Northeast Fisheries Science Center Reference Document 12-08

2010-2011 HPTRP Consequential Bycatch and Compliance Rates

by Christopher D. Orphanides and Debra Palka

April 2012

Northeast Fisheries Science Center Reference Document 12-08

2010-2011 HPTRP Consequential Bycatch and Compliance Rates

by Christopher D. Orphanides and Debra Palka

NOAA National Marine Fisheries Service
Northeast Fisheries Science Center, 166 Water St., Woods Hole, MA 02543

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

April 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 Regional Office completed both technical and policy reviews for this report. These predissemination reviews are on file at the Northeast Regional Office.

This document may be cited as:

Orphanides CD, Palka D. 2012. 2010-2011 HPTRP Consequential Bycatch and Compliance Rates. US Dept Commer, Northeast Fish Sci Cent Ref Doc. 12-08; 25 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

ABSTRACT

The New England component of the Harbor Porpoise Take Reduction Plan (HPTRP) requires the use of specified acoustic deterrent devices (known as pingers) on sink gillnet gear to reduce incidental entanglement of harbor porpoise during the course of sink gillnet fishing operations. The 2010-2011 HPTRP gillnet management season for the New England component of the HPTRP was the first season for which harbor porpoise bycatch rates were evaluated against 2010 HPTRP target bycatch rates to inform decisions regarding Consequence Closure Areas (CCAs); if the average bycatch rate from two consecutive management seasons in CCA-associated areas exceeds the HPTRP target bycatch rates, the HPTRP calls for seasonal closure of the relevant CCA(s). Bycatch rates and HPTRP compliance rates were calculated for the Coastal Gulf of Maine (CGOM) and Southern New England (SNE) CCA-associated areas. With the addition of the At-Sea Monitor (ASM) data source in 2010, bycatch rates were calculated in two ways: using only the traditional Northeast Fisheries Observer Program (NEFOP) data and using a combination of the NEFOP and ASM data. For the CGOM CCA-associated areas, the NEFOP-only and joint NEFOP-ASM bycatch rates were the very similar, and both exceeded the target bycatch rate of 0.031. The CGOM CCA-associated areas NEFOP-only bycatch rate was 0.078 harbor porpoise per mton of landings, and the joint NEFOP-ASM bycatch rate was 0.074. For the SNE CCA-associated area the NEFOP-only bycatch rate of 0.012 was below the target bycatch rate of 0.023 harbor porpoise per mton of landings, though the joint NEFOP-ASM bycatch rate of 0.048 was above the target bycatch rate. Due to larger sample sizes and corresponding lower CVs, the joint NEFOP-ASM bycatch rates were considered to be more accurate. Differences between the two SNE CCA-associated area bycatch rates were considered to be due primarily to sample size, inter-annual variability, and chance. Full pinger deployment in the CGOM CCA-associated areas (where full deployment is considered having the correct number of pingers per net string regardless of pinger functionality) occurred on 82.5% of observed hauls. However, when pinger functionality was taken into consideration, HPTRP pinger compliance dropped to 41.2%. Full pinger deployment (again, regardless of pinger functionality) in the SNE CCA-associated area occurred on 64.7% of observed hauls and HPTRP pinger compliance remained at that level when pinger functionality was taken into consideration. Overall bycatch rates in the CGOM and SNE CCA-associated areas were similar to past years, though bycatch rates on hauls with the correct number of pingers deployed (regardless of functionality) were higher than expected. High bycatch rates on hauls with the correct number of pingers were attributed to a high degree of non-functioning pingers on these hauls. High bycatch rates relative to CCA target rates are attributed primarily to continued poor compliance with pinger deployment and functionality requirements.

INTRODUCTION

Since the creation of the Northeast Fisheries Science Center (NEFSC) Northeast Fisheries Observer Program (NEFOP) in 1989, harbor porpoise bycatch has been the focus of much attention due to frequently observed incidental takes. In response to high levels of observed harbor porpoise incidental mortality and serious injury, Harbor Porpoise Take Reduction Teams (HPTRTs) were convened for the Gulf of Maine in 1996, and for the Mid-Atlantic in 1997. The Take Reduction Team (TRT) process resulted in the publication of the 1998 Harbor Porpoise Take Reduction Plan (HPTRP) (63 FR 66464, December 2, 1998) which aimed to reduce the incidental takes of harbor porpoise to the stock's Potential Biological Removal (PBR) level within 6 months of implementation. After the implementation of the 1998 HPTRP, harbor porpoise incidental take estimates showed substantial decreases from past years to below PBR levels (Waring et al. 2004).

However, increasing bycatch estimates in recent years lead the National Marine Fisheries Service (NMFS) to reconvene the HPTRT in December of 2007. The focus of this meeting was to address non-compliance with the regulations implementing the HPTRP and to address harbor porpoise incidental takes occurring outside of the original 1998 HPTRP Management Areas (MAs). As a result of reconvening the HPTRT, on February 19, 2010 NMFS published the 2010 HPTRP (75 FR 7383). One of the key new components in the 2010 HPTRP that was developed to address non-compliance in areas with historically high levels of bycatch was the Consequence Closure Area (CCA) strategy. This strategy involves three potential seasonal closure areas, which are referred to as CCAs. Under this strategy, if the average bycatch rate within two consecutive management seasons in a "CCA-associated area" exceeds a specified target bycatch rate, then a seasonal closure of the CCA is triggered. These target bycatch rates were set to match the bycatch rates within CCA-associated areas on NEFOP-observed hauls with full pinger deployment between January 1, 1999 and May 31, 2007 (Palka and Orphanides, 2008).

CCA-associated areas encompass the CCAs and surrounding areas. These areas overlap with Management Areas (MAs); the current time period that each MA is either seasonally closed to all gillnet fishing or requires the use of pingers is specified in Figure 1. The Coastal Gulf of Maine (CGOM) CCA-associated area is comprised of the Mid-Coast, Stellwagen Bank, and Massachusetts Bay MAs (Figure 1), which also includes the CGOM CCA, if triggered (Figure 2). The target bycatch rate for the CGOM CCA is 0.031 harbor porpoise per metric ton of landings. The Southern New England (SNE) CCA area is the Southern New England MA (Figure 1), which includes the Eastern Cape Cod CCA and the Cape Cod South Expansion CCA, if triggered (Figure 2). The target bycatch rate for the SNE CCA is 0.023 harbor porpoise per metric ton of landings, and if exceeded, both the Eastern Cape Cod and Cape Cod South Expansion Areas become seasonally closed.

On March 17, 2010, NMFS delayed the effective date for implementing new pinger requirements in the Stellwagen Bank and Southern New England MA from March 22, 2010 to September 15, 2010 (75 FR 12698). This was due to the lack of availability of pingers and the short time required to complete the mandatory pinger authorization training for those fishermen who had not received the training in the past. Aligning with this adjusted date, the first 2010 HPTRP management season under the CCA strategy was the 2010-2011 HPTRP management season which was from Sept 15, 2010 to May 31, 2011.

The primary purpose of this report is to document the 2010-2011 bycatch rates for these CCAs and the corresponding rates of compliance with the pinger requirements. In addition, 2010-2011 fishing practices and gear characteristics were compared to those from past fishing seasons to provide context for the 2010-2011 fishing season.

METHODS

The NEFOP data and At-Sea-Monitor (ASM) data were used to calculate bycatch and compliance rates. Because this is the first management season that ASM data were collected, bycatch and compliance rates were calculated using only NEFOP data and also using both NEFOP and ASM data. NEFOP data were also used to summarize fishing practices and gear characteristics from 1999 through 2011 to compare to those seen during the 2010-2011 HPTRP management season.

Data

The NEFSC NEFOP was initiated in 1989 to document the bycatch of marine mammals taken incidentally in commercial fishing operations (Waring et al. 2004). The role of NEFOP has since expanded beyond monitoring marine mammal incidental takes. NEFOP monitors commercial fishing from Maine through North Carolina and collects, maintains, and distributes data for scientific and management purposes. Two of the five stated uses for NEFOP data are "to monitor catch and bycatch", and "understand the population status and trends of fish stocks and protected species, as well as the interactions between them" (NOAA Fisheries 2010b). To achieve these and other goals, NEFOP collects data on landed and discarded catch, numerous fishing vessel and gear characteristics, and many other variables. For additional details on the data collected, see the NEFOP Fisheries Observer Program Manual for 2010 at http://www.nefsc.noaa.gov/fsb.

The ASM program was established in response to Amendment 16 of the Northeast Multispecies Fishery Management Plan (FMP) to monitor catch and discards in the large mesh portion of this fishery. Specifically, ASM data are used to monitor Annual Catch Entitlements (ACE) and Annual Catch Limits (ACL) of each stock managed by the FMP as of May 1, 2010 and to verify area fished as well as catch and discards by species and gear type (NOAA Fisheries 2011c, 15 CFR Part 902, 50 CFR Part 648). ASM trips monitor fishing occurring under the large mesh portion of the Northeast Multispecies FMP, which manages an assemblage of 13 species collectively called "groundfish" (Atlantic cod, haddock, pollock, yellowtail flounder, witch flounder, winter flounder, windowpane flounder, American plaice, Atlantic halibut, redfish, ocean pout, white hake, and Atlantic wolffish). Under certain circumstances, the species landed can also include monkfish, skate, and spiny dogfish in addition to the 13 listed in the FMP (15 CFR Part 902, 50 CFR Part 648). The Northeast Multispecies Fishery FMP also manages three small mesh species, though this is essentially treated as a separate FMP and the small mesh fishery is not subject to ASM coverage.

Since the fishery managed by the Northeast Multispecies FMP is commonly called the "groundfish" fishery, for the remainder of this report trips that were or could have been subject to ASM coverage based on their trip declaration as a Northeast Multispecies trip will be referred to as "groundfish" trips. This includes those trips with a Northeast Multispecies trip declaration participating in an approved sector and those in the "common pool" (i.e., those vessels not participating in an approved sector). It also includes those trips fishing under a Northeast Multispecies trip declaration but catching monkfish, skate, and spiny dogfish. In addition, NEFOP sampled trips that were fishing under a Northeast Multispecies FMP permit were included.

Together the ASM and NEFOP observer programs aim to achieve a high coverage level, with the majority of that coverage occurring through the ASM program. In 2010 the combined NEFOP and ASM individual sector coverage ranged from 12.6% to 43.5%, with a groundfish fishery-wide average of 31.7%. The average fishery-wide NEFOP groundfish coverage was 7.3% and ASM coverage was 24.4% (Palmer pers. comm. 2011).

ASM observers receive nearly the same training as the NEFOP observers (NOAA Fisheries 2010a, NOAA Fisheries 2011a) in that both types of observers must demonstrate the same skills, are tested the same during training, and go through the same level of reviews and debriefing after an observed trip (Van Atten pers. comm. 2011). In fact, some observers collect data for both types of trips. One difference between the two programs is the ASM observers collect data on fewer variables than NEFOP observers, though the data they do collect matches fields in NEFOP data. For complete information on the fields collected in ASM and NEFOP data, see the ASM Program Manual and the NEFOP Fisheries Observer Program Manual at http://www.nefsc.noaa.gov/fsb. Another difference between the two programs is that some NEFOP trips are dedicated to watching the net for protected species incidental takes (e.g., marine mammals, sea turtles), while other NEFOP trips are focused on catch and discards as on an ASM trip. All NEFOP and ASM observed trips are directed to document incidental takes, though a trip dedicated to processing fish may have a higher likelihood of missing an incidental take that falls out of a net.

Perhaps the primary difference between the NEFOP and ASM programs is that the ASM program sampled only fishing effort associated with the Northeast Multispecies (groundfish) fishery in 2010 (with approximately 24% coverage). So, the ASM data are not necessarily representative of all gillnet fishing effort in a particular time and area, especially if a significant fraction of the effort is not associated with the Northeast Multispecies fishery. In contrast, the NEFOP program is designed to sample all types of gillnet fishing efforts, though the coverage rate is typically only 5-8%. Consequently, when using the ASM data for calculating harbor porpoise bycatch rates, care was taken to combine the ASM data with NEFOP data in a manner that ensured the final sample was representative of the groundfish/non-groundfish (i.e., Northeast Multispecies fishery/other fisheries) distribution in the NEFOP data (see Bycatch Rates section of the Methods below for more details).

In order to prepare both 2010-2011 datasets (NEFOP and ASM) and the 1999-2011 NEFOP dataset for analysis, recorded dressed landed weights were converted to live weights using established conversion factors (Warden and Orphanides 2008; Palmer 2010) that have been used in past bycatch estimate and compliance calculations (e.g., Orphanides 2011; Orphanides 2010). Rare missing location values were imputed using medians from representative strata using methods described in Warden and Orphanides (2008) as has also been done in past bycatch estimate and compliance calculations (e.g., Orphanides 2011; Orphanides 2010). For the 2010-2011 data, original location values were present in over 99% of SNE and CGOM hauls and no incidental harbor porpoise takes were associated with imputed locations in CCA-associated areas.

Bycatch Rates

Bycatch rates were calculated as the number of observed harbor porpoise incidental takes per observed metric tons (mtons) of live fish landed. A harbor porpoise incidental take was defined as any observed incidentally caught harbor porpoise that was recorded as either alive or dead (fresh or under various stages of decomposition). If an incidental take was recorded as being either moderately or severely decomposed when incidentally caught, the gear's soak duration was examined to see if the incidental take could have reached the recorded state of decomposition within the given the soak time, i.e., whether the harbor porpoise could have been alive when entangled in the net. No observed harbor porpoise incidentally taken within CCA-associated areas were severely decomposed.

When calculating bycatch rates using only the NEFOP data (NEFOP $\mathrm{Byc_{CCA}}$), the number of harbor porpoise observed incidentally taken in a CCA associated time-area (NEFOP Observed $\mathrm{Takes_{CCA}}$) was divided by the amount of effort in the corresponding CCA associated time-area (metric tons of live fish landed = NEFOP Observed $\mathrm{Effort_{CCA}}$):

$$\text{NEFOP Byc}_{\text{CCA}} = \text{NEFOP Observed Takes}_{\text{CCA}} \,/\, \text{NEFOP Observed Effort}_{\text{CCA}}$$

Calculating bycatch rates using NEFOP and ASM data (Joint NEFOP ASM $\mathrm{Byc_{CCA}}$) was slightly more complicated because we needed to account for the fact that there were more ASM data and those data were only recorded from groundfish trips:

$$\begin{aligned}\text{Joint NEFOP ASM Byc}_{\text{CCA}} \\ &= (\text{Groundfish\%}_{\text{CCA}} * \text{GroundfishByc}_{\text{CCA}}) \\ &+ (\text{NonGroundfish\%}_{\text{CCA}} * \text{NonGroundfishByc}_{\text{CCA}})\end{aligned}$$

The ASM data are by definition a subset of the entire gillnet fishery as it is designed to only sample groundfish trips. When calculating the joint NEFOP-ASM bycatch rates, NEFOP data were separated into groundfish and non-groundfish trip types using the NEFOP fleet id code (NOAA Fisheries 2010b). The NEFOP groundfish trips were then pooled with the ASM groundfish trips and used to calculate a groundfish bycatch rate for each CCA associated time-area ($\mathrm{GroundfishByc_{CCA}}$). Similarly, non-groundfish NEFOP data were used to calculate a non-groundfish bycatch rate for each CCA associated time-area ($\mathrm{NonGroundfishByc_{CCA}}$). To preserve the groundfish/non-groundfish ratio of the NEFOP data and retain consistency with how the target bycatch rates were originally calculated from NEFOP data, the percentage of landings from the two trip types (groundfish and non-groundfish) was recorded for each CCA associated time-area ($\mathrm{Groundfish\%_{CCA}}$ and $\mathrm{NonGroundfish\%_{CCA}}$). The NEFOP groundfish and non-groundfish landings percentages ($\mathrm{Groundfish\%_{CCA}}$ and $\mathrm{NonGroundfish\%_{CCA}}$) were used to weight the groundfish and non-groundfish bycatch rates so that the groundfish bycatch rate had an influence proportional to the amount of groundfish trip landings in the NEFOP data.

Standard bootstrapping techniques were used to derive the coefficients of variation (CV) and 95% confidence intervals (CIs) for the bycatch estimates for each stratum, as has been done for past bycatch estimates (e.g., Orphanides 2011). Also consistent with past estimates, the re-sampling unit used was an entire trip rather than an individual haul to ensure that any trip-based characteristics that might influence bycatch rates were carried over into the estimated CV (Bisack 2003).

2010-2011 Pinger Compliance Rates

During times and areas where pingers are required in the New England gillnet fisheries, the 2010 HPTRP requires that each gillnet string has one functioning pinger on each end of the string, and one functioning pinger in between each net. For example, a typical gillnet string with 10 300-foot long nets is required to have 11 functioning pingers on the string. The number of pingers deployed was assessed using only NEFOP data because there is only one question on the ASM data sheets regarding pingers (compared to several on NEFOP data sheets) and it is potentially more likely that ASM observers may miss recording this field, and therefore potentially underestimate pinger use estimates in the ASM (Weeks pers. comm. 2011). In the past the measure of compliance was calculated based only on whether a gillnet haul had the proper number of pingers on the string because the functionality of the pingers was not regularly recorded by NEFOP (Palka et al. 2009, Orphanides et al. 2009). Use of the proper number of pingers on a string, regardless of whether the pinger is working, will be referred to here as full pinger deployment.

Recently, NEFOP developed a new pinger tester that was deployed on a limited sample of NEFOP trips during 2011 (none on ASM trips). On those trips, the aim was to test all of the pingers on each string to determine if they were functioning properly. From these data, total pinger functionality was assessed using all pingers tested. Also, pinger tester data from hauls with full pinger deployment were used to assess the true pinger compliance rate; that is, the percent of hauls that had the correct number of pingers both deployed and functioning. This type of compliance will be referred to as the true compliance.

Pinger functionality values were recorded as:

- 0 = unknown
- 1 = no pingers used on gear
- 2 = audible
- 3 = inaudible, tested and working
- 4 = inaudible, tested and not working
- 5 = inaudible, not tested
- 6 = absent (lost)
- 7 = audible, tested, and detected
- 8 = audible, tested, and not detected
- 9 = other

For this analysis, only pingers that were clearly working or clearly not working were used to assess pinger functionality. The following were considered to be clearly working: 2: audible, 3: inaudible tested and working, 7: audible tested and detected, and 8: audible, tested, and not detected. Only a value of 4 (inaudible, tested and not working) was considered to be clearly not working. The number of pingers on a haul that were clearly working was divided by the total number of tests on that haul that resulted in either a clear working or not working value. Hence, the pinger functionality values that were not clear did not play a role in calculating compliance, they were simply ignored. For example, if 11 pingers were on a haul, 8 were recorded such that it was clear whether they were functioning or not, and of these 8 pingers 6 were clearly working, then the pinger functionality rate on that haul was recorded as 75% (=6/8). In this example, the haul would be considered truly non-compliant based on functionality of the pingers even if the haul had the correct number of pingers present on the nets. Similarly, a haul would also be considered truly non-compliant if all tested pingers were functioning, but the proper number of pingers was not on the string. For example, if there were 7 pingers on a string and they were all functional, but that string was required to have 11 pingers, than that haul would have a pinger functionality rate of 100%, but the haul would be considered truly non-compliant because it did not have the proper number of pingers on the string.

To summarize, several aspects of pinger use and compliance were investigated. First, there is true compliance in which a haul has the proper number of pingers on a string and all pingers are functional. A haul is either truly compliant, or it is not, though true compliance rates or percentages may be discussed on a fleet or area level. For example, a particular CCA-associated area may have a true compliance rate of *x*, where *x* percent of hauls in that area were truly compliant. Second, full pinger deployment was measured. A haul with full pinger deployment is one in which a string simply has the proper number of pingers on a net. Pinger functionality does not play a role in the calculation of full pinger deployment. Full pinger deployment was investigated because pingers are often not tested and it is often not known whether pingers on a string are functional or not. As with true compliance, whether a particular haul has full pinger deployment is a yes or no question, though on a fleet or area level full pinger deployment may be discussed as a percentage. For example, *x* percent of hauls in a particular CCA-associated area had full pinger deployment. Third, pinger functionality was assessed on a fleet-wide level, independent of hauls and independent of compliance. For example, *x* out of *y* pingers tested were functional within a particular CCA-associated area.

1999-2011 Comparisons

Time series containing averages per haul of metric tons of live landings, bycatch rates, soak duration, total gear length, and mesh size, were created for the CCA-associated areas. CCA-associated area time series were also created for full pinger deployment and bycatch rates on hauls with full pinger deployment. These time series were used to compare the bycatch rates and fishing characteristics of the 2010-2011 HPTRP management season to corresponding periods in past years. The method of calculating the bycatch rates for these comparisons are the same as those described for calculating NEFOP-only bycatch rates. All 1999-2011 comparisons were done using only NEFOP data since ASM data were not available prior to May 2010.

RESULTS

2010-2011 Bycatch Rates

The harbor porpoise bycatch rates in the CGOM CCA-associated areas were above the HPTRP limit of 0.031 harbor porpoise/mton landed when using both calculation methods (NEFOP-only, and joint NEFOP-ASM) (Tables 1 and 2). The NEFOP-only CGOM bycatch rate was 0.078 harbor porpoise per mton of landings and the joint NEFOP-ASM bycatch rate was 0.074. The CVs and 95% CIs of these two estimated bycatch rates differed more than the point estimates of the bycatch rates because of differing sample sizes. The CV was 0.34 for the NEFOP-only data with a 95% CI range from 0.025 to 0.131. The joint NEFOP-ASM data had a CV of 0.18 and a 95% CI range of 0.048 to 0.100. The NEFOP-ASM 95% CIs were completely above the target bycatch rate while the NEFOP-only rate CIs overlapped with the target bycatch rate. Sixteen harbor porpoise were observed incidentally taken in the CGOM NEFOP trips and 33 harbor porpoises were observed in the CGOM ASM trips (Figures 3 and 4). Four additional harbor porpoises were observed incidentally taken in ASM trips just outside the borders of the CGOM CCA associated areas in the Western Gulf of Maine closure area. These takes were not included in the calculation of the CGOM CCA-associated areas bycatch rates. The CGOM ASM data contained almost twice as many hauls as the CGOM NEFOP data (1706 versus 883) (Table 3).

The harbor porpoise bycatch rate in the SNE CCA-associated area (0.012 harbor porpoise/mton landed) was below the HPTRP target rate of 0.023 harbor porpoise/mton landed when calculated using NEFOP-only data, but the CV (0.96) was quite large and the 95% CI overlapped with the bycatch rate limit (0.000 – 0.035) (Tables 1 and 2). When using joint NEFOP-ASM data, the bycatch rate (0.048 harbor porpoise/mton landed) was above the HPTRP target rate and the CV (0.43) was quite a bit lower, though the 95% CI (0.007 - 0.088) also overlapped the bycatch rate limit. One harbor porpoise was observed incidentally taken in the SNE NEFOP trips and 13 harbor porpoises were observed in the SNE ASM trips (Figures 3 and 4). The SNE ASM data contained almost twice as many hauls as the SNE NEFOP data (413/238) (Table 3). Five of the 13 ASM harbor porpoise incidental takes in SNE CCA-associated area occurred on one trip.

2010-2011 Pinger Compliance Rates

In the CGOM CCA-associated areas, 70.8% of observed NEFOP and ASM hauls had the correct number of pingers on their nets (Table 3). Within this area, the percent of hauls with the correct number of pingers was 82.5% according to the NEFOP data, and 64.8% in the ASM data. In the SNE CCA-associated area, 57.5% of observed NEFOP and ASM hauls had the correct number of pingers on their nets (Table 3). Within this area, the percent of hauls with the correct number of pingers was 64.7% according to the NEFOP data, and 53.3% in the ASM data.

Results from the pinger tester data show a high percentage of functioning pingers among those tested, but still a low degree of compliance. This is possible because many tested pingers were on strings that did not have the proper number of pingers, and also because even one non-functional pinger on a string would cause it to be non-compliant. Within the CGOM CCA-associated area 92.4% (405/438) of pingers tested were functional and 97.8% (261/267) were functional within the SNE CCA-associated areas. However, functionality alone does not fully account for compliance.

When the pinger tester sample was limited to hauls with full pinger deployment, only half (13/26) of the NEFOP observed CGOM hauls had a full complement of functional pingers. In other words, only half of the hauls with the proper number of pingers were truly compliant when pinger functionality was taken into consideration. When this rate (50%) was applied to NEFOP observed CGOM hauls with full pinger deployment in which pinger functionality was not tested, the true pinger compliance rate (deployed and functional) was 41.2% (= (728 hauls with all pingers present * .50)/883 observed hauls). Among the NEFOP SNE full pinger deployment hauls that were also tested for functionality, all of the hauls tested (8/8) had a full complement of functional pingers. Given that all SNE CCA-associated area hauls tested for pinger functionality were functional, the estimated true pinger compliance rate (present and functional) for NEFOP SNE data remained at 64.7% for this CCA-associated area (=(154 hauls with all pingers present * 1.0)/238 observed hauls).

2010-2011 Pinger Bycatch Rates

The bycatch rate for hauls with full pinger deployment using both NEFOP and ASM data was 0.085 harbor porpoise per mton of landings in CGOM CCA-associated areas and 0.051 harbor porpoise per mton of landings in SNE CCA-associated area (Table 4). However, it is difficult to interpret these numbers since this does not account for functionality of pingers. When examining only hauls known to have truly compliant pinger use (functional and deployed in the proper number), no harbor porpoise were observed incidentally taken. However, this was only 8 hauls with 3.83 mtons of landings in SNE and 13 hauls with 1.59 mtons of landings in CGOM associated areas.

1999-2011 Comparisons

NEFOP data in the CGOM associated times and areas from 1999 through 2011 indicate that many fishing practices and gear characteristics have not changed. Specifically, there are no strong trends in harbor porpoise bycatch rates, metric tons of live landings per haul, total gear length per haul, mesh size, or soak duration per haul (Figures 5 and 6). The percentage of hauls with full pinger deployment showed a large increase over previous management seasons, rising to its highest level since the 1998 HPTRP was implemented (Figure 6). However, it should be noted that pingers were not previously required in some areas within the 2010 CGOM CCA associated times and areas. For example, some of the increase in pinger deployment over previous years may be due to the fact that they are now required in times and areas where they were not previously. The bycatch rate on the hauls with full pinger deployment was also high relative to past rates (Figure 6). However, this does not account for whether the pingers that were present were actually functional, and it is not known if the current proportion of functioning pingers is more or less than that from previous years.

NEFOP data in the SNE associated times and areas from 1999 through 2011 indicate fishing practices and gear characteristics have changed, starting roughly in the 2008-2009 fishing season. Specifically, there was a marked increase in metric tons of live landed catch per haul, average soak duration, and average gear length beginning in the 2008-2009 HPTRP management season (Figure 7). These increases were maintained through the current 2010-2011 fishing season, though the mtons of landings per haul dropped somewhat in 2010-2011 (0.364 mtons) while total gear length and soak duration stayed high in 2010-2011 (roughly 4000 ft per haul and 110 hrs of soak time). Average ASM values from the 2010-2011 fishing season for metric tons of landings, total gear length, and soak duration (0.365 mtons, 4248 ft, and 134 hrs, respectively) were similar to or a little greater than those seen in the NEFOP data. Average mesh size showed no strong trends in the median values from 1999 to 2011, though the distribution of mesh sizes narrowed starting in 2008-2009 such that the mesh size distribution was more concentrated at 12 in (Figure 7). SNE bycatch rates exhibited no obvious trend and a fair amount of inter-annual variability, fluctuating between bycatch rates of zero (1999-2000, 2000-2001, 2007-2008) to 0.075 harbor porpoise per mton landed (2009-2010) for most management seasons (though pingers were not required in much of this area until 2010), with an unusual high bycatch rate of 0.225 harbor porpoise per mton landed in 2006-2007 (Figure 8).

The percentage of full pinger deployment hauls in SNE showed a large increase in 2010-2011 over the previous two management seasons (Figure 8). Despite this increase, only 65% of hauls had the required number of pingers on their nets, and this does not account for pinger functionality. It should also be noted that pingers were not previously required in some areas within the 2010 SNE CCA associated times and areas. As in the CGOM CCA-associated area, some of the increase in pinger deployment over previous years may due to the fact that they are now required in times and areas where they were not previously. The SNE bycatch rate on full pinger deployment hauls was relatively low (Figure 8). Again, bycatch rates do not reflect whether the pingers that were present were actually functional, and it is not known if the current number of functioning pingers per string is more or less than that from previous years.

DISCUSSION

The 2010-2011 HPTRP bycatch rates were not unusually high given high bycatch rates in previous years and the continued lack of compliance with pinger regulations. The 2010-2011 bycatch rates were well above the HPTRP target bycatch rates if both the NEFOP and ASM data were used to calculate the bycatch rates (joint NEFOP-ASM bycatch rates), though these bycatch rates were not very different from those seen in the recent past (Figures 6 and 8). Landings per haul were also fairly consistent with past years (Figures 5 and 7), particularly in the CGOM, and so does not seem to be a cause for increased bycatch rates. This is despite an overall decrease in the number vessels fishing and the days spent fishing per vessel (Kitts et al 2011). Similarly, the 2010-2011 pinger usage was not markedly better than recent management seasons, especially if pinger functionality was factored into the compliance calculations (Table 3 and Figures 6 and 8).

The sample size of hauls with the full required complement of pingers that were tested for functionality in 2011 is small, so the resulting data are not likely to provide a precise estimate of true compliance. However, the functionality data do clearly indicate that full pinger deployment does not reflect true compliance and that true compliance is likely lower than the full pinger deployment rate. This may be particularly true in the CGOM CCA-associated areas where half of the hauls with full pinger deployment tested for pinger functionality did not have all pingers functional. At first glance, one would expect a high percentage of functional pingers in the overall fleet to lead to a high compliance rate, at least on those hauls with the proper number of pingers present. However, even with greater than 9 out of 10 tested pingers functional (92.4% and 97.8% in CGOM and SNE CCA-associated areas, respectively), this can still result in a high degree of non-compliance given that most gillnet strings have 10 or more nets on a string, and all pingers need to be functional for the haul to be compliant.

It is possible that the mix of working and non-working pingers may result in much higher bycatch rates than on hauls with a full complement of functional pingers. This was evident in the 2010-2011 management season in the CGOM CCA-associated area, where the bycatch rate of hauls with full pinger deployment was slightly higher than the bycatch rate of all hauls. This phenomenon has also been seen in this fishery in the past when Palka et al. (2008) showed that bycatch rates can be very high when pingers are used, if an insufficient number of pingers are deployed. The combination of using some pingers, but not the required number, and using non-functional pingers may have contributed to the high bycatch rates in the CGOM and SNE CCA-associated areas.

In this paper two sets of CCA bycatch rates were calculated. One set was calculated using only NEFOP data, and the other set was calculated using both NEFOP and ASM data. It could be argued that NEFOP data should be used when calculating the CCA bycatch rates because NEFOP data were used to set the HPTRP target rates (ASM data did not exist at the time). However, statistically speaking, the joint NEFOP-ASM bycatch rates should be more accurate.

The primary purpose of collecting ASM data is to record the catch, and especially discards for groundfish quota monitoring. This is advantageous for estimating harbor porpoise bycatch rates since the unit of effort is landings. Further, the inclusion of the ASM data substantially increases the sample size, which should result in a more representative sample of the fishery and more accurate and precise bycatch estimates. This is reflected in the lower CVs for the joint NEFOP-ASM bycatch rates. Additionally, NEFOP and ASM observers receive very similar training (NOAA Fisheries 2010a, NOAA Fisheries 2011a), and both demonstrate and are tested on the same skills and go through the same level of reviews and debriefings (Van Atten pers. comm. 2011). Also, some NEFOP observers are also ASM observers, and fishermen are not told whether the observer is recording an ASM or NEFOP trip when an observer comes on board a fishing vessel (though this information is not withheld if the observer is asked). Lastly, NEFOP and ASM observers are both allocated to groundfish trips using the same process (the Pre-Trip Notification System, or PTNS) (NOAA Fisheries 2011b). Therefore, any difference in bycatch rates is likely due to chance. If anything, we would expect ASM data to slightly underestimate actual bycatch rates because ASM observers may miss a take that falls out of a net due to being focused on landings. In contrast, some NEFOP trips are dedicated to documenting protected species incidental takes instead of fish catch and discards, and are therefore less likely to miss an incidental take.

The issues of sample size, chance, and variability are more evident in the SNE region because this area had less and more varied fishing effort, resulting in a smaller sample size and bycatch rates that vary widely from year to year, particularly in the last six management seasons (Figure 8). For example, the ASM trip in the SNE CCA-associated area that caught five of that region's 13 ASM observed incidental takes of harbor porpoise had a large impact on the final bycatch rates for that area. If this trip were in the NEFOP data instead, the NEFOP and ASM bycatch rates would have been much more similar, and the NEFOP bycatch rate would have actually been higher than the ASM rate. That is not to say that the ASM rate is not representative, in fact it is likely more representative of bycatch in that time-area than the NEFOP data due to its larger sample size. Relying solely on NEFOP data for the CCA bycatch rates, particularly in the SNE CCA-associated area, is more likely to produce more variable bycatch rates from year to year.

In order for observed bycatch rates to change from what was seen in the past, and for that change not to be due to chance, something should have changed either in fishing practices or in the abundance, distribution, or behavior of the harbor porpoises. If the high SNE CCA-associated area bycatch rate seen in the ASM data is representative of a recent increase in true bycatch rates in this region, then this could be due in part to an apparent shift in that region towards fishing with longer soak times and longer gear lengths (Figure 7), both of which have been correlated with increasing bycatch (Orphanides 2009; Palka et al. 2009). In the CGOM CCA-associated areas it does not appear that basic gear parameters have changed, though the use of a mix of working and non-working pingers may have resulted in higher bycatch rates (Palka et al. 2008). Additionally, the shift to catch shares and sector management in the Northeast multispecies fishery may have changed fishing patterns that could impact bycatch rates. However, this has only begun to be investigated and changes may come to light in future reports (Kitts et al. 2011).

Increases in the abundance of harbor porpoise could also result in increasing bycatch rates as long as the gillnet fishery and harbor porpoises continue to overlap in space and time. A new harbor porpoise abundance estimate is currently being calculated, and this will be further evaluated at a later date. Shifts in harbor porpoise distribution could be occurring due to climate change and associated shifts in prey species and water temperature, though this has not been investigated. Harbor porpoise pinger habituation seems unlikely, though not impossible, given the absence of any evidence of habituation in a recent analysis (Palka et al. 2008). It is possible that there are a number of factors at play in the 2010-2011 HPTRP bycatch rates, though the most likely cause for the high bycatch rates observed seems to be the continued lack of compliance with pinger regulations.

ACKNOWLEDGEMENTS

Special thanks to the NEFOP and ASM observers whose data make this analysis possible. Also, much gratitude is due to several NEFOP and DMS staff members who sped the processing of the NEFOP gillnet data in order to help get this paper published as quickly as possible. Thanks to anonymous staff members at the NEFSC for their reviews and comments on this paper. Lastly, thanks to M. Palmer and several Protected Species Branch members for help getting up to speed on the ASM data and sector management.

REFERENCES CITED

Anderson DR. 2008. Model Based Inference in the Life Sciences: A primer on evidence. Breinigsville (PA). Springer. p. 83-104.

Bisack KD. 2003. Estimates of marine mammal bycatch in the Northeast (New England) multispecies sink gillnet fishery in 1996. US Dep Commer, Northeast Fish Sci Cent Ref Doc. 03-18; 18 p. Available from: NOAA Fisheries, 166 Water St, Woods Hole MA 02543-1026 or http://www.nefsc.noaa.gov/nefsc/publications/

Kitts A, Bing-Sawyer E, McPherson M, Olson J, Walden J. 2011. Report for Fishing Year 2010 on the Performance of the Northeast Multispecies (Groundfish) Fishery (May 2010 – April 2011). US Dept Commer, Northeast Fish Sci Cent Ref Doc. 11-12; 44 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/

NOAA Fisheries. 2010a. Training standards for the At-Sea-Monitoring System. http://www.nefsc.noaa.gov/fsb/FSB_Training/ASM_Training_Standards12_28_10.pdf. 12/28/10

NOAA Fisheries. 2010b. Northeast Fisheries Observer Program Fisheries Observer Program Manual 2010. Available from: U.S. Dept. of Commerce/NOAA Fisheries Service, National Marine Fisheries Service, Northeast Fisheries Science Center, Fisheries Sampling Branch, 166 Water Street, Woods Hole, MA 02543 or http://www.nefsc.noaa.gov/fsb

NOAA Fisheries. 2011a. Northeast Fisheries Observer Training Standards. 06/11. http://www.nefsc.noaa.gov/fsb/Misc/NEFOP Training Standards June 2011.pdf

NOAA Fisheries. 2011b. Fishing Notification System. http://www.nefsc.noaa.gov/fsb/Observer_Pre-Trip_Notification.html. Accessed 09/07/11

NOAA Fisheries. 2011c. At-Sea-Monitoring Program Manual. 06/11. Available from: U.S. Dept. of Commerce/NOAA Fisheries Service, National Marine Fisheries Service, Northeast Fisheries Science Center, Fisheries Sampling Branch, 166 Water Street, Woods Hole, MA 02543 or http://www.nefsc.noaa.gov/fsb

Orphanides CD. 2009. Protected species bycatch estimating approaches: Estimating harbor porpoise bycatch in the U.S. northwestern Atlantic gillnet fisheries. J. Northw. Atl. Fish Sci. 42: 55-76.

Orphanides CD, Wetmore S, Johnson A. 2009. Update on Harbor Porpoise Take Reduction Plan Monitoring Initiatives: Compliance and Consequential Bycatch Rates from June 2007 through May 2008, Pinger Tester Development and Enforcement from January 2008 through July of 2009. US Dept Commer, Northeast Fish Sci Cent Ref Doc. 09-14; 16 p.

Available from: National Marine Fisheries Service, 166 Water Street, Woods Hole, MA 02543-1026 or http://www.nefsc.noaa.gov/publications/

Orphanides CD. 2010. Update on Harbor Porpoise Take Reduction Plan Monitoring Initiatives: Compliance and Consequential Bycatch Rates from June 2008 through May 2009. Available from: National Marine Fisheries Service, 166 Water Street, Woods Hole, MA 02543-1026, or online at http://www.nefsc.noaa.gov/nefsc/publications/

Orphanides CD. 2011. Estimates of Cetacean and Pinniped Bycatch in the 2009 New England Sink Gillnet and Mid-Atlantic Gillnet Fisheries. US Dept Commer, Northeast Fish Sci Cent Ref Doc. 11-08; 28 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/

Palka DL, Rossman, MC, VanAtten, AS, and CD Orphanides. 2008. Effect of pingers on harbour porpoise bycatch in the US northeast gillnet fishery. J. Cetacean Res. Manage. 10(3):217-226.

Palka DL, Orphanides CD. 2008. Harbor porpoise bycatch rates that indicate compliance with pinger regulations for the Northeast gillnet fishery. US Dept Commer, Northeast Fish Sci Cent Ref Doc. 08-10; 13 p.

Palka DL, Orphanides CD, and Warden ML. 2009. Summary of harbor porpoise (Phocoena phocoena) bycatch and levels of compliance in the Northeast and Mid-Atlatnic gillnet fisheries after the implementation of the Take Reduction Plan: 1 January 1999 – 31 May 2007. NOAA Technical Memorandum NMFS-NE-212.

Palmer MC. 2010. A standard method to apportion groundfish catch to stock area for the purpose of real time quota monitoring under Amendment 16. US Dept Commer, Northeast Fish Sci Cent Ref Doc. 10-02; 32 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/.

Warden ML, Orphanides CD. 2008. Preparation of the Northeast Fisheries Observer Program gillnet data for use in bycatch analyses of protected species. US Dept Commer, Northeast Fish Sci Cent Ref Doc. 08-17; 44 p. Available from: National Marine Fisheries Service, 166 Water Street, Woods Hole, MA 02543-1026 or http://www.nefsc.noaa.gov/publications/

Waring GT, Pace RM, Quintal JM, Fairfield CP, Maze-Foley K, Editors. 2004. US Atlantic and Gulf of Mexico marine mammal stock assessments -- 2003. US Dep Commer, NOAA Tech Memo NMFS NE 182; 287 p. Available from: NOAA Fisheries, 166 Water St, Woods Hole MA 02543-1026 or http://www.nefsc.noaa.gov/nefsc/publications/

Table 1. Observed incidentally taken harbor porpoise, landings, and percent Northeast Fishery Observer Program (NEFOP) groundfish trip landings by Consequence Closure Area (CCA)-associated area in the New England gillnet fishery for the 2010-2011 HPTRP management season.

CCA-Associated Area	Total Harbor Porpoise (harbor porpoise on groundfish hauls)		Total Landings in mtons (groundfish landings in mtons)		NEFOP Percent Groundfish Trip Landings
	NEFOP	ASM	NEFOP	ASM	
Coastal Gulf of Maine	16 (16)	33 (33)	205.78 (203.58)	447.88 (447.88)	98.93%
Southern New England	1 (0)	13 (13)	86.89 (49.55)	150.89 (150.89)	57.03%

Table 2. Bycatch rates, coefficients of variations (CVs), and 95% confidence intervals (CIs) by Consequence Closure Area (CCA)-associated area in the New England gillnet fishery for the 2010-2011 HPTRP management season.

		NEFOP-only			Joint NEFOP-ASM		
CCA-Associated Area	HPTRP Target rate (harbor porpoise/mton landings)	Bycatch rate (harbor porpoise/mton landings)	CV	95% CI	Bycatch rate (harbor porpoise/mton landings)	CV	95% CI
Coastal Gulf of Maine	0.031	0.078	0.34	0.025 - 0.131	0.074	0.18	0.048 - 0.100
Southern New England	0.023	0.012	0.96	0.000 - 0.035	0.048	0.43	0.007 - 0.088

Table 3. Estimated Harbor Porpoise Take Reduction Plan (HPTRP) pinger compliance in the New England gillnet fishery during the 2010-2011 HPTRP management season.

CCA-Associated Area	Data Source	Full pinger deployment hauls	Non-Full Pinger Deployment Hauls	Total Observed Hauls	Full Pinger Deployment Percentage	Recorded Hauls (and Trips) Tested for Pinger Functionality	Full Pinger Deployment Hauls (and Trips) Tested for Pinger Functionality	Functionality on Full Pinger Deployment Hauls	Percent Compliant Estimate
Coastal Gulf of Maine	ASM	1106	600	1706	64.83%	0	0	NA	NA
Coastal Gulf of Maine	NEFOP	728	155	883	82.45%	38 (13)	26 (11)	50.00%	41.22%
Southern New England	ASM	220	193	413	53.27%	0	0	NA	NA
Southern New England	NEFOP	154	84	238	64.71%	15 (11)	8 (6)	100.00%	64.71%

Table 4. Bycatch rates of hauls with full pinger deployment by Consequence Closure Area (CCA)-associated area in the New England gillnet fishery for the 2010-2011 HPTRP management season.

CCA-Associated Area	Data Source	Harbor Porpoise	Mtons Landings	Harbor Porpoise Bycatch Rate
Coastal Gulf of Maine	ASM	24	298.72	0.080
Coastal Gulf of Maine	NEFOP	16	169.70	0.094
Coastal Gulf of Maine Total	NEFOP & ASM	40	468.42	0.085
Southern New England	ASM	6	80.42	0.075
Southern New England	NEFOP	1	58.12	0.017
Southern New England Total	NEFOP & ASM	7	138.54	0.051

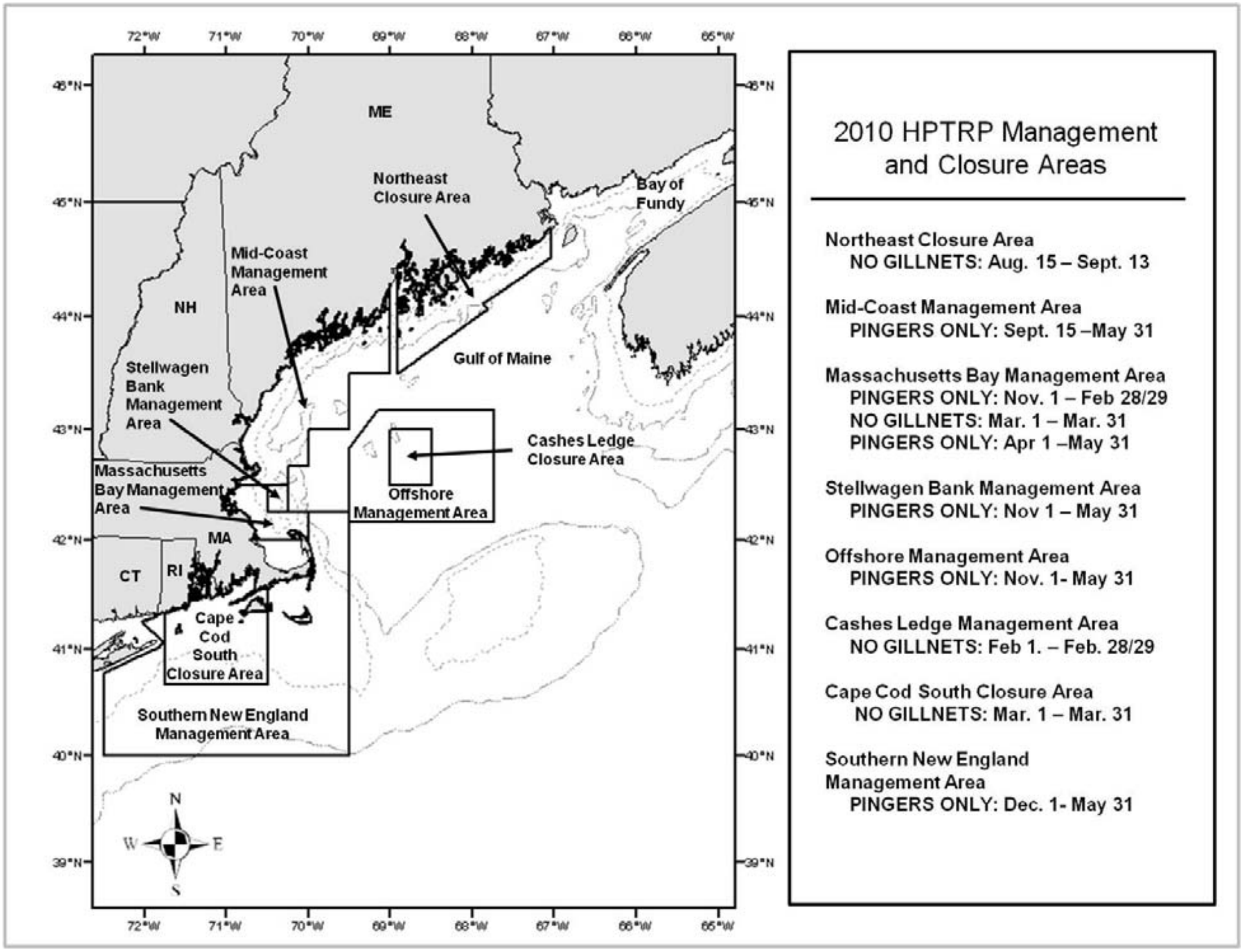


Figure 1. Harbor Porpoise Take Reduction Plan (HPTRP) New England gillnet management and closure areas.

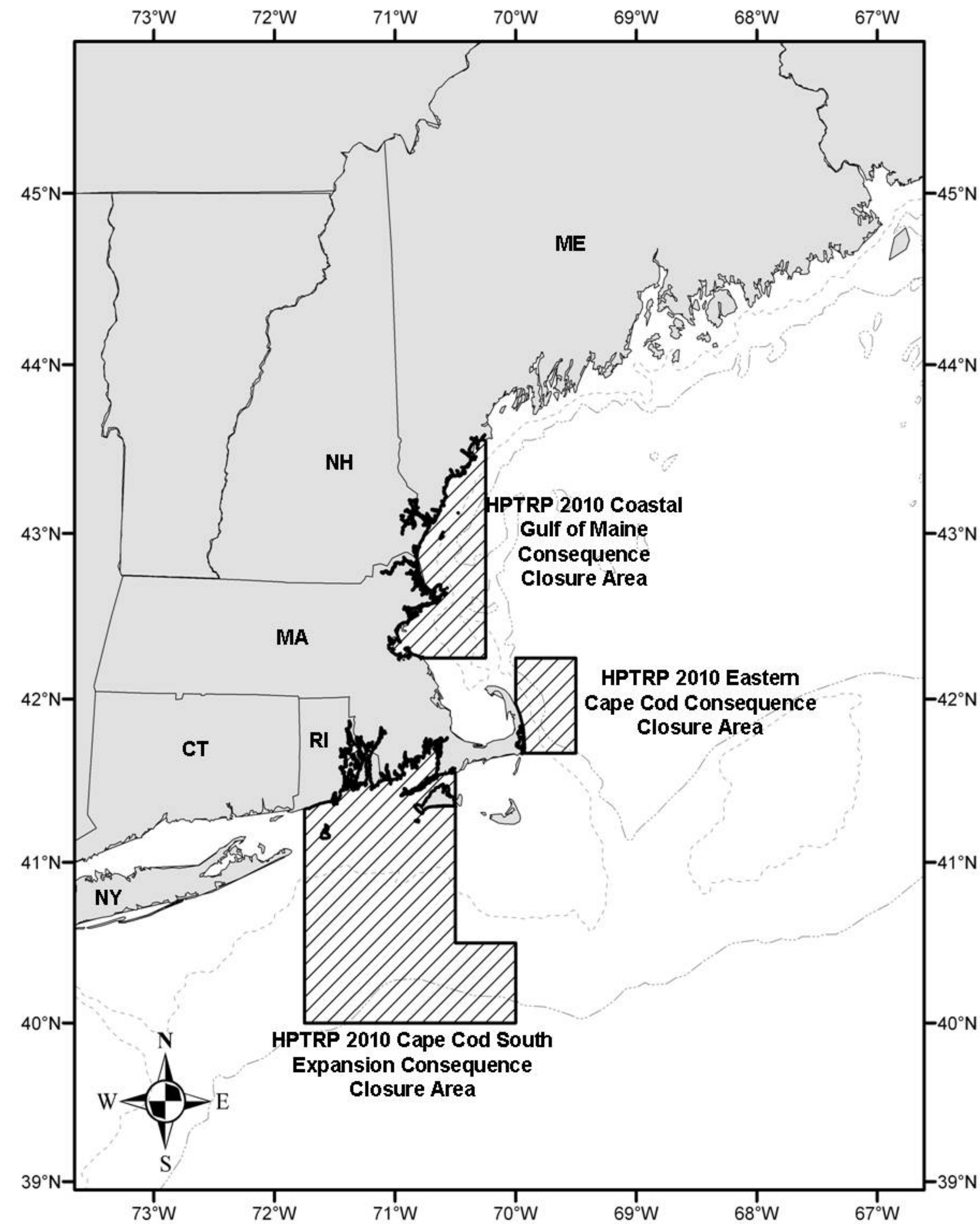


Figure 2. Harbor Porpoise Take Reduction Plan (HPTRP) New England gillnet Consequence Closure Areas (CCAs).

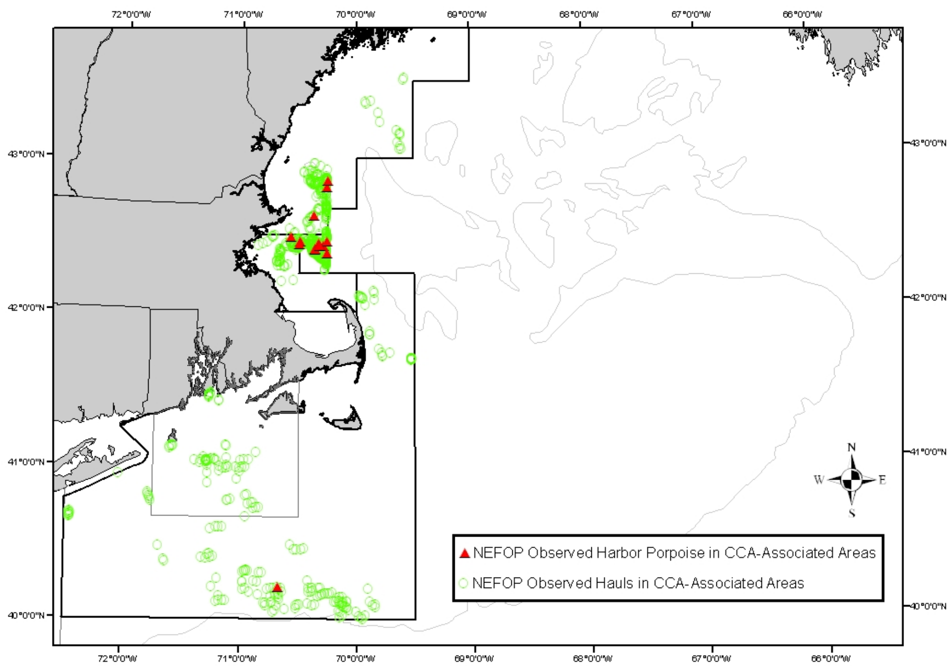


Figure 3. Northeast Fishery Observer Program (NEFOP) observed gillnet hauls and harbor porpoise bycatch locations for the 2010-2011 Harbor Porpoise Take Reduction Plan (HPTRP) management season.

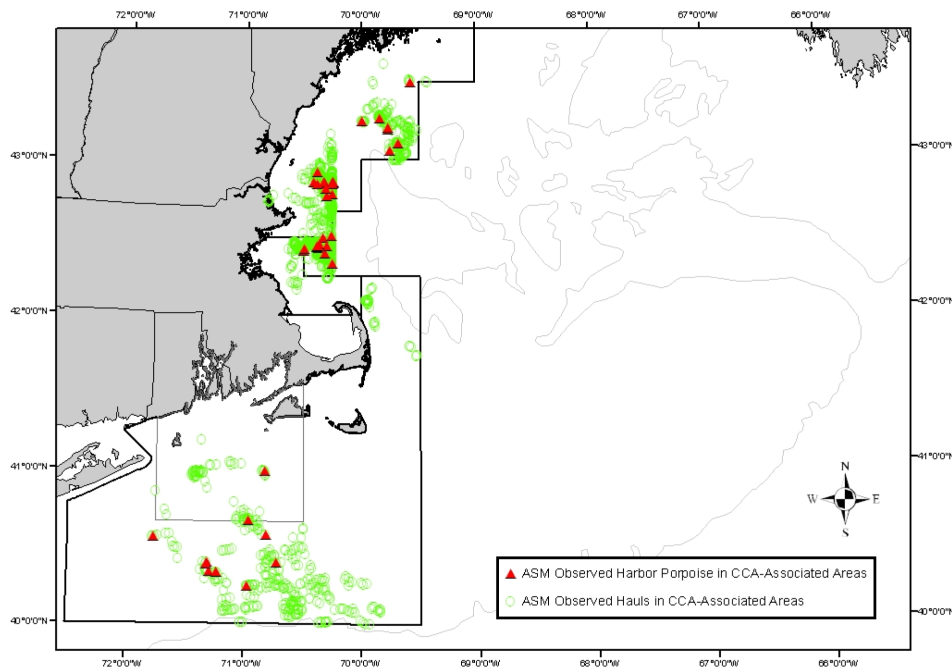
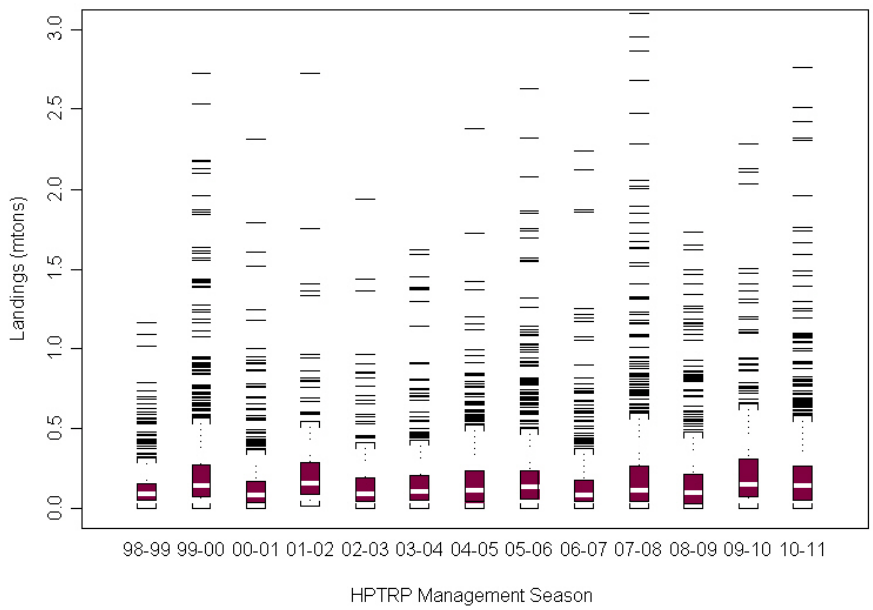
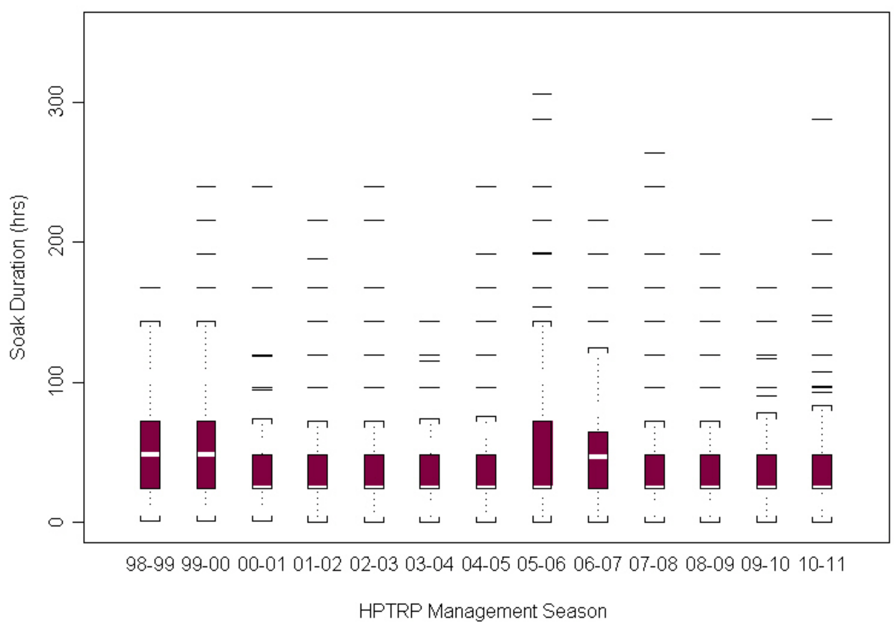


Figure 4. At-Sea-Monitor (ASM) observed gillnet hauls and harbor porpoise bycatch locations for the 2010-2011 Harbor Porpoise Take Reduction Plan (HPTRP) management season.

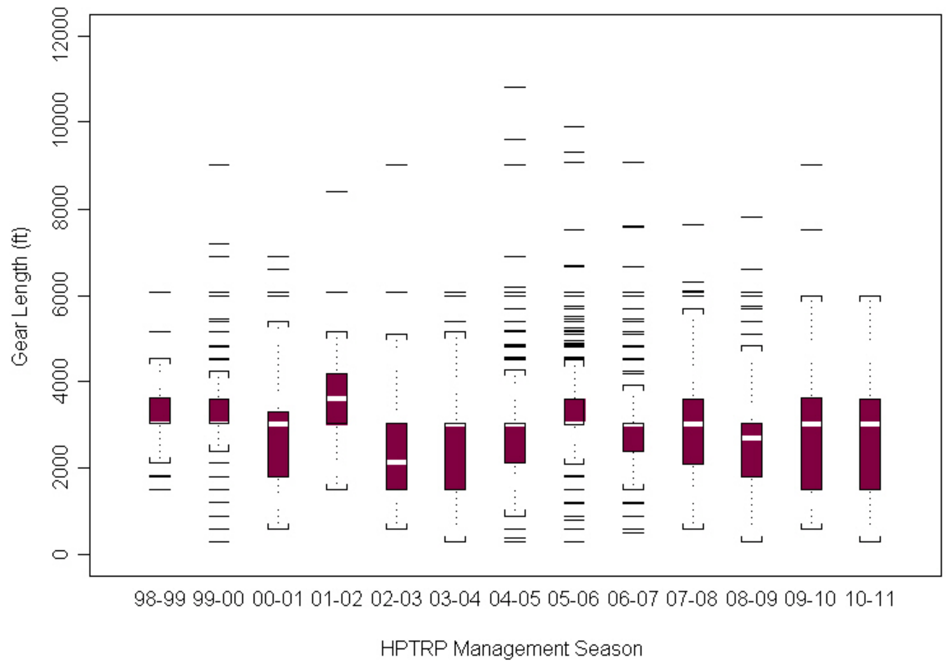


A

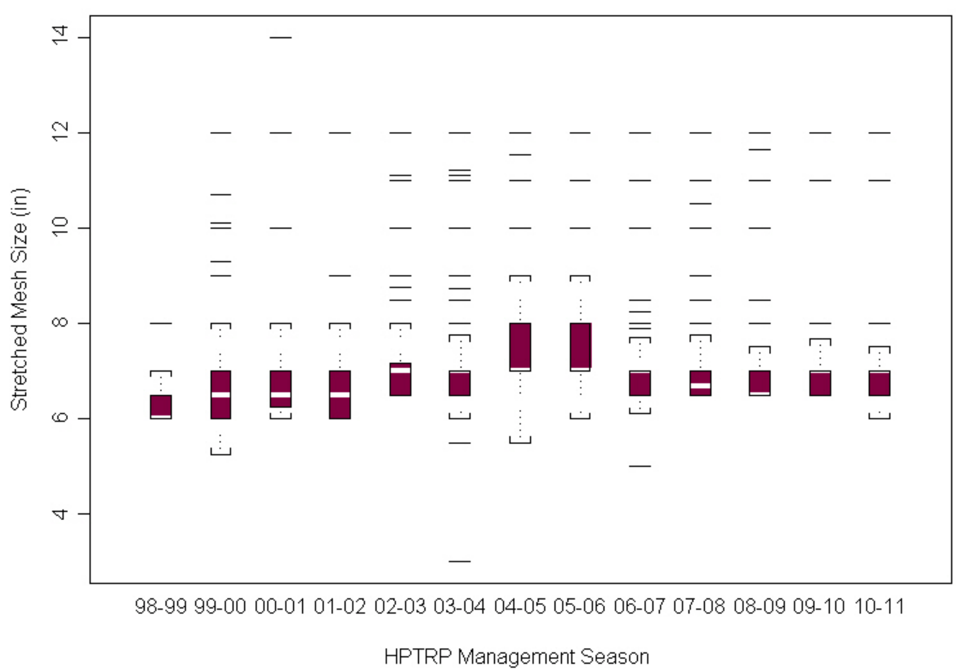


B

Figure 5. 1999-2011 Northeast Fishery Observer Program (NEFOP) Coastal Gulf of Maine (CGOM) Consequence Closure Area (CCA)-associated area effort and gear summaries. (A) Annual averages of metric tons of landings per haul, (B) soak duration per haul, (C) gear length per haul, and (D) stretched mesh size per haul.



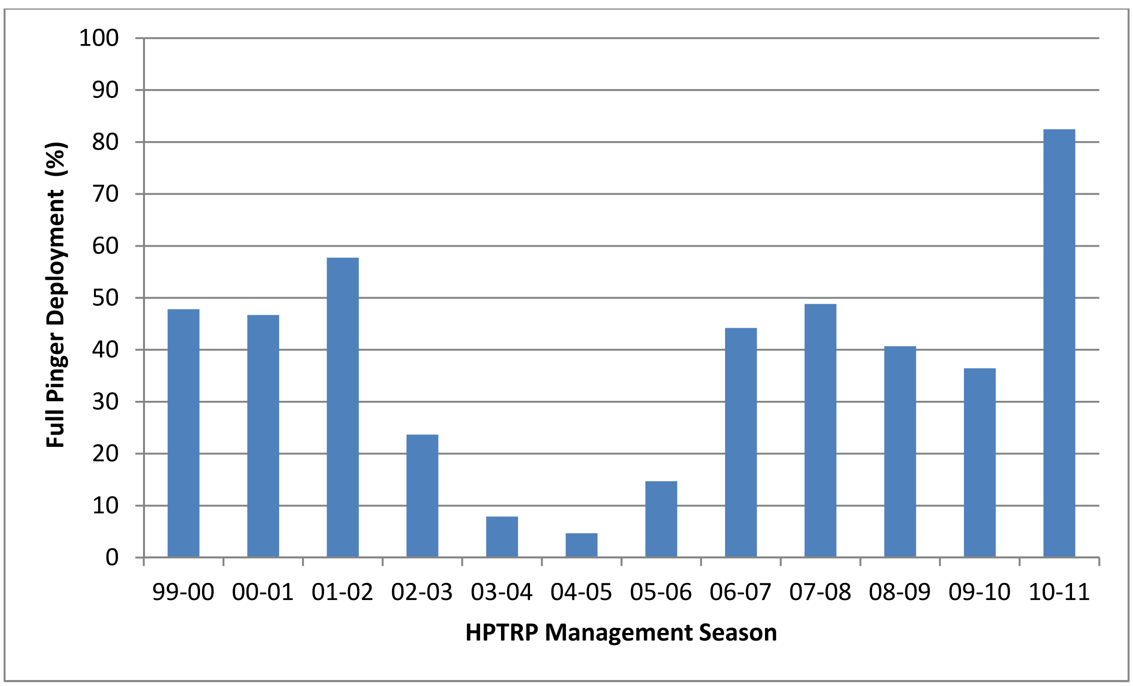
C



D

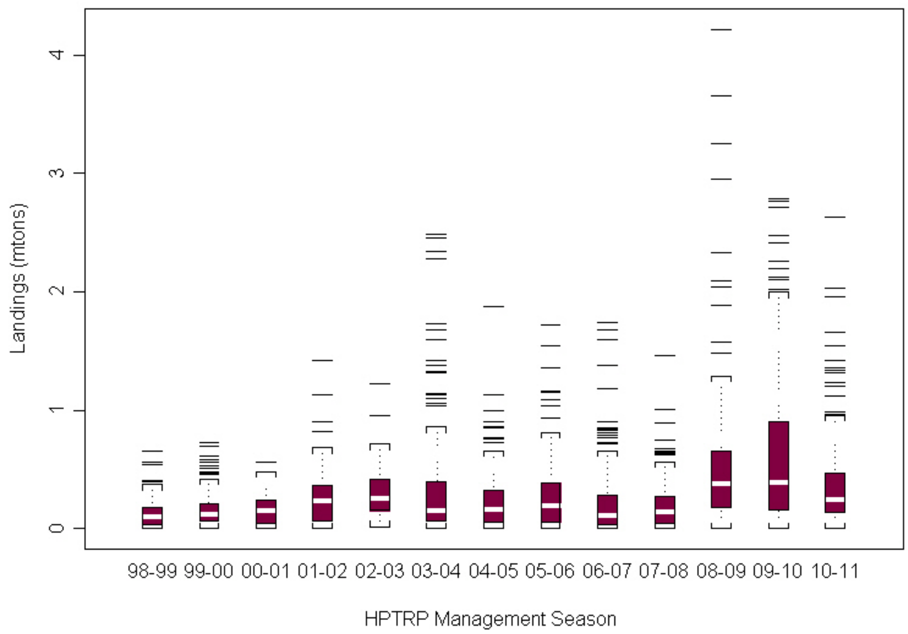
Figure 5, continued. 1999-2011 Northeast Fishery Observer Program (NEFOP) Coastal Gulf of Maine (CGOM) Consequence Closure Area (CCA)-associated area effort and gear summaries. (A) Annual averages of metric tons of landings per haul, (B) soak duration per haul, (C) gear length per haul, and (D) stretched mesh size per haul.

A

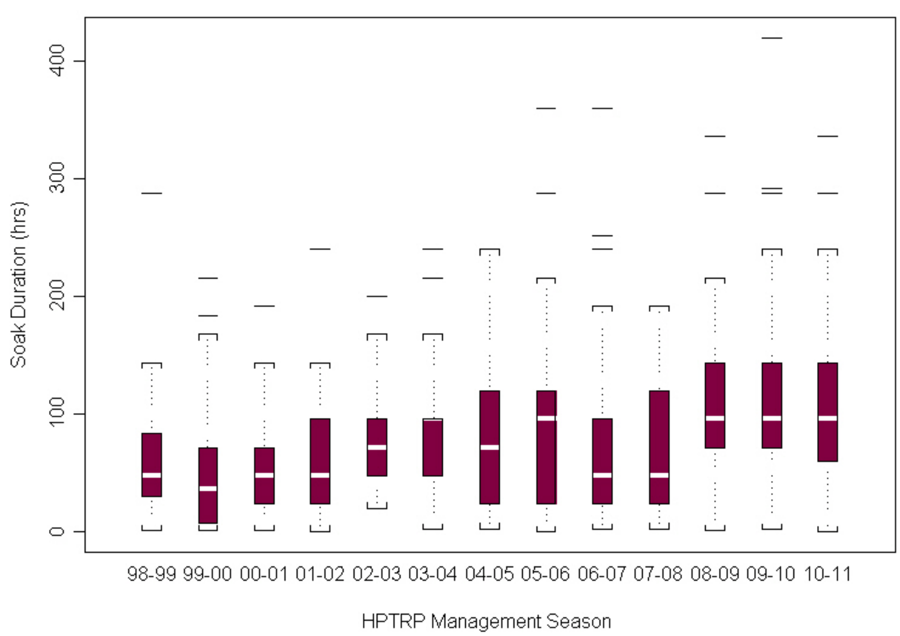


B

Figure 6. 1999-2011 Northeast Fishery Observer Program (NEFOP) Coastal Gulf of Maine (CGOM) Consequence Closure Area (CCA)-associated area bycatch rate and full pinger deployment rate summaries. (A) Annual bycatch rates using all observed NEFOP hauls and bycatch rates on hauls with full pinger deployment. (B) Full pinger deployment rates by HPTRP management season.

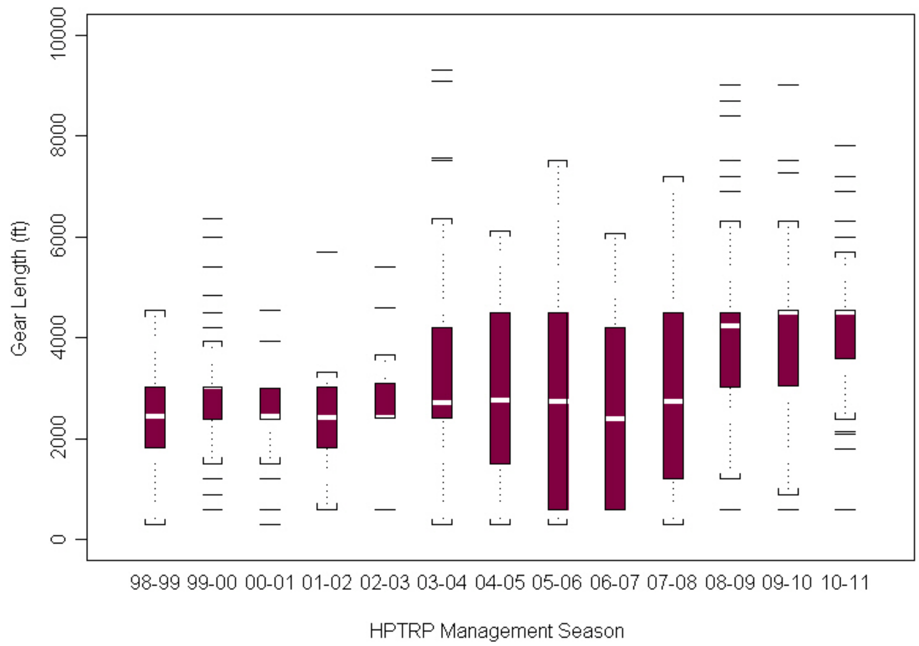


A

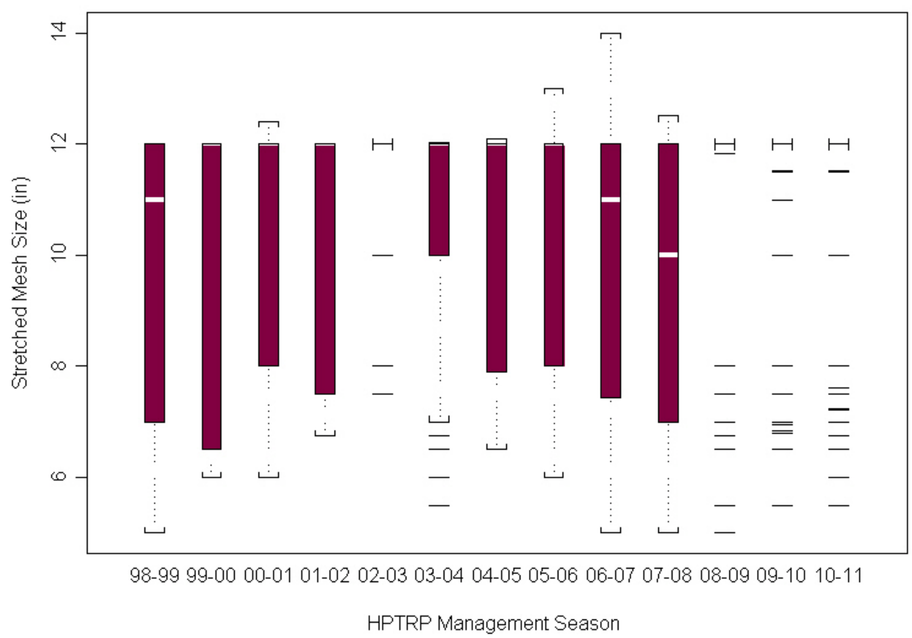


B

Figure 7. 1999-2011 Northeast Fishery Observer Program (NEFOP) Southern New England (SNE) Consequence Closure Area (CCA)-associated area effort and gear summaries. (A) Annual averages of metric tons of landings per haul, (B) soak duration per haul, (C) gear length per haul, and (D) stretched mesh size per haul.

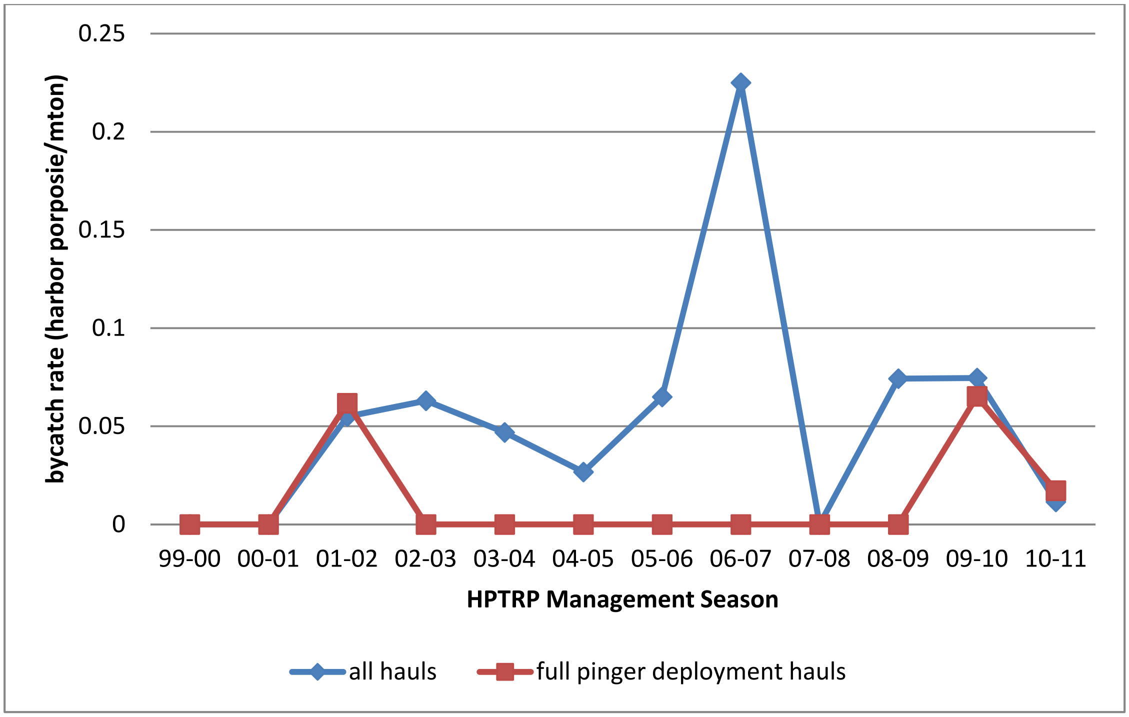


C



D

Figure 7, continued. 1999-2011 Northeast Fishery Observer Program (NEFOP) Southern New England (SNE) Consequence Closure Area (CCA)-associated area effort and gear summaries. (A) Annual averages of metric tons of landings per haul, (B) soak duration per haul, (C) gear length per haul, and (D) stretched mesh size per haul.



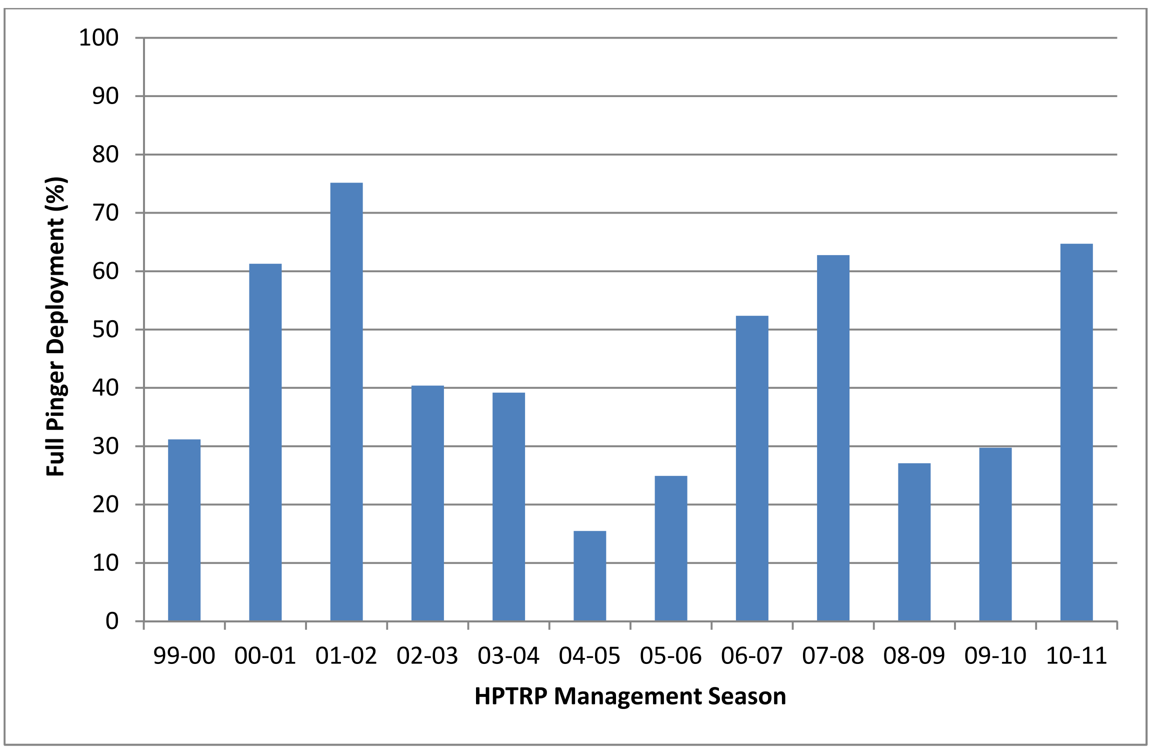


Figure 8. 1999-2011 Northeast Fishery Observer Program (NEFOP) Southern New England (SNE) Consequence Closure Area (CCA)-associated area bycatch rate and full pinger deployment rate summaries. (A) Annual bycatch rates using all observed NEFOP hauls and bycatch rates on hauls with full pinger deployment. (B) Full pinger deployment rates by HPTRP management season.

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.