



Original contribution

HUMAN PERCEPTIONS REGARDING ENDANGERED SPECIES CONSERVATION: A CASE STUDY OF SAONA ISLAND, DOMINICAN REPUBLIC

Thomas H. White Jr.¹, Arely Jhonson Camacho¹, Toby Bloom², Patricia Lancho Diéguez³ & Rita Sellares³

¹U.S. Fish and Wildlife Service, Puerto Rican Parrot Recovery Program, PO Box 1600, Río Grande, Puerto Rico 00745, FAX: 787-887-7512

²Humane Society International, 2100 L Street NW, Washington, DC 20037, USA.

³Fundación Dominicana de Estudios Marinos, Inc. (FUNDEMAR), Calle Sócrates Nolasco #6, Apto. 401, Ensanche Naco, Santo Domingo, República Dominicana

Abstract

Globally, human populations have caused increased demands on natural resources and the endangerment of numerous species, particularly on oceanic islands with limited resources. In such cases, attitudes and perceptions of resident human populations regarding natural resources are often the deciding factor in the success or failure of local species conservation efforts. As part of a proposed Hispaniolan Parrot (*Amazona ventralis*) conservation program on Saona island, Dominican Republic, local residents were surveyed to determine their knowledge of basic parrot biology as well as their opinions and attitudes regarding the importance of various aspects of parrot conservation. Comparative survey data were also collected on residents' opinions and attitudes regarding an ongoing Hawksbill Sea Turtle (*Eretmochelys imbricata*) conservation program on Saona. The study found that residents differed by gender in their knowledge of parrot biology, and also differed by gender in their opinions on the consumptive use of both parrots and sea turtles. Residents also differed in the underlying basis for their opinions and perceptions of each species, with most opinions based on biological factors in the case of sea turtles, as opposed to personal or philosophical reasons in the case of parrots. The sea turtle conservation program apparently has influenced local perceptions toward sea turtles on Saona. Future parrot conservation efforts on Saona should incorporate components of the ongoing sea turtle program, particularly those related to environmental education and direct involvement of local residents in conservation activities.

Key words: *Amazona ventralis*, Caribbean, environmental education, *Eretmochelys imbricata*, survey

Percepciones de la conservación de especies amenazadas: caso de estudio isla Saona, República Dominicana

Resumen

Globalmente, y particularmente en las islas con limitados recursos, la población humana ha causado el incremento de la demanda de recursos y ha amenazado a numerosas especies. En muchos casos, las actitudes y percepciones de los residentes sobre los recursos naturales son elementos decisivos en el éxito o fracaso de los esfuerzos de conservación. Como parte de la propuesta del Programa de Conservación de la Cotorra de La Española (*Amazona ventralis*) en la Isla Saona, República Dominicana, se encuestó a los residentes para determinar su conocimiento sobre la biología de la cotorra, así como sus opiniones y actitudes en relación con la importancia de varios aspectos de la conservación de la especie. También se colectaron datos y opiniones de los residentes sobre el Programa de Conservación de la Tortuga Carey (*Eretmochelys imbricata*) que se lleva a cabo en Saona. El estudio evidenció que los habitantes difirieron por género en su conocimiento sobre la biología de las cotorras y en su opinión en cuanto al uso para el consumo de cotorras y tortugas. Los encuestados también difirieron en la base para sus opiniones y percepciones para cada especie, la mayoría de las opiniones sobre las tortugas se basan en factores biológicos, mientras que en el caso de las cotorras se basan en aspectos personales o filosóficos. El programa de conservación de tortugas aparentemente ha influido localmente en las percepciones hacia las tortugas marinas en la Isla Saona. Un proyecto futuro de conservación de la cotorra podría incorporar componentes del proyecto actual de conservación de tortugas, particularmente aquellas relacionadas con la educación ambiental involucrando directamente a los residentes de la localidad en las actividades de conservación.

Palabras Clave: *Amazona ventralis*, Caribe, educación ambiental, encuesta, *Eretmochelys imbricata*.

*Author for correspondence: thomas_white@fws.gov

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Introduction

Globally, human population growths have caused increased demands on wildlife and other natural resources (e.g., Brash 1987, Newmark *et al.* 1993, Walters 2004, Gregory 2005, Ndenecho 2009), resulting in the endangerment and extinction of numerous species. This is particularly true on islands, where limited resources can exacerbate effects of human populations and attendant consumption patterns and development pressures (López *et al.* 2001, Abel 2003, Cuarón *et al.* 2004). In the absence of effective conservation and management strategies, human populations on islands can have a significant negative impact on local natural resources (Brash 1987, López *et al.* 2001). However, humans residing on islands can also effectively protect and conserve insular resources via application of appropriate biological, ecological and sociological models (e.g., Tershy *et al.* 2002, Kerr 2005, González *et al.* 2008, RNPT 2008). For example, local environmental education programs combined with direct involvement and cooperation of local communities proved instrumental in the successful eradication of invasive exotic mammals from several islands in northwest Mexico (Tershy *et al.* 2002), as well as from several Pacific islands (Saunders *et al.* 2007). Indeed, it is the combination of knowledge, attitudes and perceptions regarding natural resources that is most often the deciding factor in the ultimate success or failure of local conservation initiatives (Gillingham & Lee 1999, Sanderson *et al.* 2002, Gregory 2005, Lepp & Holland 2006, Holmes 2007, Ferse *et al.* 2010).

An illustrative example of a socio-ecological nexus in natural resource conservation can be found in the case of Saona Island, Dominican Republic. Saona Island is a small (110 km²) Caribbean island lying just off the southeastern coast of the Dominican Republic (which is itself part of the larger island of Hispaniola). Saona is unique among Caribbean islands in that although the entire island is part of a legally-protected National Park (Parque Nacional del Este), it also has a resident human population of approximately 280 persons in the village of Mano Juan (ONE 2002). Most residents of Saona make their living from fishing, subsistence farming, or the growing local tourist trade (Abreu & Guerrero 1997). Saona Island is also home to several

endemic, threatened, or endangered plant and animal species (Abreu & Guerrero 1997), most notably the Hispaniolan Parrot (*Amazona ventralis*) and the Hawksbill Turtle (*Eretmochelys imbricata*). The Hispaniolan Parrot is endemic to the island of Hispaniola and its offshore islands (including Saona), while the Hawksbill Turtle is a sea turtle found throughout the Caribbean basin and most of the tropical and subtropical Atlantic, Pacific and Indian oceans. Both species, however, face significant threats to their continued survival throughout their geographic ranges. Currently, the Hispaniolan Parrot is categorized as Vulnerable by the International Union for Conservation of Nature and Natural Resources (IUCN 2010), while the Hawksbill Turtle is categorized as Critically Endangered by the same entity. Although international commercialization of both species is prohibited by CITES regulations (UNEP-WCMC 2010), there has for many years – literally centuries – existed a lucrative trade in products made from hawksbill turtle shells, as well as for their meat and eggs (Troëng & Drews 2004, Bräutigam & Eckert 2006). The Hispaniolan Parrot (hereafter, “parrot”) has also long been a traditional household pet in the Dominican Republic, and large numbers of chicks are taken each year from wild nests to supply the illegal local pet trade. In some areas of the country, up to 80-100% of parrot nests are robbed annually to obtain chicks for sale as household pets (León & Garrido 2009).

Because of the international importance of Saona Island as a nesting area for the Hawksbill and other sea turtles (Tomás *et al.* 2007), and the recent documentation of the Dominican Republic as a major source of illegal sea turtle products (Reuter & Allan 2006), a Hawksbill Sea Turtle conservation initiative on Saona was begun in 2006. This ongoing initiative, led by several non-government organizations (NGOs) in collaboration with the Dominican Republic Secretary of Environment and Natural Resources (SEMARENA), consists of local environmental education programs regarding sea turtle ecology and conservation (León 2009), as well as active protection and intervention by members of the local community to save “at-risk” turtle nests from destruction or depredation (see Das 2003 for an example of this technique). To date however, no such conservation measures have been implemented on behalf of the parrot on Saona Island.

In planning future conservation efforts for the parrot on Saona, a survey was first conducted to assess the current knowledge level of local residents regarding the parrot and its basic biology, including their opinions and perceptions relating to its conservation importance, as well as opinions regarding the local practice of keeping wild parrots as pets. The objective of the survey was to acquire baseline information which could be used to develop a parrot conservation program on Saona Island. Understanding local beliefs, opinions, and perceptions can be invaluable for properly tailoring specific conservation actions to local cultural realities (Infield 1988, Lepp & Holland 2006, Holmes 2007, Larijani & Yeshodhara 2008, Hosseini *et al.* 2009, Ndenecho 2009, Campbell 2010). For instance, Lepp & Holland (2006) found that local attitudes towards resource conservation efforts differed depending on whether such efforts were led by the government or by local communities and hypothesized that community-based efforts engendered more voluntary compliance and active participation than state-led efforts, a view reiterated by Adams & Hutton (2007) and Ferse *et al.* (2010). Further, because of the established sea turtle conservation initiative on Saona, local opinions and perceptions regarding the conservation of sea turtles were also assessed relative to those regarding parrots. Differences in species-specific perceptions could provide a potential, albeit partial, indicator of the influence of the ongoing sea turtle conservation education and active community involvement on local beliefs and opinions (Infield 1988, Gillingham & Lee 1999, Campbell 2010), thereby providing potentially useful insights for parrot conservation efforts. Thus, the survey also included comparative questions (i.e., to those of parrots) regarding sea turtle conservation and its importance, as well as opinions and perceptions regarding consumptive use of sea turtles. We use the term “perceptions” herein to include the suite of knowledge, opinions and attitudes held by persons relative to a given resource and its use and conservation.

Materials and Methods

Survey questionnaire design and administration

We constructed a survey instrument consisting of 25 primary questions regarding parrots and Hawksbill

turtles on Saona (Appendix 1), with some questions ($n = 7$) having an associated follow-up question depending on response to the primary question (Converse & Presser 1986). For example, if a respondent answered “yes” to the question: “Have you seen parrots on Saona Island?” the follow-up question was then: “In which area?” An additional 3 questions asked specific demographic information of respondents. In total, there were 28 distinct questions that were posed to all respondents, independent of follow-up questions. We used a combination of dichotomous (i.e., yes-no) questions, open-ended questions, and ranking questions (Converse & Presser 1986, Fowler 1995). Ranking questions were posed either with 3-level response options (e.g., more, less, the same) or with 5-point Likert scale response options (Fowler 1995). All questions and response options were in Spanish, and all interviewers were fluent in said language. Most interviewers had previously worked either on Saona Island or in Parque Nacional del Este, and were known personally to several residents. One co-author (AJC), who was also a Dominican national, proofread all questions to ensure there were no potential misunderstandings or unintended idiomatic nuances.

The survey was conducted during July 20-21, 2010 in the village of Mano Juan, located on the south-central coast of Saona Island (18° 07'46" N; 68° 44'00" W; Figure 1). We used a systematic sampling design, with each interviewer ($n = 5$) assigned a specific sector of the village, and each day all adult (i.e., ≥ 15 years) residents encountered therein were interviewed. Interviews were conducted in residents' homes, gardens, places of business, or in village streets. Interviewers recorded all responses directly onto standardized survey forms (Appendix 1). Because of the presence of occasional visitors and transient workers on the island, we first asked potential respondents if they were a resident of Saona as a “pre-question” to ensure that only bona fide residents of the island were interviewed. Further, to increase likelihood of truthful responses, we did not ask respondents their name and also advised them that their responses were confidential (Fowler 1995).

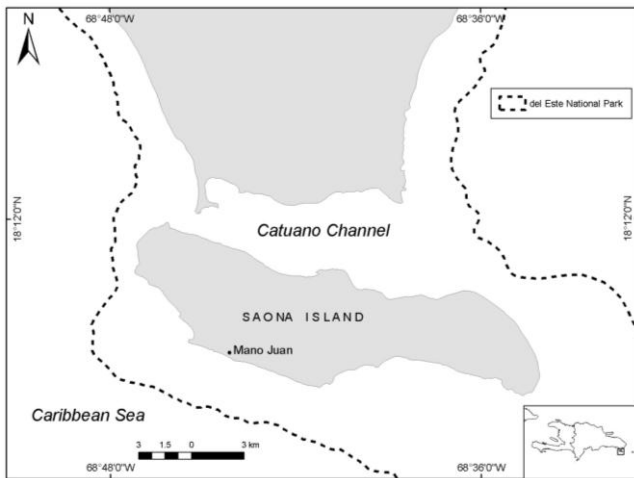


Figure 1. Location of the village of Mano Juan on Saona Island, and location of Saona Island relative to the island of Hispaniola (inset). Map prepared by the Remote Sensing Laboratory, Instituto Tecnológico de Santo Domingo, Dominican Republic.

Data analyses

We used the MINITAB Statistical Software Release 13 for Windows (MINITAB 2000) and Excel® spreadsheets for all statistical analyses. Response frequencies of categorical variables were compared using Chi-square tests. Continuous variables were compared using two-sample t-tests. We examined relationships between continuous and categorical variables using logistic regressions, and we used Pearson product-moment correlations to determine degree of association between categorical variables. We used Cronbach's Alpha coefficient (Gliem & Gliem 2003) to assess reliability of Likert scale responses regarding respondents' opinions on the relative importance of species' conservation and hypothetical species extinctions. Because of small sample sizes, we used $\alpha = 0.10$ for statistical significance to minimize Type II error rates (Taylor & Gerrodette 1993).

We interviewed a total of 73 residents; thus, our sample comprised approximately 38% of the island's adult population (~190). Our survey sampling error was $\pm 3.3\%$, based on sample size, total target population, observed sample proportion, and confidence interval of 90%. Cronbach's Alpha coefficient for the subset of conservation and extinction opinion questions was 0.77, indicating

acceptable internal consistency and reliability (Gliem & Gliem 2003, Kuvan & Akan 2005).

For the demographic question regarding respondent's occupation, responses were categorized into three general categories: 1) Agriculture/Fishing, 2) Tourism, and 3) Other (e.g., housewife, teacher, military, student). We categorized and coded responses to open-ended questions in order to analyze these data quantitatively. Responses to open-ended questions relative to the value or conservation importance of either parrots or sea turtles were classified into two categories: 1) Personal/Philosophical, or 2) Biological. Likewise, responses to questions about why wild parrots should – or should not – be kept as pets, and those regarding opinions for or against consumptive use of sea turtles, were also categorized as either Personal/Philosophical or Biological. Examples of personal/philosophical reasons included economic reasons and statements such as “because they're beautiful”, “wild animals should be free”, “cages are like jails”, or “they don't harm anyone”. Biological reasons included statements such as “they're part of the ecosystem”, “to increase reproduction”, “they're endangered”, or “they disperse seeds”. For responses to open-ended questions regarding what residents thought should be done to best protect and conserve parrots and sea turtles, we classified such measures as either “Active” or “Passive”. Examples of active conservation measures included such suggestions as “more vigilance and enforcement”, “better educate the people”, “take their eggs and incubate them”, or “raise chicks in captivity and then release them”. Passive measures included suggestions such as “leave them alone”, “don't kill them”, “don't eat their eggs”, or “don't catch them”.

Results

Respondent demographics

Of the respondents, 37 (51%) were male and 36 (49%) were female. Respondent ages ranged from 15-76 years, and mean age did not differ ($t = 0.00$; $P = 0.99$, $df = 71$) between males (35.5 yrs.) and females (35.5 yrs). Moreover, mean number of years lived on Saona also did not differ ($t = 0.54$; $P = 0.59$; $df = 71$) between male (21.7 yrs) and female (19.5 yrs) respondents. Not surprisingly, respondent

occupations differed ($\chi^2 = 18.36$; $P < 0.001$; $df = 2$) by gender, with fishing or agriculture being the primary occupation (46%) for males, while jobs related to tourism and “other” accounted in equal share for over 97% of female occupations. Tourism was also an important source of male employment, as nearly 30% of male respondents indicated this as their primary occupation.

Perceptions regarding parrots

Overall, 63 respondents (86%) reported having seen parrots on Saona Island, with no difference ($\chi^2 = 0.53$; $P = 0.47$; $df = 1$) between males and females (Figure 2). There was a positive relationship between number of years lived on Saona and the sighting of parrots by female residents ($Z = 1.68$; $P = 0.09$), although the relationship was not quite significant for male residents ($Z = 1.60$; $P = 0.11$). Further, 84% of all respondents claimed to have knowledge of parrots nesting on Saona, and again proportions did not differ ($\chi^2 = 0.47$; $P = 0.49$; $df = 1$) by gender (Fig. 2). There was also a significant positive relationship between number of years lived on Saona and knowledge of parrots’ nesting for males ($Z = 1.76$; $P = 0.08$), but not for females ($Z = 1.19$; $P = 0.24$). Regarding basic parrot biology, male and female respondents did not differ ($\chi^2 = 0.004$; $P = 0.95$; $df = 1$) regarding knowledge of when parrot chicks fledged. Seventy-five percent of both genders stated that they did not know – or incorrectly stated – parrot fledging dates. However, when asked about what parrots ate, male respondents were more knowledgeable ($\chi^2 = 4.12$; $P = 0.04$; $df = 1$), with 54% of males correctly identifying local parrot foods, while only 31% of females did so (Fig. 2). Similarly, more males (65%) than females (44%) ($\chi^2 = 3.07$; $P = 0.08$; $df = 1$) accurately stated the typical number of parrot chicks per nest. Because of the observed relationship between number of years lived on Saona by males and knowledge of parrots’ nesting, and apparent gender-related differences in knowledge of parrot biology, we also computed partial correlation coefficients (Sokal & Rohlf 1981) to control for the effect of years of residency on male respondents’ knowledge of parrot biology. Accordingly, male respondents who had knowledge of parrots’ nesting on Saona also were more likely to correctly identify

local parrot foods ($r_s = 0.29$; $P = 0.08$) and the number of parrot chicks per nest ($r_s = 0.52$; $P < 0.01$), but not chick fledging dates ($r_s = 0.09$; $P = 0.62$). On the other hand, there was no correlation between female respondents’ knowledge of parrots’ nesting on Saona and their knowledge of parrot foods ($r_s = 0.02$; $P = 0.90$), or number of chicks ($r_s = 0.16$; $P = 0.36$), and only marginally so with fledging dates ($r_s = 0.28$; $P = 0.09$).

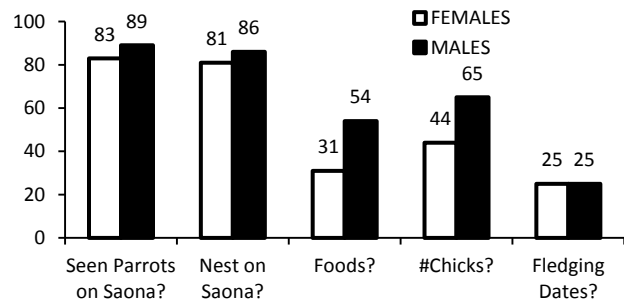


Figure 2. Percentage of respondents by gender who answered either affirmatively or correctly questions relating to Hispaniolan parrots on Saona Island, Dominican Republic.

When asked about the trend of the parrot population on Saona over the past 10 years, most respondents (49%) believed the population had increased, while 29% believed the population had declined and 22% thought there had been no change, and in this regard male and female respondents did not differ ($\chi^2 = 4.10$; $P = 0.13$; $df = 2$). No relationship was detected between the number of years lived on Saona and residents’ opinions on parrot population trends for either males ($Z = 0.13$; $P = 0.89$) or females ($Z = 0.44$; $P = 0.66$). However, opinions on whether or not wild parrots should be kept as household pets differed significantly ($\chi^2 = 6.91$; $P < 0.01$, $df = 1$) between males and females, with 56% of females advocating parrots as pets, compared to only 16% of males.

Among the underlying reasons given either for or against keeping wild parrots as pets, males and females did not differ ($\chi^2 = 1.19$; $P = 0.28$; $df = 1$), with 76% of females and 86% of males citing personal/philosophical reasons, as opposed to biological reasons, for their opinion (Figure 3). When asked the relative importance (i.e., very, somewhat, not) of parrot conservation, all respondents of both

genders stated that it was “very important”, although the underlying reasons differed ($\chi^2 = 4.47$; $P = 0.04$; $df = 1$) by gender, with more females (86%) than males (64%) citing personal/philosophical, rather than biological reasons for their opinion (Figure 3). However, males and females did not differ ($\chi^2 = 0.05$; $P = 0.82$; $df = 1$) regarding their opinions on the best conservation measures for parrots; overall, 53% of respondents suggested active measures, while 47% suggested passive measures for parrot conservation. Responding to the question of how they would feel if all parrots “disappeared” (i.e., became extinct), male and female respondents also did not differ ($\chi^2 = 2.06$; $P = 0.56$; $df = 3$), with 97% of both genders indicating “sad” or “very sad” as their response. Finally, when asked their opinion on the merits of any potential parrot conservation project on Saona, 99% of all respondents indicated approval of such an idea.

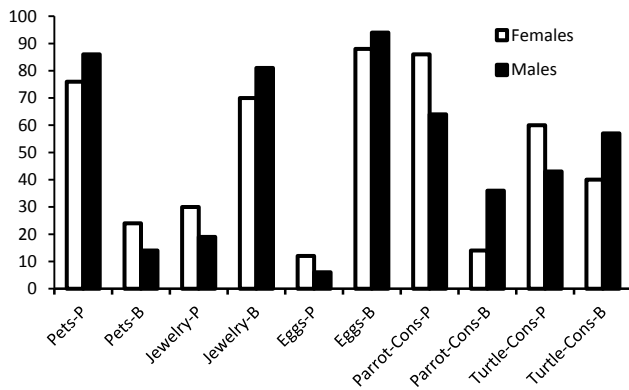


Figure 3. Pairwise percentages of male and female respondents whose opinions regarding various aspects of parrot and sea turtle conservation were based on either Personal/Philosophical (P) reasons or Biological (B) reasons.

Perceptions regarding hawksbill turtles

Overall, 56 respondents (77%) reported having seen hawksbill turtles on Saona Island and surrounding waters, although this differed by gender ($\chi^2 = 9.68$; $P < 0.01$; $df = 1$), with more males (92%) than females (61%) reporting sightings. As with parrot sightings, there was a significant positive relationship between turtle sightings and number of years lived on Saona by female residents ($Z = 2.73$; $P < 0.01$) but not for males ($Z = -0.87$; $P = 0.38$).

When asked about the population trend of Hawksbill Turtles on Saona over the past 10 years, most residents (59%) thought the population had increased, while 29% believed the population had decreased and 12% thought there had been no change, and males and females did not differ ($\chi^2 = 0.17$; $P = 0.92$; $df = 2$) in their perceptions. Further, there was no relationship between the number of years lived on Saona and residents' opinions on sea turtle population trends for either males ($Z = -0.36$; $P = 0.72$) or females ($Z = -0.21$; $P = 0.83$). Regarding consumptive use of sea turtles, male and female respondents differed substantially ($\chi^2 = 9.23$; $P < 0.01$; $df = 1$) in their opinions on the sale of jewelry items made from hawksbill turtles. More females (22%) than males (0%) thought that such items should be commercialized. However, when asked if they approved of eating sea turtle eggs, there was no difference ($\chi^2 = 1.18$; $P = 0.28$; $df = 1$) between male and female opinions, with most (93%) disapproving of the practice.

Reasons underlying opinions on the sale of sea turtle jewelry items did not differ ($\chi^2 = 1.07$; $P = 0.30$; $df = 1$) between males and females, with most (76%) citing biological, rather than personal/philosophical reasons, for their position (Figure 3). Notwithstanding, in those cases ($n = 8$) in which respondents did approve of jewelry items, their underlying reasons were all personal/philosophical, rather than biological. There was also no difference between genders ($\chi^2 = 0.74$; $P = 0.39$; $df = 1$) in the reasons underlying opinions on consumption of sea turtle eggs, with again most (91%) citing biological reasons for their opinions (Figure 4). When asked the relative importance of sea turtle conservation, 97% of both genders opined that it was “very important”, and the underlying reasons did not differ ($\chi^2 = 1.80$; $P = 0.18$; $df = 1$) by gender, with 52% of all respondents citing personal/philosophical and 48% citing biological reasons for their opinions (Figure 4). Regarding opinions on the best conservation measures for hawksbill turtles, males and females did not differ ($\chi^2 = 1.21$; $P = 0.27$; $df = 1$), with 55% of all respondents suggesting active measures and 45% suggesting passive measures. Responding to the question of how they would feel if all Hawksbill Turtles “disappeared” (i.e., became extinct), males and

females also did not differ ($\chi^2 = 4.80$; $P = 0.31$; $df = 4$), with 97% of both genders indicating “sad” or “very sad” as their response. Further, when asked if they supported the ongoing sea turtle conservation initiative on Saona, 99% of all respondents affirmed their support of said program.

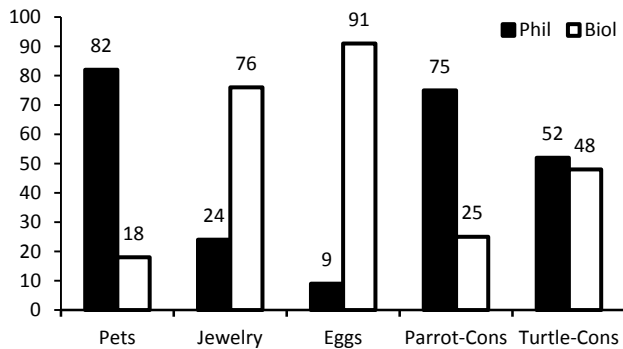


Figure 4. Total percentages of all respondents (male and female) whose opinions regarding parrots and sea turtles were based on either Personal/Philosophical or Biological reasons.

Comparative perceptions regarding parrots versus hawksbill turtles

Respondents differed dramatically ($\chi^2 = 79.93$; $P < 0.001$; $df = 1$) in the basis for their opinions on consumptive use of sea turtles in general (i.e., jewelry and eggs) versus the “consumptive” use of wild parrots (i.e., household pets). Regarding consumptive use of sea turtles, 89% cited biological reasons for their opinions (Figure 4), while the converse was true for wild parrots as pets, with 82% citing personal/philosophical reasons for their opinions. In fact, the comments most frequently expressed in support of wild parrots as pets were “because they’re beautiful” and “because they talk”. Similarly, reasons given by the few ($n = 8$) respondents in support of turtle shell jewelry were mostly “because they’re beautiful” (i.e., philosophical) and “because tourists like them” (i.e., economic). Moreover, the basis for overall opinions on the relative importance of sea turtle conservation versus that of parrots also differed ($\chi^2 = 7.35$; $P < 0.01$; $df = 1$), with 75% of respondents citing personal/philosophical reasons in the case of parrots, compared to only 52% citing such reasons for sea turtle conservation (Figure 4). Nevertheless, sentiments expressed by individual

respondents regarding hypothetical species extinction were highly correlated across species among both males ($r_s = 0.82$; $P < 0.001$) and females ($r_s = 0.88$, $P < 0.001$). Extinction of either species generally elicited the same response from individuals. Although overall opinions regarding population trends did not differ ($\chi^2 = 2.58$; $P = 0.28$; $df = 2$) by species, female respondents who believed the population of one species was either increasing, decreasing or stable tended to hold the same opinion regarding the other species ($r_s = 0.39$; $P = 0.04$), while males did not show this tendency ($r_s = 0.20$; $P = 0.29$). Furthermore, female respondents who condoned the sale of sea turtle jewelry products were likely to also advocate keeping wild parrots as pets ($r_s = 0.49$; $P < 0.01$) as well as to condone the eating of sea turtle eggs ($r_s = 0.36$; $P = 0.04$). Regarding residents’ recommendations of either active or passive conservation measures, although categorical proportions did not differ between species ($\chi^2 = 0.06$; $P = 0.80$; $df = 1$), there was a greater consistency amongst the specific active recommendations for sea turtles than amongst those for parrots. For example, 45% ($n = 17$) of all active recommendations for sea turtles directly referenced the ongoing sea turtle conservation initiative as “the best way to protect and conserve” sea turtles on Saona. Moreover, 17% ($n = 6$) of the active recommendations for parrots also suggested the ongoing sea turtle initiative as an appropriate model for parrot conservation. Most other active conservation recommendations for parrots consisted of protection of nests and nesting habitat (30%) and increased public education (14%). However, because the sea turtle conservation initiative also consists of nest protection and public education, the actual proportion of such recommendations for parrots – both direct and indirect – was 61% ($n = 17$).

Discussion

Our results suggest a high level of local support for not only the ongoing sea turtle conservation initiative, but also for the idea of a similar conservation effort for parrots on Saona Island. Residents of Saona in general demonstrated concern for the future of the Hispaniolan Parrot and the Hawksbill Turtle, as evidenced by their broad consensus on the importance of both species’ conservation, as well as their

sentiments regarding hypothetical extinction of either species. These findings suggest that residents consider both species as inherently valuable. In this regard, our findings were consistent with those of other studies which have reported high levels of local support for conservation of native species, at least in principle (e.g., Infield 1988, Newmark *et al.* 1993, Gillingham & Lee 1999). In this study however, while men and women held very similar opinions on the overall importance of species' conservation, they differed substantially in terms of their specific opinions regarding the "consumptive" use of both parrots and sea turtles. The fact that women were far more approving of having wild parrots as pets, as well as the commercialization of sea turtle jewelry items likely reflects gender-related aesthetic considerations. This contention is supported by female respondents' strong bias for personal/philosophical reasons underlying their opinions both on wild parrots as pets and for their approval of turtle shell jewelry. However, economic factors may also influence female opinions regarding turtle shell jewelry, given that these items – although illegal – are purchased by some tourists. Gillingham & Lee (1999) reported similar findings and attributed gender-related differences in rural conservation attitudes to differences in how wildlife-related costs and benefits were perceived in daily life. In this case, the end-users of the resource (i.e., pet parrots, jewelry) are primarily women, which may explain their greater approval of these items.

In general, men were more knowledgeable than women regarding basic parrot biology on Saona. This is not surprising, considering that nearly half of male respondents reported fishing or agriculture as their occupations, both of which pursuits may provide ample opportunities to closely observe wild parrots, as well as sea turtles, either on or around the island. Moreover, in traditional rural Dominican society, women – unlike men – seldom venture deep into forested areas where most parrots and their nests are encountered. Balaguera-Reina & González-Maya (2010) reported similar gender-related differences in knowledge of crocodylians among residents of the Caribbean region of Colombia. Nevertheless, despite their apparent greater biological knowledge of parrots, most men stated that they did not know when parrot chicks fledged. This seemingly incongruous finding may have resulted from an attempt at "social

desirability" (Fowler 1995) via intentional evasiveness by some male respondents, given that nest-robbing for parrot chicks is a traditional, albeit illegal, local activity and those who are – or have been – engaged in such may not have wanted to arouse interviewers' suspicions by appearing "too knowledgeable" of parrot nesting biology. Indeed, men who had knowledge of parrots' nesting on Saona were also those who most often correctly knew the number of chicks per nest.

Campbell (2010) stated that the "Top 20 research questions" for sea turtle conservation over the next decade included "Are current conservation models working?" In this context, our study suggests that the dramatic species-specific differences in the underlying reasons either for or against consumptive use of sea turtles and parrots may provide a partial indicator of the influence of the ongoing sea turtle conservation initiative on Saona. Since 2006, residents of Saona have been systematically exposed to scientific information regarding sea turtle ecology and the ecological effects of the local consumptive use of sea turtles. This educational campaign has consisted of workshops, summer camps for Saona schoolchildren, classroom activities, citizens' active participation in sea turtle conservation, and the establishment of a sea turtle educational center in the village of Mano Juan (León 2009). However, no such educational efforts have been conducted regarding parrots on Saona. Accordingly, we found that most residents not only disapproved of the consumptive use of sea turtles, but also their stated rationale for said position was rooted primarily in biological concepts. This view contrasted markedly with attitudes and perceptions regarding parrots, most of which were based on philosophical constructs such as aesthetics. In a similar study, Balaguera-Reina & González-Maya (2010) found that few residents adjacent to a national park in Colombia recognized the ecological role of crocodylians, and that most expressed their opinions of these species from an economic (i.e., anthropocentric) perspective. Vaske & Donnelly (1999) also reported similar findings and concluded that individuals with more biocentric belief systems were more likely to have positive conservation attitudes than those with more anthropocentric (e.g., "personal/philosophical") belief systems. While we recognize that we have no data on respondents' perceptions of sea turtles before

the ongoing conservation initiative, our findings nevertheless strongly suggest that the current perceptions of Saona residents relative to sea turtles are much more biocentric than those relative to parrots.

However, one of the most significant potential effects of the sea turtle initiative may be found in the comparison of respondents' suggestions of the "best" conservation measures for parrots and sea turtles. While conservation recommendations for parrots ranged broadly from the mundane (e.g., "leave them alone") to the insightful (e.g., "conduct a habitat study"), recommendations for sea turtles frequently specified the ongoing initiative as the best conservation measure. For parrot conservation, there was no single unifying concept expressed as clearly and consistently as that for sea turtles. Indeed, several respondents even recommended adapting the sea turtle initiative to the protection and conservation of parrots. This cross-species recommendation suggests a degree of conceptual endorsement of the sea turtle initiative by numerous residents of Saona Island.

Conclusions

Our findings suggest some potential avenues for improving the conservation of both Hispaniolan Parrots and Hawksbill Turtles on Saona Island. Given the apparent success of the sea turtle initiative in gaining local acceptance as a viable conservation effort, it may be possible to develop a similar strategy on behalf of parrots on Saona. For example, positive results could likely be achieved by dispelling some current misconceptions about parrots and disseminating accurate ecological information about parrots and the adverse effects of the practice of nest-robbing to obtain household pets. In fact, a relevant model already exists in the recent efforts to combat the illegal trade in wild parrots in and around Parque Nacional Jaragua in southwestern Dominican Republic (see León & Garrido 2009). In particular, creative and effective means to better inform female residents of the ecological effects of the illegal pet trade may help to reduce their acceptability of this practice, and thereby reduce the local demand for wild parrot chicks. Such an approach has been an integral part of the ongoing sea turtle initiative (León 2009), and although some female residents still

approve of items such as turtle shell jewelry, their numbers are apparently far less than those who approve of wild parrots as pets. Consequently, continued efforts to sensitize female residents to the local impact of the turtle shell jewelry trade are also warranted; indeed, the growing numbers of foreign tourists who visit Saona should also be included in sea turtle educational efforts, given the statements by at least some residents that they approved of the commerce in turtle shell jewelry "because tourists like them".

In addition to parrot-oriented educational outreach, efforts to assess the current status of parrot nesting habitat and threats thereto on Saona Island should also be an integral part of any future parrot conservation initiative. In fact, these efforts were also recommended by several residents during the interviews; results of which would provide not only valuable biological data, but also site-specific educational information which could increase the relevance of any parrot conservation program to local residents. Upon understanding that a situation exists locally, as opposed to a more abstract "far away" context, residents often assign a greater importance to the underlying causative issues (Liu & Var 1986, Weaver & Lawton 2001, Kuvan & Akan 2005).

Ndenecho (2009) stated: "There can be no meaningful conservation without the active involvement of local people", and Saona Island is no exception. Any conservation initiative for parrots on Saona Island must also actively involve local residents, just as the ongoing sea turtle initiative has demonstrated. In this sense, the sea turtle initiative constitutes a valuable model on which to base parrot conservation efforts. To this end, an adaptive management approach will be essential as additional information, both biological and sociological, is acquired during the initial development of a parrot conservation program. Local residents should be involved in all phases of program development; indeed, this study is the first step in that direction. Importantly, residents must have a sense of local ownership or co-management of the program, and also perceive that some benefit has accrued to them from their efforts. Efforts to protect and promote the local wild parrot population for its ecotourism potential amongst visiting tourists could

present opportunities for tangible benefits to the local community. For example, interpretive trails, exhibits and handicrafts using the Hispaniolan Parrot in the wild as a focal species, with local residents as vendors and paid guides, could help diversify tourism-generated revenue on Saona. This approach could foster a greater understanding of, and appreciation for, the Hispaniolan Parrot and its habitat on Saona by residents and visitors alike. Such strategies have

had success elsewhere (see Goodwin and Swingland 1996, Stronza 2000, Báez 2002). Shifting the current wild parrot valuation paradigm from that of “a bird in the hand” (i.e., household pets) to one of “two in the bush” (e.g., ecotourism) should become a conservation priority to increase long-term viability of the species and its enjoyment by future generations on Saona Island.

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