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Project Title: Optimization of Gear Size and Post-Release Mortality Reduction in the New Jersey Summer Flounder, *Paralichthys dentatus.*

Hook and Line Fishery

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Grantee: Fairleigh Dickinson University

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Project Summary

Catch and release programs increase potential mortality in discards (sub-legal fish caught) through increased stress and predation upon release. The survival of discarded fish is essential for maintaining healthy fish stocks. The objective of this study was to determine optimal hook size(s) for anglers to land legal summer flounder, *Paralichthys dentatus*, while reducing the number of discards caught and reducing the incidence of deep hooking associated with catch and release. This study was a collaborative effort between the Department of Biology at Fairleigh Dickinson University and the NJ Resident Commercial Hook and Line Fishermen. We evaluated the size selectivity of eight J-hook sizes (2/0-9/0) on flounder catches through sampling trips conducted from May through September 2014 along the coastline of NJ. Sampling trips were conducted from Raritan Bay in the North to, and including, the Delaware Bay in the South. All fishing lines were outfitted with identical J-hooks, paired for each trip as follows: 2/0-6/0; 3/0-7/0; 4/0-8/0; and 5/0-9/0. Vessels fished a single hook pair per trip with lines randomly assigned and fished side by side. Total length (TL) and hook set location: (lip, mouth, eye, gill, gut, foul) were recorded for all flounder by hook size as well as any non-target species caught. The following data were then analyzed as a function of hook size: TL, number of NJ recreational legal fish caught, number of discards caught, legal to discard ratio, estimated discard mortality, and hook set location. A total of 7764 summer flounder and 280 non target species were caught during the sampling period. As hook size increased, mean length of flounder caught increased, with 7/0 - 9/0 size hooks outperforming smaller gauges ($p<0.001$). In addition, as hook size increases, the total number of total flounder caught decreased ($p<0.001$) and the ratio of legally caught fish significantly increased ($p<0.005$). As hook size increased, estimated discard mortality decreased calculated as 10% mortality rate of discarded fish. Larger hooks significantly increased foul hooking ($p<0.005$), but had no effect on other set locations ($p>0.05$). Non-target fish caught across the 8 hook sizes comprised 3.6% of the total catch and there were no statistically significant differences by hook size ($p>0.05$). Our study concludes that larger hook sizes catches significantly larger fish while reducing overall discards and decreasing potential discard mortality. Further, our results suggest that hook size guidelines, if implemented by State and Federal entities, have the potential to greatly increase recruitment and spawning stock biomass (SSB) through reduction in mortality associated with catch and release.

Project Narrative:

Catch and release angling programs have increased in popularity as a recreational activity and management tool for a variety of economically and ecologically important fish species (Cooke and Suski, 2004). However, this increase in catch and release activity results in a greater percentage of discards, which introduces the potential of discard mortality. Released fish have been shown to display increased stress, which can result in reductions in growth rates, reproduction, and survival, presenting a future loss of recruitment to the fishery (Chopin and Arimoto, 1995; Kaimmer and Trumble, 1998). The overall survival of discards is essential for maintaining stock structure and the reduction of discard mortality is essential for healthy fish stocks. One method to increase survival, reproduction, and biomass of valuable fish stocks is to reduce the catch of discards.

Similar to other commercially valuable species, the summer flounder stock experiences recreational angling pressure and is one of the most common species caught and released in the Atlantic Coastal region, which results in discard mortality (Randowski, 2002). As of 2012, the summer flounder fishery is not overfished and fishing mortality is low (Terceiro, 2012), however, summer flounder spawning stock biomass (SSB) and recruitment are declining while the live discard rates continue to increase. The summer flounder recreational live discard rate (94%) in 2010 was the highest in the past 25 years (Terceiro, 2012). Further, the 2013 recreational annual catch limit (RACL) for summer flounder has been reduced 25% to account for discard mortality (NMFS, 2013). In the Atlantic coastal recreational summer flounder fishery, the mean percentage of live recreational discards during 2008-2011 was 91% (Terceiro, 2012). Based on the 2012 commerce stock assessment, recreational summer flounder discards (in metric tons and total number of fish) have continued to increase since 2006; however, there have been no actions to directly reduce the number of discards. Since 2010, the summer flounder SSB has declined 8% and was 5% lower than the set biomass target (Terceiro, 2012). In addition, 2011 flounder recruitment was 19% lower than 2010 and discards continue to rise. Current 2013 estimates and projections calculate flounder discards to increase 29% from the 2010 values (Terceiro, 2012). Forty percent of the total

summer flounder allowable landings (TAL) are assigned to the recreational sector, which are caught primarily by hook and line, and reducing discards can potentially reduce mortality and increase SSB and recruitment. These above stated values indicate that recreational discards is a significant problem in the summer flounder fishery and requires action. Further, a reduction in the pounds of summer flounder discards can potentially allocate additional pounds towards the harvest quota.

One method to increase the survival of younger year classes is to reduce the current live discard rates through implementation of specific gear to target legal fish. The importance of hook regulation can be demonstrated by the fact that even though recreational landings are on the decline and recreational discards continue to increase (SDWG, 2010). Further, recreational discards along the Atlantic Coast in 2009-2011 were the highest in 26 years at 91%, with the majority of discards consisting of 0 to 3 year old fish (Terceiro, 2011 & 2012). If the majority of flounder reach sexual maturity by the end of their first year, discard mortality may pose an issue for recruitment of reproductively competent individuals. Further, released flounder must return safely to the benthos after release, and may be predated upon by birds, striped bass, bluefish, dogfish, and other predators as they swim through the water column, increasing mortality that cannot be quantified. Mortality estimates of discarded marine and freshwater fish range from 10% to as high as 68%; with a 10% mean discard mortality specifically for summer flounder (Muoneke and Childress, 1994; Bartholomew and Bohnsack, 2005; Terceiro, 2011). In response to discard mortality in the commercial sector, trawling gear was required to increase mesh size, which resulted in a significant reduction in discarded fish (Carmichael et al., 2008). However, regulations to decrease discard mortality in the recreational fishery have not been implemented.

The use of proper gear size to increase survival rates and reduce the capture of sub-legal fish should be a priority and implemented for all fisheries (Grixti et al., 2007). Davis (2002) concluded that 25% of the global fisheries catch is discarded and modification of gear is a potential solution that relies on engineering and biology as well as social and economic considerations. Grixti et al., (2007) concluded that the effect of increased hook size on the survival of discards depends on the combination of deep hook rates, landing of non-legal fish, and survival rates after a deep hooking event. Further, if selectivity

characteristics of angling gear can be identified, the catch of under-sized fish can be reduced. However, there are currently very few studies that have experimentally determined the optimal gear size including gap, length, width and wire diameter, to increase size selectivity for specific fisheries. In addition, results from hook selectivity studies are species dependent, variable, and at times contradictory, leaving any generalizations regarding hook selectivity in question (Otway and Craig, 1993). Management for hook and line fisheries should include species specific hook size regulations to reduce the number the discards while shifting the size selection toward larger fish.

The current challenge implementing hook size regulations for summer flounder lies within determining appropriate hook sizes for minimizing bycatch, injury, and mortality of flounder while maximizing the capture efficiency (Cooke et al., 2005a). Independent gear selection studies are required for each commercially and recreationally valuable species, since extrapolation of gear selection and hooking mortality data across species are not valid. Additionally, several studies have investigated the effects on hook size on the catch of legal sized fish, demonstrating that increased hook sizes land larger fish (Ralston, S. 1990; Otway and Craig. 1993; Cooke et al., 2005b; Grixti et al., 2007), but few studies to date have investigated the effects of hook size on fishing success in summer flounder.

New Jersey is an excellent location to study summer flounder fishery biology, as the state is geographically located in the middle of the Northeastern stock range and contains 127 miles of shoreline bordering salt water where summer flounder reside in the summer months. Since hook and line accounts for over 40% of the total summer flounder harvested in New Jersey, catch and release mortality needs to be addressed (NMFS 2013). Therefore, the use of larger sized hooks may reduce the total number of discards as well as the percentage of gill and gut hooked flounder, thereby reducing a major mortality component in this species.

The goal of this project was to quantitatively determine the optimal hook size(s) for recreational and commercial anglers to land legal-sized summer flounder, *Paralichthys dentatus*. By quantitatively determining hook sizes that reduce the number of discarded fish caught, spawning stock biomass (SSB) should increase as well as the overall health of the summer flounder stock. Further, conclusions have the

potential to reduce the pounds of summer flounder discards within the catch limit, thereby allocating additional pounds towards the landing of legal fish. Once optimal hook sizes have been determined, recommendations for gear regulations at the State and Federal levels will be provided.

Specific Aims:

- To initiate and foster a working collaboration between Fairleigh Dickinson University and the New Jersey commercial hook and line fisherman
- To quantitatively determine the optimal hook size(s) to land legal summer flounder while reducing the number of discards caught
- To reduce the incidence of deep hooking associated with catch and release
- To facilitate development and implementation of innovative gear practices to agency managers

Methods:

Project implementation:

The project was initiated on November 1, 2013 with an organizational meeting between the Co-PIs and the FDU Office of Grants and Sponsored Projects. The collaboration between FDU and the NJ commercial hook and line fisherman began with a research compliance training meeting conducted by the Co-PIs on April 5, 2014, including participating fisherman, prior to the arrival of summer flounder to coastal NJ. All experimental gear was supplied including hooks, universal ball jigs, and measuring devices. In addition, data sheets, scope of work, and all fishing regulations and procedures were disseminated, explained, and discussed along with a question and answer session. At the conclusion of the meeting, all fishermen completed and signed the Captain's Commitment, agreeing to conduct 160 total sampling trips during the spring, summer and fall of 2014, with the goal of collecting data from 45 summer flounder, on average, per trip (Appendix A).

The on-board compliance training meeting, including all participating fisherman was conducted and completed on April 25th in Monmouth Beach, NJ. Captains from all participating vessels were present including, Carl Benson (Co-PI), Carmen Conti, Alan Cook, William Dickinson, Robert Rich, and Robert Veres. All fishermen constructed their experimental fishing rigs, which were verified by the Co-PIs and data collection and recording, including the proper measurement, rig design, and hook set location was explained to each fisherman and demonstrated using summer flounder provided by the Co-PIs. Data recording regarding non-target fish species was additionally discussed. Upon successful completion of on-board compliance training, all fishermen completed the confirmation of data collection training document and began sampling trips as soon summer flounder migrated inshore to their region (Appendix B).

Data Collection:

Sampling trips for all six vessels were conducted from early May through early September 2014. All fishing lines were outfitted with identical J-hooks (Eagle Claw®) of the following size classes 2/0, 3/0, 4/0, 5/0, 6/0, 7/0, 8/0, and 9/0 (Figs 1 & 2, Table 1). Typically, the most common hook size sold to

recreational flounder anglers, including bait shops and through online merchants, is a 2/0 hook plain sinker rig (Robert Rich, Pers. Comm., 2012). Therefore, for this study, a 2/0 J-hook served as the reference size for comparison. To reduce hook size data recording error, hooks were paired for each sampling trip to create a visually distinct hook differential. The selected size pairings were, 2/0 and 6/0; 3/0 and 7/0; 4/0 and 8/0; and 5/0 and 9/0. The Co-PIs then generated and supplied a random order of hook pairings to be used throughout the study for each participating fisherman. Each vessel then fished 1 of the 4 random pairs of hooks on a given trip. In addition, lines were randomly assigned to locations within the boat (fore, aft, port, and starboard) with the larger and smaller hook rigs actively and continuously fished side by side. Due to temporal and spatial variability during the season, bait and weight was selected by the fisherman based on trip conditions to maximize catch. Fisherman measured total length (TL) and hook set location of all flounder caught. The hook set location included the following 7 categories: Lip, Mouth, Eye, Gill, Gut, Foul Vital, & Foul Other. In addition, all non-target species caught were identified and recorded by hook size including: sea robin (*Prionotus*), skate (*Raja*), smooth dogfish (*Mustelus*), bluefish (*Pomatomus*), weakfish (*Cynoscion*), sea bass (*Centropristis*), and "other."

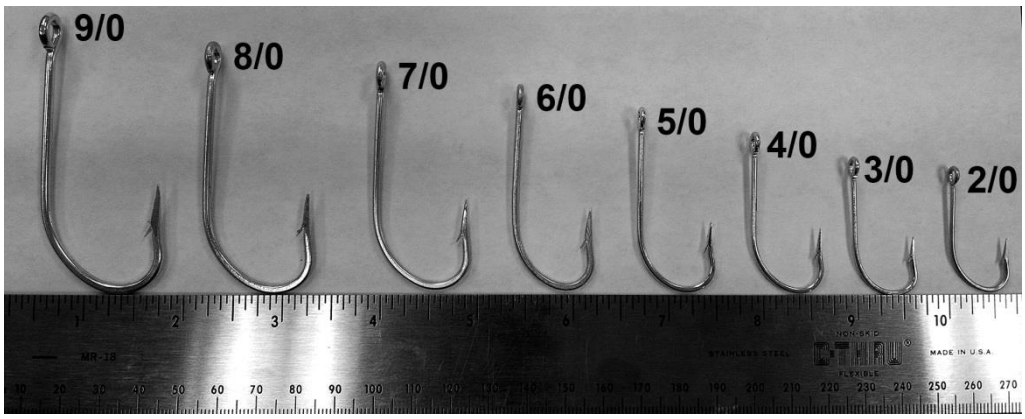

Figure 1. Representative hooks, by size, used for the study. Eagle Claw® model 254 were used for all sizes.

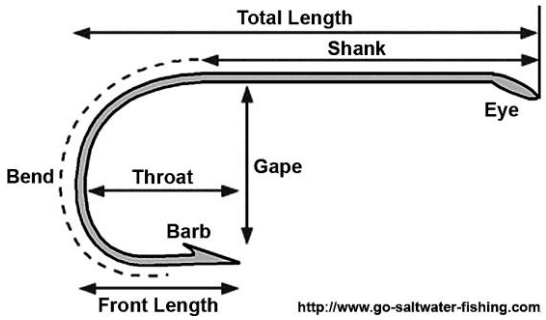

Figure 2. Hook nomenclature. Image from go-saltwater-fishing.com, modified by JDS.

Hook Size	2/0	3/0	4/0	5/0	6/0	7/0	8/0	9/0
Total Length	1.34	1.48	1.71	1.93	2.16	2.37	2.69	2.88
Shank Length	0.54	0.75	0.86	1.06	1.06	1.19	1.50	1.75
Gape	0.55	0.59	0.65	0.70	0.75	0.89	1.00	1.13
Throat	0.51	0.54	0.57	0.66	0.75	0.80	0.92	1.00
Front length	0.55	0.59	0.64	0.72	0.81	0.88	1.07	1.13

Table 1. Hook specifications by size of the gear used for the study (Cabela's Inc.). Eagle Claw® model 254 were used and all sizes were straight eye, straight point, and barbed. All measurements are in inches.

Analysis:

The following variables were evaluated as a function of hook size at the conclusion of the study: total flounder length (TL), total number of flounder caught, number of NJ legal fish (≥18 in.) caught, number of NJ discards (<18 in.) caught, number of non-target species caught, the ratio of legal to discard fish caught, discard mortality estimate, and hook set location. The discard mortality estimate was calculated as 10% of the number of discarded fish by hook size (Terceiro 2011).

The total number of flounder caught, total length (TL), total number of legal fish (≥ 18in), total number of discards (< 18 in), and number of non-target species caught as a function of hook size were analyzed using an ANOVA with a randomized complete block design (RCB) (proc mixed SAS 9.3, Cary, N.C). Using this treatment design, the effect of hook size was analyzed using date and vessel as block terms, statistically removing any variability of sampling day and vessel out of the error term, increasing sensitivity to detect effects of hook size on summer flounder caught. All variables were tested for

normality and square root transformed prior to analysis to satisfy the assumptions for parametric analysis. Chi square (X^2) non-parametric analysis was used to analyze categorical data as a function of hook size, which included hook set location, the ratio of legal to discard fish caught, mortality estimate, and non-target species caught. A p-value of ≤ 0.05 was used as the level to denote statistical difference between hook sizes.

Results:

The six fishermen completed all 160 required trips and sampled the majority of the NJ inshore coast, including Sandy Hook and Delaware Bays, from May through September 2014 (Fig 3). A total of 7764 summer flounder and 280 non target species were caught during the sampling period.

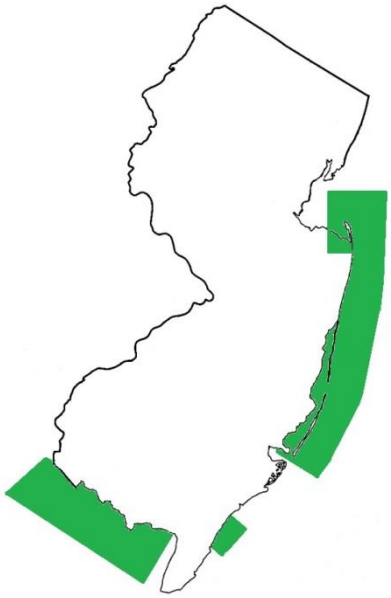

Figure 3. New Jersey representative coastal sampling locations of all participating fisherman in the study.

Summer Flounder

Results determined that as hook size increased, mean length of flounder caught significantly increased ($p < 0.001$, Fig. 4). Specifically, 7/0-9/0 size hooks outperformed smaller gauges by catching significantly larger fish ($p < 0.04$, Fig. 4). On average, 2/0-6/0 hooks caught flounder between 14.4-15.0 in. compared with 15.8-16.0 in. caught by 7/0-9/0 hooks. Additionally, the mean total number of

flounder caught significantly decreased as hook size increased ($p < 0.001$), with 6/0-9/0 size hooks catching significantly less fish than smaller gauges ($p < 0.003$, Fig. 5). When the data was further analyzed by legal and discarded fish, the number of legal flounder caught (≥18in.) was found to be not significantly different between 2/0-8/0 hooks ($p > 0.05$), but 9/0 hooks caught significantly less legal fish than 4/0 and 5/0 gauges ($p < 0.007$). However, the ratio of legally landed fish significantly increased as hook size increased, with 7/0-9/0 hooks catching significantly more legal flounder relative to discarded fish (Fig 6, X^2 =36, p<0.005). The 2/0 hook caught 8% legal sized fish with a 92% discards on average whereas the 7/0 hook caught 22% legal sized flounder, a 175% increase in legal sized fish (Fig 6). As hook size increased, estimated discard mortality significantly decreased (Fig 7, X^2 =36, p<0.005). Table 2 illustrates the overall impact of hook size on summer flounder catch; switching to a larger hook reduces discards and increases the ratio of legal flounder caught.

In terms of fish hook set location by size, larger hooks significantly increased foul hooking (Fig 8, X^2>30, p<0.005) and small hooks marginally increased gut hooking (Fig 8, X^2=13.8, p<0.1), but hook size had no effect on other locations (Fig 8, X^2<6.8, p>0.05).

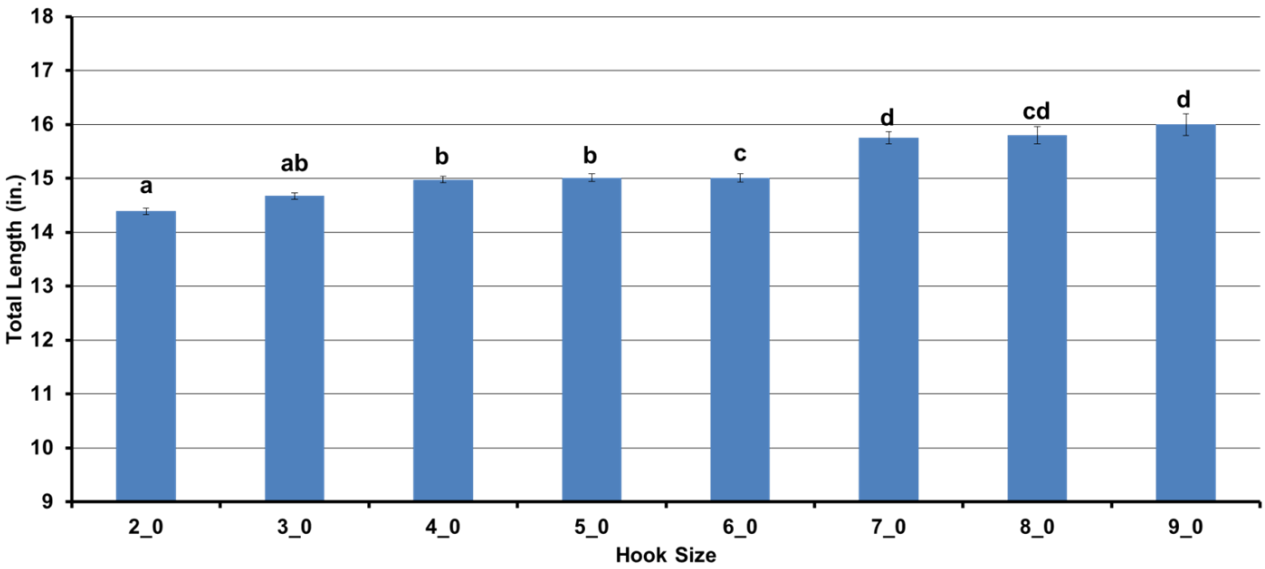

Figure 4. Mean total flounder length (TL, inches) caught by hook size. Error bars represent standard error of the mean (±S.E.).Means with different letters are significantly different (ANOVA, p<0.05)

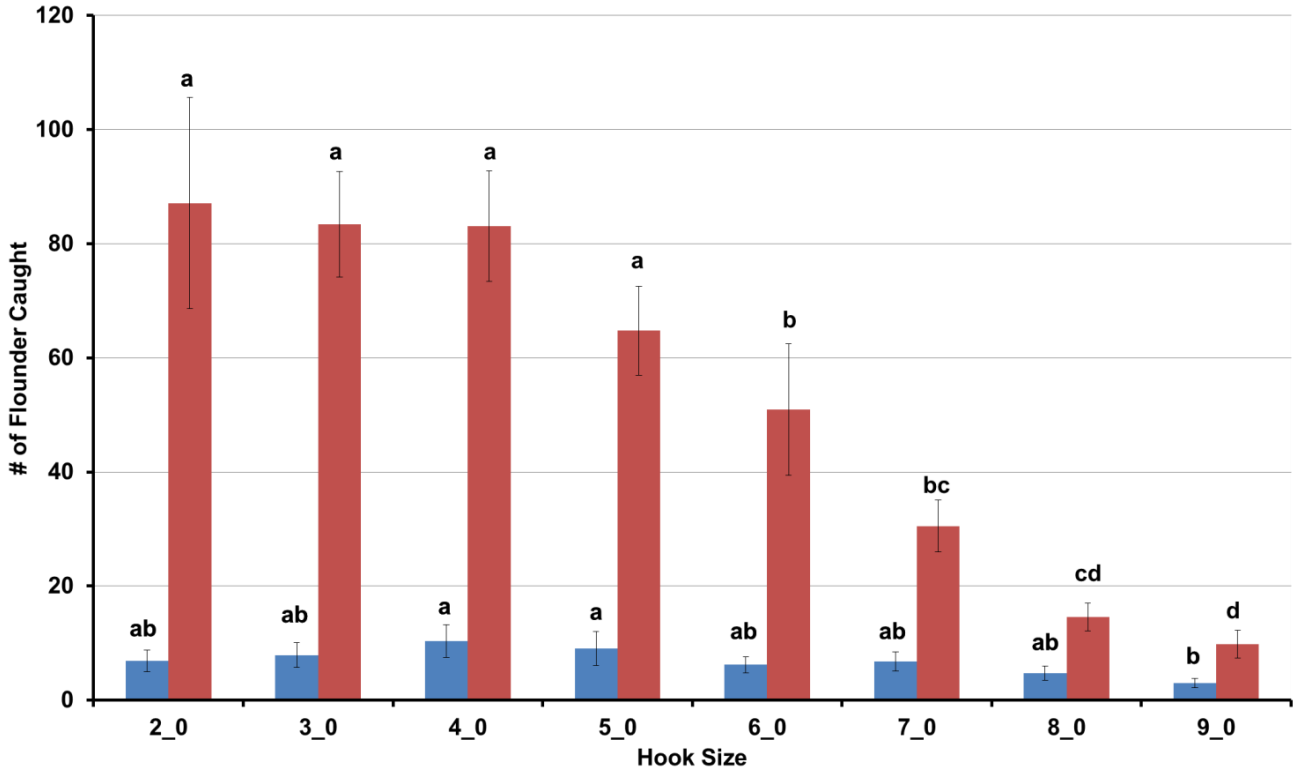

Figure 5. Mean number of NJ recreational legal flounder (blue, ≥ 18 in) and discards (red, < 18 in) by hook size. Means with different letters are significantly different (ANOVA, p<0.05)

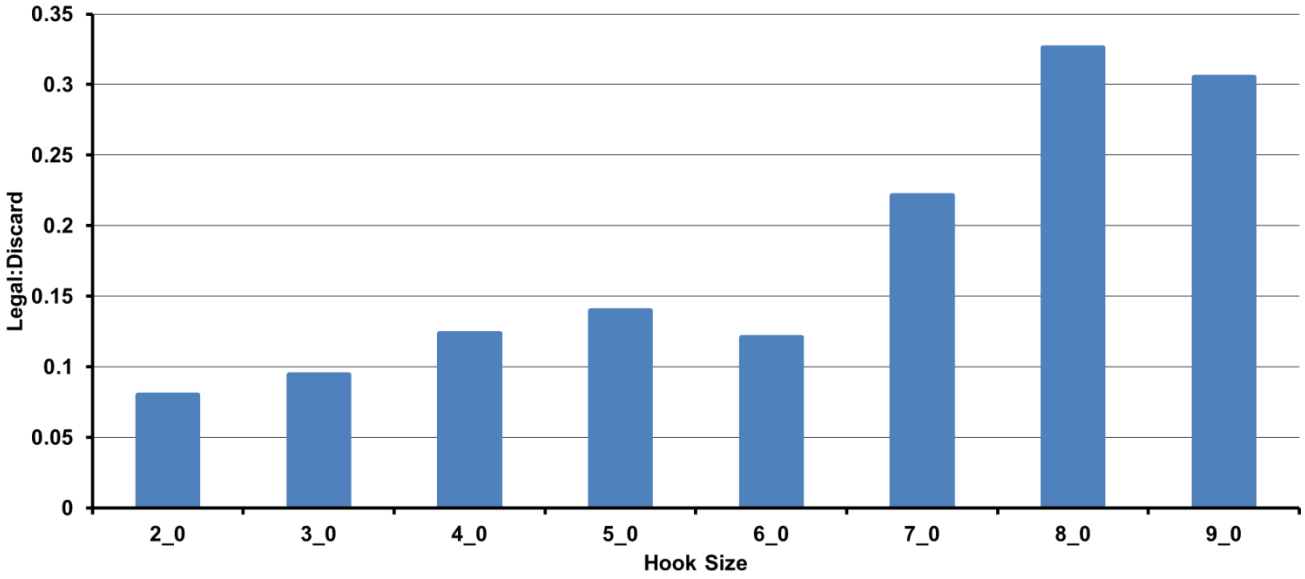

Figure 6. The ratio of New Jersey recreational landed (≥18in) to discarded flounder (<18in) by each hook size, X^2 =36, p<0.005

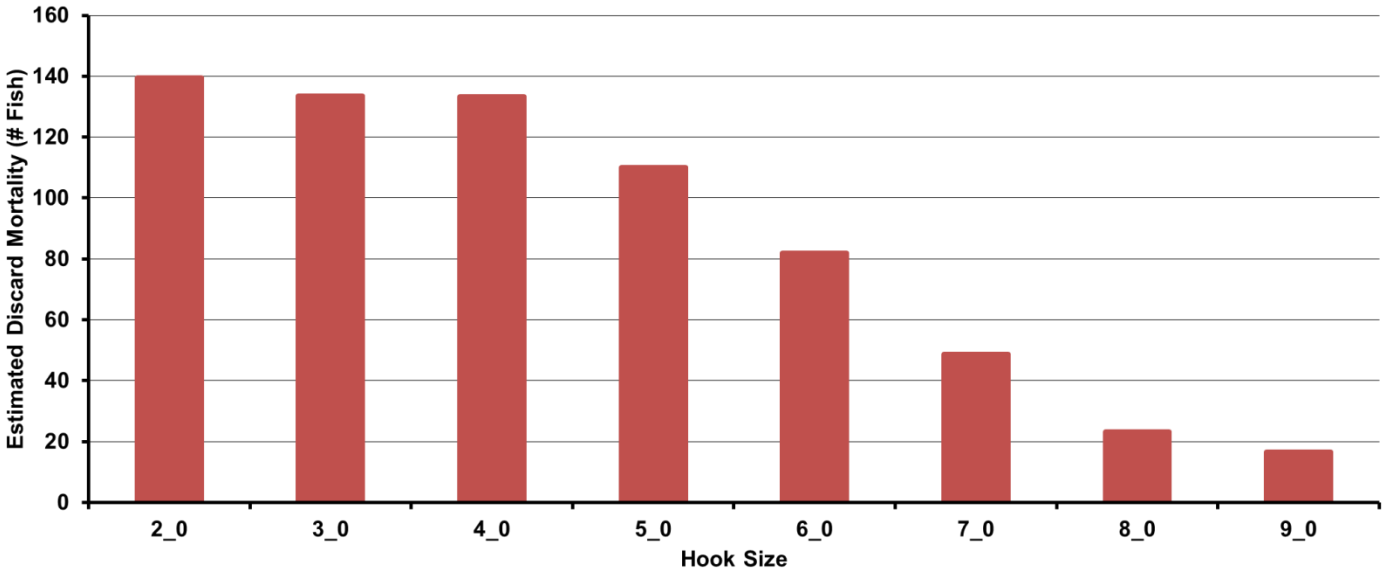

Figure 7. Estimated discard mortality by each hook size, X^2 =36, p<0.005. Estimated discard mortality is calculated as 10% mortality rate of discarded fish (Terceiro, 2011).

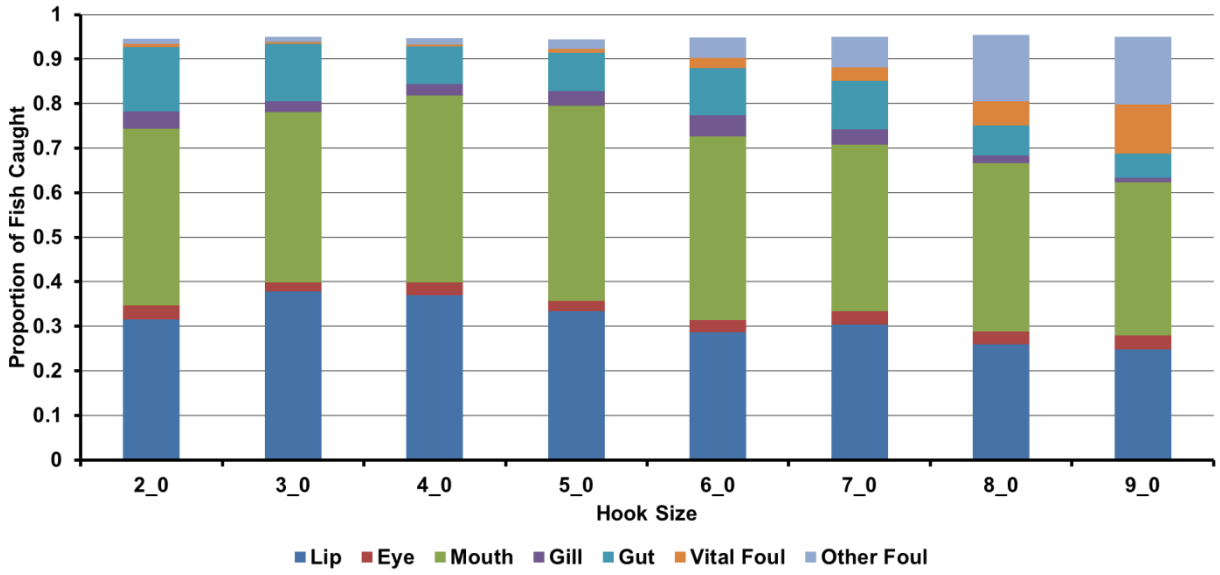

Figure 8. Proportion of discarded flounder hooked at certain body locations by each hook size. Larger hooks significantly increased foul hooking (X^2>30, p<0.005) but had no effect on other locations (X^2<6.8, p>0.05).

Switch hook from:	# of Discard fish	Legal:Discard
2/0-5/0	21% Reduction	74% Increase
2/0-6/0	39% Reduction	134% Increase
2/0-7/0	65% Reduction	175% Increase
2/0-8/0	83% Reduction	306% Increase

Table 2. Example calculations of hook size impact on summer flounder catch.

Non-target Species

In total, the 160 sampling trips caught 280 non-target fish across the 8 hook sizes, which comprised 3.6% of the total catch. Due to the small overall number of non-target fish caught, the data was variable across the different hook sizes, resulting in no statistically significant differences in the numbers of bycatch by hook size (Fig. 9, ANOVA $p > 0.05$). Across all hook sizes, the most commonly caught species were sea robin (*Prionotus*) (61%), skate (*Raja*) (16%), and smooth dogfish (*Mustelus*) (9%). In addition, there was no significant difference of hook size on bycatch species (Fig. 10, $X^2 < 1.0$, $p > 0.05$).

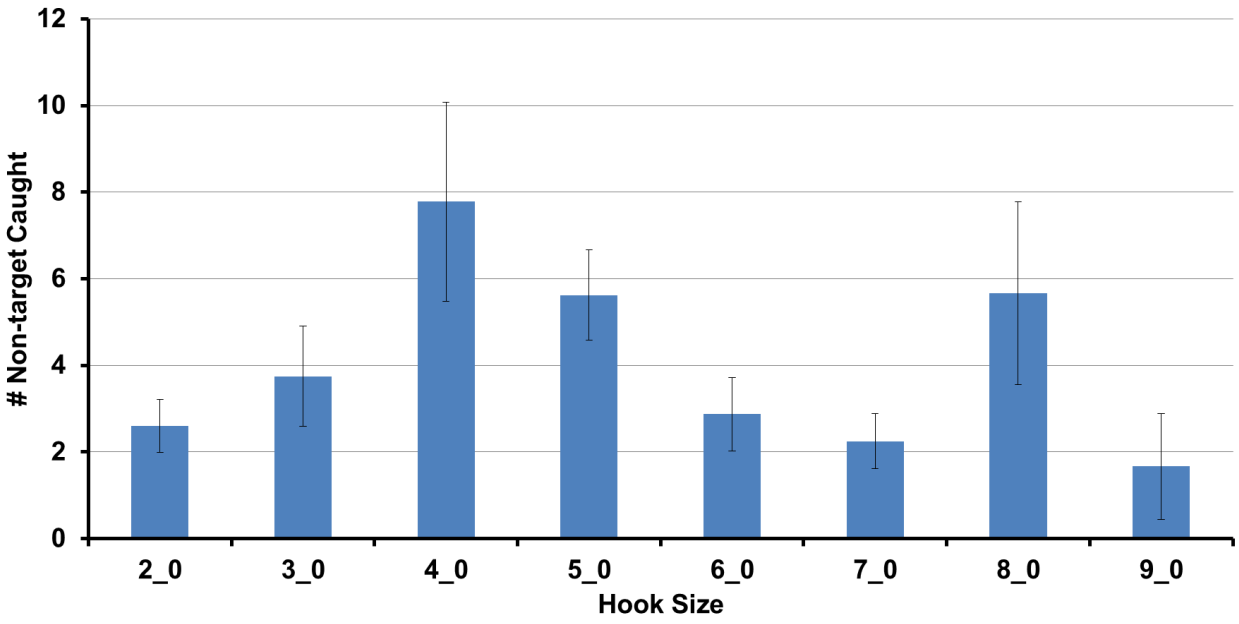

Figure 9. Mean number of non-target fish caught by each hook size. Hook size had no significant effect on non-target fish caught (ANOVA $p > 0.05$).

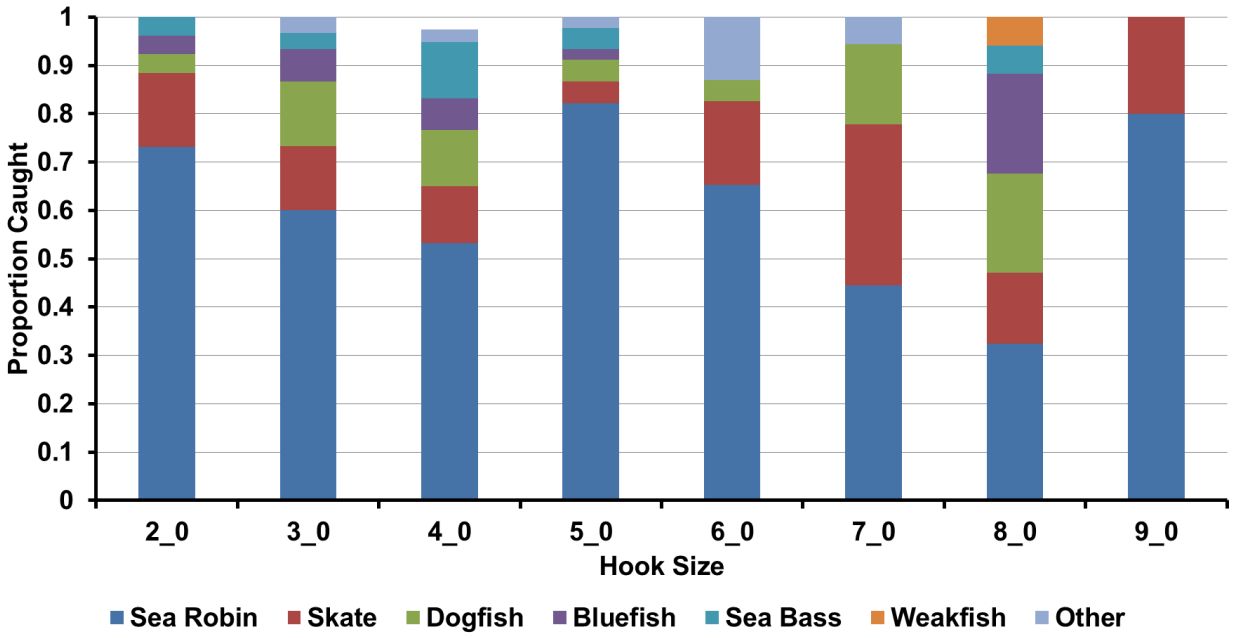

Figure 10. Proportion of non-target species caught by each hook size. Hook size had no significant effect on non target species caught ($X^2 < 1.0$, $p > 0.05$)**.**

Conclusions, Recommendations, and Outreach:

The NOAA/NMFS BREP funding provided the means to establish a successful collaboration between the NJ Resident Commercial Hook and Line Fishermen and Fairleigh Dickinson University. Further, this research was able to successfully determine hook sizes that will reduce the catch of discarded summer flounder while increasing the catch of legal fish. All fishermen in the program met their project goals and the data collected were robust. We are currently drafting future proposals to replicate this current study using wide gap (Khale) hooks to increase the knowledge base regarding the effect of hook design and size on summer flounder catches.

One method to reduce discards, and potential mortality, is to identify hook sizes selective for legal sized fish, reducing the chance of potential discards ever reaching the boat. Results determined that as hook size increased, mean length and total ratio of legal flounder caught significantly increased with 7/0-9/0 size hooks. Therefore 7/0-9/0 hooks significantly outperform smaller gauges by catching

significantly larger fish. In addition, they catch less total numbers of undersized flounder than smaller gauges, targeting legal sized fish and reducing the catch of discards. Several studies have previously determined that increased hook size results in landing larger fish while reducing the number of smaller fish caught. Ralston (1990) and Cooke at al. (2005b) experimentally determined that as hook size increased, fork length in snapper, *Lutjanidae*, and bluegill, *Lepomis*, increased. In addition, Otway and Craig (1993) caught significantly more undersized snapper, *Pagrus auratus*, with smaller sized hooks and significantly larger fish with larger hooks. These authors concluded that even though larger hooks do catch a fraction of smaller fish, there was a clear selection towards larger fish. As a result, this increased size selection will land larger sized fish and increase the catch per unit effort (CPUE). A direct example of increased efficiency has been provided by Otway and Craig (1993) in which a 27% increase in hook size resulted in 50% reduction of undersized fish caught, with no significant decline in legal fish landed. Similarly, our results demonstrate that an increase in hook size will result in large reductions in discard fish caught, increasing catch efficiency of legal sized fish (Table 2).

In addition to the reduction of discards, it has been further demonstrated that increasing hook size may reduce swallowing of hook, thereby reducing ingestion and tissue damage to gill and viscera, reducing mortality (Willis and Millar, 2001). Results from this study found that larger hooks significantly increased foul hooking and small hooks marginally increased gut hooking but hook size had no effect on other locations. Grixti et al., (2007) determined that deep hooking events were six times more likely to occur in black bream, *Acanthopagrus butcheri*, when angling with smaller hooks. Further, these authors observed an increase in length of fish caught as hook size increased, coinciding with a reduction in the incidence of gill and esophagus hooking. However, similar to gear selectivity studies, Diggles and Ernst (1997), concluded that hooking mortality can vary by the species and size. Overall, we conclude that the effect of hook size on set location to be small, and the overall benefits of larger hook on catch outweigh the cost of set location.

In terms of the effect of hook size on discard mortality, our results conclude that larger hook sizes significantly decrease estimated discard mortality through a reduction of discards. The overall impact of

hook size on summer flounder discards is large and switching to a larger hook reduces discards and increases the catch of legal flounder relative to discards. As switch from a 2/0 to a 5/0 hook would reduce discarded flounder 21% and increase the ratio of legal fish caught 74%. Through a reduction of discards, this study concludes that larger hook sizes will increase overall survival and health of summer flounder. It has been demonstrated that survival of discards depends on a number of factors including air exposure, angler experience, hook location, hook removal technique and gear type (Bartholomew and Bohnsack, 2005; Broadhurst, 2005). The effect of hooking, capturing, and releasing induces stress in several fish species, causing anoxia, pressure alterations, crushing, wounding, and exhaustion. Further, these stressors can lead to effects on survival including immunosupression, altered schooling and foraging abilities, predator avoidance, and reproduction (Davis, 2002; Broadhurst, 2005; Cooke et al., 2000; Balcom and Malchoff, 2002).

In addition to increases in stress and physical trauma, discarded fish can suffer latent effects post release. Hook related mortalities in most released fish occur within 24 hours of catch and release (Muoneke and Childress, 1994; Diggles and Ernst, 1997). In addition, it is believed that most estimates of discard mortality are underestimated due to the exclusion of predation by birds, fish, and marine mammals upon release at the surface (Bartholomew and Bohnsack, 2005). Further, Davis (2002) concluded that smaller sized fish tended to demonstrate greater discard mortality due to swimming fatigue. It is clear that catch and release mortality is significant, and further research effort to reduce and quantify discard mortality is warranted.

Gear size had no effect on non-target species caught. In total, the 160 sampling trips caught 280 non-target fish across the eight hook sizes, which comprised 3.6% of the total catch. Due to the small overall number of non-target fish caught, the data was variable across the different hook sizes, resulting in no statistically significant differences in the numbers of bycatch by hook size. The low amount of non-target species recorded in the study may be a result of professional commercial fisherman conducting the sampling effort. If the study was replicated using recreational anglers, the data regarding non-target species may differ and is an interesting area of future research.

Our study concludes that larger hook sizes catch significantly larger fish while reducing overall discards and has the potential to decrease discard mortality in the summer flounder hook and line fisheries. Our results further suggest that hook size guidelines, if implemented by State and Federal entities, have the potential to greatly increase recruitment and spawning stock biomass (SSB) through reduction in mortality associated with catch and release.

Recommendations

Based on the data and statistical analysis from over 7000 flounder caught during this study, the authors recommend a 7/0, with a 5/0 minimum, hook size in the N.J. summer flounder recreational hook and line fishery. Further, we believe that a 5/0 hook minimum has the potential to reduce the pounds of summer flounder discards within the catch limit, thereby allocating additional pounds towards the landing of legal sized fish. If State agencies enforce a hook size minimum, the potential exists to increase recruitment and spawning stock biomass (SSB) simply through hook size guidelines. Further conclusions have the potential to reduce the pounds of summer flounder discards within the catch limit, thereby allocating additional pounds towards the landing of legal fish.

Outreach

Dissemination of results aim to provide a long term benefit through implementation of specific gear to both commercial and recreational summer flounder fisheries. The Co-PIs have presented the results and recommendations to State, and Federal entities including the NJ Marine Fisheries Council (January 2015), and The Mid-Atlantic Fisheries Management Council (April 2015, Appendix C). In addition, the Co-PI has attended and presented results at the general membership meeting of Jersey Coast Anglers Association (December 2014). The PI completed and submitted a project summary for the NOAA BREP FY2013 Congressional Brief (March 2015) and the presented the findings at the Annual American Fisheries Society meeting in Portland OR (August 2015, Appendix C). The Co-PI has presented the results to several recreational fishing organizations in 2015 including the Manasquan

Fishing Club, Lacey Fish Hawks, and the Salt Water Anglers of Bergen County NJ. The Co-PIs are currently preparing the manuscript for peer-review publication and will continue to advocate for hook size regulations at the State and Federal levels.

Literature Cited:

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Appendix A: Required materials for the completion of the study including: program overview and standard operating procedures, data collection instructions, data sheet and data punch ticket with legend, captain invoice form, and Captain's commitment documents.

NOAA 2014 Bi-Catch Reduction Program
Scope of Work and Terms and Conditions

Goal

Reduce summer flounder mortality by optimizing the hook size to land legal sized flounder, thus reducing the number of sub-legal flounder caught.

Project Funding

This project is funded by the National Oceanic and Atmospheric Association (NOAA)/Department of Commerce, award number NA13nmf4720283.

Project Timing

The BCRP grant year starts November 1, 2013 and ends October 31, 2014. All activities need to be completed by October 31, 2014. The data for a total of 160 trips needs to be submitted no later than September 15, 2014. Dr. James Salierno (PI) and Captain Carl Benson (Co-PI) are responsible for submitting the final report to NOAA in accordance with the grant terms.

Targets

There are specific targets to achieve.

1. Follow protocol to **obtain the required data**. Use randomly drawn hook pairings sequence throughout participation.
2. On average **provide forty five data points per fishing day** and submit to principal investigators (PIs.)
3. **Complete all agreed to fishing days** or seek alternatives through the PI (Dr. James Salierno) or Co-PI (Captain Carl Benson.).
4. **PI and Co-PI to submit final report to NOAA** and arrange for presentations to user groups.

Guidelines for Data Collection and Recording

Each fisherman will be given boxes of hooks, ranging in size from 2/0 thru 9/0. The PI and Co-PI have paired the hooks; therefore on a daily basis you will immediately recognize the hook size. The pairings are 2/0 & 6/0, 3/0 & 7/0, 4/0 & 8/0, and 5/0 & 9/0.

You will randomly draw your pairing sequence. This order will be followed throughout the study. Each pair of hooks must be fished without favoritism. They should be side by side, with the same style rig, same weight, same bait, same attractant (GULP*, buck tag, spinner) and except for removal of fish should have the same fishing time.

Dr. James Salierno (PI) (Jim) and Carl Benson (Co PI) (Carl) will conduct a meeting to distribute hooks and rulers that are to be used in the study. The meeting will review data requirements, data recording options (digital recording, data sheet, or punch card), timing of data submission, timing of payments, and answering questions.

Dr. Salierno and Captain Benson will ensure that on board compliance checks (OBCC) are completed on each vessel prior to data collection. In general, only Captains may record data. In the event that a Captain is not available on a particular day, he must designate a specific individual to be responsible for data collection. These individuals must be trained accordingly and must attest in writing that training was completed. The original document must be provided to the PI, Dr. James Salierno.

Each captain is responsible for the accuracy of the data. All data must be submitted to the PI and Co-PI weekly, no later than 11:59PM each Monday. If no data is collected for a particular week, each Captain must report that no data was collected.

There are three possible ways to record the data. The DRAGON system will allow digital voice recording of the data on the vessel. When at a computer, the recording may be played into a data base and electronically transferred to Jim and Carl. A second method is a preprinted paper data sheet and marker system to record the data. Weekly, the data sheet must be sent to Jim and Carl. The third method is a preprinted roll of

data tickets, commonly called ADMIT ONE tickets, that may be marked or punched with a one hole punch. The data must be transferred to a data sheet and weekly sent to Jim and Carl. The captain may choose any system that best suits his needs. The original data records must be retained by the captain.

There are many options available for the rigs that may be used. The key requirement is equality of chance. You may choose a single hook rig with leader and weight; a single hook rig with leader off a dropper loop; the above two options with two hooks; a jig such as a musket ball or MAITAI where the hook is attached via a split ring or directly tied; and the above with a dropper hook above the jig. You may use another rig as you choose, but please share the design with the other fishermen.

If you are fishing two rods, the smaller and larger hook rigs must be identical in all details. As you add other pairs of rods, the rigs must be identical to each other but do not have to match the first pair. As you fish, you may recognize that one pair is more successful than the others. It makes sense to copy the successful pair.

Once all requirements for a particular hook pair is collected, you must discard any used hooks. This is to ensure that there is no mix up in the hooks you use. Always start out with hooks from the original labeled container.

Shortened Fishing Days

If you start fishing one pair of hooks and your effort is cut short, then the next project day you must continue with that hook pair to complete the effort. The delay may be a week, in that you may go back to commercial fishing, repair time or need for weather to clear. This continued effort does not constitute an additional fishing day. No additional funds will be expended. There is a collective commitment to fish the four pairings of hooks for the committed number of trips, as fairly (equally) as possible.

Payment for Fishing Effort

There is $300.00 budgeted per trip for expenses. This was based on two vessels actual costs over two years of fishing for summer flounder. There is also $300.00 budgeted per trip for the captain's remuneration. That equates to $600.00 per trip. An average of $92.00 per trip for sales of summer flounder was budgeted. FDU will payout the net of $508.00 per trip. Invoices/Request for Payment must be submitted weekly. The invoice/RFP should be forwarded to Dr. James Salierno and Carl Benson by 11:59PM on Monday, along with the data sheet. This would coincide with NMFS Vessel Trip Report (VTR) and/or Dealer Reports (DR) for those vessels' and/or vessel dealers' current requirements.

Reassigning Trips

If any fisherman needs to relinquish his committed trips, the PIs will reassign the trips. The rational to reassign will be based on completed trips and success of those trips. All trips need to be completed by mid-September in order to complete the analysis and prepare the final report.

Terms and Conditions

Compliance

Any violation of National Marine Fisheries Service or New Jersey Marine Fisheries Regulations may cause NOAA to cancel the project and demand repayment of all funds.

Any falsification of data will result in rejection of that vessel's submitted data and repayment of dispersed funds will be required. This action could also jeopardize the program.

Infractions that may cause penalties include, but not limited to: undersized fish, over limit retention, failure to call in, fish mutilation, commercial fishing when chartering, sales or bartering during the closed season, fishing in federal waters without federal permit, and illegal drugs on board.

NOTE: As professionals, each fisherman must set an example in the handling of discarded summer flounder and any other fish. For summer flounder that is deep hooked, cut the hook and gently release the fish. A rag or cloth should never be used, since it removes the protective slime; a wet hand is preferred. No fish (sea robins, smooth dogfish, bluefish, bunker, etc.) should be killed unless having a specific use, such as bait.

Commercial and Recreational Fishing and Sales

Each fisherman is aware of the rules for commercial sale of summer flounder. It has been done for years. The fishermen taking part in the project normally do not fish recreationally for summer flounder. Everyone on each vessel must have a New Jersey (free) registration. You may also fish in New York waters, so it is suggested that a free NY registration be obtained. All crew member state recreational registrations should be kept on each vessel. All regulations for fishing in other states (i.e. Delaware, etc.) should be followed.

A copy of the Captain's New Jersey Summer Flounder Landing Permit is to be provided to the PI.

Certain regulations exist when the commercial season is closed. The sale of fish (or barter) is an act of commerce. **When the commercial season is closed, no fisherman may offer and no dealer may accept any summer flounder.**

When the commercial season is open, and you need to fish recreationally, you may sell your legal fish. [This condition occurs when you have a catch over the daily trip limit that changes the total number of trips allowed.] You may not offer more than the daily creel limit for sale. If you and a crew member present over the creel limit then the name of the crew member must be attached to his fish. If checks are cut then you and he must be named as payees.

If both the commercial and recreational seasons are closed, then there is no retention of summer flounder. This happens most often in April and October.

Contact Information

Below is the contact information for the PI and Co-PI. All communications should be sent to both PI AND Co-PI. You are to send your data and invoices weekly to:

James Salierno, Ph.D.

Fairleigh Dickinson University
Phone: (973) 443-8776
Fax: (973) 443-8795
E Mail: salierno@fdu.edu
And
Carl Benson
Phone: (732) 281-1644
Fax: (732) 281-1644
E Mail: flukeman@aol.com

DATA SHEET INSTRUCTIONS

NOAA 2014 BCRP-Award Number NA13NMF4720283

FOLLOW ALL PROTOCOLS REGARDING HOOK PAIRING FISHING

At the start of fishing, fill in the date, page number (01), vessel and circle hook pair.

For the first fish caught, fill in the vessel letter, three digit date (MDD), and page number (01).

A.) For fluke, enter hook size, measure and record as a digital value (16.25), record hook position code and zero (0) in the species code.

B.) For other species, enter hook size, enter zero (0) for length, enter zero (0) for hook location, and enter the species caught.

Enter each fish caught on the subsequent line. After page is complete, print name, sign and date.

Start a new data sheet, fill in I again, then start data, indicating next sequential page number. Continue with data entry. At end of fishing day, fill in the total number of pages (X of N) on each page. It is important that all fields are recorded.

SUMMER FLOUNDER MORTALITY REDUCTION DATA COLLECTION SHEET DATE: _____ PAGE ___ of ___

Avocet **B**randy II **D**rifter,Bay **F**inest Kind **G**ypsea **R**ufus 4

HOOK PARINGS (CIRCLE ONE PAIR): 2/0 and 6/0, 3/0 and 7/0, 4/0 and 8/0, 5/0 and 9/0

VESSLE	MONTH	DAY	PAGE NO.	SEQ NO.	HOOK SIZE	LENGTH (BI-CATCH = 0)	CIRCLE THE POSITION OF THE HOOK									SPECIES										
							NON FLUKE	FELL OFF	LIP	EYE	MOUTH	GILL	GUT	FOUL (VITAL AREA)	FOUL (OTHER)	FLUKE	SEA ROBIN	SEA BASS	DOG FISH	SKATE	CROKER	WEAKFISH	STRIPED BASS	BLUEFISH	OTHER
				01	/ 0		0	1	2	3	4	5	6	7	8	0	1	2	3	4	5	6	7	8	9
				02	/ 0		0	1	2	3	4	5	6	7	8	0	1	2	3	4	5	6	7	8	9
				03	/ 0		0	1	2	3	4	5	6	7	8	0	1	2	3	4	5	6	7	8	9
				04	/ 0		0	1	2	3	4	5	6	7	8	0	1	2	3	4	5	6	7	8	9
				05	/ 0		0	1	2	3	4	5	6	7	8	0	1	2	3	4	5	6	7	8	9
				06	/ 0		0	1	2	3	4	5	6	7	8	0	1	2	3	4	5	6	7	8	9
				07	/ 0		0	1	2	3	4	5	6	7	8	0	1	2	3	4	5	6	7	8	9
				08	/ 0		0	1	2	3	4	5	6	7	8	0	1	2	3	4	5	6	7	8	9
				09	/ 0		0	1	2	3	4	5	6	7	8	0	1	2	3	4	5	6	7	8	9
				10	/ 0		0	1	2	3	4	5	6	7	8	0	1	2	3	4	5	6	7	8	9
				11	/ 0		0	1	2	3	4	5	6	7	8	0	1	2	3	4	5	6	7	8	9
				12	/ 0		0	1	2	3	4	5	6	7	8	0	1	2	3	4	5	6	7	8	9
				13	/ 0		0	1	2	3	4	5	6	7	8	0	1	2	3	4	5	6	7	8	9
				14	/ 0		0	1	2	3	4	5	6	7	8	0	1	2	3	4	5	6	7	8	9
				15	/ 0		0	1	2	3	4	5	6	7	8	0	1	2	3	4	5	6	7	8	9
				16	/ 0		0	1	2	3	4	5	6	7	8	0	1	2	3	4	5	6	7	8	9
				17	/ 0		0	1	2	3	4	5	6	7	8	0	1	2	3	4	5	6	7	8	9
				18	/ 0		0	1	2	3	4	5	6	7	8	0	1	2	3	4	5	6	7	8	9
				19	/ 0		0	1	2	3	4	5	6	7	8	0	1	2	3	4	5	6	7	8	9
				20	/ 0		0	1	2	3	4	5	6	7	8	0	1	2	3	4	5	6	7	8	9
				21	/ 0		0	1	2	3	4	5	6	7	8	0	1	2	3	4	5	6	7	8	9
				22	/ 0		0	1	2	3	4	5	6	7	8	0	1	2	3	4	5	6	7	8	9
				23	/ 0		0	1	2	3	4	5	6	7	8	0	1	2	3	4	5	6	7	8	9
				24	/ 0		0	1	2	3	4	5	6	7	8	0	1	2	3	4	5	6	7	8	9
				25	/ 0		0	1	2	3	4	5	6	7	8	0	1	2	3	4	5	6	7	8	9

DATA COLLECTOR _____
(PRINT NAME)

SIGNATURE AND DATE _____

DO NOT WRITE BELOW THIS LINE

DATE ENTERED: ENTERED BY:

DATA COLLECTION SHEET CODES

POSITION OF THE HOOK		
	NON FLUKE	0
	FELL OFF	1
	LIP	2
	EYE	3
	MOUTH	4
	GILL	5
	GUT	6
	FOUL (VITAL AREA)	7
	FOUL (OTHER)	8

SPECIES		
	FLUKE	0
	SEA ROBIN	1
	SEA BASS	2
	DOG FISH	3
	SKATE	4
	CROKER	5
	WEAKFISH	6
	STRIPED BASS	7
	BLUEFISH	8
	OTHER	9

If today's catch is estimated to be 100 lbs or more you must call the number listed below, 2 hours prior to landing.

1 (609) 748-2050

INVOICE

NOAA 2014 BCRP-Award Number NA13NMF4720283

Name: _____

Address: _____ **INVOICE DATE:** _____

City, State and Zip: _____ **INVOICE #:** _____

Phone: _____ **SIGNATURE:** _____

Bill To:

Dr. James Salierno, PI
Fairleigh Dickinson University
285 Madison Avenue, M-SB1-01
Madison, NJ 07940

DAY	DATE	DESCRIPTION	SUMMER FLOUNDER DATA POINTS COLLECTED	BILLED AMOUNT	COST SHARE	TOTAL / TRIP
SUNDAY						$ -
MONDAY	4/7/2014	Fishing activities and data collection	137	$ 508.00	$ 92.00	$ 600.00
TUESDAY						$ -
WEDNESDAY						$ -
THURSDAY						$ -
FRIDAY						$ -
SATURDAY	4/12/2014	Fishing activities and data collection	48	$ 508.00	$ 92.00	$ 600.00
		TOTALS:	**185**	**$ 1,016.00**	**$ 184.00**	**$ 1,200.00**

NOTE: Each trip should be billed at $508 with $92 shown in the "Cost Share" column for a total of $600. The totals should equal $508 x number of trips; $92 x number of trips; and $600 x number of trips. You will be reimbursed for $508 x total number of trips.

CAPTAIN'S COMMITMENT

NOAA 2014 BCRP-Award Number NA13NMF4720283

I, Carl L. Benson, owner of F/V Bay Drifter, agree to participate in the approved NOAA 2014 BI-CATCH REDUCTION PROGRAM from November 1, 2013 through October 31, 2014. I will conduct research sampling for 48 trips, with an average of 45 summer flounder per trip. I will attempt to perform these sampling trips from April through August 2014. This represents a project goal of 2,160 summer flounder. I am responsible for the data collection and recording, oversight of the data during each sampling trip, and the weekly submission of data to the principal investigators. I also ascertain that anyone I designate to collect data in my absence will receive and will attest to receiving proper training.

I agree to accept a rate of $508.00 per day. This is the budgeted net of $600.00 per day minus the budgeted summer flounder sales of $92.00 per day. My total remuneration will be $24,384 for the successful completion of my responsibilities, consistent with the terms and tasks outlined above and in the NOAA 2014 BI-CATCH REDUCTION PROGRAM Overview. (See attached file.)

If I am unable to participate or continue to participate in the study, I will inform the principal investigator, Dr. James Salierno, as soon as possible. Dr. Salierno will seek an alternate to perform the required trips.

I will review my ability to add additional trips to my assignment, if asked.

I realize that NOAA may cancel the project and any funds paid to me may need to be returned.

I have received a copy of the NOAA 2014 BI-CATCH REDUCTION PROGRAM Overview. I have read, understood and agree to this document's content.

I have received a copy of FAIRLEIGH DICKINSON UNIVERSITY's INDEPENDENT CONTRACTOR AGREEMENT. I have read, understood, agree and separately signed the agreement.

Carl L. Benson — 2/23/2014

Carl L. Benson — Date

CAPTAIN'S COMMITMENT
NOAA 2014 BCRP-Award Number NA13NMF4720283

I, Alan A. Cook, owner of F/V Avocet, agree to participate in the approved NOAA 2014 BI-CATCH REDUCTION PROGRAM from November 1, 2013 through October 31, 2014. I will conduct research sampling for 16 trips, with an average of 45 summer flounder per trip. I will attempt to perform these sampling trips from April through August 2014. This represents a project goal of 720 summer flounder. I am responsible for the data collection and recording, oversight of the data during each sampling trip, and the weekly submission of data to the principal investigators. I also ascertain that anyone I designate to collect data in my absence will receive and will attest to receiving proper training.

I agree to accept a rate of $508.00 per day. This is the budgeted net of $600.00 per day minus the budgeted summer flounder sales of $92.00 per day. My total remuneration will be $8,128 for the successful completion of my responsibilities, consistent with the terms and tasks outlined above and in the NOAA 2014 BI-CATCH REDUCTION PROGRAM Overview. (See attached file.)

If I am unable to participate or continue to participate in the study, I will inform the principal investigator, Dr. James Salierno, as soon as possible. Dr. Salierno will seek an alternate to perform the required trips.

I will review my ability to add additional trips to my assignment, if asked.

I realize that NOAA may cancel the project and any funds paid to me may need to be returned.

I have received a copy of the NOAA 2014 BI-CATCH REDUCTION PROGRAM Overview. I have read, understood and agree to this document's content.

I have received a copy of FAIRLEIGH DICKINSON UNIVERSITY's INDEPENDENT CONTRACTOR AGREEMENT. I have read, understood, agree and separately signed the agreement.

Alan A. Cook — 9/5/14

Alan A. Cook — Date

CAPTAIN'S COMMITMENT
NOAA 2014 BCRP-Award Number NA13NMF4720283

I, Carmen Conti, owner of F/V Rufus 4, agree to participate in the approved NOAA 2014 BI-CATCH REDUCTION PROGRAM from November 1, 2013 through October 31, 2014. I will conduct research sampling for 24 trips, with an average of 45 summer flounder per trip. I will attempt to perform these sampling trips from April through August 2014. This represents a project goal of 1,080 summer flounder. I am responsible for the data collection and recording, oversight of the data during each sampling trip, and the weekly submission of data to the principal investigators. I also ascertain that anyone I designate to collect data in my absence will receive and will attest to receiving proper training.

I agree to accept a rate of $508.00 per day. This is the budgeted net of $600.00 per day minus the budgeted summer flounder sales of $92.00 per day. My total remuneration will be $12,192 for the successful completion of my responsibilities, consistent with the terms and tasks outlined above and in the NOAA 2014 BI-CATCH REDUCTION PROGRAM Overview. (See attached file.)

If I am unable to participate or continue to participate in the study, I will inform the principal investigator, Dr. James Salierno, as soon as possible. Dr. Salierno will seek an alternate to perform the required trips.

I will review my ability to add additional trips to my assignment, if asked.

I realize that NOAA may cancel the project and any funds paid to me may need to be returned.

I have received a copy of the NOAA 2014 BI-CATCH REDUCTION PROGRAM Overview. I have read, understood and agree to this document's content.

I have received a copy of FAIRLEIGH DICKINSON UNIVERSITY's INDEPENDENT CONTRACTOR AGREEMENT. I have read, understood, agree and separately signed the agreement.

Carmen Conti — 2/6/14

Carmen Conti — Date

CAPTAIN'S COMMITMENT
NOAA 2014 BCRP-Award Number NA13NMF4720283

I, William Dickinson, owner of F/V Brandy II, agree to participate in the approved NOAA 2014 BI-CATCH REDUCTION PROGRAM from November 1, 2013 through October 31, 2014. I will conduct research sampling for 24 trips, with an average of 45 summer flounder per trip. I will attempt to perform these sampling trips from April through August 2014. This represents a project goal of 1,080 summer flounder. I am responsible for the data collection and recording, oversight of the data during each sampling trip, and the weekly submission of data to the principal investigators. I also ascertain that anyone I designate to collect data in my absence will receive and will attest to receiving proper training.

I agree to accept a rate of $508.00 per day. This is the budgeted net of $600.00 per day minus the budgeted summer flounder sales of $92.00 per day. My total remuneration will be $12,192 for the successful completion of my responsibilities, consistent with the terms and tasks outlined above and in the NOAA 2014 BI-CATCH REDUCTION PROGRAM Overview. (See attached file.)

If I am unable to participate or continue to participate in the study, I will inform the principal investigator, Dr. James Salierno, as soon as possible. Dr. Salierno will seek an alternate to perform the required trips.

I will review my ability to add additional trips to my assignment, if asked.

I realize that NOAA may cancel the project and any funds paid to me may need to be returned.

I have received a copy of the NOAA 2014 BI-CATCH REDUCTION PROGRAM Overview. I have read, understood and agree to this document's content.

I have received a copy of FAIRLEIGH DICKINSON UNIVERSITY's INDEPENDENT CONTRACTOR AGREEMENT. I have read, understood, agree and separately signed the agreement.

William Dickinson — 2/4/14

William Dickinson — Date

CAPTAIN'S COMMITMENT
NOAA 2014 BCRP-Award Number NA13NMF4720283

I, Robert M. Rich, owner of F/V Finest Kind, agree to participate in the approved NOAA 2014 BI-CATCH REDUCTION PROGRAM from November 1, 2013 through October 31, 2014. I will conduct research sampling for 24 trips, with an average of 45 summer flounder per trip. I will attempt to perform these sampling trips from April through August 2014. This represents a project goal of 1,080 summer flounder. I am responsible for the data collection and recording, oversight of the data during each sampling trip, and the weekly submission of data to the principal investigators. I also ascertain that anyone I designate to collect data in my absence will receive and will attest to receiving proper training.

I agree to accept a rate of $508.00 per day. This is the budgeted net of $600.00 per day minus the budgeted summer flounder sales of $92.00 per day. My total remuneration will be $12,192 for the successful completion of my responsibilities, consistent with the terms and tasks outlined above and in the NOAA 2014 BI-CATCH REDUCTION PROGRAM Overview. (See attached file.)

If I am unable to participate or continue to participate in the study, I will inform the principal investigator, Dr. James Salierno, as soon as possible. Dr. Salierno will seek an alternate to perform the required trips.

I will review my ability to add additional trips to my assignment, if asked.

I realize that NOAA may cancel the project and any funds paid to me may need to be returned.

I have received a copy of the NOAA 2014 BI-CATCH REDUCTION PROGRAM Overview. I have read, understood and agree to this document's content.

I have received a copy of FAIRLEIGH DICKINSON UNIVERSITY's INDEPENDENT CONTRACTOR AGREEMENT. I have read, understood, agree and separately signed the agreement.

Robert M Rich — 4/5/14

Robert M. Rich — Date

CAPTAIN'S COMMITMENT
NOAA 2014 BCRP-Award Number NA13NMF4720283

I, Robert Veres, owner of F/V Gypsea, agree to participate in the approved NOAA 2014 BI-CATCH REDUCTION PROGRAM from November 1, 2013 through October 31, 2014. I will conduct research sampling for 24 trips, with an average of 45 summer flounder per trip. I will attempt to perform these sampling trips from April through August 2014. This represents a project goal of 1,080 summer flounder. I am responsible for the data collection and recording, oversight of the data during each sampling trip, and the weekly submission of data to the principal investigators. I als ascertain that anyone I designate to collect data in my absence will receive and will attest to receiving proper training.

I agree to accept a rate of $508.00 per day. This is the budgeted net of $600.00 per day minus the budgeted summer flounder sales of $92.00 per day. My total remuneration will be $12,192 for the successful completion of my responsibilities, consistent with the terms and tasks outlined above and in the NOAA 2014 BI-CATCH REDUCTION PROGRAM Overview. (See attached file.)

If I am unable to participate or continue to participate in the study, I will inform the principal investigator, Dr. James Salierno, as soon as possible. Dr. Salierno will seek an alternate to perform the required trips.

I will review my ability to add additional trips to my assignment, if asked.

I realize that NOAA may cancel the project and any funds paid to me may need to be returned.

I have received a copy of the NOAA 2014 BI-CATCH REDUCTION PROGRAM Overview. I have read, understood and agree to this document's content.

I have received a copy of FAIRLEIGH DICKINSON UNIVERSITY's INDEPENDENT CONTRACTOR AGREEMENT. I have read, understood, agree and separately signed the agreement.

Robert Veres

Robert Veres

4/25/14

Date

Appendix B. Captain's On-Board Compliance Training Documents.

Confirmation of Data Collection Training

NOAA 2014 BCRP-Award Number NA13NMF4720283

I attest that I have received proper training for data collection relating to the NOAA 2014 BI-CATCH REDUCTION PROGRAM. This training has been provided by either Dr. James Salierno, PI; Captain Carl Benson, Co-PI; or the designated Captain of the vessel on which I will participate in data collection and recording. By signing this document, I am indicating that I have understood and agree to follow all procedures presented to me relating to data collection and recording for this project.

Individual Receiving Training:

Carl L Benson

Signature

CARL L. BENSON

Printed Name

April 5, 2014

Date

Countersignature of individual providing training:

James Salierno

Signature

James Salierno Co-PI

Printed Name

4/5/14

Date

Confirmation of Data Collection Training

NOAA 2014 BCRP-Award Number NA13NMF4720283

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Individual Receiving Training:

Alan A. Cook

Signature

Alan A. Cook

Printed Name

04/05/14

Date

Countersignature of individual providing training:

James Salierno

Signature

James Salierno

Printed Name

4/5/14

Date

Confirmation of Data Collection Training

NOAA 2014 BCRP-Award Number NA13NMF4720283

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(5)

Individual Receiving Training:

(1) Carmen Conti
Signature

CARMEN CONTI
Printed Name

2/6/14
Date

Countersignature of individual providing training:

(2) Edmund G Aldine
Signature

EDMUND G ALDINE
Printed Name

2/6/14
Date

James Salierno
James Salierno

4/5/14

Confirmation of Data Collection Training

NOAA 2014 BCRP-Award Number NA13NMF4720283

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Individual Receiving Training:

William C. Dickinson

Signature

William C. Dickinson

Printed Name

4/5/14

Date

Countersignature of individual providing training:

James Salierno

Signature

James Salierno Co-PI

Printed Name

4/5/14

Date

Confirmation of Data Collection Training

NOAA 2014 BCRP-Award Number NA13NMF4720283

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Individual Receiving Training:

Robert M. Rich

Signature

ROBERT M. RICH

Printed Name

4/5/14

Date

Countersignature of individual providing training:

Signature

James Salierno

Printed Name

4/5/14

Date

Confirmation of Data Collection Training

NOAA 2014 BCRP-Award Number NA13NMF4720283

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Individual Receiving Training:

Robert A. Veres

Signature

ROBERT A. VERES

Printed Name

4/25/14

Date

Countersignature of individual providing training:

Signature

James Salierno

Printed Name

4/28/14

Date

Confirmation of Data Collection Training

NOAA 2014 BCRP-Award Number NA13NMF4720283

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Individual Receiving Training:

Carl L Benson

Signature

CARL L. BENSON

Printed Name

April 5, 2014

Date

Countersignature of individual providing training:

James Salierno

Signature

James Salierno Co-PI

Printed Name

4/5/14

Date

Confirmation of Data Collection Training

NOAA 2014 BCRP-Award Number NA13NMF4720283

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Individual Receiving Training:

Alan A. Cook

Signature

Alan A. Cook

Printed Name

04/05/14

Date

Countersignature of individual providing training:

James Salierno

Signature

James Salierno

Printed Name

4/5/14

Date

Confirmation of Data Collection Training

NOAA 2014 BCRP-Award Number NA13NMF4720283

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(5)

Individual Receiving Training:

(1) Carmen Conti
Signature

CARMEN CONTI
Printed Name

2/6/14
Date

Countersignature of individual providing training:

(2) Edmund G Aldine
Signature

EDMUND G ALDINE
Printed Name

2/6/14
Date

James Salierno
James Salierno

4/5/14

Confirmation of Data Collection Training

NOAA 2014 BCRP-Award Number NA13NMF4720283

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Individual Receiving Training:

William C. Dickinson

Signature

William C. Dickinson

Printed Name

4/5/14

Date

Countersignature of individual providing training:

James Salierno

Signature

James Salierno Co-PI

Printed Name

4/5/14

Date

Confirmation of Data Collection Training

NOAA 2014 BCRP-Award Number NA13NMF4720283

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Individual Receiving Training:

Robert M. Rich

Signature

ROBERT M. RICH

Printed Name

4/5/14

Date

Countersignature of individual providing training:

Signature

James Salierno

Printed Name

4/5/14

Date

Appendix C.

1. New Jersey Marine Fisheries Council Meeting Presentation, January 2015

2. Mid-Atlantic Fishery Management Council Meeting Presentation, April 2015

3. Accepted Oral Presentation Abstract and Presentation Materials for the 145th Annual American Fisheries Society Meeting, Portland OR, August 2015

Division of Fish and Wildlife
Mail Code 501-03
P. O. Box 420
Trenton, NJ 08625-0420
David Chanda, Director
Visit our Website: njfishandwildlife.com

December 8, 2014

Honorable Kim Guadagno
Secretary of State
State House – P.O. Box 300
Trenton, New Jersey 08625

Dear Secretary Guadagno:

The next meeting of the New Jersey Marine Fisheries Council will be held on **Thursday, January 8, 2015** at **4:00** p.m. at the Galloway Township Library, Jimmie Leeds Road, Absecon, New Jersey. To the extent known at this time, the agenda is as follows.

1. Roll Call
2. Compliance with Sunshine Law
3. Approval of Minutes for November 2014
4. Enforcement Report
5. Legislative Report
6. Atlantic States Marine Fisheries Commission Report – Joint meeting with MAFMC
7. Mid-Atlantic Fishery Management Council Report – December Meeting
8. Shellfish Council Reports
9. Committee Reports
   - Striped Bass – Potential Action – 2015 management measures
   - Regulatory Committee – Diamond Terrapin issues
10. Regulatory Actions – none anticipated
11. Old Business
    - Review of Committee Advisors Applications – possible action
12. New Business
    - Presentation by Fairleigh Dickinson University – Summer flounder hook and release mortality study
13. Public Comment
14. Date of Next Meeting – March 5, 2015

Under the authority N.J.S.A. 13:1B-30 et. seq., this letter is to comply with P.L. 1975, c. 231, and enclosed is one copy for filing and one copy for posting.

Sincerely,

David Chanda
Director

c. Newark Star Ledger, State House, Trenton, New Jersey
The Press (Atlantic City), State House, Trenton, New Jersey

COUNCIL MEETINGS

April 2015

Tuesday, April 14, 2015 - Thursday, April 16, 2015

Ocean Place Resort
One Ocean Boulevard, Long Branch, NJ 07740

Meeting Materials

Agenda and Summary Documents

- Agenda
- Complete Briefing Book (10.9 MB)
- MAFMC Stock Status

Executive Committee

- Briefing Materials (Tab 1)

Ecosystem Approaches to Fisheries Management

- Briefing Materials (Tab 2)
  - Earth Justice Letter Re: Unmanaged Forage (4/13/2015)
- Presentations:
  - Climate change and fisheries adaptation, *Malin Pinsky*
  - Climate Change, Fisheries, and Communities, *Bonnie McCay*
  - Climate Science White Paper Overview (second draft)
  - Unmanaged Forage Fish - Regulatory Alternatives
- Webinar Recording

Golden Tilefish

- Briefing Materials (Tab 3)
- Presentation
- Webinar Recording

Implementation Plan

- Briefing Materials (Tab 4)
- Webinar Recording

Control Rule Clarifications

- Briefing Materials (Tab 5)
- Presentation
- Webinar Recording

Industry Funded Observer Amendment

- Briefing Materials (Tab 6)
  - Electronic and Portside Monitoring Discussion Document *(posted 4/10/15)*
  - Industry-funded Monitoring Omnibus Amendment Action Plan *(posted 4/10/15)*
- Presentation
- Webinar Recording

River Herring Technical Expert Working Group (TEWG)

- Briefing Materials (Tab 7)
- Presentation
- Webinar Recording

Delaware Recreational Shad Fishery

- Briefing Materials (Tab 8)
- Webinar Recording

Bycatch Reduction in Summer Flounder Recreational Fishery

- Briefing Materials (Tab 9)
- Presentation
- Webinar Recording

Proposed Rule - National Standards 1, 3, and 7

- Briefing Materials (Tab 10)
- Presentation
- Webinar Recording

Listening Session

- Briefing Materials (Tab 11)
- Webinar Recording

Business Session

- Briefing Materials
  - Organization Reports (Tab 12)
  - Coast Guard Report
  - Liaison Reports (Tab 13)
  - Executive Director's Report (Tab 14)

Received

Your abstract submission has been received

Print Print this page now.

You have submitted the following abstract to 145th Annual Meeting of the American Fisheries Society. Receipt of this notice does not guarantee that your submission was complete, free of errors, or accepted for presentation.

Optimization of Hook Size to Reduce Discards and Post Release Mortality in the New Jersey Summer Flounder, Paralichthys Dentatus, Hook and Line Fishery

James Salierno, Fairleigh Dickinson University and Carl Benson, NJ Resident Commercial Hook and Line Fishermen

Abstract Text:

The objective of this study was to determine optimal hook sizes to land legal summer flounder, *Paralichthys dentatus*, while reducing the number of discards and incidence of deep hooking associated with catch and release. We evaluated size selectivity of eight J-hooks (2/0-9/0) on flounder landings through collaboration with the NJ Resident Commercial Hook and Line Fishermen. Sampling trips were conducted in 2014 along the coastline of NJ. The following data were analyzed as a function of hook size: length (TL), recreational legal fish landed, discards, legal to discard ratio, estimated discard mortality, and hook set location. A total of 7764 flounder and 280 non target species were landed. As hook size increased, mean TL significantly increased with 7/0-9/0 size hooks outperforming smaller gauges. Increased hook size decreased the total number of flounder landed while significantly increasing the ratio of legally landed fish. As hook size increased, estimated discard mortality decreased calculated as 10% mortality rate of discarded fish. Our study concludes that larger hooks lands larger fish while reducing discards and potential mortality. Further, our results suggest that hook guidelines have the potential to increase recruitment and spawning stock biomass (SSB) through reduction in mortality associated with catch and release.

Title: Optimization of Hook Size to Reduce Discards and Post Release Mortality in the New Jersey Summer Flounder, Paralichthys Dentatus, Hook and Line Fishery
Submitter's E-mail Address: salierno@fdu.edu
Preferred Presentation Format: Oral
Keywords: Marine Fisheries Management; Fish Conservation; Policy

I was invited to submit by a symposium organizer

Symposia ID: 3479
Symposia Title: Exploring the benefits of collaborative fisheries research and conservation engineering to reduce bycatch and bycatch mortality

First author

Presenting Author
James Salierno
Fairleigh Dickinson University
Department of Biology
Madison, NJ, 07940, USA
Email Address: salierno@fdu.edu -- Will not be published

Second author

Carl Benson
NJ Resident Commercial Hook and Line Fishermen
Wyckof, NJ, 07481, USA
Email Address: flukeman@aol.com -- Will not be published

If necessary, you can make changes to your abstract between now and the deadline of

Friday, March 13, 2015

.

- To access your submission in the future, use the direct link to your abstract submission from one of the automatic confirmation emails that were sent to you during the submission.
- *Or* point your browser to http://afs.confex.com/afs/reminder.cgi to have that URL mailed to you again. Your username/password are 19200/851344.

Any changes that you make will be reflected instantly in what is seen by the reviewers. You DO NOT need to go through all of the submission steps in order to change one thing. If you want to change the title, for example, just click "Title" in the abstract control panel and submit the new title.

When you have completed your submission, you may close this browser window.

Tell us what you think of the abstract submittal

Home Page

Schedule of Oral Presentations – Thursday August 20 – Morning Session				
Time	**D-140** **Fluvial fish-habitat relationships**	**E-141** **Habitat Science for Ecosystem Based Fisheries Management**	**E-142** **AIS: Working with Partners Across Large Landscapes**	**E-143** **Collaboration, Engineering, and Bycatch Reduction Part 2**
8:00 AM	Recent Advances in Establishing Fish-Habitat Relationships in Lotic Systems: An Introduction ***Nick Bouwes*** **Th-140-1**	Incorporating Habitat Science into the Assessment and Management of Fishery Stocks ***Anthony R. Marshak*** **Th-141-1**	Dreissenid Prevention Across the Pacific Northwest ***Stephen Phillips*** **Th-142-1**	Evaluating the Limitations and Applications of the Reflex Action Mortality Predictor Approach for Quantifying Bycatch Mortality ***Noëlle Yochum*** **Th-143-1**
8:20 AM	Can WUA Predict the Flow Requirements of Drift-Feeding Salmonids? Comparison with a Net Rate of Energy Intake Model Incorporating Drift-Flow Processes ***John Hayes*** **Th-140-2**	Mapping Potential Coastal Shark Habitat and Interspecies Interactions in Pamlico Sound, North Carolina ***Charles Bangley*** **Th-141-2**	Building Consensus in the West: Developing a Model Legal Framework for Watercraft Inspection and Decontamination Programs ***Glenn Dolphin*** **Th-142-2**	Interactions and Post-Release Survival of Juvenile White Sharks Incidentally Caught in Coastal Southern California Gillnet Fisheries ***Christopher G. Lowe*** **Th-143-2**
8:40 AM	Using Large-Scale Application of a Foraging Model in the Interior Columbia River Basin to Help Understand Patterns of Habitat Use in Salmonids ***Eric Wall*** **Th-140-3**	Spatial-Temporal Distributions of Dominant Estuarine Species Along the Texas Coast ***James Kilfoil*** **Th-141-3**	Strategic e-Marketing of the Stop Aquatic Hitchhikers!™ Campaign Works ***Doug Jensen*** **Th-142-3**	Preventing Bycatch of Yellowtail Flounder in the Sea Scallop Dredge Fishery By Dredge Pause: Video Evaluation ***Eleanor Bochenek*** **Th-143-3**
9:00 AM	A New Mechanistic Model of Drift Feeding Based on Cognitive Limits on Visual Information Processing ***Jason R. Neuswanger*** **Th-140-4**	Modeling Environmental Effects on Juvenile Brown Shrimp Production in an Estuarine Ecosystem ***Jennifer Leo*** **Th-141-4**	Aquatic Invasive Species Management in the San Francisco Bay Delta: A Collaborative Effort ***Melanie Okoro*** **Th-142-4**	Optimization of Hook Size to Reduce Discards and Post Release Mortality in the New Jersey Summer Flounder Hook and Line Fishery ***James Salierno*** **Th-143-4**
9:20 AM	How Do You Feed Trout in Individual-Based Models? ***Bret Harvey*** **Th-140-5**	Habitat Use and Movement of Juvenile Red Drum and Spotted Seatrout Across Estuarine Seascapes ***David Moulton*** **Th-141-5**	Expansion of Shimofuri Goby from the California State Water Project to the Santa Clara River, Ventura County, California ***Steve Howard*** **Th-142-5**	Discard Fate: Using Cooperative Research and Acoustic Telemetry to Assess Efficacy of Barotrauma Mitigation Techniques and Long-Term Survival of Gag Grouper after Recreational Catch and Release ***Angela Collins*** **Th-143-5**
9:40 AM	The Role of Channel Morphology and Hydraulics in Shaping Spatial Patterns of Foraging Habitat for Drift-Feeding Trout in Small Streams ***Piotr Cienciala*** **Th-140-6**	Linking Juvenile Habitat to Adult Stock Dynamics of the Black Sea Bass ***Ian Kroll*** **Th-141-6**	Regional Management, Research, Outreach Preparedness and Response to a Natural Disaster Driven Invasive Species Pathway: Learning from the 2011 Japanese Tôhoku Tsunami ***Samuel Chan*** **Th-142-6**	Barotrauma in Lake Erie Yellow Perch and Implications to Management ***Benjamin Leonhardt*** **Th-143-6**
10:00 AM	**Break**			
10:20 AM	Vulnerability of Coastal Cutthroat Trout to Changes in Stream Temperature and Flow in Coastal Streams of the Pacific Northwest of North America ***Brooke Penaluna*** **Th-140-7**	Offshore Habitat Preference of Migrating Juvenile and Adult Black Sea Bass and the Relationship to Year-Class Strength ***Alicia S. Miller*** **Th-141-7**	History of the Asian Carp Invasion in North America from Importation to Formation of the Acrcc ***Duane Chapman*** **Th-142-7**	A Review of a Decade of Research on Haddock Trawls on the US Northeast Coast ***Pingguo He*** **Th-143-7**
10:40 AM	Trout Do Not Cope Well to Extreme Environmental Conditions or Do They? ***Ivan Arismendi*** **Th-140-8**	Description of Echinoderm Populations on Georges Bank and the Potential Modifying Role of Marine Protected Areas on These Populations ***Judith Rosellon Druker*** **Th-141-8**	Working with Partners Across Large Landscapes: Model Activities in Midwest United States to Manage Aquatic Nuisance Species ***Kevin Irons*** **Th-142-8**	Evaluation of a Selective Flatfish Sorting Grid Bycatch Reduction Device in the West Coast Bottom Trawl Fishery ***Mark J.M. Lomeli*** **Th-143-8**
11:00 AM	Temperature and Streamflow Effects on Growth and Survival of Headwater Cutthroat Trout Populations in the Greater Yellowstone Area ***Robert Al-Chokhachy*** **Th-140-9**	Offshore Video Survey and Oceanographic Analysis for Ecosystem Based Fisheries Management ***N.David Bethoney*** **Th-141-9**	Modifying Dam Operation to Inhibit the Spread of Bigheaded Carps in the Upper Mississippi River ***Daniel Zielinski*** **Th-142-9**	Bycatch Analysis of Shrimp Small Bottom Trawl with Modified Mesh Size Codend and Bycatch Excluder Device in North Kalimantan ***Dwi Ariyoga Gautama*** **Th-143-9**
11:20 AM	Using Expert Knowledge to Develop Fuzzy Habitat Suitability Models for Steelhead and Chinook Salmon in the Interior Columbia River Basin ***Sara Bangen*** **Th-140-10**	The First Assessment of the Habitat Associations and Ecosystem Roles of Offshore Marine Fishes in the Canadian Beaufort Sea ***Andrew Majewski*** **Th-141-10**	Black Carp in the United States- Past, Present, and Future ***Kelly Baerwaldt*** **Th-142-10**	Sea Turtle Bycatch Mitigation in the Southeastern US Skimmer Trawl Fishery: Size Matters ***Jeff Gearhart*** **Th-143-10**
11:40 AM	Incorporating Movement Potential with Habitat Suitability Models: Implications for the Threatened Western Silvery Minnow in an Augmented Prairie River ***Kenton Neufeld*** **Th-140-11**	Characterizing Benthic Habitats at the South Texas Banks ***Maria Cooksey*** **Th-141-11**	Production, Distribution, Certification, and Regulation of Grass Carp in the United States- a Review and Management Recommendations ***Sam Finney*** **Th-142-11**	Pause for Early Lunch Break