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Update on Harbor Porpoise Take Reduction Plan Monitoring Initiatives: Compliance and Consequential Bycatch Rates from June 2008 through May 2009

by Christopher D. Orphanides

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ABSTRACT

Harbor Porpoise Take Reduction Plan (HPTRP) compliance and bycatch rate analyses are updated for US Northwestern Atlantic gillnet fisheries using data from June 2008 through May 2009 (the 2008-2009 fishing year). The observed overall compliance rate with the 1998 HPTRP regulations, which were in place during the 2008-2009 fishing season, was 53.2%. Dividing the fisheries by region, the New England gillnet fishery had a compliance rate of 51.9%, and the Mid-Atlantic gillnet fishery had a compliance rate of 56.3%. Bycatch rates from the 2008-2009 fishing season were also examined relative to the 1998 and 2010 HPTRPs, even though the 2010 HPTRP amendments were not yet in place. Observed bycatch rates were much higher in the new management areas (MAs) implemented through the 2010 HPTRP amendments (which were not in place during the 2008-2009 fishing season) as compared to the observed bycatch rate in the 1998 HPTRP MAs. In the New England fishery, the observed bycatch rate in 2010 HPTRP MAs that are not included in the 1998 HPTRP (0.171 harbor porpoise/mtons landed) was over seven times the observed rate in the 1998 HPTRP MAs (0.023 harbor porpoises/mtons landed). Correspondingly, 59.5% (22 of 37) of the observed takes in the 2008-2009 fishing season occurred in the times and areas which will be managed under the 2010 HPTRP but are not managed under the 1998 HPTRP. Bycatch rates in the 2010 HPTRP areas associated with Consequence Closure Areas (CCAs) were well above future target rates that would trigger seasonal closures. The bycatch rate (0.101 harbor porpoise/mtons landed) in the 1998 and 2010 HPTRP MAs in nets that did not have the required number of pingers, was almost three times higher than the bycatch rate (0.035 harbor porpoise/mtons landed) from pingered nets in the same times and areas. This indicates that pingers still appear to reduce bycatch of harbor porpoises, although it is not possible to currently determine how many of the pingers were actually functional. Hypothetically, if the 2010 HPTRP amendments had been in place during the 2008-2009 fishing season and there was full compliance with the 2010 HPTRP, then it is predicted that the observed bycatch could have been reduced by 35-46%. Total estimated bycatch for the entire US Northwestern Atlantic gillnet fisheries (as compared to the subset observed by the Northeast Fisheries Observer Program) would likely also decrease by a similar amount.

INTRODUCTION

Since the beginning of the Northeast Fisheries Observer Program (NEFOP) in 1989, harbor porpoise bycatch in gillnets has been the focus of much attention. Over the years two Harbor Porpoise Take Reduction Plans (HPTRPs) have been put in place to reduce the serious injury and mortality of the Gulf of Maine/Bay of Fundy stock of harbor porpoises (*Phocoena phocoena*). The first HPTRP was implemented on January 1, 1999. From here on, this HPTRP will be referred to as the 1998 HPTRP.

Since the implementation of the 1998 HPTRP, a meeting of the Harbor Porpoise Take Reduction Team (HPTRT) was convened in December 2007 in response to recent harbor porpoise bycatch estimates that were above the stock's Potential Biological Removal¹ (PBR) level. The aim of this HPTRT meeting was to develop management actions that would reduce harbor porpoise bycatch in New England and Mid-Atlantic gillnet fisheries to levels below the stock's PBR and approaching the Zero Mortality Rate Goal (ZMRG), which is defined as 10% of PBR. To meet these goals, the meeting focused on addressing non-compliance with the HPTRP as well as harbor porpoise bycatch occurring outside of the HPTRP Management Areas (MAs).

In January 2008, the HPTRT discussions continued to address modifications to the 1998 HPTRP during a follow-up conference call. Based on the recommendations received from the HPTRT, NMFS published a proposed rule (74 FR 36058) on July 21, 2009 to amend the 1998 HPTRP, in which the modifications included an expansion of current HPTRP MAs, new management measures, implementation of a "consequence" closure area strategy in New England, and increased enforcement, monitoring, and outreach efforts.

On February 19, 2010 NMFS published a final rule amending the 1998 HPTRP (75 FR 7383), which was virtually unchanged from the proposed rule. From here on, this HPTRP will be referred to as the 2010 HPTRP. The 2010 HPTRP includes the same requirements and MAs as the 1998 HPTRP, with the following additions: 1) slight expansion in the size of the Massachusetts Bay MA as well as the pinger regulated season to include the month of November; 2) creation of the Stellwagen Bank MA (requiring pingers from November through May) as well as the Southern New England MA (requiring pingers from December through May); 3) implementation of the "consequence" closure area strategy; 4) creation of the Mudhole South MA in the Mid-Atlantic; 5) modification to the tie-down spacing requirement on large mesh gillnets in the Mid-Atlantic; and 6) slight modification to the northern boundary of the Waters off New Jersey.

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 12699). This was due to concerns expressed by members of the gillnet fishing

¹ PBR is defined as the maximum number of animals that may be removed from a marine mammal stock while allowing that stock to reach or maintain its optimum sustainable population. For the specifics on the harbor porpoise PBR, see the harbor porpoise stock assessment chapter in the most recent report on the US Atlantic and Gulf of Mexico Marine Mammal Stock Assessments (Waring et al. 2009) (<http://www.nefsc.noaa.gov/publications/tm/tm213/>)

industry regarding the lack of availability of pingers and the short time required to complete mandatory pinger authorization training. However, all other new 2010 HPTRP requirements became effective March 22, 2010.

One of the key new components of the 2010 HPTRP to address non-compliance is the Consequence Closure Area (CCA) strategy. Under this strategy, if the average bycatch rate from two consecutive management seasons in areas associated with a CCA exceeds a specified target bycatch rate, a seasonal closure of that CCA would be triggered. The CCA strategy involves three potential seasonal closure areas; these areas overlap with existing MAs. The Coastal Gulf of Maine CCA overlaps with the Mid-Coast, Stellwagen Bank, and Massachusetts Bay MAs. The Eastern Cape Cod and Cape Cod South Expansion CCAs overlap with the Southern New England MA (Figure 1C). A plan to monitor compliance was developed along with an improved enforcement strategy (NOAA Fisheries PRD 2010). Compliance with the HPTRP requirements is critical to maximizing the effectiveness of the HPTRP, and the development of the monitoring plan and enforcement strategy will contribute significantly toward achieving the goals and objectives of the HPTRP. For more information on the 1998 and 2010 HPTRP regulations, view the NOAA Fisheries Service Northeast Regional Office's HPTRP website at: http://www.nero.noaa.gov/prot_res/porptrp/.

This paper will assess compliance with the 1998 HPTRP and bycatch rates relative to the 1998 and 2010 HPTRPs using data collected during June 2008 through May 2009 (referred to as the 2008-2009 fishing season). However, it should be emphasized that only the 1998 HPTRP regulations were in effect during the 2008-2009 fishing season. The 2010-2011 fishing season will be the first of two consecutive fishing seasons used to evaluate a potential CCA. It is assumed that the implementation of the 2010 HPTRP amendments will lower future bycatch rates and that the 2008-2009 fishing season bycatch rates may not be an accurate indication of bycatch rates after the implementation of the 2010 HPTRP amendments. Nevertheless, these bycatch rates do provide reference points and so can be used by fishermen and regulators to evaluate what, and if, actions are needed to ensure that bycatch rates for the 2010-2011 fishing season are below the CCA target bycatch rates that trigger seasonal closures.

This paper can be considered an update to the Orphanides et al. (2009) paper that reviewed bycatch rates and HPTRP compliance for the time period June 2007 through May 2008 (the 2007-2008 fishing season). The Orphanides et al. (2009) paper also discussed pinger tester development and enforcement actions for the period from January 2008 through July 2009. However, updating the pinger tester work and regulations enforcement will not be covered in this paper, but will be covered in a subsequent update which will cover the 2009-2010 fishing season. This will synchronize updates on all topics to one fishing period.

METHODS AND DATA

Bycatch and Compliance

The NEFOP data were used to calculate bycatch and compliance rates. Bycatch rates were calculated as the number of observed harbor porpoise takes per observed metric tons (mtons) of live fish landed. Recorded dressed landed weights were converted to live weights using

established conversion factors (Warden and Orphanides 2008). Metric tons of fish landed were used to calculate bycatch rates in order to be consistent with how annual harbor porpoise bycatch estimates are calculated (e.g., Orphanides 2010), and because 2010 HPTRP CCAs are tied to bycatch rates using this unit of effort. Landings are used to calculate annual harbor porpoise bycatch estimates because landings are the only unit of effort that is both statistically appropriate and available in the NEFOP, Vessel Trip Report (VTR), and Commercial Landings databases, which are used to calculate the bycatch estimate for the total fishery (Orphanides and Palka 2007).

Rare missing values were imputed using medians from representative strata using methods described in Warden and Orphanides (2008). After imputing missing values from representative strata, 2.2% (97 out of 4490) of the observed hauls still had missing values in the variables used in the bycatch and compliance analysis. However, none of the hauls with missing values had any harbor porpoise bycatch, and only 25 hauls (0.6% of 4490) with missing values occurred within MAs. Mesh size was recorded on all but 0.2% (9 out of 4490) of the observed hauls. For 96.3% (4323 out of 4490) of the hauls mesh size was recorded as a single value, and for 3.5% of the hauls (158 of 4490) it was recorded as minimum and maximum values. When a minimum and maximum range was recorded, a simple average of these two mesh sizes was used in this analysis. Imputed twine size on 6.4% of hauls (286 out of 4490) accounted for most of the imputed values used in this analysis. Latitude and longitude was imputed for 22 (0.5%) out of 4490 hauls, and was missing for 31 (0.7%) hauls. These missing locations were left unknown and therefore were not included when compliance and bycatch information was summarized by area. For 6.5% of pingered hauls (50 out of 770), the number of pingers on the haul was not recorded. For 39 of these 50 hauls (78.0%), the number of pingers used was determined from examination of the NEFOP gear logs and observer comments. However, for 11 of these 50 hauls (22.0%) the number of pingers could not be determined. Only two hauls with harbor porpoise bycatch had missing or imputed values, and these contained imputed values for twine size in the Southern New England MA, where twine size is not regulated as part of either the 1998 or 2010 HPTRPs.

Recorded gear configurations were used to check for HPTRP compliance. The gear requirements that were checked within the time/areas defined within the HPTRP included: pinger use, net length, twine size, number of nets per string, tie-down length, and tie-down use. Additionally, compliance with seasonal HPTRP closures to gillnet fishing was examined. In the Mid-Atlantic large mesh and small mesh gillnets, the regulations for the tie-down spacing and number of nets per vessel were not investigated because this information was not recorded on observer logs. Also, it is required that pingers on a net are functioning properly, however, since pinger functionality is rarely recorded by NEFOP (Palka et al. 2009, Orphanides et al. 2009), compliance to this regulation was not investigated.

In the New England gillnet fisheries during times and areas where pingers are required, a typical gillnet string with ten 300-foot long nets is required to have 11 pingers on the string (one pinger on each end of the string, and one in between each net). Near compliance, with pinger use at the 90% level (10 out of 11 pingers on the string in the example above), has previously been one way that was used to evaluate compliance with HPTRP regulations (Palka et al. 2008, Orphanides et al. 2009). For this analysis, 100% pinger use is used to calculate compliance and

will be called “full compliance” in this paper. However, 90% pinger use, which will be referred to as “near compliance” in this paper, is also examined in order to compare compliance during the 2008-2009 fishing season with compliance estimates for the 2007-2008 season.

RESULTS

1998 HPTRP Compliance

The overall observed compliance rate to the 1998 HPTRP for the period June 2008 – May 2009 was 53.2% (Table 1). Note, only the 1998 HPTRP was in effect during this time period. The total observed compliance rate for New England was 51.9%, with the highest New England compliance rate within the 1998 HPTRP Cape Cod South MA (68.6%), and lowest rate within the 1998 HPTRP Offshore MA (25.7%). No hauls were observed in the Northeast Closure Area or in the Cashes Ledge Closure Area when they were closed to gillnets. The Mid-Atlantic had similarly poor compliance rates, with an overall rate of 56.3%. The highest Mid-Atlantic compliance rate was within the small mesh hauls in the Waters off New Jersey MA (79.3%), and the lowest rate was within the large mesh hauls in the Waters off New Jersey MA (46.2%). For a description of the 1998 HPTRP regulations see Table 2 and Figures 1a and 1b.

In the New England sink gillnet fishery, all non-compliant hauls were out of compliance because they did not have the required number of pingers. No fishing was observed in areas closed to all gillnet fishing (Table 3). Among the pingered hauls in the 1998 HPTRP New England MAs, 20.3% (113 out of 557) contained greater than or equal to 90%, but less than 100% of the required number of pingers (Table 4). If a near compliance rate of 90% pinger usage were used to assess compliance as in the 2008-2009 fishing season (Orphanides et. al 2009), the New England compliance rate would have been 68.4% (468 out of 684) and the total 1998 HPTRP compliance rate for all areas would have been 65.0% (619 out of 952) (Tables 1 and 4). It is important to note that the pinger compliance for this analysis did not assess whether pingers were functioning properly, but simply whether the required number of pingers was present on nets.

Outside of the 1998 HPTRP New England MAs that required pingers, 5.2% (81 out of 1570) of the observed New England hauls used pingers in a fashion that would be compliant, if they were within a MA requiring pingers. Roughly half of these New England pingered hauls outside of 1998 HPTRP MAs (53.1%, 43 out of 81) occurred within the 2010 HPTRP Stellwagen Bank MA (Table 4). Thirty-five pingered hauls were also observed in Mid-Atlantic waters off of North Carolina as part of an experiment to see if pingers could reduce bottlenose dolphin bycatch in the Spanish mackerel gillnet fishery (Read and Waples 2010).

Hauls with incidental harbor porpoise take had a relatively high compliance with the 1998 HPTRP regulations, where only three out of 34 hauls with takes were non-compliant. In the New England 1998 HPTRP MAs, there were five hauls that incidentally caught five harbor porpoises, and these hauls all used pingers, though two of the five hauls had less than the required number of pingers, and it is not known if the pingers were functional. In the Mid-Atlantic 1998 HPTRP MAs, one compliant haul in the Southern Mid-Atlantic MA incidentally caught one harbor porpoise, three compliant hauls in the Waters off New Jersey incidentally caught four harbor porpoise, and one non-compliant large mesh haul in the Waters off New Jersey MA incidentally caught two harbor porpoises on the same string when the area was closed

to large mesh gillnets. Among the 24 New England hauls with incidental takes that were outside of the 1998 HPTRP MAs, two hauls used a full complement of pingers although they were not required (Table 5).

In the Mid-Atlantic, 12.8% (15 out of 117) of all non-compliant hauls occurred in a closed area (Table 3). The majority of non-compliant hauls (84.6%, 99 out of 117) occurred on large mesh strings (Tables 1 and 3). Among non-compliant hauls, about a quarter (26.5%, 31 out of 117) had multiple violations (Table 3). Non-compliance with regards to the number of nets (33.3%, or 39 out of 117), use of tie downs (30.8%, 36 out of 117), and net length (27.4%, 32 out of 117) were each present on roughly a third of all observed non-compliant Mid-Atlantic hauls (Table 3).

Bycatch Rates

The observed harbor porpoise bycatch rate in the 2010 HPTRP Stellwagen Bank MA (0.320 harbor porpoise/mtons landed) was nearly three times higher than in any other MA in New England. The bycatch rate in the neighboring 1998 HPTRP version of the Massachusetts Bay MA (prior to its slight expansion in the 2010 HPTRP) (0.115 harbor porpoise/mtons landed) was also among the highest in the New England MAs. The second highest bycatch rate in the New England MAs was in the 2010 HPTRP Southern New England MA, outside of the 1998 HPTRP Cape Cod South MA (0.117 harbor porpoise/mtons landed). However, if the 1998 HPTRP Cape Cod South MA is included in the 2010 Southern New England MA, the bycatch rate drops to 0.079 (harbor porpoise/mtons landed).

Bycatch rates in the Mid-Atlantic varied considerably by area. An extremely high bycatch rate of 0.454 harbor porpoise/mtons landed was observed in the 2010 HPTRP Mudhole South MA. Four observed incidental takes in the Mudhole South MA occurred on 24 hauls that were in compliance with 1998 HPTRP regulations, and occurred during a time when this MA would not be closed to large or small mesh gillnets under the 2010 HPTRP. Since there was a small sample size of 24 hauls observed in this area, it is uncertain as to whether or not this bycatch rate is representative of the unobserved hauls in this time and area. However, when the 2010 HPTRP Mudhole South MA is included in the 1998 HPTRP Waters off New Jersey MA, increasing the sample size to 81 hauls, the bycatch rate in this time and area is still quite high (0.311 harbor porpoise/mtons), as two harbor porpoise were observed incidentally taken in the Waters off New Jersey outside of the Mudhole South MA (Table 6).

Bycatch rates in areas associated with 2010 HPTRP CCAs were well above the 2010 HPTRP target bycatch rates. The combined bycatch rate for the areas associated with the Gulf of Maine CCA was 0.122 harbor porpoise/mtons landed, or nearly four times the HPTRP 2010 target rate for that area (0.031 harbor porpoise/mtons landed). The bycatch rate for the area associated with the Eastern Cape Cod and Cape Cod South Expansion CCAs was 0.079 harbor porpoise/mtons landed, or more than three times the 2010 HPTRP target bycatch rate for that area (0.023 harbor porpoise/mtons landed) (Table 6). However, it should be emphasized that the 2010 HPTRP CCA management measures were not in place during the fishing season evaluated in this paper, June 2008 – May 2009. Monitoring of the areas associated with the Consequence Closure Areas begins on September 15, 2010.

Among the 37 harbor porpoises observed incidentally taken during the 2008-2009 management seasons, only 3 (8.1%) were taken outside of the 1998 or 2010 HPTRP management times and areas. The majority of bycatch (59.5%, 22 harbor porpoises) was observed in areas that were not historically regulated under the 1998 HPTRP, but were included in the 2010 HPTRP amendments. The remainder (12 harbor porpoises, 32.4%) occurred within the 1998 HPTRP MAs (Figure 2 and Tables 5 and 6). Similarly, among observed hauls in New England, the additional 2010 HPTRP MAs had a much higher bycatch rate (0.171 harbor porpoise/mtons landed) than the 1998 HPTRP MAs (0.023 harbor porpoises/mtons landed) and non-HPTRP times and areas (0.006 harbor porpoises/mtons landed) (Table 6).

Bycatch rates with compliant pinger use varied by MA (Table 7). Overall, the bycatch rate in the 1998 or 2010 HPTRP MAs was almost three times less on pingered hauls (0.035 harbor porpoise/mtons landed) than the bycatch rate on nets without pingers for the same times and areas (0.101 harbor porpoises/mtons landed). This relationship was driven by bycatch in the additional 2010 HPTRP MAs, where relatively few pingered hauls were observed. In the additional New England 2010 HPTRP MAs only one harbor porpoise was observed incidentally taken on hauls with pingers, and 21 were observed on hauls without pingers (Table 7).

DISCUSSION

Compliance levels for the 2008-2009 fishing season were similar to those of the previous fishing season (2007-2008). In the Mid-Atlantic, compliance (56.3%) was better than in the previous management season (48.4%), though it was still poor (Orphanides et al. 2009). Despite the poor compliance, the compliance rate in the Waters off New Jersey MA for the 2008-2009 management season (58.0%) was the second highest since 2002 (Palka and Orphanides 2008b, Orphanides et al. 2009). On the other hand, compliance in the observed large mesh hauls in Waters off New Jersey was 46.2% (Table 1), and this mesh category is important for reducing incidental harbor porpoise takes since it has been shown that bycatch rates increase with increasing mesh size (Orphanides 2009).

In the present paper, full compliance, defined as use of 100% of the required number of pingers, was used to assess compliance. This was done in order to stay true to the regulations, and because fully compliant hauls were used to calculate the target bycatch rates for the areas associated with the CCAs (Palka and Orphanides 2008a and 2008b). However, in order to compare New England 2008-2009 fishing season compliance with the 2007-2008 fishing season, we must use the near compliance criteria used for the 2007-2008 season analysis, defined as a 90% or greater pinger use level. The New England near compliance rate for the 2008-2009 fishing season (68.4%, Table 4) was slightly better than the New England near compliance rate in the 2007-2008 fishing season (66.3%) (Orphanides et al. 2009). Hindering the overall New England pinger compliance rate was poor compliance in the Offshore MA (53.8% near compliance, 25.7% full compliance) (Tables 1 and 4). Despite poor pinger compliance in the Offshore MA, no incidental harbor porpoise takes have been observed there since the 1998 HPTRP was implemented (Orphanides and Palka 2008, Orphanides 2010).

Aside from using near compliance to compare compliance with the 2007-2008 fishing season, it also provides additional insight into the total amount of pinger use in the fishery and the

associated decrease in bycatch rates associated with pinger use. Orphanides et al. (2009) showed that during the 2007-2008 fishing season pinger use at a 90% level resulted in much lower bycatch rate than the rate on non-pingered hauls in the same times and areas. So, while the 2008-2009 season full pinger compliance rate was only 51.9% (Table 1), use of pingers at or over the 90% level (68.4%, Table 4) suggests that some bycatch reduction due to pinger use was likely achieved on roughly two thirds of observed hauls in the 1998 HPTRP New England MAs.

Near compliance is also worth examining because there is a small amount of uncertainty regarding the number of pingers recorded on a net. The number of pingers used on a net can be recorded during either the hauling or the setting of a net. However, NEFOP observers are often not on board when the net is set, and if asked, the captain may not know precisely how many pingers were on the net when set. Observers are on board when the net is hauled back, however, they may not be able to watch the net fully to count the number of pingers present on the haul back because they may be busy processing fish caught. That said, pinger use data recorded by NEFOP observers is quality checked, and there is no reason to doubt the pinger use values recorded by the observers.

Bycatch patterns for the 2008-2009 fishing season looked largely similar to those from the previous fishing season (Orphanides et al. 2009). During both fishing seasons, the majority of the bycatch occurred in MAs included as part of the 2010 HPTRP amendments that were not regulated under the 1998 HPTRP (e.g., Stellwagen Bank, Southern New England, and Mudhole South MAs), with very little bycatch occurring outside of 1998 and 2010 MAs. Clusters of bycatch occurred in the Hudson Canyon region (in the area of the Mudhole North and 2010 HPTRP Mudhole South MAs), south of the Cape Cod South MA but within the 2010 HPTRP Southern New England MA, and in the Gulf of Maine in the region of the Stellwagen Bank, Massachusetts Bay, and southern Mid-Coast MAs (Figure 2). Also, in both the 2007-2008 and 2008-2009 fishing seasons the bycatch rate in the 2010 HPTRP Stellwagen Bank MA was particularly high.

If the 2010 HPTRP amendments had been in place for the 2008-2009 fishing season, and there was full compliance with 2010 HPTRP regulations, it can be assumed that a significant decrease in bycatch would have occurred due to the lower bycatch rate associated with pinger use. Bycatch rates from the 2008-2009 fishing season in areas associated with CCAs were far above the 2010 HPTRP target bycatch rates that could trigger closures, as they were in the 2007-2008 fishing season. However, the majority of observed bycatch occurred in areas that would be managed under the 2010 HPTRP, thus suggesting the 2010 HPTRP regulations are properly defined and may provide significant decreases in bycatch once implemented. Historic lower bycatch rates of 50-70% when pingers are used properly in the New England sink gillnet fishery (Palka et al. 2008) are consistent with rates observed during the 2007-2008 (Orphanides et al. 2009) and 2008-2009 (Table 7) fishing seasons. Assuming these lower bycatch rates for pingered hauls and given 100% compliance to the 2010 HPTRP, the predicted number of harbor porpoises observed taken without pingers in the 2010 HPTRP times and areas would have been reduced from 22 to between 7 and 11 animals. In addition, if there was full compliance in the Mid-Atlantic (to management measures in both the 1998 and 2010 HPTRP), it is predicted that two observed harbor porpoises would likely not have been taken because these incidental takes took place in the Waters off New Jersey MA during its seasonal closure period (April 1 – April 20).

Together this would result in a predicted 35 - 46% decrease in the number of NEFOP observed incidental takes for the entire region. The estimated total harbor porpoise bycatch for the entire fishery (as compared to the subset observed by NEFOP) would also likely be reduced by a similar amount.

Reducing bycatch in the US Northwest Atlantic gillnet fisheries is largely dependent on compliance with HPTRP and fishery-related regulations. Pingers need to be both present in the proper numbers, and functioning properly to be an effective deterrent to harbor porpoise bycatch (Palka et al. 2008). Pinger functionality is not currently regularly recorded by NEFOP, though pinger testers are in development (Orphanides et al. 2009). Past evaluation of a limited number of pingers found that 88.0% of pingers tested were working (Orphanides et al. 2009). In combination with enforcement, pinger testing can help improve the effectiveness of pingers by alerting fishermen when their pingers are not functioning, and thus also improve compliance to the HPTRP. In the coming years, HPTRP compliance will largely determine whether CCAs are implemented, and bycatch monitoring will play an integral role in assessing compliance to the HPTRP and the effectiveness of HPTRP enforcement.

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Table 1. Observed compliance during June 2008 – May 2009 to the 1998 Harbor Porpoise Take Reduction Plan (HPTRP), by time period and Management Area (MA). A haul is defined as non-compliant if it was out of compliance with one or more management measures.

Time Period	1998 HPTRP Management Area	Total Observed Hauls in Non-Compliance	Hauls with Unkown Compliance*	Total Observed Hauls	Percent Compliant (In Hauls)
Dec 1 - May 31	Cape Cod South	32	0	102	68.6
Dec 1 - May 31	Massachusetts Bay	42	0	126	66.7
Sep 15 - May 31	Mid-Coast	128	10	285	55.1
Dec 1 - May 31	Offshore	127	0	171	25.7
	<i>New England Total</i>	<i>329</i>	<i>10</i>	<i>684</i>	<i>51.9</i>
Jan 1 - Apr 30	Mudhole Large Mesh	4	0	9	55.6
Jan 1 - Apr 30	Mudhole Small Mesh	-	-	0	NA
Feb 1 - Apr 30	Southern Mid-Atlantic Large Mesh	67	0	132	49.2
Feb 1 - Apr 30	Southern Mid-Atlantic Small Mesh	12	0	46	73.9
Jan 1 - Apr 30	Waters off New Jersey Large Mesh	28	0	52	46.2
Jan 1 - Apr 30	Waters off New Jersey Small Mesh	6	0	29	79.3
	<i>Mid-Atlantic Total</i>	<i>117</i>	<i>0</i>	<i>268</i>	<i>56.3</i>
	<i>All Areas Total</i>	<i>446</i>	<i>10</i>	<i>952</i>	<i>53.2</i>

* For some hauls, the number of pingers used could not be determined.

Table 2. 1998 Harbor Porpoise Take Reduction Plan (HPTRP) management measures for large and small mesh nets in the Mid-Atlantic gillnet fishery that were in effect during June 2008 – May 2009. Note, a net tagging program for both large and small mesh nets was specified in the 1998 HPTRP, but was not implemented.

LARGE MESH FISHERY (7 inches to 18 inches)

Floatline length:	
NJ Mudhole	<= 3,900 ft
NJ waters (excluding the Mudhole)	<= 4,800 ft
Southern Mid-Atlantic waters	<= 3,900 ft
Twine Size	>= 0.90 mm
Tie Downs	Required; spaced not more than 15 ft apart along floatline; not more than 48 inches in length
Net Number per Vessel	<= 80 nets
Net Size	<= 300 ft
Number of Nets within a Net String	
NJ Mudhole	<= 13 nets
NJ waters (excluding the Mudhole)	<= 16 nets
Southern Mid-Atlantic waters	<= 13 nets
Time/Area Closures:	
NJ waters (including the Mudhole)	Closed from Apr 1 – 20
NJ Mudhole	Closed from Feb 15 – Mar 15, April 1 -20
Southern Mid-Atlantic waters	Closed from Feb 15 – Mar 15
Gear Modification Requirements:	
NJ waters (excluding the Mudhole)	Jan 1 – Mar 30 and Apr 21 – 30
NJ Mudhole	Jan 1 – Feb 14; Mar 16 – Mar 31; and Apr 21 – 30
Southern Mid-Atlantic waters	Feb 1 – Feb 14 and Mar 16 – Apr 30

SMALL MESH FISHERY (> 5 inches to < 7 inches)

Floatline length:	
NJ waters (including the Mudhole)	<= 3,000 ft
Southern Mid-Atlantic waters	<= 2,118 ft
Twine Size	>= 0.81 mm
Tie Downs	Prohibited
Net Number per Vessel	<= 45 nets
Net Size	<= 300 ft
Number of Nets within a Net String	
NJ Waters (including the Mudhole)	<= 10 nets
Southern Mid-Atlantic waters	<= 7 nets
Time/Area Closures:	
NJ Mudhole	Closed from Feb 15 - Mar 15
Gear Modification Requirements:	
NJ waters (excluding Mudhole)	Jan 1 – Apr 30
NJ Mudhole	Jan 1 – Feb 14 and Mar 16 – Apr 30
Southern Mid-Atlantic waters	Feb 1 – Apr 30

Table 3. Observed compliance with the 1998 Harbor Porpoise Take Reduction Plan (HPTRP) regulations categorized by compliance infraction. NA indicates violation category is not applicable to the row's specific time and management area. For additional details on HPTRPs, see Table 2 or the the NOAA Fisheries Service Northeast Regional Office's HPTRP website at: http://www.nero.noaa.gov/prot_res/porptrp/

Time Period	1998 HPTRP Management Area	Total Observed Hauls	Total Observed Hauls in Non-Compliance	General Violation Categories		Specific Violation Categories						
				Gear Modification	Closed Area	Multiple Violations Per Haul	Pingers	Number of Nets	Twine Size	Tie-Down Lengths	Tie-Down Use	Net Length
Dec 1 - May 31	Cape Cod South Massachusetts Bay	102	32	32	0	0	32	NA	NA	NA	NA	NA
Dec 1 - May 31	Massachusetts Bay	126	42	42	0	0	42	NA	NA	NA	NA	NA
Sep 15 - May 31	Mid-Coast*	285	128	128	0	0	128	NA	NA	NA	NA	NA
Dec 1 - May 31	Offshore	171	127	127	0	0	127	NA	NA	NA	NA	NA
Jan 1 - Apr 30	Mudhole Large Mesh	9	4	4	0	0	NA	4	0	0	NA	0
Jan 1 - Apr 30	Mudhole Small Mesh	0	-	-	-	-	NA	-	-	-	-	-
Feb 1 - Apr 30	Southern Mid-Atlantic Large Mesh	132	67	62	5	25	NA	20	11	0	36	20
Feb 1 - Apr 30	Southern Mid-Atlantic Small Mesh	46	12	12	0	0	NA	0	0	0	0	12
Jan 1 - Apr 30	Waters off New Jersey Large Mesh	52	28	18	10	6	NA	15	3	6	0	0
Jan 1 - Apr 30	Waters off New Jersey Small Mesh	29	6	6	0	0	NA	0	6	0	0	0

* Pinger compliance could not be determined for 10 Mid-Coast Management Area hauls because the number of pingers used was not recorded.

Table 4. New England pinger use percentages by 1998 and 2010 Harbor Porpoise Take Reduction Plan (HPTRP) Management Areas (MAs). Percentages shown are the percentage of all hauls observed within the time/area specified for that particular row. The term 100% pinger usage (full compliance) means the string has the required number of pingers as defined by the HPRTP, that is, there is one pinger on each end of the string, and one in between each net. Pinger use in the 2010 HPTRP MAs and non-HPTRP areas is summarized as if pingers were required in these areas during the 2008-2009 fishing season.

Location	Total Observed Hauls	Hauls by Pinger Use						
		0%	> 0%	Pingers Used but Quantity Unknown	> 0% and < 90%	90% to < 100%	> 90% (Near Compliance)	100% (Full Compliance)
<i>1998 HPTRP MAs</i>								
Cape Cod South	102	5 (5%)	97 (95%)	0 (0%)	14 (14%)	13 (13%)	83 (81%)	70 (69%)
Massachusetts Bay	126	20 (16%)	106 (84%)	0 (0%)	18 (14%)	4 (3%)	88 (70%)	84 (67%)
Mid-Coast	285	36 (13%)	249 (87%)	10 (5%)	34 (12%)	48 (17%)	205 (72%)	157 (54%)
Offshore	171	66 (80%)	105 (61%)	0 (0%)	13 (8%)	48 (28%)	92 (54%)	44 (26%)
Subtotal (1998 HPTRP MAs)	684	127 (19%)	557 (81%)	10 (1%)	79 (12%)	113 (17%)	468 (68%)	355 (52%)
<i>Additional 2010 HPTRP MAs</i>								
Southern New England	182	181 (99%)	1 (1%)	0 (0%)	0 (0%)	1 (1%)	1 (0.1%)	0 (0%)
Stellwagen Bank	321	210 (65%)	111 (35%)	0 (0%)	46 (14%)	22 (7%)	65 (20%)	43 (13%)
Massachusetts Bay (Additional)	5	1 (20%)	4 (80%)	0 (0%)	0 (0%)	0 (0%)	4 (80%)	4 (80%)
Subtotal (Additional 2010 HPTRP MAs)	508	392 (77%)	116 (23%)	0 (0%)	46 (9%)	23 (5%)	70 (13%)	47 (9%)
<i>Non-HPTRP Areas</i>								
Other	1062	1000 (94%)	62 (6%)	1 (<1%)	9 (1%)	18 (2%)	52 (5%)	34 (3%)

Table 5. By year, month, and Management Area (MA), the number of harbor porpoises bycaught during June 2008 – May 2009, if the required number of pingers were used on the hauls with the takes, if the hauls with the takes were compliant with the 1998 Harbor Porpoise Take Reduction Plan (HPTRP), and what type of violation was documented, if any.

Year	Month	1998 HPTRP Management Area	1998 and 2010 HPTRP Management Areas (and Management Measures)	Harbor Porpoises	Full Pinger Usage	Compliance with 1998 HPTRP Regulations	HPTRP Violation Type
2008	Sept			1	No	NA	None
2008	Sept			1	No	NA	None
2008	Sept			1	Yes	NA	None
2008	Oct	Mid-Coast	Mid-Coast (Pingers)	1	Yes	Compliant	None
2008	Dec		Southern New England (Pingers)	1	No	Compliant	None
2009	Jan		Southern New England (Pingers)	1	No	Compliant	None
2009	Jan		Southern New England (Pingers)	1	No	Compliant	None
2009	Jan		Stellwagen Bank (Pingers)	1	No	Compliant	None
2009	Jan		Stellwagen Bank (Pingers)	1	No	Compliant	None
		Massachusetts					
2009	Jan	Bay	Massachusetts Bay (Pingers)	1	Yes	Compliant	None
2009	Feb		Southern New England (Pingers)	1	No	Compliant	None
2009	Feb		Southern New England (Pingers)	1	No	Compliant	None
		Massachusetts					
2009	Feb	Bay	Massachusetts Bay (Pingers)	1	Yes	Compliant	None
						Non-	Not Enough
2009	Feb	Mid-Coast	Mid-Coast (Pingers)	1	No*	Compliant*	Pingers*
		Waters off New	Waters off New Jersey/Mudhole South				
2009	March	Jersey	(Gear Modifications)	1	No	Compliant	None
		Waters off New	Waters off New Jersey/Mudhole South				
2009	March	Jersey	(Gear Modifications)	1	No	Compliant	None
		Waters off New	Waters off New Jersey/Mudhole South				
2009	March	Jersey	(Gear Modifications)	2	No	Compliant	None
		Southern Mid-	Southern Mid-Atlantic (Gear				
2009	March	Atlantic	Modifications)	1	No	Compliant	None
2009	March		Southern New England (Pingers)	1	No	Compliant	None
2009	March		Southern New England (Pingers)	1	No	Compliant	None
2009	March		Southern New England (Pingers)	2	No	Compliant	None
2009	March		Stellwagen Bank (Pingers)	1	No	Compliant	None
2009	March		Stellwagen Bank (Pingers)	1	No	Compliant	None
2009	March		Stellwagen Bank (Pingers)	1	No	Compliant	None
2009	March		Stellwagen Bank (Pingers)	1	No	Compliant	None
2009	March		Stellwagen Bank (Pingers)	1	No	Compliant	None
2009	March		Stellwagen Bank (Pingers)	1	No	Compliant	None
2009	March		Stellwagen Bank (Pingers)	1	No	Compliant	None
2009	March		Stellwagen Bank (Pingers)	1	No	Compliant	None
2009	March		Stellwagen Bank (Pingers)	1	Yes	Compliant	None
						Non-	Not Enough
2009	April	Mid-Coast	Mid-Coast (Pingers)	1	No [†]	Compliant [†]	Pingers [†]
		Waters off New				Non-	
2009	April	Jersey	Waters off New Jersey (Closed Area)	2	No	Compliant	Closed Area
2009	May		Southern New England (Pingers)	1	No	Compliant	None
2009	May		Southern New England (Pingers)	1	No	Compliant	None

[†] 90.1% of required pingers

* 85.7% of required pingers

Table 6. Harbor porpoise bycatch rates (number of observed harbor porpoises per observed mttons of landings) in 1998 and 2010 Harbor Porpoise Take Reduction Plan (HPTRP) Management Areas (MAs) and areas associated with 2010 HPTRP Consequence Closure Areas (CCAs), and the compliance rates for the 1998 HPTRP MAs, where compliance is defined as the percent of observed hauls in compliance with all of the applicable regulations.

	Observed Number of Hauls	Observed Landings (mttons)	Observed Number of Bycaught Harbor Porpoises	1998 HPTRP Compliance Rate (percent hauls)	Bycatch Rate (harbor porpoises per mttons)
New England Management Areas					
<i>1998 HPTRP MAs</i>					
Cape Cod South	102	45.206	0	68.6%	0.000
Massachusetts Bay	126	17.436	2	66.7%	0.115
Mid-Coast	285	79.166	3	55.1%	0.038
Offshore	171	71.878	0	25.7%	0.000
Subtotal (1998 HPTRP MAs)	684	213.686	5	51.9%	0.023
<i>Additional 2010 HPTRP MAs</i>					
Southern New England (not including Cape Cod South)	182	93.714	11	NA	0.117
Stellwagen Bank	321	34.371	11	NA	0.320
Massachusetts Bay (Additional)	5	0.626	0	NA	0.000
Subtotal (Additional 2010 HPTRP MAs)	508	128.711	22		0.171
<i>New England Non-HPTRP Areas</i>					
Other	1062	505.701	3	NA	0.006
<i>Areas Associated with Consequence Closure Areas (CCAs)</i>					
Areas Associated with Gulf of Maine CCA (includes Massachusetts Bay, Stellwagen Bank, and Mid-Coast Management Areas)	737	131.600	16	NA	0.122
Areas Associated with the Eastern Cape Cod and Cape Cod South Expansion CCAs (includes Cape Cod South)	284	138.919	11	NA	0.079
Subtotal (Areas Associated with Consequence Closure Areas (CCAs))	1021	270.519	27	NA	0.100
Mid-Atlantic Management Areas					
<i>1998 HPTRP MAs</i>					
Mudhole North	9	3.141	0	55.6%	0.000
Southern Mid-Atlantic Waters off New Jersey (including 2010 Mudhole South, but not 1998 Mudhole North)	178	46.410	1	55.6%	0.022
Mudhole South, but not 1998 Mudhole North)	81	19.292	6	58.0%	0.311
Subtotal (1998 HPTRP MAs)	268	68.843	7	56.3%	0.102
<i>Additional 2010 HPTRP Management Areas</i>					
Mudhole South (included in 1998 Waters off New Jersey)	24	8.801	4	NA	0.454
<i>Mid-Atlantic Non-HPTRP Areas</i>					
Other	1968	212.324	0	NA	0.000

Table 7. Bycatch rates (number of observed harbor porpoises per observed mtons of landings) by 1998 and 2010 New England Harbor Porpoise Take Reduction Plan (HPTRP) times and areas and pinger usage.

Time Period	1998 and 2010 HPTRP Management or Closure Areas	Full Pinger Use	Observed Hauls	Observed Landings (mtons)	Observed Harbor Porpoise	Bycatch Rate
<i>1998 HPTRP Management Areas</i>						
Dec 1 - May 31	Cape Cod South	No	32	21.920	0	0.000
Dec 1 - May 31	Cape Cod South	Yes	70	23.286	0	0.000
Dec 1 - May 31	Mass. Bay (1998 HPTRP)	No	42	4.685	0	0.000
Dec 1 - May 31	Mass. Bay (1998 HPTRP)	Yes	84	12.751	2	0.157
Sep 15 - May 31	Mid-Coast	No	128	35.126	2	0.057
Sep 15 - May 31	Mid-Coast	Yes	157	44.040	1	0.023
Nov 1 - May 31	Offshore	No	127	40.301	0	0.000
Nov 1 - May 31	Offshore	Yes	44	31.577	0	0.000
<i>Additional 2010 HPTRP Management Areas</i>						
Nov 1 - May 31	Mass. Bay (Additional, not included in 1998 HPTRP)	No	1	0.008	0	0.000
Nov 1 - May 31	Mass. Bay (Additional, not included in 1998 HPTRP)	Yes	4	0.618	0	0.000
Dec 1 - May 31	Southern New England (not including Cape Cod South)	No	182	93.714	11	0.117
Dec 1 - May 31	Southern New England (not including Cape Cod South)	Yes	0	0.000	0	0.000
Nov 1 - May 31	Stellwagen Bank	No	278	31.647	10	0.316
Nov 1 - May 31	Stellwagen Bank	Yes	43	2.725	1	0.367
<i>Areas Associated with Consequence Closure Areas (CCAs)</i>						
Nov 1/Dec 1 - May 31	Areas Associated with the Gulf of Maine CCA	No	449	71.466	12	0.168
Nov 1/Dec 1 - May 31	Areas Associated with the Gulf of Maine CCA	Yes	288	60.134	4	0.067
Dec 1 - May 31	Areas Associated with the Eastern Cape Cod and Cape Cod South Expansion CCAs	No	214	115.634	11	0.095
Dec 1 - May 31	Areas Associated with the Eastern Cape Cod and Cape Cod South Expansion CCAs	Yes	70	23.286	0	0.000
All MA Time Periods	<i>All New England Management Areas</i>	No	790	227.401	23	0.101
All MA Time Periods	<i>All New England Management Areas</i>	Yes	402	114.997	4	0.035

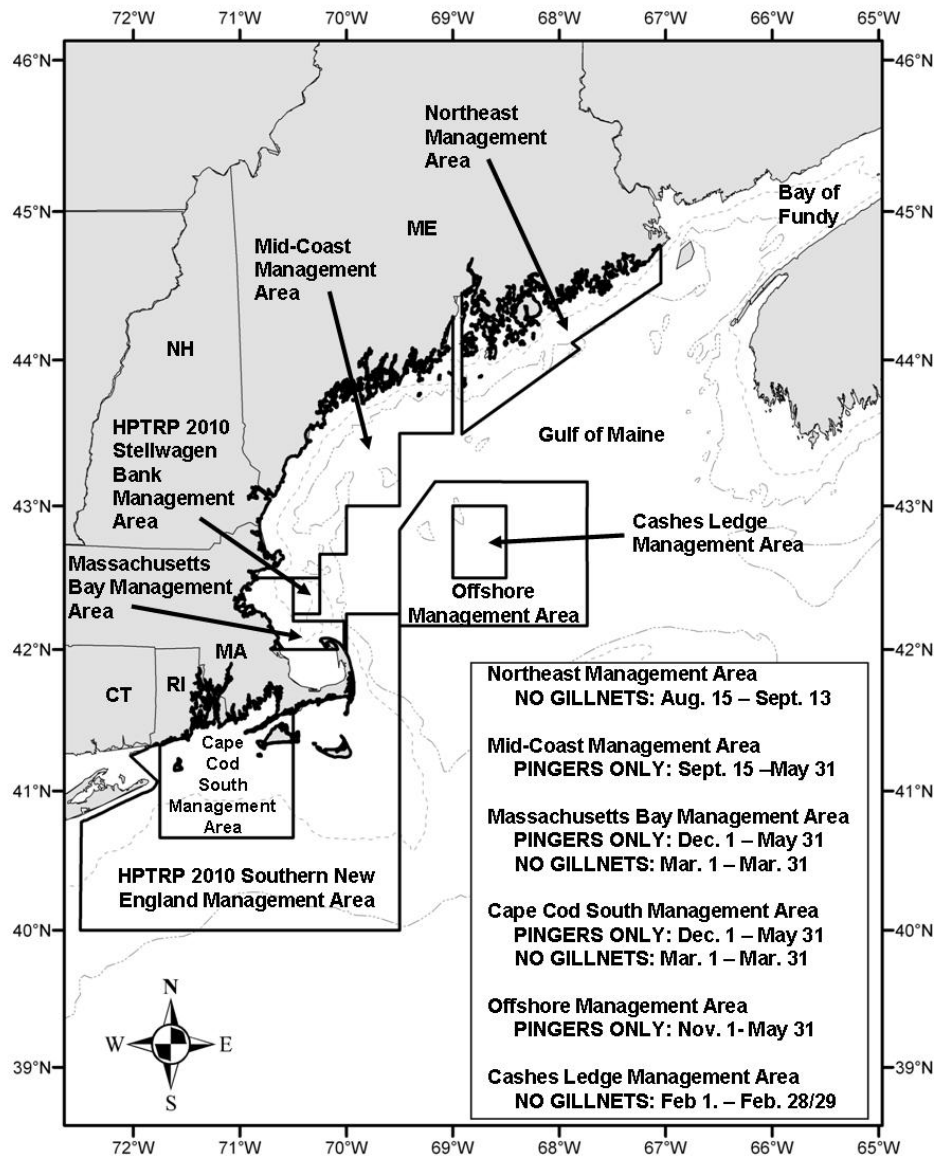


Figure 1a. 1998 New England Harbor Porpoise Take Reduction Plan (HPTRP) Management Areas (MAs) and the management measures associated with them depicted prior to the 2010 HPTRP amendments, and two additional 2010 HPTRP MAs. Note that under the 2010 HPTRP amendments, part of the Massachusetts Bay MA is expanded slightly to the north, eliminating the small gap between it and the 2010 HPTRP Stellwagen Bank MA to the north. Under the 2010 HPTRP amendments, the time period for the Massachusetts Bay MA is lengthened to include November, which matches the time period for the adjacent 2010 HPTRP Stellwagen Bank MA (Nov 1 – May 31). The time period for the 2010 HPTRP pinger requirement in the Southern New England MA is from Dec 1 through May 31. For more information on the 1998 and 2010 HPTRP regulations, see the NOAA Fisheries Service Northeast Regional Office’s HPTRP website at: http://www.nero.noaa.gov/prot_res/porptrp/

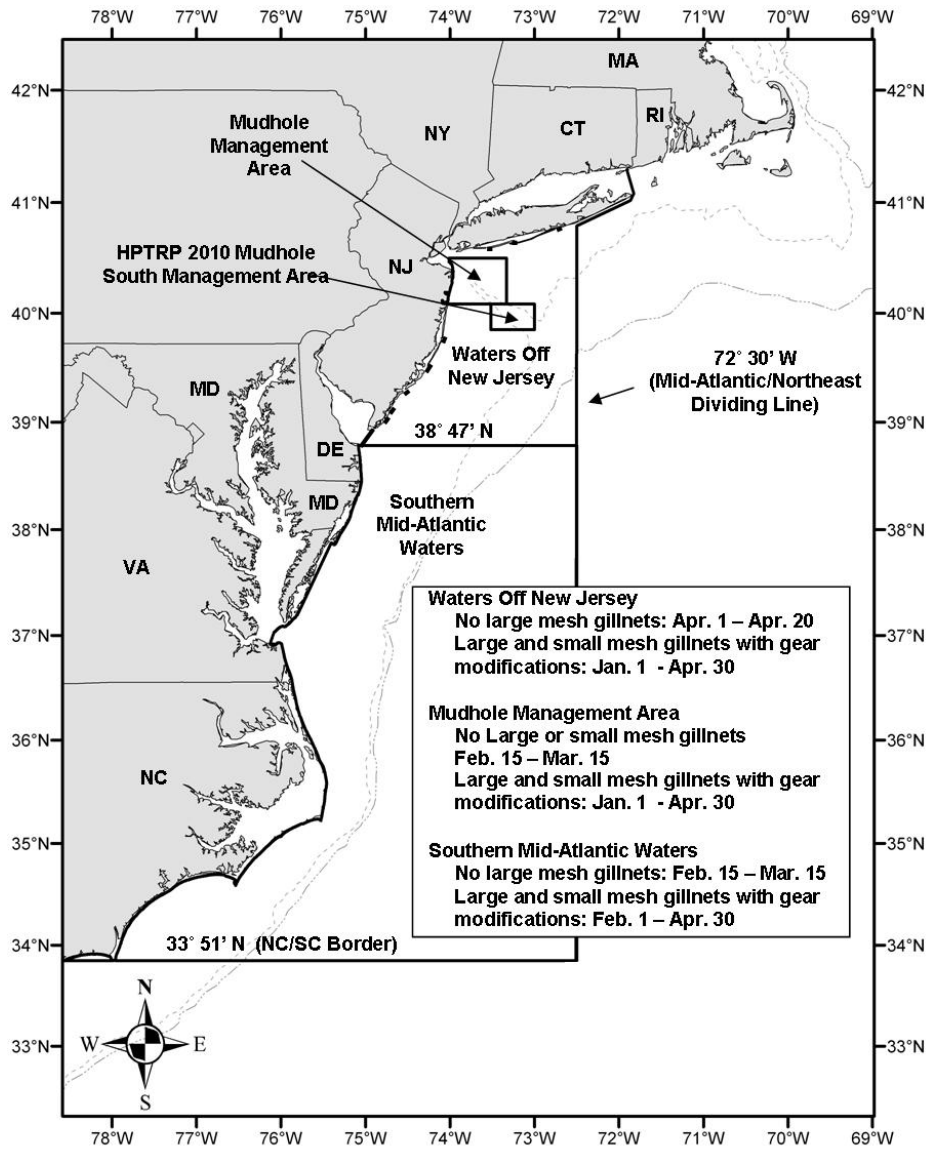


Figure 1b. 1998 Mid-Atlantic Harbor Porpoise Take Reduction Plan (HPTRP) Management Areas (MA) and a summary of the associated regulations, and the additional 2010 HPTRP Mudhole South MA. Under the 2010 HPTRP amendments, the Mudhole South MA is closed to gillnet gear from February 1 through March 15, and gear modification requirements are mandatory from January 1 through April 30, except when the Waters off New Jersey MA closure applies for large mesh gillnets (April 1-20). The boundary shown between New England and the Mid-Atlantic components of the 2010 HPTRP is the boundary that intersects the south shore of Long Island. For more details on the 1998 HPTRP gear modification requirements, see Table 2. For more information on both the 1998 and 2010 HPTRP regulations, see the NOAA Fisheries Service Northeast Regional Office's HPTRP website at: http://www.nero.noaa.gov/prot_res/porptrp/

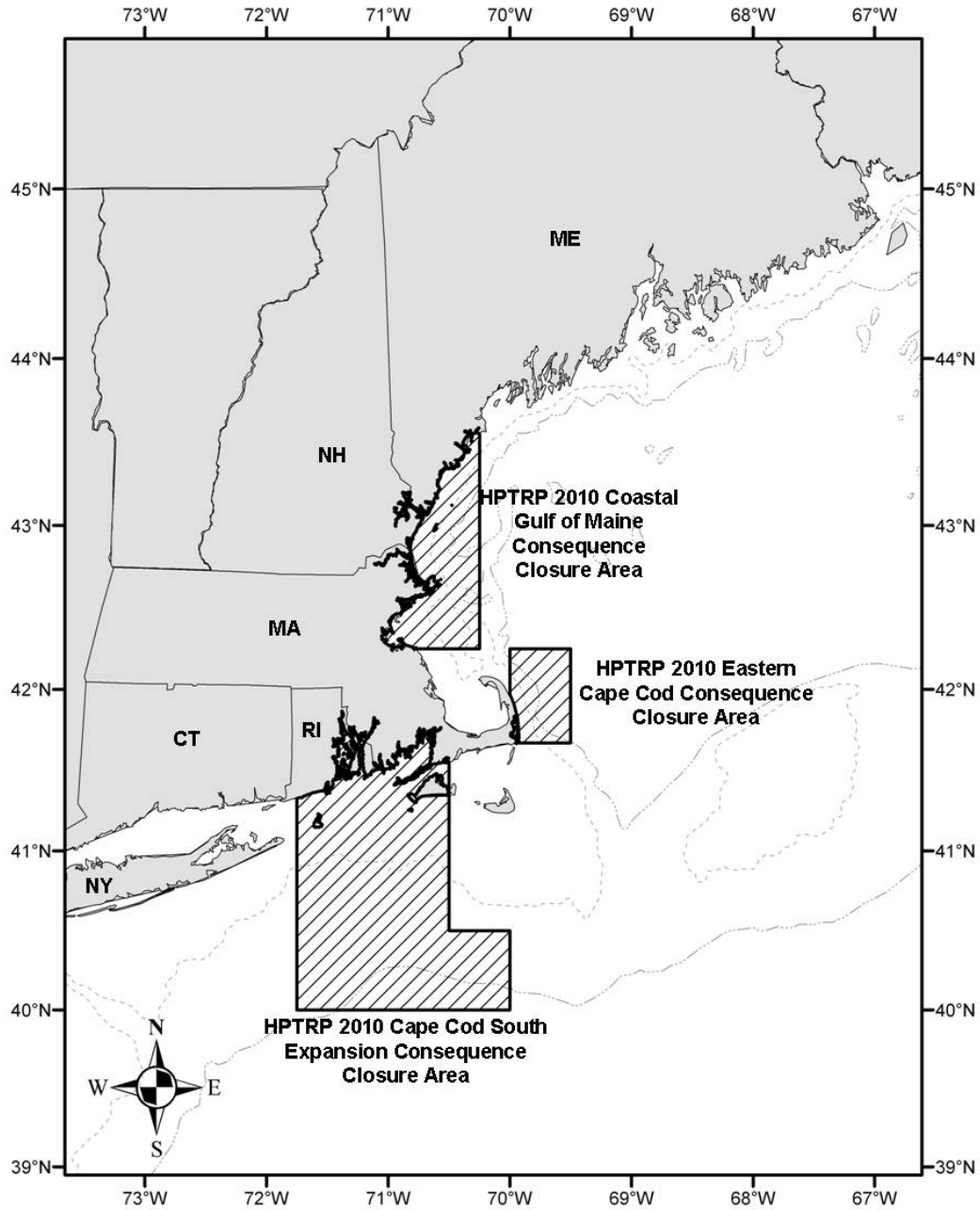


Figure 1c. 2010 Harbor Porpoise Take Reduction Plan (HPTRP) seasonal Consequence Closure Areas (CCA). For more information on these regulations, see the NOAA Fisheries Service Northeast Regional Office's HPTRP website at: http://www.nero.noaa.gov/prot_res/porptrp/

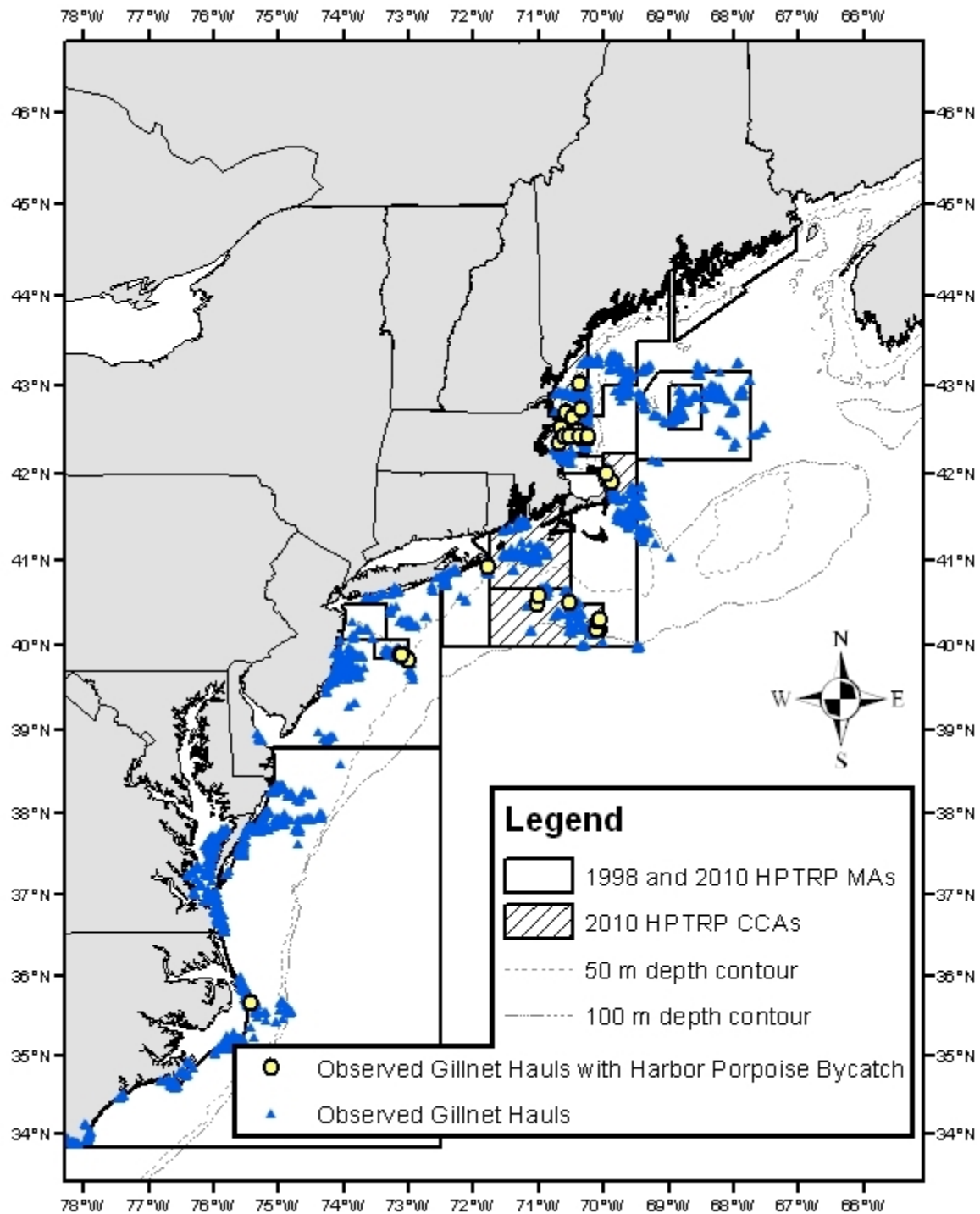


Figure 2. Location of Northeast Fisheries Observer Program (NEFOP) observed gillnet hauls without harbor porpoise takes (blue triangles) and observed hauls with harbor porpoise bycatch (yellow circles) from June 2008 through May 2009. These are overlaid on top of the 1998 and 2010 HPTRP Management Areas (MAs) as shown in Figures 1a and 1b. The hatched areas depict Consequence Closure Areas (CCAs) as shown in Figure 1c.

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