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HARNESSING RECREATIONAL DIVERS FOR THE COLLECTION OF SEA TURTLE DATA AROUND THE CAYMAN ISLANDS

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Here we present data from a 26-month program "Caribbean Turtle Watch," initiated as part of the "Turtles in the Caribbean Overseas Territories" (TCOT) program and designed to harness recreational divers to assess in-water populations of marine turtles in the Cayman Islands. We recorded 521 dives in Grand Cayman and Little Cayman between September 1, 2002 and November 29, 2003. Data, presented as the mean number of turtles sighted per dive, provide insight into spatiotemporal patterns of sightings as a proxy of abundance. Widespread sightings were recorded of two marine turtle species, green turtles *Chelonia mydas* and hawksbill turtles *Eretmochelys imbricata*, around both islands. There was no obvious relationship between the existence of Marine Protected Areas (MPAs) and the abundance of turtle sightings. Diving is allowed in Marine Park Zones and dive pressure may impact overall habitat quality in these areas. The vast majority of sightings of both species (94% in each case) were considered to be juvenile or subadults. While turtle sighting potential was not a major influence on dive site choice, actual turtle sighting greatly enhanced dive enjoyment. Spatiotemporal and morphological analyses of data collected by volunteers compared favorably with those based on data collected by scientists. This technique is transferable to other countries and may hold particular value in areas where resources assigned to marine turtle research are low.

Key words: Marine turtles; Cayman Islands; Population monitoring; Volunteers; Ecotourism; Recreational divers

Introduction

The recruitment of recreational divers for basic biodiversity assessment provides for rapid accumulation of uncomplicated observation data over a wide marine area throughout the year. The use of volunteers in marine observation and data collection has been documented in coral reef surveys (Chou, 1994), marine turtle and fish abundance assessments (Coyne & Pattengill-Semmens, 2008; Pattengil-Semmens & Semmens, 2003), coastal zone management (Jacoby, Manning, Fritz, &

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Rose, 1997; Wescott, 1998), and monitoring of lobster (Ellis & Cowan, 2002) and seahorse population distributions (Goffredo, Piccinetti, & Zaccanti, 2004). The true value of the data collected during these surveys has been the focus of much attention (Darwall & Dulvy, 1996; Halusky, Seaman, & Strawbridge, 1994; Mumby, Harbourne, Raines, & Ridley, 1995).

Recently, studies focused on "volunteer tourism" and "research ecotourism" have shown these programs to have multiple benefits for both tourists and host communities (Clifton & Benson, 2006; Gray & Campbell, 2007). Similarly, community participation programs involved in marine turtle conservation and focused largely on protection of the nesting beach, education programs (Kapaurusinghe, 2000a), and/or conversion of individuals reliant on sea turtle resources to alternative or more regulated means of economic support (e.g., eco or marine turtle tourism) (Campbell, 1998; Kapaurusinghe, 2000b) have demonstrated evidence of benefits to all involved. Few studies have, however, capitalized on the presence of volunteer observers in the water where sea turtles are present as a means to collect data. In areas where there is a high level of sea tourism, this potentially huge resource could assist research programs worldwide to overcome budget and resource constraints (Foster-Smith & Evans, 2003) and consequently contribute significantly to national and regional policymaking, at very little cost.

Diving in the Cayman Islands is considered world class and dive tourism accounts for 40% of all air arrivals and 11% of all cruise arrivals [Cayman Islands Government (CIG) Department of Tourism, unpublished data]. Cruise ship arrivals increased during the period of this study (2002–2003) and continue to do so, while air arrivals remain stable (CIG Department of Tourism, unpublished data). These data suggest that during 2002 and 2003 the mean annual number of divers arriving in Cayman was >300,000.

The Marine Parks system in the Cayman Islands was established in 1986 under the Marine Conservation Law in response to increasing pressure on marine resources by an ever-increasing tourism industry and expanding local population (Ebanks & Bush, 1990). The law prohibits the touching or taking of anything alive or dead in Marine Park Areas (Cayman Islands Government, 1986). This zoning has been mostly applied in areas of known heavy use by fishermen and dive vessels around Grand and Little Cayman. A system of moorings was established at this time to assist vessels wishing to anchor in areas where coral may potentially be damaged. Moorings are not restricted to Marine Park Areas.

The majority of the islands' commercial diving activity is concentrated on the lower/seaward margins of two submerged marine terraces and the "wall," a submerged vertical cliff face surrounding Grand and Little Cayman (Regions 1, 2, and 6, Fig. 2). Factors influencing choice of dive site by dive operators in Cayman are many and superimposed upon individual site characteristics and associated flora and fauna are hydrographical and meteorological conditions, such as exposure to wind and wave activity and ease of accessibility.

The Marine Turtle Research Project (MTRP) conducted by the Cayman Islands Department of Environment (CIDOE) has detected limited reproductive populations of green and loggerhead turtles on all three islands (Aiken et al., 2001; Bell et al., 2007), and juvenile foraging aggregations of hawksbill and to some extent green turtles in Little and Grand Cayman (Blumenthal et al., 2003; Blumenthal et al., 2007; Blumenthal et al., in press). While the beach monitoring component of the MTRP, initiated to assess Cayman's nesting marine turtle population, is currently in its 12th consecutive year of country-wide standardized monitoring, the in-water capture effort to date has been less comprehensive in its spatial and temporal coverage. Limited resources have restricted research efforts to known foraging areas and wider spatiotemporal surveys around Grand and Little Cayman have been limited. Since turtle fishing became regulated in the Cayman Islands in 1996, limited additional data on captures of large subadult and adult turtles have been recorded through catch assessment of this extremely restricted turtle fishery (Bell et al., 2006)

Here we outline the results of a 26-month program "Caribbean Turtle Watch" initiated in the Cayman Islands as part of Turtles in the Caribbean Overseas Territories (TCOT), a project that spanned all United Kingdom Overseas Territories in the Caribbean (Godley, Broderick, Campbell, Ranger,

& Richardson, 2004). The dive survey component of the project was designed to recruit recreational divers and exploit their presence in the water to assess marine turtle species present at dive sites throughout Grand and Little Cayman. Hawksbill turtles often forage on sponges in coral reef habitat (Meylan, 1988) and are therefore often present in the same areas as divers who choose these areas for their aesthetic qualities. Though they feed primarily on seagrass, green turtles are also known to feed on algae found in coral reef areas (Limpus & Reed, 1985). These charismatic mega-fauna are easily identifiable and actively forage during daylight hours (Balazs, 1996; Van Dam & Diez, 1996) and are therefore often encountered by divers.

Where available, observer data are compared with actual capture data collected by CIDOE research officers to assess the quality of the data collected by observers. Furthermore, these data are analyzed to gain insight into the relative spatial distribution of turtles in Cayman waters, seasonal patterns of observations, size classes of turtles present, and an assessment of the value of turtle sightings to divers and, ultimately, dive tourism in the Cayman Islands. Several important caveats are described and reviewed and a final evaluation of the value of this type of study and the use of volunteers in the collection of marine ecological data is given.

Study Site

The Cayman Islands are located in the Caribbean Sea (Grand Cayman: 19°21N, 81°17W; Little Cayman: 19°43N, 80°03W; Cayman Brac: 19°43N, 79°51W) (Fig. 1). The three islands are low-lying emergent carbonate sections of the Cayman ridge. All three islands lie predominantly east–west in orientation along their main axis, but only Grand Cayman is wide enough to create a truly leeward shore, sheltered from both wind and wave activity along its westward coastline. The coastal shelf around Grand and Little Cayman is narrow, typically less than 1 km wide, and consists of two seaward sloping terraces, the upper from 3 to 10 m and associated with two marine environments, lagoons (Sounds), and a fringing reef structure and the lower from 15 to 25 m and associated with the shelf-edge reef or deep reef/wall (Rigby & Roberts, 1976). The Caribbean Current generally flows west at an average speed of 0.3 m s^{-1} and can be detected to a depth of 300 m (Darbyshire, Bellamy, & Jones, 1976). Large-scale oceanic currents predominantly control the dynamics of water movement around the Islands.

Methods

Survey forms were distributed to dive operators on Grand and Little Cayman. Upon voluntary agreement to enter into the program a briefing was given providing instruction on participation. It was made clear that only one person per dive could fill out the form to avoid sighting duplication during a dive. To eliminate positive sighting bias and capture nonsightings/absence, it was emphasized that forms must be filled out on some regular or semiregular basis, not only on those excursions where turtles were observed. Participants were given species identification cards and posters/pamphlets to advertise the initiative and promote awareness. All promotional items encouraged participation from all tourist/visiting divers and gave clear instruction regarding involvement. Should no volunteer recreational divers have come forward on a designated survey day, divemasters were required to complete the form. All participating divers were able to dive as normal, and mentally note the details of all turtles observed. The remainder of the information required came from the dive computer log. If no turtles were observed, the entire form was filled out in the same way with zero sightings recorded. All entries where species identification was qualified as "not sure" were assigned for analysis to the "unidentified" turtle group. All measurements given in imperial units were converted to metric. Shore dives were eliminated from spatial analyses, as although the point of departure from shore was accurately described, final destination was not known.

The CIDOE in-water capture program has been conducted on a semiregular basis since 2000. Turtles were captured by hand and brought onto a small boat for weighing, measuring, tagging, and collection of blood and tissue samples. Carapace measurements were taken using standard tree calipers. All measurements described are notch–tip to ensure they are analogous with volunteer estimates

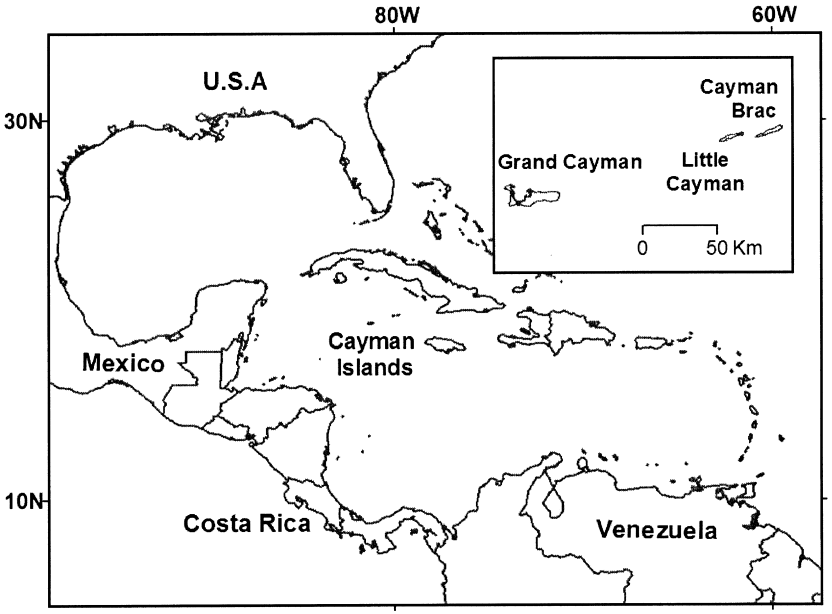

Figure 1. Map showing location of the Cayman Islands.

of entire length of the shell. For spatial analyses dive moorings were grouped into regions (Grand Cayman $n = 5$, Little Cayman $n = 2$) known to host somewhat homogenous hydrographic and benthic characteristics. A detailed description of the characteristics of these areas is given in Blanchon (1995).

Results

Results were gathered from 521 dives between September 1, 2002 and November 29, 2003. Eight dive operators took part (five in Grand Cayman and three in Little Cayman) collecting 419 surveys in Grand Cayman and 101 in Little Cayman. Only one survey form did not give a location. A total of 142 dive sites were covered although 15 of these were unknown to the authors and a further 11 were shore dives. On 196 occasions one turtle was seen, on 54 occasions two turtles were seen, and on five occasions four turtles were seen. In total 336 hawksbill, 42 green, one loggerhead, and 11 unidentified turtles were seen. A total of 243 dives recorded no turtle sightings.

There was a strong positive relationship between overall turtle sighting frequency per month and survey intensity per month (Spearman's Rank Correlation $Rs = 0.9492$, $p < 0.05$); consequently data are presented as the mean number of turtles sighted per dive to provide a more useful insight into spatiotemporal patterns of sightings as a proxy of abundance.

Volunteer observers detected species presence ratios of 9:1 (89.3% hawksbill and 10.4% green) analogous to those detected by scientists during active in-water capture sessions conducted by CIDOE (9:1 or 91.5% hawksbill and 8.5% green turtles).

Spatial Distribution of Sightings

Figure 2 maps the distribution of all dive sites, sampled and nonsampled, and marine turtle sightings corrected for effort, around Grand and Little Cayman. Widespread sightings were recorded of both turtle species on both islands. Hotspots, or areas of high abundance, are evident in regions 1, 3, and 6 for both species, although sightings of green turtles on Grand Cayman were more evenly distributed island-wide. The southwestern portion of both islands (regions 5 and 7) did not produce many turtle sightings. Not shown on the maps is

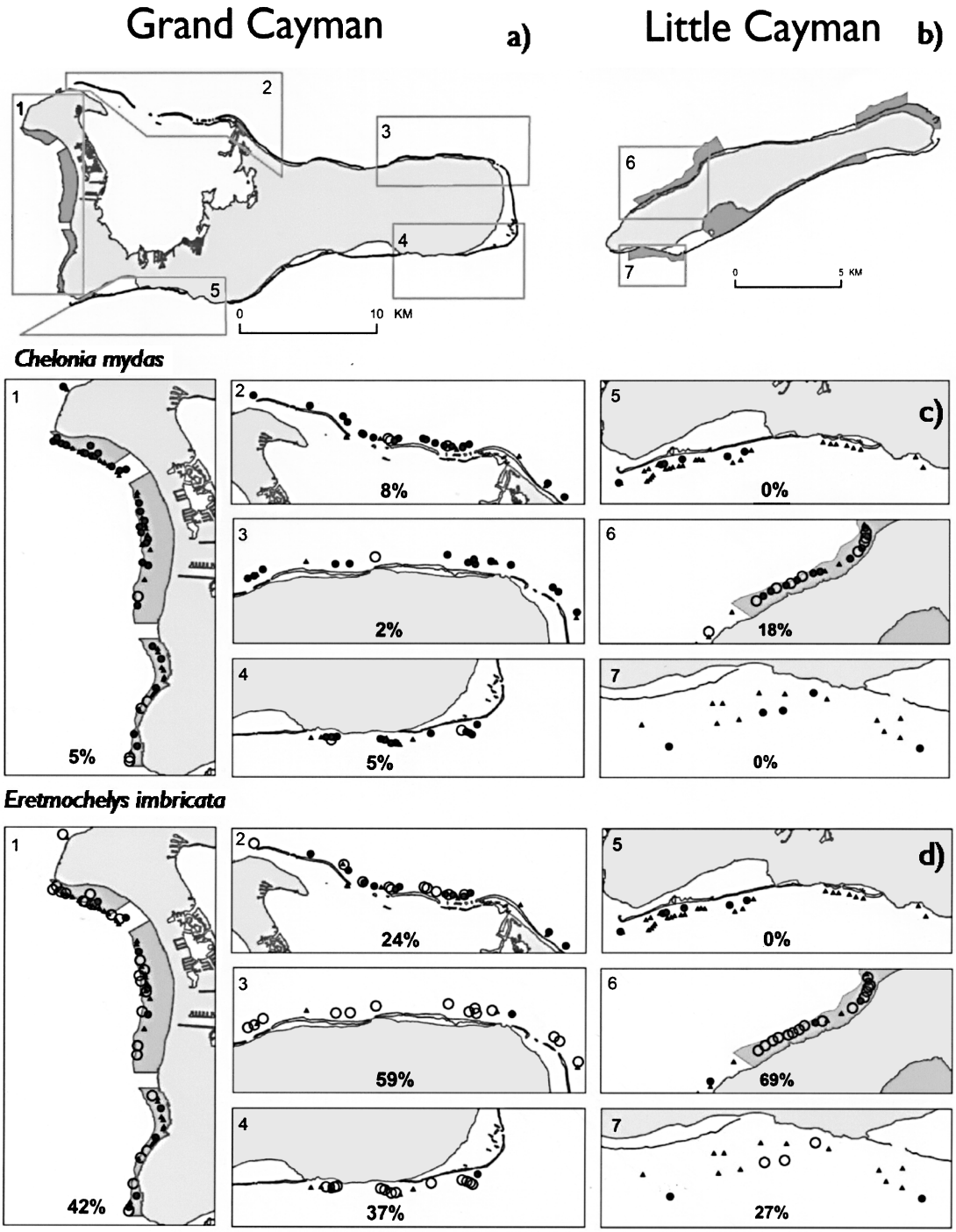

Figure 2. Map showing location and extent of regions 1–7 around (a) Grand Cayman and (b) Little Cayman. (c, 1–7) Mean *C. mydas* sightings per dive on Grand and Little Cayman. (d, 1–7) Mean *E. imbricata* turtle sightings per dive on Grand and Little Cayman. Black triangles: dive sites not included. Small black dots: sites included but no observations made. Large hollow black circles: one or more observations made at this site. Offshore gray areas: Marine Park Zones.

one loggerhead turtle observation recorded in region 6.

The Cayman Islands Marine Parks are mapped in Figure 2. There is no obvious relationship between the existence of Marine Protected Areas (MPAs) and the abundance of turtle sightings. While sightings of turtles are high in regions 1 and 6, which incorporate MPAs, they are comparably high in region 3 for hawksbills and region 4 for green turtles; neither of these regions have statutory protected areas.

Seasonality

Survey effort was unevenly distributed throughout the year with peak intensity during November to March (Fig. 3a). This distribution corresponds with the annual distribution of diving tourists arriving in Cayman ($Rs = 0.6713$, $p \leq 0.05$) which also peaks during these months (Fig. 3b). Annual distribution of mean turtle sightings per dive in each month is presented in Figure 3c–e. Distribution of sightings throughout the year is not equal; Figure 3c shows the distribution of all turtle sightings, corrected for effort, within our survey. Mean turtle sightings peaked during May when 1.8 turtles were observed per dive (Fig. 3c). Sightings of adult green turtles were only made during the reproductive season (May–September, Bell et al., 2007) and sightings of juvenile green turtles peaked in November (Fig. 3d). Sightings of adult and juvenile hawksbill turtles (Fig. 3e) both peaked during May.

Figure 4 presents the percentage of dives on which a turtle(s) was sighted in each month. During May, 86% of all dives sighted a turtle, September, 64%, and July, 62%. For most of the year (excluding January, March, and November) more

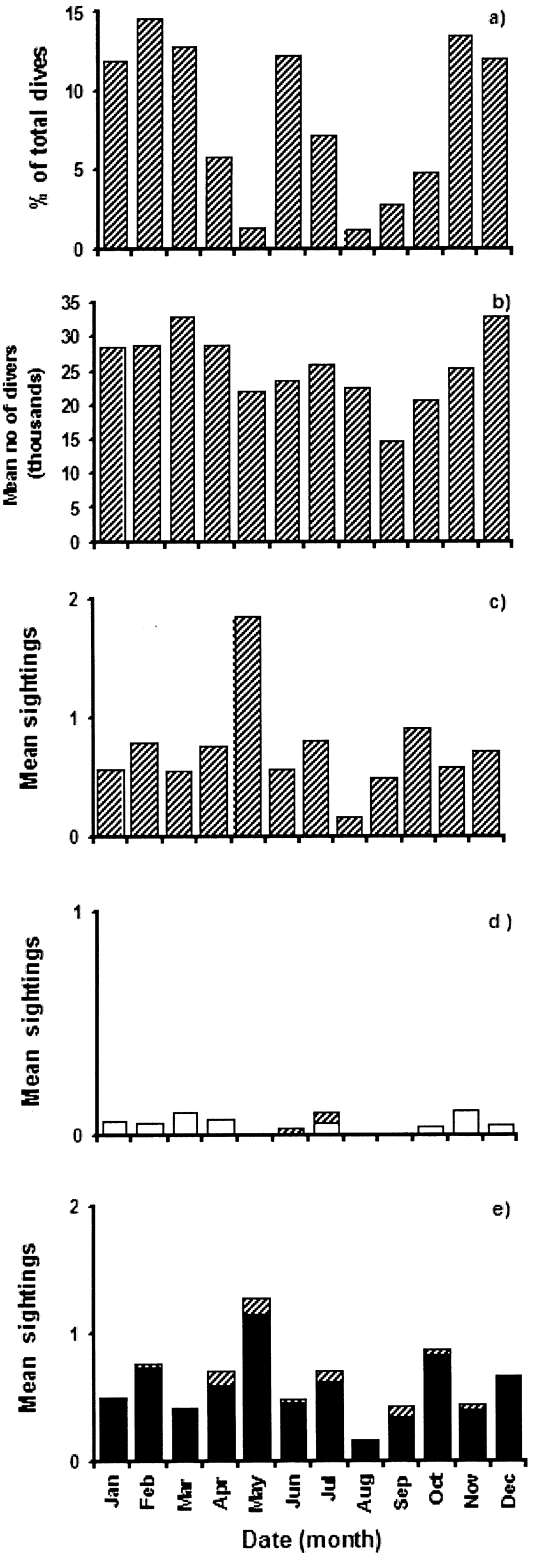

Figure 3. Seasonality of effort and observation. (a) Percentage of total dives in this study occurring in each month. (b) Mean number of divers (40% all air arrivals and 11% all cruise arrivals) arriving in Cayman in each month 2002–2003. (c) Mean turtle sightings per dive in each month Scale: 2.0 maximum. (d) Mean *C. mydas* sightings per dive in each month. Adults represented by lined boxes. Scale: 1.0 maximum. (e) Mean *E. imbricata* sightings per dive in each month. Adults represented by lined boxes. Scale: 2.0 maximum

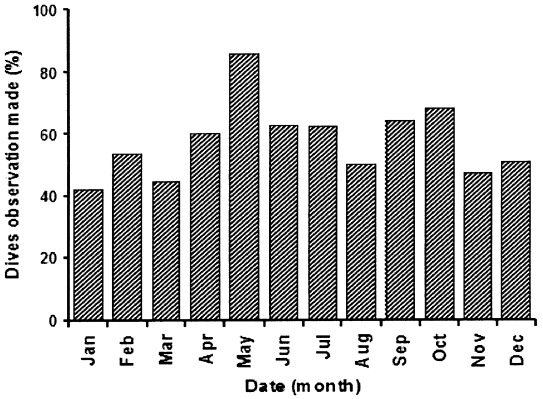

Figure 4. Percentage of dives in each month resulting in a positive sighting of a turtle(s).

than 50% of all dives in each month recorded a turtle sighting.

Size Class Distribution of Turtles Sighted

Of all green turtle sightings made by TCOT volunteers, 85% were considered to be juveniles or subadults (<99 cm estimated carapace length). The highest frequency of observations of green turtles was in the 31–40-cm size class (Fig. 5a). Equally, 94% of all hawksbill turtle sightings (Fig. 5b) were considered to be juveniles or subadults (<80 cm estimated carapace length). Observations of hawksbill turtles peaked in the 41–50-cm size class. CIDOE data show similar trends to observer data, although all turtles (green: Fig. 5c, hawksbill: Fig. 5d) were considered juveniles or subadults.

Enjoyment and Influence

Forty-one percent of respondents answered the question: Did the chance of seeing a turtle influence your decision to choose this particular dive? Of these 34% said yes, 60% said no, and 6% were unsure. An equal 41% of respondents answered the question: How important was your turtle sighting to your enjoyment of the dive? Sixty-six percent believed it was very important, 29% said it was important, and 5% felt it was not important.

Discussion

Before embarking on a discussion of the results produced by these data, several important caveats should be noted. While it was stressed that only one individual per dive team/excursion should fill out the survey to avoid all members of the team recording a sighting of the same turtle, nothing could be done to prevent a diver from unintentionally recording sightings of the same turtle more than once throughout a dive. While we aimed to eliminate potential for positive sighting bias by stressing during briefings that surveys must be carried out during all dives selected for inclusion in the survey and not only on dives where turtles were seen, it cannot be 100% guaranteed that this took place. A tendency to record dive observations only when a turtle(s) was seen, and not to remember to fill in the forms on other occasions, was expressed by some participants, and should therefore be considered when interpreting data.

When estimating size, the magnification effect of water may not be considered by observers as it is by CIDOE scientists who are practiced at making such estimates. No record was made of how far away the turtle was from the observer and thus degree of potential inaccuracy caused by distance and inherent water quality variability could not be quantified for each survey.

Species identification accuracy cannot be confirmed. Although the survey form gave divers the opportunity to assess the confidence of their identification, incorrect species identification may still have occurred. Also, although visibility was noted, the survey sheet did not prompt for information on weather conditions, such as cloud cover, which may influence sighting ease and identification.

Spatial Distribution

The potential for improved habitat quality afforded by protection of marine turtles and other ecosystem components within MPAs (Rosenburg, 2001) is worthy of investigation. Though it is known that MPAs can have positive impacts on marine species abundance (Gerber et al., 2003) and consequently there may be some level of indirect positive impacts occurring due to the maintenance of ecosystem service in these areas, there is little relationship between the presence of MPA's and marine turtle abundance in the Cayman Islands. MPAs covered areas of both high and low

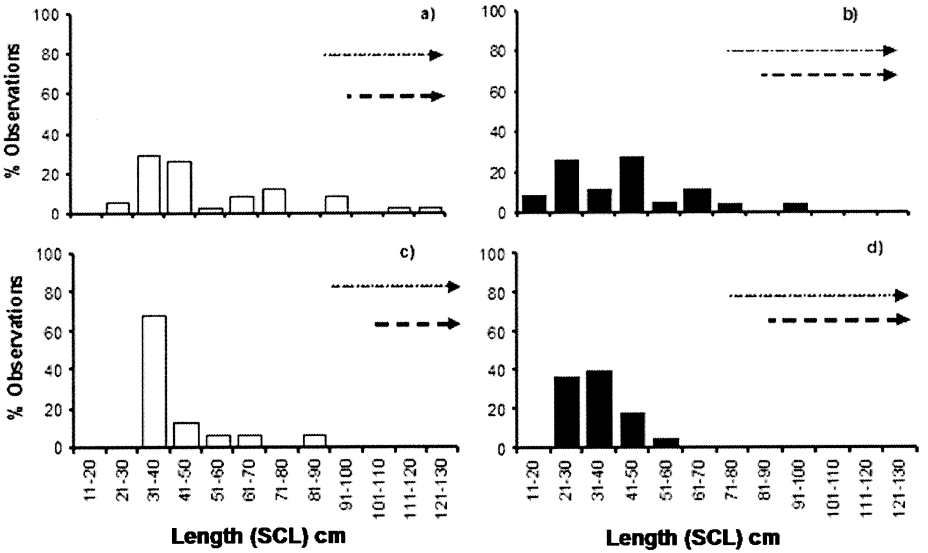

Figure 5. Frequency of estimated sizes (cm) (% observations) of all (a) *C. mydas* ($n = 34$) turtles. (b) *E. imbricata* ($n = 306$). Frequency of known sizes (cm) of all actual captures in Grand Cayman (Region 1) and Little Cayman (Region 6) only, between May 2000 and June 2004 (c) *C. mydas*, (d) *E. imbricata*. (a, c) Dashed line: minimum known adult female size (CCL cm) for *C. mydas* in Cayman (>99 cm, CIDOE unpublished data). Dotted line: minimum known adult male size (CCL cm) for *C. mydas* in Cayman (>89 cm, CIDOE unpublished data). (b, d) Dashed line: minimum known adult female size (SCL cm) for *E. imbricata* in Cuba (>80 cm SCL, Moncada, Carrillo, Saenz, & Gonzalo, 1999). Dotted line: minimum known adult male size (SCL cm) for *E. imbricata* in Cuba (>68 cm SCL, Moncada et al., 1999). The higher value in both cases (i.e., the female size at maturity) was used when ascribing adulthood to ensure immature females were not included in adulthood estimates due to smaller male maturation size.

marine turtle abundance (Fig. 2). Tratalos and Austin (2001) quantified coral damage on the west side of Grand Cayman (region 1) and confirmed significant diver impact on hard coral cover and increased incidence of coral rubble and dead coral in these areas, implying that the level of dive activity in MPA compromises the potential for protection afforded by these "no take and touch zones."

It is clear from this analysis that if observing a turtle were the goal, Region 6, or Bloody Bay Marine Park in Little Cayman would be the place to visit. Data also show that in Region 3 at the eastern end of Grand Cayman, over 59% of all dives conducted sighted one or more hawksbill turtle(s). This has important implications for CIDOE MTRP team who may choose to concentrate some study effort in this area.

Seasonality

Observation of two adult green turtles during June and July concurs with anecdotal evidence offered by local dive masters and observations by CIDOE that report adult green turtles in Cayman waters only during the summer months (March to October) when they enter Cayman waters for reproduction. Sightings of juvenile green turtles year round are few and represent a small and fragile foraging population of this species. These individuals may include headstarted animals released by the Cayman Turtle Farm (Bell et al., 2007). That annual distribution of sightings of hawksbill turtles of both classes peaks in May cannot be readily explained. It is worth noting that there were few surveys in this month ($n = 7$) (Fig. 3a), though nearly 90% of those conducted observed a turtle

(Fig. 4). Distribution appears otherwise variably distributed throughout the year, suggesting year-round presence of these animals. Peaks in distribution may be influenced by factors such as diver attention, water quality, weather conditions, and turtle behavior.

Size Class Distribution of Turtles Sighted

These data confirm the presence of year-round juvenile foraging aggregations of both green and hawksbill turtles. This size class is protected under law in the Cayman Islands (Bell et al., 2006; Cayman Islands Government, 1996) and represents known, though not yet fully assessed, foraging aggregations of both species around the Cayman Islands. Further, these data may indicate a year round presence of adult hawksbill turtles in Caymanian waters. The seasonal presence of adult green turtles was also confirmed as was the absence of any in-water populations of leatherback turtles. The sighting of only one adult loggerhead turtle during the reproductive season when they are known to nest in the Caymans Islands (Bell et al., 2007) may be due to migration during internesting intervals in this species in the Cayman Islands (Blumenthal et al., 2006).

Enjoyment and Influence

Factors influencing choice of dive site are many. While it has been suggested that "divers seek warm clear waters regardless of what there is to see" (Hawkins & Roberts, 1994, p. 507) the "wilderness experience" has also been noted as a key deciding factor (Hundloe, 1979; Kenchington, 1993; McKinnon et al., 1989), as has dive quality (Dixon & Sherman, 1991; Pendleton, 1994). In Cayman where the water is warm and clear and there are few large predators nor difficult currents, diving is most often an enjoyable relaxing experience made extraordinary primarily by sightings of charismatic marine mega-fauna.

In this study, the possibility of a turtle sighting did not influence many people's decisions to dive at a particular location. It is likely this is because numbers of marine turtles in Cayman waters are low, with most sites experiencing zero or less than one turtle sighting per dive. The option to dive at a site where marine turtles are present was probably not given as a turtle sighting can by no means be guaranteed. What is important, however, is that dive quality and enjoyment was greatly enhanced among those who were able to observe a turtle.

Dive Pressure

Although it is known that diver interaction causes damage to reefs (Barker & Roberts, 2004; Dearden, Bennett, & Rollins, 2007) and dive sites may have a finite carrying capacity before irreversible degradation is inevitable (set in the region of 4,000–6,000 dives per site per year; Dixon, Scura, & Van't Hof, 2000; Hawkins, Roberts, Van't Hof, De Meyer, Tratalos, & Aldman, 1999), it is believed that there are dive sites in the Cayman Islands that receive in excess of this limit. However, there is currently no framework in place in the Cayman Islands that would allow for the institution of a regulated and enforceable limit on dive site use. We believe, however, that dive pressure has potentially little impact on the presence of hawksbill turtles in Cayman waters, a theory supported by the high numbers of hawksbill turtles observed in region 6, Bloody Bay Marine Park in Little Cayman, the most heavily dived area in the Cayman Islands, and region 1 in Grand Cayman, also very heavily dived. The impact of the dive industry has been assessed by Tratalos and Austin (2001), who determined that although percentage cover of hard corals increased with distance from the mooring ball at each dive site, percentage cover of soft corals and sponges at high-intensity dive sites on the west side of Grand Cayman was not influenced by distance from the mooring ball, implying that this important food source for hawksbill turtles is not negatively impacted by diver intensity. While human presence underwater undoubtedly influences behavior of most marine species to some extent, it is the experience of the authors that hawksbill turtles are less disturbed by human presence than green turtles.

Value of Divers in This Study

One way to assess the value of data collected by observers is by comparison with data collected by scientists (Brewer, 2002; Foster-Smith & Ev-

ans, 2003). Harvey, Fletcher, and Shortis (2001) reported that volunteer divers were able to make accurate size estimates of fish underwater. In this study relative species abundance and size estimates are comparable to data collected by scientists at the CIDOE, although volunteer observers were seeing more turtles in the larger size classes than have been recorded by CIDOE research officers. This discrepancy may be due to either the magnifying effect of water, an inability of volunteers to make accurate estimates of size, CIDOE capture efforts targeting smaller turtles due to a free-diving capture technique without the use of SCUBA, or sightings of larger turtles being recorded at sites other than those used for CIDOE capture efforts. It is unlikely that inaccurate size estimates alone would explain the discrepancy as size estimates in this and other studies of observers have proven to closely approximate those given by scientists (Houghton, Callow, & Hays, 2003; CIDOE, unpublished data). Some combination of factors is most likely.

Value of Marine Turtles to Tourism

The value of marine turtles to dive tourism in the Cayman Islands can be qualitatively assessed using data yielded from this study. Many studies have attempted to quantify the economic value of marine turtles with perhaps the most comprehensive being Tröeng and Drews (2004), conducted with the objective of supporting claims that marine turtle conservation can have positive economic benefits. Tourism based upon the presence of one or a few species can be affected when the probability of observing that species falls below a certain level (Tisdell & Wilson, 2002; Tröeng & Drews 2004). This level should be assessed, not only for the obvious ecological benefits but also to maintain the quality of the dive experience. This has implications for the future of marine tourism in the Cayman Islands and, by association, far-reaching socioeconomic impacts for this the population of this country.

Conclusion

The value of recruiting volunteers to collect marine ecological data has been considered and assessed with encouraging results (Darwell & Dulvy, 1996; Foster-Smith & Evans, 2003). Foster-Smith and Evans (2003) point out that although there were some errors in data collected by volunteers, the main trends were identified and the substantial quantity of data collected could not be underestimated. In this study divers have collected what may be considered reliable and largely accurate data that may serve to further reduce the skepticism surrounding the use of nonscientific personnel to collect uncomplicated scientific data. Spatiotemporal and morphological analyses in this study compared favorably with those based on data collected by scientists, thus making a valuable contribution to the current store of knowledge on Cayman's wild marine turtle populations. This type of survey requires few resources to initiate and conduct particularly in areas where dive tourism is well established. This technique is transferable to other countries and is useful in areas where resources assigned to marine turtle research are low. Additionally, countries where Capture-Mark-Recapture programs of marine fauna are already under way may find this methodology useful as a means to increase sightings and reports of tagged animals year round and over a wide area.

While there are important caveats and potential biases within this study, these data could not have been collected without assistance from volunteers. In this study, dive masters completed most surveys and may be more familiar with local waters and marine species. This may have helped eliminate some potential error. This study has established a valuable baseline for future monitoring of population abundance and distribution. Further additional benefits of this type of approach, such as increased awareness and a sense of participation in local activities by residents and visitors alike, contribute to the enhanced conservation of marine turtle populations not only in Cayman but eventually worldwide as visitors take their experience away with them. This type of experience, it has been noted, may lead to increased levels of environmental responsibility and the "creation of a force for change" (Saunders, 2002, p. 54) within the marine recreation industry.

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Biographical Notes

Catherine Bell is currently an employee of Pendoley Environmental Pty Ltd, Western Australia, undertaking research and monitoring of marine turtle populations, as it relates to industry, throughout the State. She has previously been an employee of the Cayman Islands Department of Environment and a student working with the Marine Turtle Research Group, active in both fundamental and applied research related to marine turtles in the UK and internationally.

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