



## **Marine-life Data and Analysis Team (MDAT) Mammal Product Updates Summary of Changes for March 2023 Update**

### Overview

Marine mammal individual species or species guild density surface models (DSMs) were originally produced by the Marine Geospatial Ecology Lab at Duke University (MGEL) in 2016 (Roberts et al., 2016) with funding by the U.S. Navy and NASA in support of the Navy's Atlantic Fleet Training and Testing (AFTT) study area Phase III Environmental Impact Statement (EIS)/Overseas Environmental Impact Statement (OEIS). As part of the Marine-life Data and Analysis Team (MDAT), MGEL developed a suite of "summary products" representing total abundance, species richness, core abundance richness, and species diversity for various groups of species based on ecological similarity, protection status, or vulnerability characteristics. MDAT also provides web-based map services for the individual species and summary products, primarily for regional ocean council's to use in their spatial portals, and also for general access to the data. See the MDAT repository at <https://seamap.env.duke.edu/models/mdat/> for a full description.

Interim updates to several species were released in 2017 (Roberts et al., 2017) and 2018 (Roberts et al., 2018), resulting in updates to the MDAT individual species and summary products. The North Atlantic right whale (NARW) model was also updated, with those updates incorporated into MDAT Summary Products in 2022. See the MDAT repository for a full description of updates.

In 2022 a full suite of 31 updated density models for 26 species and 5 species guilds was produced using updated methodology and survey data conducted through 2020, in support of the U.S. Navy's Phase IV EIS/OEIS (Roberts et al., 2023). This document contains a brief summary of the changes to the base-layer models and the MDAT group summary products that occurred in the 2022 update. Additional details on the base-layer models and summary products can be found in the MDAT Technical Report (Curtice et al., 2019), and additional details on the models can be found on the model repository page here:

<https://seamap.env.duke.edu/models/Duke/EC/>

### Marine mammal layers

1. The updated marine mammal density surface models incorporate survey data through 2020. We incorporated a very large amount of additional survey data contributed by both continuing and new collaborators, with total aerial effort increasing by 2,139,000 linear km, or 255%, and shipboard effort by 54,000 km, or 93%. The biggest increase resulted from the incorporation of the southeast U.S. North Atlantic right whale early warning system surveys (SEUS NARW EWS), which together totaled 1,579,800 km of the added aerial effort. The program that provided the broadest overall impact was NOAA AMAPPS (Atlantic Marine Assessment

Program for Protected Species). While AMAPPS only contributed about 207,300 km of the additional aerial effort and 33,400 km of the shipboard effort, it was the only program to estimate perception bias, which provided crucial corrections needed to estimate absolute abundance. AMAPPS was also the only program to cover the entire U.S. Exclusive Economic Zone (EEZ) and provided coverage in all four seasons. New contributions from New England Aquarium, the partnership of New York State Department of Environmental Conservation and TetraTech, HDR, UNCW, and the Virginia Aquarium & Marine Science Center provided critical boosts to seasonal coverage of the Mid-Atlantic Bight and Navy OPAREAs.

2. Spatial resolution was increased to 5km X 5km grid cells for all individual species and summary product layers, while the prediction units remain the number of animals/100km<sup>2</sup>. Individual species values are density.
3. The color ramp for both individual species and summary products was changed from Viridis to Turbo. A summary of the differences and improvements with Turbo can be found [here](#).
4. The abundance layer of the summary products represents abundance (count of individual animals). To calculate abundance per cell, accumulated density values were divided by four.
5. For the first time, we incorporated a towed passive acoustic monitoring survey (MCR SOTW Acoustical). This survey was used in models for sperm whales and beaked whales.
6. Changed the resolution of contemporaneous covariates from daily to monthly for selection in all models.
7. Minke whale has been renamed as “Common minke whale,” following the name change by the Society for Marine Mammalogy.
8. We’ve added a new species prediction, with an annual abundance layer, Pygmy killer whale, given a new individual sighting by AMAPPS. The species was previously not modeled individually or as part of a guild.
9. Lacking any evidence of Bryde's whales in the East Coast study area, and given the expert opinions of Rosel et al. (2021), we now believe Bryde's whale is effectively absent from this study area and have not prepared a model for this region. We consider the previous Bryde's whale model retired, and no longer recommend its use.
10. The number of stratified models was reduced from 13 to 8, increasing the number of taxa modeled with full DSM's from 16 to 19 and adding 4 limited DSM's.
11. The seal model is now included in the MDAT release.
12. The start date of most of the models is 1998. Exceptions include 2010 for Cuvier's beaked whales, Mesoplodont beaked whales, and Unidentified beaked whales; 2003 for the NARW and 2002 for humpback whale; 1995 for False killer whale.
13. The study area was reduced in the north, where we eliminated the Laurentian Channel from the study area and extended in the mid-Atlantic to include the Balanus Seamount and offshore of Blake Spur in the southeast. Additionally, the study area was extended further inshore in certain bays and estuaries, per NOAA's request.
14. Modeling methodologies were updated.



15. The uncertainty surface estimates were updated, with new methodology used to generate them, and now account for interannual variability. (Previous versions only accounted for the estimated statistical error in model parameter estimates.)
16. It should be noted that there is a bug in the 5 and 95% rasters, whereby areas where a species is assumed absent are represented with values of NoData rather than Zero. This problem has been fixed and the updated products will be available in May or June, 2023.

### Marine Mammal Summary Product Changes

1. Humpback whale model has been removed from ESA group, per NOAA declassification
2. It should be noted that the blue whale was previously a stratified model (only one density value in the entire extent) and was excluded from the summary product calculations except the abundance. In the new release, the blue whale is a non-stratified model (a density surface model) and is now included in the summary product calculations for all products, for the groups in which they occur (cetaceans, baleen, sound sensitivity - low frequency).
3. Pygmy killer whale, a new modeled species, has been added to the All cetaceans, Large delphinoids, and Sound sensitivity high frequency summary product groups. As it's a stratified model, it's only included in the total abundance calculation.
4. The de-guirding method for the mesoplodont beaked whales in the summary products was improved in the new release thanks to passive acoustic monitoring (PAM) research and data. In the current release, the mesoplodont beaked whales was apportioned into four species (Blainville's, Gervais', Sowerby's and True's), equally throughout the entire extent. In the new release, based on the PAM research, we estimated Sowerby's and True's occur to the north of Cape Hatteras and Blainville's and Gervais' occur to the south of Cape Hatteras. Thus, the northern part of the layer was split into Sowerby's and True's equally and the southern part of the layer was split into Blainville's and Gervais' equally.
5. The unidentified beaked whales guild was apportioned into the Cuvier's beaked whale and the Mesoplodont beaked whales for the summary products, and the proportion of each has changed in this release from 48% Cuvier's / 52% Mesoplodont to 46% Cuvier's / 54% Mesoplodont, based on additional data.
6. This release fixes a bug in the summary products where the density of the dwarf sperm whale and the pygmy sperm whale apportioned from the Kogia guild was calculated based on the unidentified beaked whale guild not on the Kogia guild.

### References

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