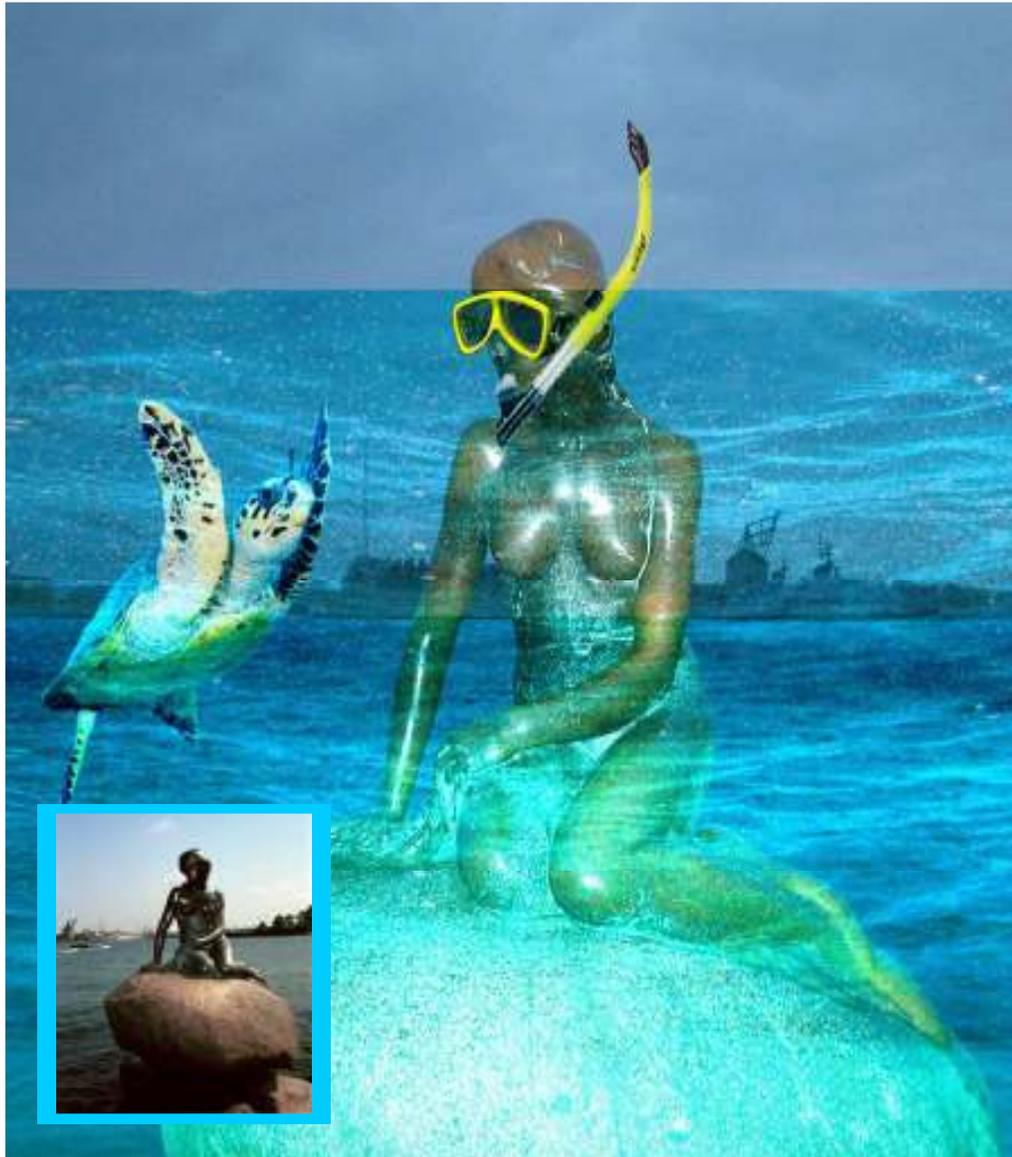


Boiling Point

**CLIMATE CHANGE AND SEA TURTLES
THE NEED FOR ACTION IN COPENHAGEN AND BEYOND**



**SEA TURTLE RESTORATION PROJECT - WWW.SEATURTLES.ORG
A PROJECT OF TURTLE ISLAND RESTORATION NETWORK**



Climate change due to global warming is a triple whammy for sea turtles and their unique life cycle:

1. Rises in ocean levels mean that sandy beaches where sea turtles lay their nests are getting submerged under waves and water. This prevents adult sea turtles from returning to the beaches where they hatched to repeat their ancient nesting ritual.

2. Hotter sand temperatures result in mostly female sea turtle hatchlings. Without enough males, the species cannot survive. And if the nest sand is much too hot, no eggs will hatch at all.

3. Changes to ocean currents, temperature and acidification are likely to throw sea turtles far off normal migrations and alter food availability and abundance.

If there is no international action to curb greenhouse gas emissions, could out-of-control warming lead to the submersion of the famous mermaid statue in Copenhagen's harbor and sea turtles summering in Denmark?(See cover images.)

CLIMATE CHANGE TAKING A TOLL

Endangered leatherback sea turtles are going to be hardest hit by climate change due to global warming. This rare and ancient sea turtle appears on the cover of *Species and Climate Change*, the report released by International Union for the Conservation of Nature (IUCN) during climate change negotiations in Copenhagen to warn of the threats to the earth's most endangered species from global warming.¹ The leatherback was also identified among the Top 10 species most threatened by climate change in the U. S. in a



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report titled *America's Hottest Species*.² Even now, we are beginning to see signs that increased global temperatures will have a devastating impact on sea turtles.

In Costa Rica, climate change is already taking a major toll on the disappearing Pacific leatherback sea turtle. The *New York Times* reports that "warmer temperatures and rising seas are further reducing turtle populations already devastated by beach development, net fishing and restaurants that consider turtle eggs a delicacy."³

"On a beach where dozens of turtles used to nest on a given night, scientists counted only 32 leatherbacks all of last year at Playa Grande at Las Baulas National Park. With leatherbacks threatened with extinction, Playa Grande's expansive turtle museum was abandoned three years ago and now sits amid a sea of weeds." Even worse, these last critical beaches are under threat not only by climate change, but by plans to build resort lodging and housing in dune habitat behind the beaches that could offer the only long-term solution to submersion of beaches. (Read more below.)

Changing ocean conditions due to climate change are also threatening Western Pacific leatherbacks that nest in Indonesia and Papua New Guinea. Once numbering over 100,000 nesting females as recently as the 1980s, these

gentle giants have diminished to between 2,000 and 5,700 nesting females. Loss of nesting beaches and hatchlings due to sea level rise and hot sand will further jeopardize this sea turtle's precarious situation.

Endangered Atlantic leatherbacks are already adapting to changing marine temperatures. In the last 17 years, leatherbacks have expanded their range in the North Atlantic by 250 miles.⁴

The leatherback is only one of seven species of sea turtles facing threats to long-term survival and the additional burden of climate change. Populations of every sea turtle species have already been decimated by human activities including industrial fishing for shrimp, tuna and swordfish, ruin of nesting beaches by commercial development, egg harvesting, hunting for meat and skin, harm from marine plastic and water pollution, ship and boat strikes, and disease. All seven species of sea turtles are listed as endangered, threatened or vulnerable under U. S. law or international treaties. Rapid climate change could turn out to be the last straw that pushes sea turtles to the point of no recovery.

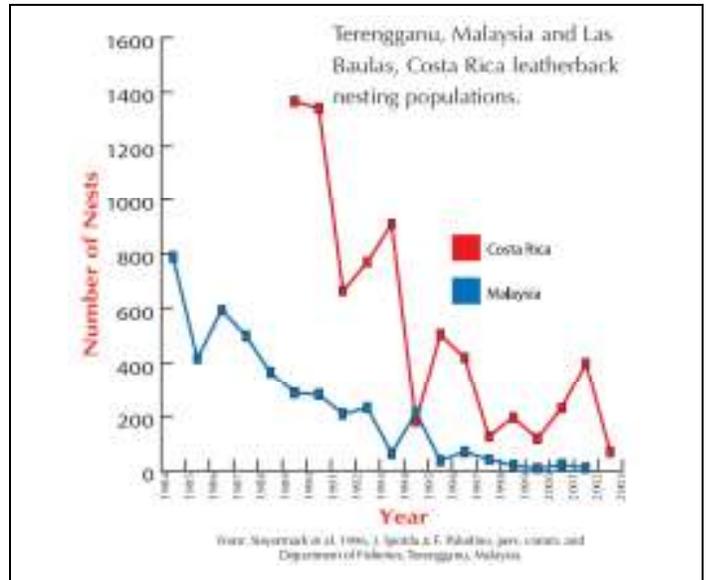
Sea turtles have swum the world's oceans since the time of dinosaurs and survived natural climate change events including the last Ice Age. But the pace of the current climate change will be faster than anything experienced in the last 10,000 years.⁵ While climate change has not been the primary factor in the decline of the sea turtles, it is a serious problem that must be addressed to help protect these ancient ocean dwellers from disappearing forever. We must take action now if we are to protect endangered species both today and in the future.

Climate Change Crisis

Since the beginning of the industrial revolution the release of carbon dioxide (CO₂) from human activities has resulted in atmospheric CO₂ concentrations that have increased from approximately 280 to 385 parts per million (ppm). The atmospheric concentration of CO₂ is now higher than experienced on Earth for at least the last 800,000 years and probably over 20 million

years, and is expected to continue to rise at an increasing rate, leading to significant temperature increases in the atmosphere and oceans in the coming decades.⁶

The Intergovernmental Panel on Climate Change (IPCC) predicts that 20 to 30 percent of



the world's species will be at an increased risk of extinction if global temperature increases exceed 3 to 5° F (1.5 to 2.5° C) above preindustrial levels. To prevent out-of-control warming, the world must reduce carbon dioxide levels in the atmosphere from 385 parts per million to below 350 parts per million. To do so the United States will need to cut its greenhouse gas emissions to 45 percent or more below 1990 levels by 2020.

Rising Sea Levels and Submersion of Nesting Beaches

Sea turtles “imprint” on the sandy beach where they hatch and return to that site decades later to repeat their ancient nesting ritual. With melting polar ice caps and rising sea levels, these beaches are starting to disappear. The direct impacts of sea level rise include loss of beaches, ecologically productive wetlands and barrier islands. Will turtles be able to adapt to rapidly rising tides? Genetic studies of sea turtle colonies suggests the answer may be no; it may take 10,000 years for new turtle nesting sites to become established. There is strong evidence that global sea level gradually rose in the 20th century and is rising at an increased rate.



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Projections for sea level rise by 2100 or before range up to almost 3 feet. During the 20th century, sea level rose about 6 inches.⁷ The two major causes are the expansion of water as it warms and the melting of land-based ice. Small Pacific islands have been identified as areas to be most severely impacted by climate change since they will go underwater or decrease in size.

Some of these same islands provide critical nesting habitat to sea turtles which will then be lost. A rising sea level could put up to 75 percent of some low-lying Northwestern Hawaiian Islands underwater by 2100. These islands provide nesting grounds for threatened green sea turtles.⁸ This loss of land will also mean crowding and competition from monk seals and birds that also use these islands.

Key nesting area for loggerhead and green sea turtles in the United States is Florida. It has been predicted that in Florida, seawater will advance inland as much as 400 feet in low-lying areas, which will flood and erode beaches.⁹

Ocean acidification, a result of increased greenhouse gas levels and the ocean's absorption of carbon from the atmosphere, also threatens the loggerheads, as it is likely to reduce the availability of the species upon which loggerheads feed such as shellfish.

Leatherbacks Losing Ground in Costa Rica

In Costa Rica where scientists estimate that sea levels have already risen by 6 to 10 centimeters since 1980,¹⁰ Eastern Pacific leatherback sea turtles are quickly losing critical nesting habitat at their last major nesting beach at Playa Grande and nearby beaches. If the beach continues to shrink, the heat and lack of space could contribute to the extinction of the species.

Beaches at Playa Grande on Costa Rica's Pacific coast are already producing clutches that are 70 to 90 percent female, depending on the year, according to Dr. James Spotila of Drexler University¹¹. At Junquillal (Hoon-ki-YAL) Beach on the Pacific coast, where it is often too hot for eggs to hatch at all, scientists have begun moving eggs to nurseries – essentially holes dug to a



Photo: © Thomas Litteral

certain depth on cooler areas of the beach. When the hatchlings emerge, rangers chaperone them from the nest to the water, protecting them against human and animal predators alike.

Scientists have long wondered why leatherback turtles are relatively successful in the Atlantic Ocean, while Pacific populations continue their rapid decline. As few as 2,700 to 5,000 Western Pacific leatherbacks remain to nest each year¹², compared with over 17,000 in the Atlantic Ocean¹³. This is despite the fact that more leatherbacks are incidentally caught through longline fisheries in the Atlantic than in the Pacific. While fisheries, egg harvesting and habitat loss are partially responsible for the continued decline, some researchers now accept that climate change could be the primary stressor on a vulnerable population. Climate and availability of food may be key parts of the puzzle.

“Resource availability is higher and more consistent in the Atlantic Ocean,” says Vincent Saba of the Virginia Institute of Marine Science. “Essentially, there’s more food in the Atlantic and the turtles don’t have to swim such great distances to reach it.” According to Saba, the Eastern Pacific is the most unstable part of the ocean in terms of marine climate. “The frequent El Niños we’re experiencing in the Pacific alter the availability of food resources,” Saba explains. Saba’s recent study¹⁴ shows that reproductive output of Eastern Pacific leatherbacks is significantly reduced during El Niño years. “With global warming possibly altering the El Niño phenomenon, the turtles will continue to experience serious resource droughts,” says Saba.

Losing Leatherbacks Beaches

Instead of protecting leatherback nesting beaches and protecting dunes behind beaches against development at Las Baulas National Park, outgoing Costa Rican President Oscar Arias is calling for a weakening of protections in critical dune habitat to allow for building of homes and lodging. A German investor has sued the Costa Rican government for not having allowed development already.¹⁵



Las Baulas National Park is critical to the survival of the Pacific leatherback sea turtle, declared as critically endangered by the World Conservation Union (IUCN). Populations of Pacific leatherback sea turtles have crashed by 90 percent over the past two decades and are not recovering. Today, fewer than 1,000 female leatherbacks survive in the entire Eastern Pacific. Las Baulas National Park has an exceptional global value as it provides the most important nesting site for this remaining Eastern Pacific population.

In 1995, Costa Rica recognized its unique responsibility in ensuring the continued survival of the Pacific leatherback by protecting one of the last nesting beaches in the Eastern Pacific, and the other delicate ecosystems of Ventanas, Playa Grande, and Langosta Beaches, through the creation of Las Baulas National Park. With leatherback turtles so perilously close to extinction, it is inconceivable to remove this protection and allow development in sensitive areas near the turtles’ nesting sites. Such developments will have a negative impact on the nesting process of the leatherback through lighting, additional access of people, vehicles and domestic animals, and could likely lead to the elimination of this most important population of leatherbacks.

Scientists have warned that, even if we were to immediately stop emitting all greenhouse gases, we cannot reverse some of the consequences we are already witnessing. Melting polar ice caps and rising seas could spell doom to seaside resorts and homes, as well as one of Costa Rica's flagship species, the sea turtle.

As sea levels rise, sea turtle nesting beaches will be flooded and the turtles will have to find nesting sites further inland from today's shoreline. Yet, President Arias has proposed to downgrade Las Baulas National Park to a wildlife refuge.

This proposed downgrading would allow new beach houses and condominiums right behind nesting habitat, preventing the leatherbacks from finding higher ground to lay their eggs as sea levels rise.

Hundreds of scientists and more than 30 conservation groups throughout the world have called on the government of Costa Rica to provide maximum protection for this critical nesting site and defeat the down-listing proposal.

Mr. Arias has tried to build on his Nobel Prize

“Peace President” legacy, even starting a Peace with Nature Commission. Yet, his encouragement of the downgrading of this national park makes a mockery of his rhetoric to protect nature, and it questions the sincerity of his commitment to address the impacts of global climate change.

Even if some of the most endangered turtles in the world didn't nest in this zone, this proposed action would be contrary to prudent regulation by any nation seriously contemplating adapting to the inevitable changes that global climate change will bring. Sea rise is inevitable and is occurring and will continue to occur—even if we could immediately eliminate all new sources of global warming gasses.

Turtle Island Restoration Network asks President Arias to withdraw his proposal and join with the world that is trying desperately to rescue this magnificent species from extinction. In so doing, he would help cement his legacy as the “Peace with Nature” president.

Extreme Storms and Rainfalls

Other affects of climate change include increased numbers of hurricanes and severe



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storms, associated beach erosion, nest loss and the destruction of nesting habitat.

Storms during nesting season could reduce nesting success through increased salinity from storm surges and increased moisture.

Additionally, storm surges can simply wipe out nests as well as transfer greater sediment and raise water tables which would also flood nests.

A team of scientists compared the reproductive seasonality of three sea turtle species along the Atlantic coast of Florida in the United States from 1995 to 2005.¹⁶ The study found that frequent or intense storms reduced the numbers of nests hatching and the number of hatchlings emerging from each nest. Storm surges affected 95 percent of the green turtle nests since these turtles' nesting season occurs during the tropical cyclone season. In 2004 and 2005 tropical cyclones occurred in this area during the entire green turtle nesting



STRP Gulf Director and her grandson observing a Kemp's ridley with satellite transmitter at Padre Island National Seashore in South Texas.

season. As a result, a mere 2 percent of all green turtle nests hatched.¹⁷

Sea Turtles After Hurricane Ike

Many questions remain about the sea turtles of the Gulf of Mexico following the disastrous hurricane named Ike that devastated upper Texas coast beaches in September 2008. Will the Kemp's ridley return to nest? What about all the sand that is needed for sea turtle nests which has been moved inland or swept away?

Plans are being made to restore beaches starting with Galveston. The Galveston City Park Board announced plans to spend more than \$7.5 million dollars to restore its beaches with 400,000 cubic yards of sand. Since numerous nests have been found on the beaches at the Galveston Seawall during the last few years, this was a welcome announcement.

Meanwhile staff and visitors at the Padre Island National Seashore were watching tons of debris wash up on the beaches. The washing machines, dryers, lumber and roofing material mixed with personal items of storm victims must be moved from National Seashore and South Texas beaches before the first Kemp's ridleys arrive to lay eggs.

Dr. Andre M. Landry, Jr. of Texas A&M University at Galveston will be coordinating patrols on Galveston Island Bolivar Peninsula and said "Beaches need to be patrolled, regardless of their present state and their status over time, to ascertain whether the upper Texas coast can continue to play a role in sea turtle nesting and recovery."

He also stressed the importance of monitoring data on nesting activity for making sound recommendations to state and federal agencies charged with maintaining beaches. The integrity of the beaches is vital for providing favorable nesting habitat, a buffer from storm related events, and a source of revenue through tourism and ecotourism to support communities like Galveston and Bolivar.

Good News for Kemp's Ridleys

In 2009, the sea turtle nesting season broke all records on the Texas coast with 197 documented nests. This was the sixth consecutive year for nesting increases setting a new record for the number of Kemp's ridley nests found on the Texas coast during a single year since record keeping efforts began on the Texas coast in the early 1980s. The previous record was 195, set in 2008. However, none of the nests were found on the beaches hardest hit by Hurricane Ike.

Soaring Temperatures and Sea Turtles

Sea turtles are temperature sensitive species. The gender of developing embryos is determined by sand and air temperatures, hatchling success depends on temperature, and temperature plays a role in the migratory range of these species.

Sea turtle gender ratios are determined by the temperatures experienced by the eggs. Higher temperatures result in more females and lower temperatures in more males.

The critical period for the determination of gender occurs during the middle third of the incubation.¹⁸ Increased sand and air temperatures due to climate change will result in gender ratios that are skewed towards females.

Research by U.K. and U.S. scientists analyzed 26 years of North American loggerhead turtle nesting and climate data and compared the findings with models for future temperatures.¹⁹ In North Carolina 42 percent of hatchlings were male, compared to just 10 percent further south in warmer Florida. Further, the study noted that certain populations in southern U.S., such as Florida, are already female biased.²⁰ The researchers found with warming as little as 1°C,

these populations would be ultra-biased to females.

Through the use of modeling, the researchers determined that increases in air temperature up to 7.5°C would lead to 100 percent female hatchlings. If there were no more male sea turtles in this population, breeding from within this population would eventually stop. Males from neighboring populations would be needed for breeding to continue or the population would vanish. As a result, every male from neighboring populations would become that much more important and need to be better protected from other sources of mortality, such as bycatch in fishing gear.



Searing Sand will Reduce Nest Success

Optimal temperatures promote hatchling success for sea turtles, which explains why they only nest in regions that maintain a certain range of temperatures. If it is either too high or too low, hatching success rates will drop. With increased temperatures, the difference can be lethal, killing eggs before hatchlings ever develop or emerge from the sand.

The researchers in the study above noted that for the southern U.S., extreme levels of nesting mortality would occur if warming exceeds 3°C.¹⁰ Additional information from the largest

remaining leatherback nesting site in the Western Pacific suggests that increased temperatures are already reducing hatchling success.

At Jamursba Medi in the Papua Province of Indonesia, reduced hatching success is being noted by those involved with protecting this nesting population.²¹ A key factor in this reduced hatching rate has been the increased temperature (compounded by poaching). Up to 2003, the hatch-out success rate was 50 to 85 percent. However, from 2004 to 2006, it was a mere 10 to 15 percent. For example, in one nest of 101 eggs, only seven hatched.²² Beach erosion due to rising tides in addition to sand temperature and predation were also contributing to low leatherback hatchling success rates at these important nesting beaches.²³

In Australia, sea turtle expert Colin Limpus has seen decreases in incubation rates of 25 percent since 1998²⁴. “Since 1998, beach temperatures have been over 32 degrees Celsius (90 degrees Fahrenheit) for most of the breeding season,” he says. “That’s too warm for turtles to hatch.”

Deforestation and Sea Turtles

Logging of tropical forests, a major climate change problem, has been identified as another climate-change related threat to sea turtles. On Western Pacific leatherback nesting beaches in Indonesia, deforestation combined with earthquakes and floods has dumped tree stumps, logs and wood in the path of sea turtles trying to lay their eggs.²⁵ A study, published earlier this year in the journal *Oryx* by scientists from the Smithsonian Tropical Research Institute and the Wildlife Conservation Society, revealed that logs wash up on important nesting beaches, impeding turtle reproductive success and even killing adult turtles in the west central African country of Gabon.²⁶ The logs caused multiple problems for sea turtles, including trapping and disorienting turtles, causing them to die; physically blocking access to nesting areas, forcing turtles to abandon

nesting altogether or establish nests dangerously close to the waterline (seawater inundation kills sea turtle eggs); altering the structure of the beach so that turtles were unable to climb steps caused



Photo: ©Doug Perrine/Seapics.com

by sand erosion; and impeding the path of hatchlings to the ocean and increasing their vulnerability to predators.²⁷

Warmer Oceans and Currents

Global warming will also increase water temperatures, changing ocean currents that are critical to migrating turtles, especially hatchlings that are mostly transported by the currents into the open ocean thousands of miles from their nesting sites. Warming ocean temperatures are also likely to negatively impact the food resources for sea turtles and virtually all marine species.

Warmer-than-usual waters of El Nino years significantly reduce oceanic productivity by inhibiting the mixing of surface water with deeper, cold waters, resulting in less available food near the surface and reducing the reproductive potential of leatherbacks and other marine species.

One of the major studied impacts of climate change is on corals. Rising sea temperatures increase the frequency of major coral bleaching events. If stressful conditions continue, these corals then die. Further research suggests an increase in coral disease can be attributed to rising sea temperatures.²⁸

Coral reefs are an important habitat for hawksbill sea turtles in the Caribbean²⁹ and in the waters of Papua New Guinea³⁰. Loss of coral reefs will remove critical foraging grounds and replacement habitat may not be easily found.

Changes to Feeding Habits

Additionally, changes in water temperatures can force changes to feeding habits and availability of food supply for sea turtles. Recent information has begun to demonstrate that the ranges of jellyfish, a prime food source for the giant leatherback sea turtle, are changing.³¹

For example, the Southwest Fisheries Science Center of NOAA has discussed the changes in the presence of jellyfish and leatherback sea turtles in Monterey Bay.³² In 2005, as many as 15-18 turtles were seen in a single day, which corresponded to increased numbers of jellyfish. In 2006, there were significantly less jellyfish and, as a result, no leatherback sea turtles sighted in the month of September. These changes were a result in differences in the atmospheric condition. This change in the location of prey can either force leatherbacks to shift feeding grounds, force delays in reproduction, and reduce available food supply to these creatures that have migrated across the entire Pacific. Thus in the pursuit of jellyfish, the migratory behavior of leatherbacks may shift, further complicating management measures in place to protect sea turtles from the impacts of fishing gear.

Ocean Acidification

Hawksbill, loggerhead, and Kemp's ridleys survive on crabs and other shellfish. Ocean acidification caused by rising carbon dioxide levels breaks down the shells of preferred turtle prey, such as mollusks and crustaceans, and could alter turtles' food supply. Declining coral reefs due to increases in temperature and ocean acidity would also have negative impacts on sea turtles such as hawksbills that depend on corals for feeding and foraging.

The oceans have absorbed approximately 525 billion tons of carbon dioxide from the atmosphere, or about one third of the anthropogenic carbon emissions released³³. This absorption has significantly reduced the greenhouse gas levels in the atmosphere and minimized some of the impacts of global



Photo: ©Doug Perrine/Seapics.com

warming. However, the ocean's uptake of carbon dioxide is having negative impacts on the chemistry and biology of the oceans. Hydrographic surveys and modeling studies have revealed that the chemical changes in seawater resulting from the absorption of carbon dioxide are increasing seawater acidity.

When carbon dioxide in the atmosphere reacts with seawater, the reduction in seawater pH (increase in acidity) also reduces the availability of carbonate ions, which play an important role in shell formation for a number of marine organisms such as corals, marine plankton, and shellfish. This phenomenon, which is commonly called "ocean acidification," could have profound impacts on some of the most fundamental biological and geochemical processes of the sea in coming decades. Some of the smaller calcifying organisms are important food sources for higher marine organisms.

Scientists Debate Climate Change Impact on Sea Turtles

Research from Australia presented at the International Sea Turtle Symposium on Sea Turtle Conservation and Biology in 2007 suggests that flatback sea turtles have made radical changes in their behavior to adapt to changing climates over the last 10,000 years.³⁴ This suggests they may be able to adapt to future climate changes, but possibly not quick enough to survive the dramatic changes predicted by some climatologists.

The new research conducted in Queensland, Australia, explores how a present day population of flatback sea turtles might respond to climate change, looking back at how they've changed behavior in the past to adapt to the environment. Prior to the last ice age, sea levels were significantly lower, so the coastline and turtle nesting beaches were further out, as far as 1,200 kilometers (745 miles) from their present day locations. By

the time the last ice age ended 4,000 years ago sea levels had risen significantly. The flatback turtle adapted by finding new nesting sites and foraging areas. Today's nesting beaches along the northern areas of Australia were once dry land.

Dr. Colin Limpus of Queensland Turtle Research believes that today's turtles can respond to new climate change impacts, given the opportunity.

"The flatback will likely continue to lay on some existing nesting beaches with elevated dunes, simply by crawling higher up the beach to lay," says Limpus. "We will likely see this at suitable beaches such as Wild Duck Island." This

is a major flatback nesting site within the Great Barrier Reef, off the northeastern coast of Australia.

Limpus cautions that not all existing nesting sites will be sustainable under rising sea levels. "Some sites are at high risk of erosion and eventual loss," explains Limpus. "Low sand islands will almost certainly flood over," he adds. In addition, developed coastlines with hotels, houses, sea walls and other man-made structures leave no place for the turtles to go as the sea rises.



Fossil Fuel Frenzy and Sea Turtles

With climate change beginning to take its toll on sea turtle nesting beaches, hatchling gender and food supplies, destroying existing nesting beaches and habitat and generating new global warming gases would seem to be a counter-productive response. However, Big Oil continues to push for drilling for oil and natural gas projects to produce more fossil fuel for burning – and increasing carbon dioxide emissions while extracting and exploiting resources along the way.

While the fossil fuel frenzy is occurring around the globe, one of the most blatant conflicts between Big Oil, global warming and sea turtles is in remote Northwestern Australia. Here Chevron

and Shell among other international corporations are running roughshod over western and indigenous communities, government and the environment to push through LNG projects that will not only destroy sea turtle nesting habitat and pollute waters that are critical to calving whales, but generate millions of tons of new carbon dioxide emissions. Sea turtles and whales that swim and nest along the wild Kimberley coast in Northwest Australia were ignored by Big Oil and the Western Australian government in deciding to site a new LNG gas plant near James Price Point – adjacent to humpback whale calving areas.

Australian flatbacks, greens, and hawksbills utilize the waters and beaches of the Kimberley region; and olive ridleys and leatherbacks are sometimes seen.

California's Chevron Corporation is part of the oil consortium pushing for industrialization in the region; and recently broke ground on the Gorgon Project on Barrow Island directly on top of critical flatback nesting beaches south of the Kimberley.³⁵

The Kimberley and the LNG Rush³⁶

The Kimberley is one of the few places on earth that hasn't been heavily impacted by humans. It has been compared to the polar

wilderness of Antarctica, the boreal forests of Canada and Alaska and the Amazon rainforests. Located 400km northwest of this remote and nearly wild region is Australia's largest gas and oil deposits under the ocean in the Browse Basin. Multinational oil and gas companies with leases in the Browse Basin include: Woodside, Shell,



Chevron, BP, BHP Billiton, Inpex, Nexus, Conoco Philips and Osaka Gas.

The Kimberley is the nearest landfall to the Browse Basin. There was concern that oil and gas companies would all apply for their own gas plants, building a whole string of them along the Kimberley coast. To avoid this, the government planned for a single hub or precinct, to be used by all the companies.

After looking at 40-odd sites on the Kimberley coast, the government rejected all but four on environmental, cultural and technical grounds. In late 2008 the new WA Premier, Colin Barnett, ignored the process and made a unilateral decision that North Head on the Dampier Peninsula was the best site. The W.A. Environmental Protection Authority (EPA) published a report in December 2008 stating that North Head was too environmentally sensitive because Humpback whales have their calves and train them there. The



report said that the least sensitive site was James Price Point. Since then, James Price Point has been the preferred site.

Besides the destruction of marine and wildlife habitat, degradation of natural lands, and other environmental disasters, a huge problem with Browse development is the greenhouse gas emissions it will produce: Woodside alone expects to emit 10 to 15 million tons a year.

Chevron Siting LNG Plans on Flatback Beaches

Chevron's Gorgon project was approved by the Western Australian government despite opposition from environmental groups³⁷ and its own environmental advisors.³⁸ The project will generate 10 to 13 million tons of carbon dioxide per year, according to estimates.



Chevron's plan for Barrow Island and flatback nesting beach. Chevron photo.

Since Chevron has taken over the existing oil drilling rigs on Barrow Island, environmental protection has gone downhill, according to people who have worked there.³⁹ Australian flatback sea turtles nest on the remote island and forage and breed in the surrounding waters. This rare sea turtle nests only in Australia and is protected by the government. Barrow Island is home to a number of endangered, rare and endemic species



Pluto LNG processing facility on Burrup Peninsula along the industrialized coast of the Pilbara in NW Australia. Photo © Teri Shore/TIRN.

including the Barrow Island mouse, the spectacled hare-wallaby, the golden bandicoot and the threatened flatback turtle. Yet that has not stopped the Western Australia government's new premiere Colin Barrett, a conservative, from giving it the Gorgon venture a green light.

In 2006, the state's EPA turned down the project saying: "Flatback turtles in particular would be put at risk from the proposal with two of the most important nesting beaches located adjacent to the proposed LNG processing plant site and the materials off-loading facility.

"There is very little science available on the life-cycle, behavior and feeding habits of flatback turtles and as a consequence it is not possible at this time to identify management measures that would ensure ongoing survival of this Pilbara Flatback turtle population."

The government's EPA also said that Chevron had not been able to demonstrate that risk could be reduced to satisfactory levels in the areas of:

- Impacts on the marine ecosystem from dredging;
- The introduction of non-indigenous species; and,
- Potential loss of subterranean and short range endemic invertebrate fauna species.

"As a result, the proposal in its present form cannot meet the EPA's environmental objectives and is considered environmentally unacceptable.

The project is also dependent on very questionable carbon sequestration technology,⁴⁰ where the excess CO2 from natural gas production will be pumped under the island instead of released into the atmosphere. This approach has never been proven to be safe or environmentally sound.

Climate Justice and Sea Turtle Communities

The beaches where sea turtles lay their eggs are often located in areas populated by indigenous people and communities. In places such as Papua New Guinea, local people are leading conservation efforts to protect sea turtles, marine resources and the community.

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s. In places such as Papua New Guinea, local people are leading conservation efforts to protect sea turtles, marine resources and the community. At Karkum on the North Coast of Madang Province where leatherbacks are known to nest, Sea Turtle Restoration Project helped facilitate the establishment of the first Marine Conservation Deed. STRP's PNG-based campaigner worked closely with community partners to hold trainings and community development activities for a total of 6 villages

representing approximately 3,500 people.

Through this process, the communities came together for workshops in sea turtle and marine resource protection to identify conservation measures. In the Conservation Deed that was adopted by the Karkum community in mid-2009, the community agreed not to take eggs, eat or harm leatherbacks; not to dump or pollute in nearshore waters and banned destructive fishing practices. The community also decided on enforcement and violations. Several neighboring communities are close to finalizing their own CDs.

In PNG communities, climate change was

identified as a concern due to the potential for raising sea-levels which are eroding the nesting sites and diverting the turtles from traditional sites and moving them to other sites.

Indigenous people around the world are taking the lead

in protecting disappearing sea turtles

and marine resources from harvest, fishing and pollution.

A growing climate justice movement is organizing to help ensure that sea turtle communities and others are given equal protection from climate change. Friends of the Earth Australia explains that climate justice "addresses climate change by looking at who is hurt, how they will be hurt and who is responsible. It examines the human rights perspective of what has been, until now, a



Karkum community members sign Conservation Deed in Papua New Guinea to protect leatherbacks and marine resources.

debate focused on science, consumption patterns and emission levels.”⁴¹

“Use of the term ‘equity’ in environmental and climate justice asserts the principle of equal rights and responsibility while also recognizing the unfair privilege of the global North. Equity requires the global North to acknowledge that the privilege of the global North is a direct result of the exploitation of the global South via colonialism and imperialism which has resulted in an ecological debt.

Sea Turtle Restoration Project supports climate justice and the need for indigenous people and developing nations to have a strong voice in any climate change agreements or actions.

Sea Turtles: Vanishing Species

Sea turtles have swum the world’s oceans for over 150 million years, since before the time of dinosaurs. Sea turtles play an important role in a variety of ecosystems. For example, these giant reptiles occupy a novel position in the ocean’s food web, feeding on an unusual range of prey including jellyfish, sponges, tunicates, algae, sea grasses, and crustaceans. The nesting phase of their life cycle makes them an important component of beach and coastal ecology, and reverses the usual flow of energy from land to sea.

The nesting females and the massive quantity of eggs laid are eaten by a myriad of predators ranging from small crabs to jaguars. Even the bacteria and micro-fauna of beaches are strongly influenced by the nesting turtles. Most populations of

sea turtles are highly migratory, traveling thousands of miles between nesting and feeding habitats.

About two months after sea turtle eggs are laid on beaches, hatchlings break free of their shells to crawl to the ocean where they begin a deep sea pelagic existence, floating with the currents for several years. Eventually, most species will then spend their sub-adult years feeding and growing in coastal zones or bays, river mouths, and estuaries. For a number of sea turtles very little is yet known about their lives during these portions of their lives on the high seas and away from land. This is one of the great mysteries of the sea turtles. At an age of 10 to 50 years, depending on the species, adult sea turtles will begin an annual migration back to their natal beaches to lay their eggs in order to continue this fascinating and successful life history.

Because of the highly migratory nature of sea turtles and the large amount of hatchlings coupled with low survival rates, it is difficult to estimate overall populations. Sea turtles are found in all of the world’s warm water oceans from the Gulf of Mexico to the Mediterranean to the South China Sea. The leatherback species spends part of its adult life in colder waters as well, with individuals



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migrating as far north as Alaska in search of jellyfish, its primary food, before returning to the tropics to reproduce.

Current Endangered Status and Threats

All seven species of sea turtles have been declared endangered, threatened or vulnerable. For example, the nesting population of Pacific leatherback sea turtles has declined by 95 percent in the last two decades⁴². In 1947, 40,000 Kemp's ridley sea turtles nested at a single beach in Mexico on a single day. Today, the nesting females for this species number only a few thousand.⁴³

However, in 2009, the sea turtle nesting season broke all records on the Texas coast with 197 documented nests. This was the sixth consecutive year for nesting increases setting a new record for the number of Kemp's ridley nests found on the Texas coast during a single year since record keeping efforts began on the Texas coast in the early 1980s. The previous record was 195, set in 2008. The species still remains vulnerable to by-catch in fishing fleets, oil spills and other human activities and natural disasters.

When species, such as sea turtles, are endangered, it is crucial that the cause of the problem and the solutions be identified through the use of scientific methods.



The threats to sea turtles are numerous including:

- **Death by fishing gear** - Sea turtles breathe air and must surface regularly to survive. When they get accidentally caught in fishing gear, they

often drown or are injured. The growth, industrialization and commercialization of fishing have resulted in higher numbers of sea turtles dying in shrimp trawl nets, longlines, and gillnets. Longline fishing for tuna and swordfish are particularly wasteful with 50 percent of the catch thrown back overboard and more than 200,000 leatherbacks taken each year in the Pacific alone. indiscriminate gear is also responsible for the incidental capture of hundreds of thousands combined whales, dolphins, seal and sea lions, sea birds, shark and other threatened or endangered species -- threatening overall marine biodiversity.



Loggerhead hooked on swordfish longline. Photo by Mar Mas/Oceana

- **Commercial development** on once- isolated nesting beaches – where sea turtles must return to nest. The development of nesting beaches for housing, tourism and other human activities interfere with the nesting activities by loss of available habitat. Certain activities also reduce nesting ability and hatching success. For instance, lighting of beaches disorients the hatchlings' ability to locate the water when they emerge from their nests. Noise can also reduce turtles' abilities to nest successfully. Commercial development also contributes to the decimation of coastal ecosystems, such as mangroves, and impacts a wide range of species and habitat.

- **Pollution** - Sea turtles have been found dead after having choked on plastic bags that are mistaken for jellyfish common food. Additionally, a disease known as fibropapilloma, a tumorous

growth that kills sea turtles, is now affecting large numbers of sea turtles around the world. It has been hypothesized that this epidemic, which is believed to be linked to toxic ocean pollution, is affecting sea turtles' immune systems.

- **Commercial exploitation** of adult turtles for their shells, skin, and meat - In Mexico, until 1990, up to 50,000 sea turtles a year were slaughtered for their skins and shells. These animal parts were made into luxury items such as boots and eye glass frames in markets such as Japan. Human demand for luxury items continues to threaten species worldwide. Turtles continue to be harvested for local and international market. Increasing population pressure and disparate economic conditions have contributed to a growth in the uncontrolled harvesting of sea turtle eggs.

- **Uncontrolled harvesting of eggs** -increasing population pressure and disparate economic

conditions have contributed to a growth in the uncontrolled harvesting of sea turtle eggs. This harvesting is often done illegally and unsustainably. For example, at one beach in Costa Rica, poaching was estimated to have been responsible for the loss of 95 percent of the eggs that were laid.⁵ Fortunately, a few communities where large numbers still nest are beginning to develop and implement sustainable egg harvesting programs, which allow for healthy sea turtle populations and additional income and protein for the local community members. Even more communities are now developing egg protection programs, noting that the vanishing sea turtles are an integral part of their culture and history.

Conclusions and Recommendations

Climate change will have an impact on sea turtle populations and the people who share beaches and waters with them. This impact is magnified by the continued threats to sea turtles and human communities from industrial fishing, coastal development, and unsustainable direct harvest.

There are two main ways to reduce the impacts of climate change: reduce climate change emissions and strengthen the ability of endangered sea turtles and their ecosystems to survive climate change.

To reduce climate emissions, the U. S. and partner nations should lead the way to:

- Convince wealthy industrialized countries (listed in “Annex I”) to agree to at least 40 percent cuts in emissions domestically by 2020, by using green energy, sustainable transport and farming and cutting energy demand.⁴⁴
- Adopt a moratorium and phase-out of coal-fired power stations
- Analyze and drastically reduce the global warming impacts of industrialized fisheries, particularly wasteful longline fisheries benefitting from fuel subsidies and government grants.
- Implement a carbon tax and 100% dividend, as defined by NASA scientist James Hansen



STRP member Barbara George made her own sea turtle costume and rallied for climate change protections at a 350.org rally in Marin County, CA. Find out how to make your own at www.seaturtles.org

as “a mechanism for putting a price on carbon without raising money for government coffers. The idea is to tax carbon at source, and then redistribute the revenue equally among taxpayers, so high carbon users are penalized while low carbon users are rewarded.”⁴⁵

- Not allow cuts to be achieved by buying carbon credits from developing countries or by buying forest in developing countries to 'offset' ongoing emissions in the industrialized world.
- Fund, develop and promote increased energy efficiency
- Commit rich countries to providing additional money for developing countries to grow in a clean way, and to cope with the floods, droughts and famines caused by climate change while ensuring that this money is distributed fairly and transparently.
- Consider and protect the rights of indigenous



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people and communities in all climate change actions and policies, ensuring climate justice

To strengthen the ability of endangered sea turtles to survive climate change, the U. S. should:

- Require analysis, regulation, avoidance, and mitigation of greenhouse gas and global warming impacts under *existing* environmental laws.⁴⁶
- Shift national endangered species conservation strategies to address the overarching threat of global warming⁴⁷
- Develop new laws to reduce greenhouse gas emissions and mitigate global warming impacts on biodiversity.⁴⁸
- Analyze, regulate, avoid and mitigate greenhouse gas and global warming impacts of U. S. fisheries and evaluate and prevent those impacts on sea turtles and other species – wasteful longline and shrimp trawl fisheries in particular.
- Respond to TIRN petition to ban the import of swordfish that does not meet minimal U. S. fishing regulations
- Establish critical habitat for the Western Pacific leatherback along the U. S. West Coast to protect key migratory and foraging habitat - which is required by law and has never been done.
- Designate North Pacific loggerheads (which nest in Japan but forage in Southern California and Baja) as a distinct population and to strengthen their status from threatened to endangered under the Endangered Species Act.
- Designate Western North Atlantic loggerheads (which nest in Florida and Georgia) as a distinct population and to strengthen their status from threatened to endangered under the Endangered Species Act and increase protections in the loggerheads' key nesting beaches and marine habitats.

- Establish a permanent, year-round no-trawl marine reserve along the South Texas coast to ensure long-term survival of the Kemp's ridley sea turtle
- Extend beach protections to include buffer zones in dune habitat to accommodate rise in sea levels
- Increase protections for all critical sea turtle nesting, foraging and migratory habitat, including the implementation of marine protected areas and time/area closures
- Reduce impacts of non-climate related threats, such as bycatch in industrial fishing gear, plastic bag pollution, and development on critical nesting beaches
- Promote citizen participation in problem solving by developing educational campaigns that build links between activists in the affected countries and the US.
- Support emerging organizations in other countries in their call for international pressure to protect endangered sea turtles and our common marine resources.

STRP views the sea turtles' dilemma not only as a single-species environmental tragedy that needs immediate attention, but also as a vehicle for shifting the paradigm of how the human species views its relationship with the natural world.



ABOUT SEA TURTLE RESTORATION

PROJECT: The Sea Turtle Restoration Project fights to protect endangered sea turtles in ways that make cultural and economic sense to the communities that share the beaches and waters with these gentle creatures. With offices in California, Texas, Papua New Guinea, and Costa Rica, STRP has been leading the international fight to protect sea turtle populations worldwide.

The goals of STRP are to:

Protect and restore populations of endangered sea turtles to healthy conditions

- Address the root causes of the sea turtle slaughter at both the policy and local level, especially related to fisheries.
- Address the needs of local economies by promoting the establishment of locally engineered sustainable development alternatives.



The Sea Turtle Restoration Project, founded in 1989, is a project of Turtle Island Restoration Network, a nonprofit environmental organization incorporated in California. In order to achieve our goals, STRP uses a strategic combination of grassroots education and organizing, legal pressure, hands-on conservation, innovative use of the media, research, and policy advocacy.

Boiling Point was first written and published by Peter Fugazzotto in 2007 and significantly revised by Teri Shore in 2009.

**SEA TURTLE RESTORATION PROJECT,
A PROJECT OF TURTLE ISLAND RESTORATION
NETWORK**

**PO BOX 370 FOREST KNOLLS, CA 94933 415-
663-8590, WWW.SEATURTLES.ORG**

info@seaturtles.org

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