

Attitudes towards marine mammal conservation issues before the introduction of whale-watching: a case study in Aruba (southern Caribbean)

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ABSTRACT

1. Effective conservation management requires a solid understanding of social and economic factors, in addition to biological factors affecting what is to be conserved. Aruba is one of the most densely populated islands in the Caribbean and its already high number of tourists is still increasing. No commercial whale-watching operations are offered yet on the island. This provides a rare opportunity to document knowledge of and values concerning marine mammals before the introduction of whale-watching operations.

2. In 2010, a survey was conducted to investigate the awareness and attitudes of resident Arubans ($n = 204$) and tourists ($n = 198$) towards marine mammals and their conservation on Aruba. Knowledge of the local marine mammal community was low for both groups. Most participants would support more stringent legislation for protecting marine mammals in Aruba. Overall concern regarding threats to marine mammals was high and oil spills, chemical pollution, litter and sewage were identified as the most serious threats. A large proportion of residents (84.2%) and tourists (83.6%) were interested in, and willing to pay for, viewing marine mammals. Both groups preferred to see marine mammals in the wild rather than in captivity.

3. This is the first study that investigates the attitudes of people towards marine mammals and their conservation in a country that does not have marine mammal related tourism yet. This study suggests that strong support for marine mammal conservation issues does not critically depend on detailed knowledge of the local marine mammal community, or on the availability of whale-watching operations.

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Received 02 October 2012; Revised 19 January 2013; Accepted 25 January 2013

KEY WORDS: Caribbean; island; mammals; public perception; recreation; pollution; legislation

INTRODUCTION

The conservation and management of ecosystems is complex and often requires the integration of social, economic and scientific aspects (Duffus and Dearden, 1990; Grumbine, 1994). Conflicting societal values and objectives are a major impediment to effective conservation and management of marine wildlife (Lavigne, 1999; Reynolds *et al.*, 2009). Therefore it is

important to understand the social values of people regarding the conservation of marine ecosystems (Reynolds *et al.*, 2009).

Coastal ecosystems face increasing pressure from humans (Crain *et al.*, 2009). This is of particular concern near densely populated areas where people and wildlife coexist and interact frequently. Threats to marine mammal populations in coastal ecosystems have increased in recent decades because

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of disturbance by boat traffic, underwater noise, injuries and death due to collisions and overfishing, among other things (Janik and Thompson, 1996; Wright *et al.*, 2007; Bearzi *et al.*, 2008; Bechdel *et al.*, 2009). Water-based recreational activities are a major component of the tourism industry but may also pose threats to coastal marine mammals and their habitat (Burgin and Hardiman, 2011). On the other hand, tourism may provide local communities with an economic incentive to conserve ecosystems and their wildlife (Goodwin, 1996; Gössling, 1999; Amir and Jiddawi, 2001).

Whale-watching is a fast growing industry worldwide and has gained broad support from the international community as a non-consumptive use of marine mammals (Hoyt, 2001; Chen, 2011). It almost certainly will increase in the near future (O'Connor *et al.*, 2009; Cisneros-Montemayor *et al.*, 2010). This is especially true for the Caribbean, where the whale-watching industry is small but the tourism industry large (Hoyt and Hvenegaard, 2002). Whale-watching could contribute to the local economy and even draw more tourists to see wildlife (Hoyt and Hvenegaard, 2002; Parsons *et al.*, 2003). Before ecotourism operations are initiated, it is important to understand the views, motivations, and concerns of tourists and locals towards ecotourism, the marine environment, and relevant conservation issues (Orams, 2000; Birtles *et al.*, 2002; Hoyt and Hvenegaard, 2002; Berrow, 2003). This may also help to identify and prevent potential conflicts between stakeholders. For instance, residents of an area in South Africa popular among whale-watchers were against the development of boat-based whale-watching, whereas tourists generally were in favour, raising issues of resource ownership and common property resource rights (Findlay, 1997). Clearly, people's values, motivations and expectations play an important part in deciding if and how to set up ecotourism operations (Boyd and Butler, 1996; Berrow, 2003).

Furthermore, the awareness and knowledge of wildlife among local people and tourists may indicate to what extent there is support for wildlife conservation issues. This kind of information may serve as a baseline for measuring changes in environmental attitudes and behaviour and also may help direct education efforts aiming at improving them (Amante-Helweg, 1996; Barney *et al.*, 2005). Typically the effects on knowledge and attitudes of people towards marine mammals are investigated in places where whale-watching is established and where local changes to economy and conservation

may already be evident (Findlay, 1997; Orams, 1997; Amir and Jiddawi, 2001; Lück, 2003; Howard and Parsons, 2006; Draheim *et al.*, 2010). Thus, a study of attitudes of people before whale-watching is implemented may provide insight into the effects of such tourism on local support for wildlife conservation issues.

Aruba is a small (180 km²) island situated 27 km north of Venezuela and is part of the western Leeward Antilles. It is one of the most densely populated islands in the Caribbean. The Aruban economy depends heavily upon the surrounding marine environment and its associated wildlife. The number of tourists visiting Aruba has grown greatly during the last 50 years, with less than one thousand tourists visiting in the early 1950s to over 1.5 million per year at present (Cole and Razak, 2009; CIA World Factbook, 2011). Tourism in Aruba will most likely continue to grow during the next 2–4 decades (Cole and Razak, 2009).

To date, at least 16 species of cetaceans have been recorded in the waters of Aruba (Debrot *et al.*, 1998; Barros and Debrot, 2006; Luksenburg, 2011, 2013). There are no commercial whale-watching operations on this island. However, the presence of marine mammals and the large numbers of tourists visiting Aruba offer prospects for whale-watching operations.

This paper reports the results of a survey (questionnaire) of the knowledge and attitudes of resident Arubans and tourists towards marine mammals and their conservation in the waters around Aruba. The survey was part of an ongoing study of the ecology and conservation management of marine mammals in Aruba, public awareness and knowledge about marine mammals, the perception of threats to marine mammals, and attitudes towards marine mammal conservation issues.

METHODS

Surveys were conducted from September to December 2010 in Aruba. Residents ($n=204$) and tourists ($n=198$) were asked to complete a pre-designed questionnaire comprising 25 questions. For both groups, several locations, including the city centres of Oranjestad and San Nicolas and the majority of the beaches on Aruba, and several time periods were sampled to ensure an even spread of occupations and people. Residents and tourists were asked to complete the questionnaire in the cities of Oranjestad and San Nicolas where every second person encountered after completion

of the previous questionnaire was chosen. Beaches on Aruba were visited to survey tourists; adults who were not sleeping or in conversation were chosen for participation in the study. Different beaches on Aruba were targeted to ensure a broad sample of tourists. Each beach was sampled only once during the survey.

The same person conducted all surveys. Care was taken to ensure that persons were approached in an identical manner. Each survey was prefaced with an explanation of the purpose of the survey and the assurance of confidentiality. The participants were asked to complete the questionnaires themselves on the spot with the interviewer next to them without prompting or interpreting the questions. Participants asking for information were provided with an explanation that was as factual as possible to avoid influencing them. All questions were in English. In some cases the questionnaire was verbally translated into Dutch (the official language of Aruba) by the interviewer (native Dutch speaker). The interviewer emphasized that answers were neither right nor wrong and that the survey simply sought their opinion. Surveys lasted 10 to 15 min. All participants were 18 years of age or older.

The response rate of the survey was 87%. For residents the most common reason for not participating was that they had no time and for tourists the most common reason was that they were on holiday and were not interested in participating. No subject declined to participate after the interviewer explained the survey topic. Participants were allowed to not respond to individual questions. Although the views of those declining to participate are not known, the fact that few declined suggests that their responses could not have altered the survey outcome significantly.

The survey was preceded by a pilot study ($n = 11$) to determine if the questions were understandable and answerable, as recommended by White *et al.* (2005). Pilot study results were not included in the study analysis. Gender, age and education level of the participants were compared with the Aruban population to judge the representativeness of the sampled resident group (CBS, 2010; CIA World Factbook, 2011).

The survey asked participants questions about their demographics (sex, age, residency, education, occupation) and their knowledge of and views regarding cetaceans, threats to the marine environment, conservation issues, and ecotourism as in previous studies by Scott and Parsons (2004,

2005) and Howard and Parsons (2006). All questions but one were close-ended (yes/no, multiple choice, Likert-scale). The open-ended question asked participants what they considered to be the three main threats to the Aruban marine environment. This question resulted in either generic answers or no answers at all, and was excluded from subsequent analyses. To assess their knowledge of Aruban marine mammals, the survey asked if participants knew whether the following five species occur in Aruban waters, in order of increasing rarity in Aruba: Atlantic spotted dolphin *Stenella frontalis* (common in the Caribbean Sea, including Aruba), rough-toothed dolphin *Steno bredanensis* (rarely seen in Aruba, but records have been highly publicized in printed media), pilot whale *Globicephala sp.* (known from one stranding in Aruba but common elsewhere in the western Leeward Antilles), blue whale *Balaenoptera musculus* (a rare visitor to the Caribbean, not recorded in the western Leeward Antilles), and gray whale *Eschrichtius robustus* (absent from the Caribbean and extinct in the Atlantic since approximately the 1600s).

For the analysis, participants' ages were determined based on their year of birth and the assumption that they already had their birthday in 2010. Education level was divided into higher education (higher professional education degree, higher technical school degree, bachelor's degree, master's degree, doctorate degree) and lower education (all other levels, including several years of college without a formal degree). It was assumed that participants who did not complete a question, or parts thereof, was because they did not know the answer to it. For statistical analysis, threat levels to marine mammals were coded as follows: 'no threat' = 0, 'minor threat' = 1, 'moderate threat' = 2 and 'serious threat' = 3. All responses for each threat were summed to develop a relative measure of perceived significance. Opinions were weighted for statistical analysis in a similar fashion: 'strongly disagree' or 'very unimportant' = 1, 'disagree' or 'unimportant' = 2, 'neutral' = 3, 'agree' or 'important' = 4 and 'strongly agree' or 'very important' = 5. The setting for viewing marine mammals was coded as follows: 'dolphinarium' = 1, 'both dolphinarium and in the wild' = 2, 'in the wild' = 3.

All analyses were conducted using the PASW[®] statistical package (SPSS version 18.0, SPSS, Chicago, IL). In all binary and ordinal regression analyses, age was treated as an independent

continuous variable and gender, and residency and education level as independent categorical variables (each with two levels).

RESULTS

The participants

The study involved 402 participants, of which 204 (51%) were residents and 198 (49%) were tourists (Table 1). The sex ratio of the resident participants (0.92 male/female) was identical to that of the Aruban population in the age group 15–64 years and near identical to that of the total Aruban population (all ages) (0.90 male/female; $n = 106,113$).

The mean age of the resident participants was 41.0 years (standard deviation (SD) 14.1, median 41 years, range 18–81 years). Age was normally distributed (Kolmogorov–Smirnov test; *n.s.*). The mean age of the tourist participants was 44.8 years (SD 15.0, median 46 years, range 19–82 years). Age of the tourist group was not normally distributed (Kolmogorov–Smirnov test; $P < 0.005$), but rather was bimodal with peaks at ages 30 and 55. The mean age of the Aruban population in the same range was 45.4 years (SD 15.4, median 45 years; $n = 74,365$). Age of the Aruban population was not normally distributed (Kolmogorov–Smirnov test; $P < 0.001$). The mean age of the resident participants was significantly lower than the mean age of the tourist participants (Mann–Whitney U-test; $P < 0.01$) and also lower than that of the Aruban population (Mann–Whitney U-test; $P < 0.001$).

The sampled resident population consisted of more higher educated people than the total Aruban population (χ^2 , $df = 1$; $P < 0.001$). The proportion of tourist participants with a higher

education was significantly higher than the proportion of residents with such degrees (χ^2 , $df = 1$; $P < 0.001$). In both groups, sexes did not differ significantly in education level. In the resident group, the higher educated people were significantly older than those with less education ($\bar{x} = 44.8$ vs. $\bar{x} = 39.4$; one-way ANOVA; $P < 0.005$). Age and education did not appear to be related in the tourist group (Mann–Whitney U-test, *n.s.*). In both groups, males were significantly older than females (residents, one-way ANOVA, $P < 0.005$; tourists, Mann–Whitney U-test, $P < 0.005$).

Most tourists came from the United States (59%), followed by the Netherlands (13%), Canada (9.7%), Sweden (5.6%), United Kingdom (3.6%), and Germany (3.1%). Participants from Italy, Brazil, Curaçao, Denmark, Ireland, Norway, and Venezuela each comprised less than 1.5% of the tourist group.

Awareness, knowledge, and support of marine mammal conservation

More than half (56.7%) of the resident participants indicated that they had seen marine mammals (mostly dolphins) in Aruban waters (Table 2). Forty-four residents (19.7%) had heard of marine mammals in Aruban waters but had not seen them. Thus, most residents (76.4%) were aware of marine mammals in Aruban waters. A small proportion (10.7%) of the tourists had seen marine mammals (all dolphins) in Aruban waters (Table 2). Forty-five (22.8%) tourists had heard of marine mammals in Aruban waters but had not seen them. Thus, a minority of the tourists (33.5%) were aware of marine mammals in Aruban waters.

The majority of participants (53.5%) indicated that they did not know how many species of

Table 1. Demographic characteristics of the study group

| | N | Male | Female | Age | Mean age \pm SD | Higher educated | | Lower educated | |
|-----------|-----|------|--------|-------|-------------------|-----------------|----|----------------|-----|
| | | | | | | M | F | M | F |
| Residents | 204 | 98 | 106 | 18–81 | 41.0 \pm 14.1 | 28 | 31 | 70 | 73 |
| Tourist | 198 | 99 | 99 | 19–82 | 44.8 \pm 15.0 | 56 | 60 | 43 | 38 |
| Total | 402 | 197 | 205 | 18–82 | 42.9 \pm 14.6 | 84 | 91 | 113 | 111 |

Table 2. Observations of marine mammals in Aruban waters by participants

| | Marine mammal | | Dolphin | | Whale | |
|-------------------------|---------------|-------------|-------------|-------------|------------|-------------|
| | Seen | Not seen | Seen | Not seen | Seen | Not seen |
| Residents ($n = 203$) | 115 (56.7%) | 88 (43.3%) | 111 (54.7%) | 92 (45.3%) | 28 (13.8%) | 175 (86.2%) |
| Tourists ($n = 197$) | 21 (10.7%) | 176 (89.3%) | 21 (10.7%) | 176 (89.3%) | 0 (0%) | 197 (100%) |

marine mammals occur in Aruban waters (Table 3). As groups, both residents and tourists tended to underestimate the number of species present in Aruban waters. The most popular answer by residents was '1–5 species' and by tourists was '6–10 species'. At least 16 marine mammal species have been recorded in Aruban waters.

Most participants indicated that they did not know if the Atlantic spotted dolphin, rough-toothed dolphin, pilot whale, blue whale, and gray whale were present in Aruban waters (Table 4). Many of the participants with an opinion incorrectly believed that Atlantic spotted dolphin, rough-toothed dolphin and short-finned pilot whale do not occur in Aruba, or that gray whale and blue whale do occur. For most species, the proportion of correct answers was about the same for residents and tourists. Compared with residents, tourists more often answered correctly that rough-toothed dolphins occur in Aruban waters (Fisher's exact test; $P < 0.001$).

Most participants (79.0% [313/396]) agreed or strongly agreed with the statement that a country should be proud to have wild marine mammals in its coastal waters. Younger participants, tourists, and higher educated participants agreed significantly more strongly with that statement than did older participants, residents, and lower educated participants (Table 5, Figure 1(a)). Agreement with the statement was not influenced by gender.

Most participants (88.4% [352/398]) indicated that issues of marine conservation were important or very important to them, whereas only 2.5% answered that marine conservation issues were either unimportant or very unimportant to them and 9.0% of the participants had no opinion. Residents accorded a significantly higher degree of importance to issues of marine conservation than did tourists (Table 5, Figure 1(b)). The results did not indicate significantly different responses to this topic based on gender, age, or education.

Most participants (81.2% [324/399]) agreed that research on marine mammals in Aruba is either important or very important, whereas 5.8% found it to be (very) unimportant and 13.0% expressed no opinion. The results did not indicate significantly different responses to this topic based on gender, age, residency status, or education (Table 5, Figure 1(c)).

Legal protection of marine mammals in Aruba

The majority of residents (67.3% [134/199]) indicated that marine mammals need more protection in Aruban waters, whereas the majority of the tourists (53.0% [105/198]) indicated that they do not know the protective status of marine mammals in Aruban waters. However, more than one-third (36.9% [73/198]) of the tourists stated that marine mammals need more protection. In both groups, a small number of participants thought that marine mammals were sufficiently protected (residents 12.1%

Table 3. Estimation of the number of species of marine mammals in Aruban waters by participants

| | None | 1–5 | 6–10 | 11–15 | 16–20 | 21–25 | >25 | Do not know |
|-------------------------|-----------|------------|------------|----------|-----------|----------|-----------|-------------|
| Residents ($n = 194$) | 12 (6.2%) | 59 (30.4%) | 15 (7.7%) | 6 (3.1%) | 11 (5.7%) | 1 (0.5%) | 2 (1.0%) | 88 (45.4%) |
| Tourists ($n = 195$) | 7 (3.6%) | 16 (8.2%) | 21 (10.8%) | 7 (3.6%) | 9 (4.6%) | 4 (2.1%) | 11 (5.6%) | 120 (61.5%) |

Table 4. Participants' perceptions of the occurrence of five marine mammal species in Aruban waters

| | All participants ($n = 399$) | | | Residents ($n = 201$) | | | Tourists ($n = 198$) | | |
|--------------------------|--------------------------------|------------|-------------|-------------------------|------------|-------------|------------------------|-----------|-------------|
| | Present | Absent | Do not know | Present | Absent | Do not know | Present | Absent | Do not know |
| Atlantic spotted dolphin | 49 (12.3%) | 28 (7.0%) | 322 (80.7%) | 25 (12.4%) | 20 (20.0%) | 156 (77.6%) | 24 (12.1%) | 8 (4.0%) | 166 (83.8%) |
| Rough-toothed dolphin | 26 (6.5%) | 32 (8.0%) | 341 (85.5%) | 11 (5.5%) | 25 (12.4%) | 165 (82.1%) | 15 (7.6%) | 7 (3.5%) | 176 (88.9%) |
| Pilot whale | 14 (3.5%) | 38 (9.5%) | 347 (87.0%) | 5 (2.5%) | 26 (12.9%) | 170 (84.6%) | 9 (4.5%) | 12 (6.1%) | 177 (89.4%) |
| Blue whale | 18 (4.5%) | 40 (10.0%) | 341 (85.5%) | 9 (4.5%) | 26 (12.9%) | 166 (82.6%) | 9 (4.5%) | 14 (7.1%) | 175 (88.4%) |
| Gray whale | 20 (5.0%) | 32 (8.0%) | 347 (87.0%) | 12 (6.0%) | 21 (10.4%) | 168 (83.6%) | 8 (4.0%) | 11 (5.6%) | 179 (90.4%) |

Table 5. Regression analysis of the effects of gender, age, residency, and education level on attitudes towards marine mammals in Aruba^{1,2}

| | Gender | Age | Residency | Education level | Regression analysis | Model χ^2 (df) | Model P value |
|---|------------|--------------|--------------|-----------------|---------------------|---------------------|---------------|
| Member NGO (no/yes) | n.s. | n.s. | n.s. | $H > L$ * | Logistic | 18.61 (4) | *** |
| Proud of having marine mammals (Likert scale 1–5) | n.s. | $Y > O$ * | $T > R$ **** | $H > L$ *** | Ordinal | 60.50 (4) | **** |
| Importance of marine conservation (Likert scale 1–5) | n.s. | n.s. | $R > T$ * | n.s. | Ordinal | 14.40 (4) | ** |
| Importance of research (Likert scale 1–5) | n.s. | n.s. | n.s. | n.s. | Ordinal | 4.25 (4) | n.s. |
| Benefit to tourism (Likert scale 1–5) | $M > F$ ** | $Y > O$ ** | $T > R$ **** | $H > L$ *** | Ordinal | 42.26 (4) | **** |
| Legal protective status (sufficient / need more protection) | n.s. | n.s. | $T > R$ * | $H > L$ * | Stepwise logistic | 7.03 (2) | * |
| Willingness to pay (no/yes) | n.s. | n.s. | n.s. | n.s. | Logistic | n.s. (4) | n.s. |
| Interest in viewing marine mammals (no/yes) | n.s. | $Y > O$ **** | n.s. | n.s. | Logistic | 14.00 (4) | ** |
| Preferred setting for viewing marine mammals (dolphinarium/both/wild) | n.s. | n.s. | $T > R$ **** | $H > L$ * | Ordinal | 26.31 (4) | **** |

¹F, female; M, male; Y, younger participants; O, older participants; R, residents; T, tourists; H, higher educated participants; L, lower educated participants.

²n.s. = not significant; * $P < 0.05$; ** $P < 0.01$; *** $P < 0.005$; **** $P < 0.001$.

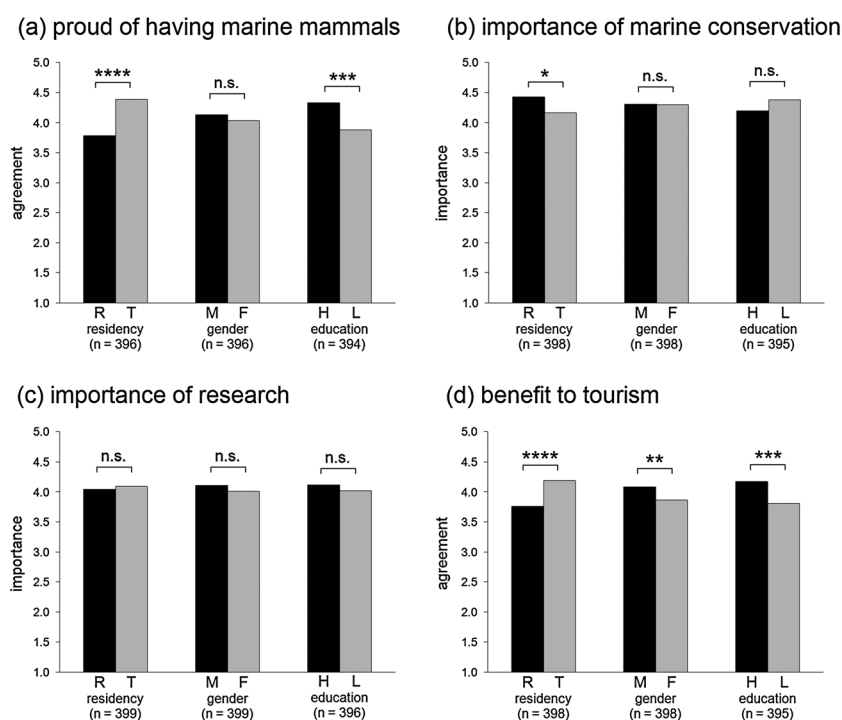


Figure 1. Opinions of participants on four questions or statements: (a) 'having wild marine mammals in coastal water is something a country should be proud of'; (b) 'how important are issues of marine conservation to you personally'; (c) 'do you think it is important to conduct scientific research on the dolphins and whales of Aruba'; (d) 'tourism on Aruba can benefit from the presence of wild marine mammals in Aruban waters.' 5 = very important/strongly agree, 4 = important/agree, 3 = neutral, 2 = unimportant/disagree, 1 = very unimportant/strongly disagree. Significance levels (ordinal regression) are indicated, n.s. = not significant; * $P < 0.05$; ** $P < 0.01$; *** $P < 0.005$; **** $P < 0.001$. R, residents; T, tourists; F, female; M, male; H, higher educated participants; L, lower educated participants.

[24/199]; tourists 10.1% [20/198]). One individual (resident) answered that marine mammals are overprotected. Residents and higher educated participants chose 'need more protection' significantly more often than did tourists and lower educated participants (Table 5). Gender and age do not appear to have influenced responses (Table 5).

Of the participants that indicated that more protection was needed for marine mammals in Aruban waters, the majority in both resident and tourist groups indicated that the Aruban Parliament should create specific legislation to protect marine mammals in Aruba's waters (residents 96.2% [128/133]; tourists 86.3% [63/73]).

Threats to marine mammals in Aruba

Overall concern regarding threats to marine mammals in Aruba was high (Table 6). The participants considered the most serious threats to be oil spills, pollution (chemical), litter, and sewage (Figure 2). Underwater noise and whale-watching were the lowest ranked threats. The ranks accorded to threats by tourists and residents were strongly and positively correlated (Spearman product-moment correlation; $r = 0.9$, $P < 0.001$).

Ordinal regression revealed several effects of gender, age, residency, and education level on the assignment of threat level (Table 7). In all cases where gender-related differences were significant (i. e. oil spills, pollution (chemical), sewage, harassment, oil exploration, injury by boat traffic, coastal development), female participants assigned higher levels of seriousness to threats than male participants (Table 7). For oil exploration, injury by boat traffic, over-fishing and underwater noise younger participants assigned a higher threat level, whereas older participants assigned a higher threat level for pollution (Table 7). Overall, tourists assigned higher levels of seriousness to threats to marine mammals than did residents, although the difference was significant only for over-fishing (Figure 2, Table 7). However, compared with tourists, residents assigned a significantly higher level of seriousness to harassment (Table 7). Three (oil spills, sewage, oil exploration) of the six highest ranked threats (oil spills, pollution, litter, sewage, harassment, oil exploration) were ranked significantly higher by lower educated participants than by participants with a higher education, while two (entrapment in fishing gear, underwater noise) of the six lowest ranked threats (injury by boat traffic, entrapment in fishing gear, over-fishing, coastal development, climate change, underwater noise, whale-watching) were ranked significantly higher by higher educated participants (Table 7).

noise, whale-watching) were ranked significantly higher by higher educated participants (Table 7). Rankings for three threats (litter, climate change, and whale-watching) did not appear to be influenced by gender, age, or education level (Table 7).

Ecotourism

The majority of the participants (81.5% [326/400]) were interested in viewing marine mammals in Aruba, whereas fewer either were not interested (12.2% [49/400]) or did not know if they were interested (6.3% [25/400]) (Table 8). Residency status, gender, and education level did not appear to influence interest in viewing marine mammals (Table 5). Younger participants were more interested than older participants (Table 5).

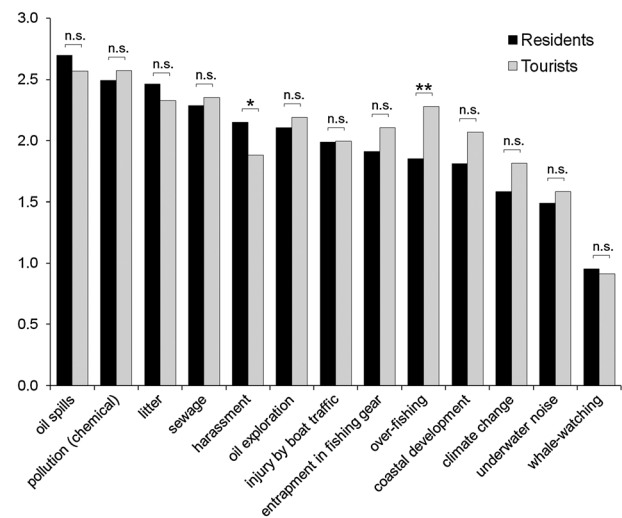


Figure 2. Differences between resident and tourist rankings on ranked threats of marine mammals in Aruban waters (3 = serious threat, 2 = major threat, 1 = minor threat, 0 = no threat). Significance levels (ordinal regression) are indicated, n.s. = not significant; * $P < 0.05$, ** $P < 0.01$.

Table 6. Ranking of threats to marine mammals in Aruba by participants ($n = 395$)

| | Serious threat | Moderate threat | Minor threat | No threat | Do not know |
|----------------------------|----------------|-----------------|--------------|-----------|-------------|
| Oil spills | 63.3% | 13.4% | 6.6% | 1.5% | 15.2% |
| Pollution (chemical) | 57.2% | 14.7% | 6.1% | 3.8% | 18.2% |
| Litter | 45.6% | 22.5% | 9.1% | 2.5% | 20.3% |
| Sewage | 44.1% | 21.8% | 9.4% | 4.6% | 20.3% |
| Oil exploration | 42.0% | 16.2% | 9.1% | 10.6% | 22.0% |
| Injury by boat traffic | 30.9% | 26.3% | 18.0% | 6.8% | 18.0% |
| Over-fishing | 32.7% | 28.6% | 11.9% | 7.8% | 19.0% |
| Harassment | 30.9% | 28.1% | 16.7% | 6.3% | 18.0% |
| Entrapment in fishing gear | 30.6% | 27.6% | 16.7% | 6.6% | 18.5% |
| Coastal development | 28.1% | 31.1% | 15.7% | 8.9% | 16.2% |
| Climate change | 21.5% | 25.6% | 17.7% | 13.7% | 21.5% |
| Underwater noise | 14.7% | 25.3% | 23.0% | 13.7% | 23.3% |
| Whale-watching | 7.8% | 11.6% | 21.5% | 32.4% | 26.6% |

Table 7. Effects of gender, age, residency, and education level on threat rankings¹ (ordinal regression)²

| | Gender | Age | Residency | Education level | Model χ^2 (df = 4) | Model <i>P</i> value |
|----------------------------|--------------------------|--------------------------|------------------------|--------------------------|-------------------------|----------------------|
| Oil spills | <i>F</i> > <i>M</i> * | n.s. | n.s. | <i>L</i> > <i>H</i> **** | 24.42 | **** |
| Pollution (chemical) | <i>F</i> > <i>M</i> * | <i>O</i> > <i>Y</i> * | n.s. | n.s. | 16.21 | *** |
| Litter | n.s. | n.s. | n.s. | n.s. | 8.81 | n.s. |
| Sewage | <i>F</i> > <i>M</i> * | n.s. | n.s. | <i>L</i> > <i>H</i> * | 12.16 | * |
| Harassment | <i>F</i> > <i>M</i> **** | n.s. | <i>R</i> > <i>T</i> * | n.s. | 24.20 | **** |
| Oil exploration | <i>F</i> > <i>M</i> **** | <i>Y</i> > <i>O</i> * | n.s. | <i>L</i> > <i>H</i> ** | 25.43 | **** |
| Injury by boat traffic | <i>F</i> > <i>M</i> **** | <i>Y</i> > <i>O</i> **** | n.s. | n.s. | 34.38 | **** |
| Entrapment in fishing gear | n.s. | n.s. | n.s. | <i>H</i> > <i>L</i> * | 11.99 | * |
| Over-fishing | n.s. | <i>Y</i> > <i>O</i> * | <i>T</i> > <i>R</i> ** | n.s. | 16.98 | *** |
| Coastal development | <i>F</i> > <i>M</i> **** | n.s. | n.s. | n.s. | 20.84 | **** |
| Climate change | n.s. | n.s. | n.s. | n.s. | 5.23 | n.s. |
| Underwater noise | n.s. | <i>Y</i> > <i>O</i> * | n.s. | <i>H</i> > <i>L</i> * | 12.23 | * |
| Whale-watching | n.s. | n.s. | n.s. | n.s. | 7.29 | n.s. |

¹F, female; M, male; Y, younger participants; O, older participants; R, residents; T, tourists; H, higher educated participants; L, lower educated participants.

²n.s. = not significant; * *P* < 0.05; ** *P* < 0.01; *** *P* < 0.005; **** *P* < 0.001.

Table 8. Interest in viewing marine mammals in Aruban waters

| | Interested in viewing | | | Willingness to pay | | |
|-------------|-----------------------|-----------|----------|--------------------|-----------|----------|
| | all participants | residents | tourists | all participants | residents | tourists |
| Yes | 326 | 167 | 159 | 272 | 139 | 133 |
| No | 49 | 23 | 26 | 26 | 17 | 9 |
| Do not know | 25 | 12 | 13 | 26 | 9 | 17 |
| N | 400 | 202 | 198 | 324 | 165 | 159 |

Of participants interested in viewing marine mammals, most (84.0% [272/324]) would pay to view them, whereas fewer either were not willing to pay (8.0% [26/324]) or did not know if they wanted to pay (8.0% [26/324]) (Table 8). Gender, age, residency status, and education level did not appear to influence willingness to pay for viewing opportunities (Table 5).

Of participants who were willing to pay to view marine mammals, both tourists and residents preferred viewing them in the wild rather than in a dolphinarium (Table 2). However, this preference was stronger for tourists than for residents (61.9% [91/147] vs. 41.6% [64/154]). Tourists also preferred to view marine mammals in a dolphinarium less often (2.0% [3/147] vs. 24.0% [37/154]). The proportion of tourist and resident participants who would like to view marine mammals both in a dolphinarium and in the wild was about equal (35.4% [52/147] and 32.5% [50/154], respectively). The setting in which participants preferred to view marine mammals did not depend on gender or age (Table 5). Higher educated participants preferred viewing marine mammals in the wild more often than did lower educated participants (Table 5). Both higher and lower educated participants tended to prefer watching marine mammals in the wild.

Most (76.1% [303/398]) participants agreed or strongly agreed that tourism on Aruba could benefit from the presence of wild marine mammals in Aruban waters. Males, younger participants, tourists, and higher educated participants were significantly more in agreement with this statement than female participants, older participants, residents, and participants with a lower education (Table 5, Figure 1(d)).

DISCUSSION

Awareness, knowledge, and support of marine mammal conservation

This study indicates that awareness of marine mammals in Aruban waters is high for residents but rather low for tourists, and that knowledge of marine mammals in Aruba (species richness and species identity) is poor for both groups. Support for marine mammal conservation is high in Aruba despite a low level of knowledge of local marine mammal species. These findings suggest that detailed knowledge of the presence of marine mammal species in Aruban waters is not a prerequisite of strong positive attitudes towards conservation issues. We suggest that the strong

support for marine mammal conservation on Aruba may be explained, at least partly, by the fact that marine mammals are popular among the general public and often elicit positive, aesthetic, and humanistic views (Kellert, 1999). This hypothesis is supported by White *et al.* (2001), who concluded that people show a greater willingness to pay for conservation action plans for marine mammals than for those aimed at terrestrial mammals. The support apparent in these results indicates that, in Aruba, conservationists could use marine mammals as flagship species for marine conservation generally. An in-depth analysis of residents' understanding, attitude, and behaviour toward local populations of marine mammals may be useful for developing educational programmes aimed at reducing negative human impacts on these populations and Aruba's marine ecosystems.

Legal protection of marine mammals in Aruba

The results of this study show that the majority of the participants were of the opinion that marine mammals need more protection in Aruba. Although many tourists were unable to answer this question, most of those who did answer the question agreed that the protection of marine mammals in Aruban waters was insufficient; very few participants thought marine mammals are overprotected. Of those participants who answered that more protection was needed, almost all expressed the view that the Aruban government should develop legislation specifically for that purpose.

Aruba has adopted the following international conventions and agreements to protect marine mammals:

- International Convention for the Regulation of Whaling (1946);
- Convention on International Trade in Endangered Species of Flora and Fauna (1973);
- Convention on the Conservation of Migratory Species of Wild Animals (1979);
- United Nations Convention on the Law of the Sea (1982);
- Convention for the protection and development of the marine environment of the Wider Caribbean Region (1983);
- Protocol on Specially Protected Areas and Wildlife (1990); and
- Convention on Biological Diversity (1992).

With the exception of International Convention for the Regulation of Whaling, these conventions are not

specific for marine mammals and thus may not fully protect them in Aruban waters. For example, these conventions do not deal explicitly with underwater noise, harmful fishing techniques, and marine mammal–vessel interactions. Whereas local concern regarding threats to marine mammals in Aruba is high, information about those threats is poor. A review of the threats to marine mammals in Aruban waters is needed to address this problem. The review also should consider whether current legislation provides sufficient protection to marine mammals against the identified threats. The results of the review could then be used by policymakers to craft legislation specific to marine mammals and the threats that require more effective management (Baur *et al.*, 1999; Meffe *et al.*, 1999; Rieser *et al.*, 2005; Parsons *et al.*, 2010a, b). The support for marine mammal conservation evident in these results indicates that future legislation to protect marine mammals in Aruban waters would be broadly supported.

Threats to marine mammals in Aruba

Participants in this study indicated high levels of concern regarding threats to marine mammals in Aruban waters. Residents and tourists generally agreed in their ranking of threats, and in the seriousness accorded to each threat. The close agreement is surprising given the different geographic backgrounds of these two groups and their exposure to different sources of information. Threats to marine mammals have neither been studied scientifically in Aruba or elsewhere in the Leeward Antilles. The close agreement between residents and tourists may reflect common tendencies in threat perception, such as to perceive rare and randomly occurring threats, and those receiving extensive media attention, as more serious than those that are less rare, occur continuously or predictably, and receive less press coverage (Slovic, 1987).

Oil spills and chemical pollution were considered the two most serious threats by both residents and tourists. These threats may be regarded as 'visual' contaminants because they often receive extensive media coverage (Scott and Parsons, 2005; Howard and Parsons, 2006). In addition, this survey was conducted 6 months after the start of the Deepwater Horizon (British Petroleum) oil spill in the Gulf of Mexico (April–July 2010), which received extensive media attention. Aruba has an oil refinery (Valero), which makes the threat of an oil spill relevant for Arubans and hence for participants to rank it as serious.

Both resident and tourist groups ranked underwater noise as the second least serious threat. Whereas anthropogenic underwater noise is receiving increased attention from the scientific, legal, and environmental communities, public awareness of this issue is poor (Firestone and Jarvis, 2007). A 2003 review by the US Ocean Studies Board (2003) emphasized a communication gap between users of sound in the ocean, including scientists, and the public, and attributed much of the gap to the public's poor understanding of fundamental acoustic concepts and the scientific community's failure to communicate those concepts effectively. Given a considerable traffic of cruise, fishing, and freighter ships in Aruban waters, and the extensive number and intensive use of small tourist boats, the effects of noise pollution on marine wildlife warrants study. The results of this should be communicated effectively to improve public awareness of this issue.

Whale-watching was ranked as the least serious threat for both residents and tourists. This is not surprising given that whale-watching was not offered on Aruba at the time this study was conducted. Public opinion about this issue should be re-assessed when whale-watching operations have become established in Aruban waters.

The ranking of the highest- and lowest-level threats in Aruban waters was similar to rankings by residents in Glasgow and Edinburgh and the county of Argyll, Scotland, United Kingdom (Scott and Parsons, 2005; Howard and Parsons, 2006). As in Aruba, oil spills, chemical pollution, litter and sewage ranked very high in Scotland, whereas underwater noise and whale-watching ranked lowest. Howard and Parsons (2006) noted that the public expressed significantly higher levels of concern over oil spills, sewage pollution, and chemical pollution than did marine conservation professionals and advocates.

Women assigned higher levels of concern to threats to marine mammals than males. Howard and Parsons (2006) obtained a similar result for residents in Glasgow and Edinburgh. Generally, women are more likely to view animals as objects of affection and to express concern about animal welfare issues (Kellert and Berry, 1987; Herzog *et al.*, 1991; Czech *et al.*, 2001).

Ecotourism

This study indicates that a large majority of tourists visiting Aruba and local Arubans are interested in

whale-watching and are willing to pay for this activity. Whale-watching was not offered commercially in Aruban waters at the time the study was conducted. Whether it would be successful depends critically on the presence and abundance of marine mammals in the area, and the quality of the encounters tourists could have with marine mammals (Orams, 2000; Hoyt and Hvenegaard, 2002). Although at least 16 species of marine mammals have been reported in Aruba, very little is known about their temporal and geographic distribution, and their habitat use, abundance, and conservation status. These are important factors that require detailed study.

This study provides a baseline for future studies of the effect of ecotourism on the knowledge and awareness of local Arubans and visiting tourists. It was found that few resident Arubans are aware of the number of species and the specific identity of the marine mammals occurring in Aruban waters. Several other studies have shown that ecotourism can assist in the education of its participants about marine mammals and their conservation (Orams, 1997; Lück, 2003), which in turn may improve conservation and management (Hoyt and Hvenegaard, 2002).

In addition, this study indicates that the majority of the participants prefer to watch marine mammals in the wild rather than in a dolphinarium. This preference was stronger in tourists than in residents. A study in the Dominican Republic also found that a majority of the tourists preferred viewing marine mammals in the wild versus in a dolphinarium (Draheim *et al.*, 2010). The Dominican Republic has both commercial whale-watching operations and three dolphinariums, whereas on Aruba neither activity is offered. The results of this study, combined with those of Draheim *et al.* (2010), suggest that the preference for seeing marine mammals in the wild rather than in dolphinarium does not depend critically on the local availability of these activities. The preference for seeing marine mammals in the wild may reflect a change in attitude in western countries from a utilitarian view to a view that includes an intrinsic value of marine mammals (Lavigne *et al.*, 1999; Jiang *et al.*, 2008).

When this study was conducted, the government of Aruba was considering whether to authorize the building of a dolphinarium on Aruba (Anonymous, 2011). Capturing and holding marine mammals in captivity for entertainment purposes is controversial because of concerns about the effects on their well-being as well as concerns about human safety

(Bekoff, 2008; Hunt *et al.*, 2008; Rose *et al.*, 2009). This study indicates that whale-watching could serve as an alternative to a dolphinarium on Aruba.

ACKNOWLEDGEMENTS

We are grateful to all participants who took the time to complete our questionnaire. We thank Ida and Henry Does for their hospitality. Angiolina Henriquez provided support and advice. Jennifer Ambler, Peter Balint, Tim Ragen, Larry Rockwood, George Sangster, Courtney Vail and an unanimous reviewer offered constructive comments on the manuscript. This study was supported by Prins Bernhard Culture Fund, George Mason University, Society for Marine Mammalogy, Lerner-Gray Fund for Marine Research of the American Museum of Natural History, Cetacean Society International, and Humane Society International, Aruban Department of Agriculture, Husbandry and Fisheries. The funders had no role in study design, data collection and analysis, decision to publish, or preparation of the manuscript.

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