

# Marine Science Review - 188

## Sea turtles



### In this review:

- A. Recent articles – no abstract available
- B. Recent articles with abstracts

### A. Recent articles – no abstract available

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Williams, E.H., Bunkley-Williams, L., and Casey, J.W. **Early fibropapillomas in Hawaii and occurrences in all sea turtle species: the panzootic, associated leeches wide-ranging on sea turtles, and species of study leeches should be identified.** *Journal of Virology* 80(9): 4643-4644, 2006.

Reece, J.S., Ehrhart, L.M., and Parkinson, C.L. **Mixed stock analysis of juvenile loggerheads (*Caretta caretta*) in Indian River Lagoon, Florida: implications for conservation planning.** *Conservation Genetics* 7(3): 345-352, 2006.

### B. Recent articles with abstracts

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Ozdilek, H.G., Yalcin-Ozdilek, S., Ozaner, F.S., and Sonmez, B. **Impact of accumulated beach litter on *Chelonia mydas* L. 1758 (green turtle) hatchlings of the Samandag coast, Hatay, Turkey.** *Fresenius Environmental Bulletin* 15(2): 95-103, 2006.

**Notes:** Samandag coast, located in the northeastern corner of the Mediterranean, is specifically used by *Chelonia mydas* (green turtles) as nesting area. While predators, such as foxes, crabs and dogs, naturally exist in the area, human impact by means of solid waste accumulation on the shoreline helps such predators to prey on more than a quarter of emerged green turtle hatchlings (an estimated value) in the area, entrapping them during their short shoreline trips from their nests to the sea or beach litter. In this study, litter accumulation, as well as its causes and types (recyclables, and medical, hazardous or hard-to-recycle ones) and amounts of these solid wastes at the Samandag coast are assessed, and it was found that solid waste transport to the Mediterranean Sea from various sources accumulates the litter on the beach due to influence of wind. Moreover, the beach litter was found to be one of the most important causes that impact turtle hatchlings, when they try to safely arrive to the sea. It was found that River Asi, an international river passing through Lebanon, Syria and Turkey, mainly used for all types of solid waste disposal purposes (including medical and hazardous types) by its surrounding cities, is a notable solid waste source to the shoreline. Additionally, coastal communities had disposed all kinds of wastes on the coastal zone for a long time that resulted in several heaps of waste nearby and on the shoreline. Mid summer and early autumn were chosen as sampling periods, and remarkable increase in solid waste amount in the sampling area after the first autumn rainfall event could be observed. Surprisingly, medical and hazardous wastes on the beach were found to be notably elevated, representing more than 5% of the total beach litter. The study area is highly contaminated with solid wastes on the coast, when worldwide compared to similar beaches. It was found that solid waste accumulations on beaches negatively affect green turtle hatchlings trying to reach the sea, and percentage of hatchlings reaching the sea was found to be negatively correlated with beach litter amount ( $r^2 = -0.84$  on 8(th) July 2003; and  $r^2 = -0.74$  on 16(th) of September 2003).

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Gilman, E., Zollett, E., Beverly, S., Nakano, H., Davis, K., Shiode, D., Dalzell, P., and Kinan, I. **Reducing sea turtle by-catch in pelagic longline fisheries.** *Fish and Fisheries* 7(1): 2-23, 2006.

**Notes:** Reducing by-catch of sea turtles in pelagic longline fisheries, in concert with activities to reduce other anthropogenic sources of mortality, may contribute to the recovery of marine turtle populations. Here, we review research on strategies to reduce sea turtle by-catch. Due to the state of management regimes in most longline fisheries, strategies to reduce turtle interactions must not only be effective but also must be commercially viable. Because most research has been initiated only recently, many results are not yet peer-reviewed, published or readily accessible. Moreover, most experiments have small sample sizes and have been conducted over only a few seasons in a small number of fisheries; many study designs preclude drawing conclusions about the independent effect of single factors on turtle by-catch and target catch rates; and few studies consider effects on other by-catch species. In the US North Atlantic longline swordfish fishery, 4.9-cm wide circle hooks with fish bait significantly reduced sea turtle by-catch rates and the proportion of hard-shell turtles that swallowed hooks vs. being hooked in the mouth compared to 4.0-cm wide J hooks with squid bait without compromising commercial viability for some target species. But these large circle hooks might not be effective or economically viable in other longline fisheries. The effectiveness and commercial viability of a turtle avoidance strategy may be fishery-specific, depending on the size and species of turtles and target fish and other differences between fleets. Testing of turtle avoidance methods in individual fleets may therefore be necessary. It is a priority to conduct trials in longline fleets that set gear shallow, those overlapping the most threatened turtle populations and fleets overlapping high densities of turtles such as those fishing near breeding colonies. In addition to trials using large 4.9-cm wide circle hooks in place of smaller J and Japan tuna hooks, other fishing strategies are under assessment. These include: (i) using small circle hooks ( $\leq 4.6$ -cm narrowest width) in place of smaller J and Japan tuna hooks; (ii) setting gear below turtle-abundant depths; (iii) single hooking fish bait vs. multiple hook threading; (iv) reducing gear soak time and retrieval during daytime; and (v) avoiding by-catch hotspots through fleet communication programmes and area and seasonal closures.

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Lagueux, C.J. and Campbell, C.L. **Marine turtle nesting and conservation needs on the south-east coast of Nicaragua.** *Oryx* 39(4): 398-405, 2005.

**Notes:** The goal of this study was to quantify marine turtle nesting activity by species, identify threats to their populations, and provide recommendations for their conservation on the south-east coast of Nicaragua. One survey was conducted in each of 1998 and 1999, and 10 surveys in 2000. The majority of nesting emergences were by leatherback *Dermochelys coriacea* and hawksbill *Eretmochelys imbricata* turtles, with some nesting also by green turtles *Chelonia mydas*. In 2000, egg poaching was highest for green turtle (83%) and hawksbill (75%) clutches. A total of 87 dead stranded turtles were encountered, of which at least 63.2% were green, 10.3% hawksbill, and 6.9% loggerhead turtles. The principal threats to marine turtle populations on the south-east coast of Nicaragua were the killing of nesting females, egg poaching, and bycatch in commercial and artisanal fisheries.

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Keller, J.M., McClellan-Green, P.D., Kucklick, J.R., Keil, D.E., and Peden-Adams, M.M. **Effects of organochlorine contaminants on loggerhead sea turtle immunity: Comparison of a correlative field study and in vitro exposure experiments.** *Environmental Health Perspectives* 114(1): 70-76, 2006.

**Notes:** Several laboratory and field studies indicate that organochlorine contaminants (OCs), such as polychlorinated biphenyls (PCBs) and pesticides, modulate immune responses in rodents, wildlife, and humans. In the present study we examined the effects of OCs on immunity in free-ranging loggerhead sea turtles (*Caretta caretta*). Mitogen-induced lymphocyte proliferation responses, lysozyme activity, and OC concentrations were measured from blood samples. Mitogens chosen in the lymphocyte proliferation assay were phytohemagglutinin (PHA) and concanavalin A (ConA) for T-lymphocyte stimulation, and lipopolysaccharide (LPS) and phorbol 12,13-dibutyrate (PDB) for B-lymphocyte stimulation. Lysozyme activity was significantly and negatively correlated with whole-blood concentrations of 4,4'-dichlorodiphenyldichloroethylene (4,4'-DDE) and the sum of chlordanes. Lymphocyte proliferation responses stimulated by PHA, LPS, and PDB were significantly and positively correlated with concentrations of the sum of PCBs measured in whole blood. LPS- and PDB-induced proliferation were also significantly and positively correlated with 4,4'-DDE blood concentrations. These correlative observations in free-ranging turtles suggest that current, chronic exposure to OCs may suppress innate immunity and enhance certain lymphocyte functions of loggerhead sea turtles. To further test this hypothesis, lymphocyte proliferation was measured after in vitro exposure of peripheral blood leukocytes from 16 turtles to Aroclor 1254 (0-13.5  $\mu\text{g}/\text{mL}$ ) or 4,4'-DDE (0-13.4  $\mu\text{g}/\text{mL}$ ). Both contaminants increased PHA- and PDB-induced proliferation at concentrations below those that affected cell viability. Moreover, the concentrations that enhanced PDB-induced proliferation in vitro were similar to concentrations measured in

turtles with the highest proliferative responses. The similarities between the in vitro experiments and the correlative field study suggest that OC exposure modulates immunity in loggerhead turtles.

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Hazel, J. and Gyuris, E. **Vessel-related mortality of sea turtles in Queensland, Australia.** *Wildlife Research* 33(2): 149-154, 2006.

**Notes:** Identification of threats is a standard component of conservation planning and the ability to rank threats may improve the allocation of scarce resources in threat-mitigation programs. For vulnerable and endangered sea turtles in Australia, vessel strike is recognised as an important threat but its severity relative to other threats remains speculative. Documented evidence for this problem is available only in stranding records collected by the Queensland Environment Protection Authority. With the authority's support we assessed the scope and quality of the data and analysed vessel-related records. We found adequate evidence that during the period 1999-2002 at least 65 turtles were killed annually as a result of collisions with vessels on the Queensland east coast. This level of mortality appears broadly comparable to that recorded in the Queensland East Coast Trawl Fishery before the introduction of mandatory turtle-exclusion devices in that fishery. Green turtles (*Chelonia mydas*) comprised the majority of vessel-related records, followed by loggerhead turtles (*Caretta caretta*), and 72% of cases concerned adult or subadult turtles. The majority of vessel-related records came from the greater Moreton Bay area, followed by Hervey Bay and Cleveland Bay. The waters of all three areas are subject to variable levels of commercial and recreational vessel traffic, and their shores are both populated and unpopulated.

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Pike, D.A., Antworth, R.L., and Stiner, J.C. **Earlier nesting contributes to shorter nesting seasons for the Loggerhead sea turtle, *Caretta caretta*.** *Journal of Herpetology* 40(1): 91-94, 2006.

**Notes:** Evidence is mounting that warming air and sea temperatures are affecting nesting patterns in oviparous species by causing earlier nesting within seasons. The potential fitness consequences of nesting earlier include extended periods of offspring growth and larger clutch sizes. Additionally, the potential for nesting seasons to last longer exists, possibly allowing species that lay multiple clutches within a season to increase the number of clutches produced. To date, no studies have examined consequences of earlier nesting on duration of nesting season in oviparous vertebrates. We demonstrate that warmer sea surface temperatures are related to earlier nesting in the Loggerhead sea turtle *Caretta caretta*, and that this response actually decreases, rather than increases, the length of the nesting season. In recent years (1995-2003), nesting became more evenly distributed throughout the season than in earlier years (1989-1994), and the nesting season decreased by approximately 43 days. Female turtles are unlikely to produce additional clutches within a reproductive season in response to this effect because of physiological constraints, and we cannot rule out the hypothesis that female turtles will lay fewer clutches because of a shortened nesting season, leading to reduced fecundity within seasons.

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Pradhan, N.C. and Leung, P. **A Poisson and negative binomial regression model of sea turtle interactions in Hawaii's longline fishery.** *Fisheries Research* 78(2-3): 309-322, 2006.

**Notes:** Sea turtle interactions with the longline fishery in Hawaii have become a serious concern in recent years. Various measures, including a swordfish harvest ban, have been adopted to protect sea turtles. This study explores the factors and degree of sea turtle interactions with Hawaii's pelagic longline fishery, i.e., the production of undesirable outputs in the pursuit of an economic activity, in an analytical framework of rare events using the count data models for the period 1994-2003. The analysis was based on the type of trip, such as those targeting tuna or swordfish. The fishing technologies associated with the choice of trip or target species, season, and turtle population explained turtle interactions with the longline fishery. The impact of a fishing vessel's previous history of turtle interactions had a negligible impact on subsequent interactions. In the absence of new longline fishing technologies to dramatically avert sea turtle interactions, there are about 6% and 55% chance that at least one turtle per trip may be encountered in tuna- and swordfish-targeted fishing trips, respectively. This study confirms that more turtle interactions are associated with the swordfish-targeted trips. Several of the factors that contributed substantially to turtle interactions can be feasibly regulated. Furthermore, the conservation and management of sea turtles require increased policy dialogues and cooperation among the coastal nations vis-a-vis the adaptation to "turtle-friendly" fishing technologies.

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Kamel, S.J. and Mrosovsky, N. **Deforestation: Risk of sex ratio distortion in hawksbill sea turtles.** *Ecological Applications* 16(3): 923-931, 2006.

**Notes:** Phenotypic sex in sea turtles is determined by nest incubation temperatures, with warmer temperatures producing females and cooler temperatures producing males. The common finding of highly skewed female-biased hatchling sex ratios in sea turtle populations could have serious repercussions for the long-term survival of these species and prompted us to examine the thermal profile of a relatively pristine hawksbill nesting beach in Guadeloupe, French West Indies. Data loggers placed at nest depth revealed that temperatures in the forested areas were significantly cooler than temperatures in the more open, deforested areas. Using these temperatures as a predictor of sex ratio, we were able to assess the relative contributions of the different beach zones to the primary sex ratio: significantly more males were likely to be produced in the forested areas. Coastal forests are therefore important male-producing areas for the hawksbill sea turtle, and this has urgent conservation implications. On Guadeloupe, as on many Caribbean islands, deforestation rates are high and show few signs of slowing, as there is continual pressure to develop beachfront areas. The destruction of coastal forest could have serious consequences both in terms of local nesting behavior and of regional demography through the effects on population sex ratios. Human alterations to nesting habitat in other reptile taxa have been shown to modify the thermal properties of nest sites in ways that can disrupt their ecology by allowing parasite transmission, increasing vulnerability to climate change, or rendering existing habitat unsuitable.

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Formia, A., Godley, B.J., Dontaine, J.F., and Bruford, M.W. **Mitochondrial DNA diversity and phylogeography of endangered green turtle (*Chelonia mydas*) populations in Africa.** *Conservation Genetics* 7(3): 353-369, 2006.

**Notes:** We analysed the genetic structure of seven nesting sites of the endangered green turtle (*Chelonia mydas*) in Africa using mitochondrial DNA control region sequences. Tissue samples were collected from 188 nesting females at six sites in West Africa and one in the Indian Ocean. A 488 bp fragment of the control region revealed 14 different haplotypes, 10 of which are previously undescribed. The most common haplotype (CM8) was observed in 157 individuals. All other haplotypes were closely related, except two divergent lineages: CM38, removed by four substitutions, and the three Indian Ocean haplotypes, distinguished by 31 substitutions. Significant differences in haplotype and nucleotide diversity were observed between Atlantic rookeries and among ocean basins. Analysis of molecular variance revealed high levels of differentiation between the Atlantic and the Indian Ocean populations but a much shallower Atlantic substructuring. Green turtle population genetic structure is thought to have been shaped by a dynamic succession of extinction and recolonisation of rookeries, by natal homing and occasional breakdown in nest-site fidelity. Mismatch distributions of pairwise differences between haplotypes at each rookery were found to be consistent with recent population expansion. We argue that demographic histories can be explained by scenarios at several temporal scales, including geological events, sea level fluctuations and more recent patterns of exploitation. We discuss management and conservation implications of our results for these threatened populations, identifying two ESUs (one in the Atlantic and one in the Indian ocean) and three MUs within the Atlantic.

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Hawkes, L.A., Broderick, A.C., Coyne, M.S., Godfrey, M.H., Lopez-Jurado, L.-F., Lopez-Suarez, P., Merino, S.E., Varo-Cruz, N., and Godley, B.J. **Phenotypically linked dichotomy in sea turtle foraging requires multiple conservation approaches.** *Current Biology* 16(10): 990-995, 2006.

**Notes:** Marine turtles undergo dramatic ontogenetic changes in body size and behavior, with the loggerhead sea turtle, *Caretta caretta*, typically switching from an initial oceanic juvenile stage to one in the neritic, where maturation is reached and breeding migrations are subsequently undertaken every 2-3 years. Using satellite tracking, we investigated the migratory movements of adult females from one of the world's largest nesting aggregations at Cape Verde, West Africa. In direct contrast with the accepted life-history model for this species, results reveal two distinct adult foraging strategies that appear to be linked to body size. The larger turtles ( $n = 3$ ) foraged in coastal waters, whereas smaller individuals ( $n = 7$ ) foraged oceanically. The conservation implications of these findings are profound, with the population compartmentalized into habitats that may be differentially impacted by fishery threats in what is a global fishing hotspot. Although the protection of discrete areas containing coastal individuals may be attainable, the more numerous pelagic individuals are widely dispersed with individuals roaming over more than half a million square kilometers. Therefore, mitigation of fisheries by-catch for sea turtles in the east Atlantic will likely require complex and regionally tailored actions to account for this dichotomous behavior.

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McMahon, C.R. and Hays, G.C. **Thermal niche, large-scale movements and implications of climate change for a critically endangered marine vertebrate.** *Global Change Biology* 12(7): 1330-1338, 2006.

**Notes:** Climate change is expected to have a number of impacts on biological communities including range extensions and contractions. Recent analyses of multidecadal data sets have shown such monotonic shifts in the distribution of plankton communities and various fish species, both groups for which there is a large amount of historical data on distribution. However, establishing the implications of climate change for the range of endangered species is problematic as historic data are often lacking. We therefore used a different approach to predict the implications of climate change for the range of the critically endangered planktivorous leatherback turtle (*Dermochelys coriacea*). We used long-term satellite telemetry to define the habitat utilization of this species. We show that the northerly distribution limit of this species can essentially be encapsulated by the position of the 15°C isotherm and that the summer position of this isotherm has moved north by 330 km in the North Atlantic in the last 17 years. Consequently, conservation measures will need to operate over ever-widening areas to accommodate this range extension.

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Gillespie, A. **The slow swim from extinction: Saving turtles in the South Pacific.** *International Journal of Marine and Coastal Law* 21(1): 57-82, 2006.

**Notes:** The purpose of this paper is to set out the essential requirements for a successful regional agreement for sea turtles in the South Pacific. To achieve this, the current Regional Marine Turtle Conservation Programme (RMTCP) which runs under the auspice of the South Pacific Regional Environmental Programme (SPREP) will be juxtaposed against the "best practice" in this area, as evinced by current development in international environmental law and a number of other regional agreements which focus exclusively on sea turtles.

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Chan, E.-H. **Marine turtles in Malaysia: On the verge of extinction?** *Aquatic Ecosystem Health and Management* 9(2): 175-184, 2006.

**Notes:** Four species of marine turtles (leatherback, green turtle, hawksbill and olive ridley) are found in Malaysia. Current statistics indicate that the leatherback and olive ridley turtles are on the verge of extinction in Malaysia; while other species, excluding the green turtles of the Sabah Turtle Islands, are in steady decline. Consumptive utilization in the form of egg exploitation until recently, took place mainly in Terengganu. Turtles are also being used to promote tourism in Terengganu and Sabah. Population decline is attributed to a long history of egg exploitation, commercial hunting and harvesting of marine turtles in neighbouring countries, fishing mortality, loss of nesting habitats, marine pollution, negative impacts of tourism and the lack of a national strategy on marine turtle conservation. Marine turtle conservation efforts in Malaysia are not lacking, but need to be upgraded and coordinated. Legislation among the various states of Malaysia should be harmonized to ensure greater protection for these endangered animals. Existing egg incubation programmes should be expanded to secure a higher level of egg protection. More sanctuaries should be established in key nesting sites and Malaysia should join her neighbours in ratifying current regional instruments aimed at marine turtle conservation.

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McClenachan, L., Jackson, J.B.C., and Newman, M.J.H. **Conservation implications of historic sea turtle nesting beach loss.** *Frontiers in Ecology and Environment* 4(6): 290-296, 2006.

**Notes:** Populations of endangered Caribbean sea turtles are far more depleted than realized because current conservation assessments do not reflect historic nesting data. We used historical sources to analyze changes in the numbers of nesting populations and population sizes for green and hawksbill turtles on all known nesting beaches in the Caribbean over the past millennium. We present the first maps of historic nesting populations, which provide the basis for an objective measure of changes in distribution and abundance. Our results indicate that 20% of historic nesting sites have been lost entirely and 50% of the remaining nesting sites have been reduced to dangerously low populations. Recent conservation efforts have resulted in large population increases at several nesting sites, but loss of widespread nesting throughout the Caribbean and reductions in the Caribbean-wide population since human hunting began indicate that Caribbean turtles are far from recovered. Focusing

attention on a small number of nesting populations is a risk-prone strategy; conservation programs should instead broaden their scope to protect both large and small nesting populations throughout the Caribbean.

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Wallace, B.P., Kilham, S.S., Paladino, F.V., and Spotila, J.R. **Energy budget calculations indicate resource limitation in Eastern Pacific leatherback turtles.** *Marine Ecology Progress Series* 318: 263-270, 2006.

**Notes:** Resource availability constrains energy allocations to competing functions such as growth and reproduction, and thus influences animal life-histories and population dynamics. Leatherback turtles *Dermochelys coriacea* are critically endangered and exhibit physiological and life-history traits unique among marine reptiles. In addition, leatherback nesting populations in the North Atlantic (NA) are, on average, larger, produce more eggs, exhibit shorter remigration intervals (RIs, time between nesting seasons), and generally demonstrate more stable population trends than Eastern Pacific (EP) nesting leatherback populations. In order to compare energy requirements of inter-basin leatherback populations, we estimated costs associated with reproduction to calculate the energy budgets of leatherback populations from the EP and the NA. Our estimations illustrate that in contrast to reported trends in RIs of these populations (EP = 3.7 yr; NA = 2 yr), NA leatherbacks should require RIs between 1.5 to 4 times longer than their EP counterparts to accumulate sufficient energy to return to their nesting beaches for an entire reproductive season. These results indicate that resource limitation might lengthen RIs for EP leatherbacks compared to NA leatherbacks, thus decreasing the EP population's reproductive success and increasing its exposure to risk of fisheries-related mortality. We hypothesize that stochastic resource availability related to El Niño-Southern Oscillation (ENSO) is exacerbating the effects of high incidental fisheries mortality, resulting in plummeting EP leatherback populations. Therefore, management strategies for fisheries should allow little, if any, mortality of Pacific leatherbacks if there is to be any reasonable hope for recovery of this population.

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de Segura, A.G., Tomas, J., Pedraza, S.N., Crespo, E.A., and Raga, J.A. **Abundance and distribution of the endangered loggerhead turtle in Spanish Mediterranean waters and the conservation implications.** *Animal Conservation* 9(2): 199-206, 2006.

**Notes:** During 2 years (2001-2003), we performed seasonal aerial surveys in the central Spanish Mediterranean following the transect line methodology in order to determine the abundance and distribution patterns of loggerhead turtles *Caretta caretta*. We surveyed a total of 16 700 km, accounting for 770 turtle sightings. Loggerhead turtles were present with high abundance all year round. No seasonal differences in abundance were found, except in spring 2001, where the density of turtles was higher than in the other seasons. Our results show that the Western Mediterranean is not a 'summer' feeding area as proposed previously, as a high number of turtles are present throughout the year. The average surface density of turtles in the whole study area was 0.21 turtles km<sup>2</sup> [95% confidence interval (CI): 0.17-0.25], and the mean abundance was 6653 turtles (95% CI: 5514-8027). The data relate to the number of turtles on the surface only, as diving turtles escape observation. Correcting our estimations of diving behaviour data in the area, the absolute abundance was 18 954 turtles (95% CI: 6679-53 786). Bearing in mind that around 25 000 loggerheads are caught per year in the Spanish Mediterranean, our results indicate that accidental captures seem to be a significant threat for this species, and conservation measures have to be implemented to avoid a non-sustainable situation.

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Richardson, J.I., Hall, D.B., Mason, P.A., Andrews, K.M., Bjorkland, R., Cai, Y., and Bell, R. **Eighteen years of saturation tagging data reveal a significant increase in nesting hawksbill sea turtles (*Eretmochelys imbricata*) on Long Island, Antigua.** *Animal Conservation* 9(3): 302-307, 2006.

**Notes:** Hawksbill sea turtle *Eretmochelys imbricata* nesting on Long Island, Antigua, West Indies (also known as Jumby Bay) has been monitored since 1987. Although the numbers of nesting females remained relatively constant for the first 11 survey seasons (1987-1997), inclusion of more recent data (1998-2004) in the analysis reveals a statistically significant upward trend. In particular, neophytes have shown a significant upturn in numbers, whereas the remigrant subpopulation has remained stationary. This indicates that recruitment is driving the upward trend in the total number of nesters. Predictive models based on the Poisson distribution suggest that the neophyte subpopulation will continue to grow in size by an average of 10% per annum. Model-based predictions and their limitations are discussed. The Jumby Bay Hawksbill Project, which has monitored

and protected nesting hawksbills and their eggs since the project's onset, is one among several factors that may contribute to the recent increase in nesting females.

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Koch, V., Nichols, W.J., Peckham, H., and de la Toba, V. **Estimates of sea turtle mortality from poaching and bycatch in Bahia Magdalena, Baja California Sur, Mexico.** *Biological Conservation* 128(3): 327-334, 2006.

**Notes:** Bahia Magdalena on the Pacific coast of Baja California Sur, Mexico, is an important feeding and nursery ground for black turtles *Chelonia mydas*, loggerhead turtles *Caretta caretta*, olive ridley turtles *Lepidochelys olivacea*, and hawksbill turtles *Eretmochelys imbricata*. Despite international and national protection, sea turtles continue to be caught incidentally and hunted for consumption in large numbers. This study examines the mortality of sea turtles in Bahia Magdalena, focusing on (1) species distribution and number of carcasses found, (2) causes of death, (3) size frequency distribution and % juveniles in the catch, and (4) changes in average size over the past years. A total of 1945 turtle carcasses were found from April 2000 to July 2003 along beaches and in towns of the region with loggerhead (44.1%) and black turtles (36.9%) being the dominant species. Slaughter for human consumption was the primary cause of death of carcasses found in towns (95-100%), while carcasses on beaches mostly died of unknown causes (76-100%). Circumstantial evidence suggests however, that incidental bycatch was the main mortality cause on beaches. Black turtles suffered the highest consumption mortality overall (91%), followed by olive ridley (84%), hawksbill (83%) and loggerhead turtles (63%). Over 90% of all turtles found were juveniles or subadults. Carapace length of black turtles declined consistently over the sampling period, while that of loggerhead turtles increased. Our results strongly suggest that turtles are being taken at high and unsustainable rates; this may partially explain why the populations have not recovered despite widespread protection on nesting beaches.

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Antworth, R.L., Pike, D.A., and Stiner, J.C. **Nesting ecology, current status, and conservation of sea turtles on an uninhabited beach in Florida, USA.** *Biological Conservation* 130(1): 10-15, 2006.

**Notes:** Although nesting beaches are critical resources for sea turtles, most beaches in the United States are disturbed by human influence, including human access, artificial lighting, and habitat alteration. In contrast, very few undisturbed beaches remain along the Atlantic coast, and these areas represent unique habitats that can help decipher the impacts of development on various species. We monitored nesting patterns and hatching success of three sea turtle species (*Caretta caretta*, *Chelonia mydas*, and *Dermochelys coriacea*) from 1985 to 2003 on Canaveral National Seashore, an uninhabited 38.3 km stretch of beach in Florida. We monitored the number of nests deposited annually, hatching success, predation rates, and spatial nesting patterns. Clutch sizes varied within, but not among years, most likely due to variation in size of nesting females rather than climate change or resource availability. The number of nests increased over the study period for all three species, indicating growing populations. Higher numbers of nests were deposited on the southern end of our beach than on the northern end. Hatching success did not vary by species, but was dependent on nest-protection effort, which increased during the study period. Protecting more nests with wire screens resulted in lower predation rates. We did not find any evidence suggesting that predators are using nest markers to locate eggs, even after using the same method of marking nests for 19 years. Our conservation efforts have lowered predation levels through increased screening effort, and over time the number of nests laid increased for each species. Collecting baseline data on nesting patterns in undisturbed locations will allow comparisons to be made on nesting trends and patterns at geographically close, but disturbed, localities.

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Carranza, A., Domingo, A., and Estrades, A. **Pelagic longlines: A threat to sea turtles in the Equatorial Eastern Atlantic.** *Biological Conservation* 131(1): 52-57, 2006.

**Notes:** Pelagic longlines are widely known to interact with several species of sea turtles, and there is an increasing concern about the by-catch of turtles in commercial fisheries and its impact on their populations. However, information on sea turtle by-catch in the South Atlantic Ocean is scarce, and there are no quantitative by-catch data available on olive ridleys for the Equatorial Eastern Atlantic. In this paper we analyze data collected by observers on board an Uruguayan long-liner targeting swordfish in two areas in the Equatorial Eastern Atlantic: off the Gulf of Guinea and north of Saint Helena Island. Specimens of *Lepidochelys olivacea* and *Dermochelys coriacea* were hooked or entangled in 26 longline sets. All registered interactions with olive ridleys took place off the Gulf of Guinea, with captures ranging from 1 to 3 specimens in a single set. The captured specimens, though not measured directly, appeared to be juveniles. In addition, the examination of the stomach contents of

one female mako shark showed dermal scutes, vertebrae and the complete head of a sea turtle identified as *L. olivacea*, allowing us to estimate its curved carapace length. In contrast, adult specimens of *D. coriacea* were caught in the two fishing areas. The capture of 10 individuals in a single set was recorded. Due to the high rate of sea turtle by-catch observed off the the Gulf of Guinea (1.02 ind/1000 hooks) conservation programs in the area should take into consideration the possible existence of a developmental and feeding area in this zone. Accordingly, longline fisheries in this area should be monitored and mitigation measures put in place to avoid or minimize damage to the pelagic phase of African populations of sea turtles.

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Marquez, R., Burchfield, P.M., Diaz, J., Sanchez, M., Carrasco, M., Jimenez, C., Leo, A., Bravo, R., and Pena, J. **Status of the Kemp's ridley sea turtle, *Lepidochelys kempfi*.** *Chelonian Conservation and Biology* 4(4): 761-766, 2005.

**Notes:** The primary nesting beach of the critically endangered Kemp's ridley sea turtle (*Lepidochelys kempfi*) at Rancho Nuevo, Tamaulipas, Mexico, was not recorded until 1947 and not known to science until 1961. Conservation work started there in 1966; during the second half of the 1960s nestings of over 2000 turtles per season were recorded, but in spite of several years of protection, between 1985 and 1987 nesting abundance reached the lowest point, with an annual average of 824 nests per year. After 1988 nesting started to increase and by 2003 had reached 5373 nests per year. With Rancho Nuevo nesting females estimated at 40,000 in 1947 and recorded at a low of 343 in 1985-87 with a gradual increase to 2339 in 2003, the nesting population had a decrease of about 99% over 40 years and has now begun to recover, but is still decreased by about 94% compared to historical levels. Until 1977 daily beach patrols covered only 27 km of beach, since then the protected area has increased slowly to over 230 km, including beaches in the state of Veracruz. Between 1966 and 1977 the average number of hatchlings released annually in Rancho Nuevo was around 23,000; since 1978 this number has increased gradually - in 2003 over 470,000 hatchlings were released. Head-start and imprinting efforts as well as ex-situ captive breeding have also been undertaken. The Rancho Nuevo beach was designated a "Natural Reserve" in 1977, covering 20 km of coastline and 4 km wide. The species has also been recorded to nest on some beaches in Veracruz in Mexico and on Padre Island in Texas, USA.

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Morreale, S.J. and Standora, E.A. **Western North Atlantic waters: Crucial developmental habitat for Kemp's ridley and loggerhead sea turtles.** *Chelonian Conservation and Biology* 4(4): 872-882, 2005.

**Notes:** Juvenile Kemp's ridley (*Lepidochelys kempfi*) and loggerhead turtles (*Caretta caretta*) occur in a continuous distribution from southern Atlantic waters far into northern latitudes. Each year, during warmer months, considerable numbers of juveniles of both species migrate into shallow coastal habitats in the western North Atlantic, where they remain for many weeks, foraging on a benthic diet composed mainly of crabs. During the foraging season, individuals remain local, and exhibit high growth rates. Recapture records and satellite telemetry data reveal that during the fall, both species leave colder northern waters and migrate southward along the continental shelf. After overwintering in common coastal areas, such as near Cape Canaveral, Florida, or Onslow Bay, North Carolina, individuals move northward and again enter coastal bays and estuaries. Studies over recent years in the western North Atlantic highlight the importance to both species of bay and estuarine habitats extending from Florida to New England. Management strategies and species recovery plans must include serious consideration of these crucial developmental habitats.

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Bhupathy, S. and Saravanan, S. **Status of marine turtles in the Gulf of Mannar, India.** *Chelonian Conservation and Biology* 5(1): 139-141, 2006.

**Notes:** *Lepidochelys olivacea* was the most frequent sea turtle documented in the Gulf of Mannar during 2000-2001, whereas during the 1970s it was *Chelonia mydas*. Reduction in overall proportions of *C. mydas* and its size classes is attributed to exploitation of eggs, turtles, and incidental catch in fishing gear.

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