INTER-AMERICAN CONVENTION FOR THE PROTECTION AND CONSERVATION OF SEA TURTLES

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CONSERVATION STATUS AND HABITAT USE OF SEA TURTLES IN THE EASTERN PACIFIC OCEAN

2012

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Purpose

At the 5th Conference of the Parties for the Inter-American Convention for the Protection and Conservation of Sea Turtles (IAC; Bonaire, June 2011), a Memorandum of Understanding (MOU) was signed between the IAC and the Inter-American Tropical Tuna Commission (IATTC). Under this agreement, the IAC believes that a first step to strengthen potential collaborations is to provide the IATTC with information about the conservation status, habitat use, and movements of sea turtles in the eastern Pacific Ocean (EPO). This report provides the current state of knowledge regarding the five sea turtle species occurring in the region, including leatherback turtles (*Dermochelys coriacea*), green or black turtles (*Chelonia mydas*), loggerhead turtles (*Caretta caretta*), olive ridley turtles (*Lepidochelys olivacea*) and hawksbill turtles (*Eretmochelys imbricata*).

The recently signed IAC-IATTC MOU presents an excellent opportunity to combine international efforts to monitor, protect, and recover marine turtle regional management units (RMUs, Wallace et al. 2010a). In particular, the IAC and IATTC can collaborate to identify which are the most critical conservation issues, and when bycatches in fisheries or other impacts from the fisheries under the Antigua Convention are contributing to the problems, and work together to identify necessary research or mitigation options to address them in sea turtle RMUs in the eastern Pacific.

Indeed, IATTC has been committed to the protection of sea turtles for many years. For example, in recognition of the lack of comprehensive information concerning the impact of fisheries on sea turtles in the eastern Pacific (IATTC Fishery Status Report 2, p. 93), IATTC adopted several recommendations relating to information gathering and mitigation of sea turtle bycatch. These include the following: Resolution C-04-07 (Resolution on a 3-year program to mitigate the impact of tuna fishing on sea turtles), which urged all nations with vessels fishing for tunas in the eastern Pacific to provide the IATTC with information on interactions with sea turtles, including both incidental and direct catches and other impacts on sea turtle populations; and Resolution C-07-03 (Resolution to mitigate the impact of tuna fishing vessels on sea turtles), which required annual reporting of interactions with sea turtles in fisheries managed under the Convention and includes a directive to countries with purse-seine vessels fishing for species covered by the IATTC Convention in the eastern Pacific to avoid encirclement of sea turtles and longline vessels to carry and, when sea turtle interactions occur, employ the necessary equipment for the prompt release of incidentally caught sea turtles.

In line with these resolutions, IATTC has been collecting information on sea turtle bycatch in the region. Annual Fishery Status Reports (FSRs) since 2002 summarize the direct impact of tuna and bill fisheries upon various species, including sea turtles. Since 2004, the IATTC has also been working with artisanal longline fisheries in the eastern Pacific to reduce turtle bycatch using hook modifications, by providing them with the necessary tools and materials on how to use them, as well as through holding frequent workshops with fishermen. The IATTC has been successfully working with interactions in purse seiners, decreasing annual mortality from its peak of close to 170 turtles to around 20 turtles today, through educational programs for the fishermen, which are reinforced by the Resolution that makes it mandatory to place a boat in the area where the net leaves the surface of the water and, whenever a sea turtle is sighted in the net, all reasonable efforts should be made to rescue the turtle before it becomes entangled in the net.

The IAC - IATTC MOU has strong potential for integrated conservation and monitoring of sea turtles in the eastern Pacific. Specifically, a joint effort by IAC and IATTC to reduce bycatch in marine turtle high-use areas, particularly those close to nesting beaches, would be a significant accomplishment for sea turtle conservation in the region, and could galvanize other regional efforts to monitor and address threats to marine turtle populations. Engaging with artisanal fleets using gillnets to mitigate sea turtle bycatch has been effective at reducing mortality in several previous cases (e.g. Eckert and Eckert 2005; Peckham et al. 2007a). In the context of this report, by providing information on sea turtle conservation status, movements, and high use internesting areas, we believe that similar successes can be gained within the eastern Pacific.

Background

Marine turtles are distributed over broad areas, occupy different habitats during different life stages, and often migrate over hundreds or thousands of kilometers between breeding and feeding areas (Wallace et al. 2010a). Because threats to marine turtles vary in space and time, their conservation requires identification of high-use areas so that efforts to reduce threats to these species can be targeted to maximize effectiveness.

Recent advances in identification of high-use areas for marine turtles using satellite telemetry provide great opportunities to shape conservation efforts to address particular threats in these areas (Godley et al. 2008; Shillinger et al. 2008; 2010; Witt et al. 2011). In particular, a primary threat to marine turtles globally is incidental capture in fishing gear, or bycatch (Wallace et al. 2010b; 2011), so effective actions to reduce or eliminate marine turtle bycatch in high-use areas would be important progress for marine turtle conservation.

Along these lines, important feeding areas and internesting areas have been described for several marine turtle RMUs that occur within the region of shared interest for IAC and IATTC, and many of these RMUs are among the most endangered in the world (Wallace et al. 2011). The concentrated movements of turtles in these areas, particularly internesting areas, suggest they would be ideal areas for at-sea conservation measures.

Sea turtle habitats are very extended, since their migrations crisscross the Pacific Ocean, but there are areas that are not so extended, close to the coast, and near nesting beaches where the densities in some periods of the year are high, and they include the most valuable individuals from the point of view of conservation: reproductive females and males. These are the internesting areas that host predictable aggregations of marine turtles (adult females and males) during each nesting season, these areas close to the coast are under national jurisdictions (i.e. within EEZs). Below, we highlight high-use areas that have been described for each species in the eastern Pacific that could be considered as targets for future time-area fisheries closures or other measures to reduce marine turtle bycatch.

To complement this information, we also provide data on high-seas foraging areas and migratory routes identified by satellite telemetry to provide other opportunities for conservation in the region.

Conservation status and movements

The waters of the eastern Pacific host important feeding and nesting areas for four sea turtle species: the leatherback, the green turtle, the hawksbill, and the olive ridley. In addition, a fifth species, the loggerhead turtle, feeds in the northern- and southern-limits of the eastern tropical Pacific, but nests on distant beaches in the western Pacific. The following accounts summarize the current knowledge regarding conservation, movements, and habitat use for each of these five species.

1) Leatherback, *Dermochelys coriacea*

Conservation Status

Leatherback nesting occurs along the Pacific coast of the Americas from México to Ecuador, although nesting is concentrated solely in two primary beach complexes – one in Costa Rica (Santidrian-Tomillo et al. 2007) and the other in Mexico (Sarti et al. 2007) – with a third, lesser nesting assemblage in Nicaragua (Urteaga and Chacon 2007)(Figure 1). The number of nesting female leatherbacks in the eastern Pacific has declined by more than 90% over the past 20 years (Figure 2), which is in stark contrast to leatherback populations in the Atlantic Ocean, most of which are either stable or increasing, and much more abundant (USFWS and NMFS 2007; Wallace and Saba 2009).

IUCN Red List Status: Critically Endangered

Figure 1. Nesting distribution and abundance for leatherback turtles in the eastern Pacific Ocean. The larger circles indicate more nesting activity. Figure from Seminoff and Wallace (2012).

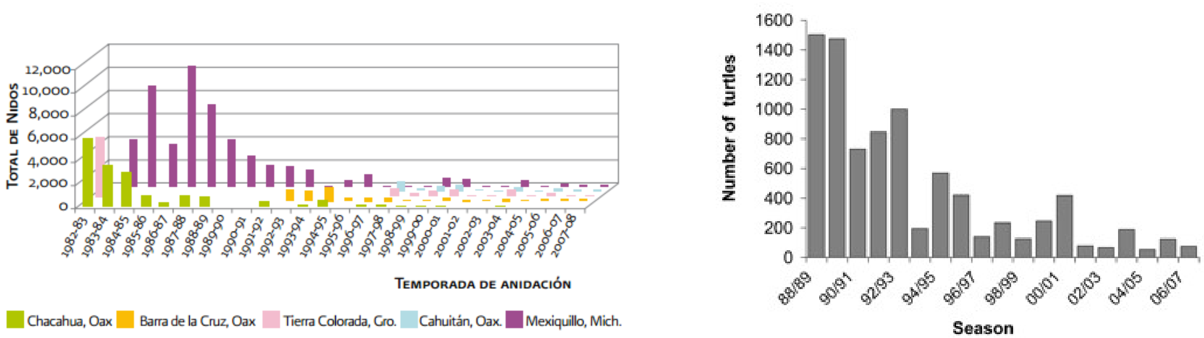


Figure 2. Summary of leatherback nesting trends in Mexico (left) and Costa Rica (right). Data for Mexico from CONANP (2010); data from Costa Rica from Santidrian-Tomillo (2007).

Internesting movements

Leatherback nesting populations in the eastern Pacific have declined more than 90% over the past two decades, owing to comprehensive egg harvest and fisheries bycatch (Santidrián Tomillo et al. 2007; Sarti Martínez et al. 2007). This trend is in contrast to the stable to increasing annual nesting populations in the Atlantic (Dutton et al. 2005), where the positive trends (vs. negative trends in the Pacific) may be attributed to a variety of factors relating to climate impacts and differential fisheries mortality in the two ocean basins (e.g. Wallace and Saba 2009). The eastern Pacific leatherback RMU is among the most endangered RMUs in the world (Wallace et al. in press). The vast majority of nesting occurs in Mexico and in Costa Rica. Nesting in Mexico is distributed across four priority beaches and several secondary beaches, according to their nesting density and abundance, the priority beaches receive about 45% of all nesting that occurs along the Pacific coast of Mexico and between 25-30% at secondary sites (Sarti 2007) while nearly all nesting in Costa Rica takes place on a few small beaches in Las Baulas National Park (Parque Nacional Marino Las Baulas, PNMB). In addition, a multi-year satellite telemetry study of adult female leatherbacks at PNMB and in Mexico has allowed clear delineation of high-use habitats in the internesting areas and high-seas migratory routes and feeding areas (Figure 3).

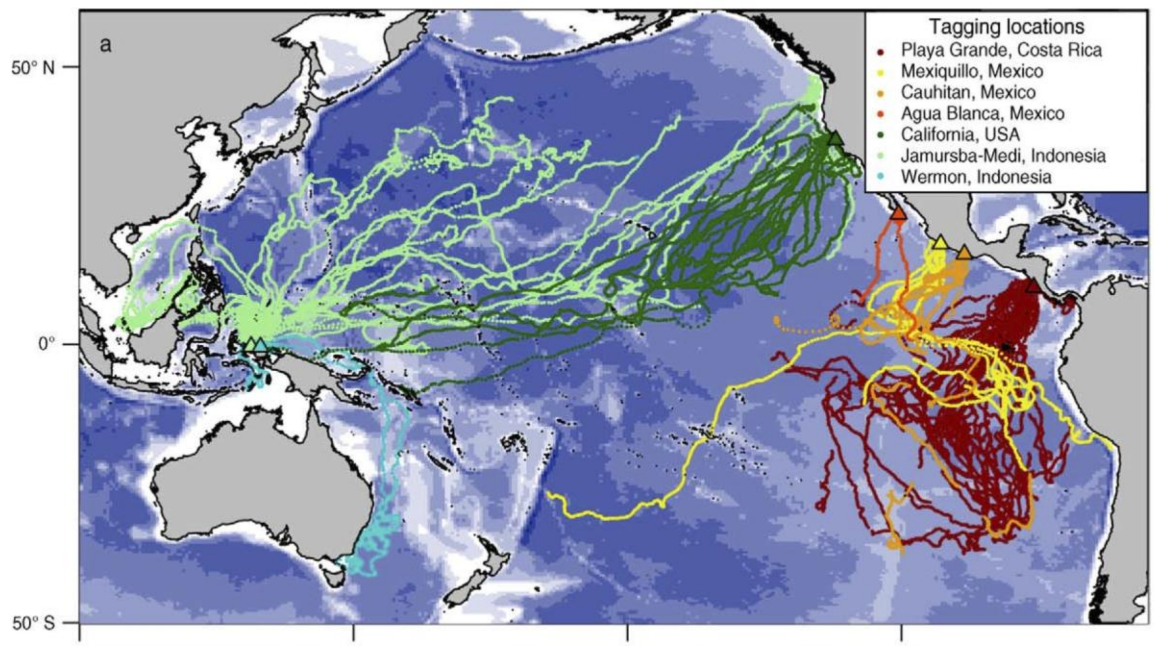


Figure 3. Satellite-tracked movements of 135 leatherback turtles in the Pacific Ocean coded by tagging location and overlaid on bathymetry. Figure from Bailey et al. 2012.

There are substantial movement data for leatherback turtles nesting at Playa Grande, with 135 leatherbacks tracked from PNMB (Morealle et al. 1996, Shillinger et al. 2008) to identify internesting, migration, and foraging movement patterns. These data provide good resolution on the time and spacing of leatherback movements during the internesting period (7-10 weeks, with peak nesting from Nov-Feb; Santidrian-Tomillo et al. 2007). The fact that turtles movements are concentrated in a relatively small area near the nesting beach during this period suggests that they are highly susceptible to spatially-explicit anthropogenic threats and underscores the potential high value of a time-area closure mechanism to reduce at-sea impacts.

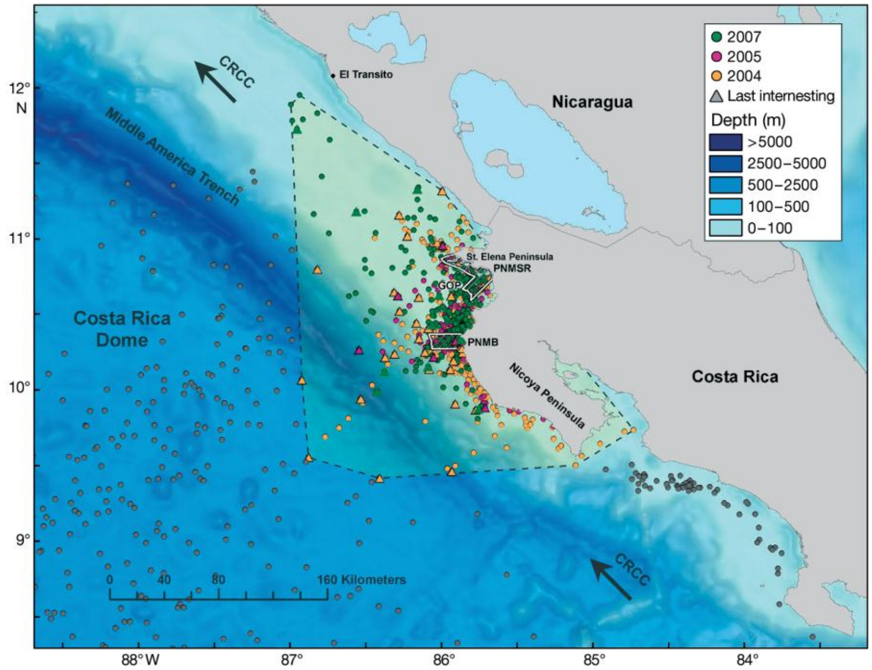


Figure 4. Internesting area for leatherbacks nesting at Parque Nacional Marino Las Baulas, Costa Rica. Map from Shillinger et al. (2010).

During the nesting period, which lasts from mid-October through mid-February each year, leatherbacks traveled between 120-160 km from their nesting beaches. The total internesting area across all years was 33,542 km^2 and spanned from 11.95°N to 9.42°N and from 84.73°W to 86.99°W (Figure 4).

This is a clear example of a defined area that hosts significant numbers of endangered leatherbacks during the same time period each year. Peak density of leatherbacks in this internesting area coincides with the peak of nesting activity, which occurs between December and January. Although the PNMB is already a no-take zone, and artisanal fishing activities (mainly hand-lining) predominate in the areas adjacent to the Park, surrounding waters included within the defined high-use internesting area should be targets for reducing interactions between fishing gears and leatherbacks during internesting periods.

The nesting season in Mexico, like in Costa Rica, lasts from October to March or April with a peak towards the end of December and beginning of January. However, in the years of higher abundance nesting was recorded from September. Leatherback rookeries or colonies in Mexico are distributed from the south of Baja California all the way to Oaxaca and they concentrate on four primary nesting beaches (Mexiquillo, (Michoacán) Cahuitan and Tierra Colorada (Guerrero) and Barra de la Cruz (Oaxaca)) (Márquez-M et al., 1981, Pritchard, 1982, Sarti et al. 2007). Nesting beaches for this species in the eastern Pacific are characterized for being medium or low energy. They are steep and not too wide, meaning that the animals do not have to move a long distance to find a suitable place to nest. Another characteristic of these beaches is that they are mostly of volcanic origin.

The majority of females make their multiple nests on the same beach, but with the tagging program it has been observed that during the internesting period (7-10 weeks during the nesting season; Santidrian-Tomillo et al. 2007) some females can move up to 300 km along the coast and make nests on neighboring beaches. As far as movements of females off the coast during the internesting period, the majority of our knowledge comes from Costa Rica (Morealle et al. 1996, Shillinger et al. 2008, Shillinger unpubl. data).

Post-nesting movements

Leatherback movements in the East Pacific are among the best studied for any marine turtle population (Figure 3). Horizontal (Eckert and Sarti 1997; Shillinger et al. 2008) as well as vertical movements (Shillinger et al. 2011) have been described in detail for this population, providing unique opportunities for fisheries managers to design and implement fishery-appropriate measures to reduce interactions between leatherbacks and fishing gears. For example, Shillinger et al. (2008) identified high-use areas for leatherbacks in the Southeast Pacific, and highlighted a core area that coincides with persistent oceanographic conditions (i.e. low-energy current field).

The identification of these high-use areas were derived from multiple years of tagging data from nearly 50 adult female leatherbacks, so reflect persistent patterns of migration and high-seas habitat use in space and time. Thus, the core use areas represent potential targets for efforts to reduce leatherback bycatch. Furthermore, these horizontal movement patterns could be integrated with analyses of leatherback vertical movements in high-use areas to design possible modifications to fishing gear and practices to mitigate leatherback bycatch in fisheries, in the Southeast Pacific in particular (Shillinger et al. 2011).

In Mexico, over a six year period, 33 leatherbacks have been tagged on the beaches of central and south of Mexico (Mexiquillo, Mich., Cahuitán, Oaxaca), as well as Baja California South (Agua Blanca)(Bailey et al. 2012, Eckert, unpubl data). The majority showed a similar migration pattern, leaving the coast once their nesting season was over and moving south, in a very well defined path, although at least one turtle exhibited post-nesting movements into coastal zones south of Costa Rica (Figure 3). This figure also shows movements of turtles emerging from nesting beaches in the western Pacific and from foraging areas in the eastern North Pacific, both of which clearly demonstrate the lack of overlap between leatherback turtles of eastern and western Pacific nesting beach origins. Figure 5 shows high use areas for leatherback sea turtles nesting at Playa Grande, Costa Rica.

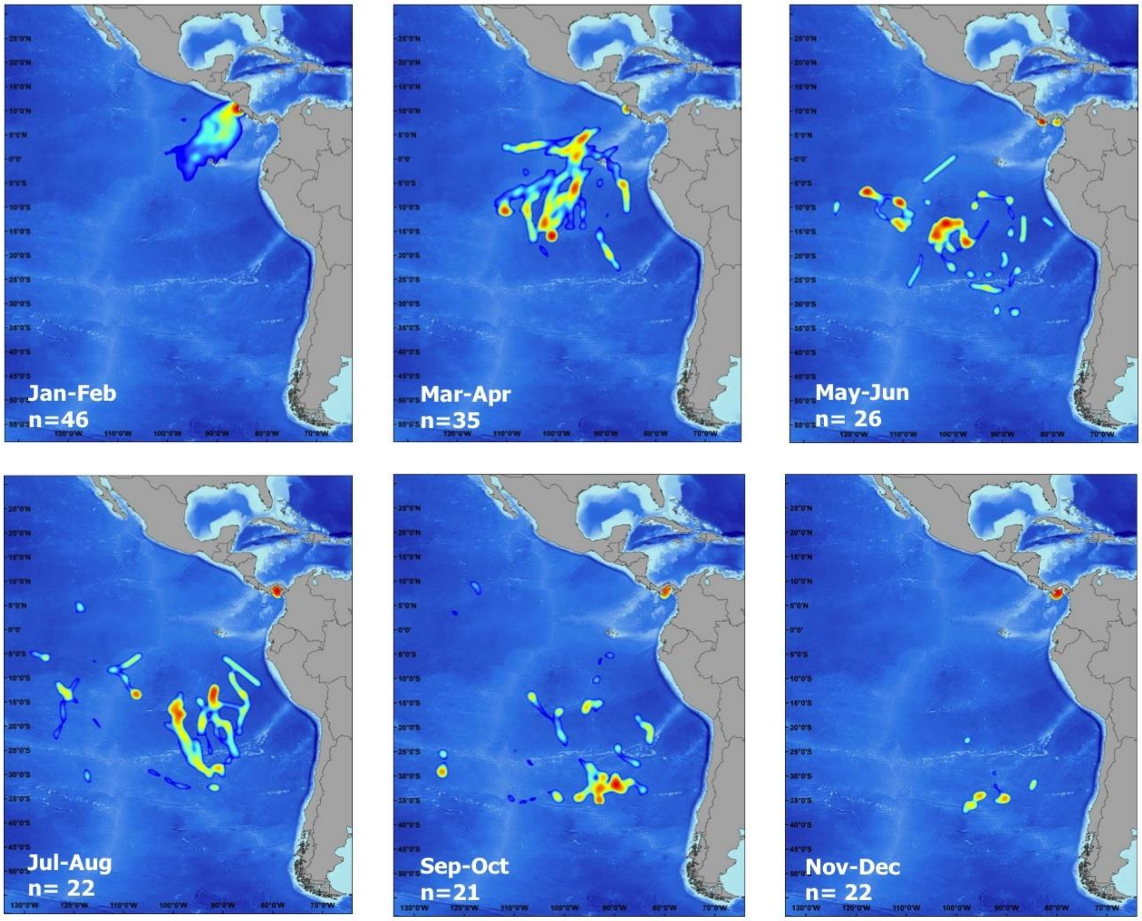


Figure 5. High use areas by month for leatherback sea turtles nesting at Playa Grande, Costa Rica (Shillinger et al. 2008, Shillinger unpubl. data). Warmer colors indicate areas if higher use. Leatherback movements are most concentrated near the nesting beach, from January to February each year. These findings present multiple opportunities for conservation efforts in the region, particular in internesting areas (January-February, upper-left panel).

At-sea distribution based on ship-based observations

In addition to the satellite telemetry data, there are also data sets on at-sea distribution that were collected via observers and fishers onboard fishing vessels in the eastern Pacific. The primary dataset available was developed by IATTC and shows a wide distribution of leatherback turtles throughout the eastern Pacific, ranging from the Gulf of California, Mexico to Peru (Figure 6). In addition, Donoso and Dutton (2010) established the location of three species of sea turtles, principally leatherbacks, that were by captured by the Chilean swordfish fishery (Figure 7). In addition to leatherbacks, Donoso and Dutton (2010) found that green turtles and loggerheads also occurred in Chilean offshore waters (Figure 7).

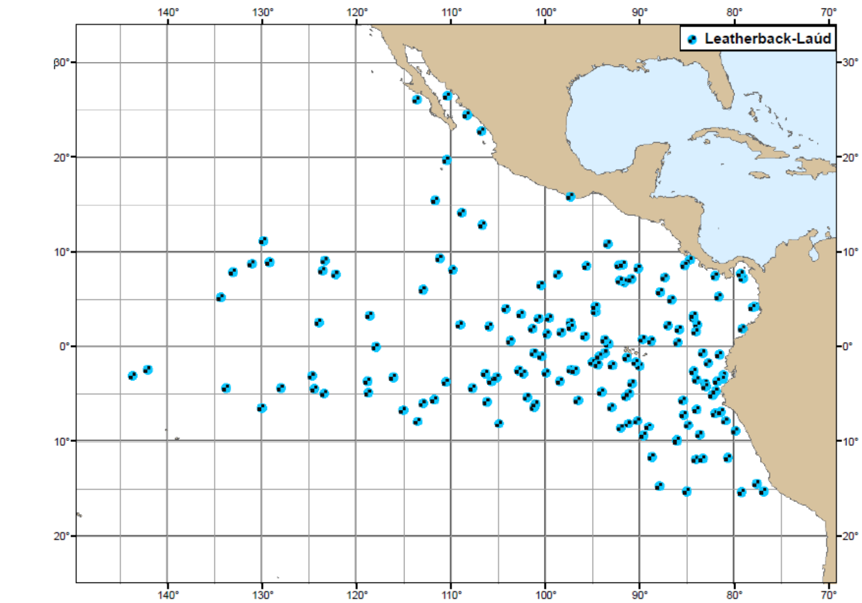


Figure 6. Sets with presence of leatherback turtles in the eastern Pacific from 1993-2008. (IATTC Observer database, Hall and Roman, pers. comm.)

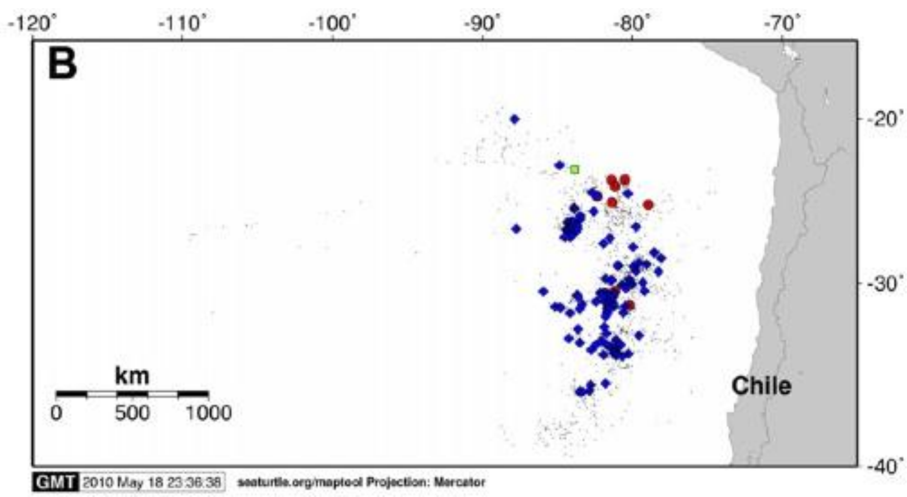


Figure 7. Distribution of leatherback (blue diamonds) green turtles (green squares) and loggerheads (red circles) in offshore waters of Chile during 2002. Figure from Donoso and Dutton (2010).

2) Loggerheads, *Caretta caretta*

Conservation status

Relative to historical abundance, today's loggerhead nesting populations in the North Pacific (Japan) and South Pacific (Australia) are substantially reduced (Figure 8). One ray of hope is that nesting in Japan may be showing early signs of recovery. Although it is much too soon to distinguish a trend, nesting for the species in 2008 and 2009 was the highest it had been in over a decade.

IUCN Red List Status: Endangered

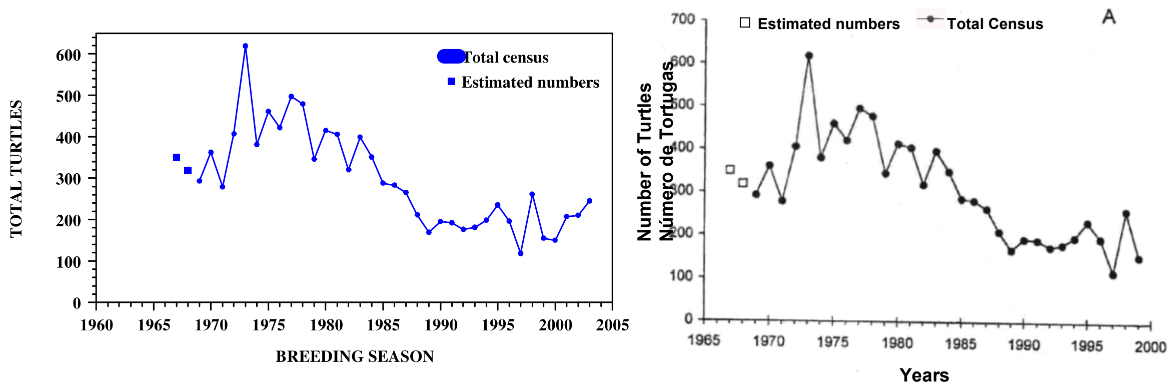


Figure 8. Nesting trends for loggerheads at Gamoda Beach, Japan (left, Kamezaki et al. 2003) and Woongarra coast, including Mon Repos. Australia (right, Limpus 2008).

Feeding areas

Although loggerheads do not nest along the eastern Pacific coastline (Márquez et al., 1982, Márquez-M., 1995), two distinct RMUs utilize feeding areas in the region. The North Pacific RMU (also one of the top 12 most endangered RMUs'; Wallace et al. in press) nests only in Japan (but also possibly on the west coast of China), then they migrate east and occupy a well-documented juvenile nursery area. However, individuals of more than 90cm carapace length are documented off the coast of Baja California, Mexico and inside the Gulf of California (Márquez-M., 1995). This high-use area has been described by satellite telemetry, but is also an area of extremely high bycatch interactions between loggerheads and small-scale fishing activities (Peckham et al. 2007b) (Figure 9). Efforts are ongoing to mitigate the impacts of these interactions.

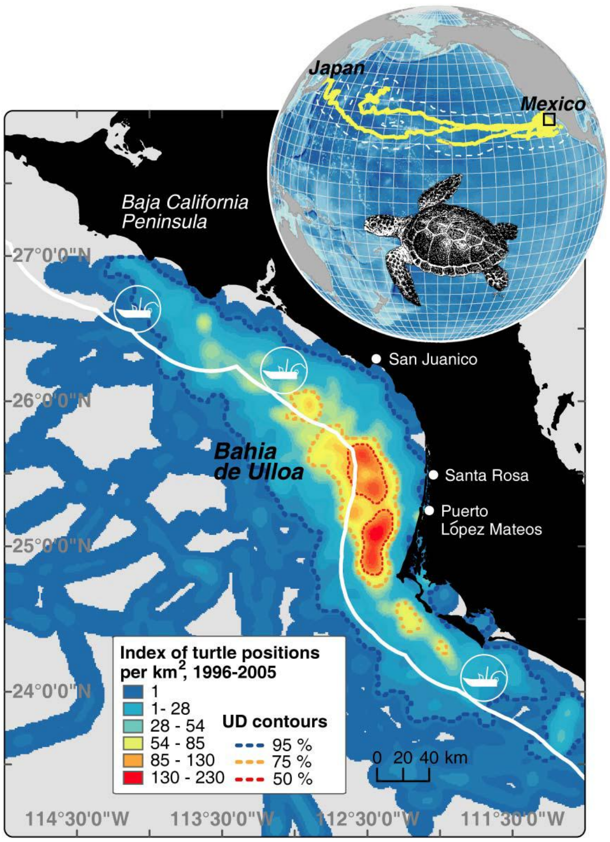


Figure 9. High-use area off Baja California, Mexico, for large juvenile loggerheads belonging to the North Pacific RMU. Conservation efforts have been ongoing for several years to reduce bycatch of loggerheads in small-scale fishing gear. Figure from Peckham et al. (2007b).

At-sea distribution based on ship-based observations

Additional data collected by onboard observers within fleets managed by IATTC show a wide distribution of loggerhead turtles throughout the eastern Pacific (Figure 10), with a clear hotspot along the Pacific coast of Baja California, consistent with results of Peckham et al. (2007b). Although some caution should be exercised due to the potential of mis-identification of olive ridleys as loggerhead turtles, a widespread problem that occurs well outside the fisheries sector (Frazier 1985), these are highly useful data for demonstrating the broad distribution of the species in the eastern Pacific despite the fact that no nesting occurs in the region.

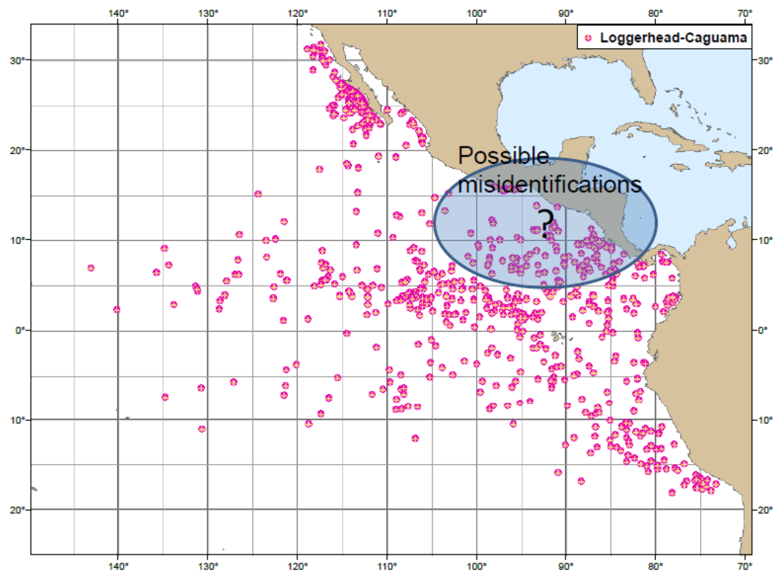


Figure 10. Sets with presence of loggerhead turtles in the eastern Pacific from 1993-2008. (IATTC Observer database, Hall and Roman, pers. comm.)

3) Green (or black) turtles, *Chelonia mydas*

Conservation status
Green turtle nesting ranges from the Los Cabos Region of Mexico's Baja California Peninsula to northern Peru (Wester et al. 2010), with major nesting rookeries in Michoacán, Mexico (Delgado-Trejo and Alvarado-Díaz, 2012) and the Galápagos Islands (Zárate et al. 2003). Lesser nesting sites are found in the Revillagigedo Islands off central Mexico and several small beaches along the Central American coastline, particularly from El Salvador through northwest Costa Rica (Figure 11). While long-term nesting trends are only available for Michoacán, the available data indicate an encouraging sign: the population has been in an apparent upward trend for nearly 10 years, and annual nesting levels at this Mexican rookery are the largest they have been since the early 1980s (Figure 12, Delgado-Trejo and Alvarado-Díaz, 2012).

IUCN Red List Status: Endangered

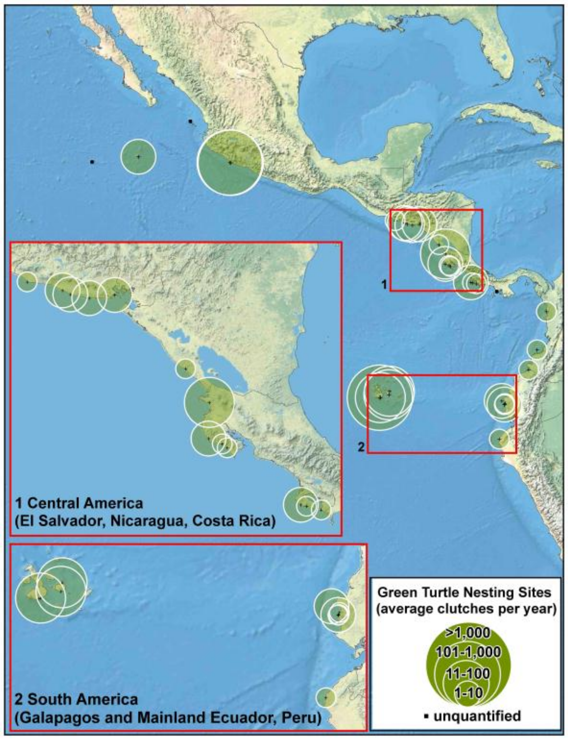


Figure 11. Nesting distribution and abundance for green turtles in the eastern Pacific Ocean. The larger circles indicate more nesting activity. Figure from Seminoff and Wallace (2012).

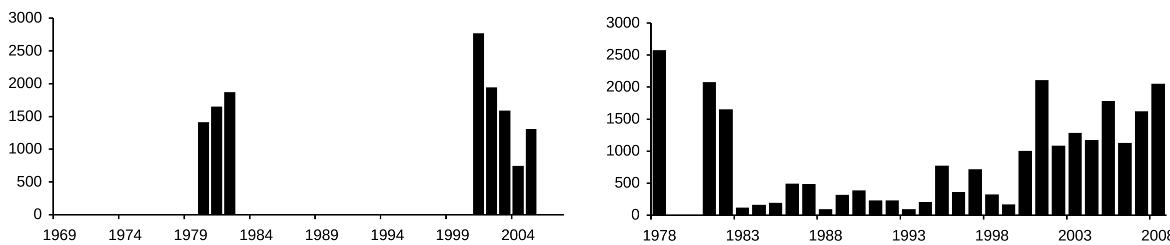


Figure 12. Annual nesting female abundance in the Galapagos Islands (left; Zarate unpubl. data), and Michoacan, Mexico (right; Delgado-Trejo and Alvarado-Díaz, 2012)

Internesting and Post-nesting

The primary nesting sites for green turtles in the East Pacific region are in Michoacán state, Mexico, and the Galapagos Archipelago, Ecuador (Márquez-M., 1995, Seminoff, 2007). Important feeding areas occur throughout the region in coastal areas and island/seamount habitats, including the Gulf of California, Mexico, along the coast of Central and South America, as well as Cocos Island, Costa Rica, Gorgona Island, Colombia, and the Galapagos Archipelago (Archipiélago de Colon). These places are characterized by abundance of sea grass beds and marine algae, the main component of this species diet.

Seminoff et al. (2008) described post-nesting movements of adult female green turtles that nested on beaches in the Galapagos Archipelago. Galapagos nesters showed multiple behavior patterns, including migration to Central American foraging areas (Type A1), resident foraging areas within the Galapagos (Type A2), and open-ocean foraging areas, where they forage on soft-bodied invertebrates and surface-dwelling prey that aggregate in frontal zones (Type B) (Figure 13). Indeed, green turtles have long been considered to be strongly tied to coastal areas with abundant seagrass and/or marine algae pastures. However, these movement data, coupled with very common at-sea observations (e.g. Figure 14) indicate that many green turtles live their lives in the high-seas of the eastern Pacific. Throughout the entire Eastern Tropical Pacific there is a limited amount of surface covered with sea grass and marine algae pasture since the water depth increases rapidly just a few miles offshore, as seen in the maps in Figure 13. This probably forces this species to change their diet in this region (Seminoff and Wallace 2012).

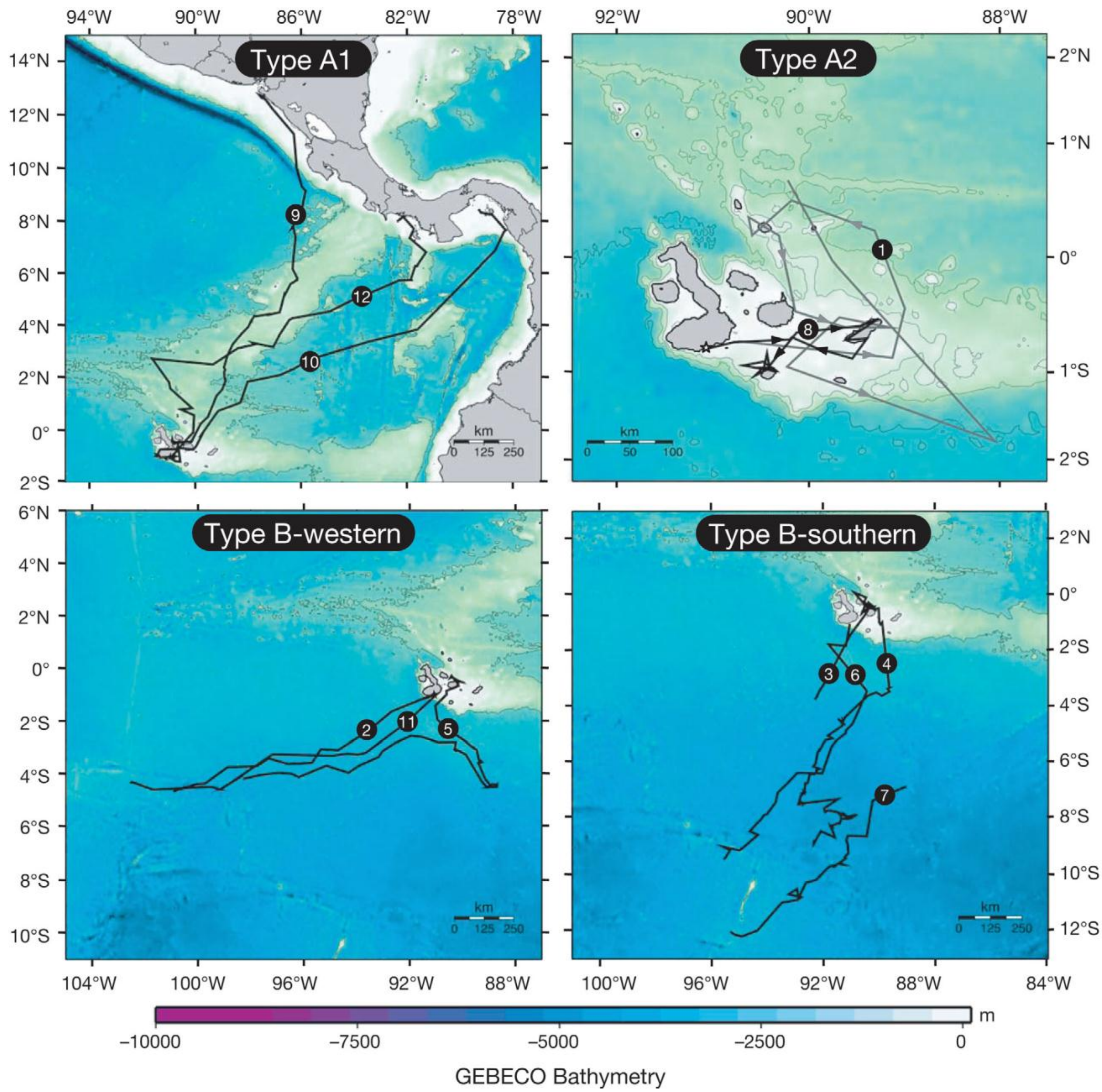


Figure 13. Multiple patterns of post-nesting migrations of green turtles from and within the Galapagos archipelago. Figure from Seminoff et al. (2008).

At-sea distribution based on ship-based observations
Additional data collected by onboard observers within artisanal tuna purse-seine vessels (IATTC 2004) show a wide distribution of green turtles throughout the eastern Pacific (Figure 14), with the greatest distribution densities along equatorial waters and along the Pacific coast of South America. Indeed, these offshore sightings force us to re-think conventional paradigms about the obligate coastal inhabitance by green turtles. Recent studies by Seminoff et al. (2008) and Hatase et al. (2006) have similarly shown that at least some green turtles live their lives in the high seas, where food is abundant in surface waters near current convergences (i.e. frontal zones).

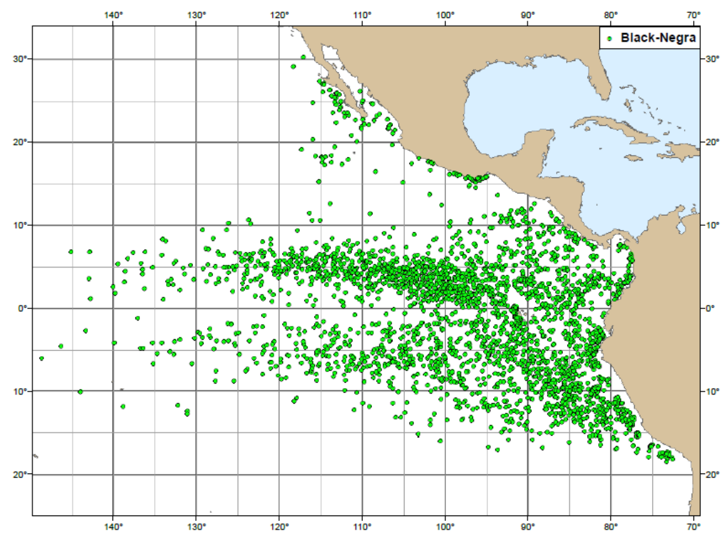


Figure 14. Sets with presence of green turtles in the eastern Pacific from 1993-2008. (IATTC Observer database, Hall and Roman, pers. comm.)

4) Olive Ridley Turtles, *Lepidochelys olivacea*

Conservation status
The olive ridley is by far the most abundant sea turtle species in the eastern Pacific, and probably in the world (Figure 15). Nesting trends at two major arribada beaches in Mexico and Costa Rica have shown dramatic increases in numbers of nesting females (Figure 16; Chaves 1998, 1999, 2002, Márquez et al. 2002, Chaloupka et al. 2004). A recent study by Eguchi et al. (2007) using shipboard observations estimated the at-sea population to number more than 6 million turtles.

IUCN Red List Status: Vulnerable

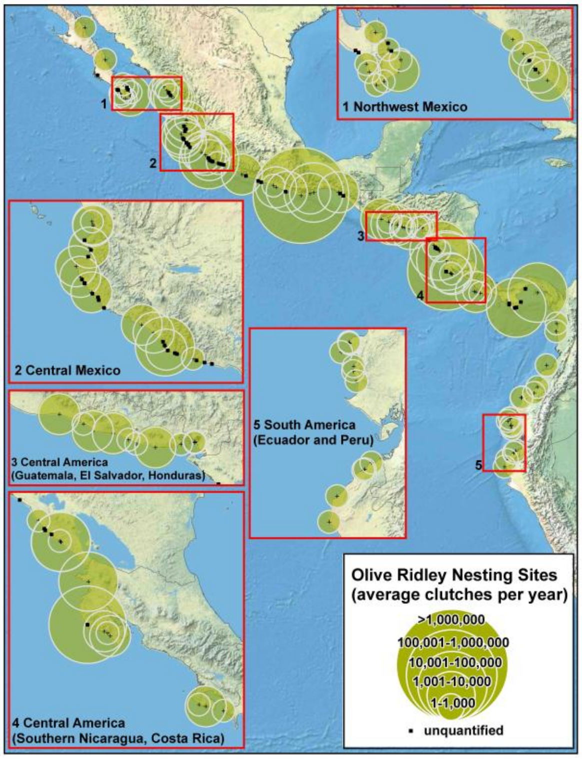


Figure 15. Nesting distribution and abundance for olive ridley turtles in the eastern Pacific Ocean. The larger circles indicate more nesting activity. Figure from Seminoff and Wallace (2012).

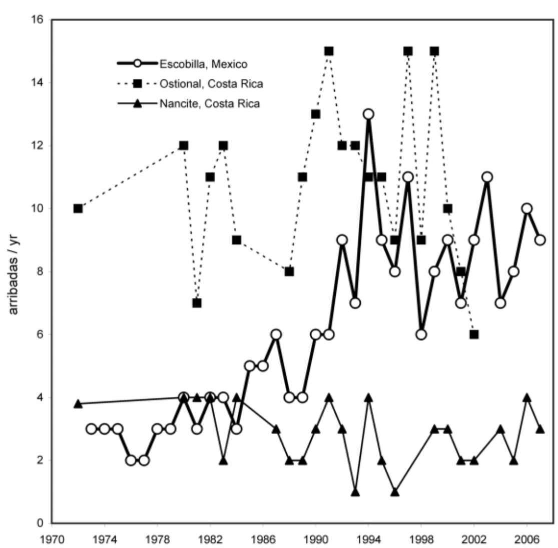


Figure 16. Change in nesting arribada abundance for olive ridley turtles at three major arribada sites in the eastern Pacific (Plotkin et al. 2012)

Post-nesting movements

The most comprehensive study of post-nesting movements was conducted by Plotkin (2010), who studied the post-reproductive migrations of 20 female olive ridley turtles using satellite telemetry (Figure 17). Long-term data revealed that turtles were widely distributed in the pelagic zone from Mexico to Peru and lacked migratory corridors. Turtles migrated long distances, swam continuously, displayed no fidelity to specific feeding habitats, and were nomadic. An El Niño occurred in the middle of the study, and turtle migration patterns changed in response. Eastern Tropical Pacific (ETP) olive ridleys have likely evolved migratory flexibility to adapt to the frequent and unpredictable environmental change characteristic of their large dynamic marine ecosystem. This suggests that ETP olive ridleys may be less vulnerable to the impacts of climate change than other sea turtle species (Plotkin 2010).

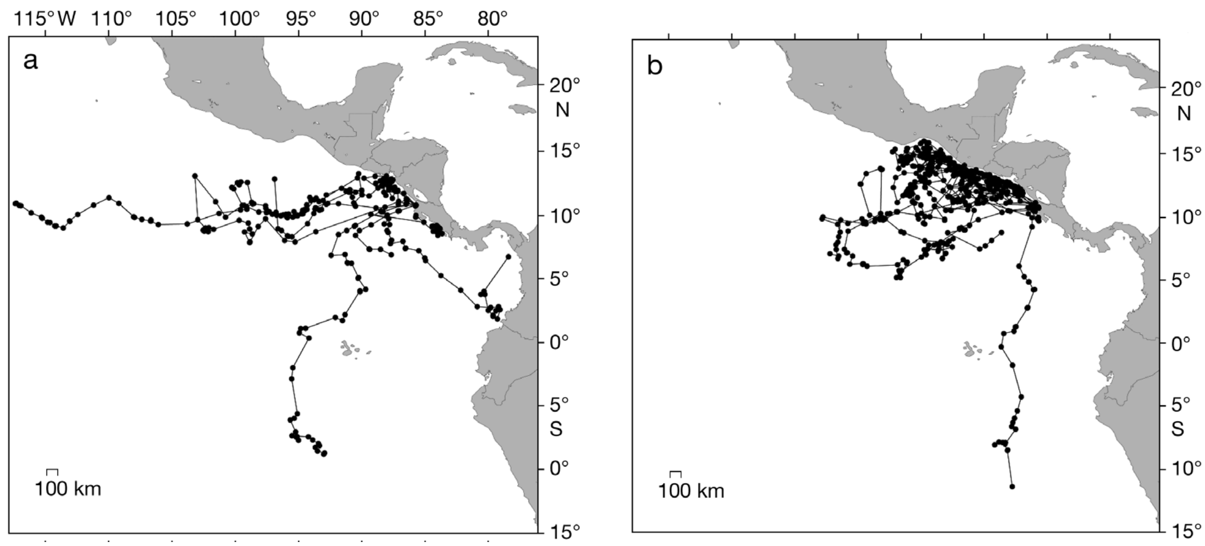


Figure 17. Post-nesting migrations of 20 female olive ridleys during (a) 1990–1991 and (b) 1991–1992 (data from Plotkin, 2010)

At-sea distribution based on ship-based observations

Additional data collected by observers onboard tuna purse-seine vessels (IATTC 2004) show a broad distribution of olive ridley turtles throughout the eastern Pacific (Figure 18), with massive hotspots located in equatorial waters, along the coast of Central America, and in offshore waters near Peru. It is well known that olive ridley turtles are the most abundant species in the eastern Pacific, and the findings presented by IATTC (2004) are consistent with this understanding.

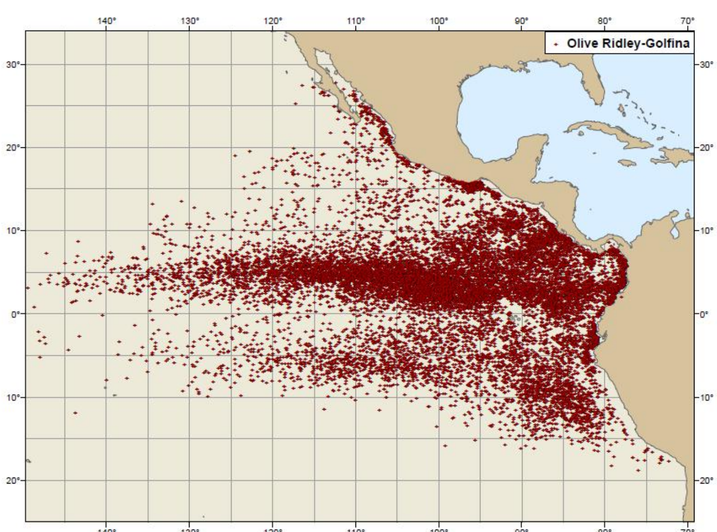
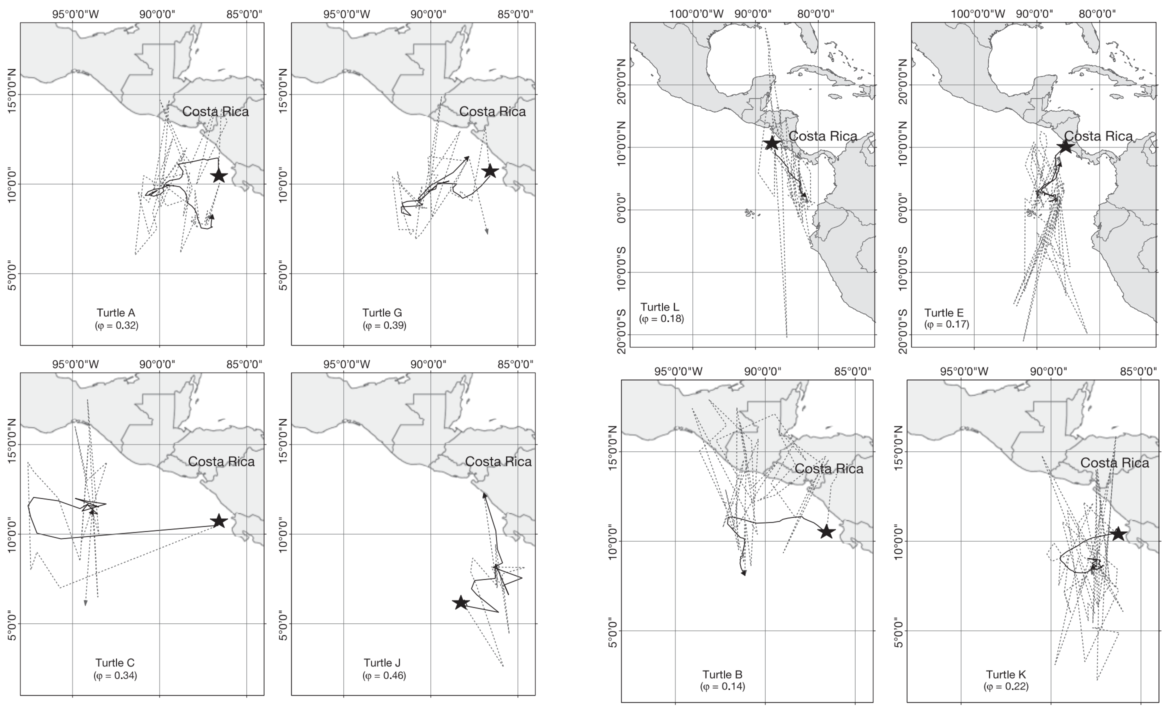


Figure 18. Sets of olive ridley turtles in the eastern Pacific from 1993-2008. (IATTC Observer database, Hall and Roman, pers. comm.)

At-sea movements

Swimmer et al. (2009) tracked eight olive ridley turtles in the eastern Pacific using 'popup' tags and geolocation post-processing techniques to show that olive ridleys captured incidentally in artisanal fisheries remained in offshore waters for their entire tracking periods (Figure 19). Peavey and Seminoff (unpubl. data) tracked three turtles offshore Pacific Mexico in 2006 and found that turtles spent the majority of their time offshore; with one animal apparently nesting during the tracking efforts, but remaining offshore when not nesting (Figure 19). It is important to note; however, that olive ridley turtles also inhabit nearshore habitats during non-nesting periods. The species has been captured during mark-recapture efforts in coastal waters of Mexico (Seminoff 2000), and Peru (ACOREMA 2000, Kelez, pers. comm).



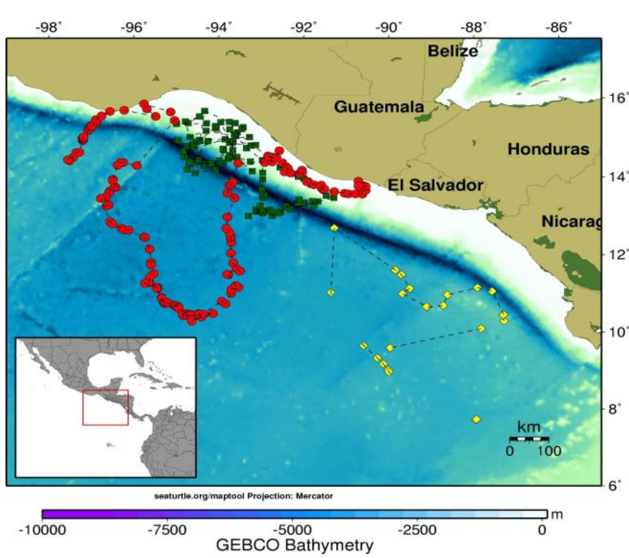


Figure 19. At sea movements of olive ridley turtles in the eastern Pacific. Upper left and upper right: eight olive ridleys tracked via popup tags - solid lines indicate 'most probable movement paths' (Swimmer et al. 2009). Left: three olive ridleys tracked via satellite telemetry (Peavey and Seminoff, unpubl. data).

5) Hawksbill turtles, ***Eretmochelys imbricata***

Conservation Status.

Hawksbill turtles are rare to absent in most localities in the eastern Pacific. For years, the population was thought to be on the verge of extinction. However, several recent discoveries have identified nesting hotspots in El Salvador, Nicaragua, and Ecuador (Gaos et al. 2009) (Figure 20). Together, these sites have between 400 and 600 nests each year (Gaos et al. 2009, Liles et al. 2011; Urteaga, unpubl. data). Although the population is highly endangered, with roughly 600 nests throughout the eastern Pacific each year (Gaos et al. 2010), it is unclear if and how much this population may be depleted from former levels. Although some believe it to be a fraction of its former abundance, no nesting trends are available.

IUCN Red List Status: Critically Endangered

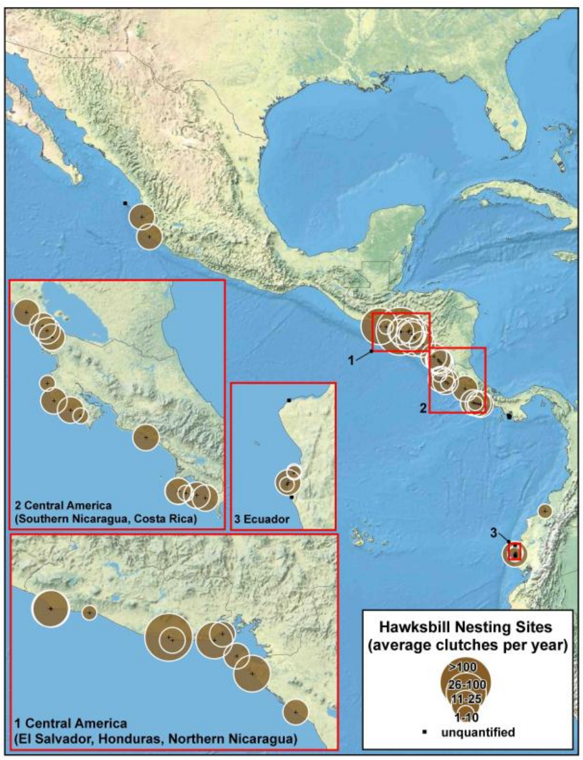


Figure 20. Nesting distribution and abundance for hawksbill turtles in the eastern Pacific Ocean. The larger circles indicate more nesting activity. Figure from Seminoff and Wallace (2012).

Post-nesting movements and habitat use in foraging areas

Recent satellite telemetry efforts have uncovered two major discoveries regarding hawksbill turtles in this region. First, we are now aware that the post-nesting migrations of hawksbills follow extremely coastal routes as turtles move to foraging areas (Figures 21, 22). Second, it is now clear that adult hawksbill turtles utilize mangrove estuaries as their primary foraging habitats (Figure 23). These discoveries hold true for nesting females from all three of the primary nesting assemblages (El Salvador, Nicaragua, Ecuador).

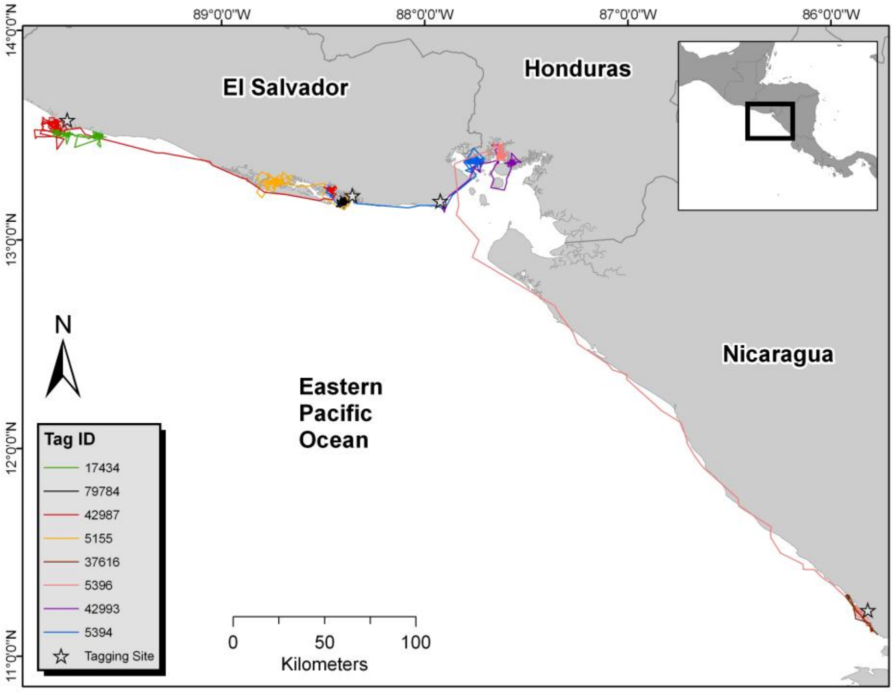


Figure 21. Post nesting movements of hawksbill turtles nesting in El Salvador and Nicaragua determined via satellite telemetry

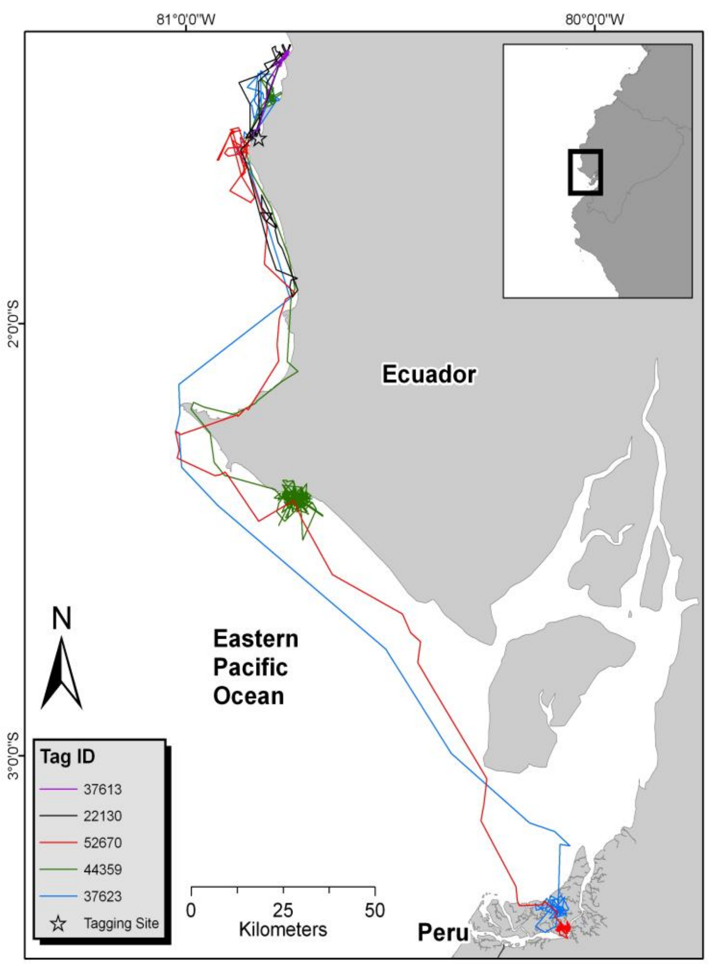


Figure 22. Post nesting movements of hawksbill turtles nesting at Machalilla National Park (Ecuador) determined via satellite telemetry

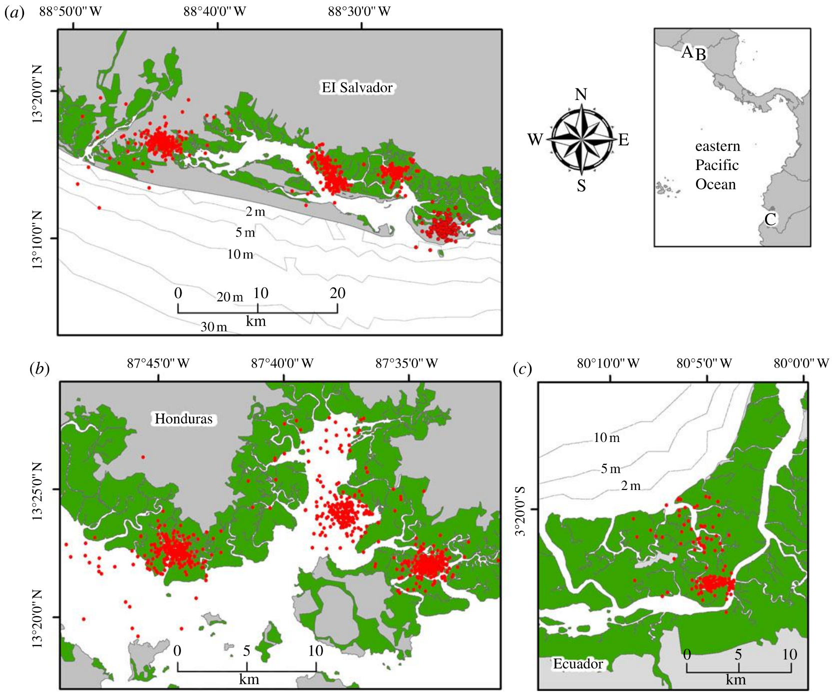


Figure 23. Mangrove estuary foraging areas used by 10 hawksbill turtles at Jiquilisco-Xiriualtique Bay, El Salvador (n = 4), Gulf of Fonseca, Honduras (n = 4) and Jambeli Canal, Ecuador (n = 2). Green shaded areas refer to mangrove estuaries and red dots are hawksbill sightings.

At-sea distribution based on ship-based observations

Much like green turtles, hawksbill turtles are believed to be coastal inhabitants that rarely venture into offshore waters. However, data collected by on-board observers in the tuna purse-seine fleet in the eastern Pacific (IATTC 2004) suggest otherwise. Indeed, some green turtles with ornate shells can be confused with hawksbill turtles; however, the distinctive shell of hawksbills suggests that this may be less of a misidentification problem as compared to the olive ridley-loggerhead misidentifications (Frazier 1985). Based on data from IATTC (2004) it appears that hawksbill turtles occur in offshore waters, albeit less common throughout the eastern Pacific, from northwestern Mexico to Peru (Figure 24). The number of sightings in offshore waters is less than that for the other hard-shelled species, but this may be due to lower overall population numbers than from avoidance of these high-seas habitats.

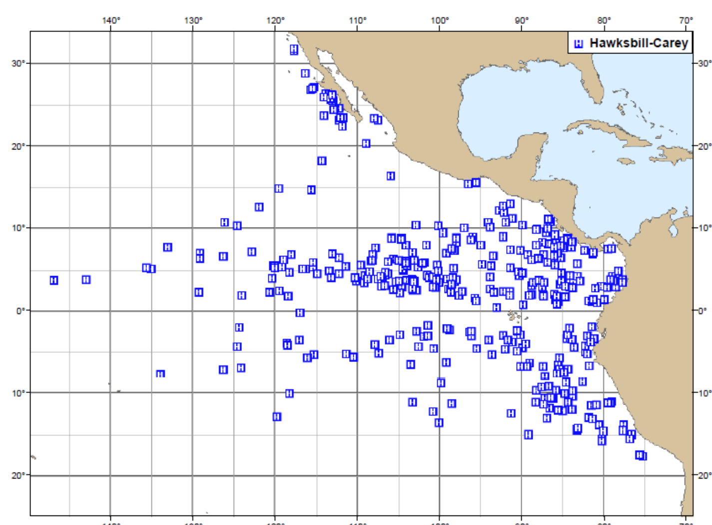


Figure 24. Sets with presence of hawksbill turtles in the eastern Pacific from 1993-2008. (IATTC Observer database, Hall and Roman, pers. comm.)

Conclusions

The recent MoU between the IAC and the IATTC is a tremendous opportunity to implement cooperative, international efforts to reduce the threat of fisheries bycatch on vulnerable marine turtle nesting populations in the eastern Pacific, especially for the leatherback turtle and its current status, which is of special concern. This document highlights several cases in which bycatch mitigation measures — from gear modifications to spatio-temporal fisheries closures — could be implemented in well-described core habitats occupied by multiple marine turtle species without major consequences or negative impacts on fisheries production. The IAC and IATTC could use this information to provide an integrated approach to the conservation of these highly endangered species and begin increasing efforts to address these issues and then build on these efforts to amplify the successes in more places within the region.

All efforts must be taken to provide the Conventions with updated data as it becomes available through new studies so that the IAC and IATTC can base their decisions regarding sea turtle issues on the best available information

Recommendations

Given the current conservation status of sea turtle populations in the Eastern Pacific Ocean, the IAC Scientific Committee has identified a series of actions that can be done in the framework of cooperation between the IAC and pertinent regional organizations that share similar conservation goals. These actions include the following:

1. Conduct additional research of at-sea movements of all species of sea turtles, particularly leatherbacks and loggerheads, in relation to seasonal oceanographic conditions.

2. Conduct additional satellite-tracking research on internesting movements of leatherback turtles and green turtles along the Pacific coast of Mexico.

3. Maintain monitoring of green turtles at the primary beaches being monitored in the Galapagos Archipelago.

4. Increase the awareness that mangrove estuaries are important in both fisheries production and also serve as vital habitats for sea turtles, especially hawksbills in the eastern Pacific. Therefore, it is recommended that conservation efforts of mangrove estuaries be improved.

5. Encourage IUCN Red List regional assessments of all sea turtle species in the eastern Pacific using the RMU framework

6. Collect additional data on sea turtle bycatch, to encourage a project that investigates fishery/sea turtle overlap areas, and options for the future (e.g. time-area closures, expansion of gear trials, etc.).

7. Implement inexpensive gear modification and measures to reduce entanglement of sea turtles in fisheries that use floating lines made from polyester or polypropylene fibers.

8. Each country undertake research to determine the feasibility and effectiveness of replacing J-hooks with circle hooks as a measure to reduce sea turtle bycatch.

9. Educate fishermen on how to reduce sea turtle bycatch and safe handling of incidentally caught turtles to improve their survivability.

10. Take measures necessary to ensure that longline vessels carry on board the necessary equipment (e.g. de-hookers, line cutters and scoop nets) for appropriate release of incidentally caught sea turtles.

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