Northeast Fisheries Science Center Reference Document 12-26

Estimating Observer Sea Day Requirements in the Mid-Atlantic Region to Monitor Loggerhead Sea Turtle (*Caretta caretta*) Interactions

by Kimberly T. Murray

Northeast Fisheries Science Center Reference Document 12-26

Estimating Observer Sea Day Requirements in the Mid-Atlantic Region to Monitor Loggerhead Sea Turtle (*Caretta caretta*) Interactions

by Kimberly T. Murray

National Oceanic Atmospheric Administration, National Marine Fisheries Service,
Northeast Fisheries Science Center, 166 Water Street, Woods Hole, MA,
02543 USA

US DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
National Marine Fisheries Service
Northeast Fisheries Science Center
Woods Hole, MA

November 2012

Northeast Fisheries Science Center Reference Documents

This series is a secondary scientific series designed to assure the long-term documentation and to enable the timely transmission of research results by Center and/or non-Center researchers, where such results bear upon the research mission of the Center (see the outside back cover for the mission statement). These documents receive internal scientific review, and most receive copy editing. The National Marine Fisheries Service does not endorse any proprietary material, process, or product mentioned in these documents.

All documents issued in this series since April 2001, and several documents issued prior to that date, have been copublished in both paper and electronic versions. To access the electronic version of a document in this series, go to *http://www.nefsc.noaa.gov/nefsc/publications/*. The electronic version is available in PDF format to permit printing of a paper copy directly from the Internet. If you do not have Internet access, or if a desired document is one of the pre-April 2001 documents available only in the paper version, you can obtain a paper copy by contacting the senior Center author of the desired document. Refer to the title page of the document for the senior Center author's name and mailing address. If there is no Center author, or if there is corporate (*i.e.*, non-individualized) authorship, then contact the Center's Woods Hole Laboratory Library (166 Water St., Woods Hole, MA 02543-1026).

Editorial Treatment: To distribute this report quickly, it has not undergone the normal technical and copy editing by the Northeast Fisheries Science Center's (NEFSC's) Editorial Office as have most other issues in the NOAA Technical Memorandum NMFS-NE series. Other than the four covers and first two preliminary pages, all writing and editing have been performed by the authors listed within.

Information Quality Act Compliance: In accordance with section 515 of Public Law 106-554, the Northeast Fisheries Science Center completed both technical and policy reviews for this report. These predissemination reviews are on file at the NEFSC Editorial Office.

This document may be cited as:

Murray KT. 2012. Estimating Observer Sea Day Requirements in the Mid-Atlantic Region to Monitor Loggerhead Sea Turtle (*Caretta caretta*) Interactions. US Dept Commer, Northeast Fish Sci Cent Ref Doc. 12-26; 10 p. Available from: National Marine Fisheries Service, 166 Water Street, Woods Hole, MA 02543-1026, or online at http://www.nefsc.noaa.gov/nefsc/publications/

TABLE OF CONTENTS

INTRODUCTION

Four species of sea turtles are found on the Northeast continental shelf, all of which are protected under the U.S. Endangered Species Act (ESA). These include the loggerhead (*Caretta caretta*), green (*Chelonia mydas*), Kemp's ridley (*Lepidochelys kempii*), and leatherback (*Dermochelys coriacea*) turtle. Having responsibility to implement programs to conserve marine life listed as endangered or threatened, the National Marine Fisheries Service (NMFS) places observers on commercial fishing vessels to gain information about interactions with listed species. Information about sea turtle interactions with fisheries may be gained via monitoring under the authority of the Endangered Species Act, Marine Mammal Protection Act (MMPA), or Magnuson-Stevens Act, though in the latter two cases sampling is designed for marine mammals or fish, not sea turtles.

Information collected by fisheries observers has been used to estimate the total magnitude of loggerhead or hard-shelled turtle interactions with commercial fisheries in the Mid-Atlantic region via model-based methods (Murray 2011, Warden 2011, Murray 2009). The model-based estimates pool several years of data across multiple fishing fleets within the same gear type, and account for gear or environmental correlates with turtle interactions rates over the entire Mid-Atlantic. The total estimated interactions with each gear type are subsequently allocated across fisheries, where a "fishery" is defined as a managed fish or invertebrate species landed, to provide information requested by the Northeast Regional Office (NERO) for ESA Section 7 consultations and other management actions (Warden 2011b, Murray 2009b). While green, Kemp's ridley, and leatherback interactions have occurred, there has been insufficient information to model the rates or magnitude of these species' interactions in commercial fishing gear. In addition, incidental captures of sea turtles have generally been rare on Georges Bank and in the Gulf of Maine, so analyses of turtle interactions to date have been limited to the loggerhead species only within the Mid-Atlantic.

This document presents the Protected Species Branch's (PSB) approach to estimating the magnitude of observer coverage needed to monitor loggerhead interactions rates in the Mid-Atlantic (i.e. west of 70°W) with 30% precision, based on available analyses (Warden 2011b, Murray 2009b, Murray 2011). While a 30% precision goal has been recommended by the National Working Group on Bycatch (NMFS 2004), monitoring requirements for a range of precision goals are also reported here. Estimated sea days to monitor loggerhead interactions are subsequently integrated with sea day projections for fish, estimated annually under the Standardized Bycatch Reporting Methodology (SBRM) Omnibus Amendment to fishery management plans of the Northeast region (Wigley et al. 2012). Sea day projections for non-loggerhead species outside the Mid-Atlantic are not computed in this report, but may be possible in the future should new information become available.

METHODS

Fishery observer sea days are estimated for vessels using sink gillnet, bottom otter trawl (including scallop trawl), and scallop dredge gear, the primary gear types with documented loggerhead interactions in the Mid-Atlantic. Projected amounts of observer coverage for vessels fishing gillnet or trawl gear are derived from CVs around total estimated loggerhead interactions in specific fisheries (Warden 2011b, Murray 2009b), where a fishery is defined within each gear type by the highest amount (by weight) of landed fish or invertebrate species on a trip. For

dredge gear, sea day projections are derived from CVs around estimated loggerhead interactions after chain mats were required in the Mid-Atlantic (Murray 2011). CVs reported in Murray (2011) are associated with bycatch rates on trips catching sea scallops.

Because the goal of monitoring is to achieve a 30% precision around loggerhead interaction rates with all fisheries within a gear type, the lower bound on coverage is the amount required to achieve a 30% CV for the fishery with the highest observer need. For example, if there are 2 fisheries (A and B) using gillnet gear in the Mid-Atlantic, and fishery A requires 100 days and fishery B requires 80 days, we would estimate 100 days needed for both fishery A and B. The maximum amount of projected coverage in a particular fishery is considered the desired level of annual sampling for that gear type in the Mid-Atlantic (i.e. it serves as an umbrella for monitoring in all other fisheries).

Data collected from these fisheries will eventually be pooled together within each gear type to estimate the total magnitude of loggerhead interactions. Therefore, the estimated sea days will remain in place each year until new bycatch estimates are published (currently every 5 years), and will be reassessed if there are major changes in the fishery (such as a gear modification).

Estimation of Desired Sea Days

The number of observed sea days needed to achieve a 30% coefficient of variation (CV), and other levels of precision, around an estimate of total loggerhead interactions was derived from (Rossman 2007):

$$n_{proj} = (CV_{obs} * \sqrt{n_{obs}}/CV_{proj})^2 \quad (1)$$

where n_{proj}= the amount of projected effort required to achieve a given precision level (converted to sea days); CV_{obs} = the precision levels around estimated interactions levels as reported in Warden 2011 (trawl), Murray 2009 (gillnet), or Murray 2011 (dredge); n_{obs}= the observed effort as reported in the above publications; and CV_{proj} = the projected precision level to be achieved. This yielded a desired level of sampling for trips catching each fish or invertebrate species. The maximum amount of projected coverage across all the fisheries was considered the desired level of sampling to monitor turtle interactions for that gear type. Alternate levels of sampling under different precision goals are presented for the fishery that required the maximum amount of coverage, i.e. the "driver" fishery for overall monitoring levels. Projected effort amounts were converted to sea days based on species specific catch information on observed hauls or VTR trips (Appendix).

RESULTS

Desired Sea Days

An estimated 4,838 sea days are needed in the Mid-Atlantic to monitor loggerhead interactions with 30% precision in bottom otter trawl fisheries, based on estimated precision levels for trips catching species managed under the small and large mesh Northeast Multispecies FMPs (i.e. NE Multispp) (Table 1). Roughly 2,170 fewer days are required to estimate

loggerhead interactions with 40% precision instead of 30% (Table 2, Figure 1a). An estimated 1,440 days are needed for 30% precision in Mid-Atlantic sink gillnet fisheries, based on estimated precision levels for trips catching spot (Table 1). Roughly 600 fewer days are needed in this fishery to estimate loggerhead interactions with 40% precision (Table 2, Figure 1b). Lastly, an estimated 1,293 days are needed for 30% precision in the Mid-Atlantic scallop dredge fishery, based on loggerhead bycatch precision levels after chain mats were implemented in the fishery (Table 1). Roughly 550 fewer days are needed in this fishery to estimate loggerhead interactions with 40% precision (Table 2, Figure 1c).

DISCUSSION

Monitoring at the Level of Fisheries

Observer coverage is estimated in this document at the level of individual fisheries in order to better meet the information needs for ESA Section 7 Consultations, prepared for Fishery Management Plan actions, or for management actions implemented at the fishery level. Typically, however, analyses of turtle interactions and allocation of observer coverage are not carried out at the fishery level. Instead, the magnitude of turtle interactions are estimated by gear type using several years of data, using models which account for gear or environmental correlates that significantly affect estimated interaction rates. Days are then allocated in proportion to the previous year's commercial fishing effort, in times and areas where turtles are likely to be present. In developing these models, analysts have found that the species landed or targeted does not significantly affect estimated interaction rates (i.e. Murray 2009, Warden 2011), so the "fishery" is not taken into account when describing variation in estimated interaction rates. Annual coverage amounts are estimated here at a finer resolution to collect information about interaction rates between turtles and a multitude of managed fisheries.

Within each gear type (trawl, dredge, or gillnet), fisheries that required the largest estimated number of sea days to reach the 30% precision goal became the "drivers" for monitoring all other fisheries. For instance, while 4,838 days were estimated for trips historically catching NE multispecies, this does not mean 4,838 days will be allocated entirely to this fishery. Instead, these 4,838 days monitor all fisheries using otter trawls for fish or scallops in the Mid-Atlantic. This approach is not expected to bias future estimated rates because analyses suggest that interaction rates do not vary by fishery. On the contrary, this approach helps ensure data are collected within a gear type from a variety of fishing methods, using different gear characteristics. Choosing the maximum number of days needed across all fisheries is intended to ensure that other fisheries also meet the 30% precision goal, but variability in the distribution and magnitude of catch, as well as the level of sea days achieved, will influence ultimate precision levels in a given fishery.

Monitoring needs for other turtle species, in other regions, and for other gear types

Loggerheads are the most commonly observed species of turtle in Mid-Atlantic waters and thus have the richest level of information available for estimating interactions and coverage needs. Sea day requirements for other turtle species are not estimated here because too few have been observed to estimate the magnitude of interactions with model-based approaches similar to those done for loggerheads. Because observers document all protected species interactions on

trips, monitoring of other turtles species will still occur via days intended to monitor fish or loggerheads. Interaction rates between non-loggerhead turtles and fishing gear can be analyzed across several years once sufficient levels of data become available, and subsequently, similar analyses to those described here can be used to determine monitoring requirements to meet various precision levels around estimated interaction rates.

Incidental captures of sea turtles are generally very rare on Georges Bank and in the Gulf of Maine. These regions have not been included in PSB's model-based bycatch analyses because turtle captures there are too sparse to support robust model-based analyses. For instance, in ~70,000 observed otter trawl hauls on Georges Bank and the Gulf of Maine over a 15 year period there was 1 observed loggerhead interaction (Warden 2011). Sampling of fleets in the Northeast region has increased in recent years with the rise of sectors and at-sea monitors. Once analyzed these data may provide new information on turtle capture rates outside of the Mid-Atlantic, which could subsequently lead to better estimates of monitoring needs on Georges Bank and in the Gulf of Maine.

While almost all loggerhead interactions observed by northeast fisheries observers have occurred in trawl, gillnet, or dredge gears, some have occurred in other gear types (for instance, one loggerhead was observed in beach seine gear between 2009-2011, Wigley et al. 2012). To date there has not been enough information to estimate turtle interactions in these other gear types, though monitoring is still estimated under SBRM for fish discards or as pilot coverage when there is insufficient observer coverage. Monitoring for turtle interactions in these gear types can be reassessed if sufficient information becomes available.

REFERENCES CITED

Murray KT. 2011. Interactions between sea turtles and dredge gear in the U.S. sea scallop (*Placopecten magellanicus*) fishery, 2001-2008. *Fish. Res* 107:137-146.

Murray KT. 2009. Characteristics and magnitude of sea turtle bycatch in U.S. mid-Atlantic gillnet gear. *Endang. Species Res*. 8:211-224.

Murray KT. 2009b. Proration of estimated bycatch of loggerhead sea turtles in U.S. mid-Atlantic sink gillnet gear to vessel trip report landed catch, 2002-2006. US Dept Commer, Northeast Fish Sci Cent Ref Doc. 09-19; 7 p.

National Marine Fisheries Service (NMFS). 2004. Evaluating bycatch: a national approach to standardized bycatch monitoring programs. U. S. Dep. Comm., NOAA Tech. Memo. NMFS-F/SPO-66, 108 p.

Rossman MC. 2007. Allocating observer sea days to bottom trawl and gillnet fisheries in the Northeast and Mid-Atlantic regions to monitor and estimate incidental bycatch of marine mammals. US Dept Commer, *Northeast Fish Sci Cent Ref Doc*. 07-19; 17 p.

Warden, ML 2011. Modeling loggerhead sea turtle (*Caretta caretta*) interactions with US Mid-Atlantic bottom trawl gear for fish and scallops, 2005-2008. *Biol. Cons*. 144: 2202-2212

Warden, ML. 2011b. Proration of loggerhead sea turtle (Caretta caretta) interactions in U.S. Mid-Atlantic bottom otter trawls for fish and scallops, 2005–2008, by managed species landed. US Dept Commer, Northeast Fish Sci Cent Ref Doc. 11-04; 8 p.

Wigley SE, Blaylock J, Rago PJ, Shield G. 2012. 2012 Discard estimation, precision, and sample size analyses for 14 federally managed species groups in the northeast region. US Dept Commer, Northeast Fish Sci Cent Ref Doc. 12-17; 146 p.

Table 1. Projected Observer Sea Day Needs to Monitor Loggerhead Bycatch on Trips Capturing Managed Species in the Mid-Atlantic. Maximum values are high-lighted in red.

	Bottom Otter Trawl (from Warden 2011b)				Sink Gillnet (from Murray 2009b)				Dredge			
Fish Species	**CV_{obs}**	observed tons landed (2005-08)	projected tons landed	projected sea days (N_{proj})	**CV_{obs}**	observed tons landed 2002-06	projected tons landed	projected sea days (N_{proj})	**CV_{obs}**	observed dredge hours 06-08	projected dredge hours	projected sea days (N_{proj})
Black Drum					0.30	2.0	2.0	38				
Blue Crab	0.5	0.0	0.1	0								
Bluefish	0.15	70.5	17.6	760	0.30	250	250	1046				
Coastal Migratory Spp	0.13	0.2	0.0	3	0.42/0.45	20	41.2	714				
Croaker	0.14	1168.8	254.5	189	0.37	520	791	1257				
Dolphin/Wahoo	0.45	0.0	0.0	0								
Flounder (other)	0.13	2.2	0.4	37								
Herring	0.53	331.1	1033.4	88								
Highly Mig Spp	0.18	0.0	0.0	0								
Horseshoe Crab	0.16	78.3	22.3	63								
Invertebrates	0.15	12.6	3.1	413								
Lobster	0.39	4.9	8.3	1426								
Mackerel	0.55	180.0	604.9	357								
Squid (Illex)	0.44	3999.9	8604.2	802								
Squid (Loligo)	0.25	1504.2	1044.6	2437								
Squid (Unc)	0.21	91.3	44.7	290								
Butterfish	0.22	30.7	16.5	1155								
Menhaden	0.3	47.6	47.6	2774								
Monkfish	0.21	472.1	231.3	2666	0.22	954	513	512				
NE Multispp	0.3	190.3	190.3	**4838**								
Red Crab	1.18	0.0	0.0	0								
Red Drum	0.23	0.1	0.1	5								
Sea Scallop	0.22	507.7	273.0	360					0.18	40597	14615	**1293**

Table 1, continued. Projected Observer Sea Day Needs to Monitor Loggerhead Bycatch on Trips Capturing Managed Species in the Mid-Atlantic. Maximum values are high-lighted in red.

	Bottom Otter Trawl (from Warden 2011b)				Sink Gillnet (from Murray 2009b)				Dredge			
Fish Species	**CV_{obs}**	observed tons landed (2005-08)	projected tons landed	projected sea days (N_{proj})	**CV_{obs}**	observed tons landed 2002-06	projected tons landed	projected sea days (N_{proj})	**CV_{obs}**	observed dredge hours 06-08	projected dredge hours	projected sea days (N_{proj})
Seatrout	0.29	0.6	0.6	19								
Shad & river Herring	0.42	13.0	25.6	1391								
Shrimp, Northern	0.46	0.0	0.0	0								
Skates	0.23	1817.9	1068.5	1776	0.27	361	292.4	654				
Smooth Dog	0.18	15.4	5.5	140	0.32	68	77.4	226				
Snapper/Grouper	0.15	0.0	0.0	0								
Spiny Dog	0.34	14.5	18.7	357	0.29	34	31.7	98				
Spot	0.17	0.6	0.2	19	0.56	52	181.2	**1440**				
Striped Bass	0.27	4.6	3.8	164	0.44	35	75.3	348				
Summer Fl	0.13	706.0	132.6	807	0.38	10	16	745				
Scup	0.37	209.3	318.3	924								
Black Sea Bass	0.26	58.9	44.2	2869								
Tautog	0.35	2.3	3.2	646								
Tilefish	0.25	2.5	1.7	204								
Weakfish	0.15	10.4	2.6	309	0.29	30	28	693				
Other	0.23	212.4	124.8	63								

Table 2. Estimated sea days needed to monitor loggerhead interactions by gear type in the Mid-Atlantic over a range of precision levels (expressed as a CV percentage)

	0.25	**0.30**	**0.35**	**0.40**	**0.45**	**0.50**
Bottom trawl for fish and scallop	6866	4838	3560	2670	2160	1785
Sink gillnet	2177	1440	1090	835	670	545
Scallop dredge	1859	1293	956	726	566	460

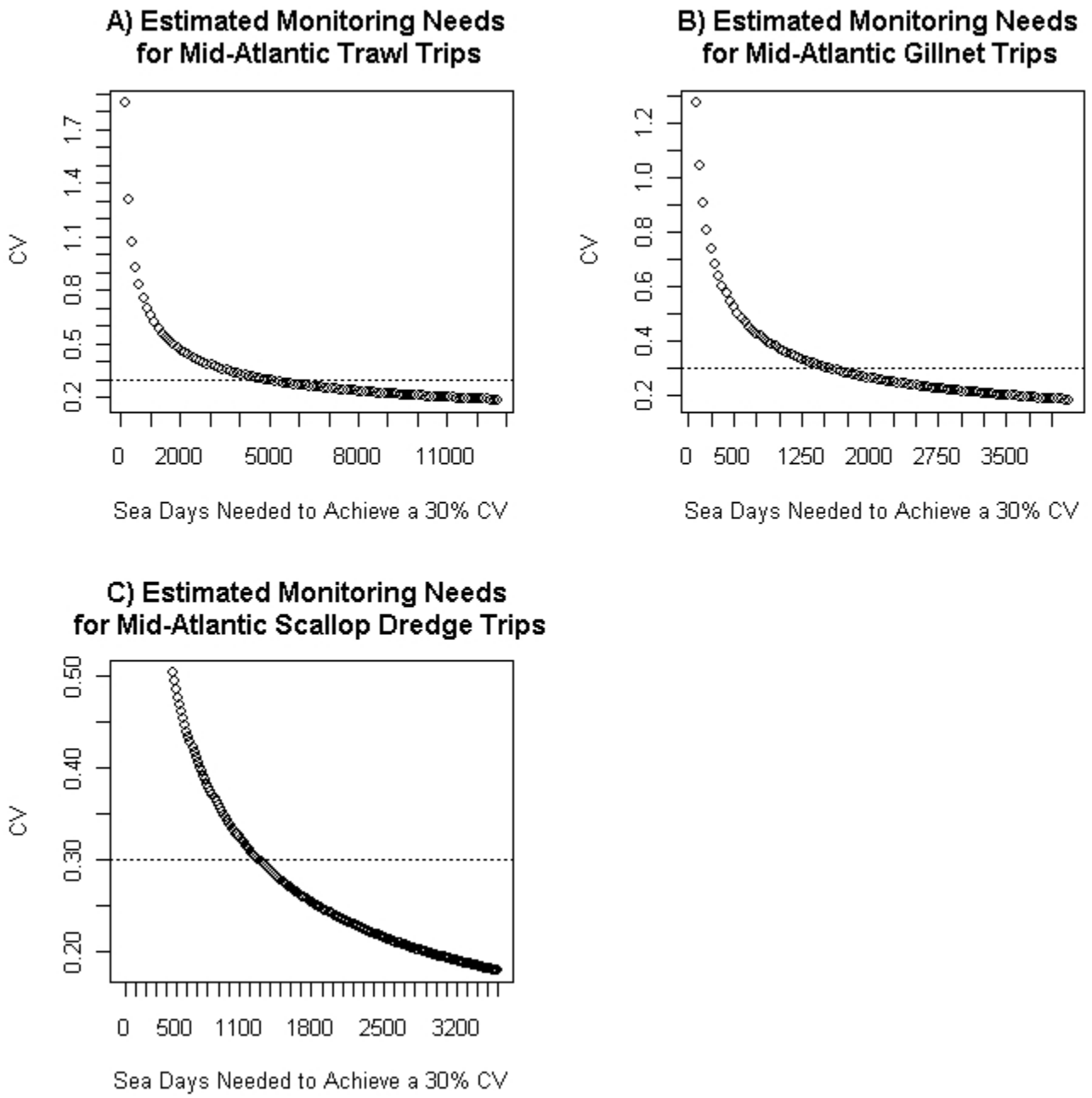

Figure 1. Estimated sea days needed to monitor loggerhead interactions in the Mid-Atlantic in a) otter trawl gear catching NE multispecies; b) sink gillnet gear catching spot; and c) dredge gear catching scallops. These fisheries are the "drivers" for all monitoring in each respective gear type. Reference lines are indicated at the 30% precision goal.

Appendix. Conversions used to convert projected tons or dredge hours to projected sea days based on observed hauls or VTR trips. Observed number of hauls per trip has been rounded to nearest whole integer.

	Bottom Otter Trawl (from Warden 2011b)					Sink Gillnet (from Murray 2009b)					Dredge			
Fish Species	Proj tons landed	Obs median tons per haul 2005-08	Obs number of hauls per trip	Obs days absent per trip	proj sea days (N_{proj})	Proj tons landed	Obs median tons per haul 2002-06	Obs number of hauls per trip	Obs days absent per trip	Proj sea days (N_{proj})	Proj dredge hours	Mean VTR dredge hours per trip 01-08	Mean VTR days absent per trip 01-08	Proj sea days (N_{proj})
Black Drum						2.0	0.0268	2	1	38				
Blue Crab	0.1	0.0009	1	1	0									
Bluefish	17.6	0.0082	3	1	760	250	0.0697	3	1	1046				
Coastal Migratory Spp	0.0	0.0059	2	1	3	41.2	0.0123	4	1	714				
Croaker	254.5	0.2265	6	1	189	791	0.1286	5	1	1257				
Dolphin/Wahoo	0.0	0	0	1	0									
Flounder (other)	0.4	0.0050	2	1	37									
Herring	1033.4	3.3160	4	1	88									
Highly Mig Spp	0.0	0	0	1	0									
Horseshoe Crab	22.3	0.1119	3	1	63									
Invertebrates	3.1	0.0030	3	1	413									
Lobster	8.3	0.0023	3	1	1426									
Mackerel	604.9	0.5450	3	1	357									
Squid (Illex)	8604.2	2.2650	5	1	802									
Squid (Loligo)	1044.6	0.0906	5	1	2437									
Squid (Unc)	44.7	0.0367	4	1	290									
Butterfish	16.5	0.0045	3	1	1155									
Menhaden	47.6	0.0095	2	1	2774									
Monkfish	231.3	0.0204	4	1	2666	513	0.2548	4	1	512				
NE Multispp	190.3	0.0113	3	1	4838									
Red Crab	0.0	0	0	1	0									
Red Drum	0.1	0.0114	1	1	5									

Appendix, continued. Conversions used to convert projected tons or dredge hours to projected sea days based on observed hauls or VTR trips. Observed number of hauls per trip has been rounded to nearest whole integer.

	Bottom Otter Trawl (from Warden 2011b)					Sink Gillnet (from Murray 2009b)					Dredge			
Fish Species	Proj tons landed	Obs median tons per haul 2005-08	Obs number of hauls per trip	Obs days absent per trip	proj sea days (N_{proj})	Proj tons landed	Obs median tons per haul 2002-06	Obs number of hauls per trip	Obs days absent per trip	Proj sea days (N_{proj})	Proj dredge hours	Mean VTR dredge hours per trip 01-08	Mean VTR days absent per trip 01-08	Proj sea days (N_{proj})
Sea Scallop	273.0	0.1880	4	1	360						14615	LAVess: 1 trip per 78.7 dredge hours GC Vessels: 1 trip per 23.4 hours	LAVess: 7 days per trip GC Vessels: 2 days per trip	1293
Seatrout	0.6	0.0303	1	1	19									
Shad & river Herring	25.6	0.0080	2	1	1391									
Shrimp, Northern	0.0	0	0	1	0									
Skates	1068.5	0.1785	3	1	1776	292.4	0.1282	3	1	654				
Smooth Dog	5.5	0.0163	2	1	140	77.4	0.1153	3	1	226				
Snapper/Grouper	0.0	0	0	1	0									
Spiny Dog	18.7	0.0284	2	1	357	31.7	0.1065	3	1	98				
Spot	0.2	0.0072	1	1	19	181.2	0.0316	4	1	1440				
Striped Bass	3.8	0.0138	2	1	164	75.3	0.0629	3	1	348				
Summer Fl	132.6	0.0430	4	1	807	16	0.0102	2	1	745				
Scup	318.3	0.1347	3	1	924									
Black Sea Bass	44.2	0.0050	3	1	2869									
Tautog	3.2	0.0032	2	1	646									
Tilefish	1.7	0.0036	2	1	204									
Weakfish	2.6	0.0036	2	1	309	28	0.0122	3	1	693				
Other	124.8	0.3300	6	1	63									

Procedures for Issuing Manuscripts in the *Northeast Fisheries Science Center Reference Document* (CRD) Series

Clearance

All manuscripts submitted for issuance as CRDs must have cleared the NEFSC's manuscript/abstract/webpage review process. If any author is not a federal employee, he/she will be required to sign an "NEFSC Release-of-Copyright Form." If your manuscript includes material from another work which has been copyrighted, then you will need to work with the NEFSC's Editorial Office to arrange for permission to use that material by securing release signatures on the "NEFSC Use-of-Copyrighted-Work Permission Form."

For more information, NEFSC authors should see the NEFSC's online publication policy manual, "Manuscript/abstract/webpage preparation, review, and dissemination: NEFSC author's guide to policy, process, and procedure," located in the Publications/Manuscript Review section of the NEFSC intranet page.

Organization

Manuscripts must have an abstract and table of contents, and (if applicable) lists of figures and tables. As much as possible, use traditional scientific manuscript organization for sections: "Introduction," "Study Area" and/or "Experimental Apparatus," "Methods," "Results," "Discussion," "Conclusions," "Acknowledgments," and "Literature/References Cited."

Style

The CRD series is obligated to conform with the style contained in the current edition of the United States Government Printing Office Style Manual. That style manual is silent on many aspects of scientific manuscripts. The CRD series relies more on the CSE Style Manual. Manuscripts should be prepared to conform with these style manuals.

The CRD series uses the American Fisheries Society's guides to names of fishes, mollusks, and decapod crustaceans, the Society for Marine Mammalogy's guide to names of marine mammals, the Biosciences Information Service's guide to serial title abbreviations, and the ISO's (International Standardization Organization) guide to statistical terms.

For in-text citation, use the name-date system. A special effort should be made to ensure that all necessary bibliographic information is included in the list of cited works. Personal communications must include date, full name, and full mailing address of the contact.

Preparation

Once your document has cleared the review process, the Editorial Office will contact you with publication needs – for example, revised text (if necessary) and separate digital figures and tables if they are embedded in the document. Materials may be submitted to the Editorial Office as files on zip disks or CDs, email attachments, or intranet downloads. Text files should be in Microsoft Word, tables may be in Word or Excel, and graphics files may be in a variety of formats (JPG, GIF, Excel, PowerPoint, etc.).

Production and Distribution

The Editorial Office will perform a copy-edit of the document and may request further revisions. The Editorial Office will develop the inside and outside front covers, the inside and outside back covers, and the title and bibliographic control pages of the document.

Once both the PDF (print) and Web versions of the CRD are ready, the Editorial Office will contact you to review both versions and submit corrections or changes before the document is posted online.

A number of organizations and individuals in the Northeast Region will be notified by e-mail of the availability of the document online.

Research Communications Branch
Northeast Fisheries Science Center
National Marine Fisheries Service, NOAA
166 Water St.
Woods Hole, MA 02543-1026

MEDIA MAIL

Publications and Reports of the Northeast Fisheries Science Center

The mission of NOAA's National Marine Fisheries Service (NMFS) is "stewardship of living marine resources for the benefit of the nation through their science-based conservation and management and promotion of the health of their environment." As the research arm of the NMFS's Northeast Region, the Northeast Fisheries Science Center (NEFSC) supports the NMFS mission by "conducting ecosystem-based research and assessments of living marine resources, with a focus on the Northeast Shelf, to promote the recovery and long-term sustainability of these resources and to generate social and economic opportunities and benefits from their use." Results of NEFSC research are largely reported in primary scientific media (*e.g.*, anonymously-peer-reviewed scientific journals). However, to assist itself in providing data, information, and advice to its constituents, the NEFSC occasionally releases its results in its own media. Currently, there are three such media:

NOAA Technical Memorandum NMFS-NE -- This series is issued irregularly. The series typically includes: data reports of long-term field or lab studies of important species or habitats; synthesis reports for important species or habitats; annual reports of overall assessment or monitoring programs; manuals describing program-wide surveying or experimental techniques; literature surveys of important species or habitat topics; proceedings and collected papers of scientific meetings; and indexed and/or annotated bibliographies. All issues receive internal scientific review and most issues receive technical and copy editing.

Northeast Fisheries Science Center Reference Document -- This series is issued irregularly. The series typically includes: data reports on field and lab studies; progress reports on experiments, monitoring, and assessments; background papers for, collected abstracts of, and/or summary reports of scientific meetings; and simple bibliographies. Issues receive internal scientific review and most issues receive copy editing.

Resource Survey Report (formerly *Fishermen's Report*) -- This information report is a regularly-issued, quick-turnaround report on the distribution and relative abundance of selected living marine resources as derived from each of the NEFSC's periodic research vessel surveys of the Northeast's continental shelf. This report undergoes internal review, but receives no technical or copy editing.

TO OBTAIN A COPY of a *NOAA Technical Memorandum NMFS-NE* or a *Northeast Fisheries Science Center Reference Document*, either contact the NEFSC Editorial Office (166 Water St., Woods Hole, MA 02543-1026; 508-495-2350) or consult the NEFSC webpage on "Reports and Publications" (http://www.nefsc.noaa.gov/nefsc/publications/). To access *Resource Survey Report*, consult the Ecosystem Surveys Branch webpage (http://www.nefsc.noaa.gov/femad/ecosurvey/mainpage/).

ANY USE OF TRADE OR BRAND NAMES IN ANY NEFSC PUBLICATION OR REPORT DOES NOT IMPLY ENDORSEMENT.