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ABSTRACT

Research was conducted in the Eastern Caribbean by the International Fund for Animal Welfare during the spring in 1995, 1996, 2000 and 2006, primarily to investigate the biology, distribution and movements of sperm and humpback whales. During dedicated passive acoustic and visual surveys, observations and acoustic detections of small cetaceans were also recorded. Thirteen different species of small cetacean were encountered. The most commonly sighted and widely distributed species was the pan-tropical spotted dolphin (*Stenella attenuata*). Other oceanic dolphin species such as long-beaked spinner dolphins (*Stenella longirostris*) and deep diving odontocetes such as the short-finned pilot whale (*Globicephala macrorhynchus*) and Cuvier's beaked whale (*Ziphius cavirostris*) were also encountered on several occasions. Mixed species groups, for example of melon-headed whales (*Peponocephala electra*) and Fraser's dolphins (*Lagenodelphis hosei*) were occasionally observed. Little is known about the presence, distribution and abundance of small cetaceans within the region; Given the long history of exploitation of some near-shore populations (and reported declining catches in the 1970's) and, in the absence of survey data for much of the region, there is much uncertainty regarding population structure, abundance and status of small cetacean species.

KEYWORDS: SMALL CETACEAN; EASTERN CARIBBEAN; SURVEYS; OBSERVATIONS; STATUS

INTRODUCTION

The distribution, abundance and population structure of cetaceans of the south-eastern Caribbean are poorly known. Since the 1990's some systematic efforts to describe the cetacean fauna have been undertaken (for example, Romero and Hayford 2000 and Romero *et al.* 2002b for Grenada, and Romero *et al.* 2002a for Trinidad and Tobago). Some insights into presence and distribution may also be obtained from information on hunting of small cetaceans in the region (see for example, Caldwell and Caldwell 1975; Price, 1985; Romero and Creswell 2005).

Here, data on sightings and acoustic detections of small cetaceans, collected during boat-based visual and acoustic surveys conducted by the International Fund for Animal Welfare (IFAW) in the eastern Caribbean are outlined. Information from research conducted in the spring of years 1995, 1996, 2000 and 2006, including dedicated surveys and opportunistic observations, are described. Visual and passive acoustic surveys for cetaceans were conducted off the islands of Dominica, Martinique, Guadeloupe, Grenada, Trinidad and Tobago. Opportunistic observations of small cetacean species were recorded during research primarily aimed at investigating the biology, distribution and movements of sperm and humpback whales. Data on large whales have been reported elsewhere (e.g. see Gordon *et al*. 1998, Stevick *et al*. 1999, Boisseau *et al*. 2000).

METHODS

Surveys were conducted from three different vessels, *Song of the Whale I*, *Silurian*, and *Song of the Whale II* (table 1). These are all small auxiliary-powered sailing research vessels ranging in length from 14m (Song of the Whale I) to 22m (Song of the Whale II). All vessels had an elevated viewing platform at a height of 12m on the mast and passive acoustic monitoring equipment including two-element towed hydrophone arrays. Although all the hydrophone arrays were built to the same basic design, there were differences in the technical specification of the pre-amplifiers and onboard data processing systems.

In 1995, 1996 and 2000, track-lines were chosen with the aim of providing roughly even coverage of the survey area and not based on prior knowledge of cetacean presence. In addition, some of the data

reported is from passages e.g. off Martinique in 2000. Off Dominica, Grenada, Guadeloupe, research was conducted off the western coasts in the lee of the islands, from just beyond the 100m depth contour to 5-15 miles offshore. In 2000, surveys were conducted off the west coast of Tobago. In 2006, three survey blocks to the east and west of Trinidad and to the north (encompassing the waters around Tobago) were surveyed; survey tracks were laid out to provide even coverage of these pre-determined survey boxes, although taking prevailing weather conditions into account. In addition, a survey of the Saba Bank was conducted in 2006, to the west of the Dutch Antillean Island of Saba.

At all times, the computer programme 'Logger' was used for routine data collection (see www.ifaw.org/sotw). This software automatically collects data from the GPS and other instruments and also prompts for information on environmental conductions, weather, sightings effort and activity. Dedicated observers were stationed either on the deck or observation platform in sea states of 4 or less. The towed hydrophone was monitored for 1 or 2 minutes every 15 minutes and codes describing the type and level category of cetacean vocalisations heard were recorded in the database. For the purposes of this analysis, acoustic listening stations were divided into just two categories, odontocetes detected (clicks or whistles but excluding sperm whales) or no odontocetes detected.

Each year, the research teams comprised a mixture of IFAW researchers and local participants (including local scientists and student interns from the Wider Caribbean Region (WCR) and University of the West Indies). Less experienced team members were provided with training in recognising cetacean vocalisations and in estimating ranges and bearings to visual sightings.

RESULTS

Species sighted

The observation effort in terms of hours of survey for the waters off each island is listed in table 1. Thirteen species of small cetacean were encountered from the surveys conducted off Dominica, Martinique, Guadeloupe, Grenada and Trinidad and Tobago, (table 2). The islands of Dominica and Grenada showed the highest diversity of species, (but this may also reflect level of survey effort). Given the level of effort, Trinidad and Tobago seemed to have a relatively low diversity of species, but this may be biased/affected by the poor visual survey conditions experienced during field work off Trinidad and Tobago in both 2000 and 2006. Group sizes ranged from lone individuals to groups of up to 200 individual dolphins and 50 pilot whales. Calves and juveniles were observed for the following species; bottlenose dolphin (*Tursiops truncatus*), false killer whale (*Pseudorca crassidens*), Fraser's *dolphin*, killer whale (*Orcinus orca*), pilot whale, pygmy sperm whale (*Kogia breviceps*), spinner dolphin and spotted dolphin.

Sightings rates

Sightings rates by hour of survey effort appeared to be highest off Martinique, followed by Dominica, Grenada and Guadeloupe (table 3; figure 1). Pan-tropical spotted dolphins were the most commonly encountered species in all areas except off Trinidad, where bottlenose dolphins were encountered more frequently (table 2). The sighting rates in table 2 have not been adjusted to take into account weather conditions.

Acoustic detections

Acoustic detection rates for small cetaceans were calculated for each island using the number of listening posts at which clicks, whistles or burst-pulse sounds were heard (excluding sperm whales). To minimise the biases presented by repeated detections of the same individuals (e.g. bowriding dolphins), consecutive detections were excluded from analysis. A detection was only included if an odontocete had not been heard for at least 45 minutes.

The distribution of acoustic detections of odontocetes (excluding sperm whales) off Dominica, Grenada and Trinidad and Tobago are illustrated in figure 2. Dolphin vocalisations were heard at 8.4% of all acoustic stations. As with visual encounters, the highest acoustic encounter rate was off Martinique, followed by Dominica, Guadeloupe and Grenada. When comparing acoustic and visual detection rates, acoustic detection rates are invariably higher (figure 1). However, visual and acoustic encounter rates followed similar patterns for each different island. Trinidad and Saba had lower ratios of visual sightings to acoustic detections, perhaps reflecting prevailing weather conditions less favourable to visual sightings. The plots of acoustic detections and listening stations in figure 2 for the islands with

pre-determined tracks (Guadeloupe, Dominica, Grenada and Trinidad and Tobago) showed a fairly even distribution of small cetaceans with no obvious concentrations.

DISCUSSION

Annex II of the SPAW Protocol (the UNEP Specially Protected Areas and Wildlife (SPAW) Protocol[1], born out of the Convention for the Protection and Development of the Marine Environment for the Wider Caribbean Region (Cartagena Convention), which came into force in 2000, lists all species of marine mammals of the WCR as threatened and endangered. Long-term objectives include to better protect, and assist with the recovery of, marine mammal species and populations, and protect their habitats (e.g., feeding, breeding, and calving grounds, movement corridors etc.) However, as noted in the recently drafted UNEP Marine Mammal Action Plan for the WCR[2], better information is required in order to assess the status of small cetaceans within the region and to develop effective regionally and nationally specific conservation measures.

Reeves (2005) notes that 'the subject of population structure of odontocetes within the WCR has hardly begun to be addressed, but judging by findings elsewhere, considerable structure is likely present (e.g., island-associated near-shore populations and farther-ranging offshore populations). Given the long history of exploitation of some near-shore species in some parts of the WCR (e.g. Caldwell and Caldwell 1975; Price 1985; Reeves 2002), this could mean that a number of populations have already been substantially depleted or even entirely eliminated. In the absence of even rudimentary survey data for most of the region (except U.S. waters of the northern Gulf of Mexico), uncertainty concerning population structure, abundance, and conservation status is the norm'.

The surveys described here can only provide a 'snap shot' view of the presence and distribution of small cetaceans, during the months January-March, off certain islands in the eastern and southeastern Caribbean. Due to their limited spatial and temporal scope, they are unable to provide insights into the seasonal distributions/movements of species or changes or trends in abundance. However, the observations presented here may complement and build upon the experiences of other research efforts and local whale watching operators who are now starting to assemble a considerable body of information about whales and dolphins in the Eastern Caribbean. This may in the future, form the basis of a long-term year round database of sightings in certain areas, which could usefully inform conservation measures. For many areas in this region visual surveys are limited by the prevailing wind conditions, which make observation difficult. Thus, much of the research effort in this study was limited to areas of relatively sheltered water. Acoustic surveys are potentially less affected by sea state than visual observations. Gordon *et al*. (2000) used similar acoustic data to examine relative abundance and distribution patterns of striped dolphins in the Ligurian Sea using a number of covariates to model detection probability in relation to sea state, wind speed and time of day. However, further work in the Caribbean region would be necessary to develop methods to discriminate small cetacean species acoustically.

[1] Annex II of the SPAW Protocol lists all species of marine mammals of the Wider Caribbean as threatened and endangered. In this context, governments have agreed on the need to develop a regional management plan for the conservation of marine mammals, through Decisions IV (2) and 2 of the First and Second Meetings of the Contracting Parties of the SPAW Protocol (Havana, Cuba, 27-29 September 2001 and Montego Bay, Jamaica, 6 May 2002, respectively); Articles 11 and 21 of the SPAW Protocol call for the development and implementation of programmes for protected species, as well as guidelines and criteria for the management of protected species, including migratory species.

[2] Draft Action Plan for Conservation of Marine Mammals in the Wider Caribbean Region. UNEP(DEC)/CAR WG.27/2 Rev 3. 23 August 2005. *Presented to Regional Workshop of Experts on the Development of the Marine Mammal Action Plan for the Wider Caribbean Region, Bridgetown, Barbados, 18-21 July 2005 and Third Meeting of the Scientific and Technical Advisory Committee (STAC) to the Protocol Concerning Specially Protected Areas and Wildlife (SPAW) in the Wider Caribbean Region, Caracas, Venezuela, 4 - 8 October, 2005.*

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'*Silurian*' undertook research with permission from the DIRENS in Guadeloupe and Martinique, the Ministry of Agriculture, Dominica and the Ministry of Agriculture, Grenada and the Ministry of Fisheries in Trinidad and Tobago in 2000.

REFERENCES

Boisseau, O., Carlson, C and Seipt, I. 2000. A report on cetacean research conducted by the International Fund for Animal Welfare off Guadeloupe, Dominica, Martinique, Grenada and Tobago from 12 January to 30 March 2000. *Unpublished report, IFAW*, 411 Main St Yarmouth Port, MA, USA.

Caldwell, D.K. and Caldwell, M.C. 1975. Dolphin and small whale fisheries of the Caribbean and West Indies: occurrence, history and catch statistics – with special reference to the Lesser Antillean island of St Vincent. *Journal of the Fisheries Research Board of Canada* 32:1105-1110.

Gordon, J., Moscrop, A., Carlson, C., Ingram, S., Leaper, R., Matthews., J and Young, K. 1998. Distribution, Movements and Residency of Sperm whales off the Commonwealth of Dominica, Eastern Caribbean: Implications for the Development and Regulation of the Local Whalewatching Industry. *Rep. Int. Whal. Commn*, 48:551-557.

Gordon, J.C.D., Matthews, J.N., Panigada, S., Gannier, A., Borsani, J.F. and Notarbartolo di Sciara, G. 2000. Distribution and relative abundance of striped dolphins, and distribution of sperm whales in the Ligurian Sea cetacean sanctuary: results from a collaboration using acoustic monitoring techniques. *J. Cetacean Res. Manage.* 2(1):27-36

Price, W.S. 1985. Whaling in the Caribbean: historical perspective and update. *Reports of the International Whaling Commission* 25:413-420

Reeves, R.R, Swartz, S.L., Wetmore, S.E and Clapham, P.J. 2001. Historical occurrence and distribution of humpback whales in the eastern and southern Caribbean Sea, based on data from American whaling logbooks. *J. Cet. Res. Manage*. 2(3):117-129.

Reeves, R.R. 2005. Distribution and Status of Marine Mammals of the Wider Caribbean Region: An Update of UNEP Documents. UNEP(DEC)/CAR WG.27/INF.3 *Presented to Regional Workshop of Experts on the Development of the Marine Mammal Action Plan for the Wider Caribbean Region, Bridgetown, Barbados, 18-21 July 2005* by Randall R. Reeves, Okapi Wildlife Associates, 27 Chandler Lane, Hudson, Quebec J0P 1H0, Canada.

Romero, A., Agudo, A.I., Green, S.M., and Notarbartolo di Sciara, G. 2001. Cetaceans of Venezuela: Their distribution and conservation status. *NOAA Technical Reports*, NMFS 151:1-60.

Romero, A., Baker, R., Creswell, J.E., McKie, A and Manna, M. 2002a. Environmental history of marine mammal exploitation in Trinidad and Tobago, W.I. and its ecological impact. *Environment and History*, 8:255-274.

Romero, A. Hayford, K.T., Romero, A. and Romero, J. 2002b. The marine mammals of Grenada, W.I., and their conservation status. *Mammalia* 66:479-494.

Romero, A. and Hayford, K.T. 2000. Past and present utlisation of marine mammals in Grenada, West Indies. *Journal of Cetacean Research and Management* 2: 223-226.

Romero, A. and Creswell, J. 2005. In the Land of the Mermaid: How culture, not ecology, influenced marine mammal exploitation in the southeastern Caribbean. Chapter 1 in: A Romero and S.E. West (eds). *Environmental Issues in Latin America and the Caribbean*, 3-30. Springer, Netherlands.

Swartz, S.L., Cole, T., McDonald, M.A., Hildebrand, JA., Oleson, E.M., Martinez, A., Clapham, P.J., Barlow., J and Jones, M.L. 2003. Acoustic and Visual Survey of Humpback Whale (*Megaptera novaeangliae*) Distribution in the Eastern and South-eastern Caribbean Sea. *Caribbean Journal of Science* 39(2):195-208.

Stevick, P.T., Carlson, C.A., and Balcomb, K. 1999. A note on migratory destinations of humpback whales from the eastern Caribbean. *J. Cet. Res. Manage*. 1(3):251-254.

Table 1. A summary of visual and acoustic effort for each study period and area .

Year	Dates	Study area	Hours of visual effort	Number of listening posts	Vessel
1995	01 Jan – 31 Mar	Dominica	280	1836	SOTW
1996	09 Jan – 04 Feb	Dominica	39	109	SOTW
1996	12 Feb – 29 Mar	Grenada	106	509	SOTW
2000	12 – 29 Jan; 24 – 30 Mar	Guadeloupe	112	333	Silurian
2000	17 Mar – 23 Mar	Dominica	47	137	Silurian
2000	02 Feb & 16 Mar	Martinique	23	55	Silurian
2000	04 – 08 Feb; 02 – 10 Mar	Grenada	81	214	Silurian
2000	12 Feb – 29 Feb	Tobago	65	266	Silurian
2006	24 Jan – 10 Mar	Trinidad & Tobago	194	804	SOTW II
2006	20 Mar – 24 Mar	Saba Bank	76	416	SOTW II

Table 2. List of small cetacean species observed /reported within the study area. Values represent the number of groups sighted; estimated minimum and maximum group sizes are expressed in parentheses. * represents those species (by island) for which juvenile animals and/or calves were observed.

Species	Saba	Guadeloupe	Dominica	Martinique	Grenada	Tobago	Trinidad	Notes
Bottlenose dolphin *Tursiops truncatus*		2* (10-10)	1 (10-10)			1 (1-1)	5 (1-10)	
Cuvier's beaked whale *Ziphius cavirostris*			1* (2-2)					
False killer whale *Pseudorca crassidens*					2* (10-25)			1[3]
Fraser's dolphin *Lagenodelphis hosei*			8* (2-200)					1[4]
Killer whale *Orcinus orca*					1* (3-3)			
Long-beaked common dolphin *Dephinus capensis*								1[5]
Melon-headed whale *Peponocephala electra*								1[6]
Pan-tropical spotted dolphin *Stenella attenuata*		11* (6-100)	27* (5-100)	2 (1-25)	11* (10-100)	8* (5-40)	1 (2-3)	
Pygmy sperm whale *Kogia breviceps*					1* (2-2)			
Pygmy killer whale *Feresa attenuata*		4 (1-12)						
Rough-toothed dolphin *Steno bredanensis*		1 (15-15)						
Short-finned pilot whale *Globicephala macrorhynchus*		2* (20-20)	10* (8-50)					
Spinner dolphin *Stenella longirostris*			6 (1-50)	2 (1-20)			2* (3-40)	
Unidentified dolphin species	1 (1-1)	4* (1-3)	38 (1-55)		12* (1-50)	2 (1-20)	2 (1-2)	
Unknown species			2 (1-9)		1 (1-1)			
Total no. species seen (out of 13)	1	5	6	2	4	2	3	

[3] *P. crassidens* also reported from St Lucia – observed 2 dead animals caught by fishermen in Castries, spring 1997.
[4] *L. hosei* were also observed opportunistically on passage to Grenada, off Carriacou
[5] *D. capensis* identified from photographs of bycaught animal, off SE coast of Trinidad, April 2006
[6] *P. electra* were observed opportunistically on passage to Grenada, off Carriacou

Table 3. Summary of visual encounter rates of all odontocete groups (excluding sperm whales) seen between 1995 and 2006 when on dedicated survey effort. Overall mean visual and acoustic encounter rates are derived for each island.

Species	Saba	Guadeloupe	Dominica	Martinique	Grenada	Tobago	Trinidad	Mean
Bottlenose dolphin	-	0.006	0.003	-	-	0.010	-	0.006
Fraser's dolphin	-	-	0.013	-	-	-	-	0.013
Pilot whale	-	0.012	0.019	-	-	-	-	0.016
Pygmy killer whale	-	0.025	-	-	-	-	-	0.025
Pygmy sperm whale	-	-	-	-	0.006	-	-	0.006
Rough-toothed dolphin	-	0.006	-	-	-	-	-	0.006
Spinner dolphin	-	-	0.003	0.134	-	-	0.013	0.050
Spotted dolphin	-	0.055	0.040	0.067	0.038	0.070	-	0.054
Unidentified dolphin	0.013	0.006	0.059	-	0.070	0.020	0.006	0.029
Unknown species	-	-	0.003	-	-	-	-	0.003
Overall visual rate	0.013	0.111	0.140	0.200	0.115	0.100	0.019	0.100
Overall acoustic rate	0.199	0.384	0.386	0.420	0.343	0.245	0.240	0.317

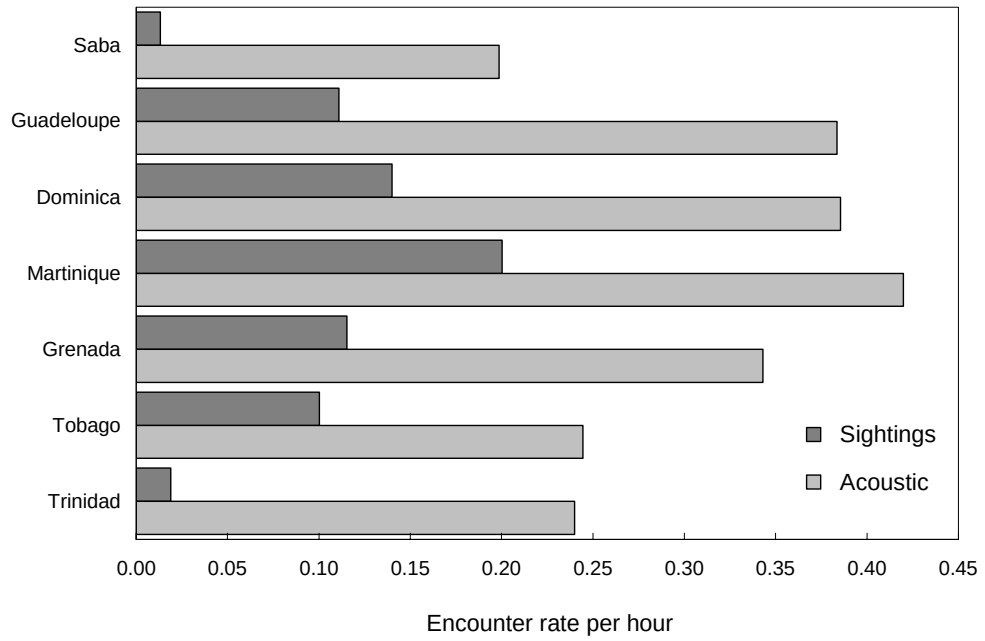
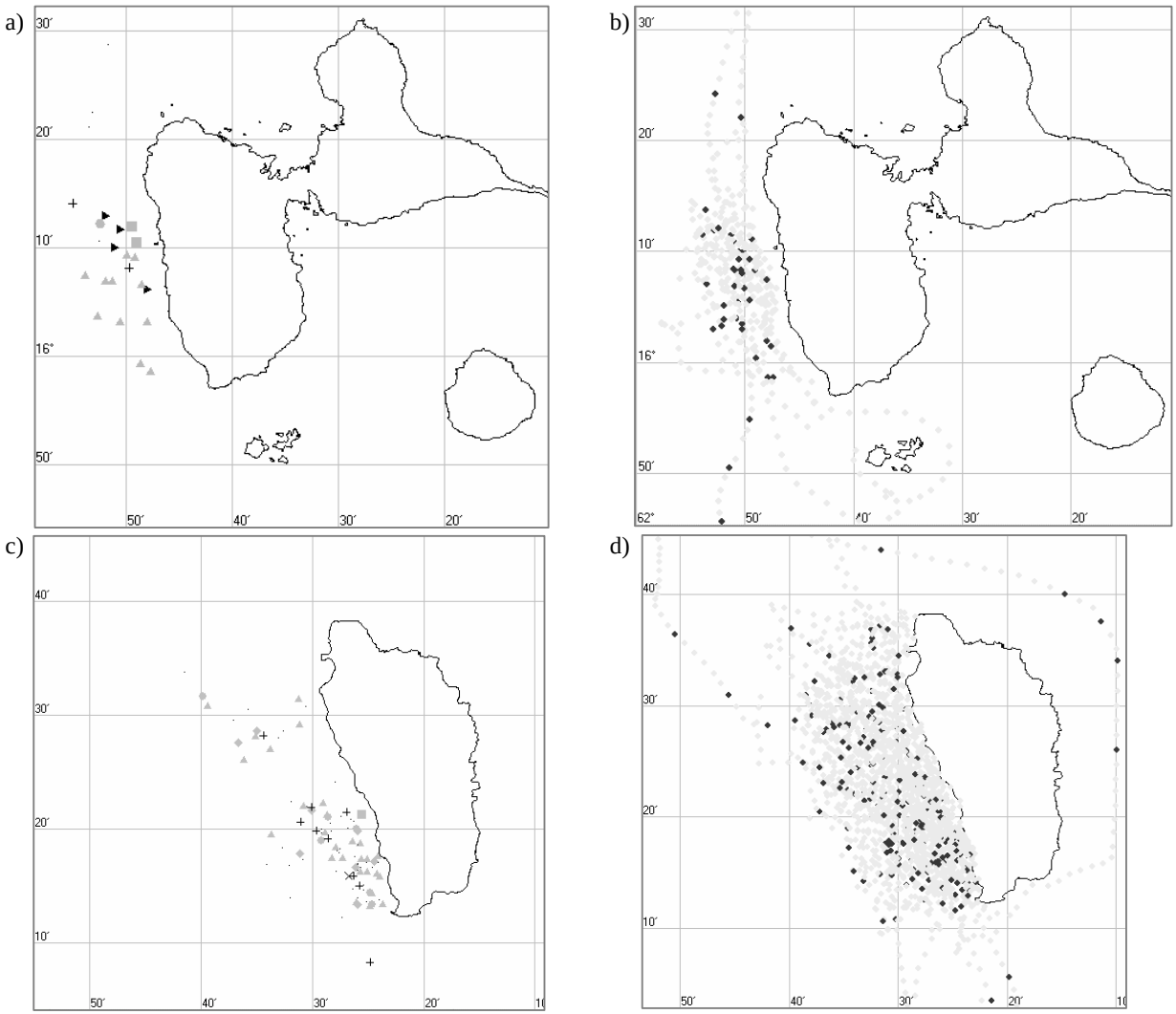


Figure 1. Overall small cetacean encounter rate measured from all islands.


a)
b)
c)
d)
Bottlenose dolphin
Cuvier's beak whale
False killer whale
Fraser's dolphin
Killer whale
Melon headed whale
Pilot whale
Pygmy killer whale
Pygmy sperm whale
Rough-tooth dolphin
Spinner dolphin
Spotted dolphin
Unidentified dolphin

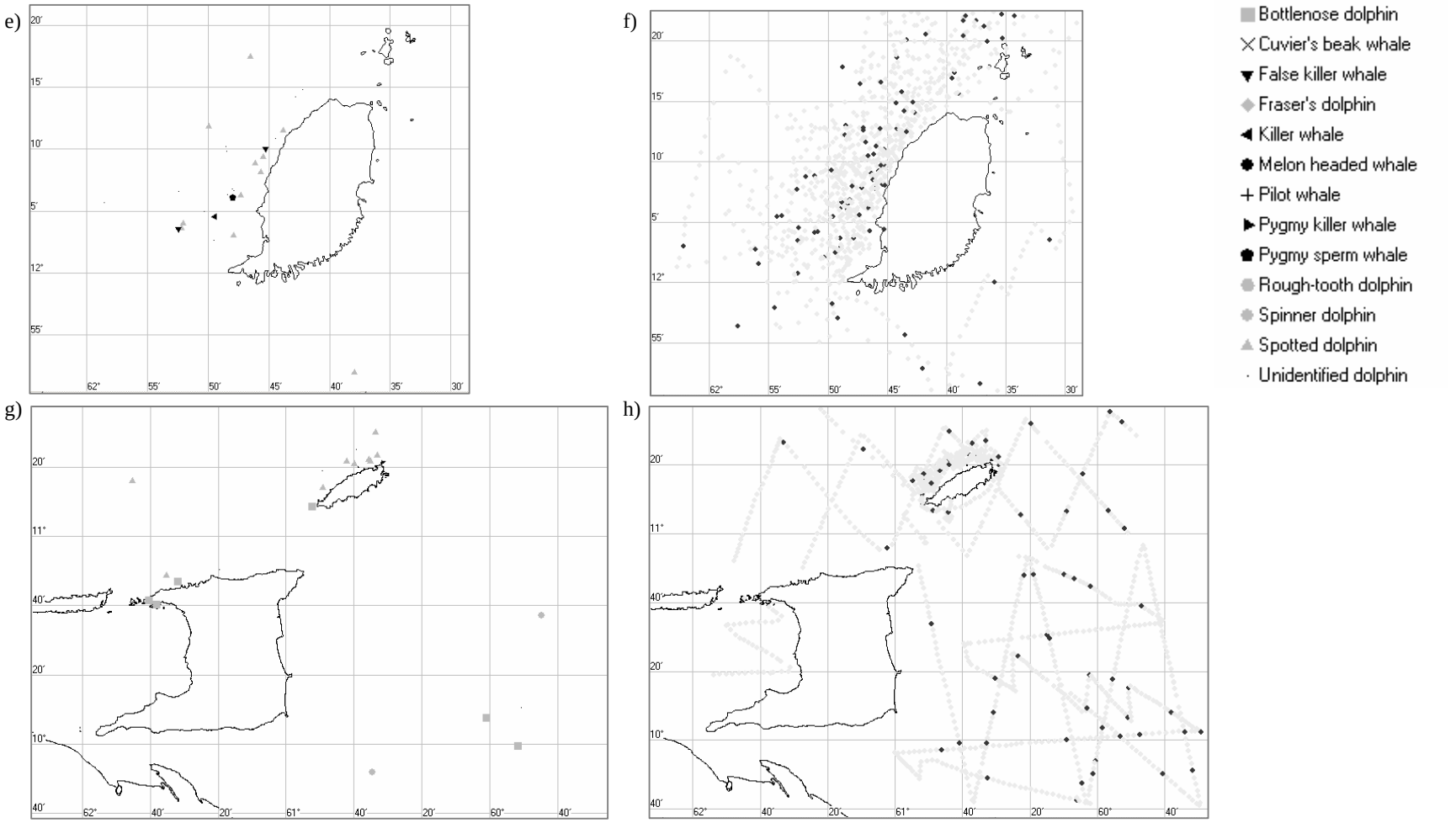


Figure 2. All sightings made off Guadeloupe (a), Dominica (c), Grenada (e) and Tobago (g). Listening posts are also shown for each island, with those at which small cetaceans were heard displayed in black; all other listening posts represented in grey.