Northeast Fisheries Science Center Reference Document 13-13

Estimates of Cetacean and Pinniped Bycatch during 2010 and 2011 in the New England Sink Gillnet Fishery, Mid-Atlantic Gillnet Fishery, and Two NMFS Gillnet Experiments 2nd Edition

Please note: The 1st edition of this report, released on August 28, 2013, contained errors in the data used to weight New England bycatch rates when accounting for ASM groundfish coverage. These errors affected many New England bycatch estimates, CVs, and CIs, and these estimates have been recalculated. The Abstract, Results, and Discussion have been revised accordingly. In developing this second edition, the paper also was closely reviewed for any additional corrections or clarifications. This resulted in a slight change in the description of the bootstrap methodology in the Methods, a minor change in Table 1 to the prorated metric tons and observer coverage for the Fall South of Cape Cod Port Group, and application of a consistent approach to rounding intermediate bycatch rates (to three decimal places) when calculating the 2010 Mid-Atlantic bycatch estimates, which resulted in minor (rounding error) changes in those estimates (Table 11).

by Christopher D. Orphanides

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ABSTRACT

This report provides incidental take estimates for seven marine mammal taxa taken during 2010 and 2011 in the New England sink gillnet (NESG) fishery, the Mid-Atlantic gillnet (MAG) fishery, and two NMFS gillnet experiments. This report also documents the methodology used to produce the estimates. The 2010 serious injuries and mortalities in the NESG fishery were 386 harbor porpoises (*Phocoena phocoena*), 1142 gray seals (*Halichoerus grypus*), 539 harbor seals (*Phoca vitulina*), 252 harp seals (*Pagophilus groenlandica*), 66 white-sided dolphins (*Lagenorhynchus acutus*), 69 common dolphins (*Delphinis delphis*), and 3 pilot whales of unknown species (genus *Globicephala)*. In addition, 1 harbor porpoise, 13 gray seals, 1 harbor seal, and 1 harp seal were caught in a NMFS experimental gillnet study and counted towards annual human-caused mortality. This results in 2010 total New England serious injuries and mortalities of 387 (CV = 27%) harbor porpoises (*Phocoena phocoena*), 1155 (CV = 28%) gray seals (*Halichoerus grypus*), 540 (CV = 25%) harbor seals (*Phoca vitulina*), and 253 (CV = 61%) harp seals (*Pagophilus groenlandica*), 66 (CV = 90%) white-sided dolphins, 69 (CV = 81%) common dolphins, and 3 (CV = 80%) pilot whales of unknown species. For the 2010 MAG fishery, the estimated serious injuries and mortalities were 249 harbor porpoises, 267 gray seals, 86 harbor seals, 32 harp seals, and 23 common dolphins. In addition, 10 harbor porpoises, 3 harbor seals, and 7 common dolphins were caught in two NMFS experimental gillnet studies and counted towards annual human-caused mortality. This results in total 2010 Mid-Atlantic gillnet estimated serious injuries and mortalities of 259 (CV = 88%) harbor porpoises, 267 (CV = 75%) gray seals, 89 (CV = 39%) harbor seals, 32 (CV = 96%) harp seals, and 30 (CV = 48%) common dolphins. The estimated serious injuries and mortalities in the 2011 NESG fishery were 273 (CV = 20%) harbor porpoises (*Phocoena phocoena*), 1491 (CV = 22%) gray seals (*Halichoerus grypus*), 343 (CV = 19%) harbor seals (*Phoca vitulina*), 14 (CV = 46%) harp seals (*Pagophilus groenlandica*), 18 (CV = 43%) white-sided dolphins (*Lagenorhynchus acutus*), and 49 (CV = 71%) common dolphins (*Delphinis delphis*). For the 2011 MAG fishery, the estimated 2011 serious injuries and mortalities were 123 (CV = 41%) harbor porpoises, 29 (CV = 53%) common dolphins, 19 (CV = 60%) gray seals, and 21 (CV = 67%) harbor seals. No takes were recorded in the 2011 Mid-Atlantic NMFS gillnet experiment.

INTRODUCTION

Section 117 of the Marine Mammal Protection Act (MMPA) states that estimates of annual human-caused mortality and serious injury to marine mammal stocks must be reported in annual stock assessment reports (SAR) for each stock of marine mammal that occurs in waters under U.S. jurisdiction. In 1989, the Northeast Fisheries Science Center (NEFSC) Northeast Fisheries Observer Program (NEFOP) was initiated to document the bycatch of marine mammals taken incidentally in commercial fishing operations (Waring et al. 2004). Since the initiation of the observer program, the estimation of total incidental takes for harbor porpoise (*Phocoena phocoena*) has been the focus of much attention due to frequent observations of incidental takes occurring in the New England sink gillnet (NESG) fishery[1] (NMFS 1998). This attention led to

[1] The New England sink gillnet fishery (NESG) was called the Northeast sink gillnet fishery in cetacean and pinniped gillnet bycatch estimating documents prior to 2011 (e.g., Orphanides 2010a). This name change was made to be consistent with recent Harbor Porpoise Take Reduction Plan (HPTRP) documents (e.g., NOAA Fisheries PRD

the development of a stratification method designed to estimate the total annual incidental takes of harbor porpoise (Bisack 1993; Smith et al. 1993; Bravington and Bisack 1996; Bisack 1997; Rossman and Merrick 1999; Bisack 2003). The regional scope of the NEFOP was expanded into the Mid-Atlantic region in 1995 to learn more about marine mammal interactions occurring in Mid-Atlantic gillnet fisheries.

Rossman and Merrick (1999) documented the methods used to estimate harbor porpoise bycatch in the NESG and Mid-Atlantic gillnet (MAG) fisheries. These methods were subsequently used to estimate the bycatch of other marine mammal species incidentally caught in the NESG and MAG fisheries (Blaylock et al. 1995, 2006; Waring et al. 1997, 2004; Belden et al. 2006; Belden 2007; Belden and Orphanides 2007; Orphanides 2010a, 2011).

The NESG fishery extends from Maine to Connecticut and is dominated by bottom-tending sink gillnets. Less than 1% of vessels in the fishery utilize a drift gillnet (not anchored and not tending toward the ocean bottom). Monofilament twine is typically used with stretched mesh sizes ranging from 6 – 12 in (Waring et al. 2004). According to data collected by the NEFOP from 1999 through May 2012, string lengths ranged from 100 – 15,000 ft. Roughly half of the observed strings were between 2700 and 4500 ft long, and the median length was about 3,000 ft. Mesh size and string length vary by the target species (Waring et al. 2004).

The MAG fishery generally ranges from Connecticut to North Carolina and utilizes both drift and sink gillnets. The majority of nets are anchored to the bottom, although unanchored drift or sink nets are also utilized to target specific species. Monofilament twine is again the dominant material and is used with stretched mesh sizes typically ranging from 2.5 – 12 in (Waring et al. 2004). According to data collected by the NEFOP from 1999 through May 2012, string lengths ranged from 100 to over 11,000 ft. Roughly half of the observed strings were 900 – 1300 ft long, and the median length was 1200 ft. As in the New England fishery, mesh size and string length vary by the target species (Waring et al. 2004).

After the 2005 bycatch estimates, the division between the New England and Mid-Atlantic changed from a system based on vessel home port (divided at the Connecticut-Rhode Island border) to one based on reported fishing location. For the 2006 – 2011 bycatch estimates, the NESG and MAG fisheries were defined by a division at 72˚30'W longitude, extending south to the North Carolina/South Carolina border.

The present analysis of the 2010 and 2011 data uses the same general ratio estimator methodology that was used to calculate cetacean and seal bycatch for the 2006 – 2009 NESG and MAG fisheries (Belden and Orphanides 2007; Orphanides 2010a, 2011). However, this analysis differs from past years due to the availability of an additional new observer data source, the At-Sea-Monitoring (ASM) data, and because of recent changes in gillnet management areas (MAs). These changes and the resulting bycatch estimates are described in this report.

2010) and to avoid confusion with the HPTRP Northeast Management Area. This change is in name only; the fishery being specified and its extent have not changed from previous cetacean and pinniped gillnet bycatch estimating documents. Also, this fishery is still called the Northeast sink gillnet fishery in NOAA's List of Fisheries, which classifies fisheries into categories based on the level of marine mammal interactions in the fishery.

METHODS

Data Sources

Six databases were used to estimate the total marine mammal incidental takes in 2010: NEFOP, ASM, Allocated Commercial Landings, Northeast Vessel Trip Reports (VTR), NMFS gillnet hanging ratio study (A.I.S. Inc. 2010), and sturgeon study (Endeavor Fisheries Inc. 2011). The NEFOP and ASM data were used to estimate the bycatch rate of marine mammals and the Allocated and VTR data were used to estimate the total effort of the fishery. The hanging ratio and sturgeon study databases were used to account for takes during experimental fishing studies.

Observer Data

The NEFOP has two types of sampling protocols when observing gillnet fishing trips: (1) complete fish sampled trips where the observer samples the catch for fish discard information, thus the observer is not able to watch the net as it is being hauled in and so might miss an incidental take; and (2) limited fish sampled trips where the observer watches the net for incidental takes as it is being hauled in and thus should not miss any incidental takes. All observers are directed to document incidental takes, though a complete sampling trip dedicated to processing fish may have a higher likelihood of missing an incidental take that falls out of a net prior to being brought on board. In the NESG and MAG fishery, hauls observed from both trip sampling protocols were used to estimate bycatch rates for all species. This had been done in past MAG estimates since 2006 (Belden and Orphanides 2007; Orphanides 2010a, 2011), and in past NESG fisheries since 2004 (Belden et al. 2006; Belden 2007; Belden and Orphanides 2007; Orphanides 2010a, 2011).

In 2010 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 sector 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 2011b; 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: Atlantic cod (*Gadus morhua*), American plaice (*Hippoglossoides platessoides*), Atlantic halibut (*Hippoglossus hippoglossus*), Atlantic wolffish (*Anarhichas lupus*), haddock (*Melanogrammus aeglefinus*), ocean pout (*Macrozoarces americanus*), pollock (*Pollachius virens*), redfish (*Sebastes marinus*), white hake (*Urophycis tenuis*), windowpane flounder (*Lophopsetta maculata*), winter flounder (*Pseudopleuronectes americanus*), witch flounder (*Glyptocephalus cynoglossus*), and yellowtail flounder (*Limanda ferruginea*). Under certain circumstances, the species landed can also include monkfish (*Lophius americanus*), skates, and spiny dogfish (*Squalus acanthias*) in addition to the 13 listed in the FMP (15 CFR Part 902; 50 CFR Part 648).

Since the ASM program monitors what is typically called the "groundfish" fishery (even though it occasionally catches other species), trips subject to ASM coverage will be referred to as "groundfish" trips[2]. Groundfish trips are subject to ASM coverage based on their trip declaration

[2] In a recent report (Orphanides and Palka 2012) what are referred to here as "groundfish" trips were referred to as "sector" trips. These two terms are referring to exactly the same types of trips, the terminology was simply changed to be more consistent with other NOAA documents discussing this fishery, its management, and the ASM data.

as a Northeast Multispecies trip, which includes trips participating in an approved sector and the "common pool" (i.e., those vessels not participating in an approved sector). Some groundfish trips were observed by NEFOP rather than by ASM, and NEFOP also observed non-groundfish trips. 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 coverage of the groundfish fishery (including trawls) was 29.3%, with 6.7% occurring through NEFOP and 22.5% occurring through ASM. In 2011 groundfish coverage (including trawls) was 26.0%, with 6.4% occurring through NEFOP and 19.5% occurring through ASM (Palmer et al. in press).

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 that ASM observers collect data on fewer variables than NEFOP observers, though the data collected by ASM observers exactly match a subset of the fields recorded 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 limited fish sampling trips as described above and may be more likely to observe incidental takes, while all ASM trips act as NEFOP complete fish sampling trips that may be more likely to miss some incidental takes. 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 (with approximately 24% coverage in 2010 and 26% coverage in 2011). So, the ASM data will not represent all gillnet fishing effort in a particular time and area if a significant fraction of the fishing 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 2 – 8%. Consequently, when using the ASM data for calculating incidental take 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 the 2010 and 2011 datasets (NEFOP and ASM) 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, 2010b). Rare missing location values were imputed using medians from representative strata following methods described in Warden and Orphanides (2008) as has also been done in past bycatch estimate and compliance calculations (e.g., Orphanides 2011, 2010b). For the 2010 and 2011 data, original location values were present in over 97% and 98% of hauls respectively, and no incidental takes were associated with imputed locations.

Study Data

From February through April of 2010, NMFS conducted year two of a study to examine the effects of gillnet hanging ratios on harbor porpoise bycatch (A.I.S. Inc. 2010). Also in November and December of 2010 and 2011, NMFS conducted a study on the effect of tie downs

on sturgeon bycatch in the gillnet monkfish fishery in waters off the coast of New Jersey (NMFS Statistical Area 612) (Endeavor Fisheries Inc. 2011; Fox et al. 2012). Any takes that occurred during this research were simply added to the total extrapolated estimate from the observed commercial fisheries to estimate total annual human-caused mortality. Since these hauls were fully observed by researchers, the effort was included in calculations of observer coverage. Research effort and takes were not used to calculate bycatch rates applied to commercial fisheries.

Dealer and Self Reported Data

The Allocated Commercial Landings and Northeast Vessel Trip Reports (VTR) were used to calculate the total landings of all finfish caught north of North Carolina, as has been done for the last three annual gillnet bycatch estimates (Orphanides 2010a, 2011). The Allocated Commercial Landings data merges by trip the VTR logbook data (which contain fishing locations and gear characteristics) and Northeast Dealer Report data (which do not contain fishing locations or gear characteristics), wherever possible (75% of VTR gillnet trips in 2010 and 84% in 2011 were matched to Northeast Dealer Report data). Thus the location and gear characteristic information of the VTR logbooks is linked with the near census of landings in the Dealer Report data (Wigley et al. 2008). This approach provides a more accurate bycatch estimate by greatly limiting the need to assign commercial landings to spatial and temporal strata with unmatched VTR data. This approach also provides a more accurate split between the New England and Mid-Atlantic fisheries because locations are now known for much of the commercial landings data.

In the cases where VTR and Allocated trips were successfully matched one to one, the Allocated landings, locations, and other characteristics for these trips were used in this analysis. In the cases where the VTR and Allocated trips could not be matched one to one, a proration scheme was used which was based on strata defined by state, season, and year, as was done in previous years (e.g., Belden and Orphanides 2007; Orphanides 2010a, 2011). That is, for strata where the total Allocated landings were greater than total VTR landings, the landings of each VTR trip in those strata were multiplied by a correction factor that ensured the total VTR landings for the strata equaled the total Allocated landings for the same strata. In the cases where the VTR landings in a stratum were larger than landings in the corresponding stratum in the Allocated data (11% of all VTR trips in 2010 and 5% of all VTR trips in 2011), the Allocated landings were retained, that is unless no Allocated landings were present for those strata, in which case the VTR landings were used. In 2010 there were no strata that contained VTR landings but no Allocated landings, and in 2011 less than 1% of trips were in strata that contained VTR landings but no Allocated landings. This approach respects the assumption that the commercial Northeast Dealer Report landings data represent a near census of all landings in the fishery, while still allowing for a limited amount of flexibility to ensure that the spatial and temporal distribution of landings is representative of effort in the VTR. The resulting landings combining the VTR and Allocated data will be referred to as the prorated metric tons of landings.

In past years North Carolina Division of Marine Fisheries (NCDMF) data were used for North Carolina fishing effort because of deficiencies in the North Carolina portion of data within the VTR and Dealer databases (Orphanides 2011). However, in 2010 and 2011 this was not necessary because no marine mammal gillnet bycatch was observed off North Carolina.

Analysis

An "incidental take" or "bycatch" is defined as any observed incidentally caught marine mammal that was recorded as either alive with injuries 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 marine mammal could have been alive when entangled in the net. Incidental takes not identified to genus were not included in the bycatch estimates.

The level of sampling (observer coverage) within each stratum was calculated by dividing the observed metric tons (mtons) of landings by the prorated metric tons of landing recorded in the effort datasets. Thus, the observer coverage represented the fraction of total landings that were sampled. Both NEFOP and ASM hauls were used to calculate observer coverage. The majority of ASM data were in New England, though some ASM hauls were observed in the Mid-Atlantic, and these hauls were treated the same as NEFOP observed hauls in the Mid-Atlantic.

The general data analysis process involved first stratifying the commercial fisheries data to encompass the spatial-temporal distribution of the fishery and bycaught species. Then within each stratum, the total bycatch was estimated as the product of the bycatch rate (estimated from the observer datasets) and the commercial fishing effort (calculated from the effort datasets). The total bycatch within a fishery is the summation of the strata-specific bycatch estimates. Then the total bycatch from NMFS experimental studies was added to the total estimate from the commercial fisheries.

Data Stratification

Data stratification used to estimate NESG fishery bycatch was nearly the same as that defined in 1999 (Rossman and Merrick 1999), with a few significant exceptions. As in 1999, the 2010 and 2011 NESG fishery data were stratified temporally by season, spatially by port group-area and management area (Figure 1, Table 1), and also by the presence/absence of pingers. Seasons were defined as winter (January to May), summer (June to August), and fall (September to December).

The temporal/spatial/pinger strata were based on the harbor porpoise take reduction plan (HPTRP) in effect, which also relates to the general migration patterns of the harbor porpoise. For 2010 and 2011, two new spatial strata were developed as a result of the new 2010 HPTRP Management Areas (the Southern New England and Stellwagen Bank Management Areas) (Figure 1). The Cape Cod South Management Area was retained for the purposes of the bycatch stratification from Dec-May as was done in past estimates, meaning that the Southern New England Management Area stratification only included the area outside of the Cape Cod South Management Area during this time period. Dividing fishing effort in southern New England this way better fits effort that is often separated between mid-shelf trips in the Cape Cod South Management Area targeting groundfish and those trips farther offshore targeting monkfish.

The other major change in the NESG bycatch estimates involved estimating the bycatch rate using both the NEFOP and ASM observer data, which had not been available in previous years. The ASM and NEFOP data were both stratified spatially, temporally, and by pinger use, as described above. However, to appropriately include the ASM data (which had a higher coverage rate in only a portion of the gillnet fishery), the ASM data were weighted to ensure that the combined NEFOP-ASM sample was representative of the fishery as a whole and was not

biased towards the portion of the fishery sampled by the ASM program. Further details can be found in the Bycatch Rates section of the Methods.

Given that the ASM data began in May of 2010, it is likely that there would be a small adjustment period for the new data collection program. Therefore, in order to avoid using potentially erroneous data, the first month's data were not used in this analysis. Not including May of 2010 also makes the New England winter bycatch season (Jan – May) more cohesive and not unduly influenced by a surge of ASM hauls in May. Bycatch observed on May ASM hauls is noted in the Results section, though it was not used in bycatch estimation. Representative sampling by the NEFOP program during the winter of 2010 should account for any bycatch observed in the ASM program during this period.

About a year and a half after the implementation of the ASM program a problem was found with how the pinger usage field was recorded. There was some confusion as to whether a missing value represented zero pingers used on a gillnet string or a field that was missed. This problem was fixed as of September 2011. Therefore, prior to September 2011, New England ASM hauls with missing values were dropped from the bycatch rate calculation process. The ASM hauls with missing pinger use values were treated similarly to the hanging ratio experiments in that the takes were counted towards the final bycatch estimate but did not factor into the bycatch rate calculation. Also, observed landings on these hauls were subtracted from the prorated metric tons of landings from the dealer and VTR data. This ensured that the observed bycatch rate in NEFOP hauls and ASM hauls with valid pinger information was not multiplied by landings for which the takes were already accounted. Takes on these hauls were added to the total commercial bycatch estimate.

Since 2006, the 72˚30'W longitude line (Figure 1) was used to divide the NESG and the MAG fisheries (Belden and Orphanides 2007; Orphanides 2010a, 2011). As a result, trips landing in Connecticut, New York, and New Jersey which fished east of 72˚30'W were included in the NESG fishery and were within the South of Cape Cod port group or Southern New England management area depending on the time of year, while data from trips which fished west of this line were included in the MAG fishery (Tables 1 - 2).

Since 2009 the MAG Waters off of New Jersey bycatch estimates for harbor seals (*Phoca vitulina*), harp seals (*Pagophilus groenlandicus*), gray seals (*Halichoerus grypus*), and common dolphins (*Delphinis delphis*) were calculated using strata defined by fishing region and season (Figure 1). Previously (2005 – 2008), a state-season stratification was used, which was based on the state where a vessel's catch was landed (Belden 2007; Belden and Orphanides 2007; Orphanides 2010a). Using the fishing region stratification improves spatial cohesion by ensuring that fishing effort occurring in the same area is treated as one unit no matter where vessels landed their catch. In practice, the spatial stratification differs only to a small degree from the state-season stratification since the majority of vessels in the Mid-Atlantic land their catch in the region where it was caught. For example, in 2010 97% of landings and 95% of hauls between November and April were caught in the Waters off New Jersey and also landed in New Jersey.

The seasonal stratification varied by species in the Waters off New Jersey, corresponding to the different times when the particular species was present in the region where it was caught. Since 2008, the stratification for the harbor porpoise bycatch estimate in the Waters off New Jersey was by a winter season of January to April (Orphanides 2011, 2010a). The 2010 and 2011 seasonal harbor porpoise bycatch strata for this area were the same as in the past. In 2011 there was also one observed harbor porpoise take off of Virginia in February. In the past, most of the harbor porpoise bycatch in the region of this take has been clustered off Delaware, Maryland,

and Virginia and occurred from February through April. So, to estimate bycatch for the region off Virginia, a season of February through April was used along with a spatial region from the southern tip of Delaware Bay south to the northern border of North Carolina.

From 1989 through 2009, only three common dolphin incidental takes had been observed in the Waters off New Jersey: one animal in January and 2 animals in December. In the 2010 calendar year, the common dolphin incidental takes observed in the NEFOP program also occurred during December and January. However, in these same waters in the hanging ratio experiment, one common dolphin incidental take occurred in February 2010. In the sturgeon study six common dolphins were taken in December 2010 and 1 was taken on November 28, 2010. To estimate the common dolphin bycatch from the 2010 NEFOP data, the seasonal stratum for the Waters off New Jersey was set to be December and January since the observed bycatch in the regular fishery took place in these months. However, in the Waters off New Jersey for 2011, the seasonal stratification for common dolphins was expanded to December through February since one common dolphin was observed taken in a non-experimental fishery in February 2011. Consistent bycatch estimating seasons are preferred if bycatch fits within historically observed seasonal patterns and the distribution expected by biologists. However, for common dolphins there is not a good record of occurrence in this fishery off of New Jersey and the recent distribution differed from that observed in the past. Given this uncertainty, the 2011 bycatch estimate season was expanded to fit the take observed.

Gray seal incidental takes in the Mid-Atlantic have also been very rare in the past 21 years: two takes occurred in the Waters off New Jersey in January and April, and a third in April off of Virginia. In 2010 incidental gray seal takes occurred in the Waters off New Jersey during February and March and off Virginia during April. Therefore, for the gray seal bycatch, a January-April season was used in Waters off New Jersey and an April season was used for Virginia. Despite the rare observations of gray seal takes off New Jersey, the January-April season in the Waters off New Jersey is consistent with the typical winter season for other seals in this area and is also consistent with expected distribution (Waring, pers. comm.). In 2011 both observed gray seal takes occurred in February in the Waters off New Jersey. Given that the 2011 bycatch was within the historical seasonal distribution of takes, a January-April season was used to estimate gray seal takes in the Waters off New Jersey as was done in 2010.

Harp seal incidental takes had previously occurred from February through April in Waters off New Jersey. In 2010 a harp seal incidental take was observed in these same waters in January. Therefore, a season from January through April was used. In 2011 no harp seals were observed incidentally taken in the Mid-Atlantic.

Since 1989 harbor seal incidental takes had previously been observed in Waters off New Jersey from December through March, though 8 of the 10 occurred in January and February. In 2010, three harbor seal takes were observed in February in Waters off New Jersey in the hanging ratio study and six harbor seals were observed by NEFOP in the Waters off New Jersey in December through March. Therefore, a season of December through March in the Waters off New Jersey was used for the harbor seal bycatch. In 2011 one harbor seal incidental take was observed in January in the Waters off New Jersey and another in February. The same seasonal stratification was used in 2011 as was done in 2010 (Dec-March).

With the advent of ASM hauls in the Mid-Atlantic during the winter of 2011, bycatch stratification for the Waters off New Jersey had to be modified. ASM hauls were characterized by long soak durations, which are known to increase bycatch (Orphanides 2009; Hatch 2012). All but 1 of 14 hauls with bycatch off New Jersey occurred on ASM hauls with an average soak

duration of 173 hr. However, it would not be appropriate to stratify observed hauls simply by observer type because that is not suspected to play a role in observed bycatch rates. Instead, hauls were stratified by soak duration because longer soak durations have been associated with higher bycatch rates. However, there was not an obvious division point for stratifying by soak duration since the historical relationship between bycatch and soak duration is fairly linear when examined over the larger region (Mid-Atlantic and New England) (Orphanides 2009). For 2011, the bycatch estimates were stratified by soak durations > 72 hrs. Since soak duration is almost always recorded in 24 hr increments, this effectively created a stratum of hauls with the median soak duration (96hrs) and longer. Since all takes in 2011 occurred with 96 hours of soak time or greater, this balanced the need for an adequate sample size while accounting for the likely higher bycatch rates associated with longer soaks (> 72 hrs).

Since 2008, the stratification for the harbor porpoise bycatch estimate in the Waters off New Jersey included stratification by mesh size (< 6.535", 6.535-9.150", and > 9.150") (Orphanides 2011, 2010a). The 2010 harbor porpoise bycatch strata for this area were the same as in the past. Orphanides (2009) suggested including mesh size in the Mid-Atlantic harbor porpoise stratification, based on a thorough examination of the most appropriate means to estimate harbor porpoise bycatch in the northwestern Atlantic U.S. gillnet fisheries. Harbor porpoise bycatch rates were shown to be different in nets with different mesh sizes (Orphanides 2009; Palka et al. 2009), as has also been shown for other marine mammals (Palka and Rossman 2001) and sea turtles (Murray 2009).

For the 2011 estimates, the mesh stratification in the Waters off New Jersey was changed slightly for harbor porpoise, and a mesh stratification was included for gray seal, harbor seal, and common dolphin. The 2010 harbor seal estimate also used a mesh stratification since mesh size >= 7 in was found to be an important factor when modeling Mid-Atlantic harbor seal bycatch (Belden pers. comm.). For 2011 all mesh stratification was set at < 7 in or >= 7 in as in the 2010 harbor seal estimates. This provides consistency across the species as protected species bycatch has been shown to increase with increasing mesh size (Palka and Rossman 2001; Murray 2009; Orphanides 2009; Palka et al. 2009; Belden pers. comm.). Although the value used to split the mesh categories for harbor porpoise changed from 9.15 to 7 inches, in reality, the fishing effort included in the mesh categories did not change because there was no recorded effort during this time-area with mesh sizes from 7 to 9.15 inches and a soak duration greater than 72 hours. Roughly 94% of all 2011 effort during this time and area - regardless of soak time – was either targeting monkfish with 12 in mesh or other species with 6 in mesh, with less than 0.5% using mesh between 6.5 and 12 in. For the 2011 harbor porpoise estimates off of Virginia, mesh size and soak duration stratification were explored, but stratifying by mesh sizes or soak duration would have made the sample size too small to get a reasonable estimate so the data were not stratified by those characteristics.

Bycatch Estimate

The estimated number of marine mammal bycatch (B) is the sum of the estimated number of incidental takes within each stratum (i) where there are a total of S strata:

$$B = \sum_{i=0}^{S} incidental\ takes_i$$

$$B_i = \sum_{i=0}^{S} bycatch\ rate_i\ *\ total\ effort_i$$

The estimated number of incidental takes within a stratum (B_i) is the product of the observed bycatch rate within that stratum (bycatch $rate_i$) multiplied by the total effort within that stratum (total $effort_i$). Bycatch rates were calculated as the number of observed marine mammal incidental takes per observed metric tons (mtons) of live fish landed. The bycatch estimate explicitly accounts for two factors: observed fishing effort in the groundfish and non-groundfish fisheries, and bycatch rates for pingered and non-pingered hauls.

In order to include the ASM data in the calculation of the NESG bycatch estimates, the estimating process was changed from previous years (e.g., Orphanides 2011). The ASM data are by definition a subset of the entire gillnet fishery as they are designed to only sample groundfish trips. Therefore, there was the possibility that groundfish fishing effort would be over-represented, and the total sample would not be representative of the entire NESG fishery. In order to account for this 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 stratum. Similarly, non-groundfish NEFOP data were used to calculate a non-groundfish bycatch rate for each stratum.

Pinger use was taken into account when calculating the bycatch rate for groundfish and non-groundfish effort in each stratum. Some gillnets in the NESG fishery are equipped with pingers, and the bycatch rate of nets with pingers is expected to differ from the rate of nets without pingers (Palka et al. 2008). To accommodate this difference, a weighted bycatch rate (WBR) was calculated for strata that had both hauls with and without pingers. This was done separately for groundfish and non-groundfish hauls. Within a stratum and effort type (groundfish/non-groundfish), two weighted bycatch rates were first calculated, one from hauls with pingers (WBR_p) and one from hauls without pingers (WBR_{np}):

$$WBR_p = \frac{observed\ takes_{with\ pingers}}{observed\ landings_{with\ pingers}} * observed\ hauls_{with\ pingers}$$

$$WBR_{np} = \frac{observed\ takes_{no\ pingers}}{observed\ landings_{no\ pingers}} * observed\ hauls_{no\ pingers}$$

Next, within a stratum and effort type (groundfish/non-groundfish), a total weighted bycatch rate (WBR) was calculated that incorporates hauls both with and without pingers:

$$WBR = \frac{WBR_p + WBR_{np}}{total\ hauls}$$

At this point in the process, two pinger-weighted bycatch rates had been calculated for each stratum, one using only observed groundfish hauls (accounting for pingers) and the other using only observed non-groundfish hauls (accounting for pingers). Calculating a final bycatch rate for each stratum that incorporated both NEFOP and ASM data (Joint NEFOP ASM $Byc_{stratum}$) was complicated by the need to account for the fact that there were more ASM data than

NEFOP data and ASM data were only recorded from groundfish trips. Thus the Joint NEFOP ASM bycstratum was calculated using:

$$Joint\ NEFOP\ ASM\ Byc_{stratum} = (Groundfish\%_{stratum} * GroundfishByc_{stratum}) + (NonGroundfish\%_{stratum} * NonGroundfishByc_{stratum})$$

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) in the NEFOP data was recorded for each stratum ($Groundfish\%_{stratum}$ and $NonGroundfish\%_{stratum}$). These NEFOP groundfish and non-groundfish landings percentages were then used to weight the (ASM and NEFOP) groundfish and (NEFOP) non-groundfish bycatch rates so that the groundfish bycatch rate had an influence on the final estimate that was proportional to the amount of groundfish trip landings in the NEFOP data.

Bias corrected and accelerated (BC_a) bootstrapping techniques were used to derive the confidence intervals (CIs) and standard bootstrapping techniques were used to derive the coefficients of variation (CV) for the bycatch estimates for each stratum. If observer coverage was greater than or equal to 10%, the Finite Population Correction factor (FPC) was applied to the variance used in the CV and CI calculations. The re-sampling unit used was an entire trip rather than an individual haul to ensure that any within trip dependence was carried over into the estimated CV (Bisack 2003).

Mortality, Serious Injury, and Non-Serious Injury

The MMPA requires that mortality and serious injury incidental to commercial fishing operations be estimated and reported in annual stock assessment reports. New serious injury criteria were developed at a Workshop in 2007 followed by NMFS policy in 2012 for applying the new criteria to distinguish serious injuries from non-serious injuries of marine mammals (Andersen et al. 2008; NOAA Fisheries 2012a, 2012b). In 2011 the new criteria were applied to bycatch events from the most recent five years (2007-2011). These determinations were then used to create proportions for the following determinations: mortalities, serious injuries, non-serious injuries, and uninjured. For example, white-sided dolphin (*Lagenorhynchus acutus*) bycatch in gillnets during 2007-2011 comprised 93.33% mortalities, 6.67% serious injuries, 0% non-serious injuries, and 0% uninjured. These percentages were applied to the total annual bycatch estimates from 2007-2011 to estimate the extent of injury or death caused by fishery interactions. As a result, the 2008 gillnet white-sided dolphin bycatch estimate of 81 animals resulted in 76 mortalities and 5 serious injuries (for the 2010 and 2011 classifications see the Results section). During the 2007-2011 time period, the only other species observed caught in gillnets with a determination other than a mortality was harbor seal. Harbor seal bycatch in gillnets from 2007-2011 comprised 99.50% mortalities and 0.50% non-serious injuries. These percentages were applied to the 2007-2011 harbor seal bycatch estimates.

RESULTS

2010 New England Sink Gillnet Fishery

The overall annual observer coverage from both the ASM and NEFOP programs in the NESG using both limited and complete trips was 11.8%, ranging from 5.8% in the winter to 24.1% in the fall (Table 1). The observer coverage levels presented here only include hauls used in the bycatch estimate calculations and do not include ASM data removed from the analysis due to unknown pinger use and ASM coverage in May of 2010; otherwise, the coverage level would be larger. The 2010 coverage level presented here is about three times the coverage level in 2009, which was 3.8% (Orphanides 2010a).

Animals observed incidentally taken in the 2010 NESG fishery and used to estimate annual bycatch (i.e., not in a fishery experiment) include 43 harbor porpoises, 94 gray seals, 70 harbor seals, 7 harp seals, 6 white-sided dolphins, 4 common dolphins, and 1 pilot whale (genus *Globicephala*) (Tables 3 – 9). All observed incidental takes were mortalities except for one white-sided dolphin that was determined to have a serious injury. Included among these takes are those that occurred on ASM hauls with unknown pinger use, including 7 harbor porpoises, 14 gray seals, 19 harbor seals, 3 white-sided dolphins, and 1 common dolphin. Several animals were incidentally caught during a 2010 NMFS experimental study to examine the impact of gillnet hanging ratio on harbor porpoise bycatch, including 1 harbor porpoise, 13 gray seals, 1 harbor seal, and 1 harp seal. The animals in the NMFS study and those on ASM hauls with unknown pinger use were added to the total bycatch estimate but did not contribute to bycatch rate calculations. Animals observed taken on ASM hauls in May 2010 were not directly included in the bycatch rate calculations (6 harbor porpoise, 13 gray seals, and 1 harbor seal) because that was the first month of the ASM program. However, assuming that winter NEFOP data are representative, these takes are represented in the total estimate through NEFOP sampling. In addition, 7 unidentified seals were observed incidentally taken on NEFOP and ASM hauls, and 1 unidentified porpoise or dolphin was observed on an ASM haul. Unidentified animals were not included in the bycatch estimates.

The MMPA requires that bycatch is classified as mortalities, serious injuries, non-serious injuries, or uninjured animals. Therefore, the 2010 estimated incidental takes provided in this report (Tables 3 – 9) include serious injuries, mortalities, and non-serious injuries. No bycaught animals were classified as being uninjured. The estimated serious injuries and mortalities in the 2010 NESG fishery were 386 harbor porpoises, 1142 gray seals, 539 harbor seals, 252 harp seals, 66 white-sided dolphins, 69 common dolphins, and 3 pilot whales of unknown species. (Tables 3-9). When the takes from the NMFS experimental gillnet study are included, the total estimated serious injuries and mortalities in New England were 387 (CV = 27%) harbor porpoises, 1155 (CV = 28%) gray seals, 540 (CV = 25%) harbor seals, 253 (CV = 61%) harp seals, 66 (CV = 90%) white-sided dolphins, 69 (CV = 81%) common dolphins, and 3 (CV = 80%) pilot whales of unknown species (Tables 3 – 9). All estimated takes were deemed to be mortalities except 4 white-sided dolphins. This results in a white-sided dolphin serious injury estimate of 4 and a mortality estimate of 62, though serious injuries are treated as mortalities under the MMPA. It was estimated that 3 harbor seals had non-serious injuries in addition to the 540 with serious injuries and mortalities, making the total estimated incidental takes 543 (540+3) (Table 5).

2010 Mid-Atlantic Gillnet Fishery

The 2010 observer coverage for the MAG fishery using both complete fish sampling trips (i.e., complete trips) and limited fish sampling trips (i.e., limited trips) was 3.9% (Table 2), a percentage point higher than 2009 (2.9%). Seasonal observer coverage for specific Mid-Atlantic bycatch strata varied from 3.1% in the winter gray and harp seal seasons to 8.7% in the winter common dolphin season (Table 10).

There were 8 harbor porpoises, 9 gray seals, 6 harbor seals, 1 harp seal, and 2 common dolphins observed incidentally taken in the MAG fishery in 2010 (Table 11). All incidentally taken animals in the MAG fishery that were observed were in the Waters off New Jersey except one gray seal off Virginia. In addition to the animals observed incidentally taken in the MAG fishery, 10 harbor porpoises, 3 harbor seals, and 1 common dolphin were taken in the NMFS hanging ratio experiment. Also, 6 common dolphins were incidentally taken in the NMFS sturgeon study. Unidentified animals were not included in the bycatch estimates, but 3 unidentified dolphins were incidentally caught in the NMFS sturgeon study, 1 unidentified small cetacean was caught in the hanging ratio study, and 2 unidentified seals were caught on NEFOP hauls.

The 2010 estimated total serious injuries and mortalities for cetaceans in the MAG fishery were 249 harbor porpoises, 267 gray seals, 86 harbor seals, 32 harp seals, and 23 common dolphins (Table 11). When the takes in the NMFS experiments are included in the total, the 2010 estimated total serious injuries and mortalities were 259 (CV = 88%) harbor porpoises, 267 (CV = 75%) gray seals, 89 (CV = 39%) harbor seals, 32 (CV = 96%) harp seals, and 30 (CV = 48%) common dolphins. All incidental takes were classified as mortalities (Table 11).

2011 New England Gillnet Fishery

The overall annual observer coverage from both the ASM and NEFOP programs in the NESG using both limited and complete trips was 12.63%, ranging from 4.86% in the summer to 20.44% in the fall (Table 12). The observer coverage levels presented here only include hauls used in the bycatch estimate calculations and do not include ASM data removed from the analysis due to unknown pinger use; otherwise, the coverage level would be larger. The 2011 coverage level presented here is very similar to the coverage level in 2010 (11.8%), but about three times the level in 2009 (3.8%) (Orphanides 2010a).

Animals observed incidentally taken in the 2011 NESG fishery and used to estimate annual bycatch include 66 harbor porpoise, 222 gray seals, 90 harbor seals, 4 harp seals, 5 white-sided dolphins, and 6 common dolphins (Tables 14 – 19). One of the 90 harbor seal incidental takes was caught alive and was later determined to have a non-serious injury. Included among these takes are those that occurred on ASM hauls with unknown pinger use, including 2 harbor porpoises, 65 gray seals, 47 harbor seals, and 1 common dolphin. Animals on ASM hauls with unknown pinger use were added to the total bycatch estimate but did not contribute to bycatch rate calculations. In addition, there were several unidentified animals incidentally caught, including 1 unknown marine mammal, 5 unknown porpoises or dolphins, and 9 unknown seal species. Unidentified animals were not included in the bycatch estimates.

The estimated serious injuries and mortalities in the 2011 NESG fishery were 273 (CV = 20%) harbor porpoises, 1491 (CV = 22%) gray seals, 343 (CV = 19%) harbor seals, 14 (CV = 46%) harp seals, 18 (CV = 43%) white-sided dolphins, and 49 (CV = 71%) common dolphins (Tables 14 – 19). These estimates were all deemed to be mortalities except for 1 white-sided dolphin estimated to be a serious injury. This results in a white-sided dolphin serious injury

estimate of 1 and a mortality estimate of 17, though serious injuries are treated as mortalities under the MMPA. It is estimated that 2 harbor seals had non-serious injuries in addition to the 343 with serious injuries and mortalities, making the total estimated incidental takes 345 (343+2) (Table 16).

2011 Mid-Atlantic Gillnet Fishery

The 2011 observer coverage for the MAG fishery using both complete and limited trips was 2.0% (Table 13), about half the coverage in 2010 (3.9%) and about one percentage point lower than 2009 (2.9%). Despite the low overall coverage levels, observer coverage for specific Mid-Atlantic bycatch strata was relatively high for the most part, with coverage ranging from 10.5% to 9.4% in strata off New Jersey and 3.7% off Virginia (Table 20).

There were 11 harbor porpoises, 2 gray seals, 2 harbor seals, and 3 common dolphins observed incidentally taken in the MAG fishery in 2011 (Table 21). All Mid-Atlantic observed incidentally taken animals were taken in the Waters off New Jersey except one harbor porpoise off Virginia. In 2011, no marine mammals were incidentally caught in the NMFS sturgeon bycatch study. Unidentified animals were not included in the bycatch estimates, but 1 unidentified seal was incidentally taken in the Mid-Atlantic. The 2011 estimated serious injuries and mortalities for cetaceans in the MAG fishery were 123 (CV = 41%) harbor porpoises, 19 (CV = 60%) gray seals, 21 (CV = 67%) harbor seals, and 29 (CV = 53%) common dolphins. All incidental takes were estimated to be mortalities.

DISCUSSION

The 2010 and 2011 pinniped and cetacean bycatch calculations differed from previous year's calculations in a few ways, but the primary difference was the inclusion of ASM data. The ASM data should be as representative of the groundfish fishery as the traditional NEFOP data since they share many observation and allocation protocols. The challenge in using these data occurs when a region's fishing effort contains other fisheries besides the groundfish fishery. In the Gulf of Maine, the groundfish fishery dominates the fishing effort in the times and areas when cetacean and pinniped bycatch are most likely to occur (Orphanides and Palka 2012; Orphanides 2012). In this region combining ASM and NEFOP data should not present a problem since both data types are sampling the same population of fishing vessels using the same protocols. In southern New England the monkfish fishery is more prominent and is not fully covered by the ASM program, unlike the NEFOP program which monitors all types of gillnet effort. The steps taken to adjust for the percentage of groundfish vs. non-groundfish effort in this fishery have already been used in harbor porpoise bycatch rate analysis and should properly account for these differences (Orphanides and Palka 2012; Orphanides 2012). Additional analysis is underway comparing NEFOP and ASM data during the first year the ASM data were collected.

Given that the ASM data began in May of 2010, it is likely that there would be a small adjustment period for the new data collection program. Given this likelihood, the first month of data collection was not used. Not including May of 2010 also makes the New England winter bycatch season (Jan-May) more cohesive and not unduly influenced by a surge of ASM observed hauls in only one month, May. Among the adjustments made in the beginning of the ASM data collection program was a refinement of recording pinger use. Because of the uncertainty in how to interpret missing values for this variable at the beginning, a number of hauls were dropped from the bycatch rate calculation, though the takes did contribute to total bycatch. For some

species, such as harbor porpoise, this had a limited effect on bycatch estimates because most of the hauls that were dropped occurred in the summer months when few harbor porpoise bycatch events are observed. Therefore, dropping many summer ASM hauls did not greatly impact bycatch rates during these months. Few fall 2010 trips were dropped because pinger usage was high in the fall of 2010 due to harbor porpoise regulations, so missing values in the pinger field were less common; the few trips that were dropped during this period had a limited impact on bycatch estimates. For example, first runs of the 2010 New England harbor porpoise bycatch estimates only differed by about 3% when calculated with and without ASM hauls that were dropped due to uncertain pinger use.

Other species that are incidentally caught more often in the summer, such as the gray and harbor seal, could potentially be more impacted by dropping some ASM hauls when calculating bycatch rates. Still, summer is not the peak bycatch season for these species. Also, the 95% confidence intervals for the estimates in the year with many hauls dropped from the bycatch rate calculation (2010) overlap with the year with fewer hauls dropped (2011),suggesting that differences in the bycatch estimates from the two years are not statistically significant (Tables 4, 5, 15, and 16). Regardless of the species, assuming the NEFOP data are representative, the bycatch rates should be similar whether all the ASM data are used or not. The main impact of using the ASM data should be to increase the precision of the estimate.

For the 2010 and 2011 Mid-Atlantic estimates, the seasons used for stratification were adjusted for some species. Since the NEFOP data record is now more than 20 years old, there were sufficient data to suggest species-specific winter or fall bycatch seasons. This should help refine the bycatch estimates by not grouping bycatch calculations by effort during times and areas that are not representative of when bycatch for a particular species is likely to occur. However, in the future these seasons should continue to be examined as climate change may cause changes in species distributions. For example, from 1989 to 2009 only three common dolphins were observed incidentally caught during December and January in gillnet gear off of New Jersey. But in 2010 and 2011 alone, 13 were incidentally caught and included takes in November and February.

Another recent change to gillnet bycatch estimates in the Northeast is the separation of bycatch into mortality, serious injuries, and non-serious injuries. This is mandated by the MMPA, but had not been incorporated in this region for estimates of small cetaceans and pinnipeds in gillnets. The method for dividing bycatch out in this manner is still relatively new and affects the previous five years of data. So, the mortality estimates in the bycatch tables of this paper may change slightly in future SAR documents if the methodology is altered for subsequent bycatch estimates.

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Table 1. 2010 New England sink gillnet totals for observed trips, observed hauls, limited hauls, observed metric tons of fish landed, prorated total metric tons of fish landed, and percent observer coverage, by season and port group or management area strata.

2010 Winter (Jan-May)	Observed Trips	Observed Hauls (Limited Hauls)	Observed Metric Tons	Prorated Metric Tons	Coverage (Metric Tons) %
Port Group-Area Strata					
Northern Maine	0	0 (0)	0.00	0.20	0.00
Southern Maine	1	3 (0)	0.54	23.49	2.30
New Hampshire	0	0 (0)	0.00	3.29	0.00
North of Boston	35	82 (34)	28.31	1142.64	2.48
South of Boston	20	62 (12)	7.78	249.58	3.12
South Of Cape Cod	17	106 (83)	87.22	2052.19	4.10
East Of Cape Cod	16	83 (28)	42.54	854.55	4.98
Offshore	1	13 (0)	7.46	66.53	11.21
Management Areas					
Offshore	9	161 (5)	56.01	271.90	20.60
Cashes Ledge Closure	0	0 (0)	0.00	0.00	-
Midcoast	12	36 (16)	6.15	196.88	3.12
Massachusetts Bay	12	48 (14)	6.78	228.29	2.97
Cape Cod Bay	0	0 (0)	0.00	8.90	0.00
Cape Cod South	20	60 (31)	30.89	871.91	3.54
Great S. Channel Closure	0	0 (0)	0.00	8.23	0.00
Hanging Ratio Study					
South Of Cape Cod Study	18	72 (72)	76.70	76.70	1.00
Subtotal	161	726 (295)	350.38	6055.28	5.79
Summer (Jun-Aug)	**Observed Trips**	**Observed Hauls (Limited Hauls)**	**Observed Metric Tons**	**Prorated Metric Tons**	**Coverage (Metric Tons) %**
Port Group-Area Strata					
Northern Maine	0	0 (0)	0.00	33.47	0.00
Southern Maine	53	215 (0)	78.98	216.05	36.56
New Hampshire	62	181 (0)	65.28	655.48	9.96
North of Boston	130	340 (0)	172.08	1433.07	12.01
South of Boston	59	157 (0)	64.45	766.36	8.41
South Of Cape Cod	28	125 (29)	94.88	2052.19	4.25
East Of Cape Cod	118	439 (0)	405.50	2428.12	16.70
Offshore	5	87 (0)	30.53	162.44	18.80
Management Areas					
Northeast Closure	0	0 (0)	0.00	0.00	-
Great S. Channel Closure	0	0 (0)	0.00	29.11	0.00
Subtotal	455	1544 (29)	911.70	7929.63	11.50
Fall (Sep-Dec)	**Observed Trips**	**Observed Hauls (Limited Hauls)**	**Observed Metric Tons**	**Prorated Metric Tons**	**Coverage (Metric Tons) %**
Port Group-Area Strata					
Northern Maine	0	0 (0)	0.00	20.94	.
Southern Maine	17	80 (4)	49.87	149.57	33.34
New Hampshire	28	91 (0)	16.88	57.93	29.14
North of Boston	97	328(19)	76.75	328.68	23.35
South of Boston	23	66 (0)	17.14	109.40	15.67
South Of Cape Cod	17	82 (22)	31.01	562.00	5.52
East Of Cape Cod	131	380 (9)	107.63	328.82	32.73
Offshore	6	60 (0)	34.56	192.75	17.93
Management Areas					
Northeast Closure	0	0 (0)	0.00		
Offshore	1	19 (0)	19.57	46.97	41.66
Midcoast	232	790 (23)	287.04	859.80	33.39
Stellwagen Bank	89	273 (13)	64.85	209.18	31.00
Massachusetts Bay	53	141 (6)	42.09	117.27	35.89
Cape Cod South	8	57 (14)	11.47	120.86	9.49
Southern New England	9	42 (0)	7.68	71.08	10.81
Subtotal	711	2409 (110)	766.54	3175.25	24.14
2010 Total	**1327**	**4679 (434)**	**2028.62**	**17160.16**	**11.82**

Table 2. 2010 Mid-Atlantic state gillnet totals for observed trips, observed hauls, limited hauls, observed metric tons of fish landed, prorated total metric tons of fish landed, and percent observer coverage, by season and state. Effort inside bays and sounds was not included in this table (e.g., Delaware Bay, Chesapeake Bay, Albemarle Sound, and Pamlico Sound).

Winter (Jan-May)	Observed Trips	Observed Hauls (Limited Hauls)	Observed Metric Tons	Prorated Metric Tons	Coverage (Metric Tons) %
Massachusetts	0	0 (0)	0	0	-
Rhode Island	1	5 (0)	0.73	1.38	52.90%
Connecticut	0	0 (0)	0	0.26	0.00%
New York	0	0 (0)	0	25.26	0.00%
New Jersey	35	117 (61)	38.44	1047.52	3.67%
New Jersey (Hanging Ratio Study)	2	8 (8)	4.36	4.36	100.00%
Delaware	0	0 (0)	0	6.92	0.00%
Maryland	0	0 (0)	0	177.01	0.00%
Virginia	56	234 (137)	70.19	691.42	10.15%
North Carolina	55	316 (296)	65.45	3806.34	1.72%
Subtotal	149	680 (502)	179.17	5760.47	3.11%
Summer (June-Aug)	**Observed Trips**	**Observed Hauls (Limited Hauls)**	**Observed Metric Tons**	**Prorated Metric Tons**	**Coverage (Metric Tons) %**
Massachusetts	0	0 (0)	0	1.71	0.00%
New York	1	4 (4)	0.92	73.42	1.25%
New Jersey	17	59 (38)	19.38	479.73	4.04%
Delaware	0	0 (0)	0	0	-
Maryland	0	0 (0)	0	14.45	0.00%
Virginia	7	24 (24)	1.5	171.57	0.87%
North Carolina	3	5 (5)	0.06	70.86	0.08%
Subtotal	28	92 (71)	21.86	811.74	2.69%
Fall (Sept-Dec)	**Observed Trips**	**Observed Hauls (Limited Hauls)**	**Observed Metric Tons**	**Prorated Metric Tons**	**Coverage (Metric Tons) %**
Massachusetts	0	0 (0)	0	1.06	0.00%
New York	2	9	1.92	43.59	4.40%
New Jersey	58	234	81.1	879.23	9.22%
New Jersey (Sturgeon Study)	30	120 (120)	25.12	25.12	100.00%
Connecticut	0	0 (0)	0	0.32	0.00%
Delaware	0	0 (0)	0	3.01	0.00%
Maryland	2	4	0.02	189.07	0.01%
Virginia	32	158	22.09	402.4	5.49%
North Carolina	48	261	13.06	765.82	1.71%
Subtotal	172	666 (464)	143.31	2309.62	6.20%
Annual Totals	349	1550 (1149)	344.34	8881.83	3.88%

Table 3. 2010 harbor porpoise serious injury and mortality estimate in the New England sink gillnet fishery (NESG) and a National Marine Fisheries Service (NMFS) gillnet experiment.

Time-Area Strata	Takes	(Take/Ton)	Takes	(%)	C.I.
Winter (Jan-May)					
South of Cape Cod Port Group	6	0.069	141.60	43%	45-273
East of Cape Cod Port Group	5	0.117	99.98	81%	13-341
Midcoast Management Area	1	0.140	27.56	93%	1-125
Cape Cod South Management Area	1	0.031	27.03	129%	1-213
South of Cape Cod Hanging Ratio Study	1		1.00		
Subtotal	**14**		**297.17**	**37%**	**127-528**
Summer (Jun-Aug)					
Southern Maine Port Group (ASM missing pinger info)	2		2.00		
New Hampshire Port Group	1	0.016	10.49	100%	1-65
New Hampshire Port Group (ASM missing pinger info)	2		2.00		
North of Boston Port Group	1	0.006	8.60	98%	1-38
East of Cape Cod Port Group (ASM missing pinger info)	1		1.00		
Offshore Port Group (ASM missing pinger info)	1		1.00		
Subtotal	**8**		**25.09**	**52%**	**8-71**
Fall (Sep-Dec)					
Southern Maine Port Group	1	0.022	3.29	136%	1-19
North of Boston Port Group	2	0.024	7.89	62%	2-27
East of Cape Cod Port Group	1	0.009	2.96	85%	1-13
Offshore Port Group (ASM missing pinger info)	1		1.00		
Midcoast Management Area	15	0.051	43.85	23%	28-68
Stellwagen Bank Management Area	1	0.016	3.35	81%	1-15
Massachusetts Bay Management Area	1	0.024	2.81	80%	1-13
Subtotal	**22**		**65.15**	20%	**45-95**
2010 Total	**44**		**387.41**	**27%**	**233-609**

Table 4. 2010 gray seal serious injury and mortality estimate in the New England sink gillnet fishery (NESG) and a National Marine Fisheries Service (NMFS) gillnet experiment.

2010 Time-Area Strata	Observed Takes	Bycatch Rate (Take/Ton)	Estimated Takes	C.V. (%)	95% C.I.
Winter (Jan-May)					
South of Cape Cod Port Group	21	0.241	494.58	61%	136-1716
East of Cape Cod Port Group	13	0.305	260.64	43%	122-582
Cape Cod South Management Area	2	0.175	152.58	81%	2-442
South of Cape Cod Hanging Ratio Study	13		13.00		
Subtotal	**49**		**920.80**	**37%**	**464-1871**
Summer (Jun-Aug)					
Southern Maine Port Group	1	0.013	2.81	84%	1-13
New Hampshire Port Group (ASM missing pinger info)	1		1.00		
North of Boston Port Group	1	0.003	4.30	83%	1-14
South of Boston Port Group (ASM missing pinger info)	1		1.00		
East of Cape Cod Port Group	29	0.071	172.40	30%	97-325
East of Cape Cod Port Group (ASM missing pinger info)	9		9.00		
Subtotal	**42**		**190.51**	**28%**	**115-346**
Fall (Sep-Dec)					
New Hampshire Port Group (ASM missing pinger info)	1		1.00		
East of Cape Cod Port Group	9	0.087	28.61	34%	15-52
East of Cape Cod Port Group (ASM missing pinger info)	1		1.00		
Midcoast Management Area	3	0.010	8.60	49%	3-20
Midcoast Management Area (ASM missing pinger info)	1		1.00		
Stellwagen Bank Management Area	1	0.016	3.35	80%	1-14
Subtotal	**16**		**43.56**	**25%**	**27-68**
2010 Total	**107**		**1154.87**	**28%**	**695-1950**

Table 5. 2010 harbor seal serious injury, non-serious injury, and mortality estimates in the New England sink gillnet fishery (NESG) and a National Marine Fisheries Service (NMFS) gillnet experiment.

2010 Time-Area Strata	Observed Takes	Bycatch Rate (Take/Ton)	Estimated Takes	C.V. (%)	95% C.I.
Winter (Jan-May)					
South of Cape Cod Port Group	3	0.035	71.83	75%	3-250
East of Cape Cod Port Group	6	0.141	120.49	75%	15-388
Midcoast Management Area	1	0.262	51.58	97%	1-193
South of Cape Cod Hanging Ratio Study	1		1.00		
Subtotal	**11**		**244.90**	**48%**	**69-525**
Summer (Jun-Aug)					
Southern Maine Port Group	7	0.090	19.44	46%	7-47
Southern Maine Port Group (ASM missing pinger info)	3		3.00		
New Hampshire Port Group	2	0.031	20.32	71%	2-64
New Hampshired Port Group (ASM missing pinger info)	7		7.00		
North of Boston Port Group	1	0.006	8.60	100%	1-37
North of Boston Port Group (ASM missing pinger info)	3		3.00		
South of Boston Port Group	1	0.015	11.50	106%	1-62
Subtotal	**24**		**72.86**	**31%**	**38-129**
Fall (Sep-Dec)					
Southern Maine Port Group	1	0.022	3.29	126%	1-17
New Hampshire Port Group	2	0.119	6.89	90%	2-38
New Hampshire Port Group (ASM missing pinger info)	3		3.00		
North of Boston Port Group	1	0.012	3.94	92%	1-22
South of Cape Cod Port Group	1	0.032	17.98	112%	1-92
East of Cape Cod Port Group	7	0.066	21.70	36%	11-42
East of Cape Cod Port Group (ASM missing pinger info)	2		2.00		
Midcoast Management Area	9	0.031	26.65	34%	14-53
Midcoast Management Area (ASM missing pinger info)	1		1.00		
Stellwagen Bank Management Area	5	0.078	16.32	36%	8-32
Cape Cod South Management Area	3	0.939	113.49	69%	3-266
Southern New England Management Area	1	0.123	8.74	119%	1-79
Subtotal	**36**		**225.00**	**32%**	**135-397**
2010 Total	**71**		**542.76***	**25%**	**316-833**

* The bycatch estimate of 543 harbor seals includes 540 (CV = 25%) mortalities and serious injuries and an estimated 3 harbor seals with non-serious injuries

Table 6. 2010 harp seal serious injury and mortality estimate in the New England sink gillnet fishery (NESG) and a National Marine Fisheries Service (NMFS) gillnet experiment.

2010 Time-Area Strata	Observed Takes	Bycatch Rate (Take/Ton)	Estimated Takes	C.V. (%)	95% C.I.
Winter (Jan-May)					
South of Cape Cod Port Group	5	0.059	121.08	80%	5-500
Offshore Management Area	1	0.018	4.89	74%	1-16
Cape Cod South Management Area	1	0.144	125.56	98%	1-475
South of Cape Cod Hanging Ratio Study	1		1.00		
Subtotal	**8**		**252.52**	**61%**	**57-711**
Summer (Jun-Aug)					
Subtotal	**0**		**0.00**		
Fall (Sep-Dec)					
Subtotal	**0**		**0.00**		
2010 Total	**8**		**252.52**	**61%**	**57-711**

Table 7. 2010 white-sided dolphin serious injury and mortality estimate in the New England sink gillnet fishery (NESG).

2010 Time-Area Strata	Observed Takes	Bycatch Rate (Take/Ton)	Estimated Takes	C.V. (%)	95% C.I.
Winter (Jan-May)					
North of Boston Port Group	1	0.044	50.28	126%	1-285
Subtotal	**1**		**50.28**	**126%**	**1-285**
Summer (Jun-Aug)					
Southern Maine Port Group (ASM missing pinger info)	1		1.00		
New Hampshire Port Group	1	0.016	10.49	98%	1-61
North of Boston Port Group (ASM misisng pinger info)	1		1.00		
South of Boston Port Group (ASM missing pinger info)	1		1.00		
Subtotal	**4**		**13.49**	**77%**	**4-64**
Fall (Sep-Dec)					
Midcoast Management Area	1	0.003	2.58	93%	1-12
Subtotal	**1**		**2.58**	**93%**	**1-12**
2010 Total	**6***		**66.35****	**90%**	**10-305**

* Includes 1 serious injury

** The bycatch estimate of 66 white-sided dolphins includes an estimated 62 mortalities and 4 serious injuries

Table 8. 2010 common dolphin serious injury and mortality estimate in the New England sink gillnet fishery (NESG) and a National Marine Fisheries Service (NMFS) gillnet experiment.

2010 Time-Area Strata	Observed Takes	Bycatch Rate (Take/Ton)	Estimated Takes	C.V. (%)	95% C.I.
Winter (Jan-May)					
Cape Cod South Management Area	1	0.031	27.03	126%	1-204
Subtotal	**1**		**27.03**	**126%**	**1-204**
Summer (Jun-Aug)					
South Of Cape Cod Port Group (ASM missing pinger info)	1		1.00		
Subtotal	**1**		**1.00**		
Fall (Sep-Dec)					
East Of Cape Cod Port Group	1	0.009	2.96	79%	1-11
Cape Cod South Management Area	1	0.313	37.83	125%	1-133
Subtotal	**2**		**40.79**	**116%**	**2-139**
2010 Total	**4**		**68.82**	**81%**	**5-222**

Table 9. 2010 pilot whale serious injury and mortality estimate in the New England sink gillnet fishery (NESG) and a National Marine Fisheries Service (NMFS) gillnet experiment.

2010 Time-Area Strata	Observed Takes	Bycatch Rate (Take/Ton)	Estimated Takes	C.V. (%)	95% C.I.
Winter (Jan-May)					
Subtotal	**0**		**0.00**		
Summer (Jun-Aug)					
Subtotal	**0**		**0.00**		
Fall (Sep-Dec)					
Stellwagen Bank	1	0.016	3.35	80%	1-17
Subtotal	**1**		**3.35**	**80%**	**1-17**
2010 Total	**1**		**3.35**	**80%**	**1-17**

Table 10. 2010 observer coverage totals for Mid-Atlantic bycatch strata. Totals for observed trips, observed hauls, observed metric tons of fish landed, prorated total metric tons of fish landed, and percent observer coverage by season.

Species Applicability	2010 Time Period	State(s)	Mesh Size	Observed Trips	Observed Hauls (Limited Hauls)	Observed Metric Tons	Prorated Metric Tons	Coverage (Metric Tons) %
Harbor Porpoise	Jan-April	NJ	> 9.15"	19	81 (52)	17.57	546.72	3.21%
Harbor Seals	Dec-March	NJ	> 7"	37	155 (59)	49.04	707.94	6.93%
Gray and Harp Seals	Jan-April	NJ	All	22	89 (57)	19.14	611.52	3.13%
Gray Seal	April	VA	All	15	80 (67)	20.63	238.15	8.66%
Common Dolphin	Dec-Jan	NJ	All	33	125 (40)	48.5	555.97	8.72%

Table 11. 2010 Mid-Atlantic marine mammal serious injury and mortality estimates and two National Marine Fisheries Service (NMFS) gillnet experiments.

Species	2010 Time Period	Area/State	NMFS Study	Mesh	Observed Takes	Bycatch Rate (Take/Ton)	Estimated Takes	C.V. (%)	95% C.I.
Harbor Porpoise	Jan-Apr	Waters off NJ	None	> 9.15"	8	0.455	248.76	91%	8-1321
	Feb-Mar	Waters off NJ	Hanging Ratio	12"	10		10.00		
	Annual Total	**Mid-Atlantic total**			**18**		**258.76**	**88%**	**18-1331**
Gray Seal	Jan-Apr	Waters off NJ	None	All	8	0.418	255.60	78%	8-1141
	April	VA	None	All	1	0.048	11.43	104%	1-67
	Annual total	**Mid-Atlantic total**	**None**	**All**	**9**		**267.03**	**75%**	**20-1155**
Harbor Seals	Dec-March	Waters off NJ	None	> 7"	6	0.122	86.37	41%	29-180
	Feb-Mar	Waters off NJ	Hanging Ratio	12"	3		3.00		
	Annual Total	**Mid-Atlantic total**			**9**		**89.37**	**39%**	**32-183**
Harp Seals	**Jan-April (Annual Total)**	**Waters off NJ**	**None**	**All**	**1**	**0.052**	**31.80**	**96%**	**1-205**
Common Dolphin	Dec-Jan	Waters off NJ	None	All	2	0.041	22.79	62%	2-66
	Feb-Mar	Waters off NJ	Hanging Ratio	12"	1		1.00		
	Nov-Dec	Waters off NJ	Sturgeon Study	12"	6		6.00		
	Annual Total	**Mid-Atlantic total**		**All**	**9**		**29.79**	**48%**	**9-73**

Table 12. 2011 New England sink gillnet totals for observed trips, observed hauls, limited hauls, observed metric tons of fish landed, prorated total metric tons of fish landed, and percent observer coverage, by season and port group or management area strata.

2011	Observed	Observed Hauls	Observed	Prorated	Coverage
Winter (Jan-May)	Trips	(Limited Hauls)	Metric Tons	Metric Tons	(Metric Tons) %
Port Group-Area Strata					
Northern Maine					
Southern Maine	12	36 (6)	4.75	29.94	15.87
New Hampshire	0	2 (0)	0.25	0.25	100.00
North of Boston	18	84 (5)	15.59	20.89	74.63
South of Boston	1	1 (0)	1.34	1.54	87.01
South Of Cape Cod	3	20 (9)	6.57	162.84	4.04
East Of Cape Cod	1	15 (0)	1.83	58.75	3.12
Offshore	2	13 (0)	6.81	58.34	11.67
Management Areas					
Offshore	19	264 (0)	93.36	227.98	40.95
Cashes Ledge Closure	1	10 (0)	6.91	17.18	40.22
Midcoast	39	202 (19)	36.06	95.54	37.74
Stellwagen Bank	261	1073 (119)	198.90	539.43	36.87
Massachusetts Bay	24	87 (29)	17.21	103.45	16.64
Cape Cod Bay	.	.	.	9.05	0.00
South Cape Closure	19	88 (32)	33.05	703.34	4.70
Southern New England	96	486 (61)	199.90	1479.24	13.51
Great S. Channel Closure					
Subtotal	496	2381 (280)	622.53	3507.76	17.75
	Observed	**Observed Hauls**	**Observed**	**Prorated**	**Coverage**
Summer (Jun-Aug)	**Trips**	**(Limited Hauls)**	**Metric Tons**	**Metric Tons**	**(Metric Tons) %**
Port Group-Area Strata					
Northern Maine				5.92	
Southern Maine	22	69 (0)	29.76	521.63	5.71
New Hampshire	27	81 (0)	37.42	1046.25	3.58
North of Boston	86	289 (30)	101.51	1178.67	8.61
South of Boston	33	128 (13)	47.57	796.44	5.97
South Of Cape Cod	21	139 (38)	50.38	2416.05	2.09
East Of Cape Cod	40	144 (5)	108.87	2218.57	4.91
Offshore	4	64 (0)	32.87	219.06	15.01
Management Areas					
Northeast Closure					
Great S. Channel Closure	1	1 (0)	0.43	1.15	37.39
Subtotal	234	915 (86)	408.81	8403.74	4.86
	Observed	**Observed Hauls**	**Observed**	**Prorated**	**Coverage**
Fall (Sep-Dec)	**Trips**	**(Limited Hauls)**	**Metric Tons**	**Metric Tons**	**(Metric Tons) %**
Port Group-Area Strata					
Northern Maine	0	0 (0)	0.00	0.00	0.00
Southern Maine	23	120 (7)	42.27	246.18	17.17
New Hampshire	25	87 (19)	17.42	168.29	10.35
North of Boston	102	464 (37)	94.41	254.78	37.06
South of Boston	19	78 (24)	23.57	64.78	36.39
South Of Cape Cod	59	350 (138)	139.72	1354.41	10.32
East Of Cape Cod	134	462 (12)	348.60	1377.65	25.30
Offshore	7	126 (0)	51.53	236.33	21.80
Management Areas					
Northeast Closure					
Offshore	8	108 (0)	72.01	160.08	44.98
Midcoast	183	854 (78)	272.40	941.14	28.94
Stellwagen Bank	143	530 (37)	83.04	335.40	24.76
Massachusetts Bay	44	228 (30)	36.11	182.06	19.83
South Cape Closure	11	76 (16)	37.30	477.58	7.81
Southern New England	10	40 (8)	21.14	264.98	7.98
Subtotal	768	3523 (406)	1239.52	6063.66	20.44
2011 Total	**1498**	**6819 (772)**	**2270.86**	**17975.16**	**12.63**

Table 13. 2011 Mid-Atlantic state gillnet totals for observed trips, observed hauls, limited hauls, observed metric tons of fish landed, prorated total metric tons of fish landed, and percent observer coverage, by season and state. Effort inside bays and sounds was not included in this table (e.g., Delaware Bay, Chesapeake Bay, Albemarle Sound, and Pamlico Sound).

Winter (Jan-May)	Observed Trips	Observed Hauls (Limited Hauls)	Observed Metric Tons	Prorated Metric Tons	Coverage (Metric Tons) %
Massachusetts	0	0	0	75.47	0.00%
Rhode Island	0	0	0	3.52	0.00%
Connecticut	0	0	0	1.86	0.00%
New York	0	0	0	119.03	0.00%
New Jersey	24	74 (51)	33.21	1081.86	3.07%
Delaware	0	0	0	0	-
Maryland	11	27 (3)	7.41	350.13	2.12%
Virginia	45	153 (97)	42.27	4138.89	1.02%
North Carolina	38	190 (10)	31.25	955.62	3.27%
Georgia				0.84	0.00%
Subtotal	118	444 (161)	114.14	6727.22	1.70%
Summer (June-Aug)	**Observed Trips**	**Observed Hauls (Limited Hauls)**	**Observed Metric Tons**	**Prorated Metric Tons**	**Coverage (Metric Tons) %**
Massachusetts	0	0	0	6.7	0.00%
Rhode Island	0	0	0	0.26	0.00%
Connecticut	0	0	0	1.58	0.00%
New York	3	8 (0)	3.22	145.48	2.21%
New Jersey	13	34 (17)	10.56	354.06	2.98%
Delaware	0	0	0	0	-
Maryland	0	0	0	15.5	0.00%
Virginia	4	46 (0)	1.04	185.12	0.56%
North Carolina	3	22 (0)	0.12	83.55	0.14%
Subtotal	23	110 (17)	14.94	792.25	1.89%
Fall (Sept-Dec)	**Observed Trips**	**Observed Hauls (Limited Hauls)**	**Observed Metric Tons**	**Prorated Metric Tons**	**Coverage (Metric Tons) %**
New Hampshire	0	0	0	0.39	0.00%
Massachusetts	0	0	0	0	0.00%
Rhode Island	0	0	0	3.22	0.00%
New York	8	33 (3)	3.7	105.72	3.50%
New Jersey	29	84 (37)	36.47	1316.6	2.77%
New Jersey (Sturgeon Study)	32	120 (120)	29.09	29.09	100.00%
Connecticut	0	0	0	0	-
Delaware	0	0	0	0.00	-
Maryland	11	55 (2)	10.78	459.67	2.35%
Virginia	9	41	8.53	1200.22	0.71%
North Carolina	24	150 (52)	7.8	687.04	1.14%
Subtotal	81	486 (196)	96.37	3801.95	2.53%
Annual Totals	222	1037 (374)	225.45	11321.42	1.99%

Table 14. 2011 harbor porpoise serious injury and mortality estimate in the New England sink gillnet fishery (NESG).

2011 Time-Area Strata	Observed Takes	Bycatch Rate (Take/Ton)	Estimated Takes	C.V. (%)	95% C.I.
Winter (Jan-May)					
North of Boston Port Group	4	0.257	5.37	30%	4-10
Midcoast Management Area	12	0.338	32.29	31%	18-58
Stellwagen Bank Management Area	17	0.087	46.93	25%	29-75
Massachusetts Bay Management Area	3	0.137	14.17	114%	3-112
Cape Cod South Management Area	3	0.049	34.46	94%	3-145
Southern New England Management Area	11	0.050	73.96	42%	30-169
Subtotal	**50**		**207.18**	**24%**	**131-327**
Summer (Jun-Aug)					
Southern Maine Port Group (ASM missing pinger info)	1		1.00		
New Hampshire Port Group (ASM missing pinge info)	1		1.00		
North of Boston Port Group	1	0.011	12.97	107%	1-55
Subtotal	**3**		**14.97**	**93%**	**3-57**
Fall (Sept-Dec)					
North of Boston Port Group	1	0.01	2.80	77%	1-11
Midcoast Management Area	5	0.018	16.94	39%	8-34
Stellwagen Bank Management Area	4	0.048	16.10	45%	6-36
Massachusetts Bay Management Area	1	0.028	5.10	90%	1-24
Cape Cod South Management Area	2	0.021	10.03	124%	2-71
Subtotal	**13**		**50.97**	30%	**30-96**
2011 Total	**66**		**273.12**	20%	**187-399**

Table 15. 2011 gray seal serious injury and mortality estimate in the New England sink gillnet fishery (NESG).

2011 Time-Area Strata	Observed Takes	Bycatch Rate (Take/Ton)	Estimated Takes	C.V. (%)	95% C.I.
Winter (Jan-May)					
North of Boston Port Group	2	0.128	2.67	39%	2-7
Offshore Management Area	1	0.012	2.74	75%	1-12
Midcoast Management Area	1	0.027	2.58	84%	1-12
Stellwagen Bank Management Area	10	0.050	26.97	28%	15-47
Cape Cod South Management Area	19	0.561	394.57	78%	77-1412
Southern New England Management Area	79	0.367	542.88	22%	350-839
Southern New England Management Area (ASM missing pinger info)	15		15.00		
Subtotal	**127**		**987.41**	**30%**	**622-1864**
Summer (Jun-Aug)					
Southern Maine Port Group (ASM missing pinger info)	2		2.00		
New Hampshire Port Group	1	0.027	28.25	102%	1-162
New Hampshire Port Group (ASM missing pinger info)	2		2.00		
North of Boston Port Group	2	0.023	27.11	92%	2-139
North of Boston Port Group (ASM missing pinger info)	9		9.00		
South of Cape Cod Port Group	1	0.013	31.41	118%	1-295
East of Cape Cod Port Group	10	0.099	219.64	36%	103-419
East of Cape Cod Port Group (ASM missing pinger info)	37		37.00		
Subtotal	**64**		**356.41**	**26%**	**209-579**
Fall (Sept-Dec)					
North of Boston Port Group	1	0.01	2.80	77%	1-12
South of Cape Cod Port Group	2	0.021	28.44	66%	2-98
East of Cape Cod Port Group	19	0.055	75.77	22%	50-115
Midcoast Management Area	4	0.014	13.18	44%	4-27
Stellwagen Bank Management Area	3	0.036	12.07	50%	5-31
Massachusetts Bay Management Area	1	0.054	9.83	96%	1-62
Cape Cod South Management Area	1	0.010	4.78	158%	1-44
Subtotal	**31**		**146.87**	**20%**	**98-214**
2011 Total	**222**		**1490.69**	**22%**	**1054-2405**

Table 16. 2011 harbor seal serious injury, non-serious injury, and mortality estimates in the New England sink gillnet fishery (NESG).

2011 Time-Area Strata	Observed Takes	Bycatch Rate (Take/Ton)	Estimated Takes	C.V. (%)	95% C.I.
Winter (Jan-May)					
Stellwagen Bank Management Area	1	0.005	2.70	83%	1-14
Cape Cod South Management Area	2	0.033	23.21	145%	2-201
Southern New England Management Area	10	0.037	54.73	40%	24-126
Southern New England Management Area (ASM missing pinger info)	3		3.00		
Subtotal	**16**		**83.64**	**46%**	**40-229**
Summer (Jun-Aug)					
Southern Maine Port Group	2	0.064	33.38	76%	2-127
Southern Maine Port Group (ASM missing pinger info)	11		11.00		
New Hampshire Port Group (ASM missing pinger info)	15*		15.00*		
North of Boston Port Group	3	0.031	36.54	57%	9-101
North of Boston Port Group (ASM missing pinger info)	18		18.00		
South of Cape Cod Port Group	1	0.013	31.41	113%	1-241
Subtotal	**50**		**145.33**	**33%**	**82-304**
Fall (Sept-Dec)	**Takes**	**(Take/Ton)**	**Takes**	**(%)**	**C.I.**
New Hampshire Port Group	1	0.058	9.76	104%	1-59
North of Boston Port Group	4	0.041	10.45	48%	4-28
South of Cape Cod Port Group	2	0.007	9.48	106%	2-66
East of Cape Cod Port Group	1	0.003	4.13	83%	1-22
Midcoast Management Area	7	0.046	43.29	48%	18-123
Stellwagen Bank Management Area	6	0.072	24.15	40%	10-54
Massachusetts Bay Management Area	3	0.083	15.11	51%	6-38
Subtotal	**24**		**116.37**	**24%**	**73-198**
2011 Total	**90***		**345.34****	**19%**	**256-538**

*Includes 1 harbor seal later determined to have non-serious injuries

** The bycatch estimate of 345 harbor seals includes 343 (CV = 19%) mortalities and serious injuries and an estimated 2 harbor seals with non-serious injuries

Table 17. 2011 harp seal serious injury and mortality estimate in the New England sink gillnet fishery (NESG).

2011 Time-Area Strata	Observed Takes	Bycatch Rate (Take/Ton)	Estimated Takes	C.V. (%)	95% C.I.
Winter (Jan-May)					
Stellwagen Bank Management Area	3	0.015	8.09	47%	3-18
Southern New England Management Area	1	0.004	5.92	85%	1-35
Subtotal	**4**		**14.01**	**46%**	**4-31**
Summer (Jun-Aug)					
Subtotal	**0**		**0.00**		
Fall (Sept-Dec)					
Subtotal	**0**		**0.00**		
2011 Total	**4**		**14.01**	**46%**	**4-31**

Table 18. 2011 white-sided dolphin serious injury and mortality estimate in the New England sink gillnet fishery (NESG).

2011 Time-Area Strata	Observed Takes	Bycatch Rate (Take/Ton)	Estimated Takes	C.V. (%)	95% C.I.
Winter (Jan-May)					
Offshore Management Area	1	0.012	2.74	73%	1-12
Midcoast Management Area	1	0.027	2.58	81%	1-11
Stellwagen Bank Management Area	1	0.005	2.70	81%	1-12
Massachusetts Bay Management Area	1	0.046	4.76	110%	1-57
Subtotal	**4**		**12.78**	**46%**	**6-38**
Summer (Jun-Aug)					
Subtotal	**0**		**0.00**		
Fall (Sept-Dec)					
South Of Cape Cod Port Group	1	0.004	5.42	88%	1-36
Subtotal	**1**		**5.42**	**88%**	**1-36**
2011 Total	**5**		**18.20***	**43%**	**9-50**

* The bycatch estimate of 18 white-sided dolphins includes an estimated 17 mortalities and 1 serious injury

Table 19. 2011 common dolphin serious injury and mortality estimate in the New England sink gillnet fishery (NESG).

2011 Time-Area Strata	Observed Takes	Bycatch Rate (Take/Ton)	Estimated Takes	C.V. (%)	95% C.I.
Winter (Jan-May)					
Midcoast Management Area	1	0.027	2.58	88%	1-13
Southern New England Management Area	2	0.006	8.88	85%	2-31
Subtotal	**3**		**11.46**	**69%**	**3-38**
Summer (Jun-Aug)					
South of Cape Cod Port Group	1	0.013	31.41	100%	1-172
South of Cape Cod Port Group (ASM missing pinger info)	1		1.00		
Subtotal	**2**		**32.41**	**97%**	**2-173**
Fall (Sept-Dec)					
Cape Cod South Management Area	1	0.010	4.78	212%	1-47
Subtotal	**1**		**4.78**	**212%**	**1-47**
2011 Total	**6**		**48.65**	**71%**	**8-169**

Table 20. 2011 observer coverage totals for Mid-Atlantic bycatch strata. Totals for observed trips, observed hauls, observed metric tons of fish landed, prorated total metric tons of fish landed, and percent observer coverage by season.

2011 Time Period	State(s)/Region	Mesh Size	Soak Duration	Observed Trips	Observed Hauls (Limited Hauls)	Metric Tons	Metric Tons	Coverage (Metric Tons) %
Jan-April	Waters Off NJ	>= 7	> 72 hrs	14	45 (4)	23.17	221.33	10.47%
Feb-April	Waters off DE/MD/VA	All	All	16	35 (9)	15.26	413.14	3.69%
Dec-Mar	Waters Off NJ	>= 7	> 72 hrs	16	60 (3)	30.63	326.49	9.38%
Dec-Feb	Waters Off NJ	>= 7	> 72 hrs	15	59 (2)	30.13	292.62	10.30%

Table 21. 2011 Mid-Atlantic marine mammal serious injury and mortality estimates.

Species	2011 Time Period	Area/State	Mesh	Soak Duration	Observed Takes	Bycatch Rate (Take/Ton)	Estimated Takes	C.V. (%)	95% C.I.
Harbor Porpoise	Jan-Apr	Waters off NJ	>= 7	> 72 hrs	10	0.432	95.61	40%	37-198
	Feb-Apr	Waters off DE/MD/VA	All	All	1	0.066	27.27	103%	1-140
	Annual Total	Mid-Atlantic Total			11		122.88	41%	47-259
Gray Seal	Jan-Apr	Waters off NJ	>= 7	> 72 hrs	2	0.086	19.03	60%	2-50
Harbor Seal	Dec-Mar	Waters Off NJ	>= 7	> 72 hrs	2	0.065	21.22	67%	2-63
Common Dolphin	Dec-Feb	Waters Off NJ	>= 7	> 72 hrs	3	0.100	29.26	53%	9-72

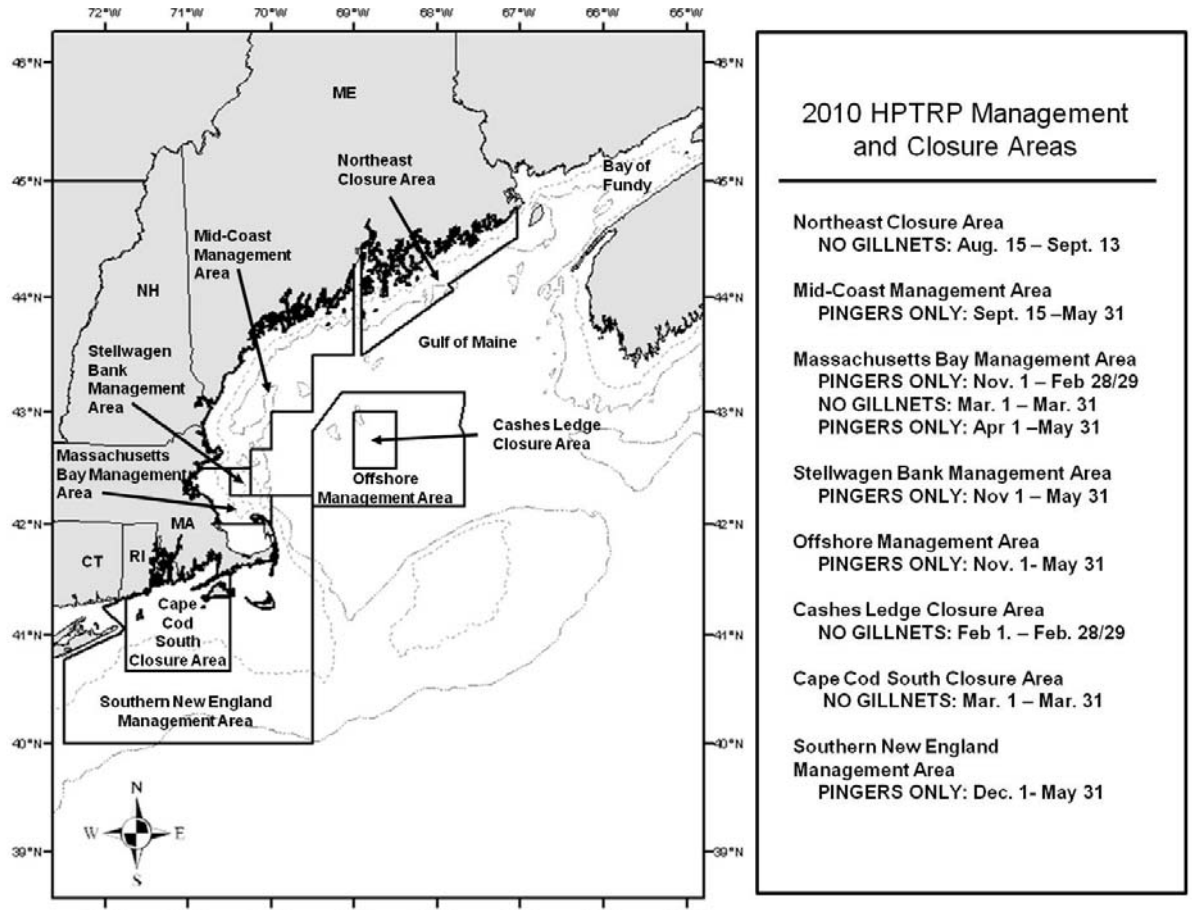

Figure 1 A. New England Harbor Porpoise Take Reduction Plan (HPTRP) Management and Closure Areas.

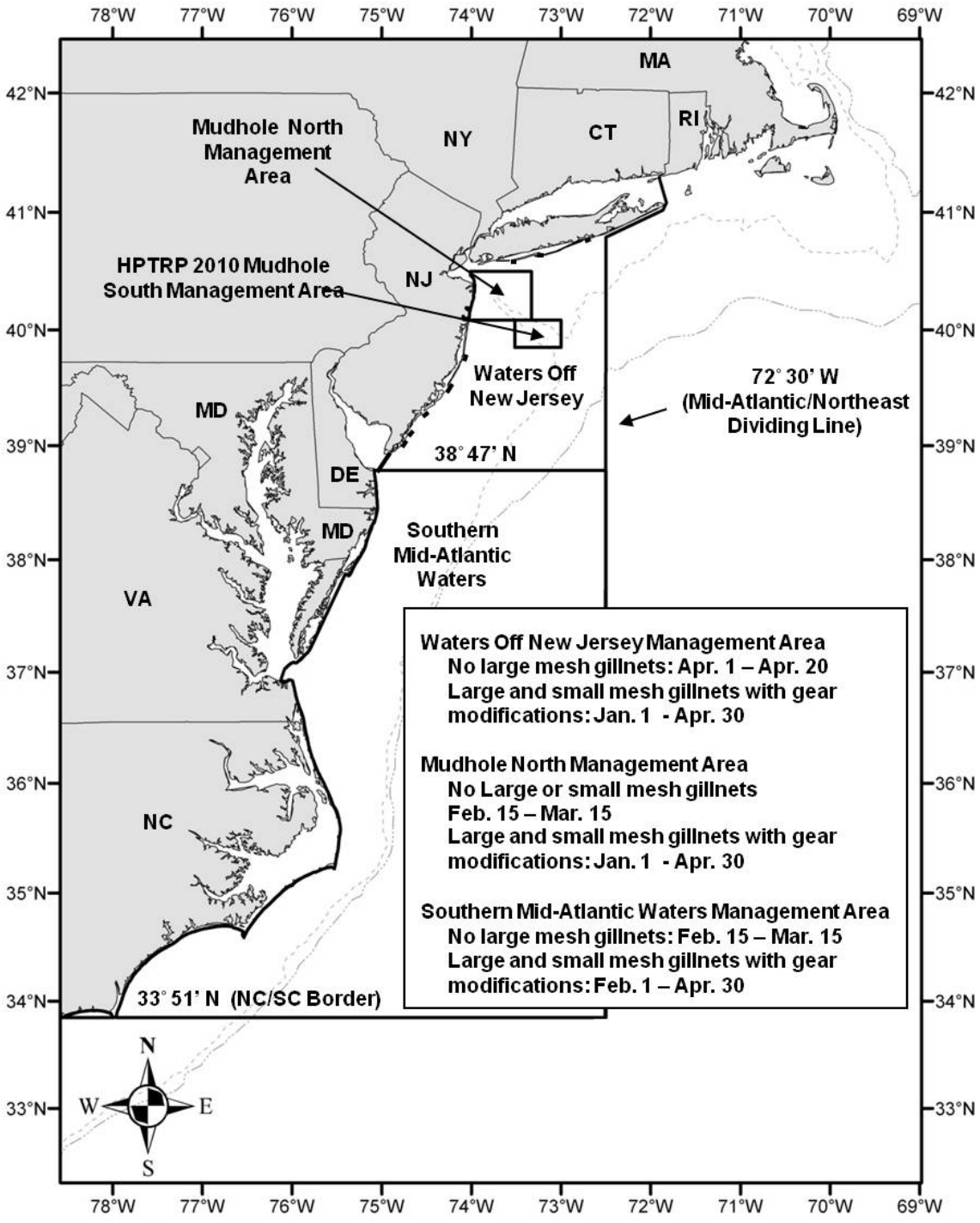

Figure 1B. Mid-Atlantic Harbor Porpoise Take Reduction Plan (HPTRP) Management and Closure Areas.

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