

Marine Turtle Newsletter

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Guest Editorial

Peter C.H. Pritchard

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Congratulations and thanks to Lisa Campbell and Matthew Godfrey for taking on the important and demanding role of editors of the Marine Turtle Newsletter. The editors of MTN, as well as the individuals who each year volunteer to organize an ever larger international sea turtle symposium, have the gratitude of all of us who study and conserve marine turtles.

In the Editorial in the October 2006 MTN, there was an announcement that somehow I had missed. This related to “a recent decision by the International Sea Turtle Society to no longer publish extended abstracts from the Annual Sea turtle Symposium.” The editors noted that MTN could be a peer-reviewed substitute vehicle for the publication of these displaced reports and abstracts, and this would indeed be a valuable service. Nevertheless, the decision by the officers of the International Sea Turtle Society is a dismaying one, and I hope it may be reversed.

My enquiries have revealed that it is not a matter of failure to find an editor or compiler for this crucial task. Rather, the Society was disturbed that its annual Proceedings generated a rather large number of unreviewed “gray literature” reports that, it felt, should be published in the peer-reviewed literature. This somehow led to a vote to cease to publish the Proceedings altogether rather than to initiate a peer-review process for the papers submitted each year.

I must take issue with this line of reasoning and its conclusion. The following points are salient:

i)The annual Proceedings of the sea turtle symposia, which were first published after the 7th symposium in 1987, now occupy over a foot of shelf space (even without the forthcoming 24th and 25th symposia) and include several thousand pages of detailed, important, and up-to-date information on all aspects of marine turtle science. Within our field, these volumes constitute the single most important information resource available. To voluntarily cease to publish this eminently successful information vehicle, and convert this living, growing series into an extinct, purely archival one would be a tragedy.

ii)While it is possible that the abstracts could be made available in electronic form, this would be an inadequate solution. Paper documents last for several centuries if properly stored; electronic and related media (punched cards, 5 inch floppies, 3 and a half inch diskettes, CD ROMs) change format or become obsolete constantly and are suitable only for relatively short-term preservation of information. (True, almost everything can be downloaded and printed but, with the price of ink-jets being what it is, how often do we do this, especially with really large documents?)

iii)I certainly raise no objection to the contributions for the annual Proceedings being peer-reviewed, but on the other hand I do not regard this as essential. A simple process of copy-editing by

a compiler with knowledge of the subject could correct egregious error and also, where necessary, improve the quality and fluency of contributions by younger contributors. This process would also be valuable for those who lack access to a research library or whose primary language is not English.

iv)Full peer review is a slow process – the delays often reach two years or more -- whereas contributions to the annual Proceedings, especially those relating to deteriorating conservation situations, may have an urgency that would not be well served by such delays.

v)While publication of the presentations in MTN would be better than nothing, one suspects that only a small percentage of presented papers would be submitted for publication -- and if the percentage were higher than we anticipate, MTN would have to expand massively in size to accommodate the new influx. Up to now there has been a gently coercive sequence of events – “you may get a travel grant IF you agree to give a presentation, and if you give a presentation you HAVE TO send in an extended abstract” – that ensures that the Proceedings incorporate all of the presentations made at each symposium. Without a Proceedings, the vast majority of presentations would disappear like a will-o-the-wisp at the conclusion of the symposium week, and even if one attempted to take personal notes during presentations, the unavoidable practice of simultaneous sessions would prevent these being even remotely comprehensive.

vi)Peer review is a standard procedure for scientific journals, but we are far more than just scientists. The sea turtle community not only includes many dedicated amateurs as well as professionals; it also includes educators, conservationists, anthropologists, volunteer beach patrollers, government officials, and many others kinds of people. Not only can mandatory peer review requirements force presentations by such people into formats that are far from user-friendly, but also insistence upon the peer review process would stifle a great amount of interesting information that takes the form of field reports, ideas and insights, suggested new approaches, and raw data, rather than finished contributions of hypothesis-driven science. Editors of peer-reviewed journals usually decline to publish such material. In the world of conservation, we need to get our data and information wherever it is to be found – interviews with fishermen, newspapers, magazines, local amateur newsletters, and other sources -- and to limit oneself to peer-reviewed published sources would be a massive handicap in this process. Note too that the informal herpetological literature – magazines like *Reptiles*, *Marginata*, *Manouria*, *La Tortue* – have a collective readership far larger than that of the professional herpetological journals (as well as publishing color photos of excellent quality). I note also that,

in the rather wide range of professional biological conferences that I have attended, peer-review is not the norm for published symposium proceedings or abstracts, and I would also observe that a newsletter with timely immediacy and attractive informality can lose both of these virtues when it morphs, by evolution or saltation, into a full-fledged scientific journal.

We need to be conscious of the needs both of young turtle people, and also of those in far-flung corners of the world where electronic

information may not always be accessible or affordable, and where well-stocked scientific libraries may not exist. Such individuals need to build up personal libraries, and to start to do so at an early stage of their careers. To do this, they could not do better than to found their personal professional library upon an annually updated set of the Proceedings of the Annual Sea Turtle Symposia (and of course the two volumes of *The Biology of Sea Turtles*, and a complete set of MTN).

Guest Editorial: Beach Driving Management at Cape Hatteras and Cape Lookout National Seashores, North Carolina, USA

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The National Park Service at Cape Lookout and Cape Hatteras manages about 130 miles (209 km) of coastline in northeastern North Carolina that is nesting habitat for the loggerhead (*Caretta caretta*), green (*Chelonia mydas*), and leatherback (*Dermochelys coriacea*) sea turtles. Cape Lookout National Seashore averages 131 sea turtle nests annually, of which 99% are loggerhead. The nests at Cape Lookout account for 20% of the loggerhead nests laid in North Carolina. Cape Hatteras National Seashore averages 80 nests annually, of which 99% are also loggerhead. In this editorial, we argue that beach vehicular driving on these beaches must be based on the best scientific information available in order to avoid impeding sea turtle recovery in North Carolina.

The beaches of Cape Lookout and Cape Hatteras are popular places for beach driving. The annual average number of vehicles driving beaches at Cape Lookout is 4,246 (National Park Service 2006a), while Cape Hatteras is visited by as many as 2,200 vehicles during daytime hours on busy summer weekends (National Park Service 2006b). Night counts of vehicles on the beaches were made during the 2005 nesting season on selected weekend nights. There were considerably fewer cars (than available daytime counts) present on Cape Hatteras beaches at night with an average of 57 vehicles. Cape Lookout allows "car camping" during nighttime hours; therefore, their vehicle count did not greatly differ from daytime counts with a mean of 41 vehicles a night (Nester 2006).

Within the Cape Hatteras National Seashore any area with a width of 170 ft (about 51 m) between dune and high tide line is open to beach driving. There are a few exceptions to this policy. Areas directly in front of three villages and one swimming area are closed to vehicles between Memorial Day (late May) and Labor Day (early September). Conversely, within the Cape Lookout Park System some islands are open to beach driving and other islands are not open to beach driving. The importance of these islands not being open to beach driving for sea turtle nesting is unknown, as only the islands open to beach driving are monitored daily for sea turtle activity. The islands of Cape Lookout that have beach driving allow driving along the entire stretch of shoreline with a few exceptions. There is an area about 1/4 of a mile (0.4 km) long located in front of the Cape Lookout Lighthouse that is closed to

beach driving. The beaches that are open to beach driving allow unrestricted beach driving below the primary dune line. Within both National Seashores beach drivers are allowed to drive the beach 24 hours a day, 365 days of the year. These beaches are patrolled by law enforcement officials, but not every day and not 24 hours a day. Beach drivers must have a legal driver's license and obey the 25 miles per hour speed limit, but a permit is not required. Temporary beach closures (which vary in size and location) are erected seasonally for beach nesting birds. However due to differing habitat requirements these closed areas are rarely used by sea turtles.

There are a few studies that have looked at the direct effects of beach driving on sea turtles, and those studies support our contention that unrestricted beach driving will hinder sea turtle conservation efforts in North Carolina. Mann (1977) showed that sand compaction from driving above a nest can decrease nesting success and kill hatchlings. Hosier (1981) and Lamont *et al.* (2002) found that tire tracks could significantly impede a hatchling's ability to reach the surf. A study conducted at Cape Hatteras and Cape Lookout concluded that driven beaches have higher percentages of false crawls and lower incubation temperatures, possibly resulting in a lower percentage of female hatchlings. The relationship between incubation period and sex ratio was determined using models for the southeastern United States (Nester 2006).

There are numerous possibilities for indirect and direct effects of beach driving on sea turtle populations. The Loggerhead Recovery Plan lists several of these effects including: disturbing nesting females, aborting nesting attempts, and disorienting hatchlings. In addition, beach driving contributes to erosion, which will eventually deteriorate the quality and quantity of nesting habitats (National Marine Fisheries Service and U. S. Fish and Wildlife Service 1991). Increased human use and the resulting increase in sand compaction have been shown to decrease hatching success (Kudo *et al.* 2003).

In an effort to comply with Presidential Orders 11644 and 11989, the National Park Service made a number of attempts at drafting a beach driving management plan. None has been finalized. At this time, the Park Service plans to continue the status quo for

beach driving in the final draft of the management plan. The Park Service staff at Cape Hatteras has written an Interim Protected Species Management Plan. Until beach driving management plans are finalized, the interim plans will guide policies for sea turtles and other species listed under the Endangered Species Act. The strategy of the Cape Hatteras Plan for sea turtle management is to "improve access past or around protected nests." If permitted by the North Carolina Wildlife Resources Commission, the Park Service plans to relocate nests that completely block beach driving access. The proposed action in the Interim Plan "has the potential for both positive and negative impacts to nesting and hatching sea turtles." (National Park Service 2006b). Cape Lookout's Interim Protected Species Management Plan provides that four alternatives be considered. Alternative A calls for maintaining current management policies. Alternative B calls for increased surveying of beaches beyond May 1 through August 31, year round closure of some areas currently open to driving, closure of 3 miles of beach to nighttime driving during nesting season, increased closure size for nests, and prohibiting beach fires to 600 ft (180 m) from turtle nests. Alternative C is similar to B with the addition of increased public outreach. Alternative D is the same as Alternative C in relation to sea turtles. Alternative D is the preferred plan of Cape Lookout (National Park Service 2006a).

We believe that the current beach driving management plans of Cape Hatteras National Seashore will not contribute to the recovery of sea turtles. We are specifically concerned about the possibilities that continued unrestricted driving on the great majority of available nesting beaches will decrease egg and hatchling survival (Mann 1977, Hosier 1981, Lamont *et al.* 2002), skew hatchling sex ratios, and cause adult females to expend additional energy on false crawls (Nester 2006). We also believe that Cape Lookout National Seashore's Alternative C or D management plans with increased surveying, beach driving closures, and public outreach are the best alternatives among those proposed by the National Park Service for sea turtle conservation.

Cape Lookout's alternative plans and Cape Hatteras unrestricted access could be improved to promote sea turtle conservation by increasing areas closed to nighttime beach driving beyond three miles for Cape Lookout, and adding in nighttime driving restrictions for Cape Hatteras. With the majority of beach vehicular use occurring during daytime hours at Cape Hatteras, beaches could be closed nightly during nesting season without hindering most park visitors. Cape Lookout could reduce nesting disturbance by beach drivers while still maintaining their car camping policy by instituting a "Park Before Dark" policy. If vehicles are parked with headlights off, disturbance to turtles would be greatly reduced. In addition to nighttime closures, the Park Service could increase areas closed to beach driving year round or seasonally by looking at past nesting trends to select areas with the greatest nesting densities and hatching success. Current closures for alternatives B and C of Cape Lookout's Plan, with a few exceptions, are primarily mud flats, areas surrounding inlets and interior island areas that are poor sea turtle nesting habitat. Cape Hatteras takes into consideration human use only when planning seasonal beach closures. Areas in front of villages and areas too narrow to be safely driven are not suitable turtle nesting habitat. Narrow areas closed to beach driving were shown to have significantly higher occurrences of tidal overwash of nests and lower hatching

success (Nester 2006). For unknown reasons, nests located within narrower areas closed to beach driving at Cape Hatteras had lower relocation percentages (Nester 2006). A permitting system could also be instituted for beach drivers. Permitting systems for beach driving are already in place at other federally owned coastlines, for example Chincoteague National Wildlife Refuge and Cape Cod National Seashore. To further aid in outreach, permit holders could be required to participate in a natural resource education program. Furthermore, there is a great need for additional data on the effects of beach driving within North Carolina before important management decisions are made.

Currently, Cape Hatteras and Cape Lookout National Seashore have the goal of completing their finalized beach driving management plans by 2009. There are several stages to the planning process and many involve public comment periods. At this time, the Park Service is not requesting comment, but unsolicited comments may help to insure that beach driving plans are based on the best science currently available. Cape Hatteras can be emailed through their website <http://www.nps.gov/caha/contacts.htm>, called at (252) 473-2111, or written to at 1401 National Park Drive, Manteo, NC 27954. Cape Lookout can be emailed through their website at <http://www.nps.gov/caloc/contacts.htm>, called at (252) 728-2250, or written to at 131 Charles St., Harkers Island, NC, 28531.

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Interactions Between Marine Mammals and Turtles

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Interactions between marine mammals and turtles are not often reported in the literature. While conducting a marine mammal aerial survey during Summer 2004 off the Atlantic continental shelf of the USA, the second author observed bottlenose (*Tursiops truncatus*) and Atlantic spotted dolphins (*Stenella frontalis*) harassing loggerhead sea turtles (*Caretta caretta*). The National Marine Fisheries Service conducted this survey (Mid-Atlantic Tursiops Survey; MATS) to determine distribution and estimate the abundance of bottlenose dolphins from Fort Myers, Florida to Atlantic City, New Jersey during July through August 2004. On several occasions, dolphins chased turtles, tossed them out of the water, and used their beaks (rostra) to force them underwater. These observations led us to the question of how frequent and to what extent these types of interactions occur in the wild and in captivity. To address this question, we conducted a review of the interactions between marine mammals and turtles.

We attempted to compile all available records of marine mammal interactions with turtles. Sources included observations found in both peer-reviewed and gray literature, as well as unpublished sources. We also contacted people working with marine mammals in both captive and free-ranging situations, where interactions with turtles might take place. Additionally, we placed messages on various internet discussion groups pertaining to either marine mammals or sea turtles, requesting information on any observed interactions. Finally, we presented our preliminary findings at various conferences where attendees provided additional information. This information was not always complete or provided in a manner that allowed for traditional compilation or summarization. Several providers gave us personal observations which could have spanned decades, or were just single incidental reports. We have compiled all records in two ways: 1) a matrix of interactions where we attempted to assess direct interactions as investigation or predation; and 2) an online appendix table that lists each report (along with the location of the observation). We defined predation as the act of feeding on another animal, including stomach content analyses that support this behavioral event. Investigation was defined as exploratory behaviors, such as swimming around the animal, touching it, and seemingly unwanted advances, such as being physically tossed or submerged, because some type of behavioral or physiological change by the animal being assessed or touched was likely taking place.

We located reports of interactions between 22 marine mammal species and nine turtle species. There were 16 cetacean (one baleen whale and 15 toothed whale), four pinniped, and two sirenian species (Table 1; Appendix I, available online at <http://www.seaturtle.org/mtn/archives/mtn115/appendix1.pdf>). Reported free-ranging interactions came from many locations including Australia, New Zealand, Hawaii, Panama, Mexico, the Gulf of Mexico, the Caribbean, Brazil, and the Azores (online

Appendix).

Interactions involving cetaceans

Cetaceans and sea turtles co-occur in many of the same areas. During the MATS 2004 summer survey, for example, there were 67 sightings where dolphins and sea turtles were sighted within 100 m of one another. Unfortunately, we were unable to report the exact number of direct interactions between the two groups since behavioral notes associated with the raw survey data sheets which would confirm these data (e.g., dates, locations, and species involved) were not available when requested.

Observations of cetaceans interacting with sea turtles, while taking advantage of easily captured prey are documented. Bottlenose dolphins in Costa Rica and Atlantic spotted dolphins in the Azores apparently sometimes feed on fish aggregated under turtles that bask at the water's surface (A. Acevedo-Gutiérrez & Yin 2000; L. Steiner, personal communication, Whale Watch Azores 5, Old Parr Close, Banbury, OX16 5HY). There is also documentation of bottlenose dolphins (which are known to feed in association with shrimp trawlers) and turtles (UID species) both associated with the same trawler, including simultaneously within the same net and its turtle excluder device (Caldwell *et al.* 2003).

We were often informed of incidents of observing both a sea turtle and a cetacean(s) nearby or even passing by one another, with no obvious interest paid attention by either species. We did, however, locate a number of reports of dolphins and whales investigating turtles while they were at or near the water's surface (see online Appendix). Some incidents included a cetacean swimming on its side, under a turtle, appearing to examine it. We considered these to be exploratory behaviors since animals approaching and investigating new objects that appear in their environment. One intriguing report was of a sperm whale (*Physeter macrocephalus*) in the Sargasso Sea swimming on its side underneath a loggerhead sea turtle, apparently investigating the animal (S. Gero, pers.comm., Department of Biology, Dalhousie University, 1355 Oxford Street, Halifax, NS B3H 4J1, Canada).

Investigatory behaviors are often linked with play (see Burghardt 2005). These were the kind of interactions most often reported by observers, likely due to more contact between the animals. Often, the actions were very physical, such as manipulations by whales and dolphins that included physically moving turtles across tanks in captivity; chasing and poking at turtles; attempting to flip sea turtles onto their backs; grabbing the turtle's flippers; pushing turtles underwater with their rostra; attempted 'mating'; tossing turtles high out of the water or onto sandy beaches; or flipping turtles out of holding tanks and subsequently injuring them (e.g., Brown 1960; Brown & Norris 1956; Caldwell 1956; Constantine 1995; Kritzler 1952; McBride & Hebb 1948; Megnet *et al.* 2006; Ritter 2002; online Appendix). We did receive an interesting account of one possible case of succorant behavior (a form of

	Species	Marine Turtles								Freshwater Turtles		
		ND	DC	LK	CC	CM	EI	LO	UNK	PS	MT	UNK
Cetaceans	Humpback whale (<i>Megaptera novaeangliae</i>)				I				I			
	Bottlenose dolphin (<i>Tursiops truncatus</i>)		I	I	I	P ¹ /I	I	I	I		P	
	Indo-Pacific bottlenose dolphin (<i>Tursiops aduncus</i>)					I						
	Atlantic spotted dolphin (<i>Stenella frontalis</i>)				I		I					
	Pantropical spotted dolphin (<i>Stenella attenuata</i>)								I			
	Spinner dolphin (<i>Stenella longirostris</i>)								I			
	Striped dolphin (<i>Stenella coeruleoalba</i>)								I			
	Rough-toothed dolphin (<i>Steno bredanensis</i>)				I			I				
	Common dolphin (<i>Delphinus</i> spp.)				I							
	Long-beaked common dolphin (<i>Delphinus capensis</i>)								I			
	Short-beaked common dolphin (<i>Delphinus delphis</i>)					I	I	I				
	Pacific white-sided dolphin (<i>Lagenorhynchus obliquidens</i>)				I							
	Killer whale (<i>Orcinus orca</i>)		P/I			P		P	P			
	Sperm whale (<i>Physeter macrocephalus</i>)				I							
	Short-finned pilot whale (<i>Globicephala macrorhynchus</i>)				I	I						
	Amazon river dolphin (<i>Inia geoffrensis</i>)										P	
Pinnipeds	Hawaiian monk seal (<i>Monachus schauinslandi</i>)					I, P ¹						
	Mediterranean monk seal (<i>Monachus monachus</i>)				P							
	Southern elephant seal (<i>Mirounga leonina</i>)					*						
	Australian sea lion (<i>Neophoca cinerea</i>)					I, P ¹						
Sirenians	Dugong (<i>Dugong dugon</i>)	I				I			I			
	West Indian manatee (<i>Trichechus manatus</i>)											P ²

Table 1. Matrix of interactions between captive and free-ranging marine mammals and turtles. ND = *Natator depressus*, DC = *Dermochelys coriacea*, LK = *Lepidochelys kempii*, CC = *Caretta caretta*, CM = *Chelonia mydas*, EI = *Eretmochelys imbricata*, LO = *Lepidochelys olivacea*, PS = *Podocnemis sextuberculata*, MT = *Malaclemys terrapin*, UNK = Unidentified species. Behavior of marine mammals is defined as: investigatory (I) and predation (P). (I) includes behaviors of swimming around the turtle and touching the turtle, and could escalate to chasing, circling, flipping, and tossing. *mortality suspected to be due to seal rolling on top of turtle while on nesting beach; ¹suspected predation; actual evidence not available; ²turtles observed sitting sometimes on the backs of manatees.

Figure 1. Hawaiian monk seal with green turtle at French Frigate Shoals (George Balazs, NOAA Fisheries).



epimeletic or care-giving behavior as defined as Caldwell & Caldwell 1966) by a humpback whale (*Megaptera novaeangliae*) directed towards an unidentified species of sea turtle in Hervey Bay (Queensland, Australia). The whale appeared to attempt to use its long foreflippers to turn over an unidentified species of sea turtle that was apparently having buoyancy problems, causing it to be flipped (S.E. Scotto, pers. comm., C/ Valle de la Fuenfria 10, 8D, 28034-Madrid, Spain).

Confirmed or suspected predation on turtles was also reported. One unconfirmed account involved possible predation on a hatchling green turtle (*Chelonia mydas*). This individual may have been eaten by a bottlenose dolphin as the group chased flying fish near a ship at night (Awbrey *et al.* 1984). There are confirmed cases of killer whales (*Orcinus orca*) preying on sea turtles, though at an unknown frequency (e.g., Caldwell & Caldwell 1969; Brongersma 1972; Esquivel *et al.* 1993; Sarti M. *et al.* 1994; Pitman & Dutton 2004). As noted by Celini *et al.* (2002), since killer whales are known to play with objects, encounters between killer whales and sea turtles cannot always be confirmed to be predatory attempts. The few observations of how leatherbacks (*Dermochelys coriacea*) might attempt to protect themselves are consistent. In these cases, the turtle extended its front flippers ahead and with its rear margins up (apparently attempting to protect its head), strongly moved the flippers to strike at a whale(s) touching its body (e.g., Celini *et al.* 2002; K.D. Mullin, pers. comm., NOAA/NMFS Pascagoula Laboratory 3209 Frederic St. Pascagoula, MS 39567, USA).

What we found particularly interesting was the co-housing of sea turtles with dolphins in captivity, particularly where the turtles served as behavioral enrichment for dolphins during rehabilitation efforts after stranding, such as in the Philippines. It was noted that having sea turtles in the same pens with dolphins stimulated feeding and swimming more quickly, perhaps with the dolphins watching the turtles and mimicking them (J. Archer & C. Torno, pers. comm., Ocean Adventure, Subic Bay, Philippines). Green, olive ridley (*Lepidochelys olivacea*), and hawksbill turtles (*Eretmochelys imbricata*) are all used, with the latter two species being less likely to bite the dolphins (J. Archer & C. Torno, pers. comm.). As noted earlier, various levels of interactions between cetaceans and turtles in other captive situations have been noted.

While compiling information on cetacean interactions with

sea turtles, we also became aware of interactions with freshwater turtles. There was an instance of predation on a six-tubercled river turtle (*Podocnemis sextuberculata*) by an Amazon River dolphin (*Inia geoffrensis*) (da Silva & Best 1982), which was determined by examination of stomach contents. Additionally, a bottlenose dolphin was observed to intentionally strand itself to capture a diamondback terrapin (*Malaclemys terrapin*) sitting on a mudbank in North Inlet Estuary, South Carolina (D. Allen, pers. comm., University of South Carolina, Baruch Marine Field Laboratory, PO Box 1630, Georgetown, SC 29442).

Interactions involving pinnipeds

Interactions between pinnipeds and sea turtles take place both in the water and on land. As with cetaceans, there are undoubtedly many instances of the two taxonomic groupings co-occurring with one another. For example, at French Frigate Shoals (Northwestern Hawaiian Islands), both Hawaiian monk seals (*Monachus schauinslandi*) and green turtles are found next to one another, lying on the same beaches, often in close proximity, without resulting in obvious behavioral changes or disturbances (Figure 1). Researchers working in the French Frigate Shoals reported that it is not uncommon for turtles to crawl ashore and “disturb” sleeping seals and sometimes even a mother with pup (G. Balazs, pers. comm., National Marine Fisheries Service, Pacific Islands Fisheries Science Center, 2570 Dole Street, Honolulu, HI 96822-2396). Usually this happens when the turtle excavates a nest and throws sand/coral rubble onto the seal(s) which appear disturbed by this. Sometimes the seal(s) move, other times they just stay put and endure the rain of sand and rock, bellowing at the turtle periodically.

There is some hazard for a sea turtle sharing the same beach with some pinniped species, however. For example, there is a record of a southern elephant seal (*Mirounga leonina*) reputedly having killed an adult-sized green turtle on a nesting beach near NW Cape in Western Australia. The mishap may have involved a nesting turtle bumping into a resting elephant seal and being rolled on and perhaps suffocated or suffering crush injury (B. Prince, pers. comm., Western Australian Marine Turtle Project, Wildlife Research Centre, Dept CALM, PO Box 51, Wanneroo, Western

Australia 6946).

Many of the interactions between pinnipeds and sea turtles are likely exploratory (investigatory) in nature. For example, one juvenile Hawaiian monk seal pup was observed swimming towards a green turtle hatchling (early morning emergence) and “mouthed” it; this response was determined to be investigatory, because pups of this age mouth many items in their environment (G. Balazs, pers. comm.). Kobayashi *et al.* (1995) reported sighting Hawaiian monk seals occasionally chasing turtles near longline fishing vessels. Play-type behavior by seals towards sea turtles also has been observed (B. Prince, pers. comm.).

Aggressive and predatory interactions were documented. Margaritoulis *et al.* (1996) reported that in a year of extreme food shortage at the island of Zakynthos (Greece), Mediterranean monk seals (*Monachus monachus*) fed on adult loggerhead turtles. No such observations have been reported since that year (D. Margaritoulis, pers. comm., ARCHELON, P.O. Box 51154, KIFISSIA, Attiki GR-14510, Greece). It is not known if this is because fish stocks recovered, or if only one seal was engaged in this behavior and that was the individual that was found dead some months later (D. Margaritoulis, pers. comm.). In Western Australia, Australian sea lions (*Neophoca cinerea*) are suspected of killing some juvenile green turtles in areas where the two species overlap in occurrence (B. Prince, pers. comm.).

Interactions involving sirenians

Very few encounters between free-ranging sirenians and sea turtles were reported (see online Appendix). Both sirenians and green turtles feed on sea grasses and there is likely some level of competition between the two in the wild. André *et al.* (2005) provided some evidence that the presence of dugongs (*Dugong dugon*) limits the feeding opportunities for green turtles. I. Lawler (pers. comm., School of Tropical Environment Studies and Geography, James Cook University, Townsville Qld 4811, Australia) mentioned that while researching dugongs in Hervey Bay he and his colleagues see many green turtles and dugongs over the same

types of seagrasses, but they are rarely seen in the same place. For example, in Burrum Heads (Hervey Bay), there are usually about 30 to 60 dugongs in the area and very few turtles, and about 30 km south, in the Great Sandy Straits (Hervey Bay), they see many turtles and just the occasional dugong. This may be an example of small-scale habitat segregation between two species that share a similar ecological niche.

The most noteworthy observations between sirenians and sea turtles come from a dugong housed together with a green sea turtle at the Toba Aquarium in Japan (Figure 2); both of these individuals apparently co-exist without conflict. There are many instances of apparent stimulation-seeking behavior (the turtle rubbing the edge of its carapace against the dugong and vice-versa) and even play observed, including the dugong playing with the turtle and bumping it around the tank. The green turtle seems to be the instigator of many of the encounters, for example, appearing to purposefully swim into the dugong (C.D. Marshall, pers. comm., Texas A&M University at Galveston, 5007 Avenue U, Galveston, TX 77551-5923, USA). This dugong has, however, been in the tank with two other individual turtles – another green and a flatback (*Natator depressus*). None of these forced associations were favorable, however, with each turtle and the dugong attacking one another.

As a side note, we received a report that occasionally, freshwater turtles (unidentified species) bask in the sun on the backs of West Indian manatees (*Trichechus manatus*) resting at the water’s surface in Florida (C. Beck, pers. comm., U.S. Geological Survey, Sirenia Project, 412 NE 16th Avenue, Gainesville, FL 32601, USA).

Marine mammals and sea turtles co-occur in many parts of the world. Encounters between the two are diverse and can range from no apparent interest between the two to harassment and mortality (both intentional and likely accidental). Opportunistic observations are anecdotal in nature and interpretations are often speculative. Most reported encounters are from coastal locations, where there are more researchers and boaters.

We hope that this review will encourage the reporting of observations and promote their publication in the scientific literature. We feel that these should be further studied to examine how rehabilitation efforts and general holding of marine mammals in captive situations might be enhanced by incorporating sea turtles. Rigorous behavioral sampling to examine the interactions of sea turtles and marine mammals housed together in captivity is suggested. By doing so, we will better understand the significance and importance of interspecific interactions between marine mammals and turtles and their behavioral and ecological implications.

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Figure 2. Dugong “Serena” with green turtle “Kamekichi” at the Toba Aquarium, Toba, Japan (courtesy of Mr. Masami Furuta, Director, Toba Aquarium).

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Identification of Bacterial Isolates from Unhatched Loggerhead (*Caretta caretta*) Sea Turtle Eggs in Georgia, USA

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Loggerhead sea turtles (*Caretta caretta*) are the most common species nesting in Georgia and represent part of the temperate nesting population in the United States (Bowen & Karl 1997). Worldwide, more than 80% of sea turtle eggs hatch successfully (Miller 1997), while mean loggerhead hatch success during the 2002-2005 nesting seasons in Georgia was 66.5%. On Jekyll Island, one of Georgia's southernmost barrier islands, mean hatch success during the same seasons was only 62.2% (Dodd & Mackinnon 2002; 2003; 2004; 2005). Mathematical models have predicted that egg loss and juvenile mortality can reduce recruitment into the adult breeding population (Heppell *et al.* 2003). Causes of egg failure during development are not always clear. While many anecdotal reports place the blame on bacterial contamination, very little data exist to support these claims. Three previous studies list bacteria found associated with unhatched sea turtle eggs (leatherback, Girondot *et al.* 1990; olive ridley, Mo *et al.* 1990; loggerhead, Wyneken *et al.* 1988). This study reports on the presence of potentially pathogenic microbes cultured from unhatched loggerhead sea turtle eggs.

Sixty-seven unhatched intact loggerhead turtle eggs from 15 nests were collected during August and September in 2004 and 2005 in an effort to characterize and identify their bacterial populations. All nests were laid on Jekyll Island, Georgia, USA and allowed to go to full term. Samples were collected 3-5 days after emergence of the hatchlings was confirmed, or after 70 days of incubation. Eggs were kept in sand from the nest, placed in sterile paper bags and transported to Armstrong Atlantic State University in Savannah, GA, USA. Bacterial sampling and assessment of embryonic development was completed within 2-3 hours of egg collection. Data from controlled healthy nests were not available due to the designation of loggerheads as a threatened species.

Sterile cotton swabs were used to remove bacterial samples from the outside surface of the eggs. Eggs were surface sterilized with hydrogen peroxide (five minutes) and 95% ethanol (three minutes). Betadine was applied to a portion of shell that was then aseptically removed with sterile scissors. A sterile cotton swab was used to obtain a fluid sample from the interior of the egg. Bacteria were grown and isolated on tryptic soy agar (TSA) and marine agar (MA) using a quadrant isolation technique. Bacterial isolates were maintained on TSA and MA slants.

After fluid samples were taken, eggs were dissected using scissors and tweezers. All contents were examined for signs of fertility (yolk metabolism, blood vessel development or visible embryonic tissue). All visible embryos representing >10 days of development were removed and preserved in 10% formalin. Straight line carapace length (SCL) was measured using stainless steel calipers. Egg contents were classified as infertile (no metabolism of albumin or yolk), fertile (yolk metabolized, no visible embryo), embryonic disc (mass of tissue, no eye spots), early embryonic death (EED, SCL

less than 1.0 cm), mid-embryonic death (MED, SCL 1.01-2.0 cm), and late embryonic death (LED, SCL > 2.01).

Bacterial characteristics such as growth patterns, texture, pigmentation, and oxygen utilization were determined using tryptic soy broth (TSB), TSA, marine broth (MB) and MA mediums. Gram stains were used to determine shape and arrangement of cells. Isolates were classified as gram-positive or gram-negative.

Isolates were identified using the API 20 Enteric and Non-enteric Identification System for Enterobacteriaceae and other non-fastidious and non-enteric gram-negative rods (bioMérieux). Positive (*Escherichia coli*) and negative (deionized water) controls were run with these kits. Gram-positive isolates were grown on Manganese agar, subjected to endospore staining and identified as endospore positive or negative. Gram-positive isolates are currently being identified using either the API 50 CHB/E for gram-positive, endospore forming *Bacillus* or API 50 CHL for gram-positive, non-endospore forming *Lactobacillus*.

Multiple isolates were obtained from eight of the nests sampled (2004 nests: 1-5; 2005 nests: 6-8). Cultures from the other seven nests sampled died during processing. Bacteria were isolated from sand surrounding the eggs, the outside shell and fluid inside the eggs (Table 1). Preliminary identification of the bacteria isolated from samples of nest sand indicated that they were identical to species on the outside surface of the eggs, so sampling of sand was discontinued. Eighteen gram-negative and two gram-positive species of bacteria were identified. Of the 12 species isolated in 2004, eight were found again in 2005 (67%), with eight new additions. Bacteria cultured were diverse (2-11 species per nest). All bacteria were known to be common soil/environmental species and 15 of the 20 isolates (75%) were potential pathogens (Kreig & Holt 1984). Five of the 15 potential pathogens were found only inside the eggs.

Four of the genera of gram-negative bacteria identified have been previously reported in unhatched loggerhead sea turtle eggs (Table 1, Wyneken *et al.* 1988). Wyneken *et al.* (1988) speciated only one microbe and sampled eggs from only one nesting season. The current study sampled during two nesting seasons in order to collect data from different nesting cohorts. Forty percent overlap of the species was found between seasons (8/20 species). Four specimens were isolated in 2004 only, and eight species were solely found in 2005, suggesting that the bacterial diversity does vary by nesting season.

Bacteria could enter eggs in the oviduct, may contaminate the shell as eggs pass through the cloaca or gain access to the eggs from the surrounding sand during incubation. It is not known which species of bacteria routinely inhabit the oviduct or the intestinal tract of adult loggerhead sea turtles. Many of the bacteria identified were small (0.4-5.0 μm in length), motile gram-negative rods (Kreig & Holt 1984) with flagella that could facilitate their entrance into the eggs.

	Motility	Found in		Nests							
		Intestine	Vertebrates	1	2	3	4	5	6	7	8
<i>Aeromonas caviae</i> *	flagella		X							O	
<i>Alcaligenes faecalis</i> *	flagella	X	X		O					O	
<i>Bacillus cereus</i> *										O	
<i>Bacillus mycoides</i>										O	
<i>Burkholderia cepacia</i> *							I			I	
<i>Chrysobacterium indologenes</i> *				I							
<i>Chrysonomonas luteola</i> *						I			I		
<i>Enterobacter cloacae</i> *	flagella	X	X							IO	
<i>Morganella morgani</i> *	flagella		X					O			
<i>Ochrobactrum anthropi</i> *						IO		O	I	I	
<i>Pasteurella pneumotropica haemolytica</i> *		X	X								I
<i>Pseudomonas aeruginosa</i> *	flagella				I	I			O	I	
<i>Pseudomonas fluorescens</i>	flagella			I					O		
<i>Pseudomonas putida</i>	flagella			I							
<i>Pseudomonas stutzeri</i> *	flagella			I							
<i>Serratia marcescens</i> *	flagella	X	X							I	O
<i>Shewanella putrefaciens</i>									IO		
<i>Sphingobacterium spiritivorum</i> *						O	O		I	O	
<i>Sphingomonas paucimobilis</i>									O		I
<i>Stenotrophomonas maltophilia</i> *								O		I	

Table 1. Bacteria isolated and identified from unhatched loggerhead eggs collected in 2004 (n= 16 eggs from 5 nests) and 2005 (n=13 nests from 3 nests). A large amount of overlap of species existed between seasons. Bacteria found in the internal fluid of the eggs are marked as I and those found on the outside shell are marked O. Pathogenic bacteria are marked with an asterisk. Motility of bacteria has been indicated (Kreig & Holt 1984).

Penetration of eggs by bacteria is called horizontal contamination and has been documented in birds. Humidity and shell quality are two variables that can affect bacterial invasion of eggs (Cox *et al.* 2000). The species identified in the current study have been associated with medical problems in mammals and non-mammals including respiratory, wound and gastrointestinal infections, inflamed fetal membranes and sepsis (Kreig & Holt 1984). These data suggest that the environmental bacteria that may be resident in the adult females or present on nesting beaches have the potential to be opportunistic pathogens and may contribute to embryonic death in sea turtles.

Known pathogens identified in fluid samples from the egg interior included *Pseudomonas aeruginosa* and *Serratia marcescens*. Growth characteristics were particularly useful for identifying these microbes. *S. marcescens* grew with a distinct red/pink pigment and *P. aeruginosa* had a green pigment. Color made these two species recognizable as common inhabitants of nests examined on barrier islands in Georgia. In 2005, Jekyll nest 46 had a 2 % hatch success. Fifty five of the 81 unhatched eggs from this nest had a distinct green hue throughout their contents. Bacteria were not cultured from nest 46, however *P. aeruginosa* may have been present.

All study nests with the exception of Jekyll nest 5 from 2004, had eggs which were contaminated internally. Embryonic development in contaminated eggs ranged from fertile to late embryonic death. In all of the nests examined, this one stood apart from the rest. The

majority of the eggs from Jekyll nest 5 had near full term embryos (>45 days of development, LED) that had ceased development. Samples of fluid from 4 eggs collected from the nest revealed no internal bacterial presence. By correlating the excavation date with the development of the embryos, it was concluded that this nest drowned during the storm surge associated with Hurricane Frances but otherwise could have hatched successfully. This nest could indirectly be used as a control since collection of a control nest was not possible.

A variety of bacteria were found in fertile eggs from 8 nests sampled on Jekyll Island, GA. (Table 1). Because the sources of the bacteria could have been the reproductive and digestive tract of the nesting female or the nesting beach, the next step in the investigation will be to swab the cloaca of nesting loggerheads to determine their resident flora. Sampling from the oviduct and collection of control nests is limited by state and federal permits. Seventy-five percent of the bacteria found in eggs were potential pathogens, some of which have been reported in non-mammalian vertebrates including fish, amphibians, birds and reptiles. This opens the door to the possibility that bacteria could act as opportunistic pathogens in sea turtle eggs. By the nature of opportunism, when present in the wrong place at the wrong time, normal environmental bacteria can cause harm. Further investigation is needed to clarify the nature and extent of the interaction.

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Captive-raised Loggerhead Turtle (*Caretta caretta*) Found Nesting Eight Years After Release

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The Brazilian coast between the states of Sergipe and Rio de Janeiro (Figure 1) is considered the most important breeding site of the loggerhead turtle, *Caretta caretta* in Latin America (Marcovaldi & Marcovaldi 1999), with over 5,000 nests laid annually (Marcovaldi & Chaloupka *in review*). Patrolling and protection of marine turtle nesting grounds in Brazil has been carried out since 1982, with a gradual spatial increase, by Projeto TAMAR-IBAMA, the Brazilian Sea Turtle Conservation Program. Projeto TAMAR-IBAMA also maintains 22 Field Stations in feeding and breeding sites. Some of these stations have Visitor Centers, where sea turtles are kept in tanks for rehabilitation and public education (Marcovaldi & Marcovaldi 1999). Occasionally, rehabilitated turtles, as well as turtles raised in captivity since birth, were released in the wild.

The first turtles that were brought into captivity by Projeto TAMAR-IBAMA hatched on 21 March 1986 from a nest laid in Combios Linhares, Espírito Santo (19°40'S). More hatchlings were collected and placed in captivity after this date. One of the captive hatchlings from Comboios (exact date of hatching unknown) was released on 17 December 1994 with a curved carapace length (CCL) of 75cm. The turtle was tagged following Bolten (1999) before release with a monel tag (style 681, National Band and Tag Company, #BR5624).

Eight years later, on 29 November 2002, the turtle was observed nesting and identified by local TAMAR personnel at Santa Maria beach, Arembépe, Bahia (12°47'S), over 1,200 km north of the release site and natal beach. The animal had a CCL of 101cm. The nest was excavated after hatching: clutch size was 135 eggs with a hatching success of 62.96%. The calculated age range of this turtle when she nested is a maximum of 8.7/16.7 years (age at

release/age at return). Based on growth analysis of 8 captive turtles (4 maintained at Comboios and 4 at Guriri, another TAMAR Station located 100 Km north of Comboios), a minimum of 4.75 years would be required for a turtle to reach the size of BR5624 when she was released (Table 1). Therefore, the recaptured turtle's minimum age is 4.75 when released and 12.75 years when observed nesting.



Figure 1. Breeding sites of loggerhead sea turtles in Brazil, showing the release and recapture points of female #5624.

Station	Turtle	Nest emergence	Measurement date	CCL (cm)	Interval (yr)
Comboios	A	16/02/1996	21/02/2000	70.0	4.07
	B	25/08/1997	14/09/2001	73.5	4.11
	C	?/01/1994*	15/09/1999	75.0	5.78
	D	25/11/1997	27/11/2002	74.5	5.07
			Mean	73.25	4.76
			SD	±2.25	±0.71
Guriri	E	?/12/1998*	09/09/2003	75.0	4.84
	F	?/01/1999*	09/09/2003	75.5	4.75
	G	?/01/1999*	09/09/2003	72.5	4.75
	H	?/02/1999*	09/09/2003	74.5	4.66
			Mean	74.37	4.75
			SD	±1.32	±0.06

Table 1. Biometric data from eight captive turtles maintained at Comboios and Guriri Field Stations. *=exact day of hatching not available; first day of the month used for calculations.

Sexual maturity is estimated to be 25-35 years in wild loggerheads (Chaloupka & Musick 1996). Effects of captivity on growth rates, however, preclude a meaningful comparison of age estimates of captive-reared animals at nesting with that of wild loggerheads (Zug *et al.* 1995). It is reasonable to assume early sexual maturity of female BR5624 because of higher growth rates during captivity. Additionally, intra- and inter-population growth-rate variability among wild *Caretta caretta* juveniles is high, between distinct populations or between individuals of the same population (Klinger & Musick 1995; Zug *et al.* 1995).

We could find in the literature only one record of a loggerhead turtle tagged as a hatchling, and recaptured as an immature female loggerhead from the Australian coast with 75.6 cm CCL after 15.2 years (Limpus *et al.* 1994). This length is similar to that of BR5624 when released in the wild, when she was no more than 8.07 years old. Skeletochronological studies carried out in the North Atlantic indicate that a loggerhead turtle of this age would typically be 50 to 55 cm CCL (Bjorndal *et al.*, 2003). The only other recapture record of a captive-reared loggerhead from Brazil is that of a juvenile, released at Comboios at 1-year age, and recaptured 40 months later in the Azores (Bolten *et al.* 1990).

This is the first documented record of a turtle tagged on the Espírito Santo coast and found nesting in a different state. However, historically there has been a low rate of recapture of tagged females along the entire coastline monitored by Projeto TAMAR (see Barata 1996). There are 9 long-distance recapture records of loggerhead turtles that had been tagged on nesting beaches (n=8) or on foraging grounds (n=1) in Brazil. All of the recaptures were individuals found dead and far from the original tagging locations; four of these records were animals found outside the known current Brazilian nesting range for this species (Marcovaldi *et al.* 2000; Almeida *et al.* 2000; Laporta & Lopez 2003). In addition, satellite telemetry studies of eight nesting loggerheads from Espírito Santo showed both northward and southward movements, bypassing northern and southern limits of Brazilian loggerhead nesting grounds (Frazier *et al.*, 2003).

This recapture raises new questions about the relationship among *Caretta caretta* nesting sites along the Brazilian coast: do the

breeding sites located in the states of Rio de Janeiro, Espírito Santo, Bahia and Sergipe host individuals from distinct populations or are they the remainders of an ancient and larger population, fragmented by coastal human occupation? Genetic studies comparing turtles from different nesting grounds in Brazil are being carried out and may shed some light on this matter.

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Tarballs and Early Life Stages of Sea Turtles in Paraíba, Brazil

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Although not ranked as one of the main threats to the sea turtles, oil exploration and transport are potential sources of direct and indirect threats to these animals (NMFS 1991; NOAA 2003). Large oil spills attract much attention of the media due to the massive damage they cause, but these events are not frequent. In contrast, smaller scale contamination events not highlighted by the media, but they are more frequent and the additive value of may have considerable impact. Tarballs are common byproducts of maritime operations, often a result of, illegal at-sea discharge. They are found in every ocean and convergences zones can aggregate them. (NOAA 2003). Here we report the stranding of a dead juvenile green turtle, *Chelonia mydas*, with curve carapace length (CCL) of 13.5 cm, completely covered by tarballs (images available at <http://www.seaturtle.org/cgi-bin/imagelib/index.pl?photo=1410>) on August 29 2004, in Bessa beach, João Pessoa, Paraíba, Brazil. Unfortunately, it was not possible to collect the gastric contents of the animal.

The specimen belongs to the most vulnerable life stage to tarballs, hatchlings and post-hatchlings. This vulnerability is related to their relative small size; to their low motility, that lead them to concentrate in convergence zones, where the oil also tends to concentrate; and to their swimming mode, surface swimming, which increases their chances of interaction. In Florida convergence zones, from 103 post-hatchling analyzed, tar was found in 65 individuals (Lohoefer *et al.* 1989). Witherington (1994) showed that 34% of post-hatchling at "weed lines" off the Florida coast had tar in their mouths or esophagi. Lutz (1989) reported that hatchlings have been found dead, apparently starved to death, with their beaks and esophagi blocked with tarballs.

This specimen also represents a register of the occurrence of a

size class that has not been found in Paraíba yet. The mean CCL size of green turtles found stranded in this area was 56.5 cm (2002-2003) and the smallest was 29.3 cm (Mascarenhas *et al.* 2005). Until the current specimen was found, there were only unpublished fishermen reports regarding the presence of individuals of this size class, captured in entanglement nets in the reefs close to the coast. The CCL of green turtles recruiting to the neritic zone is between 20-35 cm (Bjorndal 1997; Musick & Limpus 1997) with smaller individuals thought to reside in the pelagic zone (Carr 1987). The occurrence of this specimen and the fishermen reports Mandate further investigation as to the possibility of small juvenile green turtles in the neritic.

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Rapid Survey of Marine Turtles in Agalega, Western Indian Ocean

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Agalega (10°25'S, 56°40'E) 21 km², lies west of the Mascarene Ridge about 990 km to the north of Mauritius. It is composed of two islands, North and South Island, running in a NW-SE direction and separated only by a shallow pass 1.5 km wide, which is almost dry at low tide. North Island has a rather linear shape and measures about 12.4 km by 1.6 km at its widest, with an area of 11.7 km², whereas South Island is pear-shaped, measures 6.6 km by 3.6 km and covers 9.3 km² (see Figure 1). Agalega is the largest unelevated coral island in the western Indian Ocean (Fosberg *et al.* 1983). The islands are a dependency of Mauritius from which they were colonized in 1808. Agalega is currently managed by the Outer Island Development Corporation (OIDC), a government-parastatal organization. The island's human population today is about 350 people, including 20 civil servants who are replaced from time to time by colleagues from Mauritius.

Both North and South Island consist of consolidated sand or coral debris, with soil in places. Based on historical information from Portuguese sailors in 1500 and more recent biotic data, particularly on vegetation succession, it has been estimated that the islands would have been formed between 1200-1250 (Cheke & Lawley 1983). However, the rapid drop-off from the reefs has led to the suggestion that the islands may be much older. The islands are today bound by sandy beaches of 20-100 m width, and are surrounded by a fringing reef enclosing a narrow lagoon, of 25-100 m width (Cheke & Lawley 1983). The highest point of the islands, Montagne d'Emmerez, on North Island, peaks at 15m. Officially, rainfall on Agalega averages about 1.7 m annually, although this may be an underestimate. The islands have *Asplenium nidus* and *Psilotum nudum* ferns growing on the ground, both indicators of areas with heavy rainfall. The original vegetation consisted of coconuts and a mix of soft wood trees, shrubs and grasses of wide distribution, typical of coastal ecosystems in the region. Some of this vegetation remains today and grows alongside many introduced plants such as *Casuarina*, banana, papaya, and *Citrus*. Fosberg *et al.* (1983) recorded 293 plants from the two islands. It is noteworthy that despite Agalega's apparently young age, an endemic race of Day Gecko (*Phelsuma borbonica agalegae*) inhabits the islands (Griffiths & Florens 2006).

There is very little recorded about marine turtles in Agalega. Dussercle (1949) stated that in Agalega 'edible turtles' are now

rare, while the 'Caret' turtle is still common and is caught for its carapace. Similarly Scott (1961) reported:

'Turtles are not by any means plentiful: about two dozen in the year are normally caught. They are the property of the company, but anybody who can locate and turn a turtle, thus immobilizing it, is rewarded with 6 rupees. When the turtle is slaughtered, the meat is sold to the labourers at 25 cents a portion. Formerly any islander who was thought to be suffering from anemia was given about a pint of the blood to drink.'

There have been a few scientific visits to Agalega (see Cheke & Lawley 1983, Gueho & Staub 1983), hence the fauna and flora of Agalega remain poorly studied. With increasing demands by

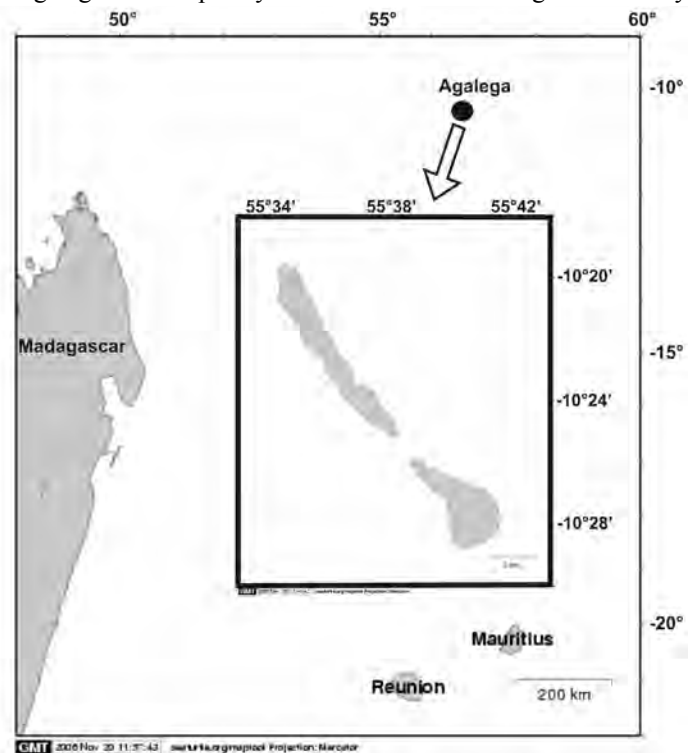


Figure 1. Map of Agalega in the Indian Ocean. Made via SEATURTLE.ORG Maptool. 2002. SEATURTLE.ORG, Inc. <http://www.seaturtle.org/maptool/> 8 December 2006.

Mauritian and foreign commercial interests to develop tourist facilities and other projects on the islands, it is important to document as much as possible the biodiversity of the islands. In 2002 the Mauritius Wildlife Foundation (MWF) applied for permission to visit the islands and carry out a survey on both islands so as to update our knowledge of the fauna and flora. The OIIC agreed and the visit finally materialized in 2006. The 10 members of the team visited the islands on the supply ship 'The Mauritius Pride' that travels to Agalega on average once every 6 months. The boat left Mauritius on 8 April 2006 for the 50-hour journey to Agalega. On the boat were 135 passengers, including about 90 Agaleans, mostly school children returning home for a 2 day visit to family from high school in Mauritius; journalists; representatives of the United Nations Development Program Small Grants Programme and Mauritian public servants who would be going for a six-month posting to replace those public servants returning on the ship.

During the outbound journey it was possible to interview five Agaleans about the islands fauna and flora, both endemic and introduced. Field guides were used to positively identify species. Interviewees were also asked to provide information on levels of poaching. These interviews produced interesting information about marine turtles on the islands. It was confirmed that at least two species of marine turtle regularly nest on the islands: greens (*Chelonia mydas*) and hawksbills (*Eretmochelys imbricata*). A third species, referred to as Koyo, was also identified and described as having a narrow, pointed snout. We did not have photos of all marine turtle species available, so we were unable to confirm if this indeed represents a separate species such as olive ridley (*Lepidochelys olivacea*) or a particular form of hawksbill. Interestingly, inhabitants in the Seychelles have also used the term Koyo to refer to hawksbills there. At this time, we are unable to confirm definitively whether there are two or three marine turtle species frequenting Agalega.

Interviewees confirmed that locals eat turtles and occasionally their eggs as part of the islanders' culture. They also stated that public servants from Mauritius were the biggest exploiters of turtles. We were told that public servants and Agaleans returning to Mauritius stock up and carry back both frozen and salted turtle meat and turtle carapaces. We were told that if we inspected the freezer of the 'Mauritius Pride' on its return journey, we would find large amounts of turtle meat and carapaces, despite the fact that turtle poaching is strictly prohibited under the Fisheries Act (1980). All of the people interviewed understood that this was an illegal activity but continued nevertheless due to the lack of enforcement, the potential to earn money and the maintenance of a cultural practice amongst native Agaleans. Not only is turtle meat considered to be a delicacy in Agalega and Mauritius, but also on Mauritius it is thought to be a remedy for gout.

The boat arrived at La Fourche, off the NW tip of North on 10 April 2006. From there passengers were transferred by way of a small OIIC launch to the jetty. The MWF team conducted a rapid two-day survey of both North and South Islands before the departure of the 'Mauritius Pride' in the evening of the 12 April 2006. During the survey, the 10-member expedition team documented plant, bird, reptile, insect and snail species, despite time, logistic and weather constraints. While the main object of the survey did not include turtles, we came across evidence of turtle harvesting. Hidden in bushes only some 100m from the disembarkation point for the boat were the remains of three large green turtles that had been butchered

for their meat only, with the smashed carapaces and plastrons left behind. The remains appeared to be a few months old. At Sainte Rita on South Island, broken marine turtle eggs were observed in a garbage dump next to a house and more green turtle remains were noted in bushes behind the beach there.

We also noted that particularly on the east coast, the upper tidal line was littered with huge amounts of plastic garbage, fishing floats and old fishing nets that appeared to have floated in from afar. This phenomenon of litter-strewn beaches has also been recorded for the Chagos Islands (1,500 km to the east of Agalega), which is nonetheless considered to be among the most unpolluted land and aquatic areas on the planet (Sheppard *et al.* 1999). Recently a small dingy was found on Agalega that had floated from Australia.

It is clear that Agalega, with its small human population, extensive coastline, 95% of which is undeveloped, pristine beach and dune formations covered in native vegetation, very likely represents an important, undisturbed habitat for nesting marine turtle nesting. The importance of the island beaches for marine turtles requires further study. Current threats to sea turtles include direct hunting of turtles in the sea and when they come ashore to lay, as well as the poaching of turtle nests. Potential threats include the possible impact of domestic but free ranging pigs and dogs on turtle nests and inappropriate development along the coastal area in years to come. Examples of such developments include the planned construction of over 200 expensive chalet type private houses around the coast and a project to lease the islands to extra-national groups for agriculture, tourism and other "strategic purposes" (reported in Le Weekend newspaper, <http://www.lemauricien.com/weekend/>). There is also a controversial onion plantation planned for the sand dunes of South Island (lease acquired but no development yet taking place). The large amounts of plastic garbage on the east coast beaches may also constitute a possible threat to nesting turtles.

The only realistic way of protecting marine turtles in Agalega would be for a Mauritian Conservation NGO to establish a project there involving the training and employment of Agaleans as conservation officers. Such a project could include nest monitoring and protection, in addition to tagging and data collection of nesting turtles. Nest protection and research can be combined, and local support can also be obtained, with and without cash payments. The project should also include a public awareness campaign to make locals and Mauritians aware of and proud of their marine turtles and an enforcement campaign to ensure that legislation protecting marine turtles is enforced. The project participants could also be involved in work on other threatened species, such as plant monitoring, sea bird and coconut crab conservation work.

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Kemp's Ridley (*Lepidochelys kempi*) Shell Damage

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A total of 37 Kemp's ridley turtles was examined at Rancho Nuevo, Tamaulipas, Mexico from May 16-29, 2006. Thirteen of these turtles (35.1%) had healed carapace damage, usually adjacent to the third through fifth coastal scutes. These injuries ranged from large gashes to small notches in the edge of the carapace (Figure 1A and Figure 1B, respectively). The well-healed nature of all injuries strongly suggests that they were immature when injured and had years to completely heal their wounds. Three ridleys (8.1%) had rear flipper damage: two had damage to a single flipper and the third turtle had both flippers damaged. The damage was different on each flipper and consisted of removal of all or part of the flipper extremities but leaving the femur, tibia and fibula uninjured. All these wounds were also well healed.

The immediate conclusion usually reached by beach workers encountering a turtle with such injuries is 'shark bite'. Sharks undoubtedly take their share of sea turtles (Witzell 1987), and it is possible that some turtles nesting at Rancho Nuevo are survivors of shark attacks in coastal developmental habitats. Damaged rear

flippers may support this supposition. Shaver (1998) stated that 2.3% of the stranded ridleys from Texas had shark damage reported on the stranding forms for 1994; however similar damage was not reported by Cannon (1998) for stranded ridleys from the upper Texas/Louisiana coast. Large coastal sharks such as bull, tiger, and hammerhead are the most likely culprits that would have little problem consuming these small turtles whole [37 cm SCL (Shaver 1998)]. An attack by a large shark would probably result death and consumption of such small turtles, and survivors would be uncommon.

Damaged turtles nesting at Rancho Nuevo could also be survivors of vessel collisions occurring years earlier while foraging in developmental coastal habitats. Many ridleys stranding on Texas beaches may be the unfortunate specimens that do not survive these collisions, given the relatively large percent of these turtles exhibiting obvious propeller cuts (4.5% - 12.3%) according to Shaver (1998) and Cannon (1998), respectively. Shaver (1998) recognized the severity of the problem and concluded that collision with boat

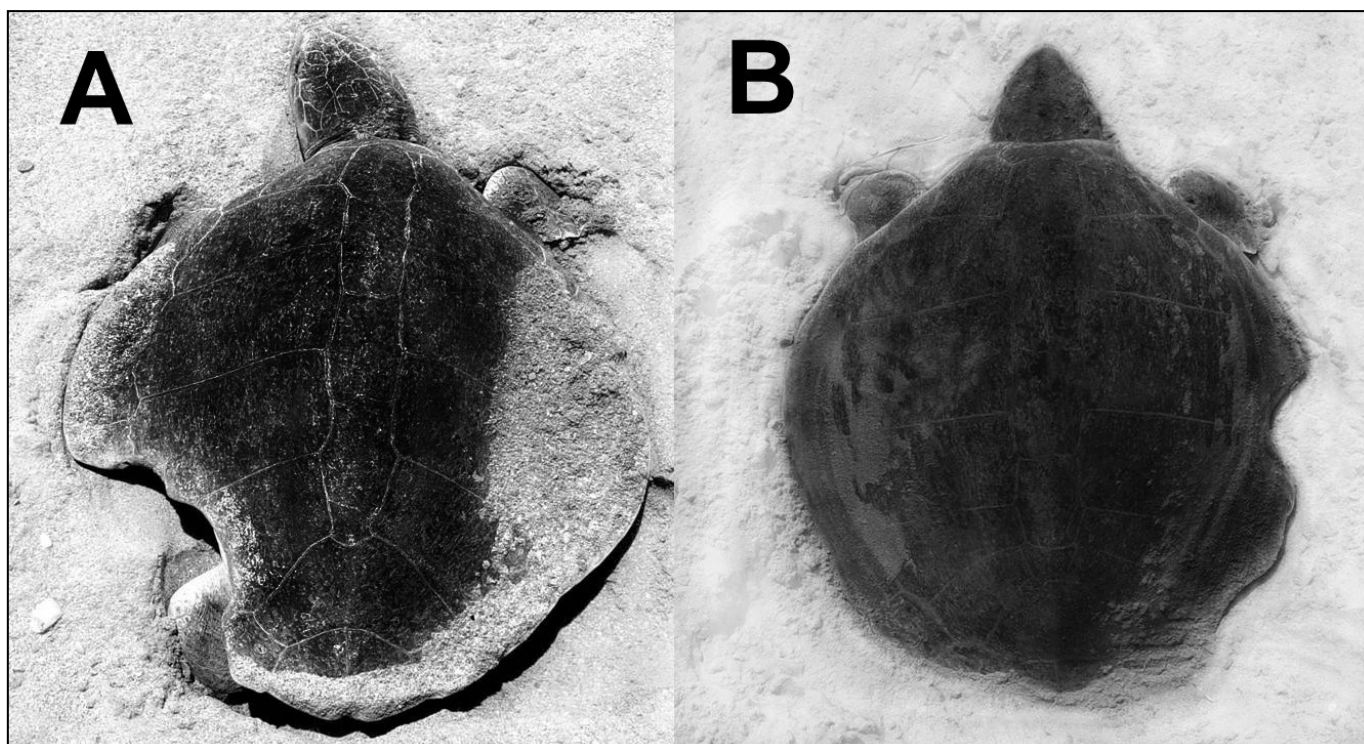


Figure 1. Shell damage in nesting female Kemp's ridleys

propellers was a significant threat to turtles in Texas coastal waters. It is probable that many stranded ridleys in the western Gulf die from collisions by fast moving vessels, probably recreational vessels. The fact that they are usually damaged in the posterior suggests that the turtles were either fleeing at the time of impact, or the turtles with posterior damage were more likely to survive the impact than if struck anteriorly. Collisions with the propulsion shafts of outboard motors could leave notches in the carapace while the turtle may or may not be impacted by the boat's propeller. Young turtles are very alert and are less likely to be hit by the slower moving commercial fishing or oil platform supply vessels (pers. obs.). Their small size, reduced mass and pliable carapace will likely prevent them from being cracked by anything but fast vessels, and simply brushed aside by large slow moving vessels. The trauma of a vessel impact must be extensive in order to kill these small turtles because they have a remarkable ability to survive severe damage from fast boats (Witzell & Schmid 2004). Unfortunately it is very difficult for stranding personnel to distinguish trauma from shark bites, boat collisions, and propeller cuts when determining causes of death. Additionally, seriously injured or dead turtles may be struck multiple times by vessels or scavenged by sharks before they drift ashore.

Important ridley developmental habitats extend beyond Texas and occur elsewhere in the Gulf of Mexico (Witzell & Schmid 2004), and some may even argue along the U.S. Atlantic coast. However, the western Gulf of Mexico is where significant numbers of immature ridleys coexist with an extensive recreational fleet, and where there are significant numbers of boat-related strandings. There are obviously significant interactions between immature Kemp's ridley sea turtles and either sharks and/or recreational boats in the

Gulf of Mexico. Although little can be done to reduce predation on immature Kemp's ridley turtles, increased protection from man-related injury and possible death mandates a better understanding of their interactions with recreational vessels in coastal habitats. It is suggested that comprehensive data be collected on shell injuries to stranded ridleys and an analysis performed to determine the temporal and spatial nature of these injuries and the size class(es) of the turtles impacted. Boat collisions are a real threat to this species and will only increase with growth in recreational vessel use within immature ridley developmental habitats. Registrations of recreational vessels 4.9-12.2m (16-40 ft) feet long have grown from 160,494 in 1975 to 375,302 vessels in 2005, an increase of 234% (unpublished data, Texas Parks and Wildlife Coastal Fisheries Division). The Kemp's Ridley Recovery Team needs to address this important issue during the formulation of the new Recovery Plan.

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Live Loggerhead Observed in Newfoundland, Canada in Late Autumn

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A loggerhead turtle *Caretta caretta*, curved carapace length 76 cm, was reported to the Whale Release and Strandings Group alive on November 15, 2006, inside a barasway in Sandyville (47° 32' N, 55° 55' 57" W) in Connaigra Bay on the south Coast of Newfoundland, Canada. The loggerhead was in a resting position and made no attempt to leave the area for deeper waters. The shell of the animal was covered with silt and seaweed. The turtle had a growth of scar tissue above and obscuring its left eye. The mean air temperatures on 15 November were 10°C. Seawater temperatures in the area were 8°C. The animal was moved by the Harbour Breton Department of Fisheries and Oceans garage and released the night of 15 November from the beach in the community. The animal swam about, dove and was not seen again. Copies of photos of the turtle are available upon request.

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Announcement – MTSG Annual General Meeting, February 23, 24, & 28, 2007

The 2007 MTSG Annual General Meeting will be held at the 27th Annual Sea Turtle Symposium in South Carolina, USA, on February 23, 24 and 28. The meeting format has been modified from previous years to include greater opportunities for member discussions. Following is the tentative schedule for the meeting. For more detail or to recommend additional agenda items, please contact the co-chairs and program officer (contact details above). We hope to see you there.

Friday, February 23rd, 13:00-17:00. Free Time for Thematic Meetings & Working Groups

****MTSG members interested in taking advantage of these time slots for such meetings please contact the co-chairs and/or program officer for scheduling****

Saturday, February 24th, 08:00-11:30. MTSG Business & Updates on Activities

This is the traditional MTSG Annual General Meeting format, with updates from the MTSG leadership and regional groups.

Wednesday, February 28th, 09:00-12:00. Working Groups & Member's Forum

This time slot will include two working group discussions, one on the subject of marine turtle use, and one on the olive Ridley biology dilemma and its relation to status assessments. It will also include an open forum for discussion of any other MTSG business.

Meeting Report – The First Workshop about Marine Turtle Conservation in Mozambique (22-23 November 2006)

The MTSG was pleased to co-sponsor *The First Workshop about Marine Turtle Conservation in Mozambique*, held on November 22-23 in Maputo and jointly organized by the Center for Development and Sustainability in Coastal Zones of the Ministry of Action for Coordination and Environmental Affairs (CDS-MICOA), World Wide Fund for Nature (WWF), and the Mozambique Marine Turtle Working Group (GTT).

The workshop brought together 46 participants from Mozambican government institutions, national and international NGOs, research institutions and the Senior Advisor for CMS/IOSEA Memorandum of Understanding, along with representatives from South Africa and Brazil. This event was the first of its kind in Mozambique, and provided the opportunity for all those involved with marine turtle conservation in Mozambique to identify common areas and better harmonize their conservation efforts.

The meeting also served as a platform for disseminating information on a variety of specific issues including the conservation status of marine turtles in Mozambique, the use of Turtle Excluder Devices (TEDs) by the shrimp trawling industry, the illegal curio market, and to discuss and agree on *urgent* actions to improve the conservation of these endangered species.

The two-day workshop was comprised of presentations and group discussions on the strategic and action plan for marine turtles in Mozambique for 2007-2012. At the end of the workshop a declaration was made by the participants urging the Mozambican government to sign the Indian Ocean – South-East Asian (IOSEA) Marine Turtle Memorandum of Understanding (MoU), and suggesting improvement of the marine turtle conservation program in Mozambique. The final workshop recommendations are:

- 1) The final version of the strategic and action plan for marine turtles in Mozambique prepared by the Mozambique Marine Turtle Working group should be submitted to the Ministry of Action for Coordination and Environmental Affairs by the end of March 2007.
- 2) The Ministry of Action for Coordination and Environmental Affairs should create a mechanism to formalize the adoption of the strategic and action plan.
- 3) The Ministry of Action for Coordination and Environmental Affairs should accelerate the process for Mozambique to sign the IOSEA MoU by the end of 2006.
- 4) The strategic and action plan should be adopted as the legal instrument to guide marine turtle conservation programs in Mozambique.

Full workshop proceedings are currently in preparation, and will include these recommendations as well as copies of papers presented at the meeting. For further information, contact Alice Costa (adabulacosta@wwf.org.mz), Eduardo Videira (pipocas99@yahoo.com), or Henrique Balidy (balidynavanavke@libero.it).

IUCN Mission to India

At the end of November, Nick Pilcher participated in an IUCN mission to India at the request of SSC Chair Holly Dublin. The mission, also including Rafiq Mohammad (head of Biodiversity and Business, IUCN HQ) and TP Singh (India focal point, IUCN East Asia office), traveled to India November 28 to December 2 to investigate the conflicts and possible solutions to the Dhamra port development issue, in which the Dhamra Port Company Ltd. (a subsidiary of Tata Steel, one of India's largest company conglomerates), intends to build a port near the well-known Gahirmatha (Orissa) olive Ridley *arribada* nesting site. Aside

from the technical and legal aspects of this development, some key concerns for marine turtles are artificial lighting and its potential impact on hatchlings, and the impacts of dredging on turtles at sea. The nesting site lies in direct line of sight of the port development, and the glow from the port will be seen many miles beyond the nesting site. Also of concern is the secondary development that will undoubtedly spring up behind the port and may bring added impacts to the turtles and their habitats.

The mission was carried out at the invitation of Mr. Ratan Tata, Chairman of the Tata Group of Industries, to address the conflicts that have arisen in the development of this project. A draft report on the mission has been prepared and submitted to the IUCN Regional Office, and will be forwarded to the Dhamra Port group shortly. Following this, further engagement of IUCN specialists, particularly our members in the country, is likely, and we will continue to provide updates as the report is made public and decisions have been made on the best way forward.

SWoT Report, Volume 2 & Report on the SWoT Outreach Grants Program

We are pleased to report that the *State of the World's Sea Turtles (SWoT) Report, Volume 2* is on schedule to be published and distributed at the 27th Annual Sea Turtle Symposium in February 2007, and will feature the loggerhead and leatherback nesting beaches of the world, with nesting data from the last complete nesting season in 2005 at all available beaches. Please look for the SWoT booth at the 27th Symposium to pick up a copy.

In the last quarter, the MTSG facilitated the first *SWoT Report*

Outreach Grants Program, which provided five \$1,000 grants to support education and outreach projects incorporating content from the first *SWoT Report*. These projects were carried out by the MarineLife Alliance in Bangladesh, the Guyana Marine Turtle Conservation Society in Guyana, WWF Malaysia (Sabah), Kolej Universiti Sains dan Teknologi Malaysia (KUSTEM), and by the Conservation Society of Sierra Leone (CSSL). After project completion in late 2006, final reports from each were reviewed by the SWoT coordinators, and one project leader was selected for sponsorship to the 27th Annual Sea Turtle Symposium (STS) in Myrtle Beach, South Carolina, USA. Although all projects were very successful and worthy of recognition, Edward Aruna of CSSL was awarded this distinction and his participation in the 27th STS will be sponsored by the SWoT project.

With the *SWoT Report* Outreach Grant funds, Edward and his team designed a workshop around *SWoT Report*, using it as a curriculum to look at the worldwide status of sea turtles and Sierra Leone's place within that global view. Using specific articles within the workshop, they examined conservation activities in other areas of the world and reviewed the current state of sea turtle conservation in Sierra Leone. The 55 workshop participants included university professors and students, police, journalists (who covered the story in the next day's news), secondary school teachers, officials from the ministry of tourism and ministry of environment, NGO representatives, coastal community members, and harbor masters. These participants have agreed become a network of people who continue to spread the word about sea turtle conservation and support sea turtle conservation activities in the future.

Meeting Report

Workshop on Marine Turtles in Taiwan, May 2006

I-Jiunn Cheng

Institute of Marine Biology, National Taiwan Ocean University, Keelung, Taiwan, 202-24, R.O.C. (E-mail: b0107@mail.ntou.edu.tw)

The International Workshop for Sea Turtle Stranding and Necropsy in Taiwan was held in Makung, Penghu County, Taiwan, Republic of China (ROC) on May 2 & 3, 2006. The participants consisted of veterinarians from various domestic county livestock disease control centers, relevant county officials as well as faculties and students from the Veterinary Department of several universities. Professor C.H. Diong from Nanyang Technological University, Singapore also participated in the workshop.

The workshop recognized that all sea turtles in Taiwan are listed as endangered species (equivalent to Category I of the Red List). Therefore, all stranded sea turtles are required to be reported to the relevant authorities. However, due to limited manpower and the different stranding report procedures followed by different counties, the spatial variation in stranding reports is high. This inconsistent reporting system may in the long run have a negative impact on sea turtle conservation in Taiwan. In addition, diagnosing the health condition and necropsy, both of which are very important to the conservation and management of sea turtles, are only available to a limited degree in Taiwan. The purpose of this workshop was to invite three experts, namely Thierry Work (USGS-NWHC-HFS,

Hawaii), Robert Morris (NMFS, Green Sea Turtle Project, Hawaii) and George Balazs (NOAA, Hawaii) from the US to exchange information and field experiences and provide us with useful recommendations regarding the current stranding report procedure. The workshop was divided into two parts: a public presentation by the three experts from the US and the three experts from Taiwan followed by a discussion session, and then sessions on necropsy including health inspection/ disease diagnostics. The workshop stressed the need to set up standard procedures for a sea turtle stranding network and necropsy/health inspections in Taiwan.

The workshop report was well received by both the Science and Technology Policy Research Information Center of the National Science Council. The National Central Library, R.O.C. placed the workshop report on their library collection list. Copies of the workshop report are available in the electronic form. Because most participants were Chinese, the report is written mainly in Chinese. You can download the workshop report in PDF format as well as the audio and video files of the practice sessions using the FTP software. The IP address is 140.121.200.84, the ID is any, the s/n is any5303, and the port is 5314.

OBITUARY: Boyd Nathaniel Lyon 1969-2006

Peter C.H. Pritchard

Chelonian Research Institute, 402 South Central Ave., Oviedo, FL 32765 USA (E-mail: ChelonianRI@aol.com)

Boyd Lyon's application to be a graduate student at the University of Central Florida was rejected at first. It seems his CV was simply too unusual. He was 36 years old, and had spent much of the previous decade as a sports and soccer coach after having achieved some unremarkable grades while on an athletic scholarship to San Diego State University in the early 1990s. True, Boyd had worked on sea turtles for the National Marine Fisheries Service in La Jolla for the last three years, and his brief inventory of postgraduate courses yielded a straight A average, but competition was strong, and the Biology Department had made its decision.

Or so it thought. Most people would have given up on UCF, perhaps with muttered irritation or disappointment, and applied elsewhere. But Boyd was not "most people." He wrote back to a bemused graduate advisor, starting with a breezy salutation "Hi, John!", not complaining, but simply commenting that the news was "rather surprising," and recommending that his application be revisited. Boyd had his sights firmly set on UCF, and he would accept no other. He enlisted Lew Ehrhart's support and mine as well, which was freely given in both cases. Lew was semi-retired and I was an adjunct professor with my own research institute to keep me busy; but we were his turtle godfathers, and we recognized a special case when we saw one. Boyd also provided a crackerjack letter of recommendation from Jeff Seminoff, his friend and supervisor at NMFS. He flew back to Orlando to make his case, and, well steeped in the art of friendly persuasion, he brought me a rare gift for the Institute – a magnificent carapace, with scutes, of a large black turtle (*Chelonia agassizi*) from the Revillagigedo Islands population, which I think he carried as checked baggage. He also submitted a new and revised three-page single-spaced letter to accompany his application – one that spelled out his history, carefully de-emphasizing his athletic achievements, and describing his lifelong infatuation with marine turtles. A visit with his father to Mazatlan when he was nine years old had shown him his first sea turtle, and a Christmas gift of Encyclopedia of Turtles from his mother combined with his watching a PBS Special on the leatherback turtle and its mysterious life cycle clinched the deal. His mother still remembers having to tell him to stop cutting pictures out of my book to stick on the wall of his bedroom.

Boyd had a fine-tuned disdain for the word 'no' that obviously got him into graduate school, and several years earlier helped get his position with the NMFS turtle team. In fact, "thanks but no thanks" were the first words he ever heard from Jeff Seminoff when asking about volunteer opportunities with NMFS. He had been interested in working at Southwest Fisheries Science Center in La Jolla California as part of the Marine Turtle Team and was not going to let this negative response curb his enthusiasm. After two more telephone conversations, he finally convinced Seminoff to meet him one December evening in 2002. His 'foot in the door' phrase went along the lines of 'please just let me come by the lab to speak with you in person and if after that you still don't need any

assistance I'll leave you alone'. Shortly thereafter the two met and, needless to say, Boyd got the gig.

He knew there would be diversions along the way, but he planned to be a turtle man – indeed, by now he already was one, having done in-depth field studies of black turtles in both western Mexico and the Galapagos during his NMFS years.

The doubters in the Biology Department administration fell silent, and his application was accepted.

Months before he left California to take up his UCF appointment, I happened to go to San Diego for a Turtle Survival Alliance meeting, and Boyd insisted that I stay in his apartment in a wonderful beachfront corner of western San Diego that had the hippie atmosphere of Gainesville in the 1960s. With characteristic hospitality, he vacated his bedroom on my behalf, and after the TSA meeting was over we joined up with Jeff Seminoff to explore Central Baja and make a quixotic search for pond turtles in the desert at the extreme southern terminus of their range. I had not seen Baja for over thirty years, and was delighted to see that the magnificent cactus forests were still intact despite the massive southward sprawl of the scrofulous border towns since my last visit. For several days we found no turtles, but finally we hit paydirt. We walked for miles along a bone-dry rocky canyon at the southernmost point of our trip, that eventually led to a cool creek with gin-clear water less than a foot deep. The three of us fanned out, and when we re-grouped after half an hour I was triumphantly clutching a live adult Pacific pond turtle. To my surprise, so was Boyd; and so was Jeff.

So the climax was exciting, but the trip was also a chance for me to get to know Boyd, a chance that I am most grateful not to have missed. I will always be grateful for the amount of quality time we had during the brief year that I knew him. I never knew anyone so unremittingly positive and happy, so committed, so optimistic.

Boyd was a good looking dude, over six feet tall and with the wiry physique of an athlete. Although a Pennsylvanian by background, you could only think "California" (or "surfer") when you saw his tanned features and half-smile of utter confidence. Having finished all preparations for his journey, he set out from San Diego for Florida in his camper-van, with his worldly possessions and his two beloved dogs in the back. His route angled north to take him through Las Vegas, where he picked up a live alligator snapping turtle for me that Bob Winokur had kept for no less than fifty years. Upon arrival in Orlando there was some confusion as to where his dogs would stay until he found a place to live, but Tim Walsh came to the rescue and offered to keep them at his house in Sanford. He quickly joined and was welcomed and accepted by Lew Ehrhart's turtle crew, which consisted mostly of female graduate students a decade or more younger than himself. With his athlete's physique, he was able single-handedly to pull in nets laden with loggerheads and green turtles, doubtless aware of the admiring glances from his fellow students. He also shook me out of my own procrastination in going out on the lagoons to join the turtle crew. I went out twice

and had a great time.

Whenever he found a deceased turtle specimen of note – a washed-up “Barnacle Bill” loggerhead, or an adult male of the same species, even the first adult Kemp’s ridley from Florida I had seen, Boyd never forgot our appetite for such things at the Institute and he brought them to our door.

While I was in San Diego, Boyd confessed that he would regard it as the opportunity of a lifetime if he could join me on an expedition I was planning to the crater area of Volcan Wolf, the highest mountain in the Galapagos Islands and the site of the recent discovery of a previously unknown population of giant tortoises, possibly the largest population in the archipelago. Others had asked if they could come, and with just two exceptions I had declined the applications. But Boyd was the most persuasive man alive, and I was glad to add him to the list. He also, like Daniel Fitter and Joe Flanagan, had considerable Galapagos field experience, and his status as an athlete as well made him eminently well qualified for Volcan Wolf.

Reflecting on his first trip to the Islands with Boyd, Jeff Seminoff marveled at Boyd’s tenacity: “In early 2005 when I was planning on going to the Galapagos I had a conversation with Boyd during which he found out I was going, at which point he made sure that he was part of the plan. He and I had been working together for about a year at that point and I was only too happy to have a wingman to come along on the trip. What I wasn’t aware of is how little sleep he required each day! After getting out to the islands, Boyd’s passion came through so distinctly....and the guy basically slept only about 2 hrs. a night. We’d be at nesting beach field camps and while everyone else was sleeping after the night’s patrols, Boyd would be out walking the beach, getting ready for daylight so he could take more pictures. We’re talking 3 AM after an already long night of work, walking the beach and putting satellite tags out on turtles. It did come at a price, however, as I remember a couple of days during which he was basically sleeping at the dinner table with his eyes opened, a sort of glazed look. Of course, Boyd absolutely refused to admit that he was tired. Always up to the task, he would load up his gear again and off to the beach we’d go. Night after night for nearly three weeks.”

Various delays presented themselves, and the Volcan Wolf expedition has still not materialized although the three of us left still hope it will. An offer to share a helicopter with BBC did not materialize, and the Galapagos Park authorities, who had suggested the trip in the first place, seemed to have trouble making up their minds about permission. Finally, Joe and Boyd went ahead to Galapagos to see what could be cleared up by a personal visit, and they returned, somewhat frustrated, but with a general plan that the expedition could be done in early 2007. We may still do it but, without Boyd, it won’t be the same.

Having arrived in Florida, Boyd was anxious to get started on his thesis research work. Already 37 years old, he did not want to be fifty before he got his Ph.D. Never was there a student with such drive, such motivation. Nothing could hold him back. In the Galapagos and in Pacific Mexico he had considerable experience in catching sea turtles in the water by leaping on them from a boat, a technique known as “turtle rodeo” that was pioneered in Australia. This exciting technique appealed both to his scientific and to his adventurous side. He researched it extensively by means of email with the Australians, and he decided that the one component of green turtle studies that had not yet been covered by the UCF crew was

the life, movements and migrations of male turtles.

On his last visit to the Institute, Boyd described the technique that he proposed to use. Wearing a weight belt and diving mask, but without SCUBA equipment, he would jump on to courting or mating male green turtles at the sea surface near the Brevard County nesting beaches. Grabbing on to the edges of the carapace of the turtle, he would be quickly taken down as the turtle dived, and then he would get a grip on the front of the shell that would allow him to point the turtle upwards so that it would bring him back to the surface as if in an elevator. If the turtle failed to cooperate, he would simply abandon it and re-surface; indeed, he did not expect more than one in ten attempts to be successful. I told him that I personally would be terrified to do such a thing, but then I am a rather modest swimmer; he was a champion.

Two weeks later came the fateful day. August 10 2006. The UCF turtle team was deployed between three boats, catching turtles the old fashioned way, in nets. Boyd was in the same boat as Lew Ehrhart and several students. They were the last boat in, and were heading back to shore when the students noticed a turtle near the surface. The boat slowed to get a better look, and Boyd decided to rodeo it, hoping to add another turtle to his in-water study data set. The water was about thirty feet deep, and the 19 foot Boston Whaler was about 400 yards off the beach, 3 miles north of Sebastian Inlet. The crew expected Boyd to resurface within a minute or less; this was free diving, and even a super-fit athlete can only hold his breath for so long. But Boyd did not come up. Cell phones permitted a fast alert to emergency authorities, but after hours of search Boyd could not be found.

What happened?

We’ll never know. But what we do know is that when his body was found on the surface by a helicopter patrol four days later, there were no signs of violent trauma of any kind; he still had a glove on one hand for gripping the turtle, and the other hand bare to grip his nose for pressure release during fast ascent. It was a demise from another age, a Beowulf-like story of being borne to the bottom of the sea by a giant reptile. Boyd would have enjoyed that thought.

Boyd had only been in Florida for a few months, and one would have imagined that his circle of local acquaintances and friends would be limited. But it was not. His people gathered, a week later, on the beach near Sebastian Inlet at dusk. It was a luminous evening, with unusually calm turquoise water and a truly spectacular sunset inland. And about a hundred people came. They ranged from a dozen quietly sobbing early teenage girls whom Boyd coached at soccer, to senior faculty and administrators from UCF. Boyd’s mother Diana, brother Dean, sister-in-law, girlfriend, and close family friends were there too. And of course the turtle people of all ages came to say goodbye. As we each had an opportunity to speak fondly of our adventures and experiences with Boyd, a sea turtle popped its head out of the water and gazed towards shore - for a brief moment - and was gone.

Boyd’s family has launched a fund in his memory. Details may be found at www.boydlyonseaturtlefund.org. It will be administered through the Ocean Foundation.

NEWS AND LEGAL BRIEFS

This section is compiled by Kelly Samek. You can submit news items at any time online at <<http://www.seaturtle.org/news/>>, via e-mail to news@seaturtle.org, or by regular mail to Kelly Samek, 127 E 7th Avenue, Havana, Florida 32333, USA. Many of these news items and more can be found at <http://www.seaturtle.org/news/>, where you can also sign up for news updates by E-mail. Note that News Items are taken directly from various media sources and do not necessarily reflect the views or opinions of the editorial members of the MTN.

AFRICA

Kenya: Conservationists Want Sea Walls Demolished

Conservationists in Mombasa want the walls along coastal beaches pulled down to save turtle species from extinction. Mr. Bernard Ogwoka of the Kenya Sea Turtle Conservation Committee said the walls and the hotel lights interfere with the breeding of the animals. Speaking at Castle Royal Hotel in Mombasa on Sunday, Ogwoka said the construction of sea walls along the Coastal beaches had interfered with the turtle nesting zones. But National Environment Management Authority Compliance Officer, Mr. Dickson Njora, differed with the conservationists saying demolishing the walls could lead to a long-drawn-out war in the courts with the hotel owners. Source: *East African Standard*, 19 November 2006.

THE AMERICAS

Beach Lights Wreak Havoc on South Florida Sea Turtles

Many coastal South Florida cities, including Hallandale Beach, Fort Lauderdale, Miami Beach and Pompano Beach, have adopted “turtle-friendly” lighting ordinances to deter turtles from wandering toward land. And farther north, most counties along Florida’s coast also have laws in place regulating lighting to protect turtles. Despite the ordinances, sea turtle experts say Broward lags behind the rest of the state in protecting the turtle population. Enforcement of lighting ordinances is spotty, and the “disorientation” problem is worse than ever. For the first time, Broward turtle conservationists aren’t relocating nests -- a practice already stopped by other coastal communities in Florida. Experts who’ve studied the practice say that moving the nests did more harm than good. Because all species of the reptiles are either threatened or endangered, the state and federal government has rules against relocating the nests. Up until the start of this season, nests in Broward were moved from brightly lit areas of the beach to darker spots where hatcheries -- a protective area or pen -- were set up. Sea turtle experts say the focus should be on educating the public on the dangers of artificial lighting to the population of loggerheads, green and leatherback turtles. Source: *Miami Herald*, 10 October 2006.

Fort Pierce Sea Turtle Activist, 78, Dies

Grace Kedziora, 78, a former South Beach resident known as a “Turtle Mother” for her extensive work with sea turtles, died Saturday night in Anchorage, Alaska. The cause of death was Lou Gehrig’s disease, the common name for amyotrophic lateral sclerosis. A native of Pittsburgh, Kedziora joined the “Turtle Mothers,” a group that keeps tabs on—and occasionally rescues—nesting sea turtles

and their hatchlings, soon after retiring to Hutchinson Island about 17 years ago. Source: *TCPalm*, 17 October 2006.

Flashlights Add to Turtle Woes

The number of sea-turtle nests found in Volusia County remained stable this year, but a new threat to the hatchlings surfaced during the just-completed nesting season. Dozens of baby sea turtles, emerging at night from their nests, got sidetracked this year from their usual trip to the sea when beachgoers disoriented them with flashlights, according to county reports. As many as 10 of the 46 cases of turtle disorientation may be traced to flashlights, which surprised Volusia officials, who had never seen so many cases of direct interference in past nesting seasons. To prevent disorientation, Volusia officials prohibit any lighting that illuminates the beach or any specific light source that can be easily seen from the beach. Source: *Orlando Sentinel*, 5 November 2006.

Loggerhead Nesting Trend Raises Alarm

Florida’s most plentiful sea turtle lays fewer nests these days, making some fret over its odds for long-term survival. The number of loggerhead sea turtle nests at 28 often-studied Florida beaches dropped by 42 percent in seven years, state researchers said recently. Loggerheads had 60,000 nests in 1998 on those “index” beaches, but dropped to about 35,000 nests in 2005. State biologists say early figures suggest another lackluster nesting season, which may shape up as the second lowest nesting year for loggerheads since the state began monitoring those beaches in 1989. Conservationists say the decline is cause for alarm and should inspire more restrictions on commercial fishing gear that kills turtles by the thousands each year in waters near Florida. Source: *Ft. Myers News-Press*, 13 November 2006.

Surveyors Report Mixed Results for Sea Turtle Nesting

As nesting season winds down, sea turtle surveyors across Palm Beach County are reporting mixed results. Debbie Sobel, of the Sea Turtle Conservation League of Singer Island, is feeling good about her numbers this year, though she would have liked to see more leatherbacks. Her numbers were down from last year. This year, the group tracked 1,020 loggerhead, 222 green and 12 leatherback nests on more than 2 miles of beach from the Ocean Mall in Riviera Beach to John D. MacArthur Beach State Park. Loggerhead nesting is declining statewide, but current numbers could be part of a long-term trend, the result of what was happening 20 to 30 years ago, said Carly de Maye, a county environmental analyst. It takes that amount of time for the turtles to reach sexual maturity. De Maye monitors three beach areas: Ocean Ridge, Carlin Park in Jupiter and Coral Cove in Tequesta. Loggerhead numbers crept up at Ocean Ridge

and Carlin Park but fell at Coral Cove. The two increases do not make up for the 21 percent drop in Tequesta, de Maye said. Source: *South Florida Sun-Sentinel*, 18 November 2006.

Five Year Moratorium on Taking Turtles

In November 2006, the Kuna General Congress established a 5 year moratorium on the capture of sea turtles throughout the Territory of Kuna Yala. The Autonomous Territory of Kuna Yala, located in the western part of the Caribbean coast of Panama, was recognized by Panama's Law 16 of 1953. The Territory includes a continental portion plus hundreds of islands, reefs and keys on the coast, including some excellent sea turtle habitat. The capture of the following species of sea turtles is now prohibited: Yauk Suer Sueret or leatherback (*Dermochelys coriacea*); Moro or green turtle (*Chelonia mydas*); Yauk or hawksbill turtle (*Eretmochelys imbricata*); and Moro Non Dummad or loggerhead turtle (*Caretta caretta*). This measure was adopted with the objective of allowing time for the populations of sea turtles to recover, and to preclude their further decline. The resolution also identifies and recognizes nesting beaches as Fishing Refuge Zones, wherein it is prohibited to harm nesting turtles in any way. Similarly, the collection, possession or sale of sea turtle eggs or other products derived from sea turtles is prohibited at all times. At these and other sites throughout the Territory, the take of juvenile turtles is now illegal. The local authorities will be entrusted with supervision of compliance with the resolution, and will adopt measures together with regional authorities. The full text of the new law can be found at http://www.congresogeneralkuna.org/dupwala_resoluciones.htm. Source: *Kika Boletín*, 01 December, 2006.

Red Tide May Threaten Turtles

During the past half-dozen years, loggerhead turtle nesting in Florida has dropped sharply. Fewer loggerheads are laying eggs in Florida, even though other Florida sea turtles, such as greens and leatherbacks, actually are nesting more. Scientists and conservationists say they suspect two main causes of the decline. One is commercial fishing - loggerheads sometimes get caught in long-line fishing in the Atlantic Ocean, for example. Another is the increasing number of sea turtle "strandings," cases in which a group of sea turtles is found close to shore, dead or dying, possibly from toxins or disease. Scientists are paying attention, especially to a mysterious series of turtle deaths. At various places around the state, groups of turtles have been found stricken, floating and struggling to stay alive. But a central cause has not been found. In some of these cases, red tide is considered a factor. Such as last summer, when scientists from the Mote Marine Laboratory in Sarasota tagged a loggerhead turtle named Ariel with a satellite-tracking device and released her. She later swam across a stretch of the Gulf of Mexico affected by red tide. Afterward, her behavior changed; eventually the satellite device showed she was floating on the surface. Scientists tried, but were unable, to recover her body. Source: *St. Petersburg Times*, 29 November 2006.

ASIA

Vehicles Barred from the Obyan Beach

Government agencies and private groups will be meeting at the Obyan Beach to install used power poles to prevent unauthorized

vehicles from entering this Green Sea Turtle nesting site. Among the groups participating are the Coral Reef Management Office, Mariana Islands Nature Alliance secretary, CUC Power Division, and Department of Lands and Natural Resources' Parks and Recreation Division. CUC has donated several used power poles and is providing heavy equipment to move the poles from Lower Base to Obyan. DLNR Parks and Recreation is donating heavy equipment and rebar to secure the poles to the ground. CRMO has conducted beach profiles and recorded beach vegetation patterns prior to their installation. They will be monitoring the changes in the beach over the next year and providing man power. Source: *Saipan Tribune*, 7 November 2006.

War Disturbs Turtles in Unlikely Refuge

Ghost crabs scuttle along an empty beach in south Lebanon, but other predators have already eaten the last green turtle hatchlings of the season -- foxes driven from the hills by Israeli-Hezbollah fighting. The foxes left their prints in the sand by the despoiled nest, strewn with the white shells the hatchlings had clambered from to start their doomed trek to the sea a few metres away. "This is a massacre," lamented Mona Khalil, 57, who has run a turtle conservation project on the Mediterranean beach since 2000 with her 48-year-old associate, Habiba Syed. Israel's 34-day war with Shi'ite Muslim Hezbollah guerrillas erupted on July 12 in the middle of the four-month turtle breeding season, eventually forcing the two women to flee. Normally, she and Syed insert a wire mesh over the nests that female turtles dig in the sand. The mesh protects the eggs from dogs or foxes, but allows hatchlings to crawl through. The 1.4 km (one mile) long beach near the Shi'ite village of Mansouri might seem an unlikely refuge for endangered sea turtles, but Khalil and Syed have monitored 70 loggerhead turtle nests this season and nine nests of the rarer green turtles. Source: *Reuters*, 9 October 2006.

Sri Lanka's Endangered Turtles Head for India's First Marine Park

In a ground-breaking project with the BBC, the Marine Conservation Society (MCS) has for the first time satellite tracked the migrations of endangered nesting green turtles from a wildlife sanctuary on the south coast of Sri Lanka to Asia's first marine protected area off Tamil Nadu on the east coast of India. MCS and their local partners, the Turtle Conservation Project (TCP), and the Department of Wildlife Conservation fitted satellite tags to six female turtles after they nested at Rekawa Turtle Sanctuary on the south coast of Sri Lanka in August this year. The Sanctuary was declared in May 2006 as the country's first Wildlife Sanctuary for marine turtles. Source: *TravelVideo.tv*, 17 November 2006.

Olive Ridley Turtles Keep Their Date with Orissa

The olive ridley turtles swim for thousands of miles to come each year to Orissa end October for breeding. They have been sighted end October, like clockwork, at the Devi river mouth near the coastal waters off the Ganga Devi beach in Puri district. The Orissa coast is the nesting ground for more than half the world's population of olive ridley turtles, the other two being Costa Rica and Mexico. Source: *TravelVideo.tv*, 17 November 2006.

British Rugby Players Campaign for Turtles in Orissa

British rugby players, who are here for teaching tag rugby to aspiring players, joined a campaign launched by local environment activists in Orissa to save the depleting number of Olive Ridley sea turtles. The players joined the campaigners in Ganjam District during the launch of a crusade to protect the Olive Ridley sea turtles facing extinction due to large-scale fishing. The environmentalists and players were opposing the construction of new port near Rusikulya, as it will harm the turtle. During the launch, the players were carrying placards carrying messages: Save Olive Ridley sea turtles. The coastal region of Orissa is one of the three nesting grounds for more than half the world's population of Olive Ridley turtles. Source: *ANI*, 19 November 2006.

Tracking Marine Turtles in Vietnam

A new satellite tracking programme to monitor green turtle populations in Vietnam has been successfully launched off the south-eastern island of Con Dao. The satellite tracking data will provide critical information on turtle location and movement patterns. Conservation managers can then use this information to establish marine protected areas, as well as monitor fishing activities. To date, three of the four transmitters are fully operational. However, one device has stopped transmitting, either due to a change in the animal's behavior (i.e. surfacing infrequently and thus minimizing the chance of sending a signal), or a technical malfunction. It is also possible the animal has died, perhaps killed by fishing gear such as gill nets or long lines. Source: *WWF press release*, 7 December 2006.

Bataan Turtle Poachers Turn Into Marine Guards

Turtle poachers in the coastal village of Nagbalayong have turned a new leaf and have become marine conservationists. The turnaround began after conservationists met with village residents a few years ago after government officials and non-government organizations noted an alarming increase in the rate of degradation of the towns' forest and marine resources, said Wendel Acena of Bantay Kalikasan. The group, mostly poachers, started to pool efforts and meager resources to help save the endangered turtles in Morong. There are five known species of sea turtles in the Philippines and two, the hawksbill and Olive Ridley, are found in the coasts of Bataan. The concerted efforts led to the formation of Bantay Pawikan, a group composed mostly of local fishermen and farmers who used to poach turtle eggs along the shores of the municipality. In 2001, a pawikan center was established in Nagbalayong after the United Nations Development Program released funds for the community's conservation works, said Acena. Japan also donated a delivery van, motorboat, warehouse, and fishing gear to the community so that fishermen could have a regular source of income. The daily catch is divided among the 20 active members of Bantay Pawikan. Source: *Manila Standard Today*, 01 January 2007.

EUROPE

Rescued Turtle Flown to New Home

An injured loggerhead turtle rescued on the Isle of Skye has been flown by seaplane to a new home in a Dorset wildlife sanctuary. The 66cm-long (26in) young male, which has a missing front left flipper, had been recuperating at the Scottish Sea Life Sanctuary,

near Oban. Nicknamed Skye, he was spotted by tourists in July. Local resident Linda Elford, 50, managed to get hold of the turtle and get it on to her husband's boat. Skye needs a bigger tank with warmer water than the Oban attraction can provide, which prompted his move to the Sea Turtle Sanctuary at Weymouth, Dorset, which opened earlier this summer. Source: *BBC*, 11 October 2006.

EU Looks over Turtle Measures

European Commission officials will be keeping a close eye on the Ionian island of Zakynthos until the end of November to determine whether Greece is breaching EU rules by not taking care of the island's endangered sea turtles. Zakynthos is the most important Mediterranean nesting ground and home for the largest population of the *Caretta caretta*, or loggerhead sea turtle. The assessment could land Greece in front of the EU's Court of Justice if recently introduced measures to help protect the turtle from humans invading their nesting areas are seen to be ineffective. Amalia Karagounis-Kyrtsoy, the head of the marine park, is optimistic that the review will go well. The percentage of turtles that lay eggs on the beach this year has risen to 14 percent from 11 percent previously, she added. But the removal of illegally built homes on beaches used by the turtles is among the recommended measures that have not yet been implemented. Source: *Kathimerini*, 20 October 2006.

OCEANIA

Turtle, Dolphin Fear in Wider Net Fishing

The State Government plans to expand the use of net fishing in the North-West in a move that has sparked outrage from conservation groups, who claim it would damage stocks of turtles, dolphins, dugongs and other species. Fisheries Minister Jon Ford claimed the change could protect dwindling species of fish by focusing on less vulnerable reef sharks instead of the bigger, rarer sharks targeted by long-line trawlers. But the move was blasted by the WA Conservation Council, which said nets were indiscriminate and took sea turtles, dolphins, dugongs, sword fish and mackerel. The Minister admitted there was a risk that species such as turtles and dolphins would be caught. An authorised observer would be on board whenever a boat went fishing and if any threatened species were caught in the nets the fishery would be closed immediately. Source: *The West Australian*, 20 November 2006.

Locals Lead Year of Sea Turtle Campaign

Environment and Conservation Deputy Secretary Dr. Gae Gowae launched the year of the sea turtle campaign in Lae, Morobe Province this week during a colorful traditional singing demonstrating the cultural link between turtles and the local people. "The campaign themed: 'Protect them, Protect our heritage' is very significant to us as marine turtles have formed an integral part of the marine ecosystems and traditional culture for most of the 13 Maritime Provinces in Papua New Guinea for many years," he said. The province hosts three of the four major turtle nesting beaches in PNG. The communities in these nesting beaches are involved in a turtle conservation and management project aimed at reducing poaching, predation and environmental impacts to increase and enhance turtle population recovery in the country. Source: *The National*, 27 November 2006.

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This section is compiled by the Archie Carr Center for Sea Turtle Research (ACCSTR), University of Florida. The ACCSTR maintains the Sea Turtle On-line Bibliography: (<http://accstr.ufl.edu/biblio.html>).

It is requested that a copy of all publications (including technical reports and non-refereed journal articles) be sent to both:

- 1) The ACCSTR for inclusion in both the on-line bibliography and the MTN. Address: Archie Carr Center for Sea Turtle Research, University of Florida, PO Box 118525, Gainesville, FL 32611, USA.
- 2) The editors of the Marine Turtle Newsletter to facilitate the transmission of information to colleagues submitting articles who may not have access to on-line literature reviewing services.

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