

Bryde's whale (*Balaenoptera edeni/brydei*):

Summary of review of AquaMaps predictions for WCR undertaken by Kristin Kaschner
& Randall Reeves/Giuseppe Notarbartolo di Sciara, February 2012

Revision of AquaMaps predictions based on available regional data (KK)

Mean depth of sightings from line transect surveys in the northern Gulf of Mexico indicated that the species in this area seems to be very closely associated with the 200 m shelf break, staying mostly seaward of the shelf (Maze-Foley & Mullin 2006). This is similar to patterns found by Jefferson & Schiro (1997), who summarized available data for cetaceans in the same area. However, this close association was more difficult to detect in analysis of mean depth values of presence cells of this species throughout the whole study area (20 available occurrence records from OBIS in 12 cells), which also included some shallower as well as deeper waters along the coast of Venezuela (Notarbartolo di Sciara 1983, Romero et al. 2001, Acevedo Galindo 2007). Taking all available information into account, I adjusted the depth envelope to the values summarized in Table 1. I also modified the preferred lower temperature range based on the general consensus that the 20° C isotherm defines the lower boundary of this species' occurrence and set the upper preferred boundary based on the values obtained from OBIS sightings for the region. This species is known to enter estuarine waters associated with lower salinities along the coast of South America (Acevedo Galindo 2007) and I therefore adjusted the lower threshold of this parameter accordingly. Finally, unlike other rorquals, at least some Bryde's whales feed in tropical areas and seem to be strongly associated with areas of relatively high productivity, which I attempted to capture by revising the primary production envelope. Final input parameter settings can be seen in Table 1 and resulting gradient predictions, generated using the AquaMaps model (Kaschner et al. 2008), are shown in Figure 1. To show the most likely known and probable occurrence of the species in the WCR I applied a presence threshold of 0.6 as suggested by recent validation analyses (Kaschner et al. 2011) (Figure 2). It should be noted, however, that at least along the coast of Venezuela occurrence of this species varies with season, which cannot be captured by an annual model. Resulting maps of

predicted high probabilities match known species occurrence well, including along the Caribbean coast of Colombia (Ward et al. 2001). Isolated areas of highly suitable habitat along the coasts of Belize and Panama may represent false predicted presence and can probably be ignored. Also, predicted lower probabilities correspond to areas of less frequent occurrence west of Boca del Horno (Romero et al. 2001), around Lake Maracaibo, in the Dutch Leeward islands (Debrot et al. 2011), and along the northern Caribbean island chain as summarized in (Ward et al. 2001) and signify the potential occurrence of the species off Yucatan and in Campeche Bay where ‘finback’ whales (likely Bryde’s whales) were observed by 19th century whalers (Reeves et al. 2011).

Mapping parameters for *Balaenoptera edeni* (Bryde's whale)_7

FAOAreas: 21 | 27 | 31 | 34 | 41 | 47 | 51 | 57 | 61 | 67 | 71 | 77 | 81 | 87

Pelagic: False

| | | | | |
|----------------------|-----|-----------------|-----------------|------|
| Bounding Box (NSWE): | 90 | -90 | -180 | 180 |
| | Min | Pref Min (10th) | Pref Max (90th) | Max |
| Depth (m) | 0 | 100 | 1000 | 2000 |
| SST (°C) | 20 | 25 | 27 | 30 |
| Salinity (psu) | 0 | 30 | 35.5 | 38 |
| Primary Production | 0 | 700 | 5900 | 6000 |

Table 1: AquaMaps input parameter settings for revised map generation

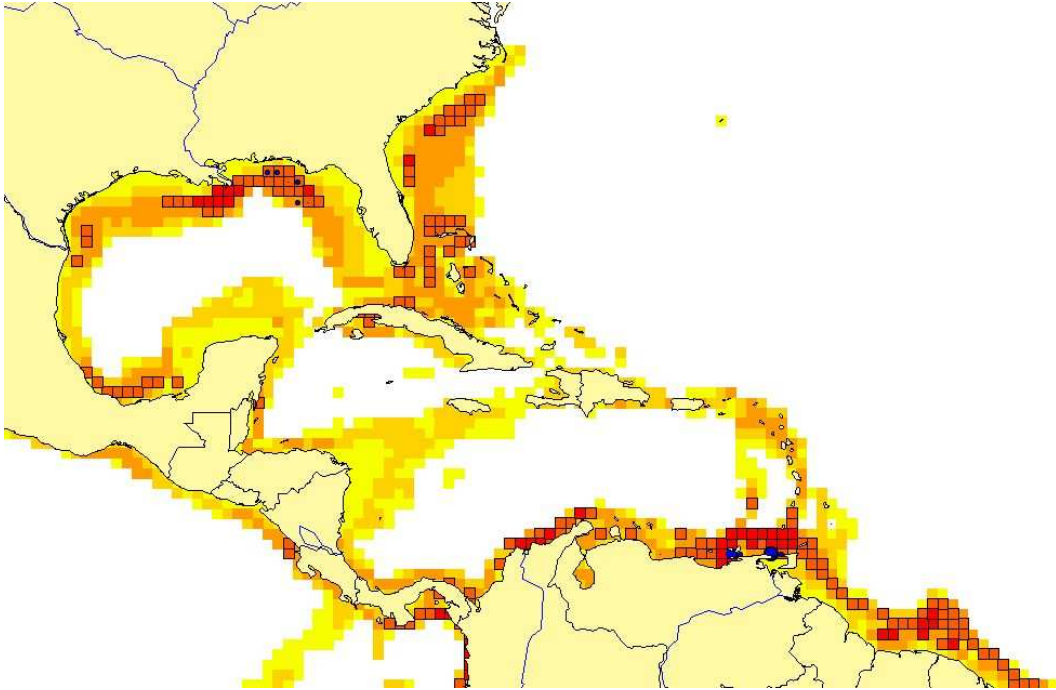


Fig 1. Predicted relative habitat suitability based on envelope settings in Table 1 and calculated relative encounter rates based on available sightings from OBIS (blue). Cells with probability values above the selected threshold are shown with boundaries. *Note that not all records of occurrence are available/accessible through online data repositories, such as OBIS (www.iobis.org), and records shown on the map do not necessarily represent the whole extent of documented species occurrence!

Review of outputs by independent experts (Randall Reeves & Giuseppe Notarbartolo di Sciara)

Given the lack of consistent reporting and the lack of systematic survey coverage in most of the region, it is difficult to interpret the fairly widespread records of occurrence in the form of occasional stranding, capture, or sighting events. The only two areas where Bryde's whales are known to occur consistently are the northeastern Gulf of Mexico and along the eastern coast of Venezuela. Regular occurrence in other areas is speculative. Although no strong seasonal signal has been reported for Bryde's whales in the Gulf, it is generally believed that their occurrence in the southern Caribbean off Venezuela is seasonal and it is thus inferred that the species is locally if not regionally migratory. For example, viewed from the perspective of his study area around Isla Margarita, it appeared to Notarbartolo di Sciara (1983) as though the whales moved offshore and eastward late in the year such that they were largely absent in January and February, then returned to coastal or inshore waters from March through August. Beginning in August and through the rest of the year, more whales were seen to the west north of Islas Caracas. In Notarbartolo di Sciara's opinion, the consensus map may put too much emphasis on occurrence east of Isla Margarita and northwards around the Grenadines as well as eastwards and southwards along the S American coast into Brazil. His recollection from surveys in Venezuela decades ago is that sightings of Bryde's whales dropped off east of Isla Margarita, and he does not recall seeing any in the waters north of Trinidad towards the Lesser Antilles.

The occurrence of Bryde's whales in Venezuela is strongly associated with high secondary production and particularly the presence of schooling fishes, mainly clupeids and engraulids (Notarbartolo di Sciara 1983; Silva-Schwarzberg et al. 2010).

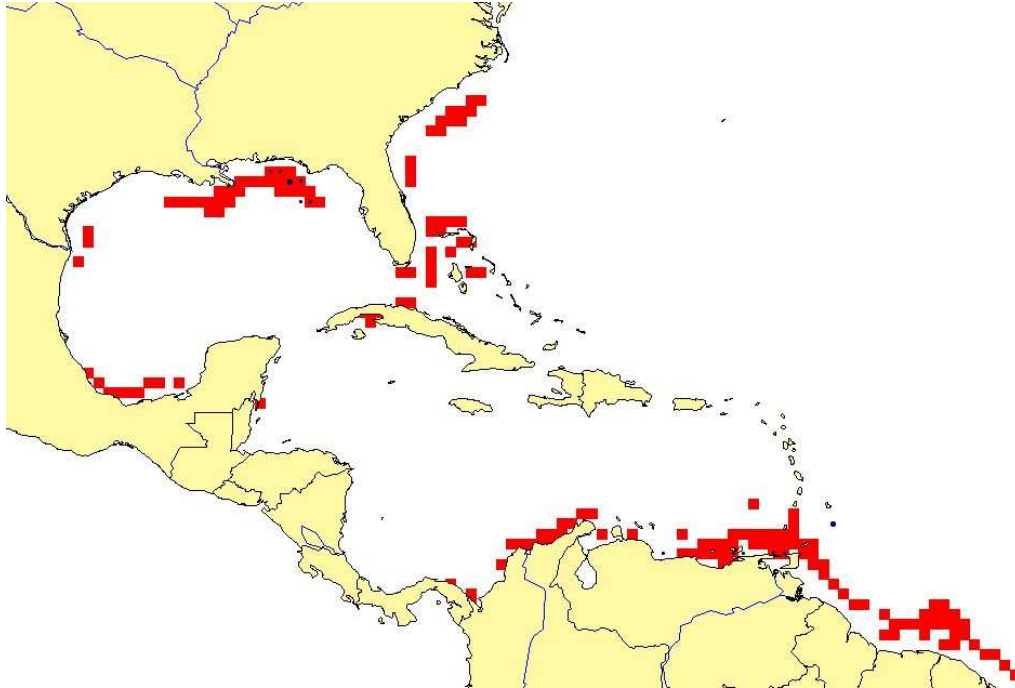


Fig 2. Consensus map of known and probable occurrence of species in WCR plus sightings available through OBIS shown in blue. *Note that not all records of occurrence are available/accessible through online data repositories, such as OBIS (www.iobis.org), and records shown on the map do not necessarily represent the whole extent of documented species occurrence.

Quality of outputs: ★★

References

- Acevedo Galindo R (2007) Potential geographical distribution of seven species of marine cetaceans reported in Venezuela, Southeast Caribbean (In English). *Acta Zoologica Sinica* 53:853 - 864
- Debrot AO, Witte RH, Scheidat M, Lucke K, Adolphe O. Debrot RHW, Meike Scheidat and, Lucke K (2011) A Proposal Towards a Dutch Caribbean Marine Mammal Sanctuary, IMARES Wageningen UR
- Jefferson TA, Schiro AJ (1997) Distribution of cetaceans in the offshore Gulf of Mexico. *Mammal Review* 27:27-50
- Kaschner K, Ready JS, Agbayani E, Rius J, Kesner-Reyes K, Eastwood PD, South AB, Kullander SO, Rees T, Close CH, Watson R, Pauly D, Froese R (2008) AquaMaps: Predicted range maps for aquatic species. World wide web electronic publication, www.aquamaps.org, Version 08/2010
- Kaschner K, Tittensor DP, Ready J, Gerrodette T, Worm B (2011) Current and future patterns of global marine mammal biodiversity. *Plos One* 6:e19653

- Maze-Foley K, Mullin KD (2006) Cetaceans of the oceanic northern Gulf of Mexico: Distributions, group sizes and interspecific associations. *Journal of Cetacean Research and Management* 8:203-213
- Notarbartolo di Sciara G (1983) Bryde's whales (*Balaenoptera edeni*, Anderson, 1878) off eastern Venezuela (Cetacea, Balaenopteridae), San Diego
- Reeves R, Lund J, Smith T, Josephson E (2011) Insights from whaling logbooks on whales, dolphins, and whaling in the Gulf of Mexico. *Gulf of Mexico Science* 29:41-67
- Romero A, Agudo AI, Green SM, Notarbartolo-di-Sciara G (2001) Cetaceans of Venezuela: Their distribution and conservation status. Report No. NMFS 151, National Oceanic and Atmospheric Administration (NOAA), National Marine Fisheries Service (NMFS), U.S. Department of Commerce, Seattle, Washington
- Silva-Schwarzberg, N., Oviedo Correa, L.E., Acevedo-Galindo, R. and Esteves, M.A. 2010. Critical areas of abundance & distribution of *Balaenoptera edeni* off the northeastern coast of Venezuela: implications for management and conservation. Poster presentation, European Cetacean Society biennial conference
- Ward N, Moscrop A, Carlson CA (2001) Elements for the development of a marine mammal action plan for the wider Caribbean: A review of marine mammal distribution First Meeting of the Contracting Parties (COP) to the Protocol Concerning Specially Protected Areas and Wildlife (SPA) in the Wider Caribbean Region. United Nations Environment Programme, Havana, Cuba, 24-25 September 2001, p 83