

Project Title: Estimating and mitigating the discard mortality rate of black sea bass in offshore recreational rod-and-reel fisheries

Applicant: Partnership for Mid-Atlantic Fisheries Science (PMAFS)

Contact Information: Raymond Bogan, Board Chair, 1636 Delaware Ave., Cape May, NJ 08204, rbogan@lawyernjshore.com

Applicant Type: Non-profit

Co- and Principal Investigators:

Principal Investigator: Dr. Olaf P. Jensen¹ (olaf.p.jensen@gmail.com, 410-812-4842)

Co-Principal Investigators: Dr. Eleanor A. Bochenek¹ (bochenek@hsrl.rutgers.edu, 609-898-0928 x12) and Dr. Jeffrey Kneebone² (jeff.kneebone@gmail.com, 617-226-2424)

Senior Associate: Dr. Douglas R. Zemeckis¹ (doug.zemeckis@gmail.com, 508-910-6336),

Scientific Collaborators: Dr. John W. Mandelman², Connor W. Capizzano^{2,3}, Dr. Thomas M. Grothues¹, William S. Hoffman⁴, and Micah J. Dean⁴

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Industry Collaborators: Captain Bob Rush (Starfish Boats, Sea Isle City, NJ), Recreational Fishing Alliance, Jersey Coast Anglers Association, and Rhode Island Charter and Party Boat Association

MAFMC Research Area Being Addressed: 4. Determine the discard mortality rate by gear type for the recreational summer flounder and/or black sea bass fisheries. Special consideration will be given to projects that address discard reduction.

Project Period: April 1, 2016 through December 15, 2017

Total Project Cost: \$229,630 + \$50,869 (Addendum Amount)=\$280,499

Matching Funds: \$52,155 + \$8,680 (Addendum Amount)=\$60,835

Funding Requested: \$177,475 + \$41,869 (Addendum Amount)=\$219,344¹

¹An addendum was approved May 2016 to add an additional two months(February and March) of sampling and telemetry work.

Executive Summary²

The proposed research addresses priority #4 of the Mid-Atlantic Fishery Management Council's (MAMFC) 2016-2017 Collaborative Fisheries Research program: **Determine the discard mortality rate by gear type for the recreational summer flounder and/or black sea bass fisheries. Special consideration will be given to projects that address discard reduction.**

Black sea bass (*Centropristis striata*) are a common species caught by numerous seasonal recreational fisheries along the east coast of the United States. Given the geographic extent of the fishery (Florida to Maine), the species is captured using a wide array of gear and tackle types, and across a wide range of depths, water temperatures, and air temperatures. Published black sea bass discard mortality rates vary considerably (i.e., 4.7% to 39%), with a general increase in mortality evident in deeper capture depths. Currently, black sea bass stock assessments and fishery management plans assume a 25% discard mortality rate for the coast-wide recreational fishery, but the wide range of estimates indicate that this rate may not be representative of all regional fisheries. In late fall and winter, black sea bass are captured by recreational anglers during directed and non-directed (e.g., scup, cod, tilefish) offshore trips in deepwater (50-80 m) off the Mid-Atlantic. Due to size restrictions, daily possession limits, "high-grading", or closed seasons, many of the captured fish are released in this offshore fishery. The black sea bass discard mortality rate following rod-and-reel capture in a similar depth range (43-54 m) off South Carolina was estimated to be relatively high (e.g., 39%), but the extent to which this estimate is applicable to the deeper depths and both colder water and air temperatures characteristic of the fall/winter offshore fishery is unclear. In addition, this estimate was derived from low sample size and by monitoring fish in cages, which can bias mortality estimates. Consequently, the discard mortality rate of black sea bass in the Mid-Atlantic offshore fishery remains uncertain and warrants further research.

The primary objective of the proposed research is to generate a robust estimate of the discard mortality rate of black sea bass captured by recreational anglers using rod-and-reel fishing gear in the deepwater offshore fishery that occurs during the fall/winter in the Mid-Atlantic. In addition, this research will generate "best practice" capture and handling recommendations to reduce the mortality of discards (e.g., through the use of circle hooks, by swim bladder venting, and/or the establishment of capture and handling practices to promote fish survival). To accomplish these objectives, we will utilize a combined approach of passive acoustic telemetry and conditional reasoning, which has proven effective for generating gear-specific discard mortality rates for other recreationally-caught species (e.g., Atlantic cod, haddock). Briefly, black sea bass will be captured by volunteer recreational anglers of varying experience levels during research tagging charters conducted from November 2016 through January 2017 aboard a recreational headboat sailing out of Sea Isle City, NJ. All fishing/sampling will occur at a shipwreck located in ~50 m depth that is representative of the locations commonly fished by recreational anglers during the winter. Prior to any sampling, we will establish standardized rod-and-reel and terminal tackle setups to be used during all research tagging charters to ensure that all capture conditions are consistent with normal fishery conditions. Based upon preliminary input from our industry and scientific collaborators, it is anticipated that J-hooks will be the most common tackle type. If true, then the proposed research will also include anglers fishing with circle hooks to evaluate their conservation benefits for

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reducing discards.

During each trip, anglers will be provided with a standardized fishing setup and allowed to determine how best to fish, handle, and unhook their catch to promote authentic scenarios. For each captured black sea bass, a series of technical (capture time, depth, angler experience level, tackle type, fight and handling time, and hook location and removal method) and biological (total length, physical injury, air and water temperature, and release behavior) variables will be recorded. Each fish will be assigned a physical injury score, which accounts for external signs of barotrauma. A random subsample of black sea bass ($n=80$) will be tagged with acoustic transmitters containing pressure/depth sensors, released at the surface, and monitored for days to weeks following release using an array of 20 acoustic receivers. Previous research on black sea bass indicated that swim bladder venting may decrease discard mortality, therefore, an equal number of transmitters will be deployed on vented and unvented fish ($n=40/\text{treatment}$). Post-release mortality will be quantitatively assessed by comparing the acoustic depth observations from each tagged sea bass to that of the depth observations of known dead fish that will be tagged and released into the array of acoustic receivers. Estimation of discard mortality rate will be accomplished using a longitudinal survival model as described in Benoit et al. (2015). In addition to generating an empirically-derived discard mortality estimate that accounts for natural mortality, this approach will allow us to identify specific capture-related variables that are predictors of mortality and therefore develop “best practice” recommendations to reduce the black sea bass recreational discard mortality rate within the offshore fishery and beyond.

Ultimately, by collecting detailed information about black sea bass capture events in the deeper range of typical fishing depths, the proposed study will both generate a conservative worst-case scenario estimate of the discard mortality rate (i.e., given the species’ susceptibility to barotrauma) and derive “best practice” recommendations that will be applicable to both inshore and offshore fisheries (given the similarities between fishing gear utilized to target black sea bass along the east coast of the United States). In addition, acoustic detection data generated by this study will improve our understanding of black sea bass spatial ecology and behavior on an offshore shipwreck. Given the expertise of the individuals from the recreational fishing and scientific communities that will be involved in the proposed study, we are confident that our results will both be accurate and highly applicable for future black sea bass management efforts. In addition, the strong partnership with the recreational industry and collaborating institutions will ensure that our results are widely disseminated to fishery scientists, fishery managers, and the recreational angling community. This comprehensive approach will both work to reduce black sea bass discards in the recreational fishery and enhance overall management of the species throughout its U.S. Atlantic range.

Main Proposal

Introduction: Recreational rod-and-reel fishing is a popular activity that produces significant economic benefits (Lovell et al., 2013). Each year, a substantial portion of the total recreational catch is discarded due to management measures (e.g., minimum landing sizes, possession limits, closed seasons) or personal conservation ethics (Tufts et al., 2015). However, reliable discard mortality estimates are often difficult to obtain, despite being vital for estimating total fishing mortality in stock assessments and for developing fishery management plans. Previous studies on recreational fisheries have indicated that discard mortality rates are species-specific and often influenced by various capture-related variables including tackle type, fish handling method, air/water temperature, capture depth, and degree of physical injury (e.g., Diodati and Richards, 1996; Hochhalter and Reed, 2011; Curtis et al., 2015). Increased recreational discard mortality research and outreach efforts have also recently been identified as key strategies for addressing challenges in managing recreational fisheries (FishSmart, 2014; NOAA, 2014).

Along the east coast of the United States, black sea bass (*Centropristis striata*) are commonly captured by recreational anglers (Shepherd and Nieland, 2010). Throughout their range, the species is caught as part of numerous seasonal recreational fisheries that utilize multiple different gear and tackle types, and occur over a range of water depths, water temperatures, and air temperatures. Accordingly, published black sea bass discard mortality rates vary considerably by region (e.g., 4.7% to 39%), with an increase in mortality rate evident in deeper capture depths (Bugley and Shepherd, 1991; Collins et al., 1999; Rudershausen et al., 2014). Currently, black sea bass stock assessments and fishery management plans assume a 25% discard mortality rate for the coast-wide recreational fishery (Shepherd and Nieland, 2010), but the wide range of published estimates indicate that this rate may not be representative of all regional fisheries.

In late fall and winter, black sea bass migrate offshore towards the edge of the continental shelf (Moser and Shepherd, 2009) and overwinter on deep shipwrecks and reefs (45-80+ m). Within this time and area, large numbers of fish can be discarded by recreational anglers during directed and non-directed (e.g., scup, cod, tilefish) trips due to size restrictions, daily possession limits, “high-grading”, or closed seasons. The discard mortality rate of black sea bass in this offshore fishery is uncertain. Collins et al. (1999) reported black sea bass discard mortality rates up to 39% following rod-and-reel capture in a similar depth range (43-54 m) off South Carolina, but the extent to which this estimate is applicable to the colder water and air temperatures and deeper depths evident in the Mid-Atlantic offshore fishery is unclear. In addition, this estimate was derived from low sample size (n=25) and by monitoring fish in cages for 24 h post-release, a technique which can bias mortality estimates (Davis, 2002). Consequently, further research to establish an accurate estimate of discard mortality in the offshore fishery is warranted.

Project Objectives: The proposed research seeks to address priority #4 by determining the discard mortality rate of black sea bass captured by recreational anglers using rod-and-reel fishing gear in the fall/winter Mid-Atlantic offshore fishery. In addition, this research will enable the establishment of “best practices” guidelines that will work to reduce discard mortality rate in both the offshore and inshore fishery, given the similarities in fishing gear utilized to target black sea bass along the east coast of the United States. Further, by working in the deeper range of capture depths, the proposed research will provide a conservative worst-case scenario of black

sea bass discard mortality rate that will be valuable for consideration in fishery management. We propose to achieve these goals by meeting the following objectives:

- (1) Estimate the discard mortality rate of black sea bass following capture with rod-and-reel fishing gear at a deepwater offshore shipwreck in the Mid-Atlantic using passive acoustic telemetry and a longitudinal survival analysis.
- (2) Identify the capture-related factors that influence black sea bass discard mortality.
- (3) Utilize the results from (2) to establish “best practice” guidelines for reducing the mortality of discarded black sea bass.
- (4) Conduct a broad outreach effort to disseminate project results from (1) and (3) to invested stakeholder groups, (e.g., fishery managers and scientists, recreational fishing community).
- (5) Describe the residency, behavior, and habitat use of black sea bass at an offshore shipwreck in the Mid-Atlantic.

Proposed Methodology: Overview: The proposed research will utilize acoustic telemetry to monitor the post-release fate of recreationally-caught black sea bass (Figure 1). Passive acoustic telemetry is emerging as a powerful technique for estimating discard mortality (e.g., Curtis et al., 2015; Ferter et al., 2015) due to its significant advantages over more traditional methods (e.g., caging studies, conventional tagging). For example, acoustic telemetry obviates the need to recapture tagged fish to determine post-release fate (as with conventional tagging) and allows tagged fish to be passively monitored with acoustic receivers for extended periods (days to months) while they are free to interact with their natural environment and are not shielded from predation (which is not possible in caging or laboratory studies). The ability to monitor individual fish tagged with acoustic transmitters following release also enables survival to be observed and quantified during the natural recovery process and enhances the ability to accurately determine the timing of mortality events. Moreover, coupling this approach with the collection of a suite of capture-related variables recorded for each capture event permits identification of the factors that influence mortality via conditional reasoning and parametric survival analyses (see Benoit et al., 2012; 2015), thereby enabling identification of best-practice methods to reduce discard mortality.

Study Site: This study will involve a range of industry collaborators to ensure selection of a suitable study site and fishing methods which accurately represent the recreational offshore fishery in the Mid-Atlantic. Fieldwork will be conducted out of Sea Isle City, New Jersey (NJ) from November 2016 through March 2017, which covers the period of highest recreational effort in deepwater. All research will be conducted at the site of a shipwreck located ~55 km off the coast of Sea Isle City, NJ in 45-55 m depth (Figure 2A). This location was chosen based on input from our industry collaborators as an area with consistently high black sea bass catch rates and a depth range representative of common offshore fishing grounds for black sea bass. In addition, it is conducive to successful maintenance of acoustic receivers with minimal risk of gear conflicts.

Field protocol and tagging strategy: Prior to any sampling, we will conduct an extensive survey of anglers and captains to establish standardized rod-and-reel and terminal tackle setups to be used during all research tagging charters. This survey will be distributed via online message boards, by our industry collaborators, and on the websites of collaborating institutions. This will ensure that the capture conditions while tagging are highly representative of typical conditions evident in the offshore fishery. Based upon input from our industry and scientific collaborators, it

is anticipated that J-hooks will be the most common tackle type. If so, then the proposed research will also evaluate the effect of circle hooks at reducing discards by using both hook types on tagging trips.

Six research tagging charters will be conducted aboard the *F/V Susan Hudson* from Sea Isle City, NJ from November 2016–January 2017. Each trip will have twelve volunteer anglers of varying experience levels (as quantified by questionnaire) and four scientific crew. We anticipate sampling ~200 sea bass per trip. Each volunteer angler will be provided with a standardized fishing setup and allowed to determine how best to fish, handle, and unhook their catch to promote authentic scenarios. For each captured black sea bass, a series of technical (capture time, depth, angler experience level, tackle type, fight and handling time, and hook location and removal method) and biological (total length, physical injury, air and water temperature, and release behavior) variables will be recorded. Each fish will be assigned a physical injury score, which accounts for external signs of barotrauma (Table 1).

Acoustic transmitters with pressure sensors (model V9P-2H; Vemco AMIRIX Systems, Inc., Nova Scotia) will be randomly deployed on a subsample of black sea bass ($n=80$) caught on the standardized fishing setups, prioritizing distribution of tags across the full spectrum of fish lengths, injury scores, and treatments. The proposed tagging method was previously used in discard mortality studies for cod and haddock, and includes attachment with end caps via Floy Spaghetti tags (model FT-4; Floy Tag Inc., Seattle, WA) (Figure 3). A holding tank study will be completed (summer of 2016) at the Rutgers University Marine Field Station to confirm the efficacy of this tagging method and the minimum size fish that will be tagged (approx. ≥ 28 cm). Tagging fish less than and greater than current minimum landing sizes will maximize the applicability of project results for fishery management.

Previous research on black sea bass indicated that swim bladder venting may decrease discard mortality (Collins et al., 1999), and anecdotal reports from the industry suggest that the inability to submerge (due to barotrauma) is a major contributor to discard mortality (Gary Shepherd, pers. comm.). Therefore, we propose to examine the effectiveness of venting for reducing discards by deploying an equal number of transmitters on vented and unvented fish ($n=40/\text{treatment}$). To minimize risk of internal injury from improper technique, all fish will be vented by a trained scientist and previously developed methods (e.g., www.catchandrelease.org). This will ensure that we are able to test whether or not venting (when done properly) will increase discard survival. All fish not tagged with acoustic transmitters will be tagged with conventional t-bar anchor tags (Floy FD-94) to confirm survival or identify movement patterns if recaptured. A database of reported recaptures will be maintained and a lottery reward system will be used to randomly choose a winner of a \$500 reward on two occasions during the project.

Acoustic Receiver Array Design: To monitor the fate of fish tagged with acoustic transmitters, an array of 20 acoustic receivers (Vemco model VR2W; 5 new purchases, 13 loaned from Massachusetts Division of Marine Fisheries, 2 loaned from Rutgers) will be strategically deployed to monitor the shipwreck and surrounding areas (Figure 2B). Receivers will be deployed from November 2016 to March 2017 following procedures used during previous projects in the Gulf of Maine (e.g., Dean et al., 2012; Kneebone et al., 2014) (Figure 4) and undergo downloads and maintenance every 1-1.5 months. Previous studies have used acoustic telemetry to study black sea bass habitat use on NJ inshore reefs and found that fish exhibit extended site fidelity and a lower probability of movement in late fall (Fabrizio et al., 2013; 2014). Although no direct information on exists for offshore wrecks/reefs, these data suggest that

there is a high probability that fish will remain within detection range for a long enough period to identify mortality events, which have been shown to mostly occur within 24 hours in previous studies with Atlantic cod (Palsson et al., 2003; Weltersbach and Strehlow, 2013).

Data Analysis: We will take a dual approach in evaluating black sea bass discard mortality, including both acute (i.e., on-deck or at-vessel) and post-release mortality. Post-release mortality will be quantitatively assessed by comparing the acoustic depth observations from each tagged sea bass to that of the depth observations of known dead fish that will be released into the array. The depth data of the known dead fish are assumed to be representative of dead sea bass in the study area (Figure 5; Capizzano et al., *in press*). Estimation of discard mortality rate will follow the approach described in Benoit et al. (2012, 2015), Mandelman et al. (2015), and Capizzano et al. (*in press*) (Objective 1; Figure 1). In addition to generating an empirically-derived discard mortality estimate accounting for natural mortality, this approach will allow us to identify specific capture-related variables that are predictors of mortality and therefore develop “best practice” guidelines (Objectives 2 and 3). Although fish caught on circle hooks are not expected to be tagged with acoustic transmitters, condition scores will be collected for these fish and the relative conservation benefit of circle hooks will be evaluated through conditional reasoning (Benoit et al. 2012). Detection data will also provide insights into black sea bass spatial ecology and residency on an offshore shipwreck (Objective 5).

Outreach: In accordance with Objective 4, project results will be disseminated to the Mid-Atlantic Fishery Management Council and other fishery managers, fishery scientists, and the recreational fishing community via technical reports, peer-reviewed publications, scientific (e.g., Mid-Atlantic Chapter of the American Fisheries Society) and public (e.g., fishing shows) seminars, social media, and press releases. We will circulate best practice capture, handling, and release methods directly to recreational fishermen via online message boards, social media pages, websites of the collaborating institutions and charter boat operations, and electronic pamphlets. This multi-point approach will ensure that the results are rapidly available for consideration in the development of future fishery management plans.

Specific Results Expected: The proposed research will estimate discard mortality rates of black sea bass captured with rod-and-reel fishing gear at a deep offshore shipwreck in the Mid-Atlantic. These estimates will be valuable for informing the development of future fishery management plans and for potential incorporation into stock assessment models to more accurately quantify total fishery removals. The proposed survival analyses will identify the capture-related factors that significantly influence discard mortality, thereby permitting identification of “best practice” guidelines for reducing discard mortality, such as the efficacy of venting and the relative conservation benefits of J-hooks versus circle hooks. Acoustic telemetry data will also improve our understanding of black sea bass spatial ecology and behavior on an offshore wreck.

Time frame/work plan: The following table outlines the timing of the work described above:

	2016	2017					
	Apr-May	Jun-Jul	Aug-Oct	Nov-Jan	Feb-Mar	Apr-Jul	Aug-Dec
Project Planning & Coordination							
Holding Tank Study Fieldwork &							
Sampling Preparation Deploy &							
Maintain Receivers Research							
Tagging Charters							
Data Analysis Disseminate							
Results/Outreach Report &							
Manuscript Preparation							
Process Tag Returns							

Elements of collaboration: All phases of the proposed research will include collaboration with the recreational fishing industry which has demonstrated its support for the proposed research (see Support Letters from PMAFS, RFA, JCAA, and RI Charter and Party Boat Association). The study design will be developed using input from industry collaborators, including their attendance at project team meetings. The standardized tackle setups will be chosen after completion of a survey shared with the angling community. This will help to obtain feedback from anglers and spread the word about the project. Research charters will be conducted aboard a recreational headboat. Funds are budgeted to maintain the acoustic receivers aboard the Rutgers research vessel. However, an appropriate commercial trap fishermen with the necessary expertise to maintain this equipment will be sought to deploy and maintain the acoustic receivers in order to utilize their local knowledge of the study site. Our Industry Collaborators will also assist with data analysis by helping to interpret results based on their experience fishing for black sea bass and will guide analyses in order to meaningfully account for common angling practices. The proposed research will also involve the angling community through outreach efforts and by engaging in conversation about the project, including through reporting of recaptured tags.

Budget

Partnership for Mid-Atlantic Fisheries Science Budget

	<u>Totals</u>	<u>Requested</u>	<u>Other Funding</u>
PMAFS Contractual			
Rutgers University Budget-Subcontract			
Bochenek (Co-PI) salary/fringe	11,384	11,384	
Zemeckis (Senior Assoc) salary/fringe	19,739	19,739	
Grothues (Researcher) salary/fringe	4835	4835	
Rental Wet Lab	500	500	
Rental Rutgers boat	9,616	9,616	
Rutgers indirect @15% for PMAFS	19,777	6,911	12,866
Rutgers Total	65,851	52,985	12,866
Consultant -Kneebone/salary/fringe/travel/ICR	15,236	15,236	
Party boat rental	16,500	16,500	
Travel	2,600	2,600	
Supplies	100,020	74,020	26,000
Accounting/bookkeeping salary	1,500	1,500	
In-Kind Volunteer hours	13,289		13,289
PMAFS Subtotal	214,996	162,841	52,155
PMAFS ICR 10%	14,634	14,634	
Total PMAFS Budget *	229,630	177,475	52,155

No other funds are being sought for this project.

A more detailed budget justification is included in Appendix 3.

*Overall project indirect charges =13.8%

SEE ADDENDUM FOR ADDITIONAL APPROVED BUDGET

Statement of Qualifications and Staffing Plan

The Partnership for Mid-Atlantic Fisheries Science (PMAFS) is a non-profit research and educational partnership of academic and fishing industry representatives from both the commercial and recreational sectors. The Board is comprised of leading members from fishing industry organizations from both NY and NJ with representatives from the Jersey Coast Anglers Association, United Boatman of New Jersey, Save the Summer Flounder Fishery Fund, New York Tackle Manufacturers Association, Garden State Seafood Association (Lunds Fisheries), and Long Island Commercial Fishing Association. PMAFS has successfully managed two multi-institutional federal appropriation grants (each ~\$999,000) to conduct research on black sea bass and summer flounder.

Our research team has extensive experience working with acoustic telemetry, studying discard mortality, participating in collaborative research with fishers, and being involved with recreational fisheries (as anglers and scientists) (See included Curriculum Vitae). More specifically, the research team has experience using acoustic telemetry to estimate discard mortality in commercial (e.g. summer flounder: Yergey et al., 2012) and recreational fisheries (e.g. Atlantic cod: Mandelman et al., 2015; Capizzano et al., *in press*; haddock: Zemeckis et al., 2014; sand tiger sharks: Kneebone et al., 2013). Researchers also have extensive expertise in tagging methods, black sea bass biology, and statistical methods. Previous discard mortality research with Atlantic cod conducted by portions of the team provided results that were included in both stock assessment and fishery management (NEFSC, 2015). Therefore, the team has prior experience providing the required data for consideration in these processes. The assembled team also has considerable history of effective collaboration. For example, Drs. Jensen, Grothues, and Bochenek collaborated to study the effects of fishing on black sea bass size, age, and sex distribution; Drs. Grothues and Bochenek collaborated on a winter flounder telemetry study to assess estuarine habitat use; the research group from New England, including Doug Zemeckis who is transitioning from UMass to Rutgers, has collaborated on many acoustic telemetry projects to study cod spawning behavior, striped bass movements, and discard mortality of cod, haddock, and cusk.

For the proposed research, O. Jensen will serve as the lead PI and oversee the project. E. Bochenek will coordinate the industry vessel and with the PMAFS and assist with fieldwork and report preparation. D. Zemeckis will lead the field work component, including the holding tank study, as well as contribute to data analysis, outreach efforts, and assist with presentations, reports, and manuscripts. T. Grothues will assist with data analysis, writing/revision, and outreach. J. Kneebone will lead the statistical modeling analyses, assist with project planning, participate in tagging trips, conduct outreach, and assist with the preparation of project deliverables. Dr. John Mandelman and Connor Capizzano (NEAq), and Micah Dean and Bill Hoffman (MADMF), will be donating their time to the project (not included as Match in the Budget), and they will provide assistance with tagging and sampling protocols, acoustic telemetry, data analysis, outreach, and manuscript preparation. Therefore, a very strong research team with the necessary expertise to ensure maximum likelihood of project success has been assembled.

Curriculum Vitae

Biographical Sketch – Olaf P. Jensen

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A. Professional Preparation:

Cornell University (Ithaca, NY)	Biol. & Soc.	B.A.	1994-1998
University of Maryland (College Park)	Marine Sci.	M.S.	2000-2004
University of Wisconsin (Madison)	Limnology	Ph.D.	2004-2007

B. Professional Appointments:

- 2010-present Assistant Professor, Department of Marine & Coastal Sciences, Rutgers University
- 2008-2010 David H. Smith Conservation Research Fellow, School of Aquatic & Fishery Sciences, University of Washington
- 2007-2008 Postdoctoral Research Associate and Lecturer, Center For Limnology, University of Wisconsin (Madison).
- 2003-2004 Knauss Marine Policy Fellow, National Oceanic and Atmospheric Administration

C. Products (selected publications related to the proposed project):

- Madenjian CP, Jensen OP, Rediske RR, O’Keefe JP, Vastano AR, Pothoven SA. 2016. Differences in energy expenditures and growth dilution explain higher PCB concentrations in male summer flounder. PLoS ONE 11(1): e0147223. doi:10.1371/journal.pone.0147223.
- Provost, M.M. and O.P. Jensen. 2015. The impacts of fishing on hermaphroditic species and treatment of sex change in stock assessments. Fisheries 40:536:545.
- Neubauer, P., O.P. Jensen, J.A. Hutchings, and J.K. Baum. 2013. Resilience and recovery of overexploited marine populations. Science. 340:347-349.
- Vert Pre, K.A., R.O. Amoroso, O.P. Jensen, R. Hilborn. 2013. The frequency and intensity of productivity regime shifts in marine fish stocks. Proceedings of the National Academy of Sciences. 110:1779-1784.
- Jensen, O.P., Branch, T.A., and R. Hilborn. 2012. Marine fisheries as ecological experiments. Theoretical Ecology. 5:3-22
- Ricard, D., Minto, C., Jensen, O.P., Baum, J.K. 2012. Examining the status of commercially exploited marine species with the RAM Legacy Stock Assessment Database. Fish & Fisheries. 13:380-398.
- Jensen, O.P., S. Hansson, T. Didrikas, J. D. Stockwell, T. R. Hrabik, T. Axenrot, J. F. Kitchell. 2011. Foraging, bioenergetic, and predation constraints on diel vertical migration: field observations and modeling of reverse migration by young-of-year herring *Clupea harengus*. Journal of Fish Biology. 78: 449-465.
- Worm, B., R. Hilborn, J.K. Baum, T. A. Branch, J. S. Collie, C. Costello, M. J. Fogarty, E. A. Fulton, J. A. Hutchings, S. Jennings, O. P. Jensen, H. K. Lotze, P. M. Mace, T. R. McClanahan, C. Minto, S. R. Palumbi, A. M. Parma, D. Ricard, A. A. Rosenberg, R.

Watson, D. Zeller. 2009. Rebuilding global fisheries. *Science* 325: 578-585

Jensen, O.P., B.J. Benson, J.J. Magnuson, V.M. Card, M.N. Futter, P.A. Soranno, K.M. Stewart. 2007. Spatial analysis of ice phenology trends across the Laurentian Great Lakes region during a recent warming period. *Limnology & Oceanography* 52:2013-2026.

D. Synergistic Activities:

- Co-Chief Science Editor for *Fisheries*
- Editorial Board for *Ecological Applications* (since 2012) and *Animal Conservation* (since 2012)
- Member; Scientific & Statistical Committee of the Mid-Atlantic Fishery Management Council

E. Collaborators and Other Affiliations:

K. Able (RU), V. Agostini (TNC), R. Ahrens (UF), T. Ahrenstorff (UM), B. Allen (UC), R. Amoroso (UW), R. Arlinghaus (Leibniz), M. Astier-Calderon (UNAM), T. Axenrot (Stockholm U.), B. Babcock (UMiami), V. Bakker (JMU), M. Balge (UM), B. Ganzorig (TCF), J. Baum (UVic), B. Benson (UW), T. Branch (UW), J. Brodie (UBC), V. Card (Metropolitan State U.), S. Chandra (UNR), J. Collie (URI), A. Contreras-Hernandez (Inst. Ecologia), J. Cope (NOAA), S. Crate (GMU), J. Deroba (NOAA), B. Dickson (NAU), T. Didrikas (Stockholm U.), M. Diebel (Wisc. DNR), M. Domeier (MCSI), T. Essington (UW), J. Fodrie (UNC), S. Gaichas (NOAA), F. Galvez (LSU), H. Gibbs (UW), D. Gilroy (Taos Public School), N. Granin (Limnological Inst.), S. Hansson (Stockholm U.), K. Heck (DISL), S. Heppell (OSU), R. Hilborn (UW), D. Hively (UW), G. Hodgkins (USGS), Z. Hogan (UNR), T. Hrabik (UM), J. Hutchings (Dalhousie U.), C. Kennedy (GMU), H. Kim (SUNY Stony Brook), J. Kitchell (UW), J. Korhonen (Finish Environment Inst.), P. Levin (NOAA), J. Link (NOAA), D. Livingstone (Swiss Federal Inst. of Aquat. Sci. & Tech.), P. Lopez-Duarte (RU), J. Magnuson (UW), S. Martell (IPHC), C. Martin (LSU), J. Maxted (UW), T. McClanahan (WCS), P. McIntyre (UW), M. Meili (Stockholm U.), M. Melnychuk (UW), B. Mendsaikhan (Mongolian Acad. Sci.), Y. Merlin-Uribe (UNAM), T. Miller (UM), C. Minto (Galway-Mayo Inst.), P. Neubauer (Dragonfly Sci.), J. Nye (SUNY Stony Brook), S. Ortega-Garcia (CICIMAR), S. Palumbi (Stanford U.), A. Parma (Centro Nacional Patagonico), M. Pinsky (RU), J. Pope (NRC Ltd.), M. Provost (RU), D. Ricard (Dalhousie U.), J. Rice (DFO), B. Roberts (LUMCON), M. Ruckelshaus (Stanford U.), A. Salomon (Simon Fraser U.), N. Sloan (Parks Canada), A. Smith (CSIRO), I. Stewart (NOAA), K. Stewart (SUNY Buffalo), J. Stockwell (UV), G. Turner (LSU), J. Vander Zanden (UW), K. Vert-pre (UW), C. Walters (UBC), B. Weidel (USGS), O. Weldon (RU), G. Weyhenmeyer (Uppsala U.), A. Whitehead (UC Davis), M. Wilberg (UM), Y. Ye (FAO), T. Young (RU), D. Yule (USGS), L. Zambrano (UNAM), R. Zaragoza (UNAM), E. Zipkin (MSU)

Graduate and Postdoctoral Advisors: T. Miller (UM), J. Kitchell (U. of Wisconsin), R. Hilborn (U. of Washington), T. Essington (U. of Washington)

Graduate Students and Postgraduate Scholars: Grad students advised – 3 current (all at RU: T. Young, C. Free, A. Vastano), 2 former (MS: M. Provost, RU; PhD: J. Vasslides, RU). Postdocs advised – 1 current (M. McCann, RU), 1 former: P. Neubauer, RU.

ELEANOR A. BOCHENEK

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Education

Ph.D. Marine Science (Fisheries and Marine Resource Management). 1989. Virginia Institute of Marine Science, School of Marine Science, The College of William and Mary, Gloucester Point, Virginia

M.S. Biology (Aquatic Ecology). 1981. East Stroudsburg University, East Stroudsburg, Pennsylvania

B.A. Biology. 1977. Vassar College, Poughkeepsie, New York

Selected Positions Held

Director, Cooperative Fisheries Center. Institute of Marine and Coastal Sciences, Rutgers University. June 2011-Present. Work directly with commercial and recreational fishing industries of New Jersey and the Mid-Atlantic region. Conduct applied research and assist the industries with fisheries management issues and problems. Current projects include incidental mortality of scallops that pass through the dredge; a study of the offshore whelk fishery and use of habCam to estimate relative abundance; and a hook and line survey to assess spatial population dynamics of black sea bass. Secretary and Science Advisor for the Partnership for Mid-Atlantic Fisheries Science and serve on the New Jersey Marine Fisheries Council.

Marine Scientist, Lecturer. Institute of Marine and Coastal Sciences, Haskin Shellfish Research Laboratory, Rutgers University. May 2000-June 2011. Conducted applied fisheries research and assisted the commercial and recreational fishing industries with fisheries management issues and problems. Key projects included the supplemental finfish survey using a commercial fishing vessel; socioeconomic and catch and effort study of fishing tournaments in New Jersey; evaluation of size and bag limits in the recreational summer flounder party boat fishery; and fine-scale spawning habitat delineation for winter flounder using telemetry. Managed the research set-aside program for the NFI-Scientific Monitoring Committee. Helped to establish the Partnership for Mid-Atlantic Fisheries Science (partnership of commercial and recreational fishers, academia, and government to solve fisheries science problems in Mid-Atlantic fish stocks).

Selected Refereed Journal Articles

Morson, J.M., E. A. Bochenek, E. N. Powell, E.C. Hasbrouck, J.E. Gius, C.F. Cotton, K. Gerbino, and T. Froehlich. 2015. Estimating the sex composition of the summer flounder catch using fishery-independent data. *Marine and Coastal Fisheries* 7(1):393-408.

Morson, J. M., E. A. Bochenek, E. N. Powell, and J. Gius. 2012. Sex-at-length of summer flounder (*Paralichthys dentatus*) landed in the party boat sector of the recreational fishery of New Jersey. *No Am J of Fish Manag* 32: 1201-1210.

Bochenek, E.A., E.N. Powell, and J. DePersenaire. 2012. Recall bias and angler preferences for new approaches to bag and size limits in recreational summer flounder party boat trips. *Fisheries Science* 78(1):1-14.

Powell, E.N., E.A. Bochenek, J. DePersenaire and S. King. 2011. Injury frequency for discarded summer flounder (*Paralichthys dentatus*) in the recreational fishery of the Mid-Atlantic Bight: Influence of landing size regulations. Pages 171-187 in Beard, T.D., Jr., R. Arlinghaus, and S.G. Sutton, editors. 2011. *The angler in the environment: social, economic, biological, and ethical dimensions*. Proc 5th World Rec Fish Conf. AFS Symposium 75, Bethesda, MD.

Bochenek, E.A., E.N. Powell, and J. DePersenaire. 2010. Evaluating catch, effort, and bag limits on summer flounder directed trips in the recreational summer flounder party boat fishery. *Marine and Coastal Fisheries* 2(1):412 - 423.

Powell, E.N., E.A. Bochenek, and J. DePersenaire. 2010. Evaluation of bag and size limit options in the management of summer flounder (*Paralichthys dentatus*). *Fisheries Research* 105(3):215-227.

King, S.E., E.N. Powell, and E.A. Bochenek. 2009. Effect of increase in codend mesh size on discarding in the *Loligo* squid-directed fishery: a commercial-scale test. *J. Northw. Atl. Fish. Sci.* 40:41-58.

Powell, E.N., A.J. Bonner, S.E. King and E.A. Bochenek. 2006. Survey augmentation using commercial vessels in the Mid-Atlantic Bight: sampling density and relative catchability. *J. Applied Ichthol.* 22 :471-488.

Bochenek, E.A., E.N. Powell, A.J. Bonner and S.E. Banta. 2005. Assessment of scup (*Stenotomous chrysops*) and black sea bass (*Centropristis striata*) discards in the directed otter trawl fisheries in the Mid-Atlantic Bight. *Fishery Bulletin* 103:1-14.

Powell, E.N., E.A. Bochenek, J.M. Klinck, and E.E. Hofmann. 2004. Influence of short-term variations in food on survival of *Crassostrea gigas* larvae: A modeling study. *J. Mar. Res.* 62:117-152.

Powell, E.N., A.J. Bonner, B. Muller and E.A. Bochenek. 2004. Assessment of the effectiveness of scup bycatch-reduction regulations in the *Loligo* squid fishery. *J. of Environmental Management* 71:155-167.

Powell, E.N., A.J. Bonner, B.M. Muller and E.A. Bochenek. 2003. Vessel Time Allocation In The U.S. *Illex illecebrosus*. Fishery. *Fisheries Research* 61:35-55.

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EDUCATION

- 2009 – 2016** Ph.D. in Marine Science and Technology, School for Marine Science and Technology (SMAST), University of Massachusetts, Dartmouth, MA
- 2005 – 2009** B.S. in Marine Science – Biological Oceanography, Rutgers College, Rutgers University, New Brunswick, NJ

PROFESSIONAL EXPERIENCE

- 2016 – Present** Postdoctoral Researcher, Department of Marine and Coastal Sciences, Rutgers University, New Brunswick, NJ. **Part-Time beginning March 2016**
- 2015 – Present** Research Associate, School for Marine Science and Technology, University of Massachusetts–Dartmouth. **Postdoctoral and part-time beginning March 2016**
- 2013 – 2015** Fisheries Research Technician, School for Marine Science and Technology, University of Massachusetts–Dartmouth
- 2009 – 2013** Graduate Research Assistant, School for Marine Science and Technology, University of Massachusetts–Dartmouth
- 2008** NSF – Research Experience for Undergraduates, Haskin Shellfish Research Laboratory, Institute of Marine and Coastal Sciences, Rutgers University, Advisor: Dr. David Bushek

PEER-REVIEWED PUBLICATIONS

- Capizzano, C.W., J.W. Mandelman, W.S. Hoffman, M.J. Dean, **D. Zemeckis**, H.P. Benoît, J. Kneebone, M.J. Stettner, N.J. Buchan, E. Jones, J.A. Langan, and J.A. Sulikowski. *In Press*. Estimating and mitigating the discard mortality of Atlantic cod (*Gadus morhua*) in the Gulf of Maine's recreational rod-and-reel fishery. ICES Journal of Marine Science.
- Benoît, H.P., C.W. Capizzano, R.J. Knotek, D.B. Rudders, J.A. Sulikowski, M.J. Dean, W.S. Hoffman, **D. Zemeckis**, and J.W. Mandelman. 2015. A generalized model for longitudinal short- and long-term mortality data for commercial fishery discards and recreational fishery catch-and-releases. ICES Journal of Marine Science, 72(6): 1834–1847.
- Zemeckis, D.**, M.J. Dean, and S.X. Cadrin. 2014. Spawning dynamics and associated management implications for Atlantic cod (*Gadus morhua*). North American Journal of Fisheries Management, 34:

- Zemeckis, D.**, D. Martins, L.A. Kerr, and S.X. Cadrin. 2014. Stock identification of Atlantic cod (*Gadus morhua*) in U.S. waters: an interdisciplinary approach. *ICES Journal of Marine Science*, 71(6): 1490–1506.
- Zemeckis, D.**, W.S. Hoffman, M.J. Dean, M.P. Armstrong, and S.X. Cadrin. 2014. Spawning site fidelity by Atlantic cod (*Gadus morhua*) in the Gulf of Maine: implications for population structure and rebuilding. *ICES Journal of Marine Science*, 71(6): 1356–1365.
- Dean, M.J., W.S. Hoffman, **D. Zemeckis**, and M.P. Armstrong. 2014. Fine-scale diel and gender-based patterns in behaviour of Atlantic cod (*Gadus morhua*) on a spawning ground in the western Gulf of Maine. *ICES Journal of Marine Science*, 71(6): 1474–1489. **Editor's Choice Article.**
- DeCelles, G.R. and **D. Zemeckis**. 2014. Acoustic and radio telemetry. In Cadrin, S.X., L.A. Kerr, and S. Mariani, Eds. *Stock Identification*, Second Edition, Elsevier, San Diego.
- Armstrong, M.P., M.J. Dean, W.S. Hoffman, **D. Zemeckis**, T. Nies, D.E. Pierce, P.J. Diodati, and D.J. McKiernan. 2013. The application of small scale fishery closures to protect Atlantic cod spawning aggregations in the inshore Gulf of Maine. *Fisheries Research*, 141: 62–69.
- Hernandez, K.M., D. Risch, D.M. Cholewiak, M.J. Dean, L.T. Hatch, W.S. Hoffman, A.N. Rice, **D. Zemeckis**, and S.M. Van Parijs. 2013. Acoustic monitoring of Atlantic cod (*Gadus morhua*) in Massachusetts Bay: implications for management and conservation. *ICES Journal of Marine Science*, 70(3): 628–635.

RELEVANT ORAL PRESENTATIONS

- Zemeckis, D.** Estimating and mitigating discard mortality in the Gulf of Maine recreational groundfish fishery. Fish Tank Workshop, hosted by the Gulf of Maine Research Institute, November 9–10, 2015, Plymouth, MA.
- Zemeckis, D.**, C. Capizzano, E. Jones, M. Dean, W. Hoffman, N. Buchan, S.X. Cadrin, and J. Mandelman. Utilizing collaborative science-industry partnerships to estimate the post-release mortality rate of haddock discarded in the Gulf of Maine recreational fishery. International Council for the Exploration of the Sea - Annual Science Conference, September 21–25, 2015, Copenhagen, Denmark.

RELEVANT ONGOING RESEARCH

- Evaluation of methods to reverse the acute effects of barotraumas and increase the post-release survival of cusk (*Brosme brosme*) discarded in the Gulf of Maine recreational fishery. 2014–2015 NOAA S-K Grant Program.
- Determining the post-release mortality rate and “best capture and handling” methods for haddock (*Melanogrammus aeglefinus*) discarded in Gulf of Maine recreational fisheries. New England Fishery Management Council via the Northeast Consortium, and the 2014–2015 NOAA S-K Grant Program.

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EDUCATION

University of New Hampshire - B.S. Marine and Freshwater Biology, May 2003; GPA – 3.95

University of New Hampshire - M.S. Zoology, December 2005; GPA – 4.00

Thesis Title: *Using bomb radiocarbon analyses to validate age and growth estimates for the tiger shark, Galeocerdo cuvier, in the western North Atlantic*

University of Massachusetts Dartmouth, School for Marine Science and Technology - PhD Marine Science and Management, January 2013; GPA – 3.98

Dissertation Title: *Spatial ecology and capture physiology of juvenile sand tiger sharks (Carcharias taurus) in the western North Atlantic*

PROFESSIONAL AND RESEARCH EXPERIENCE

New England Aquarium/University of Maine – Postdoctoral Researcher (September 2015–Present)

University of Massachusetts Dartmouth School for Marine Science and Technology – Assistant Research Technician (February 2015–August 2015)

Zeptomatrix Corporation, Franklin, Massachusetts - Research Technician (January 2008–Present)

A.I.S. Inc., New Bedford, MA - Fisheries Technician (February 2014–November 2014)

Massachusetts Division of Marine Fisheries (independent contractor) - Striped Bass Telemetry Data Analyst (January 2013–January 2014); Research Assistant (June 2012/2014–October 2012/2014)

University of New Hampshire, Durham, NH - Research Associate, Animal Science Department (January 2005–August 2008)

University of Massachusetts Amherst - Research Technician (June 2011–December 2011)

NOAA/NFMS Apex Predators Program, Narragansett, Rhode Island - Volunteer (2003–Present)

SELECTED PUBLICATIONS

Sulikowski, J.A., **J. Kneebone**, S. Elzey, J. Jurek, P. Danley, W.H. Howell and P.C. Tsang. 2005. Age and growth of the thorny skate, *Amblyraja radiata*, in the Gulf of Maine. Fisheries Bulletin 103:161–168.

Kneebone, J., D.E. Ferguson, J.A. Sulikowski, and P.C.W. Tsang. 2007. Endocrinological investigation into the reproductive cycles of two sympatric skate species, *Malacoraja senta* and *Amblyraja radiata*, in the western Gulf of Maine. Environmental Biology of Fishes 80:257–265.

Kneebone, J., L.J. Natanson, A.H. Andrews, and W.H. Howell. 2008. Using bomb radiocarbon analyses to validate age and growth estimates for the tiger shark, *Galeocerdo cuvier*, in the western North Atlantic. *Marine Biology* 154:423–434.

Bubley, W.J., **J. Kneebone**, J.A. Sulikowski, and P.C.W. Tsang. 2011. Reassessment of spiny dogfish *Squalus acanthias* age and growth using vertebrae and dorsal fin spines. *Journal of Fish Biology* 80:1300–1319.

Kneebone, J., J. Chisholm, and G.B. Skomal. 2012. Seasonal residency, habitat use, and site fidelity of juvenile sand tiger sharks (*Carcharias taurus*) in a Massachusetts estuary. *Marine Ecological Progress Series* 471:165–181.

Kneebone, J., J. Chisholm, D. Bernal, and G. Skomal. 2013. The physiological effects of capture stress, recovery, and the post-release survivorship of juvenile sand tigers (*Carcharias taurus*) caught on rod and reel. *Fisheries Research* 147:103–114.

Kneebone, J., J. Chisholm, and G. Skomal. 2014. Movement patterns of juvenile sand tigers (*Carcharias taurus*) along the east coast of the United States. *Marine Biology* 161:1149–1163.

Kneebone, J., W.S. Hoffman, M.J. Dean, and M.P. Armstrong. 2014. Movements of striped bass between the Exclusive Economic Zone and Massachusetts state waters. *North American Journal of Fisheries Management* 34:524–534.

Kneebone, J., W.S. Hoffman, M.J. Dean, D.A. Fox, and M.P. Armstrong. 2014. Movement patterns and stock composition of adult striped bass in Massachusetts coastal waters. *Transactions of the American Fisheries Society* 143:1115–1129.

Capizzano, C.W., Mandelman, J.W., Hoffman, W.S., Dean, M.J., Zemeckis, D.R., Benoit, H.P., **Kneebone, J.**, Jones, E., Stettner, M.J., Buchan, N.J., Langan, J.A., and Sulikowski, J.A. *In press*. Estimating and mitigating the discard mortality of Atlantic cod (*Gadus morhua*) in the Gulf of Maine recreational rod-and-reel fishery. *ICES Journal of Marine Science*.

SCIENTIFIC PRESENTATIONS AND OUTREACH

July 2005: 21st Annual American Elasmobranch Society Meeting, Tampa, FL (poster)
July 2006: 22nd Annual American Elasmobranch Society Meeting, New Orleans, LA (oral)
July 2008: 24th Annual American Elasmobranch Society Meeting, Montreal, Quebec, Canada (oral)
July 2009: 26th Annual American Elasmobranch Society Meeting, Providence, RI (oral)
July 2010: 27th Annual American Elasmobranch Society Meeting, Minneapolis, MN (oral)

March 2005: Seminar speaker at the Saco Bay Tackle Annual Fishing Seminar and Clambake, Saco, ME
January 2010 & 2011: Speaker at the Jones River Landing Environmental Heritage Center, Kingston, MA
August 2010: Co-coordinator of ‘Shark Day’, an educational seminar for the New England Aquarium Harbor Discoveries Camp at the Jones River Landing Environmental Heritage Center, Kingston, MA
November 2010: Seminar speaker at the Mystic Aquarium staff seminar series. Mystic, CT
March 2013: Keynote speaker at the Massachusetts Marine Educators 30th Annual High School Marine Science Symposium. University of Massachusetts Dartmouth, Dartmouth, MA
January 2014: Guest panelist at the Mass Audubon Society Film Night, Wellfleet, MA
March 2014: Seminar speaker at the University of Massachusetts Dartmouth School for Marine Science and Technology Department of Fisheries and Oceanography, Fairhaven, MA
May 2014: Lecturer, Shark Research Confessions: New England Aquarium, Boston, MA

CURRICULUM VITAE

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EDUCATION

B.A., Aquatic Biology; University of California Santa Barbara, 1988
M.S., Biology, California State University Northridge, 1994
Ph.M., Coastal Oceanography, Marine Sciences Research Center, State University of New York at Stony Brook, 1997
Ph.D., Coastal Oceanography, Marine Sciences Research Center, State University of New York at Stony Brook, 1999

WORK AND RESEARCH EXPERIENCE

2009-present Associate Research Professor, Rutgers University
2006-2012 Science Director, National Undersea Research Program, Middle Atlantic Bight Regional Center
2001-2009 Assistant Research Professor, Rutgers University
1999-2001 Post-doctoral Research Associate, Rutgers University
1996-1998 New York Sea Grant Scholar
1990-1994 Graduate Research Coordinator, Research Assistant: Bay Estuary Nearshore Ecological Study, California State University, Northridge
1993 Graduate Assistant: Advanced Ichthyology, Cal State Univ., Northridge
1992 Assistant Coordinator: State Resources Intertidal Baseline Study, Leo Carrillo State Beach. California State Resources Agency
1998-1993 Marine Scientist, crew: University of Southern California Marine Support Facility, Terminal Island, CA 90731
1989-1990 Aquaculture Technician: Gregorio Aquatech, Terminal Is. California
1989 Field Research Assistant: Catalina Island Marine Science Center, California

PUBLICATIONS – 10 MOST RELEVANT

Turnure, J. T., K. W. Able, and T. M. Grothues. 2015. Patterns of intra-estuarine movement in adult weakfish (*Cynoscion regalis*): evidence of site-affinity at seasonal and diel scales. Fishery Bulletin 113:167-179.
Able, K.W. T.M. Grothues, J. Turnure, M. Malone, G. Henkes. 2014. Dynamics of residency and egress in selected estuarine fishes: evidence from acoustic telemetry. Environmental Biology of Fishes 97(1): 91-102.
Eiler, J. H., T. M. Grothues, J. A. Dobarro, and M. M. Masuda. 2014. Comparing autonomous underwater vehicle (AUV) and vessel-based tracking performance for locating acoustically-tagged fish. Marine Fisheries Review 75(4):27-42

- Grothues, T. M.** and W. C. Davis. 2013. Sound Pressure Level Weighting of the Center of Activity Method to Approximate Sequential Fish Positions from Acoustic Telemetry. Canadian Journal of Fisheries and Aquatic Sciences. 70(9): 1359-1371(13)
- Biesinger, Z, B. M. Bolker, D. Marcinek, **T. M. Grothues**, J. A. Dobarro, W. J. Lindberg. 2013. Testing an autonomous acoustic telemetry positioning system. Limnology and Oceanography: Methods 448:46-56
- Able, K. W., **T. M. Grothues**, and I. M. Kemp. 2013. Fine-scale distribution of nektonic fishes relative to a large urban pier. Marine Ecology Progress Series. 476: 185-198
- Grothues, T. M.**, K. W. Able, J. Carter, T. Arienti. 2009. Migration patterns of striped bass (*Morone saxatilis*) through non-natal estuaries of the U.S. Atlantic Coast. Transactions of the American Fisheries Society .Symposium 69:135-153
- Grothues, T. M.**, K. W. Able, and J. A. Pravatiner. 2012. Winter flounder (*Pseudopleuronectes americanus* Walbaum) burial in estuaries: acoustic telemetry triumphs and tribulations. Journal of Experimental Marine Biology and Ecology 438:125-136
- Yergey, M. E., **T. M. Grothues**, K. W. Able, C. Crawford and K. DeCristofer. 2012 Evaluating discard mortality of summer flounder (*Paralichthys dentatus*) in the commercial trawl fishery: Developing acoustic telemetry techniques. Fisheries Research 115-116:72-81.
- Grothues, T. M.** 2009. A review of acoustic telemetry technology and a perspective on diversification in coastal tracking arrays. pg 77-90 *In*: Nielsen, J.L.; Arrizabalaga, H.; Fragoso, N.; Hobday, A.; Lutcavage, M.; Sibert, J. (Eds.) Tagging and Tracking of Marine Animals with Electronic Devices. 400 p. Reviews: Methods and Technologies in Fish Biology and Fisheries, Vol. 9

GRADUATE STUDENT COMMITTEES

Jessica Valenti (current. Ph.D. Adviser; Katherine Nickerson (current). M.S. Adviser; Paul Reiss Ph.D. (2015) Committee Member; Jenny Paterno M.S. (2015) Committee Member; Kaycee Coleman M.S. (2015). Adviser; Jamie Caridad (2013) Committee Member M.S. (withdrew); Mikaela Provost M.S. (2013), Committee Member; Matthew Yergey M. S. 2011. Committee Member; Jason Turnure M.S. 2010. Committee Member; Joan Pravantier, M.S. 2010. Committee Member; Matthew Kimball, Ph.D. 2008. Committee Member; James Vasslides, M.S. 2007. Committee Member; Clare L. H. Ng, M.S. 2006. Committee Member; Dana Rowles, M.S. 2005. Committee Member

SENIOR THESIS ADVISING

Zoe Mayo. 2014-2015. University of Liverpool, UK. Amie L. Williamson. 2014-2015. Marine Biological Association of Scotland, UK.

MS THESIS

An investigation into the genetic population structure and larval dispersal patterns of the kelp bass (*Paralabrax clathratus*). California State University, Northridge, CA

PH.D. DISSERTATION

Larval fish exchange between the South and Middle Atlantic Bights. Marine Sciences Research Center, State University of New York, Stony Brook, NY

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Education Ph.D. Biology (2006), Northeastern University, MA

Current professional appointments

- Vice President, Research & Conservation/Chief Scientist, Fisheries & Habitat Conservation, New England Aquarium
- Research Faculty, School for the Environment, Univ. of Massachusetts Boston
- Adjunct Professor, Univ. of Massachusetts Dartmouth/SMASST/Intercampus Marine Science Graduate Program
- Research Associate Faculty, Department of Marine Sciences, Univ. of New England

Selected publications with relevance to proposal

- Knotek, R.J., Gill, S.M., Rudders, D.B., Mandelman, J.W., Benoît, H.P., Sulikowski, J.A. The development of a low cost refrigerated flow-through seawater system for at-sea operation and estimation of post-release mortality. *Fisheries Research*. 170:152-157.
- Benoît, H.P., Capizzano, C.W., Knotek, R.J., Rudders, D.B., Sulikowski, J.A., Dean, M.J., Hoffman, W.S., Zemeckis, D.R., Mandelman, J.W. 2015. A generalized model for longitudinal short- and long-term mortality data for commercial fishery discards and recreational fishery catch-and-releases. *ICES Journal of Marine Science*, doi:10.1093/icesjms/fsv039.
- Barnes, C.J., Butcher, P.A., Macbeth, W.G., Mandelman, J.W., Smith, S.D.A., Peddemors, V.M. Movements and mortality of tagged and released *Carcharhinus plumbeus* (sandbar shark) and *C. obscurus* (dusky shark) following longline capture off eastern Australia. *Endangered Species Research*. Accepted.
- Danylchuk, A.J., Suski, C.D., Mandelman, J.W., Murchie, K., Haak, C., Brooks, A., Cooke, S.J. 2014. Hooking injury, physiological status, and short-term mortality of juvenile lemon sharks (*Negaprion brevirostris*) following catch-and-release recreational angling. *Conservation Physiology*. 2: doi: 10.1093/conphys/cot036
- Jordan, L.K., Mandelman, J.W., McComb, D.M., Fordham, S.V., Carlson, J.C., Werner, T.B. 2013. Linking sensory biology and fisheries bycatch reduction in elasmobranch fishes: A review with new directions for research. *Conservation Physiology*. 1: doi: 10.1093/conphys/cot002
- Mandelman, J.W., Cicia, A.M., Ingram Jr., G.W., Driggers III, W. B., Coutre, K.M., Sulikowski, J.A. 2013. Short-term post-release mortality of skates (family Rajidae) discarded in a western North Atlantic commercial otter trawl fishery. *Fish. Res.* 139:76–84.
- Mandelman, J.W., Morrison, R.A., Cavin, J.M., Farrington, M.A. 2012. The blood chemical status of Atlantic cod, *Gadus morhua*, following capture by jig and demersal longline with differential hook removal methods. *J. Fish Biol.* 81: 1406–1414.
- Cicia, A.M., Schlenker, L.S., Sulikowski, J.A., Mandelman, J.W. 2012. Seasonal variations in the physiological stress response to discrete bouts of aerial exposure in the little skate, *Leucoraja erinacea*. *Comp. Biochem. Physiol. A*. 162:130–138.

- Brooks, E.J., Mandelman, J.W., Sloman, K.A., Liss, S., Danylchuck, A.J., Cooke, S.J., Skomal, G.B., Philipp, D.P., Sims, D.W., Suski, C.D. 2012. The physiological response of the Caribbean reef shark (*Carcharhinus perezii*) to longline capture. *Comp. Biochem. Physiol. A*. 162:94–100.
- Storai, T., Zinzula, L., Repetto, S., Zuffa, M., Morgan, A., and Mandelman, J.W. 2011. Bycatch of Large Elasmobranchs in the Traditional Tuna Traps (Tonnare) of Sardinia from 1990 to 2009. *Fish. Res.* 109: 74–79.
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Recent funding with relevance to proposal

- 2015 Bycatch Reduction Engineering Program: NOAA/NMFS (\$223,924): Identifying bottom trawl bycatch hotspots and capture-and-handling practices to reduce the incidental mortality of an overfished Species of Concern – the thorny skate – in the Gulf of Maine (PI)
- 2015 Saltonstall-Kennedy (S & K) Program: NOAA/NMFS (\$397,836): Determining the post-release mortality rate and “best capture-and-handling” methods for Atlantic cod (*Gadus morhua*) discarded in Gulf of Maine lobster industry (co-PI)
- 2015 Saltonstall-Kennedy (S & K) Program: NOAA/NMFS (\$114,249): Estimating the discard mortality rate and deriving best catch-and-release guidelines for haddock (*Melanogrammus aeglefinus*) discarded in Gulf of Maine recreational fisheries (PI)
- 2015 Saltonstall-Kennedy (S & K) Program: NOAA/NMFS (\$224,639): Evaluation of methods to reverse the acute effects of barotraumas and increase the post-release survival of cusk (*Brosme brosme*) discarded in the Gulf of Maine recreational fishery (PI)
- 2015 Northeast Consortium: 2014 NEFMC Groundfish Research Program (\$147,425): Determining the post-release mortality rate and “best capture and handling methods for haddock (*Melanogrammus aeglefinus*) discarded in Gulf of Maine recreational fisheries (PI).
- 2014 Atlantic Sea Scallop Research Set Aside Program: NOAA/NMFS (\$1,657,181): Discard mortality of sea scallops following capture and handling in the sea scallop dredge fishery (co-PI; lead institution VIMS)
- 2013 Bycatch Reduction Engineering Program: NOAA/NMFS (\$248,659): Elucidating post-release mortality and 'best capture and handling' methods in sublegal Atlantic cod discarded in Gulf of Maine recreational hook-and-line fisheries (PI)
- 2012 Atlantic Sea Scallop Research Set Aside Program: NOAA/NMFS (\$1,092,643): Evaluating the Condition and Discard Mortality of Skates Following Capture and Handling in the Sea Scallop Dredge Fishery (co-PI; lead institution VIMS)
- 2008 Saltonstall-Kennedy (S & K) Program: NOAA/NMFS (\$222,618): The Immediate and Short-Term Post-Release Mortality of Species in the Northwest Atlantic Skate Complex Captured by Gillnet and Otter-Trawl (PI)

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Education:

Roger Williams University; Bristol, R.I 1993: Bachelors of Science, Environmental Biology.

Professional Experience:

- **Aquatic Biologist III, Massachusetts Division of Marine Fisheries (MADMF)**, 2010-current: Program Manager of the Fisheries Dependent Investigations Program. Project leader of the MA DMF acoustic telemetry tagging studies; which include an investigation of Atlantic cod spawning aggregations in Massachusetts spring cod conservation zone, striped bass movements and migration, Post-release mortality studies for Atlantic cod, haddock, and cusk. Continue to manage and develop MA DMF herring and mackerel portside sampling program and river herring bycatch avoidance program.
- **Aquatic Biologist II, (Ma DMF)**, 2003-2010: Project Manager. Managed and implemented a multi-year industry cooperative research trawl survey to study the spatiotemporal distribution of Gulf of Maine cod. Manage and implement the MA DMF's investigation of bycatch landed by the Atlantic sea herring and Atlantic mackerel fisheries.
- **Aquatic Biologist I, (MaDMF)**, 1999-2003: Fisheries Dependent Investigations, field coordinator and sea sampler
- **Fisheries Supervisor, (MA DMF)**, 1996-1999: Fisheries Dependent Investigations, sea sampler
- **Fisheries Observer, (Manomet Observatory)**, 1994-1996: National Marine Fisheries Service Certified Fisheries Observer

Select Technical Reports and Papers:

Hoffman, W.S., Correia, S.J., and Pierce D.E. (2007) Implementing the Industry-Based Survey for Gulf of Maine Cod Pilot Study. Final Report for Contract #: EA133F-03-CN-0109. Submitted to the National Marine Fisheries Service. August.

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Armstrong, M.P., Dean, M.J., **Hoffman, W.S.**, Zemeckis, D.R., Niles, T.A., Pierce, D.J., Diodati, P.J., McKiernan, D.J. (2012) The application of small scale fishery closures to protect Atlantic cod spawning aggregations in the inshore Gulf of Maine. *Fisheries Science*.141:62-69

Kneebone, J., **Hoffman, W.S.**, Dean, M., Armstrong M. (2014). Movements of striped bass between the exclusive economic zone and Massachusetts state waters. *North American Journal of Fisheries Management*.

Kneebone, J., **Hoffman, W.S.**, Dean, M., Fox, D., Armstrong M. (2014). Movement patterns and stock composition of adult striped bass tagged in Massachusetts coastal waters. *Transactions of the American Fisheries Society*.

MICAH J. DEAN

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PROFESSIONAL EXPERIENCE

Massachusetts Division of Marine Fisheries – Gloucester, MA (2010 – present)

Fish Biology Project – Research Analyst III

- ASMFC Atlantic Menhaden Technical Committee member (*chair: 2013 – 2015*)
- ASMFC Atlantic Herring Technical Committee member
- ASMFC Biological and Ecological Reference Points Committee member
- NEFMC Atlantic Herring Plan Development Team member
- NEFMC Northeast Multispecies Groundfish Plan Development Team member (2014-2015)
- Taught workshop on spatial analysis using R statistical software

Massachusetts Division of Marine Fisheries – Gloucester, MA (2002 – 2010)

Fisheries Statistics Project – Data Analyst III

- Chief contact for MA commercial fisheries data
- Lead fisheries data and GIS analyst for the Massachusetts Ocean Plan
- Developed multiple relational databases to house data generated by research projects
- Provided analytical support for fisheries management plans
- ACCSP Commercial Technical Committee member
- Taught workshop on the use of R statistical software

US Fish & Wildlife Service – Essex Junction, VT (1998 - 2000)

Lake Champlain Sea Lamprey Assessment Team – Fisheries Technician

EDUCATION

Northeastern University, Boston, MA – PhD in Ecology, Evolution and Marine Biology (*current student*)

Cornell University, Ithaca, NY – M.S. in Fishery Science (2002)

Thesis: “*Spatial and temporal distribution of juvenile chinook salmon in nearshore Lake Ontario*”

University of Vermont, Burlington, VT – B.S. in Environmental Science (1999)

Graduated first in major, *Magna Cum Laude*

PAPERS AND PRESENTATIONS

Papers (Peer-Reviewed)

Churchill, J.H., Kritzer, J.P., **Dean, M.J.**, Grabowski, J.H., and Sherwood, G.D., 2016. Evaluating the effectiveness of a proposed closed area for cod through larval dispersal modeling. *ICES Journal of Marine Science*. *In Review*.

O’Boyle, R., **Dean, M.J.**, and Legault, C.M., 2016. The Influence of Seasonal Migrations on Fishery Selectivity. *ICES Journal of Marine Science*. *In Press*.

Capizzano, C.W., Mandelman, J.W., Hoffman, W.S., **Dean, M.J.**, Zemeckis, D.R., Benoit, H.P., Kneebobe, J., Jones, E., Stettner, M., Buchan, N., Langan, J., and Silukowski, J.A., 2016. Estimating and mitigating the discard mortality of Atlantic cod (*Gadus morhua*) in the Gulf of Maine recreational rod-and-reel fishery. *ICES Journal of Marine Science*. *In Press*.

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Armstrong, M.P., **Dean, M.J.**, Hoffman, W.S., Zemeckis, D.R., Nies, T.A., Pierce, D.E., Diodati, P.J. and McKiernan, D.J., 2013. The application of small scale fishery closures to protect Atlantic cod spawning aggregations in the inshore Gulf of Maine. *Fisheries Research*, 141: 62-69.

Dean, M.J., Hoffman, W.S. and Armstrong, M.P., 2012. Disruption of an Atlantic cod spawning aggregation resulting from the opening of a directed gill-net fishery. *North American Journal of Fisheries Management*, 32: 124-134.

Presentations

Dean, M. J. "Understanding the reproductive ecology of Atlantic cod through acoustic technology". WHOI/NEFSC seminar Series. April, 2014. Woods Hole, MA.

Dean, M. J., W. S. Hoffman, D. R. Zemeckis, M. P. Armstrong, and S. X. Cadrin. "Cod Spawning Behavior and Observed Sex Ratios: A Liability and an Asset" 144th Annual Meeting of the American Fisheries Society. August, 2014. Quebec, QC, Canada

Dean, M. J., J. Kneebone, W. S. Hoffman, D. A. Fox, and M. P. Armstrong. "Movement Patterns and Stock Composition of Adult Striped Bass Tagged in Massachusetts Coastal Waters" 144th Annual Meeting of the American Fisheries Society. August, 2014. Quebec, QC, Canada

Dean, M. J., W. S. Hoffman, D. R. Zemeckis, and M. P. Armstrong. "Fine-scale movements of Atlantic cod on a spawning ground." ICES Symposium – Gadoid Fisheries: the ecology and management of rebuilding. October 15, 2013. St. Andrews, NB, Canada

Dean, M. J., W. S. Hoffman, D. R. Zemeckis, and M. P. Armstrong. "Fine-scale movements of Atlantic cod while spawning." 142nd Annual Meeting of the American Fisheries Society. August 21, 2012. St. Paul, MN

Dean, M. J., W. S. Hoffman, and M. P. Armstrong. "Disruption of an Atlantic cod spawning aggregation resulting from the opening of a directed gillnet fishery." 66th Annual Northeast Fish and Wildlife Conference. Newton, MA. April 27, 2010.

Dean, M. J. "A GIS-based approach to representing fisheries in the Massachusetts Ocean Plan." New England Estuarine Research Society Spring Meeting. April 2, 2004.

Dean, M. J. "Spatial and temporal distribution of chinook salmon in nearshore Lake Ontario." 132nd Annual Meeting of the American Fisheries Society. August, 2002. Baltimore, MD

Dean, M. J. "Spatial and temporal distribution of chinook salmon in nearshore Lake Ontario." Annual meeting, Northeast Division of the American Fisheries Society. April, 2002. Portland, ME. ***selected as best student paper**

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Education

University of Massachusetts Boston – Ph.D. Marine Science & Technology 2015-Present
University of New England, Biddeford, ME – M.S. Marine Science 2012-2015
Thesis: “*Estimating and mitigating the discard mortality of Atlantic cod captured in the Gulf of Maine recreational rod-and-reel fishery*”
University of Rhode Island, Kingston, RI – B.S. Marine Biology 2007-2011

Research Interests

Discard mortality; Applications of electronic tagging technology; Angling perspectives and conservation ethics; Fisheries management.

Professional Experience

Graduate Research Assistant, School for the Environment, University of Massachusetts Boston; 2012-Present
John H. Prescott Marine Laboratory, New England Aquarium
NSF Integrative Graduate Education and Research Traineeship (IGERT), School for the 2015-Present
Environment, University of Massachusetts Boston
Graduate Research Assistant, Department of Marine Science, University of New England; John 2012-2015
H. Prescott Marine Laboratory, New England Aquarium

Selected Presentations

Zemeckis DR, **Capizzano CW**, Jones E, Dean MJ, Hoffman WS, Ribblett N, Buchan NC, Cadrin SX, Mandelman JW. 2015. Utilizing collaborative science-industry partnerships to estimate the discard mortality rate of haddock in the Gulf of Maine recreational fishery. ICES CM 2015/L:12.
Capizzano CW, Mandelman JW, Hoffman WS, Dean MJ, Zemeckis DR, Benoit HP, Kneebone J, Stettner MJ, Buchan NC, Jones E, Langan JA, Sulikowski JA. 2015. Estimating and mitigating post-release mortality of Atlantic cod in the Gulf of Maine’s recreational rod-and-reel fishery. 71st Annual Northeast Fish and Wildlife Conference. Newport, RI USA.
Capizzano CW. 2014. Tagging and biotelemetry methods for estimating post-release mortality of Gulf of Maine Atlantic cod. ICES Workshop on Methods for Estimating Discard Survival II. Copenhagen, Denmark.

Published and Non-published Works

Capizzano CW, Mandelman JW, Hoffman WS, Dean MJ, Zemeckis DR, Benoit HP, Kneebone JR, Stettner MJ, Sulikowski JA. 2016. Estimating post-release mortality of Atlantic cod in the Gulf of Maine’s recreational rod-and-reel fishery using acoustic telemetry. ICES Journal of Marine Science. *In press*.
Benoit HP, **Capizzano CW**, Knotek RJ, Rudders DB, Sulikowski JA, Dean MJ, Hoffman W, Zemeckis DR, Mandelman JW. 2015. A generalized model for longitudinal short- and long-term mortality data for commercial fishery discards and recreational fishery catch-and-releases. ICES Journal of Marine Science, doi: 10.1093/icesjms/fsv039.
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Current Projects

Discard mortality of haddock and cusk using passive acoustic telemetry; Review of direct and indirect estimation methods for discard mortality.

Appendices

Appendix 1 - References

- Benoit, H.P., Capizzano, C.W., Knotek, R.J., Rudders, D.B., Sulikowski, J.A., Dean, M.J., Hoffman, W., Zemeckis, D.R., and Mandelman, J.W. 2015. A generalized model for longitudinal short- and long-term mortality data for commercial fishery discards and recreational catch-and-releases. *ICES Journal of Marine Science*, 72(6): 1834-1847.
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Ferter, K., Hartmann, K., Kleiven, A.R., Moland, E., and Olsen, E.M. 2015. Catch-and-release of Atlantic cod (*Gadus morhua*): post-release behaviour of acoustically pretagged fish in a natural marine environment. *Canadian Journal of Fisheries and Aquatic Sciences*, 72: 252-261.

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Weltersbach, M. S., and Strehlow, H. V. 2013. Dead or alive--estimating post-release mortality of Atlantic cod in the recreational fishery. *ICES Journal of Marine Science*, 70: 864–872.

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Zemeckis, D., Capizzano, C., Jones, E., Dean, M., Hoffman, W., Ribblett, N., Buchan, N., Cadrin, S.X., and Mandelman, J. 2015. Utilizing collaborative science-industry partnerships to estimate the discard mortality rate of haddock in the Gulf of Maine recreational fishery. *ICES CM* 2015/L:12.

Appendix 2: Tables and Figures

Tables

Table 1: The three-level ordinal scoring index that will be used to assess the degree of physical trauma in captured black sea bass.

Condition	Score	Description
Excellent/Good	1	No or minor barotrauma (e.g., swim bladder expansion only); no to minimal physical injury (i.e., limited to hook entry/exit); no bleeding
Fair	2	Moderate barotrauma (e.g., exophthalmia, swim bladder expansion); physical trauma ≥ 1 cm; mouth-hooked and minor localized bleeding; foul-hooked on body (i.e., not hitting the organs)
Poor	3	Severe barotrauma (e.g., exophthalmia, stomach eversion); severe physical trauma (e.g., bleeding from wound or gills); foul-hooked on head, gills, or ventral surface with bleeding or internal organs protruding.

Figures

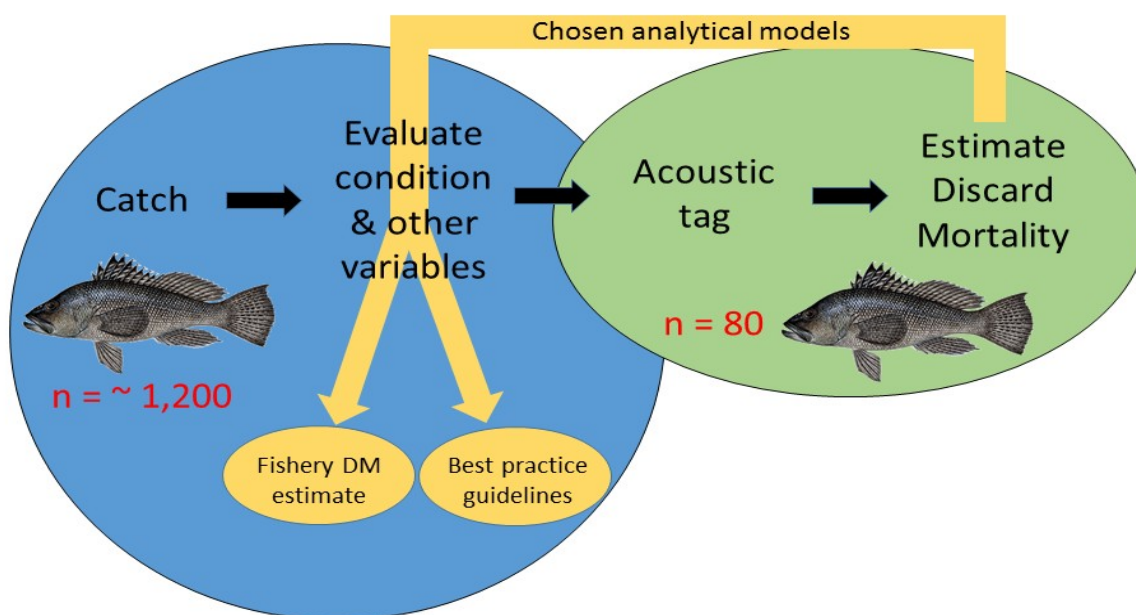


Figure 1: Schematic illustrating the study’s three-step approach (as described in the text): 1. large scale capture and evaluation of black sea bass (blue); 2. use of acoustic telemetry to assess discard mortality in black sea bass subsample (green); 3. application of chosen analytical models established by (2) to the observed black sea bass in (1) to obtain a discard mortality estimate and identify “best practice” guidelines (yellow).

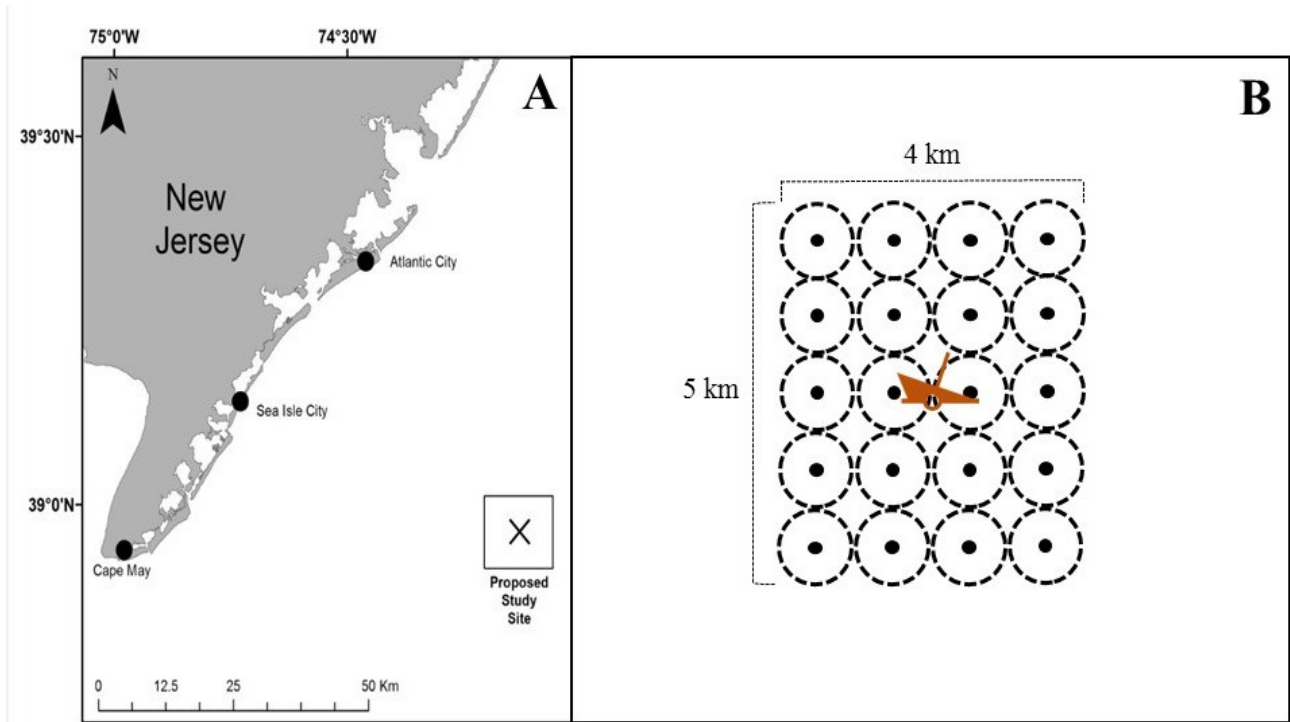


Figure 2: Proposed study site located roughly 55 km southeast of Sea Isle City, New Jersey (A). The acoustic receiver array will consist of 20 acoustic receivers centered around the shipwreck (B) and provide an approximately 20 km² detection area based on the anticipated 500 m detection radius of each acoustic receiver.



Figure 3: A Vemco V9P-1H acoustic transmitter externally affixed with an endcap (provided by Vemco) attached to an Atlantic cod using a Floy FT-4 spaghetti tag.

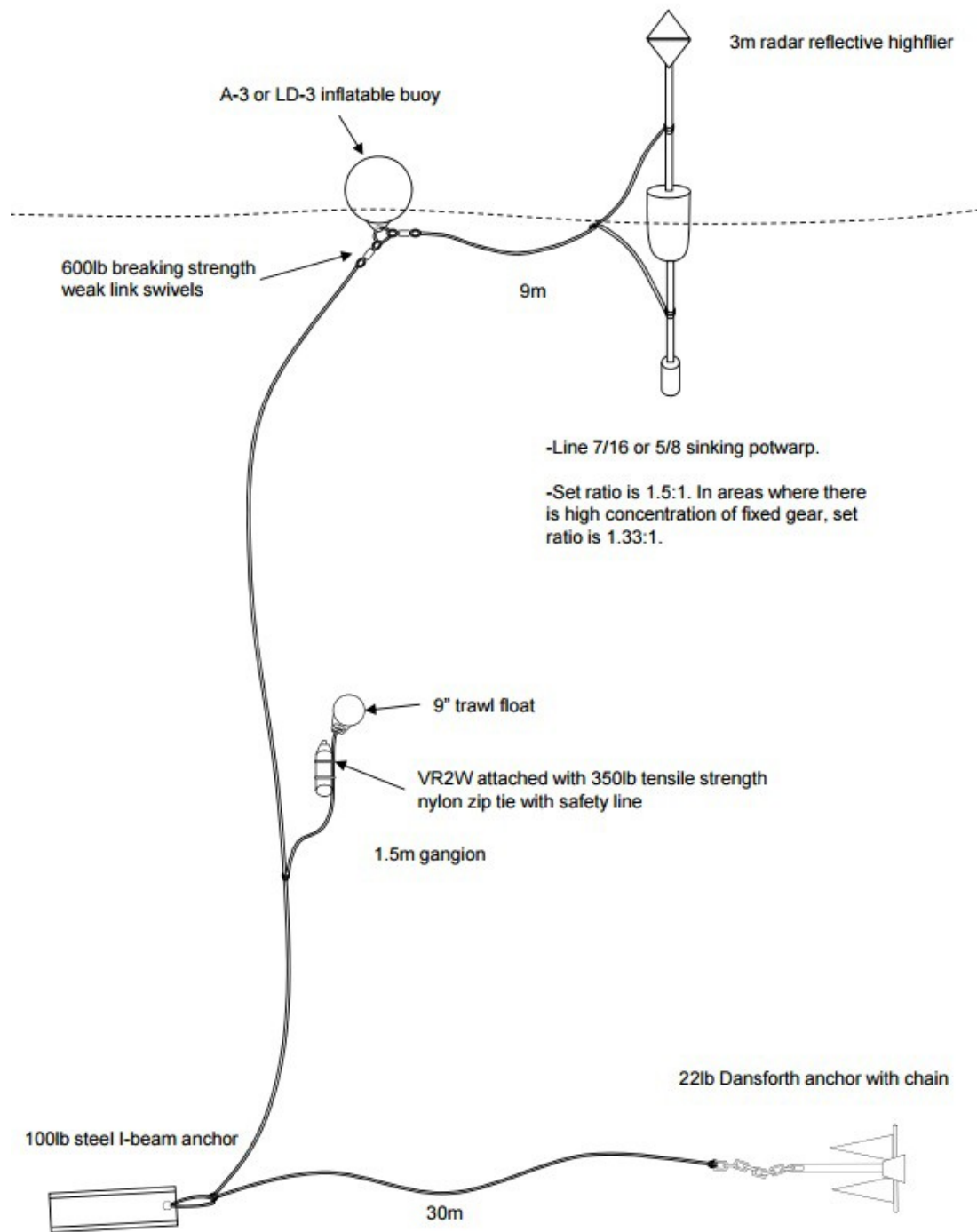


Figure 4: Schematic of the proposed acoustic receiver mooring system, based on previous studies and field-use by the Massachusetts Division of Marine Fisheries.

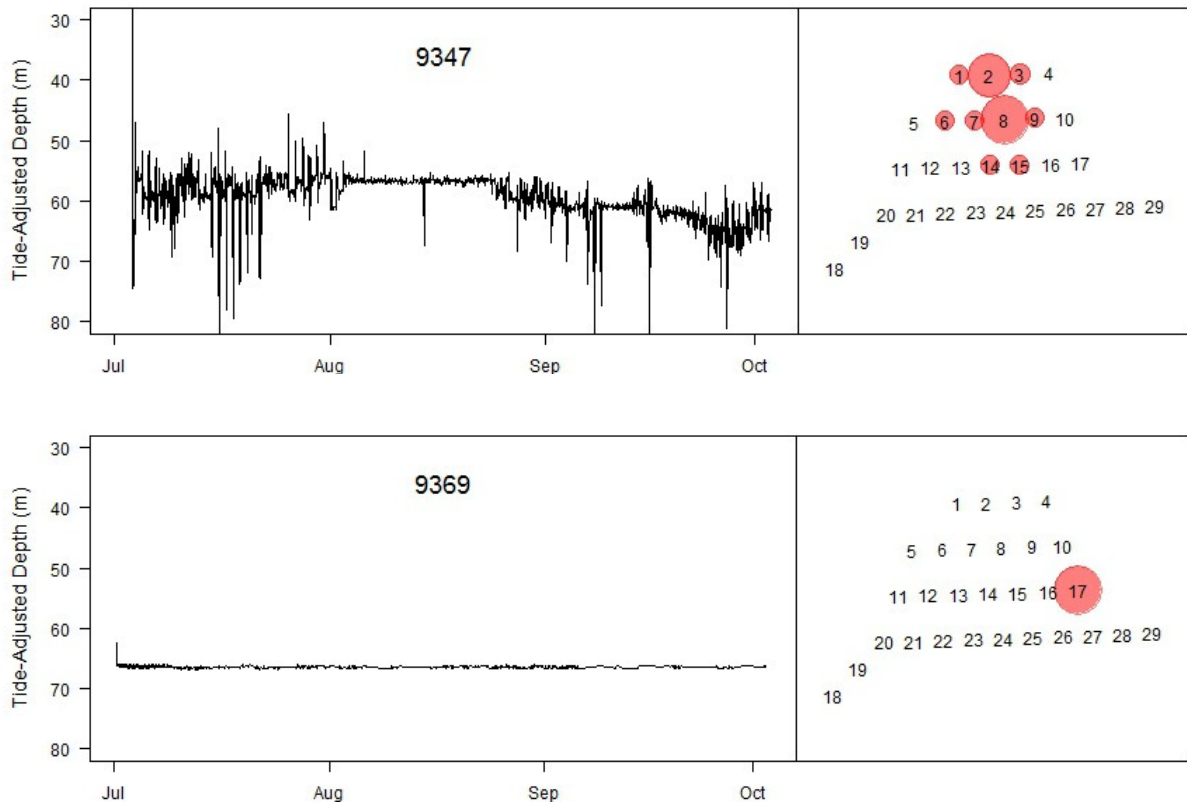


Figure 5: Sample acoustic receiver data from a previous study (Capizzano et al., *in press*) for a living (top) and a dead (bottom) Atlantic cod. These data demonstrate that mortality is easily distinguishable based on depth detections (left side) and supported by movement around the receiver array (right side). In the detections by receiver figure, each number represents an individual receiver; the red, semi-transparent circle indicates the proportion of detections at receivers that have detected the acoustic transmitter.

Appendix 3 - Budget Justification

Partnership for Mid-Atlantic Fisheries Science (PMAFS)

PMAFS will oversee the project and submit the proposal for funding and subcontract with Rutgers University and consultant Dr. Kneebone (New England Aquarium) to conduct the research.

PMAFS Budget

Project Supplies (\$74,020)

Vemco acoustic transmitters with pressure sensors, n=80 @\$699/tag; Floy t-bar anchor tags and spaghetti tags for transmitters \$1300; Vemco acoustic receivers 5@\$1500 ea; rigging supplies for acoustic receivers 11 @\$500 each (anchors, rope, buoys, swivels, etc); tag return reward 2@\$500 each; research supplies (\$2,000), including tagging guns, fishing supplies such as terminal tackle, fishing line, hooks, and etc and other misc research supplies; shipping cost for tags (insured) \$200; acoustic receiver batteries 15 @\$40 each.

Travel (\$2,600)

Train round trip from New Brunswick, NJ to Gloucester, MA and return to pick up receivers and return receivers after the project (2 trips @\$125/trip). Rent U-Haul truck one-way from Gloucester, MA to Tuckerton, NJ to bring receivers to south Jersey to deploy (\$500). One-way U-Haul truck rental from Tuckerton, NJ to Gloucester, MA to return receivers at end of project (\$500). Six round trips for Dr. Zemeckis from New Brunswick to Rutgers Marine Field Station, Tuckerton, NJ for trips on R/V Arabella and holding tank study 167 mi @6 trips @\$0.54/mi plus tolls and 6 round trips from New Brunswick to Sea Isle City for tagging trips (246 miles/trip) for 6 trips @\$0.54/mi. plus tolls.

Rentals \$16,500

Party boat rental 6 trips @\$2,750/trip

PMAFS Administrative Costs \$14,634

Administration of the grant is 10% of direct costs excluding boat rental costs. Bookkeeping/Accounting costs salary-\$1500.

Match

In-Kind donation of labor (\$13,289) will come from 12 volunteer recreational anglers from the RFA, JCAA and other organizations who will donate time (576 hours) to participate in fieldwork @\$23.07/hr (as per the 2014 federal government rate on volunteer labor) for 8 hr/trip for 6 total trips

Equipment: (\$26,000) The Massachusetts Division of Marine Fisheries will be loaning the project receivers and miscellaneous equipment needed to deploy 13 of their receivers which are worth \$26,000. Without the free loan of this equipment, we would not have been able to submit this proposal because of the high cost to purchase this equipment

Rutgers, The State University of New Jersey

Personnel - \$29,885: PI-Jensen will oversee the project and is not requesting any funds. Salary is requested for Co-PI Bochenek (\$8,106–1.0 mo.) to coordinate the industry vessel and with the Partnership for Mid-Atlantic Fisheries Science, participate in the fieldwork component, data analysis, report/publication preparation and outreach; and for Senior Associate Zemeckis (\$18,336–4.0 mo.) to lead the field work component, including the holding tank study, tagging trips, and the rigging and maintenance of acoustic receivers as well as contribute to data analysis, outreach efforts, and assist with presentations, reports, and manuscripts. Salary (calendar year) is requested for researcher Grothues at 2 weeks in Year 1 (\$3,443 0.5 mo) is 100% grant-funded research faculty and salary is for task execution, travel time, analysis, writing/revision, and outreach necessary for the project, plus all other service requirements of the faculty appointment such as graduate mentoring and providing peer review.

Fringe Benefits - \$6,073: According to the current negotiated Federal Rate Agreement dated April 24, 2015, Rutgers fringe rate is (40.43%) for salary of regular employees (\$4,669) and for Class IV is 7.65% (\$1,403).

Rental - \$10,116: Rent wet laboratory at Tuckerton Field Station to study tag retention of black sea bass for one month @\$500/mo. Rent for Rutgers research vessel to set arrays, check arrays and upload data and remove arrays at termination of project for 4 trips @\$2,404/day.

Total Direct Charges – \$46,074

Indirect Charges - \$6,911: According to the current negotiated Federal Rate Agreement dated April 24, 2015, the MTDC for on-campus research rate is 55%. As per mail dated January 28, 2016 from Raymond D. Bogan, Chairman, the Partnership for Mid-Atlantic Fisheries Science has established an indirect cost rate ceiling set for all projects at 15%. As per the Atlantic States Marine Fisheries Commission, MAFMC 2016-2017 Collaborative Fisheries Research Program “There is a 25% cap on the percentage of funds that can be allocated to cover indirect costs...”

Matching Funds - \$12,866: According to the current negotiated Federal Rate Agreement dated April 24, 2015, the MTDC for on-campus research rate is 55%. Modified total direct costs (MTDC) excludes the rental/maintenance of off-site activities. Unrecovered MTDC indirect costs (F&A) of 40% will be applied as match for the cap on TDC indirect charges (15%) set by the Partnership for Mid-Atlantic Fisheries Science

Funds Requested \$52,985; Matching Funds \$12,866 Total Project Costs \$65,851

Subcontract: Dr. Jeff Kneebone (Scientific Consultant) who will lead the statistical modeling analyses, assist with project planning, participate in tagging trips, conduct outreach, and assist with the preparation of project deliverables (presentations, reports, manuscripts) Salary for 2 mo @44250/mo, travel (\$540) for two round trips @250 mi/trip at federal per diem rate plus tolls from Boston to New Brunswick to participate in fieldwork, and work on data analysis and final report. 15% ICR (\$1987) of total costs based on accepted PMAFS ICR rate.



PMAFS: Partnership for Mid-Atlantic Fisheries Science

Science for sustainable fish stocks and a sustainable fishing industry

Members of the Board

Raymond D. Bogan
Jeffrey Reichle
Jim Hutchinson
Thomas Fote
David Arbeitman
Bonnie Brady

February 10, 2016

Dear Sir:

The Partnership for Mid-Atlantic Fisheries Science (PMAFS) is a non-profit research and educational partnership of academic and fishing industry representatives from both the commercial and recreational sectors. The Partnership seeks to utilize academic and recreational and commercial fisheries resources to address the most urgent scientific problems limiting successful management of fisheries in the Mid-Atlantic region.

The Partnership is pleased to submit the proposal entitled "Estimating and mitigating the discard mortality rate of black sea bass in offshore recreational rod-and-reel fisheries" to the Mid-Atlantic Fisheries Management Council 2016-2017 Collaborative Fisheries Research Program. This proposal will provide essential data that will improve discard mortality estimates for the recreational black sea bass fishery and provide critical outreach to recreational anglers to reduce discard mortality.

We look forward to collaborating with the scientists involved in this project. If you have any additional questions, please contact me.

Sincerely,

Raymond D. Bogan
Chairman

PMAFS
1636 Delaware Ave
Cape May, NJ 08204



February 6, 2016

Dr. Eleanor Bochenek
Director, Fisheries Cooperative Center Rutgers University
1636 Delaware Ave.
Cape May, NJ 08204

RE: Support for *Estimating and Mitigating the Discard Mortality Rate of Black Sea Bass in Offshore Recreational Rod-and-Reel Fisheries*

Dear Dr. Bochenek:

This letter acknowledges that the Recreational Fishing Alliance (RFA) is in full support of the proposal titled *Estimating and Mitigating the Discard Mortality Rate of Black Sea Bass in Offshore Recreational Rod-and-Reel Fisheries*. RFA believes this project, if funded, would gather much needed information in regards to discard mortality which would ultimately improve both the assessment and management of the recreational Black Sea Bass fishery.

The RFA has worked with you and the Partnership for Mid-Atlantic Fishery Science on past research efforts and we have been extremely impressed with your expertise, project management and quality control. RFA has absolute confidence in your ability to conduct a thorough investigation of recreational discard mortality in the recreational Black Sea bass fishery and produce meaningful results. RFA will offer its full assistance to investigators of this project. At a minimum, RFA will provide and help coordinate volunteer anglers for the field component.

In closing, the RFA fully supports the above titled proposal and believes it deserves to be awarded funding.

Best regards,

A handwritten signature in black ink, which appears to read "Jim Donofrio".

Jim Donofrio
Executive Director



R.I. Party and Charter Boat Association
140 Jerry Lane
North Kingstown, RI 02852
401-741-5648
www.nfrshrng.com



President
Vice President
Treasurer
Secretary
Director

Capt. Rick Bellavance
Capt. Steven Anderson
Capt. Andrew D'Angelo
Capt. Paul Johnson
Capt. Nick Butziger

Eleanor Bochenek
Director, Fisheries Cooperative Center
Rutgers University
1636 Delaware Ave.
Cape May, NJ 08204

RE: Mid-Atlantic Fisheries Management Council 2016-2017 Collaborative Fisheries Research Program

Dear Ms. Bochenek.

February 3, 2016

On behalf of the entire membership of the Rhode Island Party and Charter Boat Association, I would like to offer our full support and recommendation to submit a project titled "Estimating and mitigating the discard mortality rate of black sea bass in offshore recreational rod-and-reel fisheries" for funding under the Mid-Atlantic Fisheries Management Council 2016-2017 Collaborative Fisheries Research Program.

This project would collect important discard information pertaining to Black Sea Bass. Accurate discard mortality rates are vital in accounting for recreational removals, which is necessary for proper management. Black Sea Bass is an important species to the success of the for hire fleet in Rhode Island and we support the approach and methodology described to us. This project also includes broad outreach to inform the recreational community relative to the impacts of releasing black sea bass and may lead to overall reduced mortality through best practices. Please feel free to reach out to our organization if you need further assistance.

Respectfully Submitted,


Capt. Rick Bellavance, President
RI Party and Charter Boat Association
401-741-5648

Dear Dr. Bochenek,

February 8, 2016

The Jersey Coast Anglers Association (JCAA) fully supports your proposal entitled "Estimating and mitigating the discard mortality rate of black sea bass in the offshore recreational rod-and reel fishery" being submitted to the Mid-Atlantic Fisheries Management Council 2016-2017 Collaborative Fisheries Research Program.

Our organization recognizes that black sea bass are considered a data poor species. Yet, this species supports an important recreational and commercial fishery in New Jersey and the region. This project will collect critical information on discard mortality in the offshore recreational black sea bass fishery which should lead to better management.

Another important area being addressed by this proposal is the outreach to black sea bass anglers on the best techniques to utilize to reduce mortality. This component of the project will have a direct positive impact on the black sea bass stock by lowering discard mortality.

Your proposal should improve black sea bass recreational discard estimates and provide outreach to the recreational fishing industry to reduce discard mortality. I, and the JCAA and the other organizations I represent, applaud you for this effort that is sorely needed. We will provide volunteer anglers to assist the researchers on the party boat trips.

John Toth

President, Jersey Coast Anglers Association (JCAA)

Trustee, New Jersey Outdoor Alliance (NJOA)

President, Saltwater Anglers of Bergen County (SWABC)

24 Kings Mill Road, Monroe Township, NJ 08831

(732) 656 - 0139

tothjohn@verizon.net



David E. Pierce
Director

Commonwealth of Massachusetts

Division of Marine Fisheries

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Charles D. Baker
Governor

Karyn E. Polito
Lieutenant Governor

Matthew A. Beaton
Secretary

George N. Peterson, Jr.
Commissioner

Mary-Lee King
Deputy Commissioner

February 10, 2016

Dr. Olaf P. Jensen
Department of Marine and Coastal Sciences
Rutgers University
71 Dudley Rd.
New Brunswick, NJ 08901

RE: Mid-Atlantic Fishery Management Council's 2016-2017 Collaborative Fisheries Research Program

Proposal: Estimating and mitigating the discard mortality rate of black sea bass in offshore recreational rod-and-reel fisheries

Dear Dr. Jensen,

The Massachusetts Division of Marine Fisheries has recently taken interest in studies involving post-release mortality (PRM) and methods or practices to mitigate it. Working with partners at the New England Aquarium and University of Massachusetts School of Marine Science and Technology we have successfully secured grant funds to generate PRM rates for Atlantic cod, haddock, and starting this spring, cusk. To conduct this research we have acquired a large collection of Vemco acoustic receivers and associated equipment to build an expansive acoustic telemetry system that is ideal for studying prm.

If funded, we look forward to collaborating with partners listed in the proposal in a study to establish PRM rates for black sea bass caught offshore and will support the proposed study by loaning Rutgers University with 13 receivers and necessary tackle to moor them. The estimated value for this equipment is \$1500 per receiver, \$500 per mooring system for a total of \$26,000.

We feel that by teaming up with Rutgers University and the New England Aquarium we will be able to increase our knowledge of black sea bass and ultimately move closer to an improved stock assessment and management of the stock.

Respectively Yours,

William Hoffman
Senior Marine Biologist
Massachusetts Division of Marine Fisheries
Fisheries Dependent Investigations and Advanced Research

Proposal Addendum

Project Title: Estimating and mitigating the discard mortality rate of black sea bass in offshore recreational rod-and-reel fisheries

In response to the Committee's recommendation to extend the proposed work plan to include tagging and telemetry work for another two months into February and March, we are submitting an addendum to the submitted proposal with a scope of work and budget for the extension. An additional two months of field work will necessitate two more trips to maintain and download data from the acoustic receivers (\$2,404/day = \$4,808). Two additional tagging trips would be conducted (\$2,750/day = \$5,500), resulting in a total of eight tagging trips from November 2016 into early March 2017 in accordance with the availability of fish at the proposed study site. The acoustic receivers would be hauled-out by early April 2017. An additional 20 Vemco acoustic transmitters (\$699/tag = \$13,980) would be needed in order to release tags throughout the winter season on the additional trips so that we can account for the full range of seasonal air and water temperatures. Given the extended scope of work, funds will also be required for travel on sampling trips (\$610), conventional t-bar and spaghetti tags (\$412), and research supplies (\$349). In accordance with the expanded scope of work, an additional 0.93 month of salary (\$4,584/month) is requested for Zemeckis + \$326 fringe = \$4,910 to plan, coordinate, and execute the additional tagging and download trips, organize tagging and telemetry data, and process the increased number of tag returns; 0.47 months additional salary for Bochenek (\$8,106/month) + \$1,524 fringe = \$9,630 to participate in tagging trips, process vessel contracts and payment, and organize volunteer anglers; and an additional 0.47 months salary for Kneebone (\$2,125/0.5 mo) to participate in tagging trips and conduct data analysis. As outlined in the budget below, the indirect costs associated with the addendum are \$2,869 (10% indirect cost rate excluding boat time) for the Partnership for Mid-Atlantic Fisheries Science (PMAFS) and \$1,482 (15% indirect cost rate) for the subaward to Rutgers University, thereby resulting in a total budget for the extended scope of work of \$41,869. Match of in-kind donation of volunteer anglers (\$4,429) on the two additional party boat trips. Rutgers indirect cost rate match (\$4,251). Total add-on project costs \$50,549.

Partnership for Mid-Atlantic Fisheries Science Budget Add-On

	Totals	Add-On	Other Funding
PMAFS Contractual			
Rutgers University Budget-Subcontract			
Bochenek (Co-PI) salary/fringe	5,692	5,293	
Zemeckis (Senior Assoc) salary/fringe	4,935	4,589	
Grothues (Researcher) salary/fringe			
Rental Wet Lab			
Rental Rutgers boat			
Rutgers indirect @15% for PMAFS	5,734	1,483	4,251
Rutgers Total	15,616	11,365	4,251
Consultant -Kneebone/salary/fringe/travel/ICR	2,125	1,976	
Partyboat rental	5,500	5,500	
commercial boat rental	4,808	4,808	
Travel	610	610	
Supplies	15,080	14,741	
Accounting/bookkeeping salary			
In-Kind Volunteer hours	4,429		4,429
PMAFS Subtotal	47,680	39,000	8,680
PMAFS ICR 10%	2,869	2,869	
Total PMAFS Budget	50,549	41,869	8,680