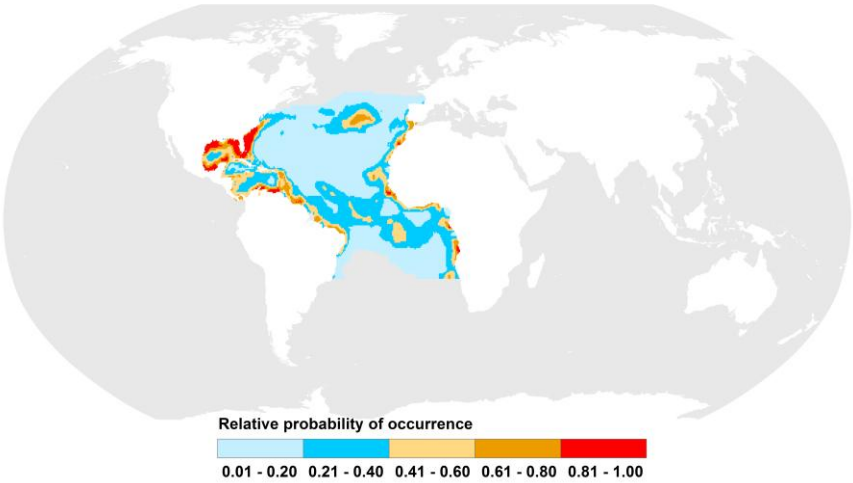
Dataset ID: Kaschner-011

Global Distribution of Atlantic Spotted Dolphins (2013)



Description: This dataset shows the modelled distribution of Atlantic spotted dolphins (Stenella frontalis). AquaMaps (www.aquamaps.org) is a species distribution modelling approach that provides standardised range maps for marine species using available information on species occurrence. IUCN status: Data Deficient (Red List of Threatened Species).

Citation(s): Kaschner K, Rius-Barile J, Kesner-Reyes K, Garilao C, Kullander SO, Rees T, Froese R (2013). AquaMaps: Predicted range maps for aquatic species. World wide web electronic publication: www.aquamaps.org, Version August 2013

Temporal range: 2013

Geographical range: Global

Supplementary information (eg attribute table): The dataset contains continuous probabilities of occurrence as a global grid of 0.5 dd resolution. Field information: scientific name (Genus, Species); center latitude of 0.5 dd cell (Center Lat); center longitude of 0.5 dd cell (Center Long); unique cell identifier following the c-squares code system (C-Square Code; see http://www.cmar.csiro.au/csquares/about-csquares.htm for more information); total predicted relative environmental suitability based on envelope settings (Overall Probability).

Predicted distributions often include the potential environmental niche of a species, including historical occurrence. Validation analysis has shown that relative probabilities >=0.6 correspond more closely to the utilised niche of this species: this is the recommended threshold to be used to delineate the core range of this species (precautionary setting). Detailed dataset-specific information (provided by K. Kaschner) is also available.

Purpose of creation: AquaMaps is a tool for generating model-based, large-scale predictions of natural occurrences of species. The maps can be used to inform environmental impact assessments.

Creation methodology: The modelled distribution was generated using the AquaMaps online species distribution model. Methodological notes (provided by K. Kaschner) are also available. Observed occurrence records (235 cells; FAO areas: 21, 27, 31, 34, 41, 47) were obtained (August 2013) from the Global Biodiversity Information Facility

(GBIF; www.gbif.org). These were supplemented by additional information obtained through online species databases such as FishBase (www.fishbase.org) and SeaLifeBase (www.Sealifebase.org), as well as published information on species-specific habitat usage and expert knowledge. The distribution model was based on four environmental variables (depth, temperature, salinity, and primary production), and details of the species envelope are in the dataset-specific information (provided by K. Kaschner).

Lineage (versioning):	AquaMaps version used: 01 August 2013. In acknowledgement that predicted distributions reflect the current state of knowledge, AquaMaps predictions are not a permanent, fixed output, but instead will be revised and updated as new data or information become available or additional experts provide new input. Environmental dataset used: HCAF version 5 (August 2013; www.aquamaps.org/envtdata/main.php).
Category:	Species distribution
Keywords:	marine, coastal, model, pelagic, high seas, deep sea
Similar datasets:	None
Quality, limitation(s), fitness for use:	Excluded from the model: species misidentifications, fossil records and outliers. The modelled distribution has been expert-reviewed by Kristin Kaschner (15 December 2013), and the quality of predictions ranks 2 out of 5 (see www.aquamaps.org/rating.html for further details). Expert comment: "Relatively good correspondence with known species´ distribution, particularly in the Gulf of Mexico where there seems to be the largest concentration of sightings, but there is a trade-off between trying to capture observed records in the western north Atlantic along the US coast which leads to large areas of false predicted presences in the eastern Atlantic (i.e., southern Spain, Morocco). Adjustment of minimum temperature limit and upper salinity limit to better capture species´ range. Introduction of southern limit in bounding box was necessary to limit predictions to match reported southern range limit".
Maintenance frequency:	Data are updated in intervals that are uneven in duration.
Main access/use constraint:	Creative Commons Attribution-NonCommercial 3.0 Unported (CC BY-NC 3.0). See http://creativecommons.org/licenses/by-nc/3.0/ for details. Free to (1) copy/distribute the work, and (2) adapt the work. The material may not be used for commercial purposes.
Other access/use constraints:	Interested users of the dataset should contact Kristin Kaschner who will identify and provide, where appropriate, the most recent updated data. For commercial use, please contact business-support@unep-wcmc.org.

Dataset ID: Kaschner-011

Contact organisation:	Albert-Ludwigs-University of Freiburg		
Organisation type:	Owner	Acronym:	
Name:	Dr. Kristin Kaschner	Position:	Research Affiliate
City:	Freiburg	Country:	Germany
E-mail:	Kristin.Kaschner@biologie.uni-freiburg.de		
Web site:	www.uni-freiburg.de		
Main format:	Tabular (.csv)	Other format(s):	Vector (point; .shp)
Distribution format:	Tabular (.csv)	Dataset size (uncompressed):	1.1 Mb
Webpage and/or download:	http://www.aquamaps.org		
Other webpage:	http://data.unep-wcmc.org/datasets/30		
Web map service:			
Resolution, scale:	0.5 dd	Reference system:	WGS 1984
West bounding:	-180.0	East bounding:	18.0
South bounding:	-21.0	North bounding:	90.0
Factsheet:	No	Metadata standard:	UNEP-WCMC Specific
Date of metadata:	13/10/2014		

Detailed dataset-specific information (provided by K. Kaschner)

Atlantic spotted dolphin (*Stenella frontalis)*

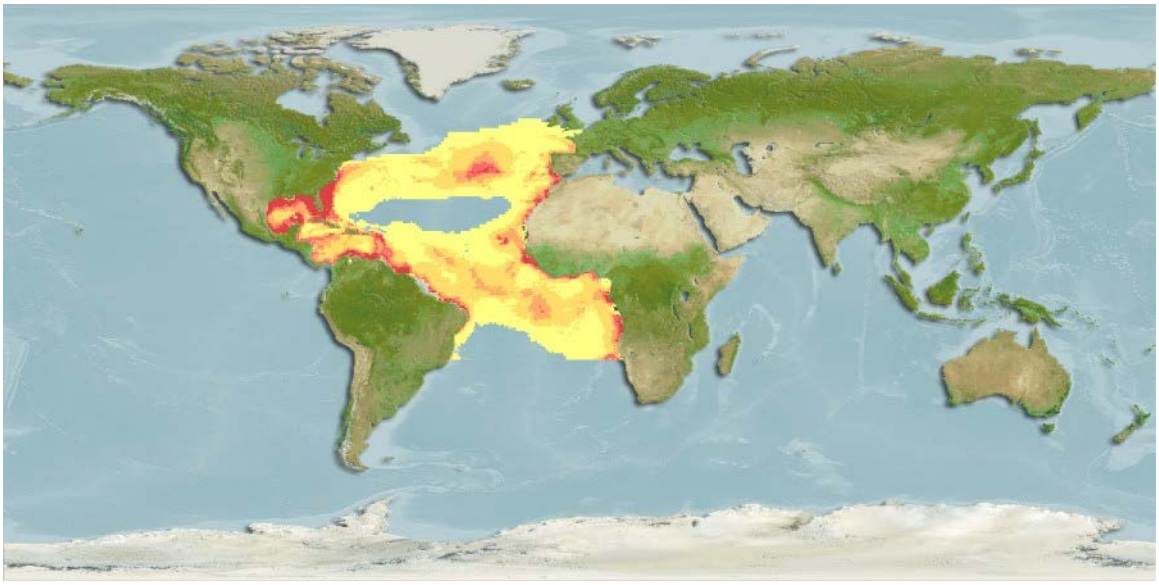


Figure 1: Expert reviewed AquaMaps predictions: Atlantic spotted dolphin (*Stenella frontalis*

Expert:	Kristin Kaschner
Review data:	15/12/2013
File name	Stfro_AQER_122013.csv
Quality of Predictions:	2 (out of 5) http://www.aquamaps.org/rating.html
Recommended threshold settings best describing utilized niche (precautionary setting)	0.6
Expert comment:	Relatively good correspondence with known species´ distribution, particularly in the Gulf of Mexico where there seems to be the largest concentration of sightings, but there is a trade-off between trying to capture observed records in the western north Atlantic along the US coast which leads to large areas of false predicted presences in the eastern Atlantic (i.e., southern Spain, Morocco). Adjustment of minimum temperature limit and upper salinity limit to better capture species´ range. Introduction of southern limit in bounding box was necessary to limit predictions to match reported southern range limit.
AquaMaps version:	01/08/2013
Environmental data set:	http://www.aquamaps.org/envtdata/main.php HCAF ver.5 (08/2013)
AquaMaps citation:	Kaschner, K., J. Rius-Barile, K. Kesner-Reyes, C. Garilao, S.O. Kullander, T. Rees, and R. Froese. 2013. AquaMaps: Predicted range maps for aquatic species. World wide web electronic publication, www.aquamaps.org, Version 08/2013.

Detailed dataset-specific information (provided by K. Kaschner)

Input data

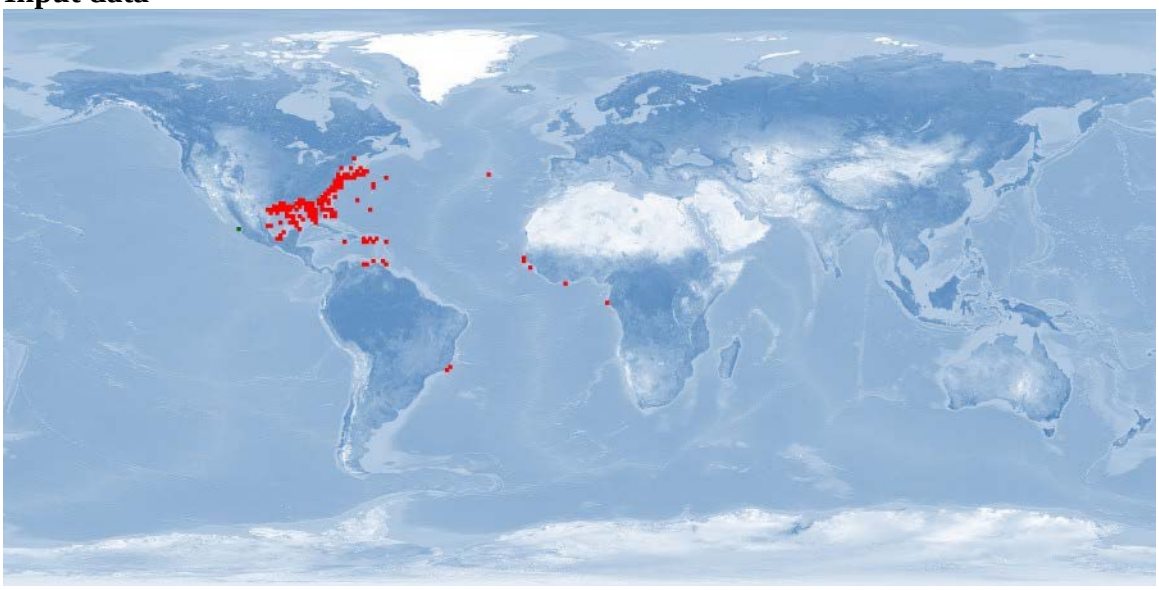


Figure 2: Atlantic spotted dolphin (*Stenella frontalis*)- available point occurrence records (GBIF download August 2013). Note that green records represent species misidentification, fossil or museum records and associated points are not included in the envelope calculations.

Mapping parameters for Stenella frontalis (Atlantic spotted dolphin)					
Map type: Expert-reviewed					
Map Option: In FAO and Bounding Box					
FAOAreas: 21 | 27 | 31 | 34 | 41 | 47					
Bounding Box (NSWE):	90	-21	-180	18	
No of good cells used for envelope	235				
Pelagic: False					
Layer used to generate probabilities: Surface					
Species Envelope (HSPEN):					
	Used	Min	Pref Min (10th)	Pref Max (90th)	Max
Depth (m)	1	0	10	500	6000
Temperature (°C)	1	15	19.66	26.82	31.02
Salinity (psu)	1	30	33.33	36.29	37
Primary Production	1	192	350	1506	3160

Raw point occurrence data & associated environmental values:
Stfro_RawOcc_122013.xls

Methodology for producing maps of known and probable worldwide distributions of marine mammals using the AquaMaps approach

Kristin Kaschner, December 2013

General methodology of AquaMaps approach

Aquamaps is an online species distribution model (www.aquamaps.org) that allows the generation of standardized digital range maps of aquatic species, currently covering more than 17 000 species. Maps are generated using a modified version of the relative environmental suitability model (RES[1]) developed by (Kaschner et al. 2006) that uses available information about habitat usage of a given species, projected into geographic space, to help visualize its distribution. Habitat usage is quantitatively described with the help of so-called environmental envelopes defining a species' preference with respect to a set of pre-defined environmental conditions, including depth, sea-ice, temperature, salinity and primary production. By default, envelopes are derived from occurrence records available through GBIF (www.gbif.org) supplemented by additional information obtained through online species databases such as FishBase (www.fishbase.org) and SeaLifeBase (www.Sealifebase.org). Acknowledging the sampling biases of currently available online occurrence data, however, AquaMaps explicitly also allows for experts to review and modify environmental envelopes manually. Map outputs represent annual average predictions of the maximum range extent of species (defined as the maximum area between the known outer-most limits of a species' regular or periodic occurrence) and gradients of relative habitat suitability or species occurrences (ranging from 0.00 – 1.00), predicted for each 0.5 degree latitude by 0.5 degree longitude cells. Predictions represent a visualization of the basic environmental niche of a species, which may often be closer to the historic occurrence of species or its potential niche rather than its realized or currently occupied niche. Binary range maps corresponding more closely to areas of known occurrence may be derived using presence thresholds ideally defined by validation analysis (Kaschner et al. 2011) (see below).

[1] Relative Environmental Suitability

AquaMaps methodology (provided by K. Kaschner)

AquaMaps predictions for different species have been validated using independent data sets (Kaschner et al. 2006, 2011, Ready et al. 2010) and generally capture existing knowledge of large-scale, long-term annual average species occurrence reasonably well. However, given the overall paucity of data and the frequently large sampling biases in the marine environment, produced outputs should be regarded as hypotheses of species occurrence, based on a clearly defined set of assumptions that can be tested and further refined as new data become available. Moreover, since marine mammal habitat usage often varies across seasons and ocean basins, global predictions should not be used without further review to describe regional species occurrence (and should ideally be checked against independent data) and the overall limitations of data availability, model biases and assumptions etc. should be kept in mind when using produced outputs for management purposes.

Specific methodology for generating updated annual average AquaMaps predictions (all 10 species)

Expert-review was based on environmental envelopes computed from the most recent AquaMaps harvest of occurrence data from GBIF (www.gbif.org) in August 2013. For each species, point occurrence records and resulting 0.5 degree presence cells were reviewed to exclude false records (species misidentifications, fossil records and outliers) based on a comparison of published information about species distributions including, but not limited to, IUCN species pages. Calculated envelopes based on the final subset were further reviewed to ensure that these matched available information about habitat usages as published in the literature. Predictions about the relative probability of occurrence /habitat suitability were then generated based on these reviewed envelopes. Finally, the resulting predictions were reviewed by comparing them with existing information about the maximum range extent and relative occurrence of species within that range, highlighting both false predicted presences and absences. Quality of predictions is reflected in the assigned rank (1 = worst to 5 = best see http://www.aquamaps.org/rating.html) associated with all outputs. It should be noted that the top two ranks are only assigned if predictions have been successfully and

quantitatively validated using independent effort-corrected survey data throughout the whole range ("5") or for at least part of the species range ("4") and as the time available for this project was insufficient for conducting these types of validation, the top rank assigned was a "3" (with the exception of sperm whales for which a quantitative validation had been carried out using data from Antarctic waters).

Presence threshold to be used for producing binary[2] range maps

Validation analyses have shown strong correlations between observed relative species occurrence and predicted relative environmental suitability as predicted by RES and AquaMaps for the majority of species and areas with enough data from large-scale, long-term dedicated marine mammal surveys to allow testing (Kaschner et al. 2006, 2011, Ready et al. 2010). Observed species densities tend to be highest in areas of predicted probability > 0.4 to 0.6, and validation analysis indicated that this is the most likely presence threshold that should be used to produce the most likely representation of known and probable occurrence of the species, although this may vary for different species. The threshold recommended in the individual species files are based on a precautionary approach that should be used in light of existing uncertainties and in the context of environmental impact assessment.

Kaschner K, Tittensor DP, Ready J, Gerrodette T, Worm B (2011) Current and future patterns of global marine mammal biodiversity. PLoS One 6:e19653

Kaschner K, Watson R, Trites A, Pauly D (2006) Mapping world-wide distributions of marine mammal species using a relative environmental suitability (RES) model. Mar Ecol progess Ser 316:285–310

Ready J, Kaschner K, South AB, Eastwood PD, Rees T, Rius J, Agbayani E, Kullander S, Froese R (2010) Predicting the distributions of marine organisms at the global scale. Ecol Modell 221:467–478

[2] i.e. presence/absence