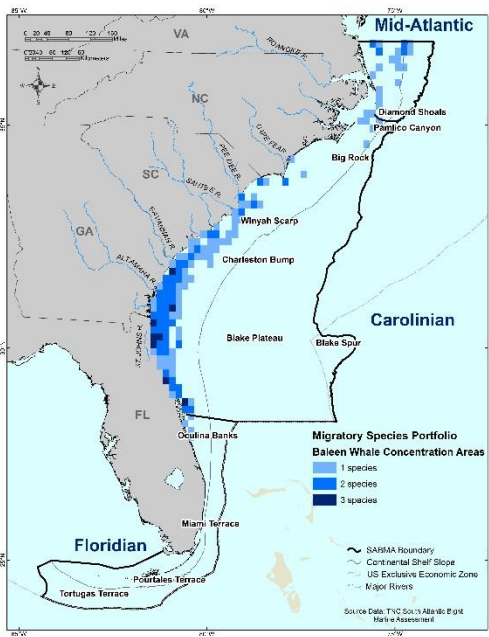# South Atlantic Bight Marine Assessment (SABMA)
Migratory Species Portfolio Data Summary

Project Webpage:
http://nature.ly/marineSAtlanticBightERA
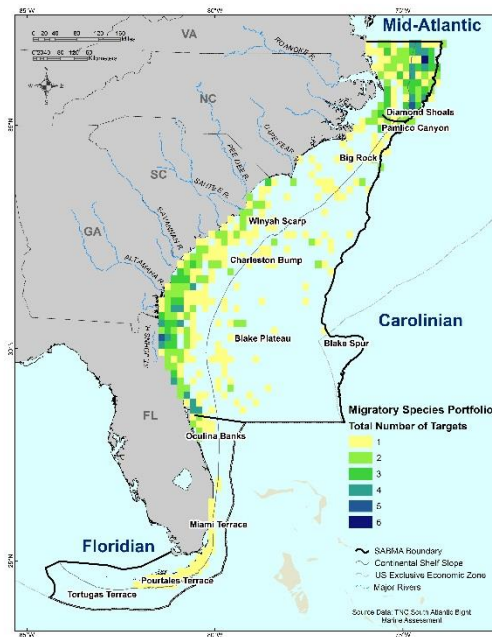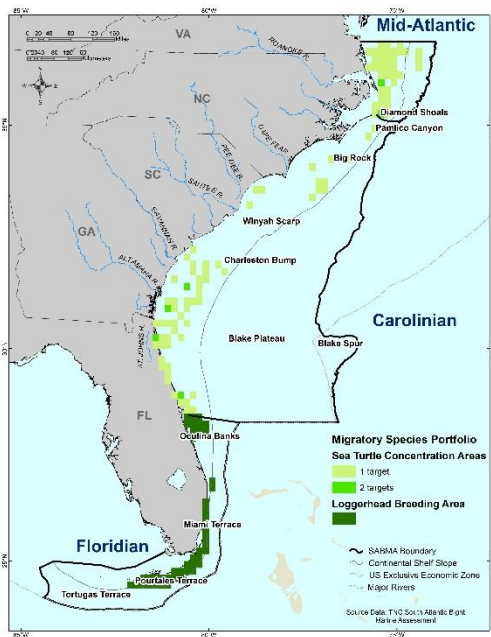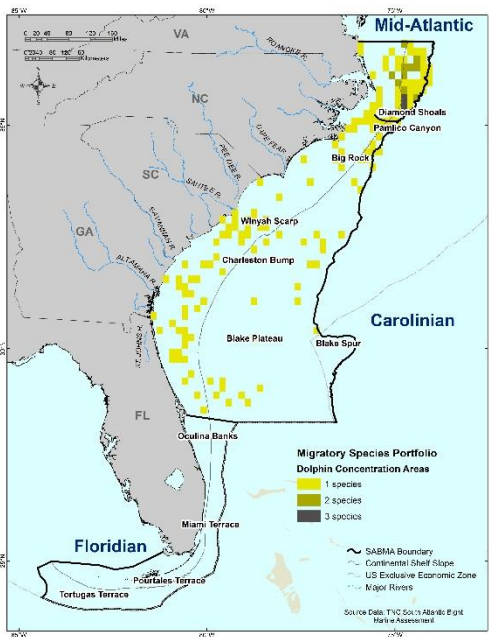
Migratory Species Portfolio Data & Full Metadata:
http://easterndivision.s3.amazonaws.com/Marine/SABMA/SABMAIdentifyingConservationAreas.zip

Portfolio Chapter:
http://easterndivision.s3.amazonaws.com/Marine/SABMA/SABMA_Chapter05_IdentifyingConservationAreas.pdf

For Questions Please Contact:
eScience@tnc.org
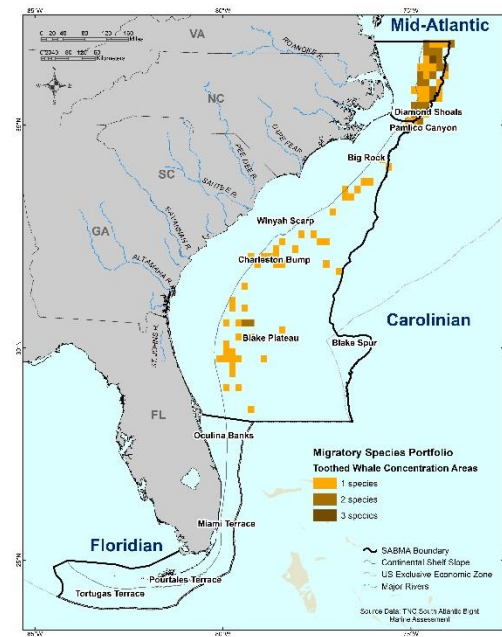
The Nature Conservancy
Protecting nature. Preserving life.®
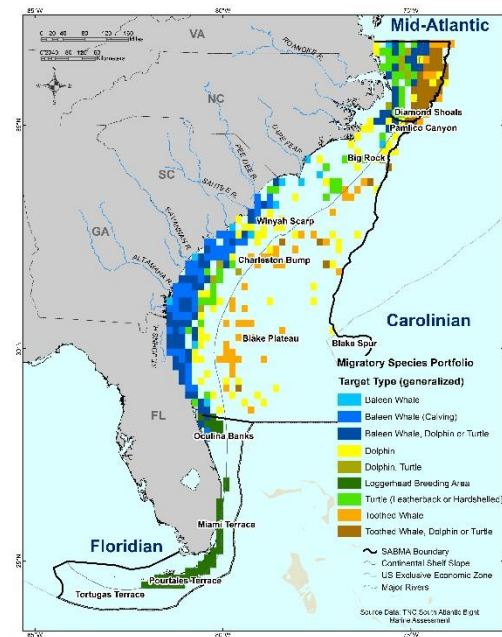
Data Sources: Department of the Navy, 2008. Marine Resource Assessment Update for the Virginia Capes Operating Area. Department of the Navy, U.S. Fleet Forces command, Norfolk, Virginia. Contract #N62470-02-D-9997, CTO 0056. Prepared by Geo-Marine Inc., Hampton, Virginia. _N. Atlantic Right Whale (NARW):_ FL Fish and Wildlife Commission (FWC) compiled and analyzed NARW calving season data for the SABMA region from many researchers made available through the North Atlantic Right Whale Consortium. Data management: North Atlantic Right Whale Consortium - University of Rhode Island, FWC-FWRI; Data analysis: FWC-FWRI

Years: Navy: 1979 – 20013, FWC: 1991/1992 - 2012/2013

Dataset Description & Methods Overview: Migratory species sighting data were only available for the Mid-Atlantic Bight and Carolinian region of the South Atlantic Bight. To accommodate for bias introduced by uneven survey coverage or "effort," we used the number of sightings per unit effort (SPUE, an index of relative density) to allow for comparison of data spatially and temporally within the study area. The SPUE calculations were provided by the US Navy along with the sources of data for each species and season. To summarize the data, we calculated the mean abundance of each species within each TMS by season, and then assigned an overall score equal to the maximum value in any season. For example, if the average North Atlantic right whale sightings were highest in winter, the overall TMS score was based on the winter season. For each species, the set of maximum values was converted to rank-based z-scores using standard methods and including only TMS where the species had been sighted. This approach allowed us to combine the species sighting scores with equal weight within a TMS. Three species of baleen whales winter on the Continental Shelf and bear their young in the relatively shallow warm water: humpback whale (129 sightings), North Atlantic right whale (528 sightings) and fin whale (443 sightings). For each TMS we first calculated individual rank based z-scores for each species as described above, then we counted the number of species that had z-scores greater than one half standard deviation below the mean (>-0.05). This provided an estimate of the number of species found in each TMS while excluding places with very few sightings. *See final report and metadata for detailed methods and more information.

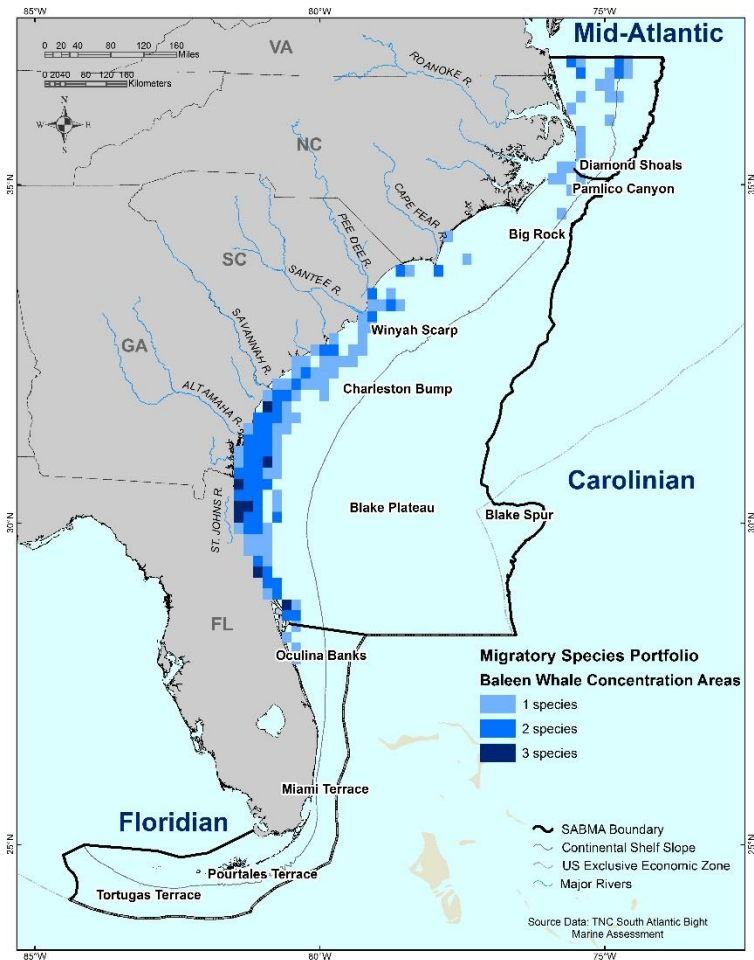*For Questions Please Contact: eScience@tnc.org*

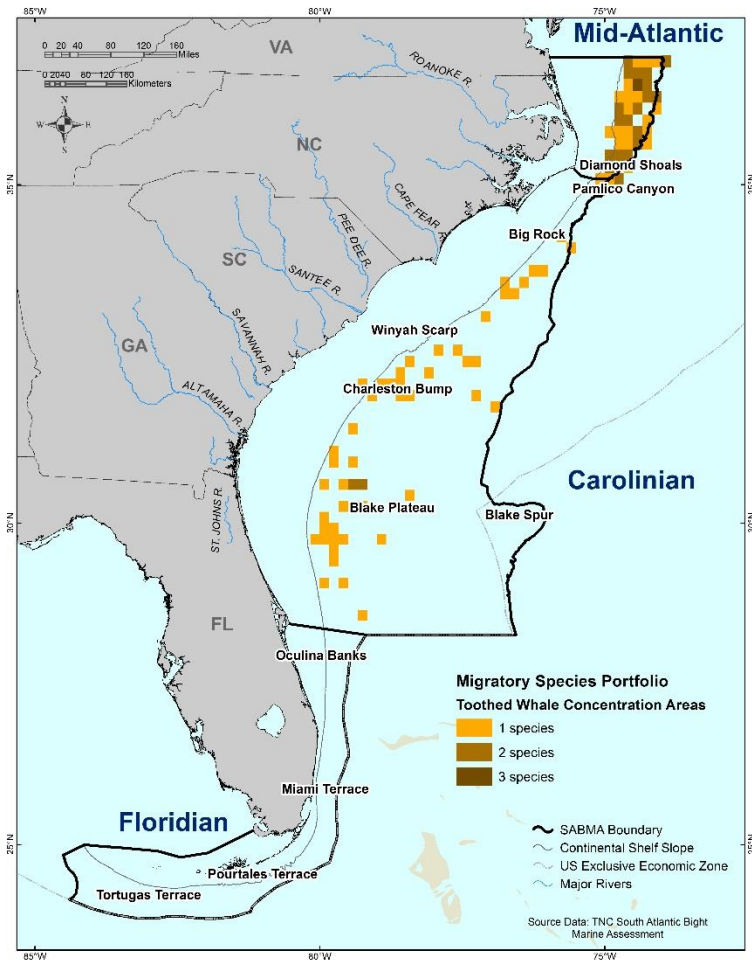# Migratory Species Portfolio: Toothed Whale Concentration Areas

Data Sources: Department of the Navy, 2008. Marine Resource Assessment Update for the Virginia Capes Operating Area. Department of the Navy, U.S. Fleet Forces command, Norfolk, Virginia. Contract #N62470-02-D-9997, CTO 0056. Prepared by Geo-Marine Inc., Hampton, Virginia.

Years: 1979 - 2003

Dataset Description & Methods Overview: Migratory species sighting data were only available for the Mid-Atlantic Bight and Carolinian region of the South Atlantic Bight. To accommodate for bias introduced by uneven survey coverage or "effort," we used the number of sightings per unit effort (SPUE, an index of relative density) to allow for comparison of data spatially and temporally within the study area. The SPUE calculations were provided by the US Navy along with the sources of data for each species and season. To summarize the data, we calculated the mean abundance of each species within each TMS by season, and then assigned an overall score equal to the maximum value in any season. For example, if the average North Atlantic right whale sightings were highest in winter, the overall TMS score was based on the winter season. For each species, the set of maximum values was converted to rank-based z-scores using standard methods and including only TMS where the species had been sighted. This approach allowed us to combine the species sighting scores with equal weight within a TMS.

Toothed whales are abundant in the region and include three species of squid-eating diving whales typical of the shelf-slope break and the deep canyon and coral mount areas: sperm whale (9,179 sightings), long-finned pilot whale (91,837 sightings), and Risso's dolphin (46,635 sightings). Various species of beaked whales (2,216 sightings) and Kogia (1,323 sighting) have been seen in the deepwater region east of the shelf-slope break but this area has been so little surveyed that we did not include them in the analysis. For each TMS we first calculated individual rank based z-scores for each species as described above and then we counted the number of species that had z-scores greater than one half standard deviation below the mean (>-0.05). This provided an estimate of the number of species found in each TMS while excluding places with very few sightings. *See final report and metadata for detailed methods and more information.

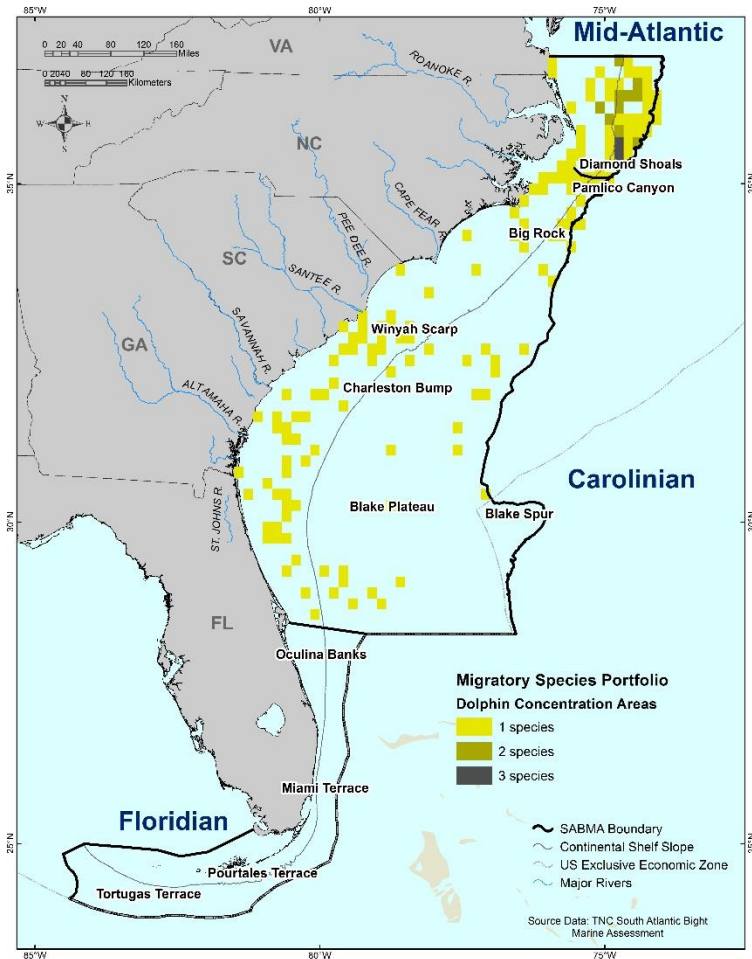*For Questions Please Contact: eScience@tnc.org*

Data Sources: Department of the Navy, 2008. Marine Resource Assessment Update for the Virginia Capes Operating Area. Department of the Navy, U.S. Fleet Forces command, Norfolk, Virginia. Contract #N62470-02-D-9997, CTO 0056. Prepared by Geo-Marine Inc., Hampton, Virginia.

Years: 1979 – 2003

Dataset Description & Methods Overview: Migratory species sighting data were only available for the Mid-Atlantic Bight and Carolinian region of the South Atlantic Bight. To accommodate for bias introduced by uneven survey coverage or "effort," we used the number of sightings per unit effort (SPUE, an index of relative density) to allow for comparison of data spatially and temporally within the study area. The SPUE calculations were provided by the US Navy along with the sources of data for each species and season. To summarize the data, we calculated the mean abundance of each species within each TMS by season, and then assigned an overall score equal to the maximum value in any season. For example, if the average North Atlantic right whale sightings were highest in winter, the overall TMS score was based on the winter season. For each species, the set of maximum values was converted to rank-based z-scores using standard methods and including only TMS where the species had been sighted. This approach allowed us to combine the species sighting scores with equal weight within a TMS.

Three species of fish-eating dolphins are very abundant on the Continental Shelf: common dolphin (120,731 sightings), bottlenose dolphin (303,094 sightings), and spotted dolphin (Stenella spp.; 411,436 sightings). To identify concentration areas for dolphins, which are two to three times more abundant and widespread than the previous groups, we first calculated individual rank based z-scores as described above and then selected TMS with sighting concentrations one standard deviation above the mean (>1SD). This focused the selection on the areas where sightings were consistently very abundant.

*See final report and metadata for detailed methods and more information.

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Data Sources: *Leatherback & hard-shelled sea turtles:* Department of the Navy, 2008. Marine Resource Assessment Update for the Virginia Capes Operating Area. Department of the Navy, U.S. Fleet Forces command, Norfolk, Virginia. Contract #N62470-02-D-9997, CTO 0056. Prepared by Geo-Marine Inc., Hampton, Virginia. *Loggerhead breeding areas:* NMFS USFWS. 2008. Recovery Plan for the Northwest Atlantic Population of the Loggerhead Sea T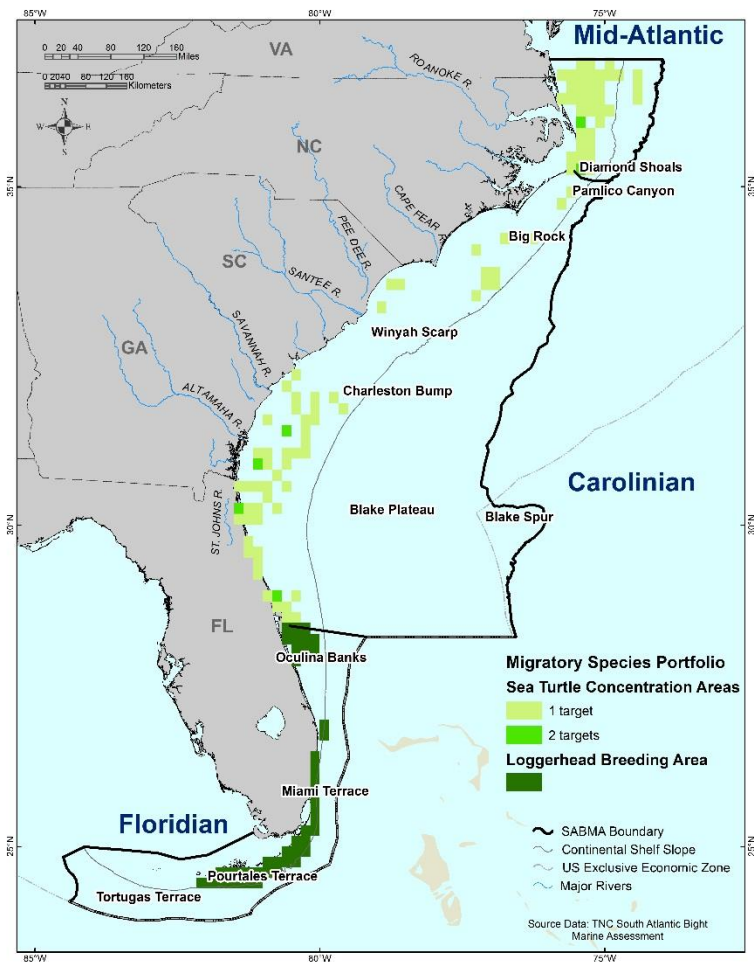urtle (Caretta caretta), Second Revision. Silver Spring, MD. http://www.nmfs.noaa.gov/pr/pdfs/recovery/turtle_loggerhead_atlantic.pdf.
Years: 1979 – 2003, 2008

Dataset Description & Methods Overview: Migratory species sighting data were only available for the Mid-Atlantic Bight and Carolinian region of the South Atlantic Bight. To accommodate for bias introduced by uneven survey coverage or "effort," we used the number of sightings per unit effort (SPUE, an index of relative density) to allow for comparison of data spatially and temporally within the study area. The SPUE calculations were provided by the US Navy along with the sources of data for each species and season. To summarize the data, we calculated the mean abundance of each species within each TMS by season, and then assigned an overall score equal to the maximum value in any season. For example, if the average North Atlantic right whale sightings were highest in winter, the overall TMS score was based on the winter season. For each species, the set of maximum values was converted to rank-based z-scores using standard methods and including only TMS where the species had been sighted.
Sea turtle species are hard to distinguish by sightings, so this analysis grouped them into two categories for easy recognition: Leatherback sea turtle (3,036 sightings) and a hard-shelled sea turtle group that included loggerhead, green, and Kemp's ridley (60,088 sightings) turtles. For each TMS, we first calculated individual rank based z-scores for each species as described above. To identify concentration areas, we selected TMS where the number of sightings was one standard deviation above the regional mean. Finally, the Floridian region is noted by NOAA as a Habitat Area of Particular Concern (HAPC) for loggerhead breeding. Because we had no sighting data for this region, we added TMS that overlapped with critical loggerhead breeding areas to the portfolio selection. *See final report and metadata for detailed methods.

For Questions Please Contact: eScience@tnc.org

Data Sources: See data descriptions on the previous slides. Refer to the SABMA portfolio chapter and the marine mammals and sea turtle chapter for additional details and information.

Years: 1979 – 2003, 2008, 1991/1992 - 2012/2013

Dataset Description & Methods Overview:

This dataset identifies important areas for migratory marine mammals and sea turtles based largely on 30 years of effort-corrected seasonal sightings data (1979-2003) provided by the United States Navy. The unit of observation was a ten-minute square (TMS) of ocean space. "Sightings" refer to clear observations of a species from a ship or plane, with enough clarity for species identification. Identification can be very difficult for some similar-looking species, so sightings of these species were combined into descriptive groups (e.g., hard-shelled turtles, beaked whales) for this analysis. Details of the analysis differ slightly by target group as discussed in the portfolio chapter. The target species groups were:

1) Baleen whales (humpback, North Atlantic right, fin)
2) Toothed whales (sperm, pilot, Risso's dolphin)
3) Dolphins (common, bottlenose, spotted [Stenella spp.])
4) Sea turtles (leatherback, hard-shelled [green, loggerhead, Kemp's ridley])

The final migratory species portfolio with the total number of targets shows the count of target concentration areas found in each TMS. For each migratory species group, the squares meeting the selection criteria were assigned a value of 1 and combined across all 12 species, including loggerhead breeding areas. For example, a TMS with two Baleen Whale species and one Dolphin species concentration area received a score of 3; 2 for the baleen whale portfolio and 1 for the dolphin portfolio. The highest score in the analysis was 6 for a TMS with the following concentration areas: 1 sea turtle species, 2 dolphin species, and 3 toothed whale species.

*See final report and metadata for detailed methods and more information.

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Migratory Species Portfolio: Target Type (generalized)

Data Sources: See data descriptions on the previous slides. Refer to the SABMA portfolio chapter and the marine mammals and sea turtle chapter for additional details and information.

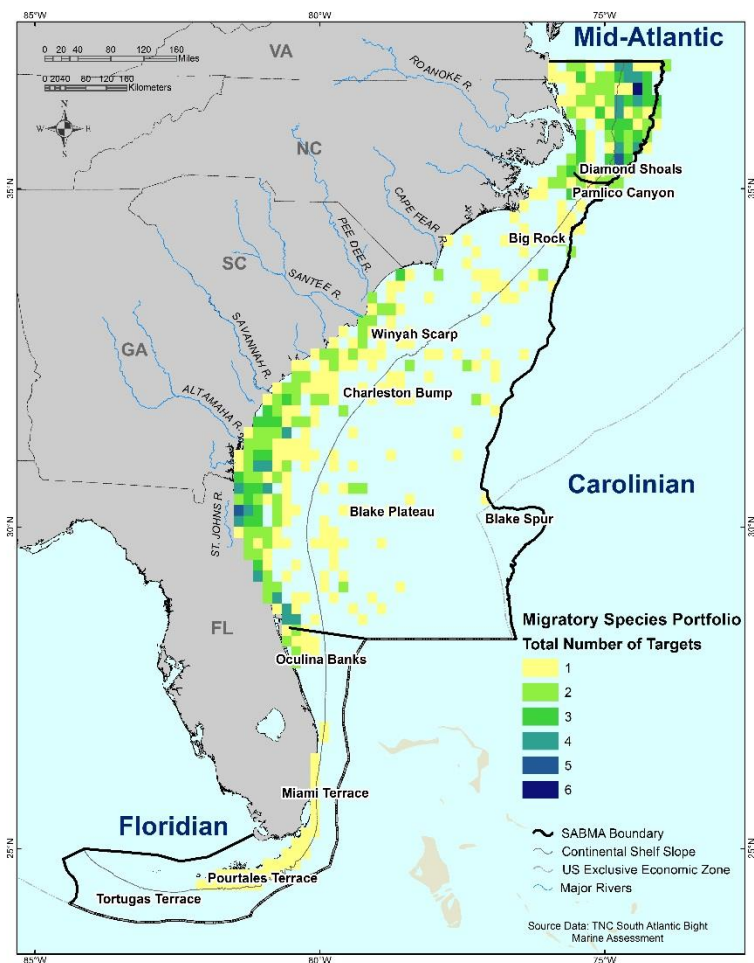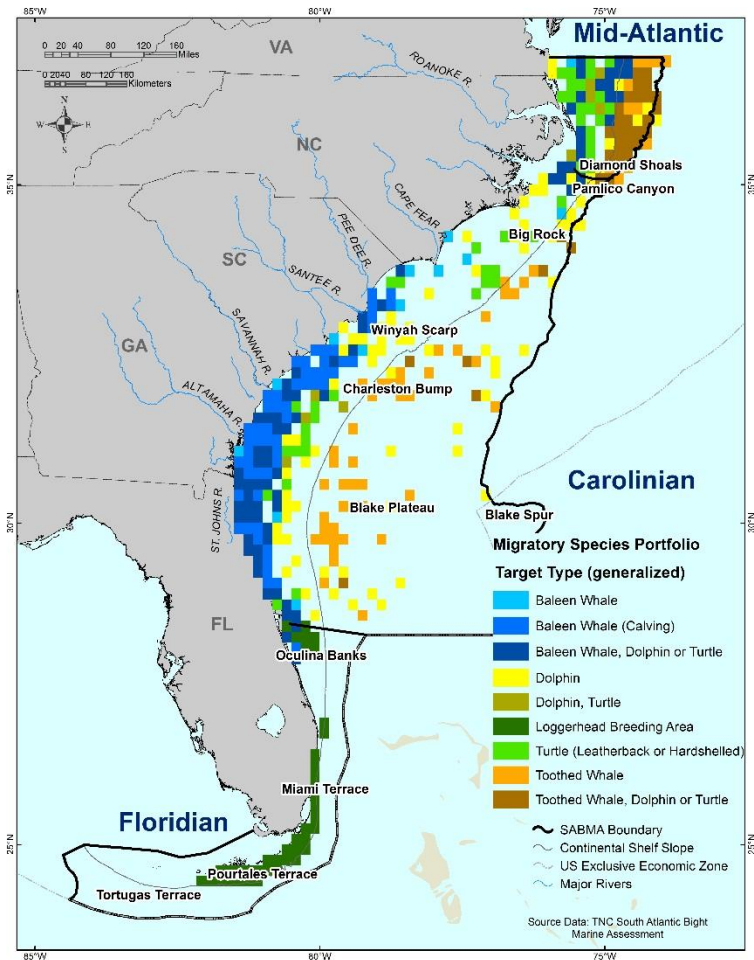**Years**: 1979 – 2003, 2008, 1991/1992 - 2012/2013

Dataset Description & Methods Overview:
This dataset identifies important areas for migratory marine mammals and sea turtles based largely on 30 years of effort-corrected seasonal sightings data (1979-2003) provided by the United States Navy. The unit of observation was a ten-minute square (TMS) of ocean space. "Sightings" refer to clear observations of a species from a ship or plane, with enough clarity for species identification. Identification can be very difficult for some similar-looking species, so sightings of these species were combined into descriptive groups (e.g., hard-shelled turtles, beaked whales) for this analysis. Details of the analysis differ slightly by target group as discussed in the portfolio chapter. The target species groups were:

1) Baleen whales (humpback, North Atlantic right, fin)
2) Toothed whales (sperm, pilot, Risso's dolphin)
3) Dolphins (common, bottlenose, spotted [Stenella spp.])
4) Sea turtles (leatherback, hard-shelled [green, loggerhead, Kemp's ridley])

For each migratory species group, the squares meeting the selection criteria were labeled with the target name and combined across all four groups: baleen whales, toothed whales, dolphins, and sea turtles. For example, a cell labeled "Baleen Whale, Dolphin" was selected for both the baleen whale portfolio and the dolphin portfolio. This generalized version of the total portfolio target type lumps several targets together to highlight broad spatial patterns from the data. The types were lumped as follows: Toothed Whale, Dolphin, or Turtle = toothed whale, dolphin; toothed whale, turtle   Baleen Whale, Dolphin, or Turtle = baleen whale, dolphin, turtle; baleen whale, turtle; baleen whale, dolphin; baleen whale calving, dolphin; baleen whale calving, turtle; baleen whale calving, loggerhead breeding area; baleen whale calving, turtle, loggerhead breeding area.
*See final report and metadata for detailed methods and more information.

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Total Migratory Species Portfolio Target Type (detailed)

- Dolphin
- Dolphin, Turtle
- Loggerhead Breeding Area
- Baleen Whale
- Baleen Whale, Dolphin
- Baleen Whale, Turtle
- Baleen Whale, Dolphin, Turtle
- Turtle (Leatherback or Hardshell)
- Toothed Whale
- Toothed Whale, Dolphin
- Toothed Whale, Dolphin, Turtle
- Baleen Whale, Toothed Whale, Dolphin
- Baleen Whale Calving
- Baleen Whale Calving, Dolphin
- Baleen Whale Calving, Loggerhead Breeding Area
- Baleen Whale Calving, Turtle
- Baleen Whale Calving, Turtle, Loggerhead Breeding Area

Source Data: TNC South Atlantic Bight Marine Assessment

- SABMA Boundary
- Continental Shelf Slope
- US Exclusive Economic Zone
- Major Rivers

Data Sources: See data descriptions on the previous slides. Refer to the SABMA portfolio chapter and the marine mammals and sea turtle chapter for additional details and information.

Years: 1979 – 2003, 2008, 1991/1992 - 2012/2013

Dataset Description & Methods Overview: This dataset identifies important areas for migratory marine mammals and sea turtles based largely on 30 years of effort-corrected seasonal sightings data (1979-2003) provided by the United States Navy. The unit of observation was a ten-minute square (TMS) of ocean space. "Sightings" refer to clear observations of a species from a ship or plane, with enough clarity for species identification. Identification can be very difficult for some similar-looking species, so sightings of these species were combined into descriptive groups (e.g., hard-shelled turtles, beaked whales) for this analysis. Details of the analysis differ slightly by target group as discussed in the portfolio chapter. The target species groups were:

1) Baleen whales (humpback, North Atlantic right, fin)
2) Toothed whales (sperm, pilot, Risso's dolphin)
3) Dolphins (common, bottlenose, spotted [Stenella spp.])
4) Sea turtles (leatherback, hard-shelled [green, loggerhead, Kemp's ridley])

For each migratory species group, the squares meeting the selection criteria were labeled with the target name and combined across all four groups: baleen whales, toothed whales, dolphins, and sea turtles. For example, a cell labeled "Baleen Whale, Dolphin" was selected for both the baleen whale portfolio and the dolphin portfolio. This detailed version of the total portfolio target type does not lump types together and shows each unique combination of targets found in the migration portfolio TMS cells across the South Atlantic Bight project area.

*See final report and metadata for detailed methods and more information.