

New Jersey Management Areas: Harbor Porpoise Bycatch and Compliance Patterns during June 2007 to May 2012

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Summary

The Northeast Fishery Observer Program (NEFOP) gillnet data collected during June 1, 2007 and May 31, 2012 in the New Jersey region were examined to document patterns in the observer coverage, harbor porpoise bycatch, and compliance to the two harbor porpoise take reduction plans (HPTRPs). The New Jersey region constitutes two to three management areas, depending upon the time period under investigation. Prior to April 2010 (i.e., afterTRT) the New Jersey region consisted of the Mudhole and Waters off New Jersey (excluding Mudhole) Management Areas (MAs). Upon implementation of the 2010 harbor porpoise take reduction plan (HPTRP; i.e., newTRP; Federal Register Volume 75, Number 33: February 19, 2010), three management areas were defined, including: Mudhole North, Mudhole South, and Waters off New Jersey MAs (excluding Mudhole North and Mudhole South).

Aggregating across both time periods and the entire management region, 24 incidental takes of harbor porpoise were observed from June 1, 2007 through May 31, 2012. The takes were all on hauls using large-mesh gillnets targeting monkfish (*Lophius americanus*), primarily located near Hudson Canyon. Observed hauls with incidental takes of harbor porpoise tended to have long soak durations (ranging from 5-30 days) and were in deeper waters (ranging from 69-82m), relative to other hauls fishing for monkfish in the New Jersey region. Furthermore, 92% (12/13) of observed hauls with incidental takes of harbor porpoise occurred on vessels whose home ports were located in New England (i.e. CT, RI, and MA), while vessels originating from New England only constitute a small proportion of the total vessels fishing for monkfish in the New Jersey region (31%). In addition, observed hauls on New England vessels targeting monkfish within the New Jersey region tended to have longer soak durations, with 75% (63/84) of observed hauls on New England vessels fishing for monkfish in the New Jersey region having soak durations ≥ 5 days, whereas only 41% (74/182) of observed hauls on Mid-Atlantic vessels fishing for monkfish in the New Jersey region have soak durations ≥ 5 days. Before the 2010 HPTRP (June 1, 2007 – March 31, 2010), 61% (14/23) of the observed takes and 67% (8/12) of the observed hauls with takes were in the time and area of the S. Mudhole MA that was eventually put into place with the 2010 HPTRP. Bycatch rates for harbor porpoise after the implementation of the 2010 HPTRP (April 1, 2010 – May 31, 2012) were markedly lower than that during the afterTRT time period (June 1, 2007 – March 31, 2010). In addition, distributions of key variables that have been shown to influence harbor porpoise bycatch rates in the region

are significantly different before and after implementation of the 2010 HPTRP. In particular after the 2010 HPTRP, sea surface temperatures were warmer and there were more landings.

Compliance varied, depending upon mesh size and management area. For hauls using large-mesh gillnets in the Waters off New Jersey MA, non-compliance for both time periods (afterTRT and newTRP) was mostly due to incorrect floatline length, number of net panels per string, and tie down length. For hauls using small-mesh gillnets in the Waters off New Jersey MA, non-compliance for both time periods was mostly due to incorrect twine size. For hauls using large-mesh gillnets in the Mudhole (North Mudhole) MA, non-compliance for both time periods was due to incorrect floatline length and number of net panels per string. Finally, for hauls using large-mesh gillnets in the South Mudhole MA, non-compliance was due to incorrect floatline length, twine size, and number of net panels per string. No hauls using small-mesh gillnets, which were also within jurisdiction of the HPTRP (January – April), were observed from June 2007 through May 2012 for either Mudhole MA.

Overall compliance on observed hauls using large-mesh gillnets during afterTRT was 56% and 55% for the Waters off New Jersey and Mudhole (North Mudhole) MAs, respectively. Overall compliance on observed hauls using large-mesh gillnets during newTRP was 58%, 50%, and 4% for the Waters off New Jersey, Mudhole (North Mudhole), and Mudhole South MAs, respectively. Finally, overall compliance on observed hauls using small-mesh gillnets within the Waters off New Jersey MA during afterTRT and newTRP was 69% and 90%, respectively. Several hauls using large-mesh gillnets were observed in time-area closures for the Waters off New Jersey MA, with 9 hauls being observed in 2008 and 10 hauls being observed in 2009. One haul that was using large-mesh gillnet gear within the Waters off New Jersey MA during the time-area closure for large-mesh gillnets also bycaught two harbor porpoises in 2009.

Incidental takes of harbor porpoise recorded by At-Sea Monitors (ASM) are not included in this report, but a brief summary of ASM data from the New Jersey area, as it relates to the 2010 HPTRP, can be found in the Appendix. Hauls monitored by ASM may not be representative of large-mesh gillnets targeting monkfish as documented by NEFOP. In particular, the distribution of soak duration appears to significantly differ between ASM-monitored and NEFOP-observed hauls that are using large-mesh gillnets targeting monkfish within the Waters off New Jersey MA. NEFOP observed hauls had shorter soak durations relative to ASM-monitored hauls. Furthermore, the bootstrapped 95% confidence interval for the median difference in soak duration between NEFOP-observed and ASM-monitored hauls does not contain zero, suggesting that observed soak duration differs significantly between observer platforms, at least for hauls targeting monkfish using large-mesh gillnets within the Waters off New Jersey MA. As such, comparing bycatch rates across observer programs is less straightforward, at least for the New Jersey region.

Data

The Northeast Fishery Observer Program (NEFOP) gillnet data collected during June 1, 2007 and May 31, 2012 in the New Jersey region were examined to document patterns in the observer coverage, harbor porpoise bycatch, and compliance to the two harbor porpoise Take Reduction Plans (HPTRP). The NEFOP data were divided into two time periods. The first time period (referred to as “afterTRT”), June 1, 2007 – March 31, 2010, was managed under the 1998 HPTRP (Table 1), and covers the time period discussed at the last harbor porpoise take reduction team (HPTRT) meeting to before the implementation of the 2010 HPTRP (Table 1). The second time period (referred to as “newTRP”), April 1, 2010 – May 31, 2012, was managed under the 2010 HPTRP plan and covers the time since its implementation to the present. Only observed hauls that are within jurisdiction of the HPTRP (January – April) were included in this analysis (e.g. inshore hauls were excluded), unless otherwise specified.

Observer Coverage

The Waters off New Jersey, Mudhole (North Mudhole), and South Mudhole Management Areas (MAs) were observed year round by the Northeast Fishery Observer Program (NEFOP), with the number of observed trips tending to be lower during the first half of the year (i.e. January-June) for both time periods afterTRT and newTRP (Figure 1). All harbor porpoise takes occurred between January – April, with the majority (92%) being observed during afterTRT. Hence, further analyses only focused on observed hauls that fell under the jurisdiction of the HPTRP (January – April), as these times, areas, and gear characteristics are the most influential to incidental takes of harbor porpoise.

In the New Jersey region during the afterTRT period, 222 hauls were observed on 60 trips for 37 vessels (Tables 2 and 3). This is relative to 103 observed hauls on 35 trips for 21 vessels during the newTRP period. Breakdown of observed hauls by management area for the region can be obtained from Tables 4-8.

General Bycatch Patterns

Most incidental takes of harbor porpoise occurred near Hudson Canyon within the Waters off New Jersey Management Area (MA) during afterTRT (Figures 2 and 3). However, one incidental take of a single harbor porpoise occurred during newTRP within the South Mudhole MA. Overall, 6 observed hauls took a single harbor porpoise, 5 observed hauls took two harbor porpoises, and 2 observed hauls took four harbor porpoises. All observed hauls with harbor porpoise bycatch were using large-mesh gillnets targeting monkfish, with 82% of all observed hauls within the region targeting monkfish and the remainder targeting a variety of fish species (i.e., bluefish, weakfish, smooth dogfish, spiny dogfish, and winter skate). In addition, 67% (8/12) of observed hauls with harbor porpoise takes and 61% (14/23) of those observed takes that

occurred during afterTRT were in the time and area of the S. Mudhole MA that was put into place with the 2010 HPTRP.

Bycatch rates for harbor porpoise in the New Jersey region tended to be highest in 2008 and 2010 during afterTRT (Table 2), and for months February and March (Table 3). Observed hauls with incidental takes of harbor porpoise tended to have long soak durations (ranging from 5-30 days), relative to other hauls fishing for monkfish in the New Jersey region under the HPTRP (Figure 4), with 52% of observed hauls targeting monkfish having soak duration's of ≥ 5 days. Observed hauls with harbor porpoise bycatch also fished in deeper waters (ranging from 69-82m), although this may be an artifact of higher densities of fishers gillnetting at greater depths during times managed under the HPTRP within the region (with and without takes). Furthermore, 92% (12/13) of observed hauls with incidental takes of harbor porpoise occurred on vessels whose home ports were located in New England (i.e. CT, RI, and MA), while vessels originating from New England only constitute a small proportion of the total vessels fishing for monkfish in the New Jersey region (31%). In addition, observed hauls on New England vessels targeting monkfish within the New Jersey region tended to have longer soak durations, with 75% (63/84) of observed hauls on New England vessels fishing for monkfish in the New Jersey region having soak durations ≥ 5 days, whereas only 41% (74/182) of observed hauls on Mid-Atlantic vessels fishing for monkfish in the New Jersey region have soak durations ≥ 5 days.

Compliance

Small Mesh

No harbor porpoise takes were observed in the New Jersey region for hauls using small-mesh gillnets. Overall, 39 hauls using small-mesh gillnets in the Waters off New Jersey Management Area (MA) were observed during afterTRT, while only 10 hauls were observed using small-mesh gillnets within the Waters off New Jersey MA during newTRP. No hauls using small-mesh gillnets were observed in either of the Mudhole MAs during afterTRT or newTRP.

Compliance for observed hauls using small-mesh gillnets within the Waters off New Jersey MA increased over time, with 40%, 79%, 88% and 100% total compliance for years 2008, 2009, 2010, and 2012, respectively (Table 4). All observed hauls using small-mesh gillnets that were non-compliant with the HPTRP had twine sizes that were less than the mandated diameter (0.47-0.70 mm), resulting in 31% non-compliance (69% compliant) during afterTRT (Table 5). Only one haul was non-compliant during newTRP, violating regulations that prohibit the use of tie downs.

Large Mesh

For the Waters off New Jersey Management Area (MA), 142 hauls were observed during afterTRT, while 48 hauls were observed during newTRP (Table 6). Majority of non-compliance for observed hauls using large-mesh gillnets in the Waters off New Jersey MA involved incorrect floatline length and number of net panels per string, with 30% non-compliance during afterTRT for both floatline length and number of net panels per string, and 21% and 19% non-compliance during newTRP for floatline length and number of net panels per string, respectively. Violations to twine size, tie down length, and number of nets per vessel were also observed, but constituted a smaller proportion of the total observed hauls in the area using large-mesh gillnets. Only two observed hauls that were out of compliance with the HPTRP during afterTRT also bycaught harbor porpoises, with one haul incidentally catching four harbor porpoises violating regulations for twine size (0.57 mm) and another haul incidentally catching a single harbor porpoise violating regulations for tie down length (6 ft). However, 82% of incidental takes of harbor porpoises on observed hauls using large-mesh gillnets within the Waters off New Jersey MA were compliant with the HPTRP.

For the Mudhole (North Mudhole) MA, 22 hauls were observed during afterTRT, while 18 hauls were observed during newTRP (Table 7). No incidental takes of harbor porpoises were observed within the Mudhole (North Mudhole) MA for either time period (i.e., afterTRT and newTRP). Non-compliance for floatline length and number of net panels per string was around 45% during afterTRT, and 43% and 36% during newTRP, respectively (Table 5).

For the South Mudhole MA, 27 hauls were observed during the newTRP (Table 8). One incidental take of a single harbor porpoise occurred on a haul using large-mesh gillnets within the South Mudhole MA. The haul was non-compliant with the HPTRP using a twine size of 0.81 mm, which is less than the mandated 0.90 mm. Overall compliance for hauls using large-mesh gillnets in the South Mudhole MA was very low, with only 4% of hauls complying with the HPTRP. Majority of non-compliance came from incorrect floatline length, number of net panels per string, and twine size, constituting 70%, 63%, and 44% non-compliance, respectively. Only 7% of observed hauls using large-mesh gillnets in the South Mudhole MA were non-compliant with the allowed number of nets per vessel, as dictated by the HPTRP.

Nineteen hauls were observed in time-area closures for the Waters off New Jersey MA, with 9 recorded in 2008 and 10 recorded in 2009. One incidental take of two harbor porpoises was observed during 2009 in the time-area closure for hauls using large-gillnets in the Water off New Jersey MA. No hauls using large-mesh gillnets were observed in time-area closures for either Mudhole MA.

Correlated Factors

Because there were only 24 takes on 13 hauls, a bycatch rate model was not developed. However, due to the striking difference in bycatch rates before and after implementation of the 2010 HPTRP, a preliminary investigation into potential shifts in influential variables was undertaken. The distributions of variables previously found to be important to harbor porpoise bycatch rates within the New Jersey region (Palka et al. 2009) were compared between the two time periods for all observed hauls (with and without takes), namely to determine if shifts occurred in environmental or gear characteristics that could potentially alter bycatch rates of harbor porpoise in the area (see Figures 5 and 6). Investigated variables included Bottom Depth (m), Sea-Surface Temperature (SST; °C), Distance to 50m Contour (m), Anchor Weight (lbs), Soak Duration (hrs), and Total Landed Kept Catch (mtons). From kernel density estimates and empirical cumulative distributions, it appears that SST and Total Landed Kept Catch differ significantly before and after implementation of the 2010 HPTRP, with observed hauls before the implementation of the 2010 HPTRP demonstrating cooler water temperatures and landing smaller amounts of kept catch (Figures 5 and 6).

Kolmogorov-Smirnov (KS) tests were used to compare the distribution of these selected variables before and after the implementation of the 2010 HPTRP. Due to the nature of the data, hauls nested within trips, it is possible to have multiple observations with the same value for a particular variable, resulting in violations to underlying assumptions of the KS-test (i.e., distributions that are discontinuous) (Sekhon 2011). In order to obtain the correct coverage level for p -values, a bootstrapped version of the KS-test was implemented (Sekhon 2011). Continuity of observed variables was then inferred from the bootstrapped distribution of the p -values. Furthermore, the probability of a p -value being less than or equal to 0.05 was calculated from the empirical cumulative distribution of the bootstrapped samples.

In every instance, the null hypothesis of no difference was rejected (based on the average p -value from the bootstrapped sample and $\alpha = 0.05$); suggesting that the distributions of observed variables that are highly correlated to harbor porpoise bycatch rates are significantly different between the two time periods (see Figure 7 and Table 9). Hence, efficacy of the 2010 HPTRP for mitigating harbor porpoise bycatch in the area is confounded, as changes in bycatch rates may also be attributable to shifts in environmental factors or modifications to fishermen behavior, resulting in less interactions between harbor porpoises and the gillnet fishery operating in the New Jersey region. However, 95% confidence intervals around p -values from bootstrapped KS-tests for Bottom Depth (m), Distance to 50m Contour (m), Anchor Weight (lbs), and Soak Duration (hrs) included 0.05 (Table 9). This suggests that there is reasonable uncertainty in calculated p -values for these variables and results should be interpreted with caution, as statistical significance does not necessarily mean biological significance.

Several variables that have been shown to be influential to harbor porpoise bycatch rates in the New Jersey region were not included in this comparison (i.e. vessel gross tons, bottom water temperature, number of anchors, and winter NAO index) for various reasons (Palka et al. 2009). Vessel gross tons and bottom water temperature are not available for recent years, all hauls fishing in the New Jersey region used the same number of anchors for both time periods (2), and the winter NAO index is practically discrete, violating underlying premises of the KS-test.

References

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Table 1 1998 and 2010 Harbor Porpoise Take Reduction Plans (HPTRP) for the Southern Mid-Atlantic and New Jersey Management Areas. 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/. (A) Regulations pertaining to the large mesh (7 – 18 in) gillnet fisheries. (B) Regulations pertaining to the small mesh (>5 - <7 in) gillnet fisheries. Shaded cells indicate where there was a difference between the two HPTRPs.

| A. LARGE MESH GILLNETS (7 inches to 18 inches) | | |
|---|---|--|
| | 1998 HPTRP | 2010 HPTRP |
| Floatline length: | | |
| NJ Mudholes (North and South) | <= 3,900 ft | <= 3,900 ft |
| NJ waters (excluding the Mudholes) | <= 4,800 ft | <= 4,800 ft |
| Southern Mid-Atlantic waters | <= 3,900 ft | <= 3,900 ft |
| Twine Size | >= 0.90 mm | >= 0.90 mm |
| | Required; spaced not more than 15 ft apart along floatline; not more than 48 inches in length | Required; spaced not more than <u>24 ft apart</u> along floatline; not more than 48 inches in length |
| Tie Downs | | |
| Net Number per Vessel | <= 80 nets | <= 80 nets |
| Net Size | <= 300 ft | <= 300 ft |
| Number of Nets within a String: | | |
| NJ North and South Mudholes | <= 13 nets | <= 13 nets |
| NJ waters (excluding the Mudholes) | <= 16 nets | <= 16 nets |
| Southern Mid-Atlantic waters | <= 13 nets | <= 13 nets |
| Time/Area Closures: | | |
| NJ waters (including the Mudholes) | Closed from Apr 1 – 20 | Closed from Apr 1 – 20 |
| NJ North Mudhole | Closed from Feb 15 – Mar 15, April 1 - 20 | Closed from Feb 15 – Mar 15, April 1 - 20 |
| NJ South Mudhole | | Closed from Feb 1 – Mar 15, April 1 -20 |
| Southern Mid-Atlantic waters | Closed from Feb 15 – Mar 15 | Closed from Feb 15 – Mar 15 |
| Gear Modification Requirements: | | |
| NJ waters (excluding the Mudholes) | Jan 1 – Mar 31 and Apr 21 – 30 | Jan 1 – Mar 31 and Apr 21 – 30 |
| NJ North Mudhole | Jan 1 – Feb 14; Mar 16 – 31; and Apr 21 – 30 | Jan 1 – Feb 14; Mar 16 – 31; and Apr 21 – 30 |
| NJ South Mudhole | | Jan 1 – 31; Mar 16 – 31; and Apr 21 – 30 |
| Southern Mid-Atlantic waters | Feb 1 – 14 and Mar 16 – Apr 30 | Feb 1 – 14 and Mar 16 – Apr 30 |

B. SMALL MESH GILLNETS (> 5 inches to < 7 inches)

| | 1998 HPTRP | 2010 HPTRP |
|------------------------------------|------------------------------------|------------------------------------|
| Floatline length: | | |
| NJ waters (including the Mudholes) | <= 3,000 ft | <= 3,000 ft |
| Southern Mid-Atlantic waters | <= 2,118 ft | <= 2,118 ft |
| Twine Size | >= 0.81 mm | >= 0.81 mm |
| Tie Downs | Prohibited | Prohibited |
| Net Number per Vessel | <= 45 nets | <= 45 nets |
| Net Size | <= 300 ft | <= 300 ft |
| Number of Nets within a Net String | | |
| NJ Waters (including the Mudholes) | <= 10 nets | <= 10 nets |
| Southern Mid-Atlantic waters | <= 7 nets | <= 7 nets |
| Time/Area Closures: | | |
| NJ North Mudhole | Closed from Feb 15 - Mar 15 | Closed from Feb 15 - Mar 15 |
| NJ South Mudhole | | Closed from Feb 1 - Mar 15 |
| Gear Modification Requirements: | | |
| NJ waters (excluding Mudholes) | Jan 1 – Apr 30 | Jan 1 – Apr 30 |
| NJ North Mudhole | Jan 1 – Feb 14 and Mar 16 – Apr 30 | Jan 1 – Feb 14 and Mar 16 – Apr 30 |
| NJ South Mudhole | | Jan 1 – Jan 31 and Mar 16 – Apr 30 |
| Southern Mid-Atlantic waters | Feb 1 – Apr 30 | Feb 1 – Apr 30 |

Table 2: Descriptive statistics for harbor porpoise (*Phocoena phocoena*) bycatch events in the New Jersey region from June 2007 through May 2012, by year and time period. Only observed hauls that are within the HPTRP's jurisdiction are included.

| | afterTRT | | | | | newTRP | | | |
|--|----------|--------|--------|----------|---------|----------|-------|---------|--------|
| | >05/2007 | 2008 | 2009 | <04/2010 | Total | ≥04/2010 | 2011 | ≤5/2012 | Total |
| Number of observed hauls | 0 | 59 | 90 | 73 | 222 | 16 | 30 | 57 | 103 |
| Number of observed trips | 0 | 19 | 24 | 17 | 60 | 5 | 9 | 21 | 35 |
| Number of observed vessels | 0 | 16 | 20 | 14 | 37 | 5 | 8 | 13 | 21 |
| Number of observed hauls with one or more take | 0 | 4 | 4 | 4 | 12 | 0 | 0 | 1 | 1 |
| Total number of observed takes | 0 | 9 | 6 | 8 | 23 | 0 | 0 | 1 | 1 |
| Total landed kept catch (mtons) | 0 | 12.020 | 22.433 | 14.728 | 49.1807 | 4.402 | 9.469 | 25.979 | 39.851 |
| Bycatch rate (observed takes / observed number of hauls) | 0 | 0.153 | 0.067 | 0.110 | 0.104 | 0 | 0 | 0.018 | 0.010 |
| Bycatch rate (observed takes / observed mtons landed) | 0 | 0.749 | 0.267 | 0.543 | 0.468 | 0 | 0 | 0.038 | 0.025 |

Table 3: Descriptive statistics for harbor porpoise (*Phocoena phocoena*) bycatch events in the New Jersey region from June 2007 through May 2012, by month and time period. Only observed hauls that are within the HPTRP's jurisdiction are included.

| | afterTRT | | | | | newTRP | | | | |
|--|----------|-------|-------|-------|--------|--------|-------|-------|-------|--------|
| | Jan | Feb | Mar | Apr | Total | Jan | Feb | Mar | Apr | Total |
| Number of observed hauls | 83 | 52 | 29 | 58 | 222 | 60 | 12 | 13 | 18 | 103 |
| Number of observed takes | 0 | 9 | 12 | 2 | 23 | 1 | 0 | 0 | 0 | 1 |
| Total landed kept catch (mtons) | 26.996 | 9.111 | 6.953 | 6.120 | 49.181 | 23.889 | 4.870 | 4.998 | 6.094 | 39.851 |
| Bycatch rate (observed takes / observed number of hauls) | 0 | 0.173 | 0.414 | 0.034 | 0.104 | 0.017 | 0 | 0 | 0 | 0.010 |
| Bycatch rate (observed takes / observed mtons landed) | 0 | 0.988 | 1.726 | 0.327 | 0.468 | 0.042 | 0 | 0 | 0 | 0.025 |

Table 4: Number of observed hauls and takes of harbor porpoises (*Phocoena phocoena*) in and out of compliance with the HPTRP for small mesh (>5-<7") gillnets operating in the Waters off New Jersey Management Area from June 2007 through May 2012. Note, any one haul could have been out of compliance for violating one or more of the requirements. – indicates no hauls were observed that were managed under the harbor porpoise take reduction plan.

Small mesh gillnets

| All Hauls | In Compliance? | afterTRT | | | | | newTRP | | | |
|-----------------|----------------|----------|------|------|-----------|-------|-----------|------|------|-------|
| | | >05/2007 | 2008 | 2009 | < 04/2010 | Total | >=04/2010 | 2011 | 2012 | Total |
| Number of hauls | No | - | 6 | 6 | - | 12 | 1 | - | 0 | 1 |
| | Yes | - | 4 | 23 | - | 27 | 7 | - | 2 | 9 |
| | % Compliant | - | 40% | 79% | - | 69% | 88% | - | 100% | 90% |
| | Total | - | 10 | 29 | - | 39 | 8 | - | 2 | 10 |
| Number of takes | No | - | 0 | 0 | - | 0 | 0 | - | 0 | 0 |
| | Yes | - | 0 | 0 | - | 0 | 0 | - | 0 | 0 |
| | Total | - | 0 | 0 | - | 0 | 0 | - | 0 | 0 |

Table 5: Percent non-compliance for each gear characteristic during the afterTRT and newTRP time periods for small mesh and large mesh gillnet fisheries in the New Jersey Management Areas. NA = Not applicable.

| Gear characteristic | afterTRT | | | | newTRP | | | |
|---------------------|------------|------------|-----------------|--------------------|------------|-----------|-----------------|--------------------|
| | Small mesh | Large - NJ | Large – Mudhole | Large – S. Mudhole | Small mesh | Large- NJ | Large – Mudhole | Large – S. Mudhole |
| Twine size | 31 | | | NA | 0 | | | 44 |
| Net size | 0 | | | NA | 0 | | | |
| Floatline length | 0 | 30 | 45 | NA | 0 | 21 | 43 | 70 |
| Nets per string | 0 | 30 | 45 | NA | 0 | 19 | 36 | 63 |
| Tie-downs | 0 | | | NA | 10 | | | |
| Inside closed area | 0 | | | NA | 0 | | | |
| Overall | 31 | | | NA | 10 | | | |

Table 6: Number of observed hauls and takes of harbor porpoises (*Phocoena phocoena*) in and out of compliance with the HPTRP for large-mesh (7-18”) gillnets operating in the Waters off New Jersey Management Area from June 2007 through May 2012, excluding hauls that were observed during time closures (9 in 2008 and 10 in 2009, where one haul took two harbor porpoises). Note, any one haul could have been out of compliance for violating one or more of the requirements. – indicates no hauls were observed that were managed under the harbor porpoise take reduction plan.

Large mesh gillnets – Waters off New Jersey Management Area

| All Hauls | In Compliance? | afterTRT | | | | | newTRP | | | |
|-----------------|----------------|----------|------|------|-----------|-------|-----------|------|------|-------|
| | | >05/2007 | 2008 | 2009 | < 04/2010 | Total | >=04/2010 | 2011 | 2012 | Total |
| Number of hauls | No | - | 18 | 18 | 26 | 62 | 5 | 6 | 9 | 20 |
| | Yes | - | 20 | 24 | 36 | 80 | 3 | 10 | 15 | 28 |
| | % Compliant | - | 53% | 57% | 58% | 56% | 38% | 63% | 63% | 58% |
| | Total | - | 38 | 42 | 62 | 142 | 8 | 16 | 24 | 48 |
| Number of takes | No | - | 4 | 0 | 1 | 5 | 0 | 0 | 0 | 0 |
| | Yes | - | 5 | 4 | 7 | 16 | 0 | 0 | 0 | 0 |
| | Total | - | 9 | 4 | 8 | 21 | 0 | 0 | 0 | 0 |

Table 7: Number of observed hauls and takes of harbor porpoises (*Phocoena phocoena*) in and out of compliance with the HPTRP for large-mesh (7-18”) gillnets operating in the Mudhole (North Mudhole) Management Area from June 2007 through May 2012. Note, any one haul could have been out of compliance for violating one or more of the requirements. – indicates no hauls were observed that were managed under the harbor porpoise take reduction plan.

Large mesh – Mudhole (North Mudhole) Management Area

| All Hauls | In Compliance? | afterTRT | | | | | newTRP | | | |
|-----------------|----------------|----------|------|------|-----------|-------|-----------|------|------|-------|
| | | >05/2007 | 2008 | 2009 | < 04/2010 | Total | >=04/2010 | 2011 | 2012 | Total |
| Number of hauls | No | - | 2 | 4 | 4 | 10 | - | - | 9 | 9 |
| | Yes | - | 0 | 5 | 7 | 12 | - | - | 9 | 9 |
| | % Compliant | - | 0% | 56% | 64% | 55% | - | - | 50% | 50% |
| | Total | - | 2 | 9 | 11 | 22 | - | - | 18 | 18 |
| Number of takes | No | - | 0 | 0 | 0 | 0 | - | - | 0 | 0 |
| | Yes | - | 0 | 0 | 0 | 0 | - | - | 0 | 0 |
| | Total | - | 0 | 0 | 0 | 0 | - | - | 0 | 0 |

Table 8: Number of observed hauls and takes of harbor porpoises (*Phocoena phocoena*) in and out of compliance with the HPTRP for large-mesh (7-18”) gillnets operating in the South Mudhole Management Area from April 2010 through May 2012. Note, any one haul could have been out of compliance for violating one or more of the requirements. – indicates no hauls were observed that were managed under the harbor porpoise take reduction plan.

Large mesh – South Mudhole Management Area

| All Hauls | In Compliance? | afterTRT | | | | | newTRP | | | |
|-----------------|----------------|----------|------|------|-----------|-------|-----------|------|------|-------|
| | | >05/2007 | 2008 | 2009 | < 04/2010 | Total | >=04/2010 | 2011 | 2012 | Total |
| Number of hauls | No | - | - | - | - | - | - | 13 | 13 | 26 |
| | Yes | - | - | - | - | - | - | 1 | 0 | 1 |
| | % Compliant | - | - | - | - | - | - | 7% | 0% | 4% |
| | Total | - | - | - | - | - | - | 14 | 13 | 27 |
| Number of takes | No | - | - | - | - | - | - | 0 | 1 | 1 |
| | Yes | - | - | - | - | - | - | 0 | 0 | 0 |
| | Total | - | - | - | - | - | - | 0 | 1 | 1 |

Table 9: Summary statistics for *p*-values obtained from bootstrapped Kolmogorov-Smirnov tests on the hypothesis of no difference in distributions of selected variables before and after implementation of the 2010 HPTRP.

| Variables | Mean <i>p</i> -value | 2.50% | 50% | 97.50% | Pr(<i>p</i> -value <= 0.05) |
|-----------------------------|----------------------|-------|-------|--------|------------------------------|
| Bottom Depth (m) | 0.023 | 0.000 | 0.002 | 0.174 | 86.1% |
| SST (°C) | 0.001 | 0.000 | 0.000 | 0.004 | 99.5% |
| Distance to 50m Contour (m) | 0.028 | 0.000 | 0.003 | 0.208 | 84.1% |
| Anchor Weight (lbs) | 0.017 | 0.000 | 0.002 | 0.135 | 90.2% |
| Soak Duration (hrs) | 0.021 | 0.000 | 0.002 | 0.160 | 88.3% |
| Landed Kept Catch (mtons) | 0.000 | 0.000 | 0.000 | 0.000 | 99.9% |

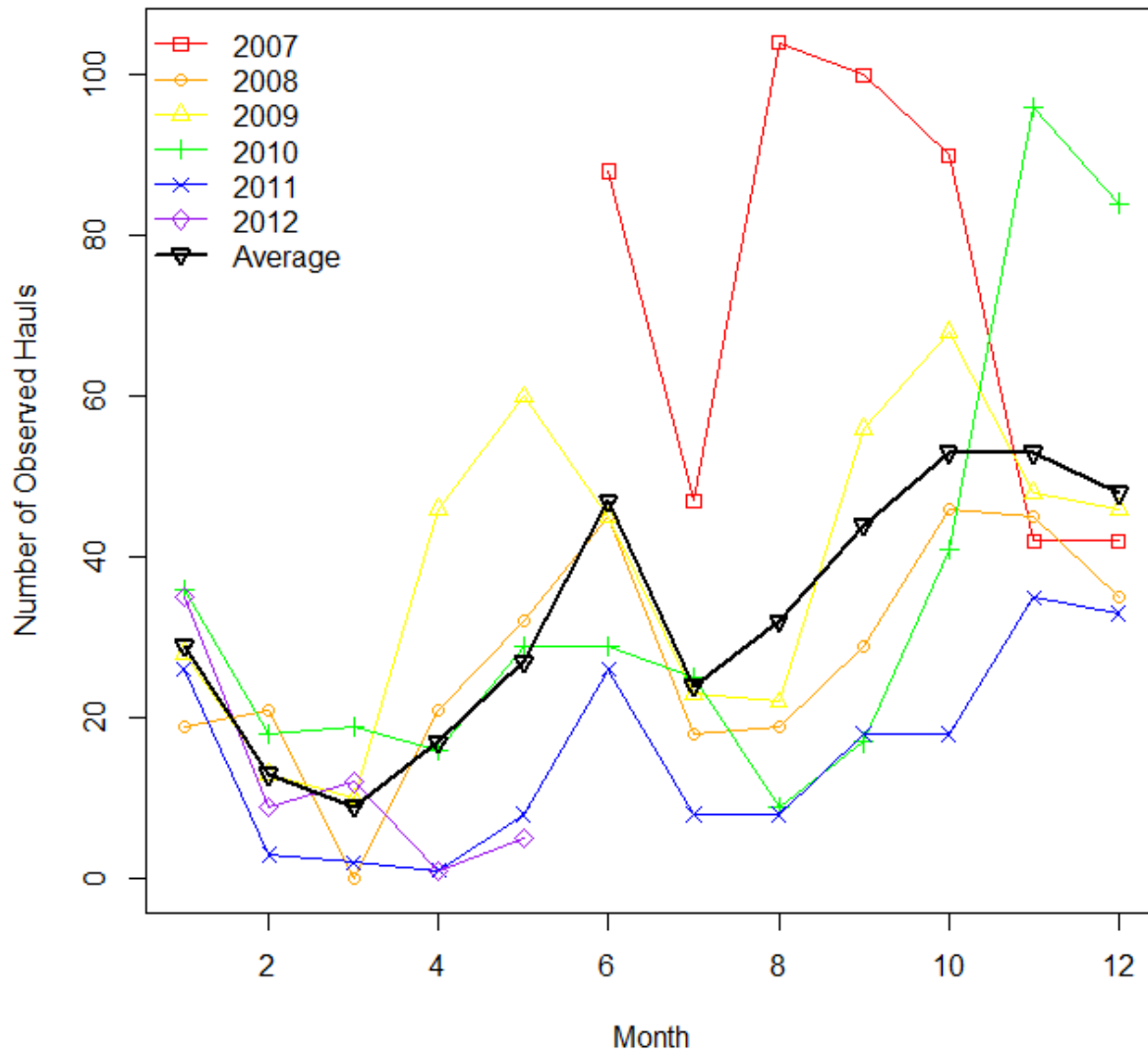


Figure 1: Number of observed hauls in the New Jersey region during June 1, 2007 - May 31, 2012.

06/07 - 03/10

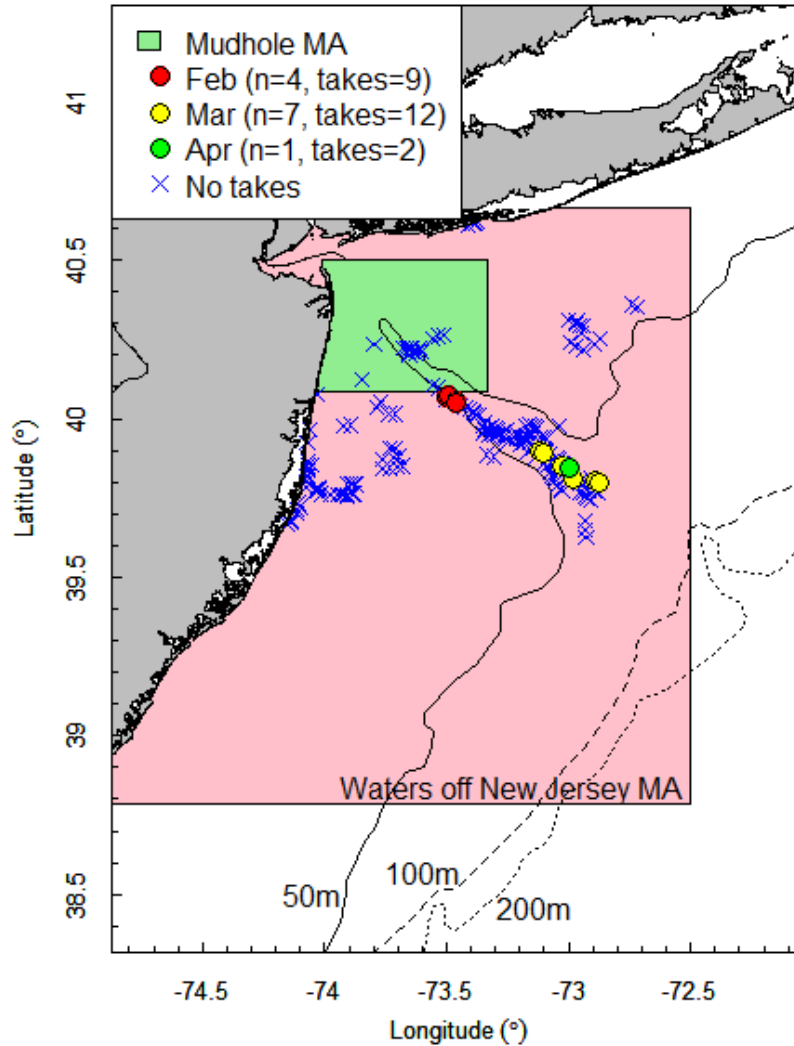


Figure 2: Location of observed hauls and takes of harbor porpoise (*Phocoena phocoena*) that fall under jurisdiction of the HPTRP (January – April) during June 1, 2007 - March 31, 2010. ‘n’ refers to the number of hauls with harbor porpoise bycatch, while ‘takes’ refers to the total number of harbor porpoises taken. 61% (14/23) of observed harbor porpoise incidental takes and 67% (8/12) of observed hauls with takes were in the time and area of the S. Mudhole MA that was put into place with the 2010 HPTRP.

04/10 - 05/12

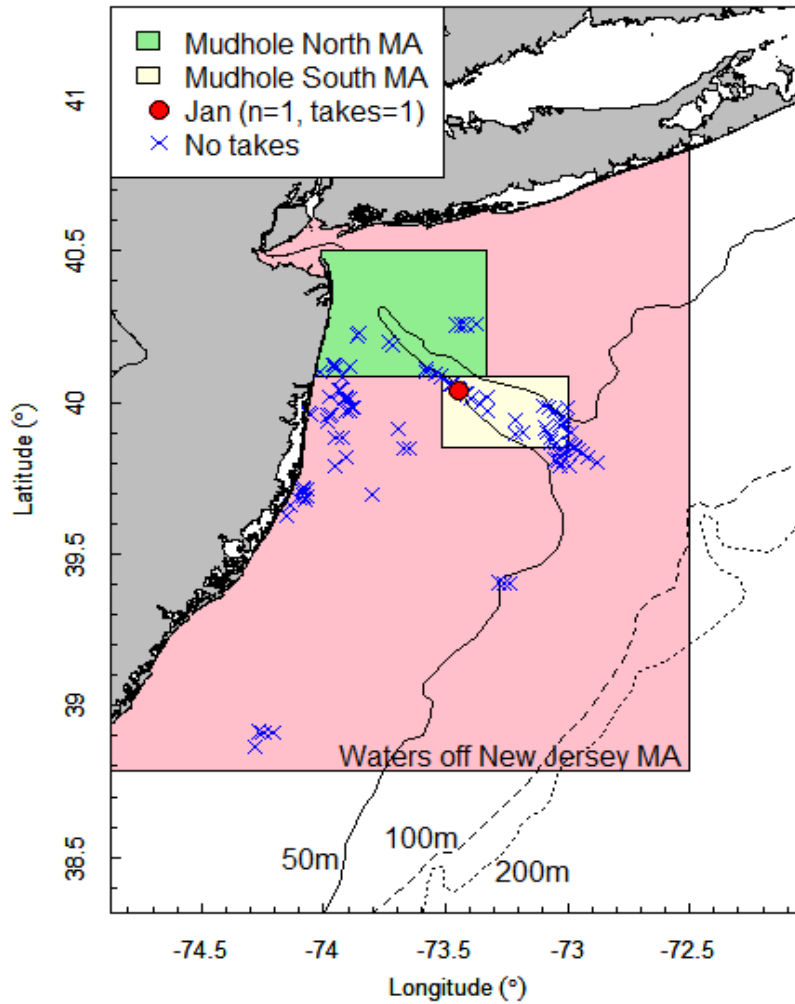


Figure 3: Location of observed hauls and takes of harbor porpoise (*Phocoena phocoena*) that fall under jurisdiction of the 2010 HPTRP (January – April) during April 1, 2010 – May 31, 2012. ‘n’ refers to the number of hauls with harbor porpoise bycatch, while ‘takes’ refers to the total number of harbor porpoises taken.

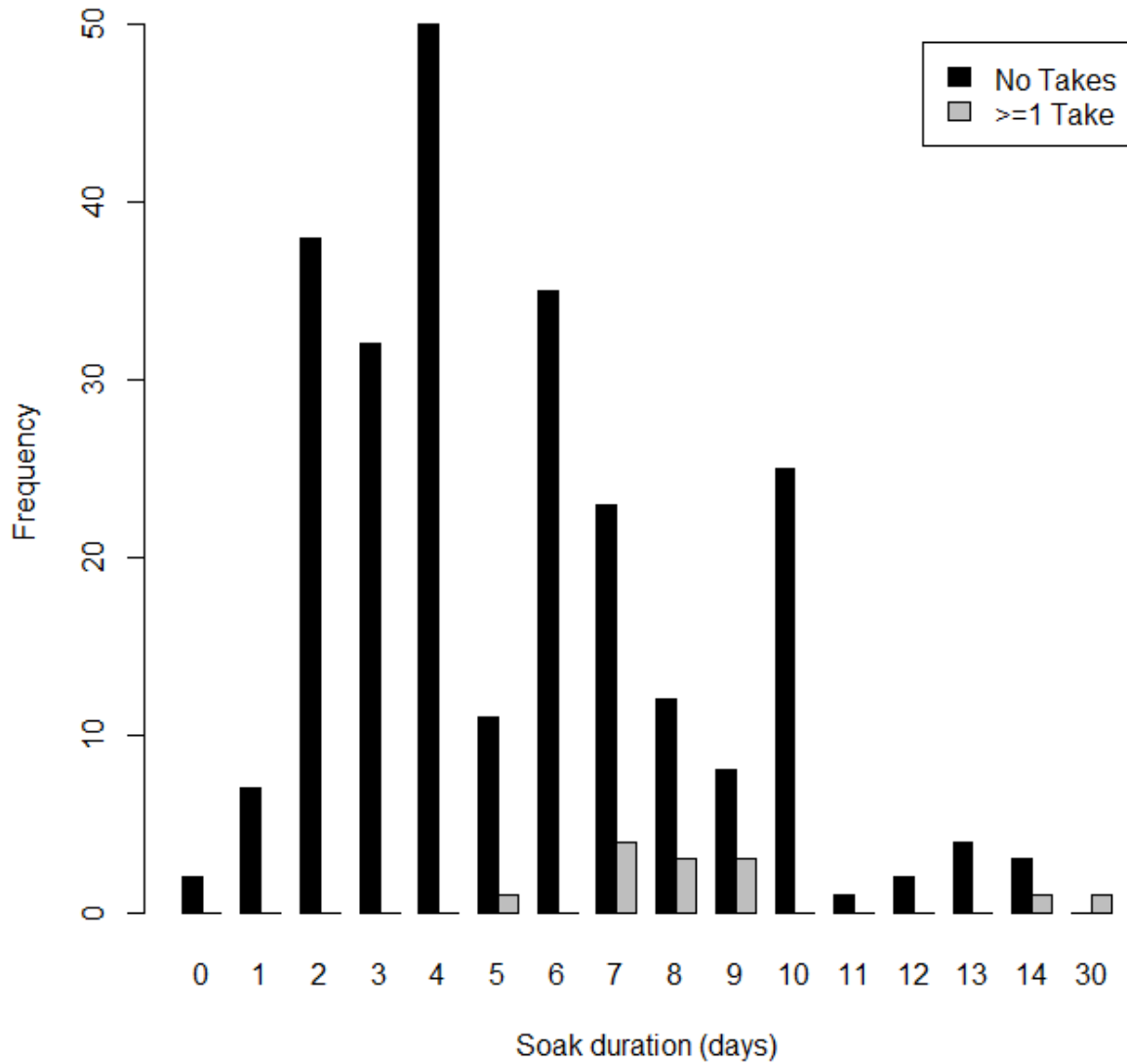


Figure 4: Barplot of soak duration (in days) for observed hauls that were targeting monkfish (*Lophius americanus*) within jurisdiction of the HPTRP (January - April), aggregated across both time periods (i.e. afterTRT and newTRP), with (gray bars) and without (black bars) takes of harbor porpoise (*Phocoena phocoena*).

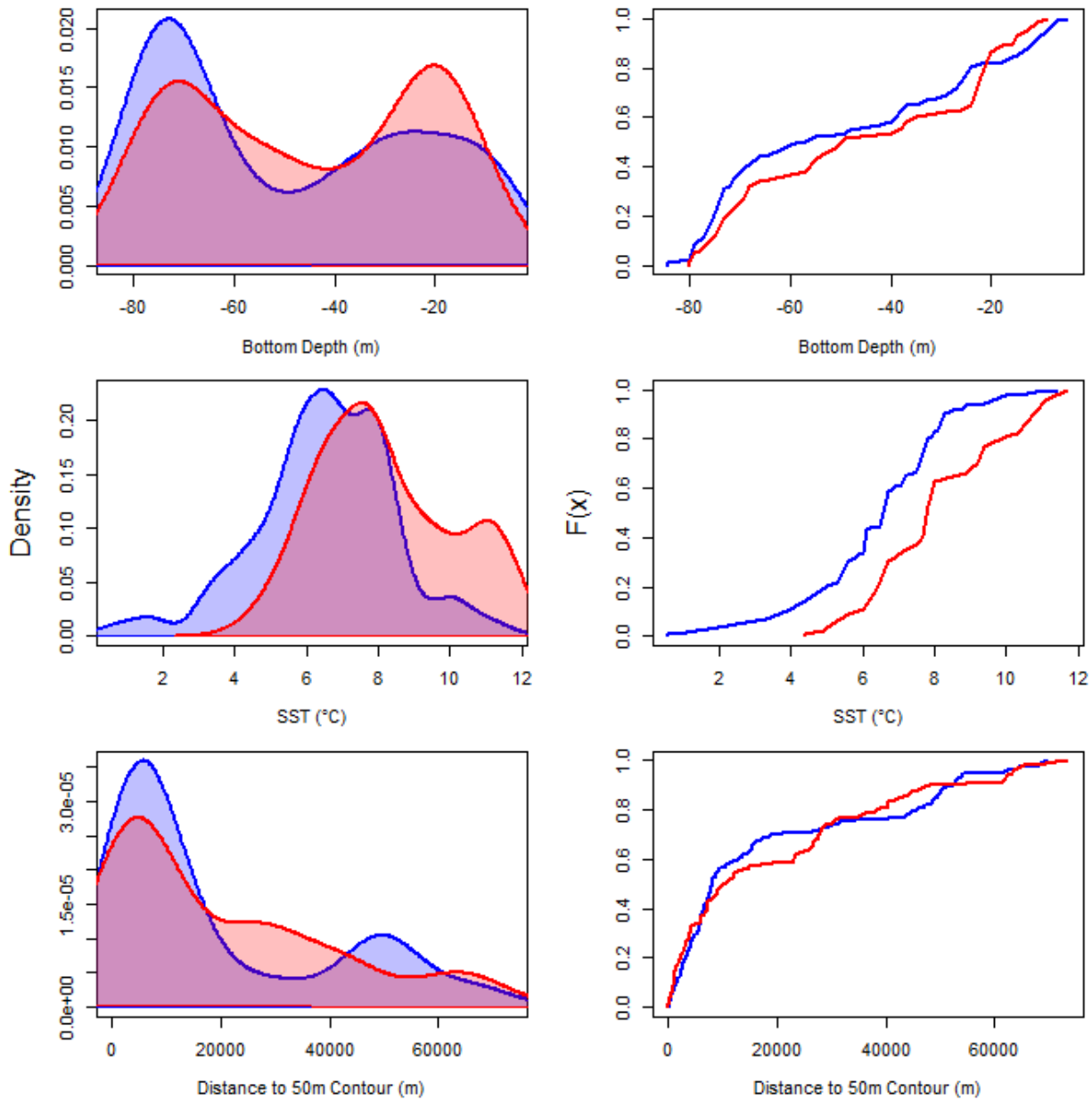


Figure 5: Kernel density estimates and empirical cumulative distributions of environmental characteristics, previously shown to influence harbor porpoise bycatch rates (Palka et al. 2009), before (blue) and after (red) implementation of the 2010 HPTRP. Purple regions in kernel density estimates indicate overlap in distributions before and after implementation of the 2010 HPTRP.

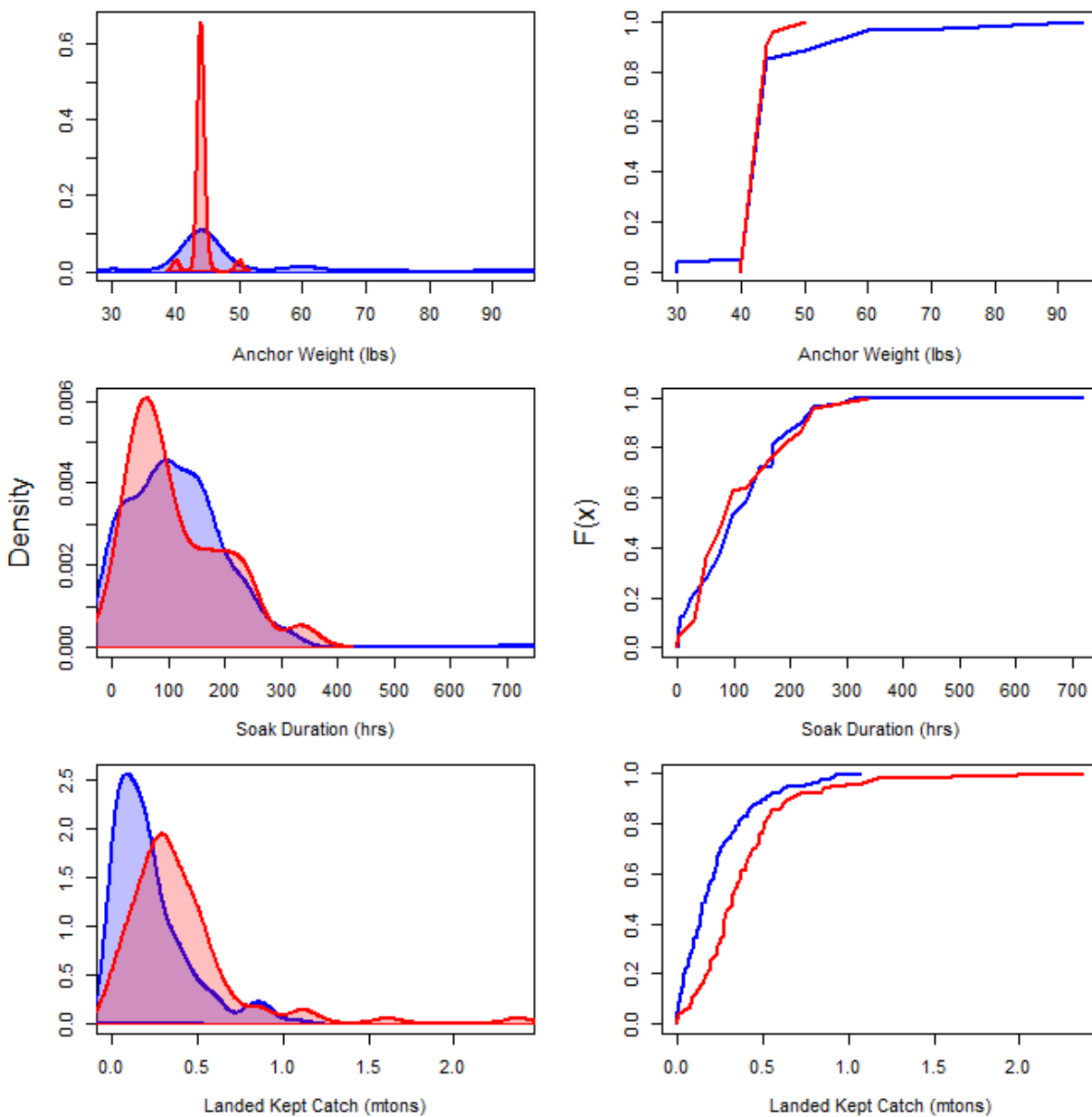


Figure 6: Kernel density estimates and empirical cumulative distributions of gear characteristics, previously shown to influence harbor porpoise bycatch rates (Palka et al. 2009), before (blue) and after (red) implementation of the 2010 HPTRP. Purple regions in kernel density estimates indicate overlap in distributions before and after implementation of the 2010 HPTRP.

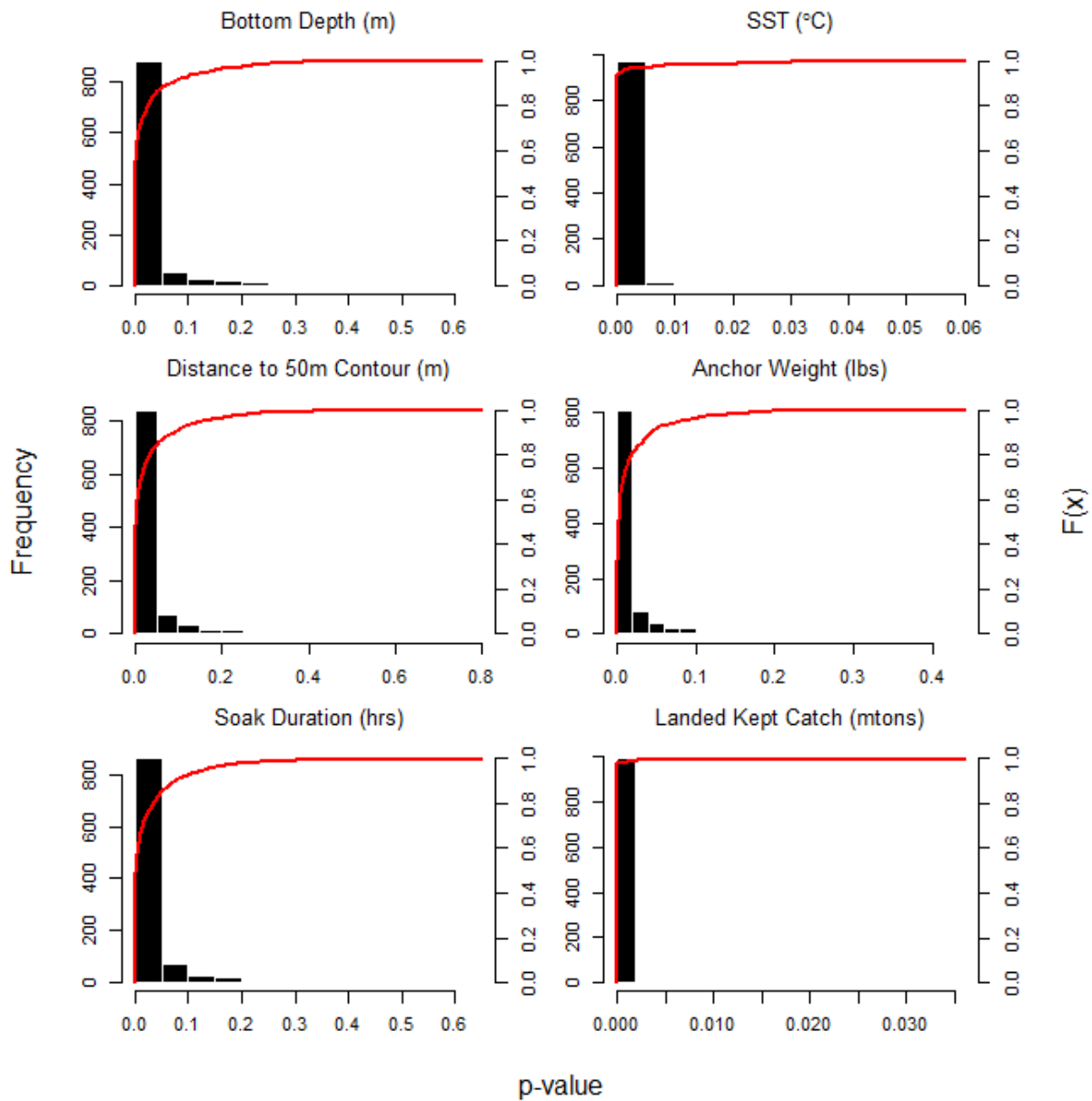


Figure 7: Histograms of bootstrapped p -values (and corresponding empirical cumulative distributions, i.e. solid red line) from Kolmogorov-Smirnov tests on the hypothesis of no difference in distributions of selected variables before and after the implementation of the 2010 HPTRP.

Appendix

The At-Sea Monitoring (ASM) program is mandated with monitoring catch and discards for the Northeast Multispecies (Large Mesh/Groundfish) Fishery and was implemented on May 1, 2010. Thirty-four (34) hauls were observed by ASM in the New Jersey region during 2011 (Table 10), 17 in January and 17 in February (Table 11). Ten (10) incidental takes of harbor porpoise were recorded by ASM monitors in February 2011 on 8 hauls (Table 10), all of which were targeting monkfish and using large-mesh gillnets within the Waters off New Jersey MA. Eight (8) hauls were observed in the South Mudhole MA, with one haul violating a time closure for large-mesh gillnets during February 2011, although no observed hauls in the South Mudhole MA had recorded takes. Due to the limited amount of information collected by ASM, compliance can only be calculated for use of tie downs, tie down length, average net size, and number of net panels per string. For monitored hauls using large-mesh gillnets within the Waters off New Jersey MA during 2011, 81% (21/26) were non-compliant with the 2010 HPTRP. For monitored hauls using large-mesh gillnets within the South Mudhole MA during 2011, 29% (2/7) were non-compliant with the 2010 HPTRP (see Table 13 for more information on compliance for each gear characteristic).

Table 10: Descriptive statistics for harbor porpoise (*Phocoena phocoena*) bycatch events in the New Jersey region from May 2010 through May 2012, by year, as recorded by ASM. Only monitored hauls that are within the 2010 HPTRP's jurisdiction are included (January – April).

| | Year | | | Total |
|--|-----------|--------|------------|--------|
| | >=05/2010 | 2011 | < =05/2012 | |
| Number of observed hauls | 0 | 34 | 0 | 34 |
| Number of observed trips | 0 | 11 | 0 | 11 |
| Number of observed vessels | 0 | 6 | 0 | 6 |
| Number of observed hauls with one or more take | 0 | 8 | 0 | 8 |
| Total number of observed takes | 0 | 10 | 0 | 10 |
| Total landed kept catch (mtons) | 0 | 19.276 | 0 | 19.276 |
| Bycatch rate (observed takes / observed number of hauls) | 0 | 0.294 | 0 | 0.294 |
| Bycatch rate (observed takes / observed mtons landed) | 0 | 0.519 | 0 | 0.519 |

Table 11: Descriptive statistics for harbor porpoise (*Phocoena phocoena*) bycatch events in the New Jersey region from May 2010 through May 2012, by month, as recorded by ASM. Only monitored hauls that are within the 2010 HPTRP's jurisdiction are included (January – April).

| | Month | | | | Total |
|--|-------|--------|-----|-----|--------|
| | Jan | Feb | Mar | Apr | |
| Number of observed hauls | 17 | 17 | 0 | 0 | 34 |
| Number of observed takes | 0 | 10 | 0 | 0 | 10 |
| Total landed kept catch (mtons) | 9.075 | 10.201 | 0 | 0 | 19.276 |
| Bycatch rate (observed takes / observed number of hauls) | 0 | 0.588 | 0 | 0 | 0.588 |
| Bycatch rate (observed takes / observed mtons landed) | 0 | 0.980 | 0 | 0 | 0.980 |

Table 12: Number of observed hauls within the Waters off New Jersey MA between May 2010 and May 2012 for large-mesh gillnets (7-18") under gear restrictions as put forth by the 2010 HPTRP, by soak duration (in days) and observer program (NEFOP vs. ASM).

| Soak Duration (days) | NEFOP | ASM |
|----------------------|-------|-----|
| 1 | 2 | 0 |
| 2 | 9 | 1 |
| 3 | 9 | 0 |
| 4 | 10 | 8 |
| 5 | 0 | 3 |
| 6 | 3 | 2 |
| 7 | 2 | 4 |
| 8 | 1 | 0 |
| 9 | 0 | 1 |
| 10 | 4 | 4 |
| 11 | 0 | 1 |
| 13 | 0 | 2 |
| Total | 40 | 26 |

Table 13: Percent compliance for each gear characteristic on ASM-monitored hauls using large-mesh gillnets within the New Jersey region between May 2010 and May 2012. Only monitored hauls that are within the 2010 HPTRP's jurisdiction are included (January – April). NA = Not applicable.

| Gear characteristic | Waters off NJ | | | South Mudhole | | |
|---------------------|---------------|----------|-------|---------------|----------|-------|
| | January | February | Total | January | February | Total |
| Used Tie Downs? | 100% | 100% | 100% | 100% | NA | 100% |
| Tie Down Length | 50% | 44% | 46% | 100% | NA | 100% |
| Net Length | 100% | 100% | 100% | 100% | NA | 100% |
| Number of Nets | 60% | 81% | 73% | 71% | NA | 71% |
| Total | 10% | 25% | 19% | 71% | NA | 71% |

05/10 - 05/12

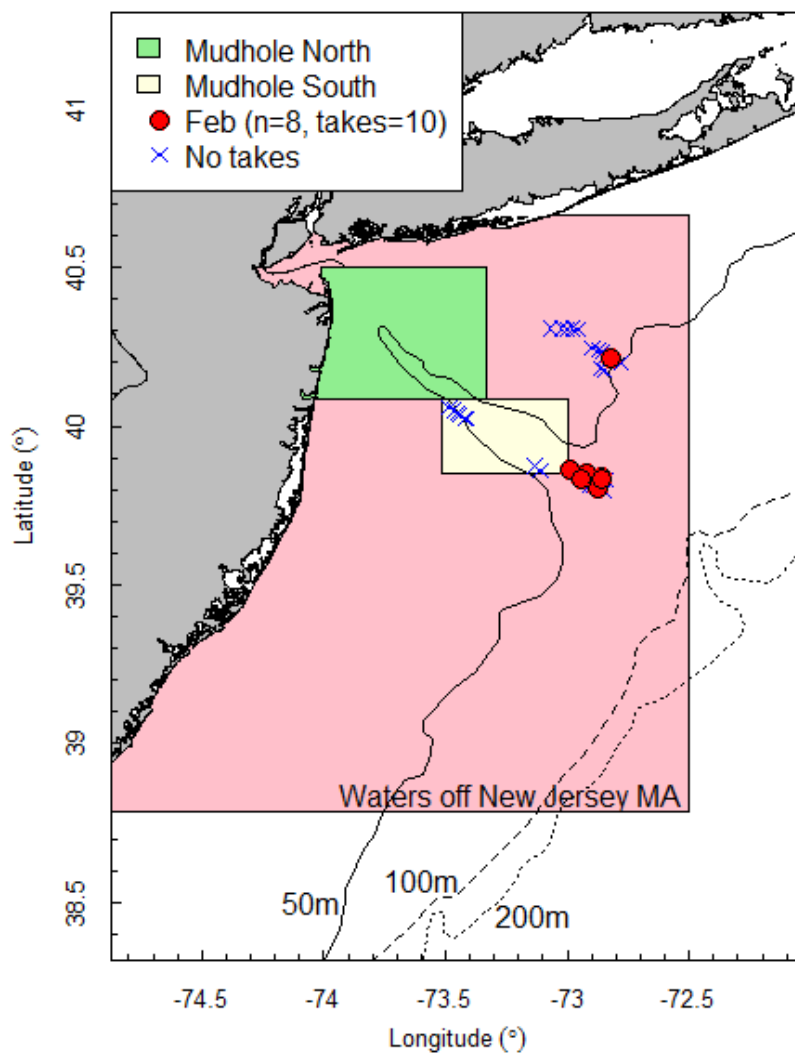


Figure 7: Location of observed hauls and takes of harbor porpoise (*Phocoena phocoena*) that fall under jurisdiction of the 2010 HPTRP (January – April) during May 1, 2010 - May 31, 2010 as monitored by ASM. ‘n’ refers to the number of hauls with harbor porpoise bycatch, while ‘takes’ refers to the total number of harbor porpoises taken.

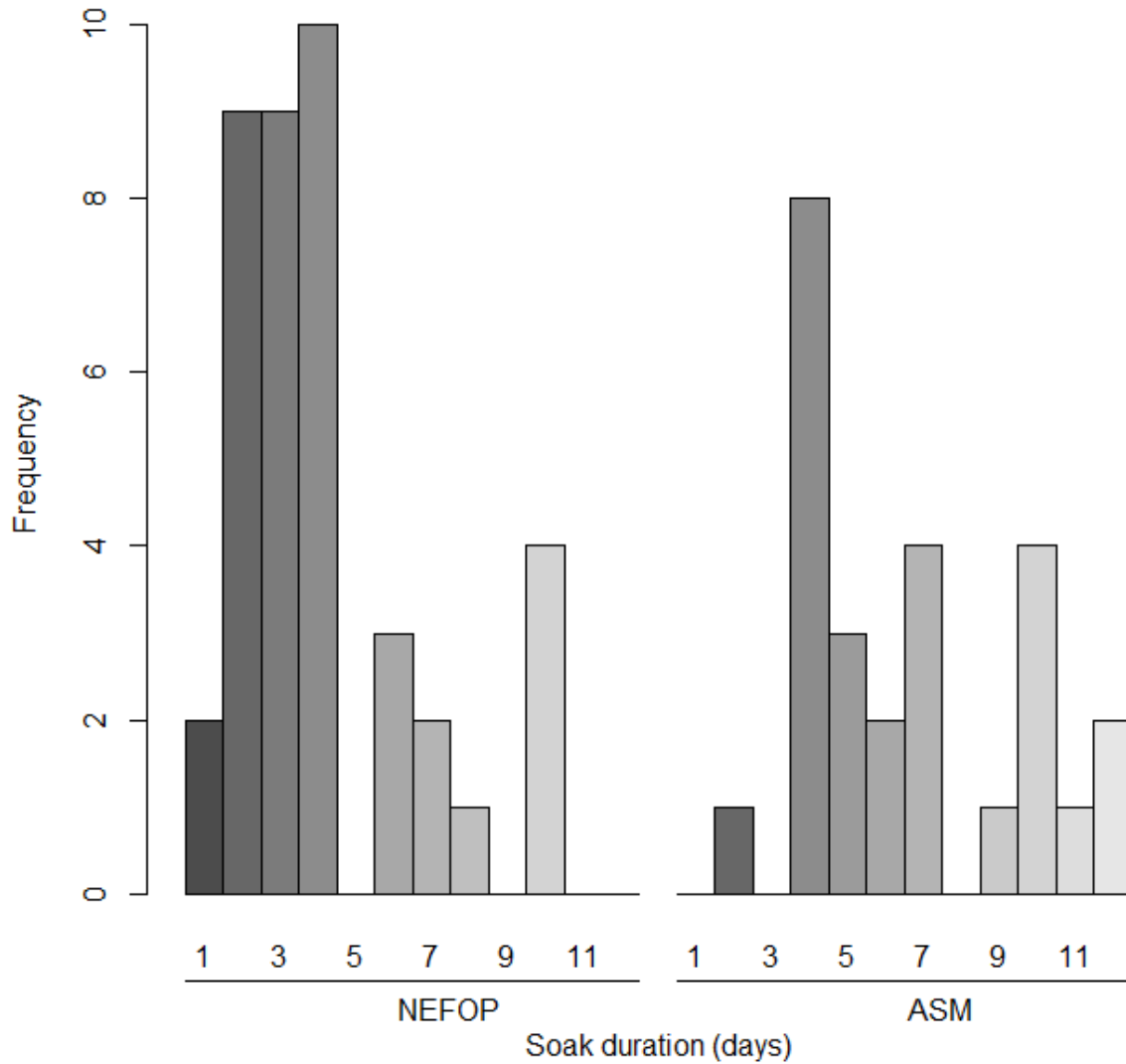


Figure 8: Barplot comparing soak duration (in days) of observed (NEFOP) and monitored (ASM) hauls using large-mesh gillnets targeting monkfish in the Waters off New Jersey MA from May 2010 to May 2012, under jurisdiction of the 2010 HPTRP (January – April).

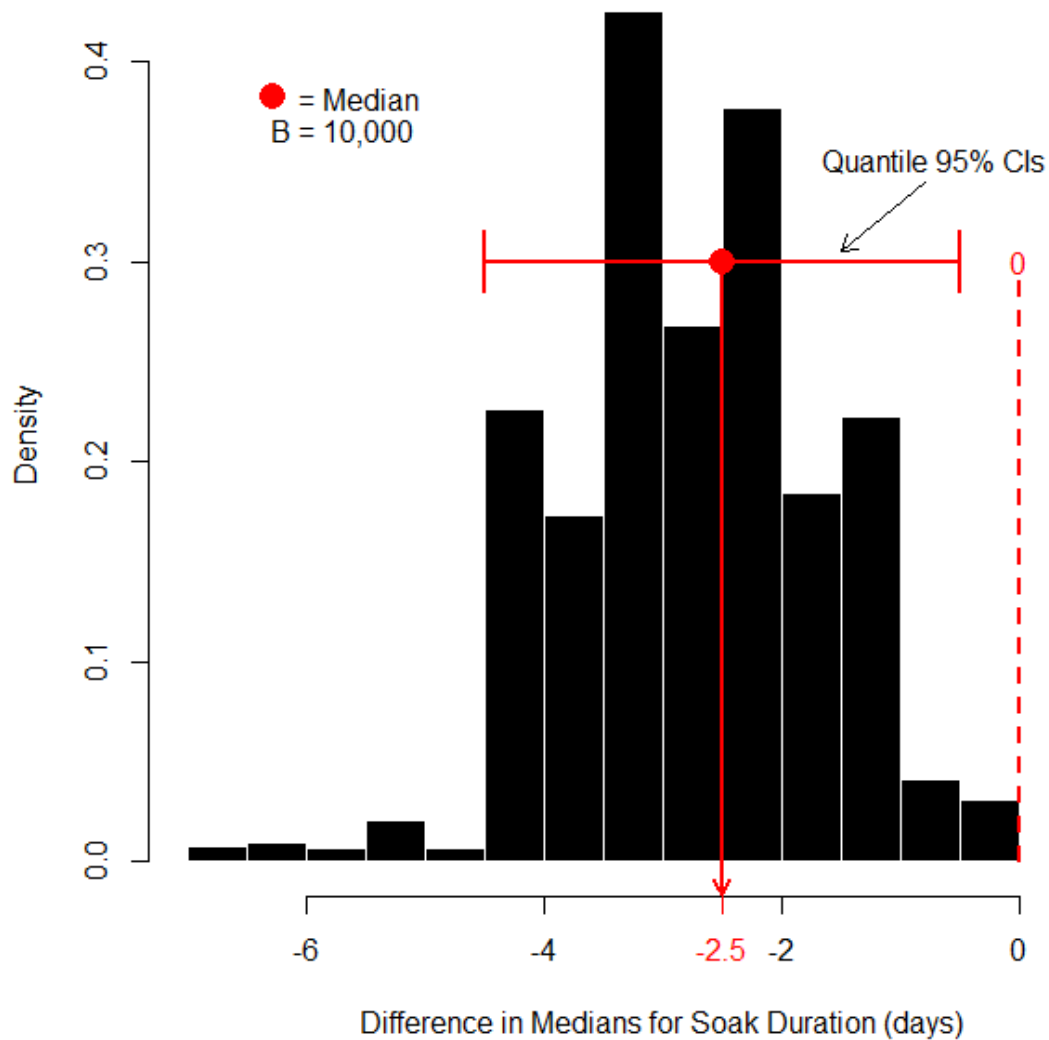


Figure 9: Bootstrapped distribution for the difference in medians for soak duration (in days) on hauls using large-mesh gillnets targeting monkfish within the Waters off New Jersey MA between May 2010 and May 2012, as observed by NEFOP (n=40) and monitored by ASM (n=26). 95% confidence intervals are based on the 2.5% and 97.5% quantiles of the 10,000 bootstrapped replicates, with a median of -2.5. This is interpreted as NEFOP observed hauls with significantly shorter soak durations relative to ASM monitored hauls, by a median of 2.5 days.