

Marine Mammals of the Northeastern Caribbean Windward Dutch Islands: Saba, St. Eustatius, St. Maarten, and the Saba Bank

ADOLPHE O. DEBROT¹, NICOLE ESTEBAN², TADZIO BERVOETS³, PAUL C. HOETJES⁴ AND MEIKE SCHEIDAT¹

¹IMARES, Wageningen University Research Center, P.O. Box 57, 1780 AB, Den Helder, The Netherlands.

²Dept. Bioscience, Swansea University, Singleton Park, Swansea, UK,

³Nature Foundation St Maarten, P.O. Box 863, Philipsburg, St. Maarten.

⁴Rijksdienst Caribisch Nederland, Kaya Internashonal z/n, P. O. Box 357, Kralendijk, Bonaire.

*Corresponding author email: dolfi.debrot@wur.nl

ABSTRACT-- At least 33 native species of marine mammals have been documented from the Wider Caribbean Region (WCR). For many of these species, the waters of the region serve as primary habitat for critical activities that include feeding, mating and calving. However, relatively little remains known about their biology, life history, distribution and behavior, particularly also around the windward Dutch islands (Saba, St. Eustatius and St. Maarten). In this study we compiled 84 marine mammal records for the waters of these islands, comprising 9 previously published records and 75 new records. A total of eight distinct species are documented, six of which are cetaceans. In comparison to the leeward Dutch islands (Aruba, Curaçao and Bonaire), documented strandings are few. Results suggest that whereas beaked whales and Bryde's whale are more common around the leeward Dutch islands, humpback whales are more common around the windward Dutch islands. This study concludes that more dedicated efforts are needed to better document and understand cetacean composition, seasonality and use of the both the windward and leeward Dutch Caribbean maritime territories. Such initiatives should help further clarify any potential regional differences as well the underlying causes thereof. Several nations, including the USA, the Dominican Republic and France, have established marine mammal sanctuaries in their Caribbean waters. Declaring the Dutch EEZ as a marine mammal sanctuary would be a valuable contribution to the conservation of marine mammals in the region.

KEYWORDS: Dutch Caribbean, Lesser Antilles, marine mammals, cetaceans.

The Dutch Caribbean maritime Exclusive Economic Zone (EEZ) as established on June 10, 2010, falls principally in the pelagic zone of the Venezuela Basin, and concerns two discontinuous areas, separated by a minimum of some 550 km. One is based around the southeastern Caribbean island group of Aruba, Bonaire and Curaçao, and amounts to some 70 thousand square kilometers of sea surface (13°11'42.81"N 69°10'51.99"W). The other is based around the northeastern Caribbean islands of Saba, St. Eustatius and St. Maarten, and amounts to a total sea surface of some 20 thousand square kilometers (17°22'54.56"N 63°30'17.95"W) (Figure 1).

While in the last twenty years several studies have been published providing basic descriptions of the marine mammal fauna of the southeastern Caribbean leeward Dutch waters (e.g. Debrot and Barros 1992, 1994; Agudo and Ponson 1996; Leduc et al. 1997; Debrot 1998; Debrot et al. 1998; Debrot 2000; Barros and

Debrot 2006; Debrot et al. 2006), practically no new information has been published about the marine mammals of the northeastern Caribbean windward Dutch waters, and no overview of available information has yet been made.

With the new constitutional changes that took place on 10 October, 2010, in the Dutch kingdom, Saba, St. Eustatius and Bonaire have integrated into the Netherlands proper as special overseas municipalities, while Curaçao and St. Maarten have become new autonomous overseas entities within the Kingdom of the Netherlands. The ultimate responsibility for the sustainable management and conservation of the marine biodiversity in the EEZ of Saba, St. Eustatius and Bonaire, as well as the territorial waters of these islands will come to lie with the Ministry Economic Affairs, Agriculture & Innovation of the Netherlands (EL&I). In preparation for this expanded responsibility, this ministry has been developing a management plan for the EEZ (Meesters et al. 2010).

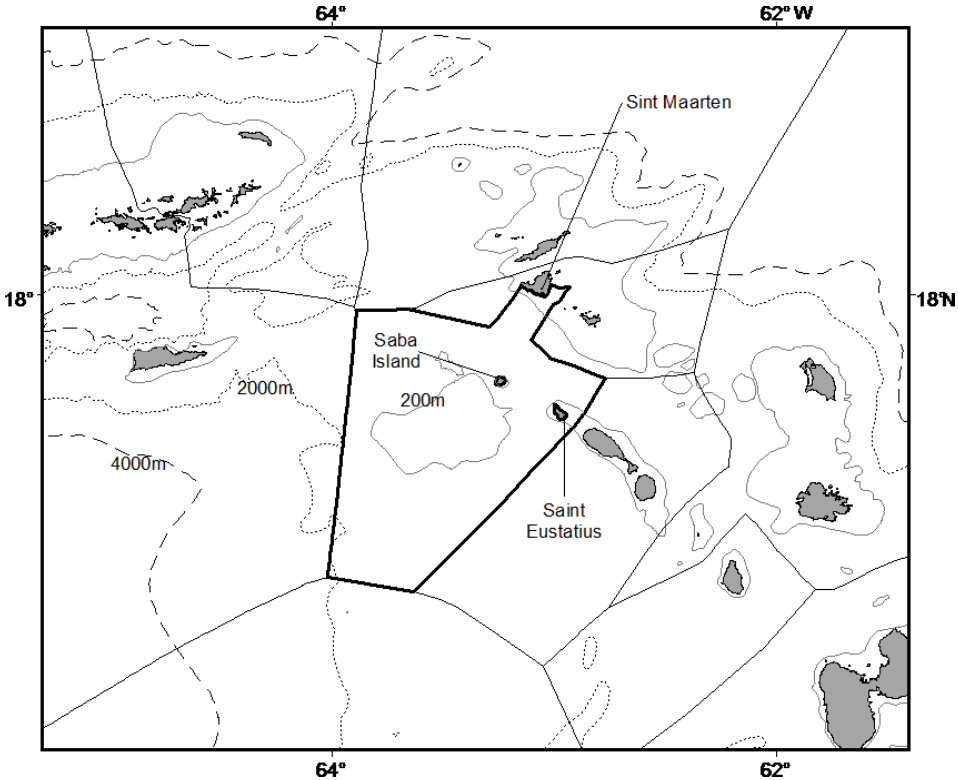


FIG 1. The Windward Dutch Caribbean islands and their EEZ around Saba Island, Saba Bank, St. Maarten and St. Eustatius, in the northeastern Caribbean Sea. (Source: VLIZ 2010).

One critical group in need of protection are marine mammals which form an integral and charismatic part of the marine ecosystem. At least 33 native species of marine mammals have been documented from the Wider Caribbean Region (WCR): namely six species of baleen whales, 24 species of toothed whales, one sirenian (the West Indian manatee), and two pinnipeds (the extinct Caribbean monk seal, and the vagrant hooded seal) (Mignucci-Giannoni 1998, Ward and Moscrop 1999, Ward et al. 2001).

For many of these species, the waters of the region serve as primary habitat for critical activities that include feeding, mating and calving. Of these, at least 16 species have been recently documented for the waters of the leeward Dutch Caribbean, including the West Indian manatee (Agudo and Ponson 1996, Debrot et al. 1998, Debrot et al. 2006). Although some species have been studied extensively elsewhere, data concerning the biology, life

history, distribution and behavior of most marine mammal populations in the Caribbean Sea remain sparse.

In this paper we assemble and assess both published and previously unpublished records of marine mammals for the northeastern Caribbean Dutch waters. We present a large number of unpublished sightings by reliable observers identifying distinctive species, as well as sightings reported but not identified with certainty. The paper provides a basic overview and preliminary synthesis of existing knowledge, as well as an indication of other key species to be expected based on research available for several bordering maritime territories.

RECORDS

We here provide an overview of 82 marine mammal records for the windward Dutch Caribbean, comprising 8 previously published

records and 74 new records (Table 1). While 58 records can be confirmed to species level, 26 remain unidentified. A total of 8 distinct species can be confirmed, one of which only to the family level.

FAMILY PINNIPEDIA

Pinnipedia sp.

Naturally occurring hooded seals (*Cystophora cristata*) have been confirmed nearby from Puerto Rico and St. John, USVI (Mignucci-Giannoni and Odell 2001, Mignucci-Giannoni and Haddow 2002). Recalling sightings of hooded seals two years earlier from nearby Guadeloupe, the sightings of pinnipeds around St. Maarten after hurricane Omar passed in October 2008 could well have concerned this species, according to N. Maslach of Réserve Naturelle. Nevertheless, during the same hurricane, four South American sea Lions, *Otaria byronia*, had escaped from the facilities of Marine World Ltd., St. Kitts. Three of these were eventually caught but one remained at large, such that both sightings of pinnipeds (2008 and 2010) could also have concerned the latter escaped species. No historical records exist for the extinct West Indian monk seal, *Monachus tropicalis*, in the windward Dutch islands (Debrot 2000).

FAMILY BALAENOPTERIDAE

Megaptera novaeangliae Lacepède

The most common records we report are for the humpback whale, which comprised almost half of all records. While according to our experience, dolphins appear to be the most prevalent species in the area (particularly *T. truncatus* and *T. longirostris*), the humpback's size, charisma, conspicuous behavior and song, and tendency to approach close to land, makes it much more noticeable and identifiable than dolphins.

This species demonstrates marked seasonality in the northeastern Caribbean (Mignucci-Giannoni 1998), and occurs principally between November and May. All our records regard the first two quarters of the year. Mignucci-Giannoni (1998) concludes that the humpback whales of the adjacent Virgin Islands waters are largely transients based on the short maximum periods between resightings. While the breeding and calving grounds to the east of the windward Dutch waters are well established, sightings of mother and calf pairs on the Saba Bank, as well as the presence of relatively warm shallow bank habitat means that further research will be needed to determine whether parts of this expansive shallow area may still serve as calving grounds to the recovering population of western Atlantic humpbacks. Most recovery of the Western Atlantic humpback population has been seen for the subpopulation wintering in the northeastern greater Antilles, while the recovery for those wintering in the eastern Caribbean lags (Swartz et al. 2003).

FAMILY PHYSETERIDAE

Physeter macrocephalus Linnaeus

Five records were compiled for the sperm whale. Sperm whales are relatively common both to the west (Mignucci-Giannoni 1998) and east (Yoshida 2010) of the windward Dutch Caribbean. They are largely restricted to deeper waters where they prey on deep-sea squid. Results by Gero et al. (2007) suggest that populations in the eastern Caribbean are relatively small and isolated. In the northeastern Caribbean they are strongly seasonal and are rarely seen from April through September (Mignucci-Giannoni 1998). According to Mignucci-Giannoni (1998), most sightings of this species occur on the leeward side of islands. However, this may say more about the distribution of observers than of the whales themselves. For the windward Dutch Caribbean, all five sightings recorded are for the first quarter of the year.

TABLE 1. Overview of documented marine mammal records for the Windward Dutch Caribbean (Saba, Saba Bank, St. Eustatius and St. Maarten).

Date	Location	Group size	Source/Reported by:	Comments
Family Pinnipedia				
<i>Unidentified pinniped</i>				
21-Oct-08	St. Maarten, Simpson Bay	several	P. Noach, N. Maslach	several sightings, escaped sea lions?
12-Jun-10	St. Maarten, Simpson Bay	1	T. Bervoets	hotel security video
Family Sirenia				
<i>Trichechus manatus</i>				
1987-88	St. Maarten, Simpson Bay	1	Debrot et al. 2006/R. Cijntje	
Family Delphinidae				
<i>Globicephalus macrorhynchus</i>				
31-Mar-02	Saba	8	J. Magor, L. Costenaro	
25-Nov-03	St. Martin	36	Anonymous 2003a,b, P. Ellinger	stranding
30-May-04	St. Maarten	1	Anonymous, 2004, A. Caballero	stranding
<i>Stenella longirostris</i>				
19-May-09	St. Eustatius, Jenkins Bay	15-20	T. Bervoets, C. Kull, N. Spanner	5 identification photos
3-Jun-09	St. Eustatius, Tumbledown Dick	?	T. Bervoets	
<i>Tursiops truncatus</i>				
Apr-May 96	Saba Bank	?	Postma and Nijkamp 1996	
21-Jun-03	St. Eustatius (Southeast)	between 8-10	N. Esteban	
11-Feb-05	Saba	7	J. Magor, L. Costenaro	
2006-2008	Saba Bank	several	W. Toller, S Lundvall 2008	several sightings
5-Apr-10	St. Maarten, Molly Beday	?	T. Bervoets	
25-Oct-07	Saba Bank	?	M. Kilgour and T. Shirley	
10-Aug-08	Saba, Fort Bay	several	Sea Saba	

Date	Location	Group size	Source/Reported by:	Comments
<i>Unidentified dolphin</i>				
19-Feb-72	St. Martin	2	Tarusky and Winn 1976	
Apr-May 1996	Saba Bank	?	Postma and Nijkamp 1996	<i>Pseudorca crassidens?</i>
Apr-May 96	Saba Bank	?	Postma and Nijkamp 1996	<i>S. clymene?</i>
16-Mar-03	Saba	40	J. Magor, L. Costenaro	
27-Dec-03	Saba	18	J. Magor, L. Costenaro	
6-Mar-05	Saba, Windward Side	2	J. Magor, L. Costenaro	
20-25 Mar 06	Saba Bank	1	IFWA 2006	
10-Jun-06	Saba, Twilight Zone	3	J. Magor, L. Costenaro	
14-Aug-06	Saba, Green Island	35	J. Magor, L. Costenaro	
24-Mar-07	Saba, Tent Reef	30	J. Magor, L. Costenaro	
31-Jul-07	Saba, Tent Reef	12	J. Magor, L. Costenaro	
10-Sep-07	Saba, Diamond Rock	?	J. Magor and L. Costenaro	
8-Jul	St. Eustatius (South)	15-20	L. Munson, K. McClellan	<i>Delphinus?</i>
29-Aug-08	Saba, Greer Gut	8	J. Magor and L. Costenaro	
June-July 2009	St. Eustatius (North)	5	C. Kull, N. Spanner, M. Herriot	
30-Aug-10	St. Eustatius (Southeast)	several	W. de Gannes	
31-Aug-10	St. Eustatius (Southeast)	several	W. de Gannes	
7-Jul-10	Saba (North)	40-50	D. Kirkby	
28-Jul-10	Saba (North)	about 15	D. Kirkby	

Date	Location	Group size	Source/Reported by:	Comments
Continued Family Delphinidae				
<i>Unidentified dolphin</i>				
1-Feb-10	Saba, Ladder Bay	several	J. Magor, L. Costenaro	
14-Mar-10	Saba, Green Island	12	J. Magor, L. Costenaro	
1-May-10	St. Eustatius	?	T. Bervoets	<i>Delphinus?</i>
9-May-10	St. Eustatius	?	T. Bervoets	<i>Delphinus?</i>
Family Physeteridae				
<i>Physeter macrocephalus</i>				
Jan-Mar 1995	St. Martin	?	Roden and Mullin 2000	
Jan-Mar 1995	Saba Bank (West)	?	Roden and Mullin 2000	
20-25 Mar 2006	Saba Bank	5	IFWA 2006	photos for 5 animals
20-25 Mar 2006	Saba Bank	5	IFWA 2006	
27-Feb-07	Saba (North)	1	J. and H. Bijl	photo
Family Ziphiidae				
<i>Ziphius cavirostris</i>				
25-Jun-66	St. Maarten	1	Bree et al. 1973	stranding, male
Unidentified beaked whale				
Apr-May 1996	Saba Bank	?	Postma and Nijkamp 1996	<i>Mesoplodon</i> sp.?
Family Balaenopteridae				
<i>Megaptera novaeangliae</i>				
?	St. Eustatius	?	Mignucci-Giannoni 1989	
?	St. Maarten	?	Mignucci-Giannoni 1989	
25-Feb-95	Saba Bank	?	Roden and Mullin 2000; - Stevick et al. 1999	

Date	Location	Group size	Source/Reported by:	Comments
Continued Family Balaenopteridae				
<i>Megaptera novaeangliae</i>				
27-Mar-02	Saba	4	J. Magor, L. Costenaro	
6-Mar-03	Saba	?	J. Magor, L. Costenaro	song
6-Mar-03	St. Eustatius, Anchor Pt.	2	Golden Rock Divers	
24-Jan-04	St. Eustatius - Zeelandia Bay	3	N. Esteban	breaching, moving north
27-Mar-04	Saba	?	J. Magor, L. Costenaro	song
4-Mar-05	Saba, Fort Bay	several	J. Magor, L. Costenaro	breaching
10-Jan-06	Saba Bank	3	J. Magor, L. Costenaro	breaching, plus calf
1-Oct-06	Saba Bank	2	P. Hoetjes, Lundvall 2008	female with calf
28-Jan-06	Saba	?	Sea Saba	song
6-Mar-06	Saba (North)	1	J. and H. Bijl	video
18-Mar-06	Saba, Twilight Zone	?	Sea Saba	breaching
20-25 Mar 2006	Saba Bank	1	IFWA 2006	
1-Apr-06	Saba, Fort Bay	2	J. Magor, L. Costenaro	breaching
30-Mar-07	Saba, Ladder Labyrinth	?	J. Magor, L. Costenaro	song
16-Apr-07	Saba, Green Island	?	J. Magor, L. Costenaro	
20-Apr-07	St. Eustatius, Zeelandia Bay	4	N. Esteban	breaching, moving north
12-May-07	St. Eustatius, Oranje Bay	1	N. Esteban	breaching
11-Jun-07	St. Eustatius, Tumbledown Dick	1	N. Esteban (T. Keogh)	at tankers at berth for 4- 5 days
13-Jan-08	Saba	?	J. Magor, L. Costenaro	song

Date	Location	Group size	Source/Reported by:	Comments
Continued Family Balaenopteridae				
<i>Megaptera novaeangliae</i>				
23-Jan-08	Saba, Green Island	1	J. Magor, L. Costenaro	
2-Mar-08	Saba, Tent Reef	2	J. Magor, L. Costenaro	
26-Apr-08	Saba, Ladder Labyrinth	1	J. Magor, L. Costenaro	
9-Mar	Saba	?	J. Magor, L. Costenaro	song
2-Apr-09	Saba, Tedran Wall	1	J. Magor, L. Costenaro	breaching
13-Feb-10	St. Eustatius, Zeelandia Bay	3	N. Esteban	heading north
12-Feb-10	Saba, Cove Bay	1	J. Magor, L. Costenaro	breachin
16-Mar-10	Saba Bank	1	J. Magor, L. Costenaro	
1-Apr-10	St. Eustatius, north	1	T. Bervoets	breaching
3-Apr-10	St. Eustatius, Zeelandia Bay	2	N. Esteban	breaching, moving north
4-Apr-10	Saba (North)	2+	J. and H. Bijl	photos
6-Apr-10	St. Eustatius, Zeelandia Bay	3	N. Esteban	breaching, moving north
24-Apr-10	St. Eustatius, Zeelandia Bay	3	N. Esteban	breaching, moving north
1-May-10	St. Eustatius, Zeelandia Bay	2	N. Esteban, T. Keogh	breaching

FAMILY ZIPHIIDAE

Ziphius cavirostris Cuvier

This species is listed based on one published stranding record. Strandings and sightings for Cuvier's beaked whale in adjacent U.S. waters to the west are relatively common (Mignucci-Giannoni (1998), but sightings are also known for areas to the east (Boisseau et al. 2006).

Around Puerto Rico and the Virgin Islands the species ranks high in terms of strandings and most occurrences for the species are for winter and spring (Mignucci-Giannoni 1998).

One sighting recorded for the Saba Bank likely concerned an unidentified beaked whale, possibly either *Ziphius* or *Mesoplodon*.

FAMILY DELPHINIDAE

Globicephala macrorhynchus Gray

The short-finned pilot whale is confirmed for the windward Dutch Caribbean based on three records. It has been reported numerous times from sightings for areas both to the west and east to Guadeloupe (Boisseau 2006), as well as the nearby Anegada Passage (Mignucci-Giannoni 1998), Anguilla and Antigua (Mignucci-Giannoni 1996). Therefore, its occurrence in the Windward Dutch Caribbean is not surprising.

Stenella longirostris (Gray)

Two records are provided for the long-snouted spinner dolphin. The most nearby sightings of this species concern the area just west of the Windward Dutch Caribbean, east of St. Croix (Mignucci-Giannoni 1998).

Tursiops truncatus (Montagu)

Seven sightings are recorded for the bottlenose dolphin. The bottlenose dolphin generally shows preference for shelf waters, and is the most commonly sighted delphinid in Puerto Rico and the Virgin Islands (Mignucci-Giannoni 1998). It is also commonly sighted eastwards to Guadeloupe and beyond (Boisseau et al. 2006; Yoshida et al. 2010). Its occurrence in the Windward Dutch Caribbean is not unexpected or unusual.

UNIDENTIFIED DELPHINIDS

Our observations indicate that delphinids are present year-round in the Windward Dutch Caribbean, but that most records so far are for the second and third quarters of the year. Documented records for dolphins are particularly low for the five-month period spanning September through January which represented less than 10% of all 33 pooled (dolphin records (identified plus unidentified dolphins). This may be weather-related as the peak surfing season with highest wave action is October through

March, due to winter storm swells rolling in from the east coast of North America. While most of the unidentified delphinid sightings are likely to concern *T. truncatus* and *S. longirostris*, other species are also likely present. Some of the unidentified dolphin sightings might even have involved the long-beaked common dolphin, *Delphinus capensis*, but this is unlikely. Recent surveys nearby in the windward Caribbean islands have failed to produce any confirmed sightings for this species (Boisseau et al. 2006, Gero and Whitehead 2006). In addition, in their recent review Jefferson et al. (2009) rejected most previous records for this species in the Caribbean and found that confirmed Caribbean records for this species appear to be virtually restricted to waters off central-eastern Venezuela.

FAMILY TRICHECHIDAE

Trichechus manatus manatus L.

We list one reliable recent record for the West Indian manatee in the Dutch Caribbean windward islands. The species formerly occurred in the lesser Antilles with a concentration around Guadeloupe (Richard 2001). Today the species is highly threatened in the region, having practically disappeared throughout the lesser Antilles, except on the coastal swamps of Caroni, Trinidad, close to the mainland of South America (Venezuela). The nearest remnant population hanging on in the Greater Antilles, is centered around Puerto Rico (USFWS 2007). The Puerto Rico manatee population is considered a separate stock of the West Indian subspecies, and is either stable or possibly increasing. While transient animals are occasionally reported for the Lesser Antilles, only one 1988 record is known directly east from Puerto Rico, from the nearby St. Thomas, U.S.V.I. (USFWS 2007). The only recently suitable habitat for this species in the Windward Dutch Caribbean is the Simpson Bay Lagoon of St. Maarten, where the last sighting was also recorded in the late 1980s (Debrot et al. 2006).

DISCUSSION AND CONCLUSIONS

The marine mammal fauna for several nearby maritime areas (e.g. U.S.A. and France) are better known than the Dutch Caribbean and provide an indication of additional species to be expected. For areas to the west, namely the Virgin Islands and Puerto Rico, Mignucci-Giannoni (1998) reports the occurrence of 17 species/taxa of cetaceans, of which six are now reliably documented for the Windward Dutch Caribbean. All these species we here report are also well known from the lesser Antilles to the east and southeast, spanning roughly from Guadeloupe to Trinidad (Boisseau et al. 2006; Yoshida et al. 2001).

Based on Mignucci-Giannoni (1998), other species to be on the lookout for include the largely off-shore Risso's dolphin (*Grampus griseus*), the killer whale (*Orcinus orca*), as well as deep-water species such as rough-toothed dolphin (*Steno bredanensis*), and pigmy sperm whale, *Kogia breviceps*, all of which have also been documented to the east, from Guadeloupe and beyond towards Trinidad (Boisseau et al. 2006, Yoshida et al. 2010). Another likely species is the Atlantic spotted dolphin *Stenella frontalis*, which is relatively common in shallow shelf areas of Puerto Rico and the Virgin Islands and for which Roden and Mullin (2000) document several records to the immediate north and east of the Windward Dutch Caribbean waters.

Additionally, common minke whale, *Balaenoptera acutorostrata*, have been recorded several times nearby on the Anguilla Bank, and several records exist for large *Balaenoptera* for areas near St. Croix, directly west of the Windward Dutch Caribbean waters (Mignucci-Giannoni 1998). These latter likely regard either the sei whale, *B. borealis*, or fin whale, *B. physalus* (Mignucci-Giannoni 1998).

Species which may also occur but would most likely be rare are *Stenella clymene*, recorded to the south east off St. Vincent and St. Lucia, but very rare in the Caribbean (Jefferson and Curry 2003), *S. coeruleoalba*, only reported once for the immediate surrounding areas (west of St. Croix) (Mignucci-Giannoni 1998) and *Balaenoptera edeni* which appears to be

principally a southern Caribbean species (e.g. Watkins et al. 1979; Notarbartolo di Sciarra 1983; Romero et al. 2001). Watkins et al. (1994) document Fraser's dolphins (*Lagenodelphis hosei*) for as nearby as Dominica. However, this species is quite rare and has not yet been reported near the Virgin Islands. Recent surveys of the eastern Caribbean further indicate the pan-tropical spotted dolphin (*Stenella attenuata*) as a common and widespread species from Guadeloupe down to Trinidad (Boisseau et al. 2006).

The review of cetaceans for the adjoining Venezuelan waters towards the south, only provides a single record of the humpback whale in the vicinity of the windward Dutch EEZ (Aves Island, Venezuela), as almost all Venezuelan cetacean records are located in the far southeastern Caribbean, near mainland Venezuela (Acevedo et al. 2007, Romero et al. 2001).

Based on what is known for the leeward Dutch EEZ, some basic faunal differences between the windward and leeward EEZ sectors appear eminent. Briefly, the most important contrasts appear to be a remarkably higher abundance of beaked whales and Bryde's whale around the leeward Dutch islands (Debrot et al. 1998) than around the windward Dutch islands, and a much higher abundance of humpback whales around the windward Dutch islands (this paper) than around the leeward Dutch islands.

While the Bryde's whale (*B. edeni*) is well known from the Leeward Dutch EEZ (Debrot et al. 1998) and the southeastern Caribbean in general (e.g. Mignucci-Giannoni 1998, Romero et al. 2001), it appears much less common in the northeastern Caribbean and therefore also in the windward Dutch EEZ. Romero et al. (2001) describe this species as principally occurring in the southern Caribbean. The present combined knowledge for the two contrasting sectors of the Dutch EEZ confirm their view.

The apparent rarity of *B. edeni* in the northeastern Caribbean (Mignucci-Giannoni 1996) as opposed to several reported sightings of the minke whale, *B. acutorostrata*, for that zone give cause to suspect that the most common

rorqual whale for the Windward Dutch Caribbean will be *B. acutorostrata*. Nevertheless, Bryde's whales are actually the most common baleen whales throughout much of the tropics and it cannot yet not be ruled out that Bryde's whales might have been mistaken for minke whales. This emphasizes the importance of using well-trained and experienced observers and the value of obtaining good quality photographic material to validate identifications of species.

Based on several crossings from the leeward to the windward Dutch islands, Poppe (1974) further suggests that the southern part of the Venezuela Basin has higher densities of cetaceans than the northern half. This would correlate with the higher density and species richness of seabirds observed in the southern half of the Venezuela Basin (north of the ABC islands) (Poppe 1974) and might be expected based either on the higher productivity caused by the seasonal upwelling phenomenon of the southern Caribbean (Sturm 1991). This idea would need further corroboration based on committed quantitative survey effort before being confirmed.

Curiously, only three records in the windward Dutch islands concerned strandings. This is an important contrast to the Leeward Dutch Caribbean where strandings form a much larger contribution to the available marine mammal records (Debrot et al. 1998). This might be ascribed to the general inaccessibility of the coastlines in the windward Dutch islands and therefore an inherently lower likelihood of detection of any strandings. Another possibility may be a difference in faunally-related mortality rates, either due to natural or anthropogenic causes.

Therefore, as a small contribution towards better management and conservation of Caribbean cetaceans, this study concludes that more dedicated efforts are needed to better document and understand cetacean composition, seasonality and use of the both the windward and leeward Dutch Caribbean maritime territories. Such initiatives should help further clarify any potential regional differences and contrasts in species densities and distributions as well the

underlying causes thereof.

While whale watching in the Caribbean has grown in recent years to an important new 10+ million dollar a year industry, the humpback and other whales remain hunted on artisanal scale in the eastern Caribbean. This activity is based in St. Vincent and the Grenadines which have a IWC regulated quota for 20 humpback whales for the period 2002-2007. While as of 2010, Dominica has decided to abandon its formerly pro-whaling stance, four other eastern Caribbean nations continue to vote pro-whaling in the IWC, in support of Japan. As a consequence, the future of whaling remains contended and the protection of the severely depleted humpback stocks of the eastern Caribbean remains ever so critical. A recent survey in the waters of St. Maarten based on opportunistic sightings by boaters, produced twenty-five cetacean sightings during a three-month winter observation period of which seventeen concerned the humpback whales (NFSM 2011). Humpback mother-calf pairs were particularly common and the overall results suggest that whales and dolphins may be sufficiently abundant in St. Maarten to offer directed whale watching to tourists.

The results of our study show that marine mammals, particularly the endangered and targeted humpback whale make notably regular and consistent use of the windward Dutch EEZ. While absolute densities remain unknown and are difficult to extrapolate to the whole area of approximately 20 thousand square kilometers, the regionally high frequency of humpback sightings may make the area meaningful to marine mammals, in its own merits.

To effectively protect whales, protection of their habitat is also essential. To this end, several nearby nations have already established marine mammal sanctuaries in their Caribbean waters. These are the Dominican Republic and France. Their sanctuaries are located in the northeastern Caribbean in relatively close proximity to the Windward Dutch Caribbean. In addition, in U.S. Caribbean waters surrounding Puerto Rico and the Virgin Islands, marine mammals are protected under the U.S. Marine Mammal Protection Act. The concepts of habitat size

and connectivity are critical to conservation ecology and signify that purely on these criteria alone, the designation of the Dutch EEZ as a marine mammal sanctuary can help bolster these other related conservation initiatives. These considerations, along with the evident current value and future potential value of the windward Dutch EEZ for cetaceans, argue for the Netherlands to join the larger international cetacean conservation initiatives and declare the Dutch EEZ as a marine mammal sanctuary.

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