel and 12” drop chain sweep - to reduce winter flounder bycatch in the SNE stock area;
2. Extend the proof of concept and full proposal research done under the Challenge Grant Program for Conservation Engineering Projects for these gear types by observing the
effectiveness of each in reducing winter flounder bycatch in other types of small mesh trawl fishing situations;

3. Utilize both fishermen qualitative observations and additional quantitative measurements by researchers to extend the research record for these two gear types and communicate this information back to fishing industry members; and

4. Implement an education/outreach component for this conservation gear engineering work along with providing an option for members of the small mesh fleet to demonstrate to managers they can avoid unwanted bycatch of limiting flounder species through collaborative innovations.

Methodology:

Description of Gear Types Used in the Gear Trials Program

As previously stated, the Gear Trials Program focused on assisting industry with utilizing and testing further the large mesh belly panel and the 12” drop chain sweep, both of which had proven to be effective in reducing winter flounder bycatch in the small mesh squid fishery in the southern New England winter flounder stock area. The 12” drop chain sweep with a 24” head rope adjustment, is shown in Figure 1 below. In field trials, this gear type showed an overall reduction of 78% in winter flounder catch compared to a control net, and there was no statistically significant difference in longfin squid catch between the control net and the modified experimental net.¹

Figure 1. 12” Drop Chain sweep with 24” headrope adjustment. (Cornel Cooperative Extension Marine Program)

The large mesh belly panel avoidance gear (shown below in Figure 2) was initially tested by the CCE in 2010 in the small mesh longfin squid fishery as part of the CFRF Southern New England Collaborative Research Initiative. The panel consists of 6mm poly webbing with the mesh size opening being 80 cm or 32 inches. The overall panel is two meshes deep and 16 meshes wide and is sewn into the belly part of a standard 6” mesh net, forming a large mesh opening for fish such as winter flounder to escape through. Field trials demonstrated an 88% reduction in winter flounder catch and an 83% reduction in demersal species with no statistically significant loss of squid, the targeted species.²

Figure 2. Large Mesh Belly Panel (Cornell Cooperative Extension Marine Program).

Voucher component

The voucher component of the Gear Trials Program was the method the CFRF used to convey financial assistance to fishing vessel owners interested in utilizing these new gear types on their fishing vessels. In the spring of 2012, the CFRF staff and Board members developed a list of qualifying criteria for participation in the voucher program, focusing on helping active fishermen in the small mesh trawling fleet in the southern New England region. This list of initial qualifying criteria was as follows:

1. Must have a current, valid fishing permit or license (federal or state) with no pending fisheries violations. (Each voucher would be issued to the owner of the fishing vessel and only one voucher would be issued per fishing vessel. Captains and crew would be able to use this voucher by knowing the voucher ID #).
3. Must be a resident of Rhode Island, Massachusetts, Connecticut, or New York *
4. Must have active fishing history in small mesh fisheries within the past two years (beginning with January 2010). This would be demonstrated by submittal of VTR or state logbook entries for three trips at sea indicating
   a. Landings (in small mesh trawl fishery for the following species: squid, whiting, scup)
   b. Fishing activity on one or more of the following statistical areas: #537, 538, 539, 611, 612, 613
   c. Use of small mesh trawl

*Note: These criteria were later expanded to include fishing vessels actively fishing in the southern New England winter flounder stock area but home ported in other states in the Mid-Atlantic region.

The initial rules for participating in the voucher program were as follows:

1. A voucher must be used only for one or both of the gear types covered by the program.
2. Vouchers were only valid at participating gear suppliers within the program (Superior Trawl and Reidar’s Trawl-Scallop Gear and Marine Supply, Inc.).
3. Participant needed to be willing to report back observations qualitatively (by survey form or interview) on a monthly basis.
4. Voucher recipients could elect to stop using the gear (after one time) but were asked to report back why.
5. Only one voucher for each type of gear would be issued per fishing vessel, and these would be issued to the owner. (Vouchers could be used by captain and/or crew members with issued voucher ID number at participating gear suppliers).
6. Voucher would expire on March 31, 2013.*
7. Fishing vessels would keep the gear at the end of the program.

*Note: The Gear Trials Program was ultimately extended, and the final expiration date was June 30, 2015.

Once the qualifying criteria and rules of participation were established, the CFRF staff began working with state fisheries management agency personnel in RI, MA, CT, and NY and with NMFS to develop a contact list of potential participants for the program. Some 280 letters of notification were mailed in July 2012 to potential participants (RI – 56; MA – 136; CT – 23; NY – 65), along with background information on the program, and an application form. (See Appendices A, B, and C.) In addition to these individual letters, the CFRF also issued a press release to the Commercial Fisheries News and local papers in Rhode Island and New York explaining the program opportunity. (See Appendix D). Follow up outreach to the fishing community was carried out in subsequent years of the program through CFRF issued post card
reminders, verbal communication with fishing vessel owners/captains by CFRF staff, Board members, and CCE staff, and CFRF newsletters. Examples of these communications are included in Appendix E.

While potential qualifying fishermen were contacted and invited to participate in the voucher program, the CFRF worked with a private consultant to establish a mechanism for tracking voucher usage. This involved developing a dedicated, interactive Gear Trials website that provided the following functions:

- Explained the voucher and research components of the Gear Trials Program;
- Provided the necessary background information on qualifying criteria and how to apply;
- Provided an online application form (for participation in both the voucher component and the quantitative research component) that could be submitted directly to the CFRF for processing;
- Provided an administrative function that would allow owners of participating gear supply companies to determine if an approved voucher was still active, and to record voucher transactions, and for CFRF staff to monitor transactions; and
- Post research report findings.

This dedicated, interactive website was activated in 2012 and continued as an online resource until the program was completed in June 2015. The CFRF now maintains a Gear Trials project page on its home website (www.cffoundation.org) that posts an explanation of the program along with the results, and a documentary program video.

The program was officially launched in July 2012. Fishing vessel owners were invited to apply for vouchers and they could also apply to be considered for involvement in the research component. Completed applications were reviewed as received, and once approved, voucher numbers were issued. Two companies, Superior Trawl in Narragansett, RI and Reidar’s Trawl-Scallop Gear and Marine Supply, Inc. in New Bedford, MA entered into work agreements with the CFRF to participate in the voucher program and supply the gear. These companies were reimbursed on a monthly basis as the vouchers were used.

Priority was given to fishing vessel owners residing in RI, MA, CT, and NY but as the program progressed and it was apparent that additional fishing vessels could be accommodated, the CFRF expanded outreach efforts to notify small mesh trawling vessels based in the Mid-Atlantic region that fished in the southern New England winter flounder stock area that they could also apply. This was done in cooperation with the Mid-Atlantic Fishery Management Council.

**Research/Outreach Components**

As part of the funds set aside for the Gear Trials component of the Challenge Grant Program, the CFRF also made plans to support further research on the effectiveness of these gear types at a proof of concept level in the small mesh whiting fishery, and to contract for assistance with conducting outreach activities as explained above. In April 2012 the CFRF issued a “Request for
Applications” to conduct this research and assist with the fishermen feedback portion. (A copy of this “Request for Application” is included in Appendix F of this summary report.) In June 2012 the CFRF entered into a work agreement with the CCE to carry out the following work:

- **Conduct quantitative data collection** – A research team comprised of Cornell scientists and commercial fishermen working on board commercial fishing vessels chartered by the CFRF would conduct comparison tows to further test each gear type in the small mesh whiting fishery.

- **Track and summarize qualitative observations by voucher program participants** – Under the voucher program, participating fishing vessel owners were asked to report back on a monthly basis via survey form on their observations about gear performance. The Cornell team was asked to assist with this feedback component by developing a standard reporting form that participants could fill in and return, conducting some verbal dockside interviews with a subset of participants, and compiling and summarizing the information that was collected.

- **Conduct program outreach** - This work component was aimed at providing outreach throughout the program to inform industry of the opportunity to participate, to share observations, and provide an overview of the data collected, the analysis, and the summary of findings.

- **Develop a documentary video** – The Cornell team and the CFRF staff would work together to develop a project video explaining how the Gear Trials Program was conducted and the fishing community’s response to it.

Specific work tasks were to include:

1. Developing and distributing a flyer explaining the program at the major fishing ports of Pt. Judith, Montauk, New Bedford, Stonington, and working with CFRF staff in providing assistance in developing an outreach article for inclusion in the Commercial Fisheries News;
2. Developing a survey form for qualitative component (fishermen reported observations regarding how gear is performing);
3. Compiling, analyzing, and reporting on the qualitative data reported by fishermen;
4. Conducting supplemental dockside interviews with a subset of fishermen participating in program and summarize these interviews;
5. Completing additional field research onboard commercial fishing vessels in the whiting fishery;
6. Compiling, analyzing, and reporting on the data from the quantitative research component conducted onboard fishing vessels;
7. Conducting underwater video of gear performance during onboard research component, if feasible;
8. Developing periodic updates (quarterly over the course of the study year) on gear performance to be posted on CFRF project website;
9. Developing a newsletter to be mailed out to program participants to convey information being reported;
10. Working with the CFRF staff to develop a documentary video on the program;
11. Developing and submitting a final summary report on program work.

During the same time, the CFRF reviewed applications from fishermen interested in working as part of a collaborative team conducting the test trials in the whiting fishery. As a result of this process, the CFRF entered into work agreements with the owners of two fishing vessels (F/V Lightning Bay and F/V Excalibur based in Pt. Judith, RI) to work with the CCE scientists to conduct the additional at sea trials testing these two gear types in the small mesh whiting fishery. The members of the CFRF Conservation Engineering Review Panel ³ worked with the team of CCE scientists and fishermen to finalize a quantitative data collection approach on the level of a proof of concept phase of research. ⁴ The at sea research was to be conducted over 6 days at sea and consist of a total of 72 paired tows using large mesh belly panel and the 12” drop chain sweep in comparison with a standard small mesh trawl (control net). The timing of the field work was to be the fall months of 2012. A detailed description of the research protocols is included in this report in Appendix G.

Regarding qualitative fishermen feedback, the CCE team developed a survey form for fishermen to report back their monthly observations. A copy of this survey form is included in Appendix H of this report. These survey questions were used during dockside interviews, telephone interviews, and were available online through a survey form installed on the CFRF program website. The CCE team monitored these responses, and also developed an additional final survey form (included in Appendix I) as a means of determining fishermen’s opinions of the overall program.

Results:

Voucher component

Table 1 and Table 2 summarize the participation in the voucher component of the Gear Trials Program. As the numbers indicate, 63 fishing vessel owners based in the states of RI, MA, CT, and NY applied to receive either one or both vouchers for their fishing vessels. From these applications, 119 vouchers were issued [35 for the small 12” drop chain sweep; 24 for the large

³ The CFRF Conservation Engineering Review Panel was comprised of Fred Mattera (CFRF Board member with years of experience as a commercial trawler); Henry Milliken (NMFS NEFSC scientist, Protected Species Branch); Arne Carr (private conservation engineering consultant); and Mark Gibson (RI DEM Div. Fish & Wildlife). The Review Panel members worked with teams of scientists and fishermen engaged in CFRF conservation engineering projects, giving advice and guidance as projects were developed and data results were analyzed and summarized.
⁴ This was considered a proof of concept project because the budget only allowed for a limited number of days at sea for tows, and this was the first time the gear was tested in the whiting fishery.
12” drop chain sweep; and 60 for the large mesh belly panel. Of the 119 vouchers issued, 109 were used by the end of the program. Various reasons accounted for the 10 unused vouchers including fishing vessel no longer fished, etc.

Table 1. Summary of Gear Trials Voucher Component – By State

<table>
<thead>
<tr>
<th>State</th>
<th># Applications</th>
<th># Vouchers Issued</th>
<th># Vouchers Used</th>
<th># Vouchers Unused</th>
</tr>
</thead>
<tbody>
<tr>
<td>RI</td>
<td>31</td>
<td>57</td>
<td>51</td>
<td>6</td>
</tr>
<tr>
<td>CT</td>
<td>4</td>
<td>8</td>
<td>8</td>
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<td>MA</td>
<td>2</td>
<td>4</td>
<td>4</td>
<td>0</td>
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<td>NY</td>
<td>26</td>
<td>50</td>
<td>46</td>
<td>4</td>
</tr>
<tr>
<td>Total</td>
<td>63</td>
<td>119</td>
<td>109</td>
<td>10</td>
</tr>
</tbody>
</table>

Table 2. Summary of Gear Trials Voucher Component – By Gear Type

<table>
<thead>
<tr>
<th>Gear Type</th>
<th># Vouchers Issued</th>
<th># Vouchers Used</th>
<th># Vouchers Unused</th>
</tr>
</thead>
<tbody>
<tr>
<td>Small 12” Drop Chain Sweep ($450 each)</td>
<td>35</td>
<td>31</td>
<td>4</td>
</tr>
<tr>
<td>Large 12” Drop Chain Sweep ($800 each)</td>
<td>24</td>
<td>24</td>
<td>0</td>
</tr>
<tr>
<td>Large Mesh Belly Panel ($400 each)</td>
<td>60</td>
<td>54</td>
<td>6</td>
</tr>
<tr>
<td>Total</td>
<td>119</td>
<td>109</td>
<td>10</td>
</tr>
</tbody>
</table>

Although the voucher program was opened up to fishing vessel owners based in the Mid-Atlantic region part way into the program when the CFRF determined that it could re-direct additional funds to the program and extend the application deadline by a year, no fishing vessel owners from this region participated. But during this extended program period, an additional 17 fishing vessels based in RI, CT, and NY applied to the program and were issued vouchers.

A complete listing of all of the fishing vessels that participated in the voucher component of the Gear Trials Program along with their homeport and the type of gear they received a voucher for is included in Appendix J of this report.

Research Component

The Cornell team’s final summary report was submitted to the CFRF in June 2015 and is included in Appendix K of this report. This report gives a detailed summary of the findings from the quantitative research component done in the whiting fishery, the qualitative information received from the fishermen participating in the Gear Trials Program voucher component as well as the work done in partnership with the CFRF on outreach for the program.

Highlights of the at sea trials in the whiting fishery:
• Neither the 12” drop chain sweep nor the large mesh belly panel experimental net proved to reduce the quantity of winter flounder bycatch by statistically significant levels. However, a winter flounder escapement of 25% in the drop chain net and 44% in the large mesh belly panel net was observed when all tows were combined.
• There was no significant difference in whiting or squid catch between the control net and either experimental net modified with the 12” drop chain sweep or the large mesh belly panel. Retention of whiting, the target species, was maintained using both experimental nets.
• Both experimental nets proved to be functionally effective in significantly reducing the quantity of miscellaneous flounder (all flounders excluding winter flounder) and all combined flounder (including winter flounder) bycatch.
• The 12” drop chain net reduced miscellaneous flounder catch by 67.4%. The large mesh belly panel reduced miscellaneous flounder catch by 63%. When all flounders (including winter flounder) were pooled, there was a significant difference in the catch between the control net and net with the 12” drop chain sweep that yielded a 66.1% reduction in total flounders.
• The large mesh belly panel significantly reduced the catch of all combined flounders by 61.7%.
• When all demersal species were pooled, there was a highly significant difference between the control net and both experimental nets that yielded a 66.8% reduction in catch by the 12” drop chain treatment and a 65.5% reduction by the large mesh belly panel.

**Fishermen Feedback:**

• 114 surveys were received relative to the use of the 12” drop chain sweep, 47 surveys were received relative to the use of the large mesh belly panel, and 13 surveys were received commenting on the use of the combined use of the 12” drop chain sweep and the large mesh belly panel.
• Squid was the most targeted fishery followed by whiting and scup.
• Fishermen reported adjusting the gear in 65 instances, and in 109 instances no adjustments were made.
• Fishermen reported using the gear under various conditions. Most commonly, the gear was used when there was a high incidence of skates and dogfish.
• Of the 174 surveys received, 95% (165) reported that the gear was effective in reducing winter flounder bycatch.
• Bycatch reduction estimates of winter flounder ranged from 15% to nearly 100%.
• 124 of the 174 surveys (72%) stated there was no reduction in retention of the target species. Most of the rest of the surveys indicated a minimal reduction in target species.
• 110 of the 174 surveys stated they did observe a reduction in bycatch species other than winter flounder when using the gear.
• 100% (174) of the monthly survey respondents reported that they would continue to use the gear in the future.
• For 32 out of 37 respondents, this was their first use of the drop chain sweep.
• 97% of participants felt it was helpful to the industry to have this opportunity to install gear on their vessel at no cost.

In summary, the feedback received on the performance of the gear types was exceedingly positive, and participants felt the program was beneficial to fishermen at a time when it is becoming increasingly difficult to maintain an income in the fishing industry. Some 85% of participants that have been using the gear will continue to use the gear because it is effective in reducing bycatch, reduces the time spent processing catch on deck, and use of this gear improves the quality of the catch.

Outreach activities:

Throughout the Gear Trials Program, the CFRF staff, CFRF Board members, owners of the two gear supply companies, and the Cornell Cooperative Extension Marine Program staff worked together as a team to communicate with industry members. This communication was accomplished through a variety of means, including the following:

• **Mailings to potential Gear Trials Program participants** – Early in the program the CFRF and CCE staff developed a comprehensive list of potential participants and used direct mailings to notify these fishing vessel owners of the opportunity to acquire vouchers and possibly participate in further at sea trials of the gear. Post card messages followed to remind contacts of the opportunity and the need to use vouchers that had been issued.

• **Direct verbal conversations by phone and dockside interactions** – The CCE and CFRF staff and Board members, together with the gear suppliers, also engaged in direct verbal communications with fishing vessel owners in Pt. Judith, ports in NY, and at Superior Trawl and Reidar’s Trawl-Scallop Gear and Marine Supply, Inc. facilities. This interaction was followed up with assistance with filling out and filing the necessary application materials.

• **Media articles** – The CFRF used its newsletter and articles in the Commercial Fisheries News and local newspapers to publicize the program, and the CCE team developed a Gear Trials newsletter to describe the program, explain how to apply, and report on additional research findings.

• **Video development and distribution** – The CCE and CFRF staff worked together to produce a short documentary video about the Gear Trials Program and this was posted on both organization’s websites, along with the issuance of an announcement to the CFRF contact list that this video was available for viewing.
• **Posting of research results** – The CCE team developed a summary report on the added research trials in the whiting fishery and after this was reviewed by the members of the CFRF Conservation Engineering Review Panel, it was posted on the CFRF home website.

• **Dockside demonstrations** – Jon Knight of Superior Trawl and the CCE team worked together to demonstrate to fishermen how to install the gear on their fishing vessels. J. Knight traveled to NY ports to conduct these sessions and deliver gear to participants in the program not based on RI or MA.

The outreach efforts encompassed in the program, along with the added length of time, enabled the program team to engage a relatively large number of participants in the program. It is anticipated as the gear continues to be used, fishermen will continue to informally convey their experiences with it to the CFRF and CCE staff and other fishermen, and this gear will become even more widely used in the region.

**Observations/Conclusions:**

The Gear Trials Program was unique in that fact it provided an opportunity to incorporate a proactive implementation phase to accompany conservation engineering research. From this perspective, some general observations and conclusions can be drawn that may help inform other such efforts to follow. These include the following:

- Programs such as the CFRF Gear Trials Program are important in bringing conservation gear engineering research results to the industry, educating fishing vessel owners about possible solutions for reducing unwanted bycatch, and enabling industry members to be proactive in trying to solve bycatch problems as they fish for species in abundance. Program such as this also contribute to demonstrating to NMFS Observers and fisheries managers that these gear types are effective in reducing winter flounder and other types of flounder bycatch. In this particular case, it helped keep open important fishing grounds for the small mesh fleet based in the southern New England region.
- NMFS Observers should be instructed to make notes of the fishing vessels utilizing these gear types in the southern New England winter stock area and make their own observations on bycatch reduction. This would help document industry’s efforts in addressing bycatch problems.
- Financial assistance programs help fishermen make the decision to invest in these kinds of gear changes, and sometimes are necessary in terms of providing the incentive to try something different and new. Providing vouchers to install these gear types without cost to the fishing vessel owner was a way to quickly increase their use in the small mesh fleet.
- Fishing vessel captains and crew members may continue to adjust and modify these gear types to increase their effectiveness in their own individual fishing situations, and that will further help reduce bycatch and increase overall catch efficiency. Providing
fishing vessel captains with basic tools to choose from and the flexibility to use those tools in their own way was the intent of this program and all the conservation gear engineering work the CFRF engages in and may prove to be in the long term the best approach to solving bycatch problems.

- Helping fishermen file the necessary application materials and gathering fishermen input on how the gear was performing on their own fishing vessels were not easy tasks and the CCE team spent a large amount of effort on this part of the communication process. But assisting fishermen with participation and gathering their qualitative feedback is important. Maximizing participation in a program such as this and closing the communication circle with fishermen is a valuable way to expand the body of knowledge about the effectiveness of these gear types in other fisheries, and helps in assessing future research needs.

- Visuals such as the brief documentary video produced as part of the Gear Trials Program can be an effective way to communicate about such programs.

- Setting aside some funding in the Gear Trials Program to continue at sea trials for these two gear types was a valuable way to collect quantitative information in another small mesh fishery, the whiting fishery. While the days at sea were limited and a significant reduction in winter flounder bycatch was not proven, the results did show promise in that the total catch of all founders was reduced.

- The involvement of the CFRF Conservation Engineering Review Panel was instrumental in helping the research team conduct an effective trial of the gear types in the whiting fishery with limited resources. As with other teams involved in the overall CFRF Challenge Grant Program, the Review Panel members were able to work with the research team before they went to sea to help finalize the research approach, and to help in the review of the findings. This is a cost effective and productive way to conduct conservation engineering research.

- Implementing a program such as this takes time and the added extension of time was very valuable in terms of maximizing participation.

**Summary of Major Results:**

The major results of the CFRF Gear Trials Program are as follows:

- A total of 63 fishing vessel owners based in the states of RI, MA, CT, and NY applied to receive either one or both vouchers for their fishing vessels. From these applications, 119 vouchers were issued [35 for the small 12” drop chain sweep; 24 for the large 12” drop chain sweep; and 60 for the large mesh belly panel]. Of the 119 vouchers issued,
109 were used by the end of the program. Various reasons accounted for the 10 unused vouchers including fishing vessel no longer fished, etc.

- During additional at sea trials, there was no significant difference in whiting or squid catch between the control net and either experimental net modified with the 12” drop chain sweep or the large mesh belly panel. Retention of whiting, the target species, was maintained using both experimental nets.
- In the whiting fishery trials, neither the 12” drop chain sweep nor the large mesh belly panel experimental net proved to reduce the quantity of winter flounder bycatch by statistically significant levels. However, a winter flounder escapement of 25% in the drop chain net and 44% in the large mesh belly panel net was observed when all tows were combined. When all flounders (including winter flounder) were pooled, there was a significant difference in the catch between the control net and net with the 12” drop chain sweep that yielded a 66.1% reduction in total flounders. The large mesh belly panel significantly reduced the catch of all combined flounders by 61.7%.
- Outreach activities such as direct mailings, interactions with fishermen at the docks, newsletters and media coverage, gear demonstrations, and development of a program video were all necessary tools to maximize participation in the program.
- The feedback received on the performance of the gear types was exceedingly positive, and participants felt the program was beneficial to fishermen at a time when it is becoming increasingly difficult to maintain an income in the fishing industry. Some 85% of participants that have been using the gear will continue to use the gear because it is effective in reducing bycatch, reduces the time spent processing catch on deck, and use of this gear improves the quality of the catch.

Appendices:
- Appendix A – Notification Letter
- Appendix B – Program Background Information
- Appendix C - Application form
- Appendix D – Press Release
- Appendix E – Newsletters, Post cards
- Appendix F – Request for Application to assist CFRF
- Appendix G – Description of Research Protocols
- Appendix H – Survey Form 1 – Fishermen Feedback
- Appendix I – Survey Form 2 – Fishermen Feedback
- Appendix J – List of participants
- Appendix K – Summary Report – Cornell Cooperative Extension Marine Program
Appendix A:

July 14, 2012

Re: Gear Trials Program – Opportunity to apply for vouchers - small mesh trawl fishery – winter flounder bycatch reduction

Dear Fishing Vessel Owner:

This letter is to notify you of the availability of a financial assistance program for fishermen actively fishing in the small mesh trawl fishery in the southern New England winter flounder stock area. The Commercial Fisheries Research Foundation (CFRF) is administering a “Gear Trials Program” to assist fishing vessel owners interested in installing one or both of two types of gear – the 12” drop chain and the large mesh belly panel – on their fishing vessels. These two gear types have been designed to reduce winter flounder bycatch in small mesh trawl fisheries.

You have been identified as a potential participant in this program, and are being invited to apply if you meet the following criteria:

1. Have a current federal permit or state license for use in small mesh fisheries
2. Are a resident of Rhode Island, Massachusetts, Connecticut, or New York
3. Have an active fishing history in the small mesh fisheries within the time frame of January 2010 to present as demonstrated by submittal of VTR’s or logbook entries for 3 separate fishing trips showing:
   a. Landings from small mesh fisheries (squid, scup, whiting)
   b. Small mesh fishing activity in one or more of the following Statistical Areas: #537, #538, #539, #611, #612, #613.

Under the program, participating fishing vessel owners will be issued vouchers to purchase either one or both of the gear types, and use them as they target species such as squid, whiting, and scup using small mesh trawls in areas where winter flounder are also found. Fishing vessel owners will be asked to report back their observations periodically so additional information can be compiled on how these gear types work in different fishing circumstances and on different size vessels.

General summaries of the feedback received from fishermen will be posted on the CFRF project website (www.geartrials.org) and shared at a public research session at the end of the program so all participants and interested others will be able to learn about how these gear types have been used and how they worked. Fishermen observations will be used to determine if further modifications might be needed, or if the gear is helpful in circumstances not yet fully tested. The program, by adding fishermen
observations together with new data from cooperative fishing research trips, will build on the research done to date.

The deadline for applying to receive a voucher(s) for a gear purchase is December 31, 2012. To expedite the processing of applications and the issuance of vouchers, it would be helpful for applicants to provide all of the required information when submitting the application. It would also be helpful for applicants to apply using the online application form if possible. However, applications and supporting documents can be submitted by using any one of the following methods:

1) **Apply online**: Go to the website [www.geartrials.org](http://www.geartrials.org) and click on apply on the home page. This will enable you to fill out and submit the application form online. You will also need to provide copies of the documents listed at the top of the application form. These can be submitted by scanning them in and using the option to attach them to the online application form, or by mailing or faxing them to the address/fax number listed below.

2) **Apply through the mail**: Fill out the enclosed application form and mail it and the supporting documents to the following address: Commercial Fisheries Research Foundation, P.O. Box 364, Saunderstown, RI 02874.

3) **Apply through fax**: Fill out the enclosed application form and fax it and the supporting documents to the following fax number: (401) 515-3537.

Applicants will receive notice by mail (and e-mail) that their application has been reviewed, and accepted. Approved participants will receive a voucher with an individual ID#, and instructions on how to use the voucher and where the voucher can be used.

In addition to the voucher program, the CFRF will also be seeking to involve two comparable fishing vessels in a cooperative research approach with scientists from the Cornell University Cooperative Extension Marine Program. The researchers will team up with the captain and crew of the fishing vessels to conduct further at sea research on these two gear types, and the fishing vessel owner will be compensated in accordance with CFRF policies for fishing vessel at sea research involvement. **The deadline for applying to be considered for participation in the cooperative research component of the program is August 31, 2012.**

Attached with this letter you will find:

1. Background information sheet with a summary of the program, voucher amounts, list of the qualifying criteria for vouchers, rules for participating, list of participating gear suppliers, and directions for applying.
2. Application form for gear vouchers
3. Application form for cooperative research component (optional).

Potentially eligible participants are asked to apply and return requested materials to the CFRF as soon as possible. Upon receipt, applications will be reviewed for completeness and the information submitted will be verified by CFRF staff. Each approved applicant will be issued a voucher(s) equivalent to the cost of the gear the fishing vessel owner applies for (one or both types of gear). The voucher(s) will be able to be used for purchases of the gear at one of the participating gear suppliers.
Thank you for your interest, and we encourage you to participate in this program. If you have any questions, please contact Jane Dickinson, CFRF Administrative Assistant, by e-mail at jdickinson@cfrfoundation.org or by phone: (401) 515-4892.

Sincerely,

Peg Petruny-Parker, Executive Director
Commercial Fisheries Research Foundation

E-mail: pparker@cfrfoundation.org

Cc:
- David Spencer, President, CFRF
- Fred Mattera, Vice-President, CFRF
- Jane Dickinson, Administrative Assistant, CFRF
Appendix B:

Commercial Fisheries Research Foundation (CFRF)

“Gear Trials Program – Reduction of Winter Flounder Bycatch”

Summary:

The “Gear Trials Program” is aimed at assisting industry with utilizing and further testing two gear types – large mesh belly panel and 12” drop chain - that are designed to reduce winter flounder bycatch in the southern New England stock area. Through the program, the CFRF will offer financial assistance to fishing vessel owners based in the southern New England region willing to install the gear types on their fishing vessels and test their performances. The intent is to provide industry members with an opportunity to try these gear types in a wide range of small mesh fishery applications (squid, whiting, scup) and report back their findings.

Through previous research studies, these two gear types have shown to be successful in reducing winter flounder bycatch in the squid fishery. Under this program, additional observations from fishermen participants, combined with additional at sea research by the Cornell University Cooperative Extension Marine Program, will be used to determine if these gear types are also effective in other small mesh fisheries, and on different size fishing vessels.

The Gear Trials Program is part of the CFRF’s “Challenge Grant Program for Conservation Engineering Projects – Winter Flounder Bycatch Reduction” that was established through federal financial support obtained by U.S. Senator Jack Reed (D-RI). This Challenge Grant Program focuses on developing tools for fishermen to avoid unwanted winter flounder bycatch in the southern New England stock area.

Amount of vouchers:

Large Mesh Belly Panel – for all size fishing vessels = $400

Drop Chain:

- Smaller fishing vessel category (< 500 HP) = $450
- Larger fishing vessel category (>500 HP) = $800

List of qualifying criteria:

5. Must have a current, valid fishing permit (federal or state) for use in small mesh fisheries (e.g. squid, whiting, scup).
6. Must be a resident of Rhode Island, Massachusetts, Connecticut, or New York.
7. Must have active fishing history in small mesh fisheries within the timeframe of January 2010 to the present. This will be demonstrated by submittal of VTR or state logbook entries for 3 separate fishing trips at sea indicating the following:
a. Landings for species in small mesh trawl fisheries (e.g. squid, whiting, scup)
b. Small mesh fishing activity in one or more of the following statistical areas: #537, #538, #539, #611, #612, #613.

Applications must be submitted by Monday December 31, 2012.

Rules for participating in program:

8. Voucher must be used only for one or both of the gear types covered by the program.
9. Voucher only valid at participating gear suppliers within the program. (See below.)
10. Need to be willing to report back observations (by survey form or interview) on monthly basis.
11. Voucher recipient can elect to stop using gear (after one time) but will need to report back why.
12. Only one voucher for each gear type issued per fishing vessel – issued to the owner (but may be used by captain and/or crew member with presentation of issued voucher ID number at participating gear suppliers).
13. Need to use voucher by Monday, April 1, 2013, after which time voucher will expire.
14. Fishing vessels will keep gear.

Participating Gear Suppliers:

Superior Trawl
55 State Street
Narragansett, RI 02882
Phone: (401) 782-1171
Contact: Jon Knight

Reidar’s Manufacturing, Inc.
10 Water Street
Fairhaven, MA 02719
Phone: (508) 999-4616
Contact: Tor Bendiksen

How to apply:

Send completed application and support documents by fax, mail, e-mail to:

Jane Dickinson, Administrative Assistant
Commercial Fisheries Research Foundation
P.O. Box 364
Saunderstown, RI 02874
Fax #: (401) 515-3537
E-mail: jdickinson@cfrfoundation.org

Or apply online at www.geartrials.org

If you have questions contact Jane Dickinson at (401) 515-4892 or jdickinson@cfrfoundation.org
Appendix C:

Gear Trials Program

To receive a voucher(s) for the trial gear covered by this program, please submit no later than Monday, December 31, 2012 the following items:

1) completed application form
2) copy of current federal permit or state license
3) copies of VTRs or state logbook entries for 3 separate fishing trips during the time period of January 2010 to present, indicating the following:
   - Landings for species in at least one small mesh trawl fishery (includes squid, whiting, scup)
   - Statistical areas fished (must show fishing activity in one or more of the following statistical areas: #537, #538, #539, #611, #612, #613)
   - Use of small mesh trawl.

Voucher Application Form

Name (Fishing vessel owner): ____________________________________________

Federal Permit # or State License #: ____________________________________

Fishing Vessel Name: __________________________________________________

Fishing Vessel Home Port: _____________________________________________

Fishing Vessel Length: ________________________________________________

Fishing vessel Horse Power: ____________________________________________

Company Name (if applicable): _________________________________________

Residence Address of Fishing Vessel Owner: ________________________________

____________________________________________________________________

Mailing Address (if different from residence address above): ________________

____________________________________

E-mail Address: _______________________________________________________

Phone Numbers: ______________________________________________________

  Home: _____________________________________________________________

  Cell: _____________________________________________________________

Gear Types Seeking Vouchers For: (choose one or both of the gear types listed below by checking next to the gear name)

  _____ 12 “ Drop Chain
I verify that the information supplied in the above application form is accurate.

Signature: _______________________________________

Gear Trials Program – Application Form for Fishing Vessel Owners
Interested in Being Considered for Research Team Participation

Two commercial fishing vessels will be contracted and compensated by the CFRF to participate in field research with the Cornell University Cooperative Extension Marine Program researchers. Criteria for consideration is as follows: 60-70’ fishing vessel, willing to fish in the Deep Hole east of Block Island or southwest of Block Island in the whiting fishery, 450-600 HP. If interested, please complete and return the application form below to the CFRF by August 31, 2012.

Name (Fishing vessel owner):_________________________________
Federal Permit #:__________________________________________
Fishing Vessel Name:________________________________________
Fishing Vessel Home Port:____________________________________
Fishing Vessel Length:________________________________________
Fishing vessel Horse Power:____________________________________
Size net being towed: _______________________________________
Size Doors being towed: _______________________________________
Number of crew members:_____________________________________
Company Name (if applicable):________________________________
Residence Address of Fishing Vessel Owner:_______________________
Mailing Address (if different from residence address above):___________
E-mail Address:_____________________________________________
Phone Numbers:
   Home:____________________________________________________
   Cell:______________________________________________________
Is there another fishing vessel(s) that you know of that is comparable in size, horsepower, with the same fishing nets, doors, legs, and ground cable that would be willing to pair up with your vessel?

If yes, please name that fishing vessel and its owner here. ________________________________
Appendix D:

Press release

Date: July 10, 2012

The Commercial Fisheries Research Foundation (CFRF) is announcing the establishment of a new program, the “Gear Trials Program” that combines financial assistance for the commercial fishing industry with cooperative research. Under the program, the CFRF will offer financial assistance to fishing vessel owners based in the southern New England region willing to install one or both of two new gear types on their fishing vessels and test their performances. The gear types are the 12” drop chain and the large mesh belly panel, designed to reduce winter flounder bycatch in the small mesh trawl fisheries. The intent is to provide industry members with an opportunity to try these gear types in a wide range of small mesh fishery applications (squid, whiting, scup) and report back their findings.

The information below outlines the program.

Background information:

- Through previous research studies, these two gear types have shown to be successful in reducing winter flounder bycatch in the squid fishery. Under this program, additional observations from fishermen participants, combined with additional at sea research by the Cornell University Cooperative Extension Marine Program, will be used to determine if these gear types are also effective in other small mesh fisheries, and on different size fishing vessels.

- The Gear Trials Program is part of the CFRF’s “Challenge Grant Program for Conservation Engineering Projects – Winter Flounder Bycatch Reduction” that was established through federal financial support obtained by U.S. Senator Jack Reed (D-RI). This Challenge Grant Program (approximately $1.2 million for a 4 year program) focuses on developing tools for fishermen to avoid unwanted winter flounder bycatch in the southern New England stock area.

Qualifying criteria:

8. Must have a current, valid fishing permit (federal or state) for use in small mesh fisheries (e.g. squid, whiting, scup).

9. Must be a resident of Rhode Island, Massachusetts, Connecticut, or New York.

10. Must have active fishing history in small mesh fisheries within the timeframe of January 2010 to the present. This will be demonstrated by submittal of VTR or state logbook entries for 3 separate fishing trips at sea indicating the following:

   a. Landings for species in small mesh trawl fisheries (e.g. squid, whiting, scup)
b. Small mesh fishing activity in one or more of the following statistical areas: #537, #538, #539, #611, #612, #613.

Rules for participating in program:

15. Voucher must be used only for one or both of the gear types covered by the program.
16. Voucher only valid at participating gear suppliers within the program. (See below.)
17. Need to be willing to report back observations (by survey form or interview) on monthly basis.
18. Voucher recipient can elect to stop using gear (after one time) but will need to report back why.
19. Only one voucher for each gear type issued per fishing vessel – issued to the owner (but may be used by captain and/or crew member with presentation of issued voucher ID number at participating gear suppliers).
20. Need to use voucher by Monday, April 1, 2013, after which time voucher will expire.
21. Fishing vessels will keep gear.

Duration of Program – Summer 2012 through October 2013 – research session to report overall results to be scheduled for sometime in January 2014.

Participating Gear Suppliers:

- Superior Trawl
  55 State Street
  Narragansett, RI 02882
  Phone: (401) 782-1171
  Contact: Jon Knight

- Reidar’s Manufacturing, Inc.
  10 Water Street
  Fairhaven, MA 02719
  Phone: (508) 999-4616
  Contact: Tor Bendiksen

Amount of vouchers:

- Large Mesh Belly Panel – for all size fishing vessels = $400
- Drop Chain:
  - Smaller fishing vessel category (< 500 HP) = $450
  - Larger fishing vessel category (>500 HP) = $800

How to apply for vouchers:

Potential qualifying participants will receive application materials in the mail. Completed applications and required support documents can be sent by fax, mail, e-mail to:

Jane Dickinson, Administrative Assistant
Commercial Fisheries Research Foundation
P.O. Box 364
Saunderstown, RI 02874
Fax #: (401) 515-3537
E-mail: jdickinson@cfrfoundation.org

Potential participants can also apply by going online to: www.geartrails.org

Applications must be submitted by Monday December 31, 2012.
Research Component:

- The CFRF will also be seeking to contract two comparable fishing vessels to work with the research team from the Cornell University Cooperative Extension Marine Program to conduct further at sea comparison tows.
- Criteria for consideration is as follows: 60-70' fishing vessel, willing to fish in the Deep Hole east of Block Island or southwest of Block Island in the whiting fishery, 450-600 HP.
- If interested, fishing vessel owners please complete and return the application form below to the CFRF by August 31, 2012.
- Application form can be obtained online at www.geartrials.org or by contacting:
  Jane Dickinson, Administrative Assistant
  CFRF
  Phone: (401) 515-4892
  E-mail: jdickinson@cfrfoundation.org

Additional information about the program can be obtained at the program website at www.geartrials.org

List of contacts for additional information/observations about the program:

- Fred Mattera, CFRF Vice-President – Phone: (401) 741-4178
- Jon Knight, Owner Superior Trawl, Narragansett, RI (worked with researchers to develop conservation gear types) – Phone: (401) 782-1171
- Tor Bendiksen, contact at Reider’s Manufacturing, Fairhaven, MA (also continually works with researchers on conservation engineering techniques) – Phone – (508) 999-4616
- Emerson Hasbrouck, Cornell University Cooperative Extension Marine Program, leader of research team that has been working with fishing industry to develop these two gear types. Phone – (631) 727-7850 Ext. 319
- John Scotti, Cornell University Cooperative Extension Marine Program, part of research team that has been working with fishing industry to develop these two gear types. Phone – (631) 727-7850 Ext. 223
- Fishermen who have been working on developing gear onboard their fishing vessels:
  - Phil Ruhle, Jr.  Captain F/V Sea Breeze Too – (401) 265-8862
  - Charles Weimar Captain F/V Rianda S – (631) 668-9274
  - Richard Jones  Captain F/V Pontos – (631) 871-3855
  - Steve Arnold Captain F/V Elizabeth Helen – (401) 639-6335
- Peg Petruny-Parker, Executive Director, CFRF – (401) 515-4662 [Note: Will be away on vacation July 12-July 22, 2012]
Remarks about program from Peg Petruny-Parker:

- “The CFRF is excited about being able to provide this opportunity to the fishing community. So far these two gear types have shown success at being able to significantly reduce winter flounder bycatch in the southern New England stock area within the small mesh squid fishery. We would now like to see if fishermen will find them to be successful on their own boats, and in other small mesh fisheries for species such as whiting and scup.”

- “Through this program we are piloting a new approach. We will be able to combine fishermen observations with at sea research to determine if these gear types have other applications as bycatch reduction tools, or if they would benefit from additional modifications.”

- “The CFRF believes strongly in providing fishing vessel captains with appropriate tools to fish selectively as needed and leaving the decisions of how and when to use these tools up to them.”

- “The story of how fishermen, net builders, and scientists worked together to develop these gear types and provide a conservation option for the industry is a prime example of how problems can be solved through collaborative research.”

- “It is our hope that as many qualifying fishing vessel owners as possible will take part in this program.”

- “Those interested in this program can follow along as information on fishermen observations and comparison tow findings are reported back over the coming year. New information will be continually posted on the program website at www.geartrials.org”
COMMERCIAL FISHERIES RESEARCH FOUNDATION

SMALL MESH TRAWL FISHERIES VOUCHER PROGRAM
Two Gear Types to Reduce Winter Flounder Bycatch:

12” Drop Chain
Smaller vessel (<500HP - $450 voucher)
Larger vessel (>500HP - $800 voucher)

Large Mesh Belly Panel
(All size fishing vessels)
$400 voucher

You may qualify to receive vouchers to purchase these gear types for your fishing vessel if you:

1. Have a current federal permit or state license for small mesh fisheries
2. Are a resident of Rhode Island, Massachusetts, Connecticut, or New York
3. Have an active fishing history in the small mesh fisheries within the time frame of January 2010 to present as demonstrated by submittal of VTR’s or logbook entries for 3 separate fishing trips showing:
   a. Landings from small mesh fisheries (squid, scup, whiting)
   b. Fishing activity in one or more of the following Statistical Areas:
      #537, #538, #539, #611, #612, #613

If interested please read the enclosed materials and apply by December 31, 2012.
SMALL MESH TRAWL FISHERIES VOUCHER PROGRAM
Two Gear Types to Reduce Winter Flounder Bycatch:

12" Drop Chain
$450 (Smaller Vessels)
$800 (Larger Vessels)

Large Mesh Belly Panel
$400
(All Size Fishing Vessels)

To inquire about how to submit a voucher application, please contact the Commercial Fisheries Research Foundation (401)515-4892 or visit www.geartrials.org

VOUCHER APPLICATION DEADLINE: DECEMBER 31, 2012

Commercial Fisheries Research Foundation
PO BOX 364
Saunderstown, RI 02874

You may be eligible to participate in the Gear Trials Voucher Program

To learn more about the Gear Trials Voucher Program, please contact the Commercial Fisheries Research Foundation at (401)515-4892 or visit www.geartrials.org

VOUCHER APPLICATION DEADLINE: DECEMBER 31, 2012
CFRF and the Gear Trials Program

The Commercial Fisheries Research Foundation (CFRF) is a non-profit, private organization that was founded in 2004 by a group of commercial fishermen. The fundamental goal of the CFRF is to create practical solutions to the issues faced by commercial fishermen in southern New England.

The CFRF's Board of Directors is filled entirely by commercial fishermen and individuals who work in industries that support commercial fishing. The Foundation's mission is to establish quality relationships between fishermen, managers, and scientists through collaborative research projects. These projects allow fishermen and scientists to work together to alter current gear designs or develop new ones to fish more selectively which ultimately culminates in better management decisions.

The Gear Trials Program was established and sponsored by the CFRF. The Program addresses two experimental gear types, the large mesh belly panel and the 12” drop chain sweep. Both were designed to reduce winter flounder bycatch in the southern New England stock area within the small mesh trawl fisheries. Through this project, CFRF with Cornell University Cooperative Extension Marine Program (CCE) acting as a facilitator, implemented a program to assist the commercial fishing industry with obtaining and implementing these two conservation engineering gear modifications. The program will also continue to test the performance of the two gear modifications. The financial support component of the program assists fishing vessel owners with acquiring this new gear technology (large mesh belly panel and/or 12” drop chain sweep) through a financial assistance program for fishing vessel owners.

The overall goals and objectives of the two components of the Gear Trials Program are the following:

• To coordinate and assist industry with acquiring the new gear technology (large mesh belly panel and/or 12” drop chain sweep) through a financial assistance program for fishing vessel owners.

• Establish an outreach program that will monitor and record fishermen’s observations and comments about the performance of these two gear types and effectively relay this information back to fishing industry members. The outreach program will also distribute the results of the continued testing of the new gear in the whiting fishery when the research is completed.

The large mesh belly panel was initially tested by CCE in 2010 for a Southern New England Collaborative Research Initiative (SNECRI) project which was funded by CFRF. Results of the study showed that the use of the belly panel resulted in an 88% reduction in winter flounder, and an 83% reduction in combined demersal species (all flounders, skates, dogfish and sea robins) while showing no statistically significant loss of squid. Similarly, the experimental 12” drop chain sweep was proven to be functionally effective through testing conducted by CCE in 2011/2012 and funded by CFRF. During this project, the 12” drop chain sweep resulted in a 78% reduction in winter flounder bycatch and a 76% reduction in combined demersal species bycatch with no significant loss of squid.

Both of these demonstration projects were well received by the commercial fishing industry. The significant bycatch reduction achieved by each of the modified gear types in the squid fishery has been recognized mutually by industry and scientists prompting them to now seek more information on the performance of this technology in the small mesh whiting fishery.
Outcomes (as of September 16, 2013)

At the start of the program efforts focused on identifying qualified participants and informing them of the unique opportunity that was being offered by the CFRF. Qualifications included home port (NY, CT, MA, RI, DE, NJ, VA) and vessel trip reports (current VTR’s indicating the use of an otter trawl with 3” mesh or smaller landing whiting, squid, or scup in NMFS statistical areas 537, 538, 539, 611, 612, or 613). Eligible participants received voucher applications for one or both of the new gear types from CFRF that could be redeemed at Superior Trawl or Reidar’s Manufacturing, Inc.

To date:
- 44 completed applications have been received from the combined states of NY, CT, MA, and RI.
- From all the completed applications, 41 vouchers were issued for the 12” drop chain sweep and 39 vouchers were issued for the large mesh belly panel.
- 31 participants have already received their new gear accounting for 27 drop chain sweeps and 26 belly panels.

Fishermen have begun using the new gear and CCE has started to receive feedback on the performance of the new gear types. The gear has been used by fishermen targeting primarily squid, whiting, and scup. Opinions of these gear modifications are predominantly positive.

To date:
- 18 responses have been received by CCE in the form of a brief survey (10 questions) regarding the fishermen’s opinions.
- The surveys are from March, April, May, and June of 2013.
- 16 surveys were received relative to the use of the 12” drop chain sweep and 2 surveys were received commenting on the combined use of the 12” drop chains and the large mesh belly panel.

- All 18 surveys indicated a positive reduction in bycatch with estimates ranging from a 20% reduction to a 90% reduction.
- 15 of the 18 surveys stated there was no reduction in retention of the target species while the 3 remaining surveys indicated an estimated 20% reduction in the target species.

Continued Research

During mid-July of 2013 four days of research fishing evaluating the performance of the two gear types were conducted while targeting whiting. Two additional days of fishing still remain and then the accumulated data will be organized and analyzed to evaluate the effectiveness of the two gear types as a means of winter flounder bycatch reduction in the targeted small mesh whiting fishery. Once completed, the results will be available to all interested parties. Future research may be directed at the effectiveness of these gear types in reducing the bycatch of other flounders as well.

For More Information:

If you are interested in participating in the Program there is funding still available. Please contact Jane Dickinson at:

jdickinson@cfrfoundation.org

Commercial Fisheries Research Foundation go to: www.cfrfoundation.org

Gear Trials Program go to: www.geartrials.org

Cornell University Cooperative Extension Marine Program go to: www.ccesuffolk.org/marine-2/

Gear Trials Program funding provided to the CFRF through NOAA Award # NA09NMF4720414 and efforts made by U.S. Senator Jack Reed.
LOBSTER FLEET UPDATE:

In June 2013, the CFRF launched the field component of its Lobster Research Fleet Pilot Project, naming it the “On-Deck Data Program”. A fleet of twelve lobster vessels fishing in Lobster Management Areas 2 and 3 took to the water equipped with Google Nexus tablets and electronic calipers to sample a minimum of either 300 lobsters or 60 traps per month, whichever comes first. To date, biological data has been reported for over 24,000 lobsters (from the Gulf of Maine to the Mid-Atlantic Bight, from inshore bays to offshore canyons).

Lobster biologists, managers and industry leaders will continue to direct the pilot project as it continues for one more year. A beta testing phase is underway that is aimed at adding Jonah crab data and bottom temperature data to the mix. The first round of data has been conveyed to scientists at the ASMFC for use in the upcoming lobster assessment, with more to come. View a short video documentary of the project and follow project updates on the CFRF Lobster Fleet website at www.cfrfoundation.org/lobster-research-fleet.

Funded through NOAA Award#NA09NMF4720414 and NA10NMF4720285

CONSERVATION GEAR ENGINEERING PROJECT:

Dr. Pingguo He, graduate student Natalie Jones, and others from SMAST, UMass Dartmouth, have been working in partnership with Captains Tom and Aaron Williams of the F/V Tradition, and Tor Bendiksen of Reidars Manufacturing Co., to test experimental large mesh trawling gear with “escape windows” aimed at reducing the bycatch of winter flounder and sub-legal Atlantic cod, while retaining legal size cod. The team has been working with members of the CFRF Conservation Engineering Review Panel to determine the most effective net configuration as well as targeted fishing locations. Modifications to the experimental net have begun to show promise, but the challenge has been finding the target species in significant numbers in the southern New England stock area in order to complete the field trials. The team is scheduled to finish their research and report findings in the coming year. For more information on this project, visit the CFRF Challenge Grant Program for Conservation Engineering Projects webpage at www.cfrfoundation.org/challenge-grant-program/.

Funded through NOAA Award #NA08NMF4720595

UPCOMING PROOF OF CONCEPT RFP OPPORTUNITY

The CFRF Board of Directors was able to re-direct funding from proceeds from sale of fish and other remaining funding in the Challenge Grant Program to provide a new Proof of Concept opportunity that will be issued late spring/early summer of 2014. The Proof of Concept RFP will be a call for proposals to test ideas on how to reduce juvenile butterfish bycatch. Additional information will be forthcoming on the CFRF website homepage (www.cfrfoundation.org) and in e-mail announcements.

Funded through NOAA Award #NA08NMF4720595

MESSAGE CORNER:

Welcome to the first edition of the CFRF newsletter. As the CFRF works to complete two of its multi-year research programs and launches into new initiatives, we will use a series of newsletters to update the fishing community on research findings and new work underway. We are always interested in hearing from industry members in terms of what the research needs and priorities are as they relate to our industry based here in southern New England. Feel free to make this a two way communication by contacting our staff or Board members with your ideas and comments. Bringing industry into the field of fisheries research in a collaborative way is our number one mission.

-David Spencer, CFRF President, F/V Nathaniel Lee
WORKSHOPS COMPLETED

Short-lived Species Workshop
The CFRF, in partnership with Rutgers University and MARACOOS (Mid-Atlantic Regional Association Coastal Ocean Observing System) organized and hosted a workshop on September 4-5, 2013 focusing on what we know and do not know about short-lived species, such as squid and butterfish. Some 24 participants including members of the commercial fishing industry, stock assessment scientists, state and federal managers, physical oceanographers, ecologists, and fisheries biologists discussed a series of topics that ranged from the natural history of these species, their role in marine food webs, distribution and stock delineations, and response to changing environmental factors, as well as modeling capabilities, and information sharing techniques. A final summary report is available online at: http://cfrfoundation.org/short-lived-species-workshop-september-2013 or by calling (401) 515-4892.

International Collaborative Research Summit
The CFRF, in partnership with The Nature Conservancy and the NMFS Northeast Fisheries Science Center, hosted an International Collaborative Research Summit at the Village Inn in Narragansett, RI on October 1-2, 2013. The goal of the summit was to provide an opportunity to learn from case studies in other parts of the world where fishermen are successfully working with scientists to provide data that is used in stock assessments, and to discuss how lessons learned might be applied to the U.S. Northeast. The highlighted case studies included: 1) A lobster research fleet approach in Nova Scotia, Canada, 2) A Norwegian Reference Fleet, and 3) An industry-based squid data collection system in the Falkland Islands. The event was well attended by members of the commercial fishing industry from New England, Mid-Atlantic, and Gulf regions, state and regional managers, scientists from academic institutions, and representatives of environmental organizations. Additional information on the summit can be found at www.cfrfoundation.org/summit. A final summary report has been drafted and is expected to be released shortly.

Funded through CFRF through NOAA Award# NA08NMF4720595, a grant from the Walton Family Foundation, and financial contributions from The Nature Conservancy

NEW PROJECT:

Research on Scup Processing:
The CFRF has begun research on methods for efficiently processing scup, an underutilized species here in the southern New England/Mid-Atlantic region. Work has begun with two seafood processing equipment manufacturers to investigate existing fillet machines, potential modifications, and future development of a machine to fillet scup cost effectively. Whole scup have been shipped from Pt. Judith to the collaborating companies, and equipment research/development is underway. The CFRF will communicate results to local processing companies soon as they are forthcoming. If promising, the CFRF will seek funding to pursue a scup marketing research project.

Funded through NOAA Award # NA09NMF4720414

SNECRI:
The CFRF Southern New England Collaborative Research Initiative, begun in 2008 with an earmark obtained through efforts made by U.S. Senator Jack Reed, is coming to a close. The program covered a wide variety of research topics and funded 19 project teams, involving some 92 scientists and students, 22 fishing vessels and fishing businesses, and 11 academic, private research institutions and state agencies. Future newsletters will highlight the results from the individual research projects. SNECRI project summaries can also be found at www.cfrfoundation.org/snecri/.

Funded through NOAA Awards #’s NA09NMF4720414, NA08NMF4720595 and NA10NMF4720285

What we are currently seeking funding support for:

* Scup processing and marketing research
* Juvenile butterfish bycatch reduction
* Pioneer Array Project – data sharing and ongoing communications with the industry
* Testing and verification of “flounder friendly” gear approaches in the small mesh trawl fishery
* Continued funding for Lobster Research Fleet beyond 2015, adding environmental data collection
* Research to further develop technology for fishermen-collected data approaches
* Development of research fleet approach in other fisheries
NEAMAP Project:

The CFRF was able to support the northern leg of the well-respected NEAMAP survey over the course of four years (2009-2013) through the SNECRI research program. CFRF Board members and staff are hopeful that the results of this work, conducted by VIMS scientists and the captain/crew of the F/V Darana R, will be used to inform stock assessments and management plans for key resource species in the southern New England/Mid-Atlantic region.

The NEAMAP team was asked by the CFRF to report on how the data for key commercial species surveyed in northern waters is being used in stock assessments. The following information on data usage as it relates to assessments, was included in their final report submitted on August 21, 2013. A full NEAMAP project report is available at www.cfrfoundation.org/projects/neamap.

Uses of Data Generated by the NEAMAP Mid-Atlantic/Southern New England Nearshore Trawl Survey, 2007-2013 (as of May 31, 2013)

<table>
<thead>
<tr>
<th>Data provided to &amp; incorporated into past assessments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Atlantic Menhaden</td>
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<tr>
<td>Atlantic Sturgeon</td>
</tr>
<tr>
<td>Longfin Squid</td>
</tr>
<tr>
<td>River Herring (Alewife &amp; Blueback)</td>
</tr>
<tr>
<td>Winter flounder</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Data provided to but not incorporated* into an assessment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Atlantic Sea Scallop</td>
</tr>
<tr>
<td>Black Drum</td>
</tr>
<tr>
<td>Bluefish</td>
</tr>
<tr>
<td>Scup</td>
</tr>
<tr>
<td>Skate complex (Clearnose, Little, &amp; Winter)</td>
</tr>
<tr>
<td>Spiny Dogfish</td>
</tr>
<tr>
<td>Weakfish</td>
</tr>
</tbody>
</table>

*(Due to short time series of data available, NOT because of data quality)

<table>
<thead>
<tr>
<th>Data provided to an assessment &amp; assessment results currently pending</th>
</tr>
</thead>
<tbody>
<tr>
<td>American lobster</td>
</tr>
<tr>
<td>Atlantic croaker</td>
</tr>
<tr>
<td>Black Sea Bass</td>
</tr>
<tr>
<td>Butterfish</td>
</tr>
<tr>
<td>Horseshoe crab</td>
</tr>
<tr>
<td>Smooth dogfish</td>
</tr>
<tr>
<td>Spot</td>
</tr>
<tr>
<td>Striped Bass</td>
</tr>
<tr>
<td>Summer Flounder</td>
</tr>
<tr>
<td>Tautog</td>
</tr>
</tbody>
</table>

Funded through NOAA Award # NA09NMF4720414

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GEAR TRIALS PROGRAM UPDATE:

The CFRF will continue its Gear Trials Program for one more year. The program provides financial assistance in the form of vouchers for fishing vessels installing one or two types of gear modifications: 1) a 12” drop chain, and 2) a large mesh belly panel. Both gear types have been tested and proven to be effective in reducing winter flounder bycatch in the small mesh trawling fishery while retaining targeted species such as squid. To date 47 fishing vessels have applied for the vouchers, which can be used at either Superior Trawl in Pt. Judith or Reidars Manufacturing in New Bedford. Vouchers are still available for an additional 25 vessels.

On the research side, Cornell scientists have been working with the captains/crew of the F/V Lightning Bay and F/V Excalibur out of Point Judith, to test the two gear types in the whiting fishery. Preliminary results indicate that the drop chain and belly panel modifications are effective in reducing winter flounder bycatch while retaining whiting. Qualitative information coming back from the fishing vessels participating in the Gear Trials Program is also being compiled.

As the NEFMC moves towards accountability measures such as closed areas, it is becoming increasingly important for the small mesh trawling fleet to participate in programs such as Gear Trials to demonstrate that the fishing industry is taking proactive measures to fish selectively.

To apply for gear vouchers, visit www.geartrials.org or call the CFRF office at (401) 515-4892.

Help demonstrate an alternative to closed areas.

Funded through NOAA Award#NA09NMF4720414
COMMERCIAL FISHERIES RESEARCH FOUNDATION

The Commercial Fisheries Research Foundation (CFRF) is a non-profit, private research foundation founded and directed by members of the commercial fishing industry and other support businesses based in Rhode Island. Its primary mission is to support teams of scientists and fishing industry members working together collaboratively on research and data collection projects important to the fishing industry in the southern New England region.

MESSAGE CORNER:

Welcome to the second edition of the CFRF newsletter. We are proud to acknowledge that 2014 marks the CFRF’s 10th anniversary as a non-profit research foundation. These past 10 years have been filled with hard work, learning, and growth, and the CFRF remains strong in its dedication to carrying out the vision of its original founders. Utilizing a collaborative approach to conduct sound research in support of sustainable fisheries here in the southern New England region seems more important than ever. It is at the heart of supporting a viable, sustainable fishing industry and securing a healthy source of food for our region and beyond. Thank you to all who have contributed to making this fishing industry run research foundation a successful endeavor. We all look forward to the next 10 years.

David Spencer, CFRF President, F/V Nathaniel Lee and Fred Mattera, CFRF Vice-President, NESTCO, Inc.

LOBSTER FLEET UPDATE:

In June 2014, the CFRF entered the second year of its Lobster Research Fleet Pilot Project (“On-Deck Data Program”). Captains and crew members from a fleet of 12 lobster fishing vessels continue to collect and relay biological lobster data from a subsample of their catch. The Google tablets and electronic calipers have been holding up well at sea, and to date biological data for more than 42,000 lobsters has been collected and relayed to a central database. The ASMFC stock assessment scientists have received the first complete year of data, and the data collected in the 2013 time frame is being used in the current lobster stock assessment.

In response to industry’s requests, the On-Deck Data tablet application was modified to enable lobstermen to rate the severity of shell disease and designate when they discard legal size lobsters due to a soft shell or severe shell disease. These details will help provide a more accurate picture of the lobster fishery for those working with the data. At the same time, given the increase in Jonah crab landings and anticipated development of a management plan by the ASMFC, fleet members requested that the On Deck Data program be modified to provide an opportunity to record biological information for Jonah crabs. The Jonah crab component of the On Deck Data program was launched in June 2014, and data from more than 5,200 Jonah crabs has been recorded to date.

A bottom water temperature monitoring component was also added to the Lobster Research Fleet in June 2014. This addition involves each fleet member deploying a temperature sensor on a ventless lobster trap that is kept in the same location for at least one month at a time. When a temperature sensor is retrieved, fleet members transfer and view the data onboard via the “Ocean Temps” tablet application. Within Ocean Temps, fishermen are able to view a time series of temperature readings, record notes, and wirelessly upload data to a central database. Temperature data are beginning to be coupled with the biological lobster data collected at the same location to provide a new perspective on how this critical environmental factor may be affecting the distribution and life history of lobsters.

For more information, please visit the CFRF Lobster Research Fleet project page at:  [http://cfrfoundation.org/lobster-research-fleet](http://cfrfoundation.org/lobster-research-fleet) .

Funded through NOAA Award # NA09NMF4720414 and # NA10NMF4720285

Captain Brian Thibeault, F/V Ashley Ann
SHELLFISH RESEARCH IN NARRAGANSETT BAY:
The team working on the SNECRI research project entitled “An Assessment of Quahog Larval Supply and Distribution in the Upper Narragansett Bay with a Focus on Spawning Sanctuaries and Alternative Area Management Strategies” recently completed their project. The primary research results were included in the team’s final project report posted on the CFRF home website earlier this year. Over the summer months, scientists and students from Roger Williams University continued to work with commercial shellfishermen to assess and calibrate bullraking as a technique to supplement state dredge surveys for stock assessments. A video documentary of this project is expected to be released later this fall. For more information on this project visit: http://cfrfoundation.org/projects/quahoglarval

RESEARCH ON SCUP PROCESSING:
The CFRF continues to work with local processing companies and a manufacturer of seafood processing machinery to investigate if there is machinery available to fillet and debone scup efficiently. Fresh, whole scup have been shipped from RI to the manufacturer and then shipped back for inspection. So far, the results have been promising. The next trial, anticipated to be completed this month, will involve frozen scup. The CFRF staff will review the results with all of the local participating processing companies and seek their feedback on next steps. Scup is currently an underutilized species with marketing potential.

NEW PROJECTS:

Shelf Research Fleet Project:
The CFRF has teamed up with the Woods Hole Oceanographic Institution (WHOI) to begin a two year study aimed at collecting weekly temperature and salinity profiles across the continental shelf south of Rhode Island. The CFRF has organized a fishing vessel research fleet that will collect year-round oceanographic data from six study zones as part of their routine fishing and transiting activities. See adjacent map. In addition, members of the fleet will meet with WHOI scientists periodically to share at sea observations. The project provides an opportunity to better understand how changing environmental conditions are impacting key fishery resource in the region. For more information about this project, please visit: http://cfrfoundation.org/shelf-research-fleet

BOEM Project: Identifying Research Needs and Approaches for Assessing Potential Impacts of Offshore Wind Farm Development on Fisheries Resources in the Northeast Region
The CFRF, in partnership with the federal Bureau of Ocean Energy Management (BOEM), and the Cornell Cooperative Extension Marine Program (Cornell CEMP), has begun a project aimed at soliciting, gathering, and summarizing input from leaders in the commercial fishing industry, and fisheries scientists and managers based in the northeast. Specifically the project is aimed at identifying and reporting on: 1) potential impacts on fisheries resources from offshore wind energy development in the RI/MA and NY BOEM wind energy areas (see adjacent map); and 2) recommended research approaches for impact assessment. The project will focus on potential impacts to commercially and ecologically important fish and invertebrate species inhabiting or migrating through these areas (vs. impacts to commercial fishing activities). The goal is to compile and synthesize the input received into a draft best practices document that outlines standard protocols for monitoring and assessing impacts associated with offshore wind energy development. Ultimately, this effort is aimed at assisting BOEM with its development of guidelines, protocols and regulations for how offshore wind farm development in the northeast will proceed, including aspects such as wind farm micro-siting, design, size, and construction schedule decisions, as well as how fisheries resource impacts will be evaluated once wind farms are operational. A draft project report is planned to be completed by the summer of 2015. For more information about this project or to provide input, please visit: http://cfrfoundation.org/offshore-wind

Funded through NOAA Award # NA08NMF4720595

Funded through NOAA Award # NA09NMF4720414

Funded by the MacArthur Foundation

Funded through BOEM Contract #M14PC00005
CONSERVATION GEAR ENGINEERING PROJECTS:

Winter Flounder Bycatch Reduction:

Since the last newsletter, research projects funded under the CFRF Challenge Grant Program for Conservation Engineering Projects have been coming to completion. The Cornell Cooperative Extension Marine Program staff, working together with the fishing vessels F/V Lightning Bay and F/V Excalibur, have completed preliminary trials aimed at reducing winter flounder bycatch using the 12” drop chain sweep and the large mesh belly panel in the small mesh whiting fishery. Winter flounder bycatch results were inconclusive given the limited available days at sea and the inconsistent amounts of winter flounder in the fishing area, but the testing did show that: 1) The targeted catch (whiting) was retained in experimental nets (i.e. there was no significant difference in whiting or squid catch between the control and experimental nets); 2) Both experimental nets proved to be functionally effective in significantly reducing the quantity of all flounders (including winter flounder); and 3) It is likely that both of these gear types could be effective in reducing winter flounder bycatch in the whiting fishery while retaining the targeted catch, but more rigorous testing is needed. For more information on this project see: http://cfrfoundation.org/gear-trials

The field trials for the project entitled “Testing of a Modified Groundgear to Reduce the Catch of SNE Winter Flounder in the Large Mesh Groundfish Fishery” (Project team: Pingguo He, SMAST, UMass Dartmouth, Natalie Jones, SMAST, UMass Dartmouth, Tor Bendiksen, Reidar’s Manufacturing, and Aaron Williams, F/V Tradition ) have also been completed, and the final results will be reported out in December 2014. The team has been testing an “escape window” approach aimed at triggering the escape behavior of flatfish and juvenile cod while retaining legal size cod. Preliminary analysis indicates that the experimental net design was effective in significantly reducing all bycatch species including winter flounder, but the mean catch of cod was also reduced. For more information on this project see: http://cfrfoundation.org/projects/2012/11/13/testing-of-a-modified-groundgear-to-reduce-the-catch-of-sne-winter-flounder-in-the-large-mesh-groundfish-fishery

Juvenile Butterfish Bycatch Reduction:

In September, 2014 the CFRF issued funding to support two new proof of concept projects aimed at reducing the catch of juvenile butterfish. The two experimental designs include an 8 cm square mesh constructed cod liner and an 8 cm T-90 mesh cod liner. Both designs will be tested onboard the F/V Prevail (Captain Phil Ruhle Jr., vessel owned by SeaFreeze Ltd). Team partners include staff from the Cornell Cooperative Extension Marine Program, Glenn Goodwin of SeaFreeze Ltd., Captain Phil Ruhle Jr., and Jon Knight of Superior Trawl. The sea trials are planned to take place during the fall 2014/winter 2015 time frame, and results will be reported out in the spring of 2015. This project is an example of the commercial fishing industry being pro-active in solving an anticipated conservation problem before it becomes limiting to the butterfish fishery.

WELCOME:

The CFRF staff and Board members offer a warm welcome to Michael Long, CFRF intern, who joined the staff in September 2014. Michael has a bachelor’s degree in Aquaculture and Fisheries Technology from the University of Rhode Island and has plans to continue his education in fisheries. His CFRF work will be focused on the new BOEM and Shelf Research Fleet projects.

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GEAR TRIALS PROGRAM UPDATE:

The Gear Trials Program still has openings available for members of the small mesh trawling fleet in the region to apply and receive vouchers to cover the costs of obtaining one or two types of gear modifications to reduce winter flounder bycatch: 1) a 12” drop chain sweep and 2) a large mesh belly panel. Participation in this program is critical to demonstrating that the industry is being proactive in reducing winter flounder bycatch as the NEFMC moves towards accountability measures such as closed areas. To apply for gear vouchers, visit www.geartrials.org or call the CFRF office at (401) 515-4892.

Reminder: To those who have received vouchers, you need to use the vouchers at either Superior Trawl in Pt. Judith, RI or Reidar’s Manufacturing in New Bedford, MA as quickly as possible or risk losing them. This program will end in the spring of 2015. Unused vouchers will not be honored after that time.

Funded through NOAA Award # NA09NMF4720414

WHAT WE WILL BE SEEKING FUNDING SUPPORT FOR IN THE COMING YEAR:

- Research aimed at reducing uncertainties in black sea bass stock assessments
- Continued funding for the On-Deck Data Program beyond May 2015 to collect much needed biological data for lobster and Jonah crab, and bottom water temperature data
- Research to further develop technology for industry-based data collection
- Development of the fishing vessel research fleet approach in other fisheries
- Scup processing and marketing research
- Conservation gear engineering projects aimed at reducing the catch of juvenile butterfish
- Further testing and verification of “flounder friendly” gear approaches in the small mesh trawl fisheries
- Increased ocean monitoring to properly identify in situ conditions and possible impacts of climate change on fisheries
COMMERCIAL FISHERIES RESEARCH FOUNDATION

The Commercial Fisheries Research Foundation (CFRF) is a non-profit, private research foundation founded and directed by members of the commercial fishing industry and other support businesses based in Rhode Island. Its primary mission is to support teams of scientists and fishing industry members working together collaboratively on research and data collection projects important to the fishing industry in the southern New England region.

MESSAGE CORNER:

Welcome to the third edition of the CFRF newsletter. This edition is dedicated to reporting on the major projects the CFRF staff and Board members have been directly engaged in during the past couple of years. They highlight our dedication to engaging in strategic projects important to the fishing industry based here in the southern New England region. They range from research fleets, to better utilization of an underutilized species, to forward looking conservation engineering initiatives, to assessing potential impacts on fisheries resources from offshore wind development, and are all centered on providing opportunities for members of our industry to work collaboratively with fisheries managers and scientists. Thank you to all of you who have participated in these projects, and to those who continue to support this foundation and maintain an interest in its work.

David Spencer, CFRF President, F/V Nathaniel Lee and Fred Mattera, CFRF Vice-President, NESTCO, Inc.

RESEARCH ON SCUP PROCESSING:

The CFRF completed its initial work on scup processing, focusing on investigating the most appropriate and cost effective means of filleting and packaging this hard to work with species in order to produce enough yield in the form needed to be marketable. The project was done in collaboration with three local Rhode Island processing companies, Seafreeze Ltd, Sea Fresh USA, Inc., and The TownDock, and a manufacturing company, Pisces Fish Machinery Inc., based in Wells, Michigan. Findings showed that Pisces was able to use existing machinery to develop a lineup of machinery able to process whole scup into boneless, skinless fillets. The lineup works best with fresh scup but can also be used on frozen scup effectively if the scup are de-frosted to a temperature of just 31-32 degrees F. The machinery is able to process about 30 fish/minute, with an estimated water usage of between 12-15 gallons/minute. Processing results in fillets averaging 4-5 ounces, with a yield on the order of 30-35% depending on the size of the scup. The results of the processing research are promising but additional challenges remain including limited waste water disposal options in Quonset Pt. and Pt. Judith, and low market demand resulting in low prices.

The CFRF partnered with the chefs and students at Johnson & Wales University and the RI Sea Grant Program to sponsor the RI Seafood Challenge on April 10, 2015. Scup was featured, and teams of students competed for top prize in a scup cook off challenge. Fishermen participated in a panel to discuss how they harvest scup. The event was an important opportunity to showcase this underutilized species, as well as the local commercial fishing industry.

For more information on this project see http://cfrfoundation.org/scup .

Funded through NOAA Award # NA09NMF4720414
Shelf Research Fleet Project Update:

The CFRF and Woods Hole Oceanographic Institution (WHOI) launched the Shelf Research Fleet project in October 2014. A fleet of nine fishing vessels has been collecting oceanographic data from across the continental shelf south of New England since then. Participant fishermen use Conductivity, Temperature, and Depth instruments (CTDs) and iPads to conduct water column profiles, view their data, and communicate data to WHOI and CFRF partners. Oceanographic data are processed and posted online in near real time (see: http://science.whoi.edu/users/seasonal/cfrfwhoi). Despite a number of technical difficulties, the Shelf Research Fleet has collected over 70 water column profiles from across the study area. To date, the following vessels have contributed oceanographic data: F/V Aces High (Point Judith, RI), F/V Cailyn Grace (Sakonnet Point, RI), F/V Debbie Ann (Point Judith, RI), F/V Heather Lynn (Point Judith, RI), F/V Mister G (Point Judith, RI), F/V Timberwolf (Point Judith, RI), and F/V Excalibur (Newport, RI). In April, members of the Shelf Research Fleet met with WHOI scientist, Glen Gawarkiewicz, to discuss recent oceanographic conditions and to share at-sea observations. Discussions focused on recent intrusions of warm, salty slope water to the inner shelf south of Rhode Island, formation and entrainment of Gulf Stream warm core rings, severe winter storms, and the impacts of these events on fisheries resources in the region. For more information about this dialog and the Shelf Research Fleet project, please visit: http://cfrfoundation.org/shelf-research-fleet.

Funded by the MacArthur Foundation

BOEM Project Update: Identifying Research Needs and Approaches for Assessing Potential Impacts of Offshore Wind Farm Development on Fisheries Resources in the Northeast Region

The CFRF staff, working in partnership with the federal Bureau of Ocean Energy Management (BOEM) and the Cornell Cooperative Extension Marine Program, spent time over the fall and winter months gathering input from fisheries managers, scientists, and members of the commercial fishing industry on potential impacts to fisheries resources from offshore wind development in 3 northeast BOEM wind energy sites. The information gathered also included input on suggested research approaches to evaluate the impacts. Subject areas discussed included species of concern, potential impacts associated with construction and operational development activities on different life phases, likely environmental and ecological changes, and possible mitigation measures. Recommendations on how to best approach baseline survey work, and longer term monitoring were also received, as well as the process that should be followed in implementing a comprehensive research program. In addition, background research was conducted by the CFRF staff to uncover existing information on potential impacts and research approaches.

The CFRF has compiled the information received into a draft summary report, along with a list of suggested best practice protocols. This document is currently under review by BOEM and is expected to be made available publicly at the end of the summer. The project information is intended to assist BOEM as they develop guidelines and requirements for offshore wind energy developers.

For more information about this project or to provide input, please visit: http://cfrfoundation.org/offshore-wind.

Funded through BOEM Contract #M14PC00005

Lobster Fleet Update:

June 2015 marked the start of the third year of data collection for the CFRF Lobster Research Fleet (“On-Deck Data Program”). Captains and crew members from 12 lobster fishing vessels continue to collect and relay biological lobster and Jonah crab data from a subsample of their commercial catch as well as three ventless traps. To date, biological data for more than 52,000 lobsters and 12,000 Jonah crabs has been collected. All biological data has been communicated to state and federal agencies for application in the 2015 lobster stock assessment and the Jonah crab Fishery Management Plan. The fleet also continues to collect and communicate bottom water temperature data from over 75 locations, ranging from the Gulf of Maine to Hudson Canyon. Early in the year, the On Deck Data program was updated to include the capability to record Jonah crab biological data from ventless traps. This data was requested by and has been communicated to the scientists and managers developing the Jonah crab Fishery Management Plan. This data is critical to answering research questions about Jonah crab size and sex distributions across the southern New England continental shelf.

In June 2015, the CFRF received an award from NOAA’s Saltonstall-Kennedy Grant Program to continue the Lobster Research Fleet project through 2017. As part of this award, the CFRF will work with the Massachusetts Division of Marine Fisheries to assess Jonah crab size at age and size at sexual maturity. The CFRF is extremely pleased to have received this award and looks forward to continuing this collaborative data collection effort between fishermen and scientists.

For more information, please visit the CFRF Lobster Research Fleet project page at: http://cfrfoundation.org/lobster-research-fleet.

Funded through NOAA Award # NA09NMF4720414 and # NA10NMF4720285
CONSERVATION GEAR ENGINEERING PROJECTS:

Juvenile Butterfish Bycatch Reduction:

Over the winter months, the field trials for the proof of concept project entitled "Improvement of Trawl Net Selectivity in the Directed Butterfish Fishery Using Square Mesh and T-90 Codend Liners to Reduce Juvenile Butterfish" aimed at reducing the catch of juvenile butterfish was completed. Team partners included Captain Phil Ruhle Jr (F/V Prevail owned by Seafreeze, Ltd.), staff from the Cornell Cooperative Research Marine Program, and Jon Knight. The two experimental designs tested included an 8cm square mesh constructed cod liner and an 8cm T-90 mesh cod liner. A trawl net was modified to accommodate a “trouser trawl” design to tow the control and experimental codends simultaneously. Since 50% of butterfish are mature at 12 cm, the project goal was to determine the effectiveness of each of the experimental designs at reducing the capture of 12 cm butterfish by a minimum of 50%.

Final results from this proof of concept phase indicated a significant difference in the catch weights of butterfish compared to the control codend, and the square mesh codend reduced the catch of 12 cm butterfish by 66.5% and the T-90 codend reduced the catch of 12 cm butterfish by 67.1%. The team concluded that both of these experimental codends show potential to release juvenile butterfish in comparison to the current required codend. The final results of this proof of concept are currently under review by the members of the CFRF Conservation Engineering Review Panel. They will make a final recommendation on whether this work should continue past this proof of concept phase.

The final report for this proof of concept project is posted at http://cfrfoundation.org/projects.

Funded through NOAA Award # NA08NMF4720595

Winter Flounder Bycatch Reduction:

The CFRF has been completing its final phase of its Challenge Grant Program for Conservation Engineering Projects focused on winter flounder bycatch reduction (made possible through efforts by U.S. Senator Jack Reed – D-RI). Field work and submittal of the final report for the one remaining project was completed.

Final results for the project entitled “Testing of a Modified Groundgear to Reduce the Catch of SNE Winter Flounder in the Large Mesh Groundfish Fishery” (Project team: Pingguo He, Natalie Jones, Christopher Rillahan, SMAST, UMASS Dartmouth; Tor Bendiksen, Reidar’s Manufacturing; and Aaron Williams, F/V Tradition) indicated that the experimental gear containing “escape windows” located along the length of the groundgear was successful in reducing winter flounder, but the mean catch of the targeted species (cod) was also reduced significantly. However, the experimental net caught less small cod indicating that additional modifications to the groundgear may further reduce the loss of legal size Atlantic cod.

The final report for this project is posted at http://cfrfoundation.org/projects.

Funded through NOAA Award # NA09NMF4720414

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GEAR TRIALS PROGRAM UPDATE:

The Gear Trials Program has been brought to a close, and has been successful in assisting local fishermen in being proactive in reducing unwanted winter flounder bycatch in the southern New England stock area. Under this program, as part of the CFRF Challenge Grant Program for Conservation Engineering Projects, the CFRF issued vouchers to active members of small mesh trawling fleet in the region for purchase of either one or both successfully tested gear modifications to reduce winter flounder bycatch: 1) a 12” drop chain sweep and 2) a large mesh belly panel. By the close of the program, some 63 fishing vessels had been issued vouchers. Initial feedback indicated that fishing vessel captains were finding the gear to be effective in reducing winter flounder bycatch in a number of fishing situations in the small mesh trawl fisheries. Additional fishermen feedback is being compiled by the Cornell Cooperative Extension Marine Program staff, and will be posted in a final report issued later this summer.

A documentary video about this project can be viewed at [http://cfrfoundation.org/gear-trials](http://cfrfoundation.org/gear-trials).

Funded through NOAA Award # NA09NMF4720414

RESEARCH PRIORITIES FOR THE COMING YEAR:

- Continued work on better utilization of scup
- Continuation of Shelf Research Fleet oceanographic data collection
- Continuation of the On-Deck Data Program – lobster and Jonah crab fleet
- Development of an industry based research fleet for quahog data collection
- Data collection to support new modeling approaches for black sea bass
- Continued evaluation of impacts on fisheries resources in the northeast BOEM Wind Energy Areas
COMMERCIAL FISHERIES RESEARCH FOUNDATION

The Commercial Fisheries Research Foundation (CFRF) is a non-profit, private research foundation founded and directed by members of the commercial fishing industry and other support businesses based in Rhode Island. Its primary mission is to support teams of scientists and fishing industry members working together collaboratively on research and data collection projects important to the fishing industry in the southern New England region.

MESSAGE CORNER:

Welcome to the third edition of the CFRF newsletter. This edition is dedicated to reporting on the major projects the CFRF staff and Board members have been directly engaged in during the past couple of years. They highlight our dedication to engaging in strategic projects important to the fishing industry based here in the southern New England region. They range from research fleets, to better utilization of an underutilized species, to forward looking conservation engineering initiatives, to assessing potential impacts on fisheries resources from offshore wind development, and are all centered on providing opportunities for members of our industry to work collaboratively with fisheries managers and scientists. Thank you to all of you who have participated in these projects, and to those who continue to support this foundation and maintain an interest in its work.

David Spencer, CFRF President, F/V Nathaniel Lee and Fred Mattera, CFRF Vice-President, NESTCO, Inc.

RESEARCH ON SCUP PROCESSING:

The CFRF completed its initial work on scup processing, focusing on investigating the most appropriate and cost effective means of filleting and packaging this hard to work with species in order to produce enough yield in the form needed to be marketable. The project was done in collaboration with three local Rhode Island processing companies, Seafreeze Ltd, Sea Fresh USA, Inc., and The TownDock, and a manufacturing company, Pisces Fish Machinery Inc., based in Wells, Michigan. Findings showed that Pisces was able to use existing machinery to develop a lineup of machinery able to process whole scup into boneless, skinless fillets. The lineup works best with fresh scup but can also be used on frozen scup effectively if the scup are de-frosted to a temperature of just 31-32 degrees F. The machinery is able to process about 30 fish/minute, with an estimated water usage of between 12-15 gallons/minute. Processing results in fillets averaging 4-5 ounces, with a yield on the order of 30-35% depending on the size of the scup. The results of the processing research are promising but additional challenges remain including limited waste water disposal options in Quonset Pt. and Pt. Judith, and low market demand resulting in low prices.

The CFRF partnered with the chefs and students at Johnson & Wales University and the RI Sea Grant Program to sponsor the RI Seafood Challenge on April 10, 2015. Scup was featured, and teams of students competed for top prize in a scup cook off challenge. Fishermen participated in a panel to discuss how they harvest scup. The event was an important opportunity to showcase this underutilized species, as well as the local commercial fishing industry.

For more information on this project see http://cfrfoundation.org/scup.
The CFRF and Woods Hole Oceanographic Institution (WHOI) launched the Shelf Research Fleet project in October 2014. A fleet of nine fishing vessels has been collecting oceanographic data from across the continental shelf south of New England since then. Participant fishermen use Conductivity, Temperature, and Depth instruments (CTDs) and iPads to conduct water column profiles, view their data, and communicate data to WHOI and CFRF partners. Oceanographic data are processed and posted online in near real time (see: http://science.whoi.edu/users/season/cfrfwhoi). Despite a number of technical difficulties, the Shelf Research Fleet has collected over 70 water column profiles from across the study area. To date, the following vessels have contributed oceanographic data: F/V Aces High (Point Judith, RI), F/V Cailyn Grace (Sakonnet Point, RI), F/V Debbie Ann (Point Judith, RI), F/V Heather Lynn (Point Judith, RI), F/V Mister G (Point Judith, RI), F/V Timberwolf (Point Judith, RI), and F/V Excalibur (Newport, RI). In April, members of the Shelf Research Fleet met with WHOI scientist, Glen Gawarkiewicz, to discuss recent oceanographic conditions and to share at-sea observations. Discussions focused on recent intrusions of warm, salty slope water to the inner shelf south of Rhode Island, formation and entrainment of Gulf Stream warm core rings, severe winter storms, and the impacts of these events on fisheries resources in the region. For more information about this dialog and the Shelf Research Fleet project, please visit: http://cfrfoundation.org/shelf-research-fleet.

Funded by the MacArthur Foundation

BOEM Project Update: Identifying Research Needs and Approaches for Assessing Potential Impacts of Offshore Wind Farm Development on Fisheries Resources in the Northeast Region

The CFRF staff, working in partnership with the federal Bureau of Ocean Energy Management (BOEM) and the Cornell Cooperative Extension Marine Program, spent time over the fall and winter months gathering input from fisheries managers, scientists, and members of the commercial fishing industry on potential impacts to fisheries resources from offshore wind development in 3 northeast BOEM wind energy sites. The information gathered also included input on suggested research approaches to evaluate the impacts. Subject areas discussed included species of concern, potential impacts associated with construction and operational development activities on different life phases, likely environmental and ecological changes, and possible mitigation measures. Recommendations on how to best approach baseline survey work, and longer term monitoring were also received, as well as the process that should be followed in implementing a comprehensive research program. In addition, background research was conducted by the CFRF staff to uncover existing information on potential impacts and research approaches.

The CFRF has compiled the information received into a draft summary report, along with a list of suggested best practice protocols. This document is currently under review by BOEM and is expected to be made available publicly at the end of the summer. The project information is intended to assist BOEM as they develop guidelines and requirements for offshore wind energy developers.

For more information about this project or to provide input, please visit: http://cfrfoundation.org/offshore-wind.

Funded through BOEM Contract #M14PC00005

LOBSTER FLEET UPDATE:

June 2015 marked the start of the third year of data collection for the CFRF Lobster Research Fleet (“On-Deck Data Program”). Captains and crew members from 12 lobster fishing vessels continue to collect and relay biological lobster and Jonah crab data from a subsample of their commercial catch as well as three ventless traps. To date, biological data for more than 52,000 lobsters and 12,000 Jonah crabs has been collected. All biological data has been communicated to state and federal agencies for application in the 2015 lobster stock assessment and the Jonah crab Fishery Management Plan. The fleet also continues to collect and communicate bottom water temperature data from over 75 locations, ranging from the Gulf of Maine to Hudson Canyon. Early in the year, the On Deck Data program was updated to include the capability to record Jonah crab biological data from ventless traps. This data was requested by and has been communicated to the scientists and managers developing the Jonah crab Fishery Management Plan. This data is critical to answering research questions about Jonah crab size and sex distributions across the southern New England continental shelf.

In June 2015, the CFRF received an award from NOAA’s Saltonstall-Kennedy Grant Program to continue the Lobster Research Fleet project through 2017. As part of this award, the CFRF will work with the Massachusetts Division of Marine Fisheries to assess Jonah crab size at age and size at sexual maturity. The CFRF is extremely pleased to have received this award and looks forward to continuing this collaborative data collection effort between fishermen and scientists.

For more information, please visit the CFRF Lobster Research Fleet project page at: http://cfrfoundation.org/lobster-research-fleet.

Funded through NOAA Award # NA09NMF4720414 and # NA10NMF4720285
CONSERVATION GEAR ENGINEERING PROJECTS:

Juvenile Butterfish Bycatch Reduction:

Over the winter months, the field trials for the proof of concept project entitled "Improvement of Trawl Net Selectivity in the Directed Butterfish Fishery Using Square Mesh and T-90 Codend Liners to Reduce Juvenile Butterfish" aimed at reducing the catch of juvenile butterfish was completed. Team partners included Captain Phil Ruhle Jr (F/V Prevail owned by Sea freeze, Ltd.), staff from the Cornell Cooperative Research Marine Program, and Jon Knight. The two experimental designs tested included an 8cm square mesh constructed cod liner and an 8cm T-90 mesh cod liner. A trawl net was modified to accommodate a “trouser trawl” design to tow the control and experimental codends simultaneously. Since 50% of butterfish are mature at 12 cm, the project goal was to determine the effectiveness of each of the experimental designs at reducing the capture of 12 cm butterfish by a minimum of 50%.

Final results from this proof of concept phase indicated a significant difference in the catch weights of butterfish compared to the control codend, and the square mesh codend reduced the catch of 12 cm butterfish by 66.5% and the T-90 codend reduced the catch of 12 cm butterfish by 67.1%. The team concluded that both of these experimental codends show potential to release juvenile butterfish in comparison to the current required codend. The final results of this proof of concept are currently under review by the members of the CFRF Conservation Engineering Review Panel. They will make a final recommendation on whether this work should continue past this proof of concept phase. The final report for this proof of concept project is posted at http://cfrfoundation.org/projects.

Funded through NOAA Award # NA08NMF4720595

Winter Flounder Bycatch Reduction:

The CFRF has been completing its final phase of its Challenge Grant Program for Conservation Engineering Projects focused on winter flounder bycatch reduction (made possible through efforts by U.S. Senator Jack Reed – D-RI). Field work and submittal of the final report for the one remaining project was completed. Final results for the project entitled “Testing of a Modified Groundgear to Reduce the Catch of SNE Winter Flounder in the Large Mesh Groundfish Fishery” (Project team: Pingguo He, Natalie Jones, Christopher Killahan, SMAST, UMASS Dartmouth; Tor Bendiksen, Reidar’s Manufacturing; and Aaron Williams & Tom Williams, Sr., F/V Tradition) indicated that the experimental gear containing “escape windows” located along the length of the groundgear was successful in reducing winter flounder, but the mean catch of the targeted species (cod) was also reduced significantly. However, the experimental net caught less small cod indicating that additional modifications to the groundgear may further reduce the loss of legal size Atlantic cod.

The final report for this project is posted at http://cfrfoundation.org/projects.

Funded through NOAA Award # NA09NMF4720414

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COMMERCIAL FISHERIES RESEARCH FOUNDATION  
JULY 2015 NEWSLETTER  
www.cfrfoundation.org
GEAR TRIALS PROGRAM UPDATE:

The Gear Trials Program has been brought to a close, and has been successful in assisting local fishermen in being proactive in reducing unwanted winter flounder bycatch in the southern New England stock area. Under this program, as part of the CFRF Challenge Grant Program for Conservation Engineering Projects, the CFRF issued vouchers to active members of small mesh trawling fleet in the region for purchase of either one or both successfully tested gear modifications to reduce winter flounder bycatch: 1) a 12" drop chain sweep and 2) a large mesh belly panel. By the close of the program, some 63 fishing vessels had been issued vouchers. Initial feedback indicated that fishing vessel captains were finding the gear to be effective in reducing winter flounder bycatch in a number of fishing situations in the small mesh trawl fisheries. Additional fishermen feedback is being compiled by the Cornell Cooperative Extension Marine Program staff, and will be posted in a final report issued later this summer.

A documentary video about this project can be viewed at http://cfrfoundation.org/gear-trials.

RESEARCH PRIORITIES FOR THE COMING YEAR:

- Continued work on better utilization of scup
- Continuation of Shelf Research Fleet oceanographic data collection
- Continuation of the On-Deck Data Program – lobster and Jonah crab fleet
- Development of an industry based research fleet for quahog data collection
- Data collection to support new modeling approaches for black sea bass
- Continued evaluation of impacts on fisheries resources in the northeast BOEM Wind Energy Areas

Funded through NOAA Award # NA09NMF4720414
Appendix F:

Issued April 11, 2012

Request for Application

To conduct research under the program entitled

“Gear Trials – Reduction of Winter Flounder Bycatch”

A program to assist industry with utilizing and further testing of two gear types – large mesh belly panel and drop chain- that are designed to reduce winter flounder bycatch in the southern New England stock area. The financial assistance component of the program will assist fishing vessel owners with acquiring the gear. The research component will extend the research conducted under the proof of concept and full proposal phases of the CFRF sponsored Challenge Grant Program for Conservation Engineering Projects, encompassing both qualitative observations reported by fishermen and quantitative analyses conducted by scientists onboard commercial fishing vessels.

A project supported by the

Commercial Fisheries Research Foundation

Funding provided by
NOAA Award # NA09NMF4720414

Project Duration: June 2012 through December 2013

Research Budget Limit (not including fishing vessel allotment): $120,000

Application Deadline: May 4, 2012 – 5:00 PM

Contact:

Peg Petruny-Parker, Executive Director
Commercial Fisheries Research Foundation
P.O. Box 278
Saunderstown, RI 02874
Phone: (401) 515-4662
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I. Project Description:
Background Information

Since the fall of 2009, the Commercial Fisheries Research Foundation (CFRF) has been administering a “Challenge Grant Program for Conservation Engineering Projects – Winter Flounder Bycatch Reduction” (Challenge Grant Program) that has been aimed at developing tools for fishermen to avoid unwanted winter flounder bycatch in the southern New England stock area. As a result of this research program, two gear types, the large mesh belly panel and the drop chain, have been demonstrated, through both proof of concept and full proposal stages of research, to be effective in reducing winter flounder bycatch in the small mesh squid trawl fishery.

In the next phase of the overall Challenge Grant Program, the “Gear Trials Program”, the CFRF will offer financial assistance to fishing vessels owners based in the southern New England region willing to install the gear types on their fishing vessels and test their performances in other small mesh trawl fishing circumstances including the squid, whiting and scup fisheries. The intent of this phase is to build on the promising research results to date by providing industry members with an opportunity to try these gear types in a wider range of applications. Additional feedback from industry members will enable researchers to compile further information on whether this type of gear is useful to different size fishing vessels, and in other small mesh fisheries, and if there are additional ways to improve its effectiveness. The Gear Trials Program is also intended to provide an opportunity to combine both qualitative and quantitative information, and to relay those observations back to the commercial fishing industry. It follows the strategy of seeking to provide more information on a set of tools that fishermen may utilize as they seek to diminish unwanted bycatch of winter flounder.

Overall Goals and Objectives

The overall goals and objectives of the Gear Trials Program include the following:

5. To financially assist fishing vessel owners with utilizing two gear types - large mesh belly panel and drop chain - aimed at reducing winter flounder bycatch in the SNE stock area;
6. To extend the proof of concept and full proposal research done under the Challenge Grant Program for Conservation Engineering Projects by observing the effectiveness of these gear types in reducing winter flounder bycatch in other types of small mesh trawl fishing situations;
7. Utilize both fishermen qualitative observations and additional quantitative measurements by researchers to extend the research record on these two gear types and communicate this information back to fishing industry members.

Major Work Components of Gear Trials Program

The major components of the Gear Trials Program include the following:

A. Financial assistance – This will be based on the administration of a voucher system to qualified participating fishing vessel owners for purchase of one or both of the two types of gear being
tested further. Participating fishing vessel owners will be able to use vouchers as store credit with net builders/gear suppliers who have an established work agreement under this program with the CFRF.

B. Qualitative observations by fishermen – Participating fishing vessel owners will be required to report back on a monthly basis via survey form on their observations about gear performance. This reporting will be assisted by providing a standard reporting form that participants can fill in and return. This may be supplemented with some verbal dockside interviews with a subset of participants.

C. Quantitative data collection - This data will be collected by the chosen research team via onboard research on a subset of participating fishing vessels chartered by the CFRF for this phase of the work. CFRF plans include involving 4 fishing vessels (2 inshore and 2 offshore) who will enter into work agreements with the CFRF. Comparison tows will be conducted aiming for 6 days in the spring and 6 in the fall (total of 12 research days to further test each type of gear) targeting the whiting and scup small mesh fisheries.

D. Outreach– This work component will be aimed at providing outreach at the beginning of the program to inform industry of the opportunity, and at the end to share observations, and an overview of the data collected, the analysis, and the summary of findings.

E. Administrative tasks – This will involve direct communication with a pool of potential industry participants (based on qualifying criteria developed by the CFRF), processing of applications, issuing of acceptances into program, working with a subset of fishing vessels engaged in the quantitative research element, participation in the outreach efforts in the beginning and end of the program, development and submittal of progress and financial reports to NOAA under Award # NA09NMF4720414, and the development of a project website for participant interactions and the posting of interim results.

The work components listed above will be carried out by both the CFRF staff and its Board of Directors, and a research team chosen under this Request for Application. The chosen research team will be responsible for carrying out sections B, C, D listed while the CFRF will be responsible for sections A, and E.

The rest of this Request for Application gives further detail on Sections B, C, and D.

Work Tasks - Project Research Team

In carrying out Sections B, C, and D (qualitative observations by fishermen, quantitative data collection, and outreach) the research team will be required to complete the following list of work tasks:

12. Develop a proposal (application to do the work) and project budget for submittal back to the CFRF;
13. Develop and distribute a flyer explaining the program at the major fishing ports of Pt. Judith, Montauk, New Bedford, Stonington, and working with CFRF staff in providing assistance in developing an outreach article for inclusion in the Commercial Fisheries News;
14. Develop survey form for qualitative component (fishermen reported observations regarding how gear is performing);
15. Compile, analyze, and report on the qualitative data reported by fishermen;
16. Conduct supplemental dockside interviews with a subset of fishermen participating in program and summarize these interviews;
17. Field work - Work onboard 4 fishing vessels to conduct comparative tows for the quantitative research component of program (12 days at sea total);
18. Compile, analyze, and report on the data from the quantitative research component conducted onboard fishing vessels;
19. Conduct underwater video of gear performance during onboard research component;
20. Compile, analyze, and report on the data from the quantitative research component conducted onboard fishing vessels;
21. Develop of newsletters to be mailed out to program participants to convey information being reported (1-2 times over course of study year);
22. Develop and submit final summary report on program work;
23. Participate in outreach/discussion session at end of program to present general overview of results;
24. Present results to New England and Mid-Atlantic Councils;
25. Submit semi-annual progress report to CFRF summarizing status of work;
26. Work with CFRF to submit pictures, information for use on project website.

Role of CFRF

The chosen research team will coordinate their work with the CFRF staff throughout the project. The CFRF staff, working with the CFRF Board of Directors will be responsible for carrying out the following work tasks:

1. Establishment of work agreements and approved budgets with Project research team and fishing vessels participating in quantitative data collection component;
2. Establishment of qualifying criteria for participation;
3. Establishment of potential pool of participants and contact information based on qualifying criteria;
4. Development of written communications to:
   a. Announcement program to fishing industry (fishing vessels and gear providers)
   b. Provide for application to participate
   c. Outreach to net builders/gear providers to provide opportunity to enter into work agreement with CFRF;
5. Receipt of applications/review/determination of participants for gear receipt
6. Receipt of applications/review/determination of fishing vessel owners for participation in research with scientists onboard;
7. Establishment of Project website
   a. Information about program
b. Interactive portion to handle vouchers/gear provider reports
c. Data collection part of program
d. Online application option
e. Online reporting option;
8. Issuance of vouchers (two options – large mesh belly panel and drop chain);
9. Development and maintenance of project website;
10. Monitoring of transactions;
11. Payment of monthly invoices – reimbursements to participating net builders/gear providers;
12. Review of semi-annual progress and final reports from project research team;
13. Assistance with logistical arrangements of outreach sessions at beginning and end of program;
14. Submittal of progress report to NMFS for NOAA Award #NA09NMF4720414.

Timeline for Program

1. April - May 2012 – Submittal of application from research team and finalization of work agreement and project budget
2. April – May 2012 – Development of notification materials, set up project website, work agreements with participating net builders
3. June – August 2012 – launch program with industry – application period

Total Budget Allotment for Project Research Team

The total budget allotment for the Project Research Team is $120,000. This includes costs for the following:

- Salaries/wages/benefits
- Travel
- Equipment
- Supplies/equipment
- Indirect costs (not to exceed 25% of total direct project costs)

Budget allotment for 4 fishing vessels chosen to participate in the research component of program will be administered directly through Work Agreements with the CFRF. The budget allotment for this component is separate from the $120,000.

II. Procedures for Applying

Application Information – Project Research Team is asked to supply the following information:
1. **Identification of Project Research Team** – List of Project Research Team members and their roles

2. **Work Plan** – A detailed outline of the planned scope of work and timeline to complete the project work tasks described above

3. **Experience** – A summary of the experience the Project Research Team brings to the project (Note: Resumes for each Project Team member should be attached separately).

4. **Proposed Project Budget** – Proposed project budget must be within the total allocated budget amount of $120,000. The proposed budget should present costs in the categories of salaries/wages/benefits; travel; equipment; supplies, and indirect costs and should include a budget justification to explain line items.

Application Length: Applications must be limited to a total of 8 pages (single spaced, minimum of a 11 font size, normal margins) including the title and budget pages but not including attachments such as resumes.

Format: Single spaced, at least a size 11 font, normal margins in pdf format.

Submittal of application - One copy submitted electronically to Peg Parker at pparker@cfrfoundation.org

Deadline for submittal: May 4, 2012 - 5:00 PM

**III. Other information**

Final decision – The CFRF Executive Committee will review the application and notify the submitting project research team if there are any outstanding questions. Upon approval of the members of the Executive Committee, a recommendation will be forwarded to the full Board of Directors of the CFRF for final approval. This process is anticipated to be completed by the middle of May 2012.
Appendix G:

GEAR TRIALS PROGRAM
SUMMARY OF RESEARCH PROTOCOLS

QUANTITATIVE DATA COLLECTION

To expand on the knowledge and achievements made in the proof of concept and full proposal research done under the Challenge Grant Program for Conservation Engineering Projects, Cornell Cooperative Extension (CCE) will conduct an at-sea experimental fishing component to the Gear Trials Program. This portion of the work will be approached as a Proof of Concept experimental fishery phase. The goal of the at-sea research component is: To demonstrate what the potential is, for two different conservation gear modifications, to reduce winter flounder bycatch in the small mesh trawl fishery for whiting in the southern New England winter flounder inshore stock area. The two gear types to be tested are the 12” drop chain sweep and the large mesh belly panel.

Data will be collected onboard two commercial fishing vessels targeting whiting. Paired tows will be conducted using the large mesh belly panel and the 12” drop chain sweep (experimental) against a standard small mesh trawl (control). A detailed description of this evaluation follows.

Research Design:

The experimental design proposed is intended to test the large mesh belly panel and 12” drop chain sweep with a 24” headrope adjustment in the commercial small mesh whiting fishery using existing gear and typical fishing practices. The team will test for differences in both the target species catch and protected winter flounder species of concern. The team will test across appropriate identified strata of time, depth, area, fishing practices and fishing vessel size and power. Two, similar size and horsepower vessels (60-70’ vessels; 450-600 HP with identical fishing nets, doors, legs, ground cable) will be chosen by the CFRF from a pool of applicants to work with CCE on the quantitative data collection portion of the project. These vessels will enter into direct Work Agreements with the CFRF and receive compensation for their participation separately through the CFRF. These vessels will be representative of the small mesh whiting trawl fleet and chartered as a research platform to compare the experimental nets to a control net.

The unaltered trawl nets (control nets) will be identical on both vessel and will be typical of the small mesh nets used in the whiting fishery along the east coast of the US. The two participating captains will have extensive experience fishing for whiting in the project areas and will work cooperatively to accomplish all project goals. CCE will work with the vessel boat captains and the CFRF Board of Directors to confirm that the study area at the time of the fieldwork will be the best geographic location for testing the two types of gear. The geographic area will be chosen based on confirmed empirical fisherman knowledge that winter flounder and whiting will likely both be present during the designated study time. The tentative general fishing area will likely be the “Deep Hole” area – east of Block Island. (Note: This area has a history of a concentration of whiting in the late summer months (August – September).
Tow procedure will have each vessel essentially fish as it would in a standard commercial fishing trip, with the exception that all tows will be 1 hour in length. The standard control net is the one that the vessel would normally use in its standard commercial whiting trip. The two fishing vessels will have identical nets, and will each have just one net that they will make adjustments to in order to move from a control to an experimental design. The drop chains in the control net are to be 2 links plus a shackle connected to the traveler with 4 chain links hanging – this will be switched to an experimental design by changing the links to 6 links plus a shackle connected to the traveler (= 12” drop chain length). Both vessels will use the ‘2 links plus the shackle connected to the traveler with 4 hanging’ as the control net in order to provide consistency of the sweep between the control net on each vessel. For the large mesh belly panel design, the large panels will be sewn in place with 5” mesh laced over the large mesh area for the control. For the experimental design the 5” mesh will be removed leaving the 32” mesh panel exposed as the experimental design.

The two vessels will tow the gear side by side in the designated study area while fishing for whiting. Each vessel will have just one test gear type onboard (12” drop chain or the large mesh belly panel) incorporated within the control net as described above, and will follow an alternating testing pattern. Comparison tows will be accomplished as the vessels fish side by side as the vessels switch from control to experimental nets. One vessel will use the control and one vessel will use the experimental on each tow as described below.

### Test Design

<table>
<thead>
<tr>
<th>Vessel 1 and Vessel 2 (towing side by side)</th>
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</thead>
<tbody>
<tr>
<td>A= Control fishing net</td>
<td>B= Experimental net</td>
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</table>

#### Vessel 1– Testing 12” Drop Chain

<table>
<thead>
<tr>
<th>A</th>
<th>B</th>
<th>Comparison tows</th>
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<tbody>
<tr>
<td>B</td>
<td>Variable</td>
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#### Vessel 2- Testing Large Mesh Panel

<table>
<thead>
<tr>
<th>A</th>
<th>B</th>
<th>Variable</th>
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<tr>
<td>B</td>
<td>A</td>
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</table>

Tows will be made oriented along slope. We will use the coupled ABBA-BAAB protocol described above throughout each trip. To minimize any bias, the control and experimental nets will be fished using the alternative paired method whereby the control and experimental nets are paired and the nets are switched according to an ABBA protocol (DeAlteris and Castro 1991, King et al. 2009). The coupled ABBA-BAAB protocol will have 1 vessel use the ABBA sequence and the other use the BAAB.
sequence. That way on every tow one vessel will be fishing a control net to which the other vessel’s experimental net will be compared. We can also compare the alternate hauls of each vessel by individual vessel. On the next fishing day the sequence will be reversed where the vessel that had the ABBA sequence will next use the BAAB sequence. If an even number of tows are completed in a day, on the subsequent day (or trip) the pairs will be reversed to reduce any bias that could result from varying catches related to time-of-day differences. This method will also reduce the number of net changes required thus maximizing at-sea time. The coupled ABBA sequence is the best approach to use. The paired tows will fish side by side within a half-mile of each other. After haul-back of one tow, the vessel will turn around and make the same tow in the opposite direction with the next net in the ABBA sequence. This will maximize the number of tows to be made per trip. Also by using the ABBA protocol tows over the same ground, depth (and temperature) within each trip (and over the experiment) will be randomized and will thus normalize the data relative to depth (and temperature). Since the team does not know how fish are oriented relative to any depth gradient that may exist along the tow, depth affect will be randomized. The towpath or track will be moved or changed only if necessary due to changes or movement of fish concentrations, at the end of a tow-block sequence.

**Number of trips and tows:**

The team will conduct 6 scientific trips. Each scientific trip is defined as one day at sea for 2 vessels. This will result in a total of 12 scientific trips. Each vessel will make 6 tows per day consisting of 1 hour in duration per day. Six tows per scientific trip will equal a total of 72 tows (36 with the control net and 36 total experimental nets (18 per treatment)). This research design maximizes the quantitative data collection component of this program.

**Timing:**

The proposed experimental sampling will focus on the Fall of 2012. This time period coincides with the normal activities of the small mesh fisheries for whiting and (highest likely) co-occurrences with winter flounder. CCE will conduct research trips in the fall targeting whiting in the SNE winter flounder inshore stock area.

**Area and Fishing Practice:**

The operational plan will be based on information from the active fishermen, NEFSC trawl surveys, observer data and landings reports. The vessels will operate with one net switching back and forth between the chosen modifications. Evaluation of the control and experimental tows will be based on differences in catch of winter flounder with scup or whiting retention and total catch. Catch levels for all species will be collected. One-hour tow durations will be used during this study to maximize the number of tows conducted per trip and still remain within the range of commercial tow durations (1-3 hours). Specific fishing practice adjustments will be discussed and agreed upon by project partners and will be as follows: tow speed of 3 knots and a 2.5-3.0:1 wire to depth ratio scope range for inshore tows. The headrope for both the control net and the experimental net with the belly panel will be set on even. The headrope will be lengthened 24” only on the experimental net with the 12” drop chain sweep. The experimental 12” drop chain sweep is in three pieces consisting of the two wings and center sections. The sweep will be lengthened by 2 feet (one foot per side) to get the sweep to fall behind the bottom hanging line. The two-foot extension will be removed when using the net as the control. The actual scope will be determined and coordinated by the vessel captains based on the area fished and the normal tow warp used at that depth of water. The team has offered a standard range used by inshore vessels. CCE will
coordinate with captains prior to gear deployment in order to keep the scope similar from tow to tow. These fishing practice adjustments will be consistent between vessels.

The study vessels will depart from commercial ports of chartered vessels in NY and RI. During the fall whiting will be targeted in depths of 20-30 fathoms. Fish movements, captain’s knowledge and normal fishing activity will determine specific areas as described above.

On Board Catch Processing:

The onboard catch processing procedure will follow standard NMFS survey methods as described below (NEFSC, 1988). The target is winter flounder catch relative to quantifying differences in the retention between control and experimental nets. As such, total catch of winter flounder for each tow of both nets will be accurately weighed. Winter flounder will also be sampled for length frequency. The goal will be minimally 100 random length measurements per tow. If fewer individuals are caught, all will be measured. The team will also quantify the catch of winter flounder in terms of numbers as well as weights. This will be accomplished by actually counting the fish (if the catch is small) or by utilizing the number of individuals in our length frequency and the weight of that sample extrapolated over the entire winter flounder catch. Since The team also wants to quantify if the catch of whiting is influenced by the experimental net modifications, the total whiting catch will also be weighed on each tow and a length sample of at least 100 individuals will be obtained. The total weight of all additional species in each tow will also be obtained either by direct weighing or by catch estimations. Catch estimations will be based on basket or tote counts. Catch estimations will be made by separating individual species into baskets or totes. An average weight will be determined by weighing a minimum of 3 baskets or totes. Next, a count of the number of baskets or totes will be made for the particular species and this number will be multiplied by the average weight. This number will then be recorded as the estimated total catch weight. This procedure for catch estimations, based on basket or tote counts, follows the NMFS At Sea Monitoring Program and the Observer Program Biological Sampling protocols as outlined in the NEFSC 2010 sampling manuals.

Statistical Analysis:

Statistical analysis will rely on GLM and GAM regression approaches to model bycatch rates and will determine if the avoidance gear 12” drop chain sweep with a 24” headrope adjustment and the large mesh belly panel significantly reduces retention of winter flounder relative to the standard control net. The team anticipates that our data may be non-normal and so we will consider other distributions for the fit as necessary. Dependent variables will be catch weight of winter flounder per tow and the percentiles (25th, 50th, 75th) of the size-frequency distribution. Main effect variables will be net (control and each experimental). The team will also analyze time of day, recognizing that catches of whiting (and thus perhaps winter flounder exclusion) could be affected by time-of-day. Since the objectives are also to evaluate a proportional decrease in winter flounder retention relative to the catch of whiting, and to determine if the avoidance gear adaptations have any effect on target species catch or size selectivity, whiting catch weight per tow and the percentiles (25th, 50th, 75th) of the target species size-frequency distribution will also be used as dependent variables in the analysis. Total catch of all species will be used as a covariate. Total catch used as a covariate allows us to isolate the difference in our dependent variables (winter flounder and whiting catch and length frequency) that are due to the main effects of net, and not due to the change in total catch from one tow to the next. Where necessary, binomial tests will be used to evaluate the likelihood of achieving observed significant differences by chance. Response variables will all be in weights. Counts are useful however in comparing length frequencies as the focus
is on individual fish, so numbers of fish will also be used in the analysis. Also, since both the control and experimental nets are the same (with the exception of the 12” drop chain sweep and the 24” headrope slack or large mesh belly panel) and fished the same, the gear effect is only related to the gear modification. As described above, depth (and temperature) will be randomized and thus the effect should be accounted for.

Underwater Video Recording:

Videotape recordings will be made during as many tows as possible and where conditions permit. A self-contained underwater video camera and recording system will be attached to the net. The video camera and equipment will be loaned to CCE for use in this project by the NEFSC when available. A qualified video technician will train CCE staff on camera use, maintenance and positioning in the net. The technician will be onboard the vessel when available. Due to these variables, The team can not specify the number of tows that will be recorded with video.
Appendix H:

Gear Trials Program
Testing of 12” Drop Chain and Large Mesh Belly Panel
Fishermen Survey Form – Monthly Reporting

Please complete the survey form below with all the appropriate information and submit by fax, e-mail or mail by the first of each month to:

John Scotti/Cornell University Cooperative Extension Marine Program
423 Griffing Avenue, Riverhead, NY 11901
E-Mail: jns8@cornell.edu

You may also fill out and submit the form online by going to: www.geartrials.org. Click on “Submit Survey” at the top of the homepage.

If you have any questions, please contact John Scotti at (631) 727-7850 x 223.

Your Name: ________________________ Vessel: _________________________
Reporting Period (Month and Year): ________________

1. Check the type of bycatch reduction gear have you been using on your fishing vessel during this reporting period:
   _______ 12” drop chain (small vessel category) _______ 12” drop chain (large vessel category)
   _______ large mesh belly panel

2. What small mesh fishery were you targeting?
   _______ squid _______ whiting _______ scup
   _______ other (please name species) _____________________________________

3. What statistical areas did you primarily fish in while using the bycatch reduction gear? ____________

4. Did you make any adjustments or modifications to the gear? If so, how? ________________________
   ___________________________________________________________________________________

5. Under what fishing conditions did you use the bycatch reduction gear? (ex: high incidence of dogfish)
   ___________________________________________________________________________________

6. Did you find the gear to be effective in reducing winter flounder bycatch? _____ Yes _____ No

7. Over the past month, did you observe a reduction in target species when using the bycatch reduction gear? If so, estimate the percent reduction of each target species.
   ___________________________________________________________________________________

8. Over the past month, did you observe a reduction in bycatch species when using the bycatch reduction gear? If so, estimate the percent reduction of each bycatch species.
   ___________________________________________________________________________________

9. Will you continue to use the gear? _____ Yes _____ No

10. Please share any additional observations below.
    ___________________________________________________________________________________
Appendix I:

Gear Trials Program - Testing of 12” Drop Chain and Large Mesh Belly Panel Fishermen Survey Form – Final Reporting

Name: ________________________ Vessel: _________________________

1. Which bycatch reduction gear(s) have you been using on your fishing vessel: __ 12” drop chain (small vessel) __ 12” drop chain (large vessel) __ large mesh belly panel

2. What small mesh fishery were you targeting? __ squid __ whiting __ scup __ other ______

3. What statistical areas did you primarily fish in while using the bycatch reduction gear? ______

4. Overall, did you make any adjustments or modifications to the gear? _____ Yes _____ No If so, how? ____________________________________________________________

5. Under what fishing conditions did you use the bycatch reduction gear? (ex: high incidence of dogfish)

6. Did you find the gear to be effective in reducing winter flounder bycatch? _____ Yes _____ NO

7. Did the gear reduce other types of flounders? _____ Yes _____ No

8. Did you observe a reduction in target species when using the gear? If so, estimate the percent reduction of each target species. ___ Yes ___ No ________________________________

9. Did you observe a reduction in bycatch species when using the gear? If so, estimate the percent reduction of each bycatch species. __Yes ___ No ________________________________

10. Did the gear(s) work best on certain bottoms? ___ Yes ___ No If yes, which bottom?______________

11. Did the gear work best in certain fisheries? __Yes ___No If Yes, which fisheries? ____________________

12. Will you continue to use the gear in the future? _____ Yes _____ No
If yes, will these gears be used permanently or randomly based on the fishery and bottom?

13. Was this your first set of drop chains or a replacement (RI fluke fishery pilot project)?
   _____ First Set _____ Replacement

14. Was the design and directions to install the gears easy to understand and complete? ___
    Yes ___ No

15. Do you think it was helpful to the industry in general to have this opportunity to install this
    gear on their fishing vessels at no cost? ___ Yes ___ No

16. Did the program provide needed financial assistance to put the gear on your vessel(s)?
    ___Yes ___ No

17. Did the program provide the incentive to install the gear? _____ Yes ______ No

18. Are more research projects needed in the area of conservation gear engineering? _____Yes
    _____ No
   If so, what issues need to be addressed to help fishermen in the southern New England/Mid-
   Atlantic region fish selectively for target species and avoid unwanted bycatch?
   __________________________________________________________________________________

19. If you chose to NOT use the gear, why not?
   __________________________________________________________________________________

20. Overall, what are your thoughts on the gear trials program?
    __________________________________________________________________________________
### Appendix J - GEAR TRIALS
#### PROGRAM FISHING VESSEL PARTICIPANTS

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Gear Types:
- BP - Belly Panel
- DC - Drop Chain - Small
- DCL - Drop Chain - Large
GEAR TRIALS – REDUCTION OF WINTER FLOUNDER BYCATCH

Final project report to the Commercial Fisheries Research Foundation

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June 30, 2015
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ABSTRACT

To build upon the successes of Commercial Fisheries Research Foundation’s (CFRF) Conservation Engineering projects, Cornell University Cooperative Extension (CCE) in coordination with CFF implemented a program to assist the commercial fishing industry with utilizing and testing two conservation engineering gear types. CCE assisted in developing and employing a cohesive, two part program entitled “Gear Trials – Reduction of Winter Flounder Bycatch”. This program allowed the commercial fishing industry to both obtain and use these new and improved gear concepts while participating in the continuing study of their effectiveness in the field. This program focused on conservation gear designs commonly known as the 12” drop chain sweep and the 32” large mesh belly panel. Both of these gears were designed to reduce winter flounder bycatch in the southern New England stock area.

The first component of the program was the gear technology transfer through financial assistance. This helped fishing vessel owners with acquiring this conservation gear technology. In return, vessel owners and their captains were asked to provide feedback on the effectiveness of the gear and suggestions for improving their performance. CCE collected quantitative and qualitative data from surveys submitted by fishermen regarding the performance of the gear. This served as a starting point to begin improving fishing practices and to help fishermen fish more selectively. Extensive outreach was fundamental to facilitate each step of this process.

The second component was the research element. This extended the research conducted under the proof of concept and full proposal phases of the CFF sponsored Challenge Grant Program for Conservation Engineering Projects. This encompassed quantitative analyses of data collected by CCE while onboard commercial fishing vessels actively using the gear. Further testing and evaluation of the avoidance gear adaptation (AGA) large mesh belly panel developed for a 2010 SNECRI project and the avoidance gear 12" drop chain sweep with a 24" headrope adjustment were needed. The continued testing was to determine the potential for these types of gear to reduce winter flounder bycatch in the small mesh trawl fishery for whiting in the Southern New England (SNE) inshore winter flounder stock area. These avoidance gears were evaluated in paired sea trials over a total of 6 days of research fishing. CCE used 2 vessels reflective of the active, inshore whiting fleet during the early fall fishery.

The experimental gear did not cause any significant reduction in the catch of whiting, the primary target species, or of squid. However, the primary goal of specifically reducing winter flounder bycatch by statistically significant levels was not accomplished. Nevertheless, both experimental gears tested for this project significantly reduced bycatch of miscellaneous flounders, demersal species, and combined flounders (including winter flounder) making these gear types practical solutions to the overall bycatch problem in the small mesh fisheries. Despite the primary goal of a statistically significant reduction in winter flounder bycatch not being met, we are still encouraged by the results of this study.
INTRODUCTION/BACKGROUND

Winter flounder in the Mid-Atlantic/Southern New England (MA/SNE) areas are often bycatch within the economically important small mesh fisheries. At the time this project was initially proposed, the most recent stock assessment (NEFMC, 2011) indicated that winter flounder stocks had been suffering severe decline in recent years. The SNE/MA winter flounder stock complex was overfished but overfishing was not occurring. This 2011 SAW 52 stock assessment of the SNE/MA stock complex of winter flounder includes fishery and research survey catch through 2010. The assessment indicated that during 1981-1993, fishing mortality (F ages 4-5) varied between 0.61 (1982) and 0.95 (1993) and then decreased to 0.47 by 1999. Fishing mortality then increased to 0.70 by 2001, and has since decreased to 0.051 in 2010, generally tracking the decrease in fishery catch. Spawning Stock Biomass (SSB) decreased from 20,100 mt in 1982 to a record low of 3,900 mt in 1993, and then increased to 8,900 mt by 2000. SSB has varied between 4,500-8,000 mt during 2001-2009, and was 7,076 mt in 2010. Recruitment at age 1 decreased nearly continuously from 71.6 million age-1 fish in 1981 (1980 year class) to 7.5 million fish in 2002 (2001 year class). Catch of 842 mt in 2011 was projected to provide median F2011 = 0.100 and median SSB2011 = 9,177 mt. Projections at F = 0.000 in 2012-2014 indicate less than a 1% chance that the stock would rebuild to spawning stock biomass maximum sustainable yield (SSBMSY) = 43,661 mt by 2014 as required by the Magnuson-Stevens Fishery Conservation and Management Act.

Most of the commercial landings from the SNE/MA stock complex have historically been taken from statistical areas 521 and 526 (east and south of Cape Cod, MA), 537 and 539 (south of Rhode Island), and 611-613 (Long Island Sound and south of Long Island). With the restrictions on Exclusive Economic Zone (EEZ) landings beginning in 2009, the percentage of landings from area 521 decreased from about 40% in 2007-2008 to about 20% in 2009; however, that percentage rebounded to 58% in 2010. In 2009 about 40% of the commercial landings were from areas 537 and 539 off Narragansett Bay, RI, and about 35% off the coasts of NY and NJ. In 2010 about 18% of the commercial landings were from areas 537 and 539 off Narragansett Bay, RI and about 12% off the coasts of NY and NJ. The primary gear used in the commercial fishery is the otter trawl, which has accounted for an average of 98% of the landings since 1989. Scallop dredges, hand-lines, pound nets, fyke nets, and gill nets account for the remaining 2% of total landings. Most SNE/MA winter flounder are landed as large and small market categories; additional, port-specific categories exist for medium, unclassified, and lemon sole (NEFMC, 2011).

Avoidance of winter flounder during fishing activities is imperative at this time in order to reduce fishing mortality and assist rebuilding efforts. In Amendment 16 to the Northeast Multispecies Fishery Management Plan (FMP), implemented on May 1, 2010, retention of winter flounder was prohibited by federally permitted vessels throughout the SNE/MA winter flounder stock area. This area of prohibition extended from Massachusetts to North Carolina and affects many fisheries. The no-retention provision would cause an increase in winter flounder discard in the designated area. For this reason it was and still is crucial to have available functional gear adaptations to avoid catching winter flounder, while minimizing the economic impacts on the small mesh fisheries.
Through this project CCE in coordination with CFRF implemented a program to assist the commercial fishing industry with both the utilization and the continued testing of the two conservation engineering gear types: the large mesh belly panel and the 12" drop chain sweep. Both of these were designed to reduce winter flounder bycatch in the southern New England stock area. A financial assistance component of the program would help fishing vessel owners with acquiring this conservation gear technology. Vessels that met the program criteria were issued vouchers that could be used toward obtaining either or both gear types at no cost to them. The research component extended the research conducted previously for these two gear types during the proof of concept and full study project phases completed under the previous CFRF sponsored Challenge Grant Program for Conservation Engineering Projects.

This new project encompassed both qualitative observations reported by fishermen using the conservation gear and quantitative analyses of data collected by CCE while conducting further testing of the gear aboard commercial fishing vessels. Further testing and evaluation of the avoidance gear adaptation (AGA) large mesh belly panel developed for a 2010 Southern New England Collaborative Research Initiative (SNECRI) project and the avoidance gear 12" drop chain sweep with a 24" headrope adjustment was needed to determine the potential for these types of gear to reduce winter flounder bycatch in the small mesh trawl fishery for whiting in the Southern New England (SNE) inshore winter flounder stock area. These avoidance gears were evaluated in paired sea trials during the at-sea research fishing. CCE used 2 vessels reflective of the active, inshore, small mesh fleet that targets whiting during the early fall. Each vessel fished for 6 days for a project total of 12 days at-sea (2 vessels x 6 days each = 12 days).

The large mesh belly panel avoidance gear adaptation was initially tested by CCE in 2010 for the SNECRI project in the small mesh longfin squid fishery. The large mesh panel was made from 6mm poly webbing with the mesh size being 80cm or 32 inches. The actual panel was 2 meshes deep by 16 meshes wide and was sewn into the standard 16cm (6") mesh of the belly. When combined with the “saw-toothing” effect that is created by being sewn into the 16 cm mesh an effective opening of 3 full 32” meshes is produced. This forms a total of 96” (8 feet) of large mesh opening for fish to escape through. The panel attached five 16cm meshes (approximately 2.5’) behind the footrope and went from gore to gore (22 meshes wide or approximately 30’). Results of that study showed that the use of the large mesh belly panel resulted in a statistically significant 88% reduction in winter flounder, and an 83% reduction in demersal species. Demersal species included all flounders, skates, dogfish and sea robins. There was no statistically significant loss of squid in the experimental net compared to the control net. It was determined in the limited scope of that project that the large mesh belly panel is an effective avoidance gear adaptation that successfully reduces winter flounder bycatch and the bycatch of other demersals without significantly affecting squid catch.

Milliken and DeAlteris (2004) tested the effectiveness of 4 different large mesh panels positioned in the lower belly of a standard whiting trawl to reduce bycatch of various flatfish (including winter flounder) while still capturing viable levels of the target species (whiting). One of the panels proved to be effective in reducing flatfish bycatch while not reducing the catch of whiting. They found that a large mesh panel of 40.6-cm diamond shaped, stretched mesh constructed from orange-colored nylon twine 1.6 mm in diameter sewn in the lower belly of the
net resulted in a 73% reduction in flatfish catch with no effect on the catch of whiting. This study gives supporting evidence that a large mesh belly panel can be effective in the whiting fishery.

Data from a previously completed CFRF proof of concept study, assessing headrope length variability coupled with the use of a 12” drop chain sweep conducted by CCE in 2010, showed that across all adjustments of the headrope (0” – 36”) there was no significant difference in winter flounder catch between the control (0 slack) and any headrope slack adjustments when combined with the 12” drop chain sweep. However, there was a significant difference between the control (0 slack) and all headrope adjustments (6” – 36”) for squid, combined demersals, and crustaceans (combined demersals for this study also included winter flounder). Catches of these species were reduced in the experimental net. A significant reduction in catch of demersal species was found in tows with the headrope lengthened. There was also a highly significant difference between control (0 slack) vs. experimental treatment in crustacean catch. The limited data set produced by that proof of concept project was not robust enough to draw definitive conclusions and an increased number of tows needed to be conducted to improve statistical strength.

As a continuation and addition to this Proof of Concept work, CCE also previously completed a full evaluation of the 12” drop chain sweep combined with a single 24” headrope adjustment in the small mesh longfin squid fishery. The decision to increase the headrope length by 24” was based on the knowledge gained during the above mentioned 2010 proof of concept project and the results of Jon Knight’s (SuperiorTrawl) work in a flume tank evaluating the 12” drop chain sweep and associated headrope slack. The 24” headrope adjustment showed the most promise for bycatch reduction in the “combined demersals” category during CCE’s proof of concept. In 2011 and 2012 CCE conducted 4 research trips and completed 98 paired tows comparing an experimental net outfitted with a 12” drop chain sweep and the overall headrope length increased by 24” to a control net with no slack in the headrope and the industry standard 5 inch drop chains. Results of that study showed the experimental avoidance gear provided a statistically significant reduction in the bycatch of winter flounder as well as the bycatch of other demersal species. The 12” drop chain sweep showed an overall reduction of 78% in winter flounder catch compared to the control net. In addition, there was no statistically significant difference in longfin squid catch between the control net and the modified experimental net.

All three of these demonstration projects were well received by the commercial fishing industry. The significant bycatch reduction achievements made by the modified gear in the longfin squid fishery have been recognized by industry and scientists leaving them seeking more information on the performance of this technology in the small mesh whiting fishery. This formed the basis of the at-sea research component of this current study

**STATEMENT OF WORK/GOALS AND OBJECTIVES**

To build upon the successes of CFRF’s Conservation Engineering projects, CCE developed and implemented a cohesive program that allowed for the commercial fishing industry to employ new and improved gear concepts and provide feedback on their effectiveness and suggestions for improving their performance. CCE also collected the quantitative and qualitative data necessary
to complete the final research phase for improving fishing practices and helping fishermen fish more selectively.

Goals:

1. To coordinate and facilitate a transfer of conservation gear technology through a financial assistance program for fishing vessel owners to utilize two gear types – a large mesh belly panel and a 12” drop chain sweep - aimed at reducing winter flounder bycatch.
2. Conduct a Proof of Concept at-sea evaluation to determine the effectiveness of these gear types at reducing winter flounder bycatch by extending the research record relative to the whiting fishery.

Objectives: Inherent and related objectives are:

1. Implement a comprehensive outreach program that will monitor and record fishermen’s qualitative observations for these two gear types and effectively communicate this information back to fishing industry members.
2. Implement a voucher program developed by CFRF that provides financial assistance to vessel owners to help them obtain and utilize the two gear types.
3. To determine if a 12” drop chain sweep or a 32” large mesh belly panel are each an effective avoidance gear in the small mesh whiting fishery and are adaptable to existing gear and fishing practices.
4. To achieve a positive statistical level of difference between the control net and the experimental nets relative to the bycatch of the protected winter flounder species.
5. To demonstrate that the experimental gear types do not cause any significant reduction in the catch of the target species.

METHODOLOGY

1. Gear Technology Transfer Component (Voucher Program) – The description of the methodology for this component of the Gear Trials Program is separated into two distinct categories, Procedure and Outreach. This was done to help detail CCE’s role in the program.

   A) Procedure – How the voucher program worked and CCE’s role in it.

   The Gear Trials Program was established in the summer of 2012 and sponsored by the CFRF. The Program addressed two experimental gear types, the 32” large mesh belly panel and the 12” drop chain sweep. Both were designed to reduce winter flounder bycatch in the southern New England stock area while vessels were engaged in small mesh trawl fisheries. Through this project, CFRF with CCE acting as a facilitator implemented a program to assist the commercial fishing industry with obtaining the two conservation engineering gear types. The gear technology transfer component of the program offered financial support to assist fishing vessel owners with acquiring this conservation gear technology. The Gear Trials Program provided an opportunity for fishermen to have this gear on their vessels and try it out for themselves. It also
served to gather additional qualitative and quantitative data relative to the gear and provided a means to transmit any observations back to the commercial fishing industry. The program delivered information as well as tangible goods to fishermen so that they were able to make an educated decision as to how they choose to reduce the unwanted bycatch of winter flounder.

The gear technology transfer component or voucher program began by identifying potential participants. Fishing vessel owners who meet the following criteria were eligible for vouchers to cover the costs of the gear:

- Vessel/owner must have a current, valid federal fishing permit or state license for use in small mesh fisheries (e.g. squid, whiting, scup).
- Vessel owner must be a resident of Rhode Island, Massachusetts, Connecticut, or New York.
- Vessel/owner must have an active fishing history in small mesh fisheries within the timeframe of January 2010 to present. This must be demonstrated by submittal of VTR or state logbook entries for 3 separate trips at sea showing:
  1. Landings from small mesh fisheries
  2. Small mesh fishing activity in one or more of the following statistical areas:
     537, 538, 539, 611, 612, 613

Research was done to find qualified fishermen for this project based on the criteria listed above. CCE personnel searched through vessel trip reports from the last three years. Our efforts focused on finding at least three vessel trip reports that indicated the use of otter trawl nets with 3” mesh or smaller that had landings of whiting, squid, or scup and were in statistical areas 537, 538, 539, 611, 612, or 613. When qualifying vessel trip reports were found, CCE personnel contacted the fishermen and then, faxed, mailed, or E-mailed the fishermen a copy of the voucher application. CCE assisted CFRF in the enrollment and completion of applications from active fishermen who met the required criteria and who wanted to use the conservation gear technology during normal fishing activity. CCE created an Excel database to record the quantitative data on types of gear received by vessel as the Gear Trial applications were being issued to qualified fishermen and faxed to CFRF for approval. This database was updated continually with pertinent information and proved to be a valuable tool for maintaining contact with those participating in the program. This Excel database is included at the end of this report as Appendix 3. Once the application was signed and returned to CCE, the signed application, three vessel trip reports, and an up to date copy of the fishermen’s permit info was printed and faxed to CFRF for approval.

Once an application was approved, the fishing vessel owner was issued a voucher(s) for store credit at one of the participating gear suppliers to purchase either 1) the drop chain sweep gear; or 2) the large mesh belly panel; or 3) both types of gear. Applying for one or two vouchers (for one or both types of gear) was the fishing vessel owner’s choice. The two participating gear suppliers for the program were:

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The amount of financial assistance was based on the type of voucher CFRF administered and the characteristics of the qualified, participating fishing vessel. The voucher for the large mesh belly panel, for all size fishing vessels, was equal to $400. The drop chain sweep voucher was divided into two categories:

1. Smaller fishing vessel category (< 500 HP) = $450
2. Larger fishing vessel category (> 500 HP) = $800

Participating fishing vessel owners were able to use the vouchers as store credit with the net builders/gear suppliers listed previously. Both Superior Trawl and Reidar’s had an established work agreement under this program with CFRF. Goals for participation and enrollment were set at the start of the project to enlist the involvement of 40-60 fishermen.

When the fishing vessel owner was issued a voucher, that person or a designated representative, i.e. a captain, presented the voucher to one of the participating gear suppliers. The gear supplier was able to use the individual ID number on each voucher to access an online database to determine if the voucher was still valid (not previously used at another gear supplier). Once that determination was made, the gear supplier was able to proceed with the gear transaction and construct the belly panel, drop chain sweep, or both that were particular to the individual participant’s net specifications. Superior Trawl and Reidar’s in turn submitted monthly invoices and online reports verifying all transactions and were reimbursed by CFRF.

In return for receiving the gear voucher, participating fishing vessel owners agreed to several stipulations. Vouchers were to be used only for the gear types included in the Gear Trials Program and could only be redeemed at the participating gear suppliers. A voucher recipient could elect to stop using the gear after only one use but was requested to report back as to why. Finally and perhaps most importantly, participants in the program were asked to report back observations relative to the gear and its use on a monthly basis. This was done via a monthly survey form created by CCE and approved by CFRF. A copy of the survey is included at the end of this report as Appendix 4. The survey questions were used during dockside interviews, telephone interviews, or were available in electronic format. The information collected from participating fishing vessel owners/captains through these surveys, provided an invaluable understanding of the performance of the gear from those whose livelihoods depend on it.

As the project moved forward, outreach continued as program participants received their new gear. CCE was often required to relay net schematic specifics from participating individual fishermen to either Reidar’s or Superior Trawl in an effort to expedite the gear technology transfer. Through conversations between CFRF, CCE, and the gear suppliers it was decided that both the belly panel and drop chain gear modifications would also be made available in a kit form. These kits could then be installed by the participating fisherman or their chosen gear professional. CCE personnel served to retrieve, transport, and deliver gear kits from Reidars and Superior Trawl to participating fishermen throughout the project timeline. This also served to
expedite the gear transfer as many participants were finding it difficult to coordinate schedules with the gear suppliers.

As an additional means to facilitate technology transfer for those vessels finding it difficult to travel to Rhode Island or Massachusetts, we brought a gear specialist to New York. On April 12th and 13th 2013, CCE served as host to Jon Knight of Superior Trawl as he travelled to New York. Mr. Knight met with participating fishermen to discuss and promote the project and install the gear modifications. CCE staff assisted Mr. Knight during his visit and a total of three 12 inch drop chain sweeps were installed and one large mesh belly panel was installed. The following is a summary of Mr. Knight’s trip to Long Island:

**Friday April 12th 2013**

- Phil Karlin, Riverhead NY, F/V Brianna:
  - Demonstration of how each modification would be installed.
  - Kits to be supplied for belly panel and drop chain sweep.
- Kenny Jayne, Shinnecock NY, F/V Lady J
  - Removed existing sweep and installed new gear to create 12 inch drop chain sweep.
  - Kit supplied for belly panel
- Victor Makis, Shinnecock NY, F/V Terry Sue
  - Removed existing sweep and installed new gear to create 12 inch drop sweep chain
  - Kit supplied for belly panel

Each installation involved 3-4 hours of work, so further installations were to be continued on Saturday April 13th. The gear trials database was updated to reflect this work.

**Saturday April 13th, 2013**

- Bruce Beckwith, Montauk NY, F/V Allison Lisa
  - Net prepped by removing portion of the first bottom belly and a 32 inch large mesh panel was installed.
  - Discussion about the performance of the drop chain sweep led to a kit to be supplied later.
- Charles Morici, Montauk NY, F/V Act I
  - Removed existing sweep and installed new gear to create 12 inch drop chain sweep.
  - Kit supplied for belly panel.
- Mike Decker, Montauk NY, F/V Sea Angel
  - Belly panel kit supplied to vessel captain.
  - Discussion about the performance of the drop chain sweep led to a kit to be supplied later.
- Charles Weimar, Montauk NY, F/V Rianda S
  - Belly panel kit delivered to vessel.
- Arrangements made to receive necessary information for a drop chain kit to be supplied later.
- David Aripotch, Montauk NY, F/V Caitlin Maread
  - Vessel was actively fishing, CCE took possession of the belly panel kit for later drop off.
  - Arrangements still need to be made to receive necessary information for a drop chain kit to be supplied later.

As the project timeline progressed, CCE’s role relative to issued vouchers left unused was condensed to focusing only on New York vessels. As per CFRF’s request, CCE concentrated their efforts on having NY vessels redeem any unused vouchers.

B) Outreach – CCE and the role of outreach in the voucher program

The marketing of this program to the industry was a key element intrinsically linked to the success of the project. CCE's mission as an organization is to enable people to improve their lives and communities through partnerships that put experience and research knowledge to work. Through this opportunity afforded by CFRF, CCE fostered its strong industry relationships by supporting and advancing conservation gear technology within the commercial fishing industry. The outreach portion of the gear technology transfer component or voucher program of this project was constant throughout the entire program timeline.

The focus at the start of the gear technology/voucher component was aimed at identifying potential industry participants. CCE’s outreach role in this recruitment process was extensive. CCE along with CFRF conducted industry outreach/discussion sessions periodically during the initial portion of the project timeline. CCE conducted these interactive discussions in Pt. Judith, RI to inform and educate the industry of the benefits of the avoidance gear adaptations and the unique opportunity that was being offered by CFRF.

CCE continued industry outreach/discussion sessions periodically at the major ports included in the program area throughout the entire timeline of the project. Staff from CCE continued outreach over the course of the project by engaging industry members in discussions regarding the Gear Trials Program while they were in the field. Additionally, CCE gave a presentation to fishermen at the Research Set-Aside (RSA) Auction on February 5, 2014 that was held at our office in Riverhead, NY. The presentation included a segment detailing the specifics of the Gear Trials Program.

CCE developed and distributed a flyer detailing the program activities and how to participate in the project. A copy of this flyer is included at the end of this report as Appendix 5. CCE personnel travelled to major fishing ports located in Pt. Judith RI, Shinnecock NY, Montauk NY, New Bedford MA, and Stonington CT in an effort to increase awareness of the Gear Trials Program by both distributing the flyer and engaging in conversation with industry members. CCE assisted CFRF in a direct mailing of the informational flyer to eligible fishing permit holders.
CCE assisted CFRF with press releases to media outlets that contained program information helping to enlist participants. This included CCE posting program information on both of its relevant websites; http://www.ccesuffolk.org and http://www.squidtrawlnetwork.com. CCE also worked with CFRF by providing assistance in the development of an outreach article for inclusion in the Commercial Fisheries News. This also was a means of increasing program awareness. In addition, phone calls to the commercial fishermen of the small mesh fleet in the SNE/MA area were made in an effort to get as many qualified fishermen as possible to participate in this project.

As participating fishermen received their new gear, CCE also began focusing outreach efforts on Gear Trials surveys. The survey, included as Appendix 4, was designed to collect qualitative information relative to the performance of the avoidance gears on a monthly basis. CCE’s role was to solicit input on the performance of the two gear modifications from participating fishermen who were actively using the gear. Fishermen who received the gear and had not used it were also routinely contacted to discuss their future plans for the gear. Solicitation was done via either a dockside interview or telephone conversation and the information was recorded on the survey form. In addition, CCE continued outreach to encourage participating fishermen to respond to the survey directly online at the Gear Trials website. CCE also recorded all survey results in a dedicated Excel database as well as entering them directly on the Gear Trials Program website on behalf of CFRF. CCE in cooperation with CFRF also developed a final survey. Additional questions were added to the original monthly survey as a way of determining participating industry members overall opinions of the program. An example of this survey is included at the end of this report as Appendix 6. The Excel database created by CCE for survey results is also included at the end of this report as Appendix 7.

As per the original work agreement and roughly half way through the project timeline CCE developed an outreach Gear Trials Newsletter describing the program and accomplishments to date. CCE submitted the newsletter draft to CFRF for final approval at the end of August 2013. The final draft of the newsletter was completed in early September of 2013. The finalized newsletter was printed and mailed to industry members and is also available in electronic format on the CFRF, CCE, and Squid Trawl Network websites. Printed newsletters were also distributed to any interested parties when CCE personnel were in the field. An example of the newsletter is included at the end of this report as Appendix 8.

An informational video was developed on the application of the 12” drop chain sweep and the large mesh belly panel. The main goal of creating this video was to give the viewer an overview of the Gear Trials Program being implemented by CFRF and CCE’s Marine Program. In the video we highlighted the following topics:

1. What the program is
2. Why the program was developed
3. How it is being implemented
4. Reaction to program

In order to accomplish the goal of creating a quality video the following objectives were employed:

1. A brief description of the problem that lead to the program development
a. Need for small mesh trawlers fishing for species such as squid and whiting to be able to fish selectively and avoid limiting winter flounder bycatch in the southern New England stock area. This need in turn resulted in the need to develop and test gear modification ideas so successful tools could be identified, and fishing vessel captains/crew could continue use these tools to solve in the bycatch problem, and continue fishing for commercially important small mesh fisheries.

2. A brief description of the program
   a. Combination research/financial assistance program to develop and implement conservation gear aimed at winter flounder bycatch reduction in the southern New England stock area in small mesh fisheries.

3. A brief description of the major work elements of the program including:
   a. Development and testing of gear modifications
      I. 12” Drop Chain Sweep
      II. Large mesh belly panel
      III. Voucher program
      IV. Education/outreach to make fleet aware of these available tools and to assist them with installing them on the vessel
      V. Continued research in whiting fishery
      VI. Continued feedback – fishermen observations on gear performance

4. Provide comments from fishermen and scientists involved in the program
   a. interviews and testimonials

Using this outline CCE Fisheries staff, Tara Froehlich and CCE Videographer Rory Macnish travelled to Pt Judith, Rhode Island to film scenes and fishermen interviews for the project video in early May of 2014. Scheduling and weather allowed for exceptional participation by the fisherman. Joined by CFRF’s Executive Director, Peg Parker, CCE was able to interview fishermen who played integral roles in all components of the project. Captains including: Phil Ruhle Jr., Donald Fox, Jeff Wise, Steve Arnold, and David Aripotch all agreed to be filmed and were involved in the research, voucher, and survey components of the project. Captain Steve Follet used the 12” drop chain sweep before the Gear Trials Program was developed and was able to offer his observations on film as to how well the gear performs. Gear specialist Jon Knight from Superior Trawl Inc. was also extremely cooperative and gave an in depth presentation on the installation, structure, and use of the conservation engineering gear types. We were very fortunate to have CFRF Vice President, Fred Mattera be filmed. He gave an interesting interview from two perspectives: as a fisherman and as a CFRF board member who was essential in the development of the Gear Trials Program. All these interviews added up to an abundant amount of video footage that would make editing a challenge but rewarding.

Narration and editing of the video footage occurred over the winter of 2014. An interview with the CCE Principal Investigator, Emerson Hasbrouck and underwater video footage of the 12” drop chain sweep was added during this time. CCE coordinated with CFRF to make final edits and the final video was released with a welcome reception in the early spring of 2015. The project video is currently on the CFRF website http://cfrfoundation.org/gear-trials, the CCE Suffolk website http://ccesuffolk.org/marine/fisheries/gear-trials, CCE’s Squid Trawl Network Website http://www.squidtrawlnetwork.com/httpcfrfoundationorggear/ and promoted on both Facebook pages.
2. At-Sea Research Component (Experimental Fishery)

To expand upon the knowledge gained and the achievements made in the proof of concept and full proposal research done under the Challenge Grant Program for Conservation Engineering Projects (discussed previously), CCE conducted an at-sea experimental fishing component to this Gear Trials Program. This portion of the work was approached as a Proof of Concept experimental fishery phase. The goal of the at-sea research component was: To demonstrate what the potential is, for two different conservation gear modifications, to reduce winter flounder bycatch in the small mesh trawl fishery for whiting in the southern New England winter flounder inshore stock area. The two gear types tested were the 12" drop chain sweep and the large mesh belly panel. Research and testing was completed aboard two commercial fishing vessels targeting whiting. Paired tows were conducted using the large mesh belly panel (experimental A) and the 12" drop chain sweep (experimental B) against a standard small mesh trawl (control). A detailed description of this methodology and ensuing evaluation is included in Appendix 1 (Gear Trials – Reduction of Winter Flounder Bycatch experimental fishery phase – Final Project Report).

The experimental research design utilized was intended to test the large mesh belly panel and 12" drop chain sweep with a 24" headrope adjustment in the commercial small mesh whiting fishery while using existing gear and typical fishing practices. CCE tested for differences in both the target whiting species catch and the bycatch of the winter flounder species of concern. CCE tested across the appropriate identified strata of time, depth, area, fishing practices and fishing vessel size and power. Two vessels of similar size and power (60-70' vessels; 450-600 HP with identical fishing nets, doors, legs, ground cable) were chosen by CFRF from a pool of applicants to work with CCE on the quantitative data collection portion of the project. These vessels entered into direct Work Agreements with CFRF and received compensation for their participation separately through CFRF. These vessels were representative of the small mesh, otter trawl, whiting fleet and were chartered as a research platform to compare experimental nets to a control net. For the research portion of this project, a scientific trip was defined as one day at sea for 2 vessels and a paired tow between vessels described a tow consisting of one vessel pulling the control net and a corresponding experimental net pulled by the other vessel. Utilizing these definitions, CCE completed 6 scientific trips and 36 paired tows. A comprehensive description containing much greater detail is also offered in Appendix 1 (Gear Trials – Reduction of Winter Flounder Bycatch experimental fishery phase – Final Project Report) located at the end of this report.
Results

1. Gear Technology Transfer Component (Voucher Program)

- A total of 62 completed applications for the gear were received from the combined states of NY, CT, MA, and RI.
- From all the completed applications, 107 vouchers were issued. A total of 24 vouchers were issued for the large 12” drop chain sweep, 30 vouchers were issued for the small 12” drop chain sweep and 53 vouchers were issued for the large mesh belly panel.
- 40 participants received their gear accounting for 19 large drop chain sweeps, 29 small drop chain sweeps, and 47 large mesh belly panels.
- 12 vouchers were left unused – 5 small drop chain sweeps and 7 large mesh belly panels.

Monthly Survey Responses

CCE has compiled feedback on the performance of the gear types by conducting monthly surveys (see Appendix 4 for survey instrument used). Opinions of these gear modifications are predominantly positive (Results are tallied below). The individual number of survey responses for each type of response is included in parenthesis. Note that not all respondents answered all questions and some respondents submitted multiple answers per question.

- 174 responses have been received by CCE in the form of a brief survey (10 questions) regarding the fishermen’s opinions.
- Monthly surveys were conducted from March 2013 to June 2015.
- 114 surveys were received relative to the use of the 12” drop chain sweep, 47 surveys were received relative to the use of the large mesh belly panel, and 13 surveys were received commenting on the combined use of the 12” drop chain sweep and the large mesh belly panel.
- Fishermen reported their targeted fishery as:
  
  - SQUID (164)  WHITING (22)  SCUP (27)
  - OTHER – spot (1), butterfish (13), fluke (5), ling (3)

- Statistical areas fished included 113 (2), 119 (2) 132 (1), 148 (5), 149 (5), 165 (1), 166 (3), 167 (11), 168 (2), 520 (1), 526 (8), 537 (35), 538 (26), 539 (72), 612 (4), 613 (51), 620 (1) 622(24).
- Fishermen reported adjusting the gear in 65 instances. In 109 instances there was no adjustment to the gear. All adjustments were made to the drop chain sweep. No adjustments were made to the large mesh belly panel. Adjustments were made in the following ways:
  - Adjusted chain
  - Adjusted sweep and added slack in top
• Adjusted top and bottom, pulled travel chain in to make top go up and let sweep out so it doesn't dig
  • Kept at even most of the time
  • Headrope slacked 18-24 inches using 50 fa of tow wire & 50 fa ground gear
  • No adjustment when there is no flatfish around, then lowered to 2 links to get more flounder
  • One link hanging on bottom, pulled in
  • Pulled in sweep even, no headrope slack
  • Pulled sweep in (to catch fluke)
  • Rockhopper section in middle
  • Shackled up drop chain fully when targeting fluke
  • Let drop chain out to 6" drop when fluke limit was 50 lbs. Let it out to full 12" while targeting butterfish in October
  • Slack head rope back
  • Slack headrope 1 ft, sweep slacked out
  • Slack middle and top 16"
  • Slacked headrope 8-10"
  • Slacked out
  • Slacked out top & middle 18" and pulled in sweep 4" past even in 613 - took out slack in top in 537
  • Sweep and tow cable lengths to get the gear flying off the bottom
  • Sweep slacked all the way out, also using 6" roller gear
  • Sweep slacked out 2 links from even, added 6 cans, 2 ft. Slack in headrope
  • Top on even, bottom (sweep) slacked all way out
  • Tried raising & lowering whole net with more or less tow wire - pulled sweep closer - each tow tried something
  • Used both together
  • Adjusted sweep ahead of drop chain, then adjusted drop chain ahead of sweep, then made drop chain and sweep even
  • Pulled in sweep to catch fluke, then dropped it back down to avoid fluke
  • Straightened out the chains, added 3 cans, let out top of net 2 ft
  • By letting the sweep line out we were able to further reduce bycatch

• Fishermen reported using the gear under various conditions. Most commonly, the gear was used when there was a high incidence of skates and dogfish. The conditions fishermen report using the gear under are as follows:
  • High incidence of skates (45)
  • High incidence of dogfish (23)
  • High incidence of bottom species (5)
  • High incidence of crabs (5)
  • High incidence of seaweed (5)
  • High incidence of squid mops (1)
  • High incidence of scallops (8)
  • When trying to reduce winter flounder bycatch (7)
  • When trying to catch clean squid (22)
  • When trying to reduce fluke bycatch (7)
  • When trying to reduce all flounder /flatfish bycatch (44)
When trying to reduce bycatch of all flatfish (7)
- When trying to reduce general bycatch (1)
- Belly panel used to reduce scallops (1)
- When squid fishing (2)
- When there are no flatfish present (1)
- Always (72)
- Always except when ground fishing (1)

- In 165 out of 174 surveys (95%), the gear was reported to be effective in reducing winter flounder bycatch.
- Bycatch reduction estimates of winter flounder ranged from 15% to nearly 100%. One respondent reported no reduction in winter flounder bycatch and one respondent was unable to determine if there was a reduction. The table below shows the number of monthly survey responses to the percentage of winter reduction while fishing.

<table>
<thead>
<tr>
<th>Percentage Range</th>
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<tr>
<td>10-20%</td>
<td>6</td>
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<tr>
<td>20-30%</td>
<td>1</td>
</tr>
<tr>
<td>30-40%</td>
<td>5</td>
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<td>70-80%</td>
<td>49</td>
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<tr>
<td>80-90%</td>
<td>5</td>
</tr>
<tr>
<td>90-99%</td>
<td>28</td>
</tr>
<tr>
<td>Nearly 100%</td>
<td>8</td>
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</tbody>
</table>
- 124 of the 174 surveys (72%) stated there was no reduction in retention of the target species. Most remaining surveys indicated a minimal reduction in target species. The table below shows monthly survey answer frequencies broken down by gear type and by species for target species reduction.

<table>
<thead>
<tr>
<th>Target Species Reduction</th>
<th>12&quot; Drop Chain Sweep</th>
<th>Large Mesh Belly Panel</th>
<th>Used Together</th>
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<tr>
<td></td>
<td>SQ</td>
<td>SCUP</td>
<td>BUTT</td>
</tr>
<tr>
<td>None</td>
<td>72</td>
<td>3</td>
<td>2</td>
</tr>
<tr>
<td>0-5%</td>
<td>3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6-10%</td>
<td>13</td>
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</tr>
<tr>
<td>11-20%</td>
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</tr>
<tr>
<td>21-30%</td>
<td>7</td>
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<td></td>
</tr>
<tr>
<td>&gt; 30%</td>
<td>1</td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>No, Increased</td>
<td>5</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hard to Tell</td>
<td>6</td>
<td></td>
<td></td>
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<tr>
<td>Similar to Other Nets</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes, Unknown %</td>
<td></td>
<td></td>
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</tbody>
</table>

- 110 of the 174 surveys stated that they did observe a reduction in bycatch species other than winter flounder when using the gear. The percent reduction ranged from 20% to nearly 100%. Bycatch reduction survey answers are tallied below.

The following are all answers pertaining to the use of the 12" Drop Chain Sweep:
- All bottom species – 0-25% (6); 26-50% (25); 51-75% (34); 76-100% (39)
- All flatfish/flounders – 75-80% (1)
- Fluke – unspecified reduction (1); 20-30% (1)
- Skates – unspecified reduction (1); 20-30% (2); 50% (3); 60% (1); 70% (1); 75-80% (3); 90% (1)
- Crabs – unspecified reduction (2); 50% (1)
- Conch, crab lobster – 90-100% (2)
- Squid mops – unspecified reduction - 50% (2)
- Seagrass – unspecified reduction (1)
The following are all answers pertaining to the use of the Large Mesh Belly Panel:
- All bottom species – 20% (1); 90-100% (53)
- Fluke – unspecified reduction (1)

The following are all answers pertaining to the use of both gears together:
- All bottom species -50% (3)
- All flatfish/flounders –50% (3)

- 100% (174) of the monthly survey respondents reported that they would continue to use the gear in the future.
- Additional observations reported in the monthly survey included the following anecdotes:
  - Large mesh belly panel works slightly better than the drop chain sweep
  - Bags are much cleaner when using gear
  - Both gears work great and should be used
  - Two fishermen report that they have been using a drop chain now for a few years
  - Less weed caught
  - Won’t leave dock without the large mesh belly panel
  - Large mesh belly panel should be mandatory
  - Did not catch a single flounder and very clean catches of squid
  - Not taking the drop chain sweep off, it fishes so clean
  - Drop chain sweep will be most useful when squid show up inshore
  - Will change around configuration to further reduce bycatch reduction
  - Drop chain sweep reduces scallops and squid mops
  - Drop chain sweep didn't work as well with sweep slacked out, worked better with it pulled in.
  - Had a hard time catching spot during the heavy run with the drop chain sweep on the net

**Overall Assessment of the Program from Final Survey**

- 15 respondents reported that the gear reduced other types of flounders in addition to winter flounder.
  - 12” Drop Chain Sweep: 15 YES (windowpane and fluke) 1 NO 1 UNSURE
  - Large Mesh Belly Panel: 9 YES (windowpane and fluke) 0 NO 1 UNSURE

- 8 out of 16 fishermen reported that the gear works best on certain bottoms.
  - 12” Drop Chain Sweep: 9 YES 6 NO 2 UNSURE
  - Large Mesh Belly Panel: 4 YES 40 NO 2 UNSURE

According to the responses, the best bottoms for the gear are flat sand, hard sand, soft bottom (mud), and areas with lots of grass.

- 19 Fishermen reported that the gear works best in certain fisheries.
12” Drop Chain Sweep: 17 YES 1 NO 1 UNSURE

The fisheries identified included squid (14) and butterfish (4).

Large Mesh Belly Panel: 9 YES 0 NO 1 UNSURE

The fisheries identified included squid (8) and butterfish (2).

The gears perform best at reducing winter flounder bycatch in the squid fishery.

- For 32 out of 37 survey respondents, this was their first use of the drop chain sweep. This gear was a replacement for only 3 respondents. In RI, some fishermen were already using a drop chain sweep for a pilot program on catch shares in the RI summer flounder fishery.
  32 FIRST SET 3 REPLACEMENT 2 USING THEIR OWN (not through this program)
- 26 out of 29 participants (90%) that used the gear reported that the design and directions to install the gear were easy to understand and complete. Three participants had the gear installed for them.
- 37 out of 38 participants (97%) felt it was helpful to the industry to have this opportunity to install the gear on their vessel at no cost. 1 was unsure since he just got gear
- 37 out of 38 participants (97%) agreed that the program provided the needed financial assistance to put the gear on their vessel
  Relative to this question, 1 respondent reported that the 12” drop chain sweep is not expensive to install.1 reported that this is a good trial run, 1 reported that they did not need financial assistance.
- 33 out of 37 participants (89%) felt that the program provided the incentive to install the gear. For the respondents that reported that the program did not provide the incentive, the reason was that they were already using the gear.
- 28 out of 33 survey respondents reported that more research projects are needed in the field of conservation gear engineering. Only 4 respondents did not feel that more research is necessary.
  Specific research projects suggested included:
  - Any issues that will help fishermen deal with unwanted bycatch (5x)
  - Reduce bycatch of dogfish (3x)
  - Will be continuing to test belly panel in scup fishery with CCE
  - Bycatch of dogfish and skates
  - Selectivity studies are very important, leave the fish you don't want
  - Need to study fishing in mid-water and getting nets off the bottom
  - More work with doors needs to be done since the rig starts with the doors (2x)
  - Increase landings and marketing of dogfish and skates
  - Project to keep squid and reduce sea bass and scup
  - Need to allow a certain amount of “bottom time” where fishermen can keep everything with no bycatch
  - Fishermen will use large mesh belly panel in small mesh scup fishery in upcoming research project with CCE
  - More research needs to be done on water quality
More research needs to be done on fish spawning  
Look to Europe may be options in extension of the net

- 27 fishermen surveyed did not use one or both gears. The reasons reported for choosing to NOT use the gear included:
  - Just got the gear in June 2015 (10)
  - Waiting to use large mesh belly panel on new whiting net
  - Just built a new net and didn't want to rip it up
  - Wants to keep fluke (4)
  - Not catching flounders when targeting whiting
  - Does not want to do the reporting
  - Did not have time
  - Will use it in the future (3)
  - Did not have the chance
  - Cannot change configuration of nets because of involvement with wind farm trawl surveys
  - Boat went on fire, waiting to get new boat
  - Interested in using drop chain sweep but not large mesh belly panel
  - Will start using it in the summer when fishing for squid
  - Using rope net most of the time but will be installing large mesh belly panel in the box net soon.
  - Openings are too big in the large mesh belly panel
  - Too much labor to install
  - Already had the drop chain gear (2)
  - Catching fish cleanly in the scup/squid fishery
  - Was not participating in fishery that warranted the use of small mesh
  - Did not use drop chain sweep because fisherman was extremely happy with the performance of the large mesh belly panel
  - Uses rope trawl but will install drop chains on new net
  - Uses rope trawl and needs to keep fluke
  - Did not see flounders while squid fishing may use in future to avoid scallops

- 18 OF 21 (86%) of participants that have been using the gear will continue to use the gear. 3 will use it permanently and the other 15 will use it randomly based on the fishery and bottom.
  - They will use the gear when not trying to catch fluke
  - Has another net for squid
  - Will continue to try it out
  - Will use it when squid fishing
  - Will use belly panel when fishing for whiting
  - I will not use it because the boat was sold

- 15 program participants received their gear in May and June 2015 and have not gotten a chance to install or use the gear yet.

- Overall thoughts on the gear trials program reported in the final survey are as follows:
  - I just received the gear (both) and did not get a chance to install but looking forward to using it (7x)
  - A good/great program/idea (17)
  - This gear works (4)
  - We are fishing clean when targeting whiting so this gear is not necessary for my boats
Any information on these gears is better than none
Program works well if the gear works well especially if the gear becomes mandatory in the future
Rigged net with a drop chain sweep 10 years ago and helped to convince others that it was the way to go.
Drop chain sweep works better than large mesh belly panel (in one opinion)
Drop chain sweep works really well. It will make unfishable areas fishable and make fishing cleaner
Large mesh belly panel works better than drop chain sweep
Good thing, liked it, drop chain sweep works well
Hard to give an opinion since just started using the gear and needs to try it on other area and fisheries
Like drop chain sweep, not interested in belly panel
Not overly convinced that it makes more of a difference than when we are fishing our nets light off the bottom
It is good because any reduction in bycatch makes fishing easier and keeps quality of fish better.
Finally doing something to help fishermen. Fishing is so restrictive and we can’t keep any fish, need to get rid of everything
Good program but the drop chain sweep is not that expensive anyway
Financial assistance is needed if gear becomes mandated eventually
The program should be continued
There should be talk with NEFMC about getting mandatory gear
Fishermen should use this gear but it should not be a legal issue
Reduces squid mops and squid mortality
Drop chain sweep is a good bycatch reduction device
Definitely helpful to industry (2)
Program had merit especially for those involved extensively in small mesh fisheries where reducing bycatch of any type is imperative
Other issues need to be addressed before gear modification
Overall, the program was a success since it got a few fishermen to try and use the gear
The gear was a fairly inexpensive way to reduce bycatch

- A total of 12 vouchers were not used. Vouchers were unused for the following reasons:
  - 1 fisherman in jail (1 unused voucher)
  - 1 fisherman not using vouchers (2 unused vouchers) because he is participating in wind farm trawl surveys for a few years and will not be fishing commercially
  - 3 fisherman are not interesting in using large mesh belly panel (3 vouchers unused)
  - Vessel was sold (2 vouchers unused)
  - Fisherman had gear installed before program started (1 voucher unused)
  - Unknown reason (2 vouchers unused)
  - Already has the gear (1 vouchers unused)
- We were unable to contact 11 fishermen regarding voucher use or surveys after multiple daytime and nighttime attempts.
The feedback received by CCE on the performance of the gear types was exceedingly positive. In 95% of the surveys, the gear was reported to be effective in reducing winter flounder bycatch. 78% of the surveys indicated that the reduction of winter flounder was over 70%. One third of the surveys reported the reduction in winter flounder to be between 90% and 100%. In 72% of the surveys, fishermen reported that there was no reduction in retention of the target species. For those surveys that indicated a reduction in target species, the reduction was minimal. The conditions under which fishermen used the gear most were when there was a high incidence of skates and/or dogfish. All of the final survey respondents felt it was helpful to the industry to have this opportunity to install the gear on their vessel at no cost. The overall thoughts on the program were all positive indicating that both gears are effective and the program was beneficial to fishermen at a time when it is becoming increasingly difficult to maintain making an income in the commercial fishing industry. A total of 85% of participants that have been using the gear will continue to use the gear because it effectively reduces bycatch, reduces time spent processing the catch, and improves quality of the catch.

1. **At-Sea Research Component (Experimental Fishery)**

In summary, neither the 12” drop chain sweep nor the large mesh belly panel experimental net proved to reduce the quantity of winter flounder bycatch by statistically significant levels. However, a winter flounder escapement of 25% in the drop chain sweep net and 44% in the large mesh belly panel net was observed when all tows were combined. There was no significant difference in whiting or squid catch between the control net and either experimental net modified with the 12” drop chain sweep or the large mesh belly panel. Retention of whiting, the target species, was maintained using both experimental nets. Both experimental nets proved to be functionally effective in significantly reducing the quantity of miscellaneous flounder (all flounders excluding winter flounder) and all combined flounder (including winter flounder) bycatch. The 12” drop chain sweep net reduced miscellaneous flounder catch by 67.4%. The large mesh belly panel reduced miscellaneous flounder catch by 63%. When all flounders (including winter flounder) were pooled, there was a significant difference in the catch between the control net and net with the 12” drop chain sweep that yielded a 66.1% reduction in total flounders. The large mesh belly panel significantly reduced the catch of all combined flounders by 61.7%. When all demersal species were pooled, there was a highly significant difference between the control net and both experimental nets that yielded a 66.8% reduction in catch by the 12” drop chain sweep treatment and a 65.5% reduction by the large mesh belly panel. The at-sea component was restricted by funding to a limited number of days and tows. More days/tows would have provided more statistically robust results, possibly attaining the winter flounder reduction goal. The results of this study as well as the above referenced previous SNECRI and Challenge Grant projects have served as the basis of an extensive test of the large mesh belly panel to reduce the bycatch of yellowtail and windowpane flounders on Georges Bank.

A detailed narrative of the results including the statistical analysis of all the data collected during this portion of the project can be found in Appendix 1 (Gear Trials – Reduction of Winter Flounder Bycatch Experimental Fishery Phase – Final Project Report) at the end of this report. Also, Appendix 2 contains all the raw data collected during research fishing in an Excel database
created by CCE.

**PROBLEMS ENCOUNTERED**

1. **Gear Technology Transfer Component (Voucher Program)**

   The following is a list of the difficulties CCE faced relative to this portion of the project:

   - After determining a fisherman met the program criteria and was qualified to participate, establishing contact with them proved difficult. Many phone calls and long periods of time were required to get fishermen to fill out Gear Trials voucher applications and use the vouchers.
   - Establishing and maintaining contact with eligible and participating fishermen in regards to the scheduling and installation of new avoidance gear proved difficult.
   - Establishing and maintaining contact with eligible and participating fishermen in regards to the use and performance of the avoidance gear (collecting survey information) has proven to be difficult. Encountering fishermen personally while visiting ports was unreliable. Numerous attempts at various times of the day to contact fishermen via telephone often resulted in unreturned messages.

2. **At-Sea Research Component (Experimental Fishery)**

   A short discussion and complete list of the difficulties CCE faced relative to this portion of the project is included Appendix 1 (Gear Trials – Reduction of Winter Flounder Bycatch Experimental Fishery Phase – Final Project Report)

**DISCUSSION/SUMMARY OF CONCLUSIONS**

1. **Gear Technology Transfer Component (Voucher Program)**

   The feedback received by CCE on the performance of the gear types was exceedingly positive. In 95% of the surveys, the gear was reported to be effective in reducing winter flounder bycatch. 77% of the surveys indicated that the reduction of winter flounder was over 70%. One third of the surveys reported the reduction in winter flounder to be between 90% and 100%. In 71% of the surveys, fishermen reported that there was no reduction in retention of the target species. For those surveys that indicated a reduction in target species, the reduction was minimal. The conditions under which fishermen used the gear most were when there was a high incidence of skates and/or dogfish. All of the final survey respondents felt it was helpful to the industry to have this opportunity to install the gear on their vessel at no cost. The overall thoughts on the program were all positive indicating that both gears are effective and the program was beneficial to fishermen at a time when it is becoming increasingly difficult to maintain an economically viable income in the commercial fishing industry. A total of 90% of participants that have been using the gear will continue to use the gear because it effectively reduces bycatch, reduces time spent processing the catch, and improves the quality of the catch.
2. **At-Sea Research Component (Experimental Fishery)**

Cornell Cooperative Extension conducted an at-sea experimental fishing component on board commercial fishing vessels as part of the Gear Trials Program to demonstrate the potential for two different conservation gear modifications to reduce winter flounder bycatch in the whiting small mesh trawl fishery in the Southern New England/Mid-Atlantic winter flounder stock area. The two gear types that were tested were the 12” drop chain sweep and the large mesh belly panel.

Results of the research indicated that neither the 12” drop chain sweep nor the large mesh belly panel experimental net proved to reduce the quantity of winter flounder bycatch by statistically significant levels. However, a winter flounder escapement of 25% in the drop chain sweep net and 44% in the large mesh belly panel net was observed when all tows were combined. There was no significant difference in whiting or squid catch between the control net and either experimental net modified with the 12” drop chain sweep or the large mesh belly panel. Retention of whiting, the target species, was maintained using both experimental nets. Both experimental nets proved to be functionally effective in significantly reducing the quantity of miscellaneous flounder (all flounders excluding winter flounder) and all combined flounder (including winter flounder) bycatch. The 12” drop chain sweep net reduced miscellaneous flounder catch by 67.4%. The large mesh belly panel reduced miscellaneous flounder catch by 63%. When all flounders (including winter flounder) were pooled, there was a statistically significant difference in the catch between the control net and net with the 12” drop chain sweep that yielded a 66.1% reduction in total flounders. The large mesh belly panel significantly reduced the catch of all combined flounders by 61.7%. When all demersal species were pooled, there was a highly significant statistical difference between the control net and both experimental nets that yielded a 66.8% reduction in catch by the 12” drop chain sweep treatment and a 65.5% reduction by the large mesh belly panel. Even though there was not a significant reduction in winter flounder with either experimental net as expected, there was a significant reduction in all flounders combined. Equally important was the fact that there was no significant loss of whiting in either experimental net. The results of this and other CFRF/CCE gear studies have served as the basis of an extensive test of the large mesh belly panel to reduce the bycatch of yellowtail and windowpane flounder on Georges Bank. A comprehensive description containing much greater detail is also offered in Appendix 1 (Gear Trials – Reduction of Winter Flounder Bycatch Experimental Fishery Phase – Final Project Report) located at the end of this report.
LITERATURE CITED


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<th>Appendix Description</th>
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<td>2. Experimental Fishery Phase Raw Data (Excel Database)</td>
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<td>3. Application, Voucher, and Gear Tracking (Excel Database)</td>
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<td>7. Monthly Survey Tracking (Excel Database)</td>
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<td>8. CFRF Gear Trials Program Newsletter</td>
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Appendix 1
GEAR TRIALS – REDUCTION OF WINTER FLOUNDER BYCATCH

Proof of Concept Program – Experimental Fishery Phase

Final project report to the Commercial Fisheries Research Foundation

June 2014

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ABSTRACT

Cornell Cooperative Extension (CCE) conducted an at-sea experimental fishing component as part of the Gear Trials Program to expand on the knowledge and achievements made in the proof of concept and full proposal research done under the Challenge Grant Program for Conservation Engineering Projects. This portion of the work was approached as a Proof of Concept experimental fishery phase. The goal of this at-sea research component was to demonstrate the potential for two different conservation gear modifications to reduce winter flounder bycatch in the whiting small mesh trawl fishery in the Southern New England/Mid-Atlantic winter flounder stock area. The two gear types that were tested were the 12” drop chain sweep and the large mesh belly panel. Data was collected onboard two commercial fishing vessels that targeted whiting. Paired tows were conducted using either the large mesh belly panel or the 12” drop chain sweep as the experimental component and a standard small mesh trawl as the control.

In summary, neither the 12” drop chain sweep nor the large mesh belly panel experimental net proved to reduce the quantity of winter flounder bycatch by statistically significant levels. However, a winter flounder escapement of 25% in the drop chain net and 44% in the large mesh belly panel net was observed when all tows were combined. There was no significant difference in whiting or squid catch between the control net and either experimental net modified with the 12” drop chain sweep or the large mesh belly panel. Retention of whiting, the target species, was maintained using both experimental nets. Both experimental nets proved to be functionally effective in significantly reducing the quantity of miscellaneous flounder (all flounders excluding winter flounder) and all combined flounder (including winter flounder) bycatch. The 12” drop chain net reduced miscellaneous flounder catch by 67.4%. The large mesh belly panel reduced miscellaneous flounder catch by 63%. When all flounders (including winter flounder) were pooled, there was a significant difference in the catch between the control net and net with the 12” drop chain sweep that yielded a 66.1% reduction in total flounders. The large mesh belly panel significantly reduced the catch of all combined flounders by 61.7%. When all demersal species were pooled, there was a highly significant difference between the control net and both experimental nets that yielded a 66.8% reduction in catch by the 12” drop chain treatment and a 65.5% reduction by the large mesh belly panel.
INTRODUCTION

Winter flounder in the Southern New England/Mid-Atlantic (SNE/MA) areas are often bycatch within the economically important small mesh fisheries. At the time of this project proposal, the most recent stock assessment (NEFMC, 2011) indicated that winter flounder stocks had been suffering severe decline in recent years. The SNE/MA winter flounder stock complex was overfished but overfishing was not occurring. The 2011 SAW 52 stock assessment of the SNE/MA stock complex of winter flounder includes fishery and research survey catch through 2010. The assessment indicated that during 1981-1993, fishing mortality (F ages 4-5) varied between 0.61 (1982) and 0.95 (1993) and then decreased to 0.47 by 1999. Fishing mortality then increased to 0.70 by 2001, and has since decreased to 0.051 in 2010, generally tracking the decrease in fishery catch. SSB decreased from 20,100 mt in 1982 to a record low of 3,900 mt in 1993, and then increased to 8,900 mt by 2000. Spawning stock biomass (SSB) has varied between 4,500-8,000 mt during 2001-2009, and was 7,076 mt in 2010. Recruitment at age 1 decreased nearly continuously from 71.6 million age-1 fish in 1981 (1980 year class) to 7.5 million fish in 2002 (2001 year class). Catch of 842 mt in 2011 is projected to provide median F2011 = 0.100 and median SSB2011 = 9,177 mt. Projections at F = 0.000 in 2012-2014 indicate less than a 1% chance that the stock will rebuild to spawning stock biomass maximum sustainable yield (SSBMSY) = 43,661 mt by 2014 as required by the Magnuson-Stevens Fishery Conservation and Management Act.

Most of the commercial landings of winter flounder from the SNE/MA stock complex have historically been taken from statistical areas 521 and 526 (east and south of Cape Cod, MA), 537 and 539 (south of Rhode Island), and 611-613 (Long Island Sound and south of Long Island). With the restrictions on Exclusive Economic Zone (EEZ) landings beginning in 2009, the percentage of landings from area 521 decreased from about 40% in 2007-2008 to about 20% in 2009; however, that percentage rebounded to 58% in 2010. In 2009 about 40% of the commercial landings were from areas 537 and 539 off Narragansett Bay, RI, and about 35% off the coasts of NY and NJ. In 2010 about 18% of the commercial landings were from areas 537 and 539 off Narragansett Bay, RI, and about 12% off the coasts of NY and NJ. The primary gear used in the commercial fishery is the otter trawl, which has accounted for an average of 98% of winter flounder landings since 1989. (NEFMC, 2011)

Avoidance of winter flounder during fishing activities is imperative at this time in order to reduce fishing mortality and assist rebuilding efforts. At the time of the proposed project, Amendment 16 to the Northeast Multispecies Fishery Management Plan (FMP) was implemented on May 1, 2010 and prohibited retention of winter flounder by federally permitted vessels throughout the SNE/MA winter flounder stock area. This area of prohibition extended from Massachusetts to North Carolina and affected many fisheries. The no-retention provision will likely increase winter flounder discard in the designated area. The no-retention provision has
since been modified to allow a very restricted harvest. Therefore it is crucial to have available functional gear adaptations to avoid or reduce catching winter flounder, while minimizing the economic impacts on the small mesh fisheries.

Through this project, Cornell University Cooperative Extension Marine Program (CCE) in conjunction with the Commercial Fisheries Research Foundation (CFRF) implemented a program to perform additional testing on two conservation engineering gear types, the large mesh belly panel and the 12” drop chain sweep, and to assist the commercial fishing industry with utilizing these gear types. Both gear types are designed to reduce winter flounder bycatch in the southern New England stock area. A financial assistance component of the program assisted fishing vessel owners with acquiring this conservation gear technology. Fishermen were issued vouchers to be used towards obtaining either gear type at no cost. This research component extended previous research conducted under the proof of concept and full proposal phases of the CCF sponsored Challenge Grant Program for Conservation Engineering Projects. This new project encompassed both qualitative observations reported by fishermen and quantitative analyses conducted by scientists onboard commercial fishing vessels. Further testing and evaluation of the avoidance gear large mesh belly panel developed through a 2010 SNECRI project and the avoidance gear 12” drop chain sweep with a 24” headrope adjustment was conducted. This testing would determine the potential for these types of gear to reduce winter flounder bycatch in the small mesh trawl fishery for whiting in the Southern New England (SNE) inshore winter flounder stock area. These avoidance gears were evaluated in paired sea trials over a total of 6 days of at-sea research fishing using 2 vessels representative of the active whiting fleet fishing inshore during the late summer and early fall. Each vessel fished for 6 days for a project total of 12 days at sea.

The large mesh belly panel avoidance gear adaptation was initially created and tested by CCE in 2010 for a SNECRI project in the small mesh fishery. The large mesh panel was made of 80cm (32”) mesh 6mm poly webbing, 2 meshes deep X 16 meshes wide sewn into the standard 16cm (6”) mesh of the belly. With the ‘saw-toothing’ of the 16cm mesh, this yields an effective opening of 3 full meshes deep, a total of about 8’ of large mesh. The panel attaches five 16cm meshes (approximately 2.5’) behind the footrope and goes from gore to gore (22 meshes wide or approximately 30’). Results of that study show that the use of the large mesh belly panel resulted in a statistically significant 88% reduction in winter flounder, and an 83% reduction in demersal species. Demersal species include all flounders, skates, dogfish and sea robins. There was no statistically significant loss of squid in the experimental net compared to the control net. It has been determined in the limited scope of that project that the large mesh belly panel is an effective avoidance gear adaptation that successfully reduces winter flounder bycatch and the bycatch of other demersals without significantly affecting squid catch.
Milliken and DeAlteris (2004) tested the effectiveness of 4 different large mesh panels positioned in the lower belly of a standard whiting trawl to reduce bycatch of various flatfish (including winter flounder) while not significantly reducing the whiting catch. One of the panels proved to be effective in reducing flatfish bycatch while not reducing the catch of whiting. They found that a large mesh panel constructed of 40.6-cm diamond shaped stretched mesh with orange-colored nylon twine 1.6 mm in diameter in the lower belly of the net resulted in a 73% reduction in flatfish catch with no effect on the catch of whiting. This study gives supporting evidence that a large mesh belly panel can be effective in the whiting fishery.

Data from a previously completed CFRF proof of concept study, assessing headrope length variability coupled with the use of a 12” drop chain sweep conducted by CCE in 2010, showed that across all adjustments of the headrope (6” – 36”) there was no significant difference in winter flounder catch between the control (0 slack) and any headrope slack adjustments combined with the 12” drop chain sweep. However there was a significant difference between the control (0 slack) and all headrope adjustments (6” – 36”) for squid, combined demersals and crustaceans (combined demersals for this study also included winter flounder). Catches of these species were reduced in the experimental net. A significant reduction in catch of demersal species was found in tows with the headrope lengthened. There was also a highly significant difference between control (0 slack) vs. experimental treatment in crustacean catch. The limited data set produced by that proof of concept project was not robust enough to draw definitive conclusions and an increased number of tows needed to be conducted to improve statistical strength.

As a continuation and addition to the Proof of Concept work discussed above, CCE completed a full evaluation of the 12” drop chain sweep combined with a single 24” headrope adjustment. The decision to increase the headrope length by 24” was based on the knowledge gained during the previously mentioned 2010 proof of concept project and the results of Jon Knight’s (Superior Trawl) work in a flume tank evaluating the 12” drop chain sweep and associated headrope slack. The 24” headrope adjustment showed the most promise for bycatch reduction in the “combined demersals” category during CCE’s proof of concept. In 2011 and 2012 CCE conducted 4 research trips and completed 98 paired tows comparing an experimental net outfitted with a 12” drop chain sweep and the headrope lengthened by 24” to a control net. Results of the study showed the experimental avoidance gear provided a statistically significant reduction in the bycatch of winter flounder as well as the bycatch of other demersal species. The 12” drop chain sweep showed an overall reduction of 78% in winter flounder catch compared to the control net. In addition, there was no statistically significant difference in squid catch between the control net and the modified experimental net.

All three of these demonstration projects have been well received by the commercial fishing industry. The statistically significant bycatch reduction achievements of the modified gear in the
Squid fishery have been recognized by industry and scientists, leaving them seeking more information on the performance of this technology in the small mesh whiting fishery.

**STATEMENT OF RESEARCH QUESTION**

Avoidance of winter flounder during commercial fishing activities is crucial at this time in order to reduce fishing mortality and assist rebuilding efforts of the SNE/MA winter flounder stock. The question addressed by this research is whether an avoidance gear adaptation, the large mesh belly panel or the 12” drop chain sweep, can successfully reduce winter flounder bycatch without reducing the harvest of the target species to levels below economic viability. While this approach was functionally and conceptually possible, it was necessary to determine, in practice, if either or both of the gear modifications would effectively reduce winter flounder bycatch in the small mesh, whiting fishery.

**GOALS AND OBJECTIVES**

To build upon the successes of CFRF’s previous Conservation Engineering projects, CCE collected both quantitative and qualitative data that was necessary for the completion of this research phase in the ongoing effort to improve fishing practices and help fishermen fish more selectively.

The overall goal and objective of the Gear Trials Program Proof of Concept experimental fishery phase was to conduct a Proof of Concept at sea evaluation to determine the effectiveness of these gear types (large mesh belly panel and 12” drop chain sweep with a 24” headrope adjustment) at reducing winter flounder bycatch while at the same time not significantly reducing the catch of whiting or squid. This was accomplished by extending the research record previously established to now include information relative to the whiting fishery.

**METHODOLOGY**

The experimental design and methodology developed for the research portion of this project incorporated the use of existing gear and typical fishing practices to test the large mesh belly panel and 12” drop chain sweep (with a 24” headrope adjustment) in the commercial, small mesh whiting fishery. CCE tested for differences in the catch of both the target species (whiting) and the protected species of concern (winter flounder). CCE conducted the research fishing across the appropriate identified strata of time, depth, area, fishing vessel size and power, and fishing practices. Two vessels of similar size and horsepower (60’-70’ vessels; 450-600 HP with identical fishing nets, doors, legs, ground cable) were chosen by the CFRF from a pool of applicants to work with CCE on the quantitative data collection portion of this phase of the project. The selected vessels were the F/V Lightning Bay and the F/V Excalibur both from Pt.
Judith, RI and both representative of the small mesh whiting trawl fleet. These vessels were specifically chartered to act as research platforms necessary for comparing the nets outfitted with the different experimental avoidance gears to a control net. The two participating captains (Jeff Wise and Phil Merris) have extensive experience fishing for whiting in the project areas and they worked willingly and supportively to accomplish all project goals. CCE, the vessel captains, and the CFRF Board of Directors cooperated to confirm that the study area at the time of the fieldwork was the best geographic location for testing the two types of gear. The geographic area was chosen based on confirmed empirical fisherman knowledge that winter flounder and whiting would likely both be present during the designated study time.

Tow procedure had each vessel essentially fish as it would in a standard commercial fishing trip, with the exception that all tows were 1 hour in duration. Each vessel was equipped with an identical net that was typical of the small mesh nets used in the commercial whiting fishery along the east coast of the United States – a four seam, three bridle box net. The two fishing vessels each had just one net that served as both the control and the experimental. This was accomplished by making adjustments to the single net in order to move from the standard control design to the experimental design. When a net was in the control mode, the sweep was attached to the traveler (hanging line/fishing line) by 2 chain links plus a shackle and there was an additional 4 links of chain left hanging from the shackle. Both vessels used this “2 links plus the shackle connected to the traveler with 4 hanging” as the control net design to provide consistency between vessels. While in control mode, both the headrope and the sweep were pulled in and fished on-even. The experimental 12” drop chain was assigned to the F/V Excalibur and remained with the boat for the entirety of the research fishing. The procedure the Excalibur followed to switch the net between the control and experimental arrangements was as follows: The drop chains in the control net were 2 chain links plus a shackle connected to the traveler with 4 chain links left hanging. This created a drop chain length of approximately 5”. This was switched to the experimental design by undoing the shackle connected to the traveler and including the 4 chain links that were left hanging. The result was 6 links of chain connected to the traveler by a shackle which resulted in an overall drop chain length of 12”. Further, the headrope was slacked out 12” on each side for a total adjustment/increase of 24”. The sweep was also slacked back 12” on each side in order to drop the sweep back behind the fishing line. The F/V Lightning Bay was supplied with the experimental large mesh belly panel for all of the experimental fishing component. In this case, the experimental large mesh belly panel was sewn in place in the first bottom belly of the net. The procedure the Lightning Bay followed to switch the net between control and experimental formats was as follows: For this net to be in the control format a 5” mesh “patch” was sewn over the large mesh panel rendering the large openings unusable. For the experimental format the 5” mesh “patch” was unlaced and removed leaving the 32” mesh panel exposed and ready for testing. The 5” mesh was consistent with the unaltered surrounding mesh in that area of the net.
The two vessels towed the gear side by side in the designated study area while fishing for whiting. Again, each vessel had just one experimental gear type onboard either the 12” drop chain or the large mesh belly panel and it was incorporated into the control net as was described above. Comparison tows were accomplished because of the capability of each vessel to switch the single net onboard between the control format and the experimental format. This resulted in one vessel pulling the control net while the other vessel pulled its experimental net thus equaling a paired tow. Evaluation of the control and experimental nets was based primarily on differences in catch of winter flounder, whiting, and total catch across the paired tows. The weights for all other species were also collected and recorded for every tow.

CCE used the coupled ABBA-BAAB protocol for all the research fishing that occurred during this project. The ABBA – BAAB protocol is a comparative system by which a control net and experimental net are fished and compared using an alternating, paired methodology (DeAltaris and Castro, 1991). This system was used to reduce any bias that may occur (across an array of variables) when comparing the performance of two nets. This coupled ABBA-BAAB protocol had 1 vessel use the ABBA sequence while the other vessel used the BAAB sequence thus creating a paired tow. This ABBA – BAAB protocol with each vessel having only one of the experimental nets was recommended to be used by the CFRF Conservation Engineering Review Panel in order to try to accomplish more paired tows within the limited budget available for this project. A further depiction of this alternating, paired tow methodology follows:

**ABBA – BAAB Protocol**

Vessel 1 and Vessel 2 (towing side by side)
A = Control fishing net
B = Experimental fishing net

It was determined prior to the start of research fishing which vessel would begin with the net in the experimental format. Regardless of how many tows were completed at day’s end, the
individual vessel continued to follow its predetermined sequence during each consecutive day of fishing. By using this procedure, the sequence is automatically reversed for each vessel on each successive day of fishing. In other words, the vessel that had the ABBA sequence on day 1 would follow the BAAB sequence on day 2. This worked to reduce any bias that could have resulted from time of day differences.

For Example:

<table>
<thead>
<tr>
<th></th>
<th>A = experimental net</th>
<th>B = control net</th>
</tr>
</thead>
<tbody>
<tr>
<td>DAY 1 – 6 TOWS</td>
<td>ABBA AB</td>
<td>BAAB B</td>
</tr>
<tr>
<td>VESSEL 1</td>
<td></td>
<td>ABBA AB</td>
</tr>
<tr>
<td>DAY 2 – 5 TOWS</td>
<td>BAAB BA</td>
<td>ABBA A</td>
</tr>
<tr>
<td>VESSEL 2</td>
<td></td>
<td>BAAB BA</td>
</tr>
<tr>
<td>DAY 3 – 6 TOWS</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Also, by using the ABBA protocol over the same sea bottom, the variables of depth and temperature within each trip and over the course of the experiment were randomized. This randomization served to normalize the data relative to depth and temperature. This system also maximizes at-sea time by reducing the number of net changes thus allowing the greatest number of comparison tows to be completed. Finally, this methodology also created the possibility of comparing the experimental net to the control net within the same vessel thus equaling a paired tow. By comparing sequential tows of an individual vessel, an experimental/control paired tow could be established (see figure 1). This allowed an increase in the sample size or data set by combining the paired tows formed between the two vessels with those created by a single vessel. It was thought that this could increase statistical strength to the analysis of this otherwise limited Proof of Concept research.

At the time of planning the experiment, we chose this research design to maximize the quantitative data collection component of this program. We assumed that tows could be paired in two ways: 1. Paired by tow when the tows were occurring simultaneously with one vessel towing an experimental net and the other vessel towing a control net, and 2. Paired by vessel with the same vessel utilizing the experimental gear and control net consecutively.

Number of trips and tows

For the research portion of this project, a scientific trip was defined as one day at sea for 2 vessels and a paired tow between vessels described a tow consisting of one vessel pulling the control net and a corresponding experimental net pulled by the other vessel. Utilizing these definitions, CCE completed 6 scientific trips and 36 paired tows. A slight discrepancy arises when you look at the number of individual tows completed. This was due to mechanical failure prohibiting the F/V Excalibur to complete a tow causing the F/V Lightning Bay to complete the tow unaccompanied. As a result, instead of 72 individual tows or 36 paired tows, 73 individual tows were completed. These 73 individual tows can be separated into 36 tows completed with
the control net and 37 tows completed with an experimental net. The 37 completed experimental tows can be broken down further into 18 tows completed with the belly panel net and 19 tows completed with the drop chain net.

Timing, Fishing Practice, and Area

The research fishing focused on a time period that coincided with the normal activities of the small mesh whiting fishery and would provide the highest likelihood of the co-occurrence of whiting and winter flounder. This operational plan was based on information from active fishermen, NEFSC trawl surveys, observer data, and landings reports. As was stated earlier in this report, the final decision as to where and when to fish was made jointly by fishermen, CFRF, and CCE. CCE’s 6 research trips occurred in the summer and fall of 2013. The specific dates were July 16th, 17th, 18th, and 19th and October 14th and 15th, 2013.

Each vessel operated with a single net switching back and forth between the control mode and the individual experimental mode that was assigned to that vessel as described above. The nets, doors, legs and ground cables were identical with both vessels. The experimental and control nets were towed side by side with the vessels attempting to remain within a half-mile of each other. Tows were made oriented along slope. After haul-back, the vessels turned around and made the same tow in the opposite direction with the next net in the ABBA sequence. The towpath or track was moved or changed only if it was necessary due to changes in or movement of fish concentrations and this could occur only at the end of a tow-block sequence. One-hour tow durations were used during this study. This allowed CCE to maximize the number of tows conducted per day. One-hour tows are recognized by industry and managers alike as acceptable because they fall within the standard range of commercial tow durations (1-3 hours). Specific adjustments to fishing practices were discussed and agreed upon by project partners prior to the start of research fishing and were adhered to throughout the project. One shortened tow was conducted prior to actual research fishing for net mensuration purposes to ensure nets were fishing with similar geometries. Each vessel maintained an average tow speed of 3 knots and tow wire scope was kept in the range of 2.5 to 3.0 to 1 depending on depth, which is the accepted ratio range for inshore tows. The headrope for both the control net and the experimental net with the belly panel was set on even. The headrope on the experimental net with the 12” drop chain was lengthened by 24” (12” each side). This 24” extension was removed when it was necessary for the drop chain net to function as a control net. This was accomplished by adding or removing a 12” length of chain from the upper bridle on each side of the trawl net mouth. Also, the experimental 12” drop chain sweep was constructed in three pieces, the two wings and a center section, and it too was lengthened by 2 feet (one foot per side). This additional length is necessary to allow the 12” drop chains to function as they were designed. The reason for the extension is twofold. First, the increase in the sweep length allows the sweep to travel behind the hanging line causing the drop chains to extend to their full potential (12”) and thus offering
the greatest area for fish escapement between the sweep and hanging line. Second, by lengthening the sweep and allowing it to travel behind the hanging line, the mud cloud created by the sweep does not obscure the enlarged opening created by the experimental drop chains. This increased visibility offers fish the greatest opportunity for escapement. The two-foot extension in the sweep was removed when the net needed to be used as the control. This was accomplished in the exact same manner as the headrope extension except the 12” length of chain was added or removed from the lower bridle on each side of the net.

The study vessels departed from the commercial port of Point Judith, Rhode Island. All research fishing was conducted in a historically productive fishing site locally known as “The Dump”. The area earned the name due to its past as a munitions and debris dumping ground and is located approximately 30 miles south of Martha’s Vineyard, MA and roughly 50 miles south and east of Montauk Point, NY. The center of this area is generally viewed to be in the vicinity of latitude 40° 44’N and longitude 70° 52’W.

**On Board Catch Processing**

Our objective was the winter flounder catch specifically relative to quantifying differences in retention between a control net and each individual type of gear modification (12” drop chain or large mesh belly panel). As such, the total catch of winter flounder captured was accurately weighed for each and every tow in order to determine and quantify differences. Winter flounder were also sampled for length frequency. The goal was minimally 100 random length measurements per tow. If fewer individuals were caught, than all the specimens available were measured. Since we were looking at winter flounder bycatch in the targeted whiting fishery, the total weight of the whiting catch was also obtained by direct weighing for every tow. This was necessary to quantify and determine if the total whiting catch was positively or negatively influenced by the experimental modifications to the net. In addition, a length sample of whiting of at least 100 individuals was obtained. The total weight of all additional species in each tow was also collected either by direct weighing or by sub-sampling/ catch estimations. For sub-sampling, a random sample of either 3 totes or 5 baskets was immediately taken from the catch after it was released on deck. From this random sample, individual species were separated and weighed and catch estimations were calculated. Catch estimations were made using the Catch Estimation Worksheet from the NMFS Fisheries Observer Program. This procedure for catch estimations and all other onboard catch processing procedures followed standard NMFS survey methods and/or the NMFS At Sea Monitoring Program and the Observer Program Biological Sampling protocols as outlined in the NEFSC 2010 sampling manuals.
DATA ANALYSIS

Below is a quantitative evaluation and summary of the data analysis. Data were analyzed primarily to determine if a statistical difference exists in the catch of winter flounder and of whiting between the control net and each experimental net and to further quantify what the difference was. Analysis was based primarily on the paired tow difference in catch (control minus experimental). Analysis was conducted in weights. We also tested for difference in length frequencies between the nets. We further looked at the performance of the two experimental nets and the control net relative to squid, combined flounders (all flounders including winter flounder), miscellaneous flounders (all flounders except winter flounder), and combined demersal species. Combined demersal species includes all flounders, all skates, smooth and spiny dogfish, monkfish, and sea robins. The data generated from the paired tows was normally distributed; therefore the parametric t-test was an appropriate statistical model to use to analyze the data. We have also included the results of the Wilcoxon test as a nonparametric analysis. All statistics were at the $\alpha = .05$ level. Data from 18 paired tows are used for the large mesh belly panel comparison and data from 19 paired tows are used for the drop chain comparison. A vessel breakdown resulted in one less tow for the large mesh belly panel comparison.

The best analytical approach is to pair each treatment tow with its corresponding control tow in order to reduce the variability that occurs from place to place and time to time in the ocean environment. The pairing of the treatment and the control is the best way to reduce the between-sample variability due to ocean processes that are independent of the treatment effects. The research design suggested by the Conservation Engineering Review Committee (described above) was set up to provide this pairing and to increase the number of pairs that could be accomplished in each day of fishing. This would potentially allow the experimental of one boat to be compared to the control of the other boat during the same tow (paired by tow) as well as each boat comparing its own control to its own sequential replicate experimental tow (paired by boat).

However once we started the statistical analysis, we realized that this full complement of pairing was not statistically valid. In the paired by tow analysis it became obvious that the treatment was confounded with vessel and we could not separate out the gear effect from the vessel effect. This was because each vessel had its own experimental net that was not switched with the other experimental net during the experiment. Therefore we could not statistically determine if the differences in the catch between the control (on one boat) and the experimental (on the other boat) were due to differences in the fishing effect of each vessel or the fishing effect of the gear. If we had switched experimental nets between the vessels several times during the experiment, we would have been able to randomize for vessel effect. We tried to resolve this by conducting a statistical analysis of variance across all tows both paired by boat and paired by tow, but the need to do the pairing did not allow the ANOVA to be a valid approach.
Therefore we used the paired by boat tows as the basis for the statistical analysis. This helped to resolve the variance but reduced the number of tow pairs that could be used for each experimental net.

**WINTER FLOUNDER**

First, statistical analysis of the data was conducted to determine if either the large mesh belly panel (Figure 1) or the 12” drop chain sweep experimental net (Figure 2) significantly effected retention of winter flounder relative to the standard control net.

The total catch weights of winter flounder for each tow were relatively low. Paired t-test results showed no significant difference between paired tows in terms of winter flounder catch for either experimental net. (Drop chain: \( t = 1.5154, \text{df} = 18, \text{p-value} = 0.147 \), mean of \( x = 3.715789 \); Large mesh belly panel: \( t = 1.4676, \text{df} = 17, \text{p-value} = 0.1605 \), mean of \( x = 7.461111 \)). The Wilcoxon nonparametric test showed similar results (Drop chain: p-value=0.06105; Large mesh belly panel: p-value=0.1406). These results were contradictory to CCE’s previous studies on the 12” drop chain sweep and large mesh belly panel conducted with similar gear in the squid fishery. In the previous studies, the experimental nets were proven to significantly reduce the amount of winter flounder bycatch compared to the control net. It is likely that the very low and zero catches of winter flounder that occurred in the current study coupled with the low number of paired tows produced the non-significant result. However we are still encouraged by the results of this study and suggest that conducting more tows in an area where winter flounder catches are higher might produce a result more consistent with our results in the squid fishery. As is shown below, both experimental gears significantly reduced the catch of all flounders and winter flounder are included with all flounders. Thus a more robust study may provide significant results for winter flounder.
Figure 1. Distribution of Paired Tow Differences for Winter Flounder (lbs) in the Large Mesh Belly Panel Net

Figure 2. Distribution of Paired Tow Differences for Winter Flounder (lbs) in the 12” Drop Chain Sweep Experimental Net
In the figures below, the total weight of winter flounder caught by the large mesh belly panel (Figure 3) and the 12” drop chain sweep experimental net (Figure 4) are compared to the paired control net catch of winter flounder.

**Figure 3. Total Catch Weight of Winter Flounder (lbs) in the Large Mesh Belly Panel Experimental Net and the Control Net for All Trips Combined**

**Figure 4. Total Catch Weight of Winter Flounder (lbs) in the 12” Drop Chain Sweep Experimental Net and the Control Net for All Trips Combined**
Although the result is not statistically significant, there was a 25.3% reduction in winter flounder catch in the net fitted with the 12” drop chain sweep compared to the control net. For the large mesh belly panel net, there was a 44% reduction in winter flounder in the experimental net compared to the control net.

WHITING

Next, statistical analysis of the data was conducted to determine if either experimental net (large mesh belly panel (Figure 5) or the 12” drop chain sweep (Figure 6)) significantly affected retention of whiting relative to the standard control net.

A paired t-test showed no significant difference between paired tows in terms of whiting catch in pounds. Neither experimental net significantly reduced the catch of whiting compared to the control net. (Drop chain: \( t = 0.8952, \text{df} = 18, \text{p-value} = 0.3825 \), mean of \( x = 117.1 \); Large mesh belly panel: \( t = 1.8449, \text{df} = 17, \text{p-value} = 0.08255 \), mean of \( x = 223.7389 \)). The Wilcoxon nonparametric test showed similar results (Drop chain: \( \text{p-value} = 0.3736 \); Large mesh belly panel: \( \text{p-value} = 0.1187 \)).

Figure 5. Distribution of Paired Tow Differences for Whiting (lbs) in the Large Mesh Belly Panel Net
In the following figures the total weight of whiting caught by the large mesh belly panel (Figure 7) and the 12” drop chain sweep experimental net (Figure 8) are compared to the paired control net catch of whiting.
According to Figures 7 and 8, a larger quantity of whiting was retained by the control net; however, the result is not statistically significant.
Next, statistical analysis of the data was conducted to determine if either the large mesh belly panel experimental net (Figure 9) or the 12” drop chain sweep experimental net (Figure 10) significantly affected retention of longfin squid relative to the standard control net.

Neither experimental net significantly reduced the catch of squid compared to the control net. (Drop chain: \( t = 0.705, \text{df} = 18, p\text{-value} = 0.4898 \), mean of \( x = 22.81053 \); Large mesh belly panel: \( t = -0.8031, \text{df} = 17, p\text{-value} = 0.433 \), mean of \( x = -20.62778 \).) The Wilcoxon nonparametric test showed similar results (Drop chain: \( p\text{-value}=0.2101 \); Large mesh belly panel: \( p\text{-value}=0.2837 \)).

Figure 9. Distribution of Paired Tow Differences for Squid (lbs) in the Large Mesh Belly Panel Net
In the following figures the total weight of squid caught by the large mesh belly panel (Figure 11) and the 12” drop chain sweep experimental net (Figure 12) are compared to the paired control net catch of squid.
Although the result was not statistically significant, a larger quantity of squid was retained by the large mesh belly panel compared to the control net. When compared to the experimental net with the 12” drop chain sweep, a larger quantity of squid was retained by the control net but the difference was not significant.
MISCELLANEOUS FLOUNDER

Next, the effect of the both the large mesh belly panel (Figure 13) and the 12” drop chain sweep (Figure 14) on the catch of miscellaneous flounders was analysed. Miscellaneous flounders includes yellowtail flounder, summer flounder, fourspot flounder, gulfstream flounder, witch flounder, and grey sole. Miscellaneous flounder does not include winter flounder.

The paired t-test results for miscellaneous flounder catch weights between the control net and both experimental nets showed a significant difference. Both experimental nets caught significantly less flounders. (Drop chain: $t = 4.6064$, df = 18, $p$-value = 0.0002191, mean of $x = 304.2789$; Large mesh belly panel: $t = 4.514$, df = 17, $p$-value = 0.0003064, mean of $x = 150.4222$). The Wilcoxon nonparametric test showed similar results (Drop chain: $p$-value = <0.0001; Large mesh belly panel: $p$-value=0.0001907).

Figure 13. Distribution of Paired Tow Differences for Miscellaneous Flounder (lbs) in the Large Mesh Belly Panel Net
Figure 14. Distribution of Paired Tow Differences for Miscellaneous Flounder (lbs) in the 12” Drop Chain Sweep Experimental Net

In the following figures the total weight of miscellaneous flounder caught by the large mesh belly panel (Figure 15) and the 12” drop chain sweep experimental net (Figure 16) are compared to the paired control net catch of miscellaneous flounder.

Figure 15. Total Catch Weight of Miscellaneous Flounder (lbs) in the Large Mesh Belly Panel Experimental Net and the Control Net for All Trips Combined
When miscellaneous flounder species were pooled, there was a 67.4% reduction in miscellaneous flounder catch in the net fitted with the 12” drop chain sweep compared to the control net. For the large mesh belly panel net, there was a 63% reduction in miscellaneous flounder in the experimental net compared to the control net when all paired tows were combined. Results are significant.

ALL FLOUNDERS

Next, the effect of both the large mesh belly panel (Figure 17) and 12” drop chain sweep (Figure 18) on the catch of all flounders combined was analysed. All flounders includes flounder species mentioned above as miscellaneous flounders, as well as winter flounder.

The paired t-test results showed a significant difference in the catch of all flounder combined in the control net compared to the net with the 12” drop chain sweep \((t = 2.4069, \text{df} = 18, \text{p-value} = 0.00025, \text{mean of } x = 307.94)\). The net with the 12” drop chain sweep caught significantly less flounders. The paired t-test results also showed a significant difference in the catch of all flounder in the control net compared to the net with the large mesh belly panel \((t = 1.2917, \text{df} = 17, \text{p-value} = 0.00035, \text{mean of } x = 157.88)\). The Wilcoxon nonparametric test showed similar results.
Figure 17. Distribution of Paired Tow Differences for All Flounders (lbs) in the Large Mesh Belly Panel Net

Figure 18. Distribution of Paired Tow Differences for All Flounders (lbs) in the 12” Drop Chain Sweep Experimental Net
In the figures below, the total weight of all flounders caught by the large mesh belly panel (Figure 19) and the 12” drop chain sweep experimental net (Figure 20) are compared to the paired control net catch of all flounders.

**Figure 19. Total Catch Weight of All Flounders Combined (lbs) in the Large Mesh Belly Panel Experimental Net and the Control Net for All Trips Combined**

![Figure 19](image)

**Figure 20. Total Catch Weight of All Flounders Combined (lbs) in the 12” Drop Chain Sweep Experimental Net and the Control Net for All Trips Combined**

![Figure 20](image)
When all flounder species were pooled, there was a 66% reduction in total flounder catch in the net fitted with the 12” drop chain sweep compared to the control net. There was a 61.7% reduction in total flounders caught when all paired tows were combined for the large mesh belly panel. These results are consistent with the results for miscellaneous flounders. These results also provide encouragement that winter flounder can be effectively, and possibly significantly, reduced by these gear modifications. A more robust study would provide further information on winter flounder results.

COMBINED DEMERSALS

Next, the data was analyzed to determine if a statistical difference exists in the catch of combined demersals in the large mesh belly panel net (Figure 21) and 12” drop chain sweep net (Figure 22) compared to the control net. Combined demersal species include all flounders, all skates, dogfish, monkfish and sea robins.

The paired t-test results for the catch of combined demersals showed a highly significant difference between the control net and both experimental nets (Drop chain: t = 5.6106, df = 18, \textit{p-value} = <0.0001, mean of x = 814.0842 ; Large mesh belly panel: t = 6.0928, df = 17, \textit{p-value} = <0.0001, mean of x = 480.9611). Both experimental nets caught fewer combined demersals. The nonparametric Wilcoxon signed rank test also returned a significant result for combined demersals catch weight differences between the control and experimental nets (Drop chain: \textit{p-value}= <0.0001; Large mesh belly panel: \textit{p-value}= <0.0001).
Figure 21. Distribution of Paired Tow Differences for Combined Demersals (lbs) in the Large Mesh Belly Panel Net

Figure 22. Distribution of Paired Tow Differences for Combined Demersals (lbs) in the 12” Drop Chain Sweep Experimental Net
In the figures below, the total weight of combined demersals caught by the large mesh belly panel (Figure 23) and the 12” drop chain sweep experimental net (Figure 24) are compared to the paired control net catch of combined demersals.

**Figure 23. Total Catch Weight of Combined Demersals (lbs) in the Large Mesh Belly Panel Experimental Net and the Control Net for All Trips Combined**

![Figure 23](image1.png)

**Figure 24. Total Catch Weight of Combined Demersals (lbs) in the 12” Drop Chain Sweep Experimental Net and the Control Net for All Trips Combined**

![Figure 24](image2.png)
When all demersal species were pooled for this comparison, the 12” drop chain sweep experimental net allowed for a 66.8% escapement rate of all combined demersal species (Figure 23). The large mesh belly panel experimental net allowed for a 65.5% escapement rate of all combined demersals (Figure 24). For both experimental gears, this reduction in the capture of combined demersal species is statistically significant.

The results of all statistical tests by species and species grouping for both experimental gears are combined in Table 1 below.

### Table 1. Results of T-Test and Wilcoxon Test on Catch Difference by Species for Both Experimental Gears

<table>
<thead>
<tr>
<th>Species</th>
<th>Gear</th>
<th>T-Test Results</th>
</tr>
</thead>
<tbody>
<tr>
<td>Winter flounder</td>
<td>12” Drop Chain</td>
<td>P=0.1470 (NS)</td>
</tr>
<tr>
<td></td>
<td>Large Mesh Belly Panel</td>
<td>P=0.1605 (NS)</td>
</tr>
<tr>
<td>Whiting</td>
<td>12” Drop Chain</td>
<td>P=0.3825 (NS)</td>
</tr>
<tr>
<td></td>
<td>Large Mesh Belly Panel</td>
<td>P=0.0825 (NS)</td>
</tr>
<tr>
<td>Squid</td>
<td>12” Drop Chain</td>
<td>P=0.4898 (NS)</td>
</tr>
<tr>
<td></td>
<td>Large Mesh Belly Panel</td>
<td>P=0.4330 (NS)</td>
</tr>
<tr>
<td>Miscellaneous flounder</td>
<td>12” Drop Chain</td>
<td>P=0.00002 (S)</td>
</tr>
<tr>
<td>(excludes winter flounder)</td>
<td>Large Mesh Belly Panel</td>
<td>P=0.0003 (S)</td>
</tr>
<tr>
<td>All flounders</td>
<td>12” Drop Chain</td>
<td>P=0.00025 (S)</td>
</tr>
<tr>
<td>(includes winter flounder)</td>
<td>Large Mesh Belly Panel</td>
<td>P=0.00035 (S)</td>
</tr>
<tr>
<td>Combined demersals</td>
<td>12” Drop Chain</td>
<td>P&lt;=&lt;0.0001 (S)</td>
</tr>
<tr>
<td></td>
<td>Large Mesh Belly Panel</td>
<td>P&lt;=&lt;0.0001 (S)</td>
</tr>
</tbody>
</table>

For all comparisons, the Wilcoxon test yielded results similar to the t-test results.

**TIME OF DAY**

Next we tested to see if there were any differences in the whiting catch based on the time of day the tow was conducted. Tows were conducted during the day and night. For analysis purposes we divided the fishing period into four time segments to determine if time of day affected the catch of whiting. The four time segments were as follows: 1) 05:00 – 10:00; 2) 10:00- 15:00; 3) 15:00 – 20:00; 4) after 20:00.

We performed an ANOVA with whiting catch in pounds for all control and experimental nets as the dependent variable and time segment as the main effect. The results are given in Table 2.
We next conducted a Tukey analysis on the results of the ANOVA to see how the whiting catch during each time segment was different from the other time segments. Results are in Table 3. Time segment 4 (tows made at night) is significantly different from time segment 2 (tows made from mid-morning to mid-afternoon), and marginally significantly different from time segment 1 (morning tows), but not different from time segment 3. The rest of the segments are all similar to each other.

<table>
<thead>
<tr>
<th>Time Segment Comparison</th>
<th>P-Value</th>
</tr>
</thead>
</table>
| 2 – 1                   | 0.5344  | NS       
| 3 – 1                   | 0.9999  | NS       
| 4 – 1                   | 0.0529  | Marginal 
| 3 – 2                   | 0.6674  | NS       
| 4 – 2                   | 0.0039  | S        
| 4 – 3                   | 0.1031  | NS       

We then looked at the mean whiting catch weights for each time segment (Table 4). Time segment 2 had the lowest mean catch weight while time segment 4 had the largest mean catch weight of whiting. This confirms what fishermen already know: in this fishing area, at this time of year, you will catch more whiting at night than you will in the middle of the day. Further the larger catch at night is statistically significant from the smaller catch during the middle of the day. However, these differences by time segment have no effect on the overall analysis of species escapement afforded by the experimental gear because all of those comparisons are based on the fact that we are analyzing by paired tows and all pairs occurred within the same time segment.

<table>
<thead>
<tr>
<th>Time Segment</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean Weight (Lbs)</td>
<td>877.88</td>
<td>716.43</td>
<td>883.05</td>
<td>1332.69</td>
</tr>
</tbody>
</table>

Table 2. Results of ANOVA on Whiting Catch

<table>
<thead>
<tr>
<th>Time Segment</th>
<th>Whiting Catch (Pounds)</th>
<th>P=0.00888 Significant</th>
</tr>
</thead>
<tbody>
<tr>
<td>Time Segment</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table 3 – Tukey Results for Time Segment Comparison of Whiting Catch

NS=Not Significant, S=Significant

Table 4 - Mean Catch Weights of Whiting by Time Segment
LENGTH FREQUENCY

Next, we looked at the effect of both experimental nets and the control nets on the length frequency distribution of winter flounder (Figure 25) and of whiting (Figure 26).

ANOVAs were conducted to determine if any of the nets caused a significant difference in the mean lengths of winter flounder (Table 5) and of whiting (Table 6). Mean length was the dependent variable. Gear was the main effect. A separate ANOVA was conducted for each species.

Table 5. ANOVA on Mean Length of Winter Flounder with Gear

<table>
<thead>
<tr>
<th>Gear</th>
<th>Mean Length of Winter Flounder (cm)</th>
<th>P= 0.411</th>
<th>Not Significant</th>
</tr>
</thead>
</table>

Gear was not significant for winter flounder so there was no size selectivity caused by either of the experimental nets. A boxplot of winter flounder length frequencies for each net type is shown in Figure 25.

Figure 25. Boxplot of Winter Flounder Length Frequencies (cm) For Each Net Type
Table 6. ANOVA on Mean Length of Whiting with Gear

<table>
<thead>
<tr>
<th>Gear</th>
<th>Mean Length of Whiting (cm)</th>
<th>P= &lt; 0.0001 Significant</th>
</tr>
</thead>
</table>

For whiting there was a significant result for the effect of gear on length frequency. We then conducted a Tukey analysis on the results of the ANOVA to see which nets were significantly different from the others for whiting length frequency. Results are in Table 7. The belly panel net is significantly different from both the drop chain net and the control net. There was no significant difference in size distribution between the drop chain net and the control net. A boxplot of whiting length frequencies for each net type is shown in Figure 26.

Table 7. Tukey Results for Net Comparison On Whiting Length Frequency

<table>
<thead>
<tr>
<th>Net Comparison</th>
<th>P-Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Control – Belly panel</td>
<td>&lt; .0001 Significant</td>
</tr>
<tr>
<td>Drop chain – Belly panel</td>
<td>&lt; .0001 Significant</td>
</tr>
<tr>
<td>Drop chain – Control</td>
<td>0.09 Not significant</td>
</tr>
</tbody>
</table>

Figure 26. Boxplot of Whiting Length Frequencies (cm) For Each Net Type
The mean lengths of winter flounder and whiting for each experimental net and the control are shown in Table 8 below.

Table 8. Mean Lengths of Winter Flounder and Whiting for Each Gear

<table>
<thead>
<tr>
<th>Gear</th>
<th>Mean Lengths (cm)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Whiting</td>
</tr>
<tr>
<td>Large Mesh Belly Panel</td>
<td>25.82</td>
</tr>
<tr>
<td>Drop Chain</td>
<td>24.98</td>
</tr>
<tr>
<td>Control</td>
<td>25.23</td>
</tr>
</tbody>
</table>

The mean size of whiting is larger in the belly panel net and the belly panel caught fewer smaller size whiting. So it seems that even though there is no significant difference in whiting catch in pounds between the belly panel and control (see t-test analysis above) there is a significant difference in size. The belly panel may allow for greater escapement of small whiting. The largest winter flounder were caught in the net with the 12” drop chain sweep and the smallest were caught in the net with the large mesh belly panel. Smaller winter flounder may have increased ability to avoid capture in the net with the 12” drop chain sweep but the difference is not significant.

DISCUSSION

For this project we looked mainly at the difference in winter flounder catches and in whiting catches of the two experimental nets (large mesh belly panel and 12” drop chain sweep) compared to the control net. We also looked at the difference in catch of squid, miscellaneous flounders (excluding winter flounder), all flounders (including winter flounder), and combined demersals between the experimental nets and the control net. For the large mesh belly panel, paired t-test results showed no significant difference in the catch weights of winter flounder or of whiting. The large mesh belly panel does not significantly reduce the whiting or winter flounder catch. Although the result was not significant, there was a 44% reduction in winter flounder catch in the net with the large mesh belly panel compared to the control net when all 18 paired tows were combined. Paired t-test results also showed a non-significant result for the catch differences of squid in the net with the large mesh belly panel compared to the control net. Paired t-test results showed a significant difference for miscellaneous flounders, all flounders combined, and combined demersals in the net with the large mesh belly panel compared to the control net. The experimental net with the large mesh belly caught significantly less miscellaneous flounders (excluding winter flounder), combined flounders (including winter flounder) and combined demersals than the control net. The nonparametric Wilcoxon signed rank test produced the same results for all tests. The large mesh belly panel experimental net reduced miscellaneous flounders by 63%, reduced total flounders by 61.7% and reduced combined demersals by 65.5%.
For the 12” drop chain sweep, paired t-test results showed no significant difference in the catch weights of winter flounder or of whiting. The 12” drop chain sweep does not significantly reduce whiting or winter flounder catch. Although the result was not significant, there was a 25.3% reduction in winter flounder catch in the net with the 12” drop chain sweep compared to the control net when all 19 paired tows were combined. Paired t-test results also showed a non-significant result for the catch difference of squid in the experimental net compared to the control net. Paired t-test results showed a significant difference for miscellaneous flounders, all combined flounders and combined demersals. The nonparametric Wilcoxon signed rank test produced the same results. The experimental net with the 12” drop chain sweep caught significantly less miscellaneous flounders, combined flounders and combined demersals than the control net. The 12” drop chain experimental net reduced miscellaneous flounders by 67.4%, reduced total flounders by 66.1% and reduced combined demersals by 66.8%.

Neither experimental net caused any significant reduction in the catch of the target species of whiting and squid. This met the goal of these gears not reducing the catch of the target species. However the primary goal of significantly reducing winter flounder catch was not accomplished. However we are still encouraged by the results of this study.

Results of the statistical analysis of the current project differ from results of the previous projects examining winter flounder bycatch reduction using both the large mesh belly panel and the 12” drop chain sweep in the longfin squid fishery. In previous projects, statistical analysis indicated that both experimental gears significantly reduced winter flounder bycatch. It is possible that the lack of statistical significance for winter flounder catch difference in the current project is being influenced by low sample size and low or zero catches of winter flounder. Both experimental gears tested for this project significantly reduce bycatch of miscellaneous flounders, demersal species and combined flounders while retaining the target species of whiting and squid making these gear types practical solutions to the overall bycatch problem in the small mesh fisheries.

**SUMMARY OF CONCLUSIONS**

- Neither the 12” drop chain sweep or large mesh belly panel experimental net has proven to significantly reduce the quantity of winter flounder bycatch by statistically significant levels. However, a winter flounder escapement of 25% in the drop chain net and 44% in the large mesh belly panel net was observed when all tows were combined.
- There was no significant difference in whiting or squid catch between the control net and either experimental net modified with the 12” drop chain sweep or the large mesh belly panel. Retention of these target species was maintained using both experimental nets.
Both experimental nets proved to be functionally effective in significantly reducing the quantity of miscellaneous flounder (all flounders excluding winter flounder) bycatch. The 12” drop chain net reduced miscellaneous flounder catch by 67.4%. The large mesh belly panel reduced miscellaneous flounder catch by 63%.

When all flounders (including winter flounder) were pooled, there was a significant difference in the catch between the control net and net with the 12” drop chain sweep that yielded a 66.1% reduction in total flounders. The large mesh belly panel significantly reduced the catch of all combined flounders by 61.7%.

When all demersal species were pooled, there was a highly significant difference between the control and both experimental nets that yielded a 66.8% reduction in catch by the 12” drop chain treatment and a 65.5% reduction by the large mesh belly panel.

Given the above results we are still encouraged that these two gear modifications can be successful in reducing winter flounder bycatch since they are successful in reducing the catch of all flounders and all demersals. A more robust study (more tows where there are higher concentrations of winter flounder) will provide greater statistical strength to this study.

OUTREACH

The outreach component of this program is a significant element linked to the project’s success. CCE’s mission is to enable people to improve their lives and communities through partnerships that put experience and research knowledge to work. Through this opportunity afforded by CFRF, CCE has fostered its strong industry relationships to support and advance the tools used for conservation gear technology within commercial fisheries. Outreach associated directly with the research component that has been conducted by CCE includes the following:

- CCE staff members have and will continue to conduct outreach by engaging industry members (including fishermen, dealers, and dockworkers) in discussions regarding this program and the associated research while they are in the field.
- CCE completed a Gear Trials Program newsletter on behalf of CFRF in early September 2013. The finalized newsletter was printed and mailed to industry members and is still available in electronic format on the CFRF, CCE, and Squid Trawl Network websites. Printed newsletters were also distributed to any interested parties when CCE staff is in the field. This newsletter did contain a small section regarding the research work that had been completed at that time.
- CCE gave a presentation to fishermen at the RSA Auction on February 5, 2014 that was held at CCE’s office in Riverhead, NY. The presentation included a segment detailing the specifics of the Gear Trials Program including the research component.
- The results of this project linked with previous results for the large mesh belly panel and drop chain projects are being used to encourage fishermen to enroll in the Gear Trials Program and to use these gears to reduce bycatch.
In addition to the activities completed and those continuing to occur, CCE has committed to also do the following:

- CCE will focus outreach and education efforts at the end of the program to share observations, present an overview of the data collected, explain the analysis of the data, and offer a summary of the final results. This will be done for the research component as well as the financial/technology transfer component.
- Results of the project will be provided and presented to NMFS, MAFMC, NEFMC, ASMFC, and state agencies at regional council meetings as requested.
- Presentations of the final program findings will also be offered at CFRF workshops and to commercial fishing group meetings and other entities interested in the results.

**PROBLEMS ENCOUNTERED**

Commercial fisheries research is always an uncertain enterprise. Performing research aboard commercial fishing vessels with experimental gear and scientific equipment offers many opportunities for problems to arise. The research portion of this project overall went very well. The issues that did arise and should be noted were as follows:

- Scheduling research trips was challenging due to the availability of the cooperating vessels.
- The occasional loss of door spread readings throughout the course of the project. Door spread sensors are prone to be erratic in their performance and such was the case during this project.
- Winter flounder catches were relatively small. Despite the historical co-occurrence of winter flounder and whiting in the area fished, the numbers we encountered were unfortunately lower than we had hoped for and likely affected the statistical power of the results.
- Underwater Video Recording – CCE had written into the submitted proposal for this project that “videotape recordings would be made during as many tows as possible and where conditions permit”. This component of the research proved impossible because of the conflicting availabilities of the cooperating fishing vessels and the necessary video technician and equipment supplied by the NEFSC. Also, based on CCE staff observations, the water clarity and sea bottom (soft, mud) conditions would have made visibility difficult.
- The F/V Excalibur experienced complete mechanical failure and needed assistance via a tow to return to port for repairs during one of our research trips. Once the vessel was repaired, CCE staff returned to sea with captain and crew and completed the unfinished research fishing.
Unfortunately the field design suggested for this project did not stand up to statistical rigor. We therefore had only half of the paired tows that we had hoped for. This coupled with low winter flounder catches likely affected the statistical power of the results.

**LITERATURE CITED**


The Commercial Fisheries Research Foundation (CFRF) is a non-profit, private organization that was founded in 2004 by a group of commercial fishermen. The fundamental goal of the CFRF is to create practical solutions to the issues faced by commercial fishermen in southern New England.

The CFRF’s Board of Directors is filled entirely by commercial fishermen and individuals who work in industries that support commercial fishing. The Foundation’s mission is to establish quality relationships between fishermen, managers, and scientists through collaborative research projects. These projects allow fishermen and scientists to work together to alter current gear designs or develop new ones to fish more selectively which ultimately culminates in better management decisions.

The Gear Trials Program was established and sponsored by the CFRF. The Program addresses two experimental gear types, the large mesh belly panel and the 12" drop chain sweep. Both were designed to reduce winter flounder bycatch in the southern New England stock area within the small mesh trawl fisheries. Through this project, CFRF with Cornell University Cooperative Extension Marine Program (CCE) acting as a facilitator, implemented a program to assist the commercial fishing industry with obtaining and implementing these two conservation engineering gear modifications. The program will also continue to test the performance of the two gear modifications. The financial support component of the program assists fishing vessel owners with acquiring this conservation gear technology. The research component will extend the work conducted previously in the squid fishery into the small mesh whiting fishery to continue to evaluate the performance of the two gear types.

The large mesh belly panel was initially tested by CCE in 2010 for a Southern New England Collaborative Research Initiative (SNECRI) project which was funded by CFRF. Results of the study showed that the use of the belly panel resulted in an 88% reduction in winter flounder, and an 83% reduction in combined demersal species (all flounders, skates, dogfish and sea robins) while showing no statistically significant loss of squid. Similarly, the experimental 12" drop chain sweep was proven to be functionally effective through testing conducted by CCE in 2011/2012 and funded by CFRF. During this project, the 12" drop chain sweep resulted in a 78% reduction in winter flounder bycatch and a 76% reduction in combined demersal species bycatch with no significant loss of squid.

Both of these demonstration projects were well received by the commercial fishing industry. The significant bycatch reduction achieved by each of the modified gear types in the squid fishery has been recognized mutually by industry and scientists prompting them to now seek more information on the performance of this technology in the small mesh whiting fishery.

The overall goals and objectives of the two components of the Gear Trials Program are the following:

- To coordinate and assist industry with acquiring the new gear technology (large mesh belly panel and/or 12" drop chain sweep) through a financial assistance program for fishing vessel owners.
- Continue to evaluate the effectiveness of these two gear types at reducing winter flounder bycatch, as well as the bycatch of other demersal species, by conducting at sea research during the whiting fishery.
- Establish an outreach program that will monitor and record fishermen’s observations and comments about the performance of these two gear types and effectively relay this information back to fishing industry members. The outreach program will also distribute the results of the continued testing of the new gear in the whiting fishery when the research is completed.
Outcomes (as of September 16, 2013)

At the start of the program efforts focused on identifying qualified participants and informing them of the unique opportunity that was being offered by the CFRF. Qualifications included home port (NY, CT, MA, RI, DE, NJ, VA) and vessel trip reports (current VTR's indicating the use of an otter trawl with 3" mesh or smaller) landing whiting, squid, or soup in NMFS management areas 537, 538, 539, 611, 612, or 613). Eligible participants received voucher applications for one or both of the new gear types from CFRF that could be redeemed at Superior Trawl or Reidar's Manufacturing, Inc.

To date:

• 44 completed applications have been received from the combined states of NY, CT, MA, and RI.

• From all the completed applications, 41 vouchers were issued for the 12" drop chain sweep and 39 vouchers were issued for the large mesh belly panel.

Fishermen have begun using the new gear and CCE has started to receive feedback on the performance of the new gear types. The gear has been used by fishermen targeting primarily squid, whiting, and soup. Opinions of these gear modifications are predominantly positive.

To date:

• 18 responses have been received by CCE in the form of a brief survey (10 questions) regarding the fishermen's opinions.

• The surveys are from March, April, May, and June of 2013.

• 16 surveys were received relative to the use of the 12" drop chain sweep and 2 surveys were received commenting on the combined use of the 12" drop chains and the large mesh belly panel.

• All 18 surveys indicated a positive reduction in bycatch with estimates ranging from a 20% reduction to a 90% reduction.

• 15 of the 18 surveys stated there was no reduction in retention of the target species while the 3 remaining surveys indicated an estimated 20% reduction in the target species.

Continued Research

During mid-July of 2013 four days of research fishing evaluating the performance of the two gear types were conducted while targeting whiting. Two additional days of fishing remain and then the accumulated data will be organized and analyzed to evaluate the effectiveness of the two gear types as a means of winter flounder bycatch reduction in the targeted small mesh whiting fishery. Once completed, the results will be available to all interested parties. Future research may be directed at the effectiveness of these gear types in reducing the bycatch of other flounders as well.

For More Information:
If you are interested in participating in the Program there is funding still available. Please contact Jane Dickinson at:
jdickinson@cfrfoundation.org

Commercial Fisheries Research Foundation go to:
www.cfrfoundation.org

Gear Trials Program go to:
www.geartrials.org

Cornell University Cooperative Extension Marine Program go to:
www.su.suffolk.org/marine-2/

Gear Trials Program funding provided to the CFRF through NOAA Grant 
NA09NMF4720414 and efforts made by U.S. Senator Jack Reed.
Appendix 4
Gear Trials Program

Testing of 12” Drop Chain and Large Mesh Belly Panel

Fishermen Survey Form – Monthly Reporting

Please complete the survey form below with all the appropriate information and submit by fax, e-mail or mail by the first of each month to:

John Scotti/Cornell University Cooperative Extension Marine Program
423 Griffing Avenue, Riverhead, NY 11901
E-Mail: jns8@cornell.edu

You may also fill out and submit the form online by going to: www.geartrials.org. Click on “Submit Survey” at the top of the homepage.

If you have any questions, please contact John Scotti at (631) 727-7850 x 223.

Your Name: __________________________ Vessel: __________________________

Reporting Period (Month and Year): ________________

1. Check the type of bycatch reduction gear have you been using on your fishing vessel during this reporting period:
   ______ 12” drop chain (small vessel category) ______ 12” drop chain (large vessel category)
   ______ large mesh belly panel

2. What small mesh fishery were you targeting?
   ______ squid _______ whiting _______ scup
   ______ other (please name species) __________________________

3. What statistical areas did you primarily fish in while using the bycatch reduction gear? ______________

4. Did you make any adjustments or modifications to the gear? If so, how? __________________________

5. Under what fishing conditions did you use the bycatch reduction gear? (ex: high incidence of dogfish)
   __________________________

6. Did you find the gear to be effective in reducing winter flounder bycatch? ______ Yes ______ No

7. Over the past month, did you observe a reduction in target species when using the bycatch reduction gear? If so, estimate the percent reduction of each target species.
   __________________________

8. Over the past month, did you observe a reduction in bycatch species when using the bycatch reduction gear? If so, estimate the percent reduction of each bycatch species.
   __________________________

9. Will you continue to use the gear? ______ Yes ______ No

10. Please share any additional observations below.
   __________________________
Appendix 5
You may qualify to receive vouchers to purchase these gear types for your fishing vessel if you:

1. Have a current federal permit or state license for small mesh fisheries
2. Are a resident of Rhode Island, Massachusetts, Connecticut, or New York
3. Have an active fishing history in the small mesh fisheries within the time frame of January 2010 to present as demonstrated by submittal of VTR’s or logbook entries for 3 separate fishing trips showing:
   a. Landings from small mesh fisheries (squid, scup, whiting)
   b. Fishing activity in one or more of the following Statistical Areas: #537, #538, #539, #611, #612, #613

If interested please read the enclosed materials and apply by December 31, 2012.
Gear Trials Program - Testing of 12” Drop Chain and Large Mesh Belly Panel

Fishermen Survey Form – Final Reporting

Name: ___________________________  Vessel: ___________________________

1. Which bycatch reduction gear(s) have you been using on your fishing vessel:
   __ 12” drop chain (small vessel) __ 12” drop chain (large vessel) __ large mesh belly panel
2. What small mesh fishery were you targeting? __ squid  __ whiting __ scup  __ other________
3. What statistical areas did you primarily fish in while using the bycatch reduction gear? ______
4. Overall, did you make any adjustments or modifications to the gear? ______ Yes ______ No
   If so, how? _________________________________________________________________
5. Under what fishing conditions did you use the bycatch reduction gear? (ex: high incidence of dogfish)

6. Did you find the gear to be effective in reducing winter flounder bycatch? ______ Yes ______ NO
7. Did the gear reduce other types of flounders? ______ Yes ______ No
8. Did you observe a reduction in target species when using the gear? If so, estimate the percent reduction
   of each target species. ______ Yes ______ No ______________________________________
9. Did you observe a reduction in bycatch species when using the gear? If so, estimate the percent
   reduction of each bycatch species. ______ Yes ______ No ______________________________
10. Did the gear(s) work best on certain bottoms? ______ Yes ______ No If yes, which bottom?__________
11. Did the gear work best in certain fisheries? ______ Yes ______ No If yes, which fisheries?_____________
12. Will you continue to use the gear in the future? ______ Yes ______ No
    If yes, will these gears be used permanently or randomly based on the fishery and bottom?

13. Was this your first set of drop chains or a replacement (RI fluke fishery pilot project)?
    ______ First Set ______ Replacement
14. Was the design and directions to install the gears easy to understand and complete? ______ Yes ______ No
15. Do you think it was helpful to the industry in general to have this opportunity to install this gear on their
    fishing vessels at no cost? ______ Yes ______ No
16. Did the program provide needed financial assistance to put the gear on your vessel(s)? ______ Yes ______ No
17. Did the program provide the incentive to install the gear? ______ Yes ______ No
18. Are more research projects needed in the area of conservation gear engineering? ______ Yes ______ No
    If so, what issues need to be addressed to help fishermen in the southern New England/Mid-Atlantic
    region fish selectively for target species and avoid unwanted bycatch?

19. If you chose to NOT use the gear, why not?
    __________________________________________________________________________

20. Overall, what are your thoughts on the gear trials program?
    __________________________________________________________________________
Appendix 8
The Commercial Fisheries Research Foundation (CFRF) is a non-profit, private organization that was founded in 2004 by a group of commercial fishermen. The fundamental goal of the CFRF is to create practical solutions to the issues faced by commercial fishermen in southern New England.

The CFRF’s Board of Directors is filled entirely by commercial fishermen and individuals who work in industries that support commercial fishing. The Foundation’s mission is to establish quality relationships between fishermen, managers, and scientists through collaborative research projects. These projects allow fishermen and scientists to work together to alter current gear designs or develop new ones to fish more selectively which ultimately culminates in better management decisions.

The Gear Trials Program was established and sponsored by the CFRF. The Program addresses two experimental gear types, the large mesh belly panel and the 12” drop chain sweep. Both were designed to reduce winter flounder bycatch in the southern New England stock area within the small mesh trawl fisheries. Through this project, CFRF with Cornell University Cooperative Extension Marine Program (CCE) acting as a facilitator, implemented a program to assist the commercial fishing industry with obtaining and implementing these two conservation engineering gear modifications. The program will also continue to test the performance of the two gear modifications. The financial support component of the program assists fishing vessel owners with acquiring the new gear technology (large mesh belly panel and/or 12” drop chain sweep) through a financial assistance program for fishing vessel owners.

The overall goals and objectives of the two components of the Gear Trials Program are the following:

- To coordinate and assist industry with acquiring the new gear technology (large mesh belly panel and/or 12” drop chain sweep) through a financial assistance program for fishing vessel owners.
- Continue to evaluate the effectiveness of these two gear types at reducing winter flounder bycatch, as well as the bycatch of other demersal species, by conducting at sea research during the whiting fishery.
- Establish an outreach program that will monitor and record fishermen’s observations and comments about the performance of these two gear types and effectively relay this information back to fishing industry members. The outreach program will also distribute the results of the continued testing of the new gear in the whiting fishery when the research is completed.

The large mesh belly panel was initially tested by CCE in 2010 for a Southern New England Collaborative Research Initiative (SNECRI) project which was funded by CFRF. Results of the study showed that the use of the belly panel resulted in an 88% reduction in winter flounder, and an 83% reduction in combined demersal species (all flounders, skates, dogfish and sea robins) while showing no statistically significant loss of squid. Similarly, the experimental 12” drop chain sweep was proven to be functionally effective through testing conducted by CCE in 2011/2012 and funded by CFRF. During this project, the 12” drop chain sweep resulted in a 78% reduction in winter flounder bycatch and a 76% reduction in combined demersal species bycatch with no significant loss of squid.

Both of these demonstration projects were well received by the commercial fishing industry. The significant bycatch reduction achieved by each of the modified gear types in the squid fishery has been recognized mutually by industry and scientists prompting them to now seek more information on the performance of this technology in the small mesh whiting fishery.
Outcomes (as of September 16, 2013)

At the start of the program efforts focused on identifying qualified participants and informing them of the unique opportunity that was being offered by the CFRF. Qualifications included home port (NY, CT, MA, RI, DE, NJ, VA) and vessel trip reports (current VTR’s indicating the use of an otter trawl with 3” mesh or smaller landing whiting, squid, or scup in NMFS statistical areas 537, 538, 539, 611, 612, or 613). Eligible participants received voucher applications for one or both of the new gear types from CFRF that could be redeemed at Superior Trawl or Reidar’s Manufacturing, Inc.

To date:
- 44 completed applications have been received from the combined states of NY, CT, MA, and RI.
- From all the completed applications, 41 vouchers were issued for the 12” drop chain sweep and 39 vouchers were issued for the large mesh belly panel.
- 31 participants have already received their new gear accounting for 27 drop chain sweeps and 26 belly panels.

Fishermen have begun using the new gear and CCE has started to receive feedback on the performance of the new gear types. The gear has been used by fishermen targeting primarily squid, whiting, and scup. Opinions of these gear modifications are predominantly positive.

To date:
- 18 responses have been received by CCE in the form of a brief survey (10 questions) regarding the fishermen’s opinions.
- The surveys are from March, April, May, and June of 2013.
- 16 surveys were received relative to the use of the 12” drop chain sweep and 2 surveys were received commenting on the combined use of the 12” drop chains and the large mesh belly panel.
- All 18 surveys indicated a positive reduction in bycatch with estimates ranging from a 20% reduction to a 90% reduction.
- 15 of the 18 surveys stated there was no reduction in retention of the target species while the 3 remaining surveys indicated an estimated 20% reduction in the target species.

Continued Research

During mid-July of 2013 four days of research fishing evaluating the performance of the two gear types were conducted while targeting whiting. Two additional days of fishing still remain and then the accumulated data will be organized and analyzed to evaluate the effectiveness of the two gear types as a means of winter flounder bycatch reduction in the targeted small mesh whiting fishery. Once completed, the results will be available to all interested parties. Future research may be directed at the effectiveness of these gear types in reducing the bycatch of other flounders as well.

For More Information:
If you are interested in participating in the Program there is funding still available. Please contact Jane Dickinson at: jdickinson@cfrfoundation.org

Commercial Fisheries Research Foundation go to: www.cfrfoundation.org
Gear Trials Program go to: www.geartrials.org
Cornell University Cooperative Extension Marine Program go to: www.ccesuffolk.org/marine-2/

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