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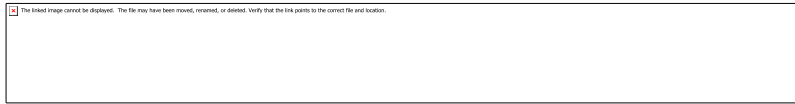
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Sea Turtle Conservation in Ghana's Western Region: The Bigger Picture

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Sea turtle conservation has progressed dramatically over the last few decades, now occurring on every continent, with many developed countries having dedicated, long-term sea turtle conservation projects (e.g., the USA; North Carolina wildlife resources Commission 2010). However, in lesser-developed countries, such as Africa, sea turtle conservation is in its infancy and often faces challenges and constraints. For new projects (such as Wildseas in western Ghana), protecting sea turtles throughout their range is a long-term goal that is often difficult to achieve. Several long-term sea turtle conservation projects, such as the one protecting green turtles in Hawaii (Balazs *et al.* 2004), have begun to demonstrate stabilizing or even increasing populations of nesting females. These great achievements indicate that conservation actions have a positive effect if given time.

There are seven species of sea turtle worldwide; four of which may be found in west Africa; the leatherback (*Dermochelys coriacea*), olive ridley (*Lepidochelys olivacea*), green (*Chelonia mydas*), and hawksbill (*Eretmochelys imbricata*) (Barnett *et al.* 2004). All of these are believed to have nested in Ghana – however the once common hawksbill has been absent for the past 15 years. Locals claimed that green turtles were the most numerous, reporting that they caught them frequently in fishing nets. Although greens have been recorded nesting – the olive ridley seems to be the most common along the coast. Leatherback turtles were also recorded in 2011 after 9 years of absence – although this may be due to misidentification by locals (Davis unpublished data).

The most westerly coast of Ghana, stretching from the border with the Ivory Coast to Sekondi, is known as the western region and has an area of approximately 2,391 km². The western region is rich in natural resources, making it of significant economical importance to the country. However, since many of these resources are processed elsewhere, it is one of the poorest regions economically (Modern Ghana Media 2010). Although it is illegal to kill sea turtles in Ghana, these laws are not well enforced and poverty in the community has led to an increase in poaching of sea turtles and other destructive activities such as sand extraction (which destroys nesting habitat) and overfishing (increasing sea turtle captures). Occupations that directly affect sea turtles include fishing, animal husbandry and hunting; these jobs account for 58.1% of the working population. Mining (including sand extraction) and quarrying account for 2.4% (Modern Ghana Media 2010). Although the level of unemployment is relatively low at 10%, it does not include periods when fishermen are unable to work, such as when algae blooms occur (Modern Ghana Media 2010).

Poaching. In Ghana there are sufficient national and international laws already in place outlawing the poaching or killing of sea turtles and the collection of eggs (without a scientific licence). All sea turtle species are protected by the Ghana wildlife regulations act of 1974

(Doak 2009). All the resident species of sea turtle in Ghana are also protected under international CITES laws banning any trade of the species, alive or dead (Abreu-Grobois & Plotkin 2008; Mortimer & Donnelly 2008; Sarti Martinez 2000; Seminoff 2004).

Ghana, unlike many other developing nations, does not have a medicinal trade for sea turtles. The shells, meat, bones and eggs hold no value in traditional medicine of the Ghanaian people. Therefore, contrary to popular belief, there are relatively few poachers specifically targeting nesting sea turtles, relative to countries where sea turtles have medicinal value. Those who do poach in Ghana wait for an adult female to emerge from the sea to nest, then drag the animal inland and invert it to ensure it cannot escape. It is then either cut up immediately, or moved to a house if the poachers fear being caught. An animal may remain alive upside down in the house for a number of days to keep the meat fresh. If a female is poached, the eggs will be removed and the meat separated before sale.

In general, the local people are law-abiding and reluctant to break the law due to their fear of police involvement and the consequences of any allegations. Being caught could result in years in jail for the poacher, leaving their family with significantly less money to live on. However, many families are in the clutches of poverty, so when income is low and they happen to pass a nesting sea turtle, their first inclination is to kill it to feed their family. In large fishing villages, where there is a high demand for meat, a mature olive ridley can fetch 30 to 60 GH ¢ (\$15.78 to \$31.56 USD) whereas in a small village the same sea turtle would only be worth 5 to 20 GH ¢ (\$2.63 to \$10.52 USD) (Doak 2009). This extra income would be invaluable to families in the western region, as although the national average per capita income is GH ¢400 (\$210.38 USD at the current exchange rate of GH ¢1.90 to \$1, <<http://www.xe.com>> 2012), the average income per annum for the western region is a mere GH ¢130 (\$68.37 USD) (Ghana statistical service 2008). The payment for a sea turtle could gain a fisherman half an annual wage in a large village in the western region. There is little to no market for sea turtle eggs in Ghana due to low demand; therefore any eggs poached are eaten by the family of the collectors.

In sum, the majority of poachers in Ghana's western region are opportunists. Recently, in Beyin, marked success has been made in negotiations with fishermen where locals now organize their own poaching control whereby any person seen taking a sea turtle from the beach surrounding the village will be handed over to the police or be subjected to tribal laws. This community has been personally advertising their support of sea turtle conservation to other villages. In other towns along the coast, including Secondi-Takoradi, Axim, Dixcove and Eikwe, the villagers have pledged to release sea turtles that they catch accidentally while fishing. In Axim, the local fishermen have even started collecting data on accidentally caught sea turtles for a NPO (Non-Profit organization) (Flynn 2012).

Fishing. Many of the local people of Ghana's western region are fishermen by trade. Although previously catch rates of fish were high, these have been decreasing. As the fishing decreases, the fishermen have been using bycaught sea turtle meat to feed their families. Fishing boats that catch sea turtles slaughter the animal on board before coming ashore so that they can keep it for meat while reducing the risk of being caught, as this might result in a large fine and prison sentence. Large algae blooms across the western region's coastline have prevented fishermen from working for a number of months throughout the year. This severely affects fishermen's income. Due to poverty and low wages, a large family may need every person's income to survive. This is one identified scenario when many may turn to

opportunistic sea turtle poaching, with a few setting out deliberately to poach on days that they cannot fish.

The local methods of fishing are negatively affecting sea turtles and reducing the population of reproductively active fish. Although the Ghanaian Fisheries act (2002) states that a fishing licence may be recalled if fishing net sizes used are too small, the actual legal sizes are not stated, leaving them unable to enforce the law consistently. Many, if not all, fishermen use small net sizes, designed to catch higher volumes of fish, although the smaller fish caught are unwanted by the fishermen as they are too small to sell, and so are discarded on the beach when the boats come ashore. As the smaller, immature fish are also caught, the fish population therefore decreases due to there being few adult fish left to reproduce. The decline in fish catches results in a higher level of sea turtle poaching as the fishermen use sea turtle meat as an alternative subsistence meat to fish when catches are low.

Illegal trawling has caused problems for fishermen in the western region by catching large amounts of fish within the EEZ (Exclusive Economic Zone), therefore reducing the fish stocks available for the local fishermen along the Ghanaian coast. It is estimated that illegal unreported and unregulated (IUU) fish loss is up to \$100,000 USD per boat per year in Ghana (Eyiwanmi Falaye 2008). Policing is lax and local communities cannot enforce laws themselves and the government lacks the funds and equipment to do so. There is currently a program starting in collaboration between Wildseas and Environmental Justice Foundation which aims to reduce, if not eliminate, the IUU trawler problem from the Ghanaian coast. It is hoped that this will increase fish catches therefore reducing the need for the fishermen to poach sea turtles.

Jellyfish have been causing problems across the globe. Jellyfish swarms significantly decrease shrimp fishing catch, creating losses of millions of dollars in the Gulf of Mexico, USA (Martin *et al.* 2003). Large population increases and swarms of gelatinous groups have been seen on multiple occasions historically, although, at present, these are becoming more frequent (Hay 2006). Recent research suggests that overfishing of certain fish species allows more frequent swarms by opening niches for the jellyfish to occupy, with urban runoff causing eutrophication and aiding the jellyfish by increasing the abundance of small-zooplankton (Hamner & Dawson 2009). If catches decrease, fishermen look for alternative methods of gaining money and meat, such as sea turtle poaching. Fishermen admitted to killing sea turtles more often during the months of jellyfish swarms as it is not as effective to fish at these times. There are currently no studies in the western region of Ghana to compare sea turtle poaching levels to jellyfish numbers, although this would be helpful for conservation organizations as there are at present, no solutions or efforts to curb increased sea turtle poaching during jellyfish swarms.

Beach habitat loss. As the villages along the western region's coast expand, raw materials to build new houses are in high demand. The traditional method of building using wood and palm-leaved thatch, although it is more environmentally friendly, cheaper and cooler than concrete, has been slowly replaced by quicker modern techniques of bricks and mortar. To make the bricks, sand is mined from the beach in vast quantities, creating large areas with unnaturally steep inclines that are hard for nesting sea turtles to navigate while leaving the rest of the beach vulnerable to extensive erosion (Ibe 1996). If sand extraction continues at its present rate, the wide beaches in front of each village will rapidly disappear, forcing local people to relocate and restricting sea turtle nesting areas even further; they will have to use the beaches in front of hotels for nesting. This may also be problematic because as tourism

increases at these hotels, there may be effects on hatchlings (disorientation by light pollution from the hotels), sea turtle nesting habitat may become blocked by deck chairs, and more people using the beach may destroy nests, e.g., digging sand for sandcastles, which has been observed in Cape Verde (Turtle Foundation 2013).

Most of the coastline along the western region is being eroded heavily by tidal action, which is visibly noticeable in some parts. This either prevents nesting (as in areas with cliff faces) or, in the cases of steeper slopes caused by erosion, causes sea turtles to nest below high tide where the nests are washed away. The erosion occurs up to the vegetation line, leaving only small sections suitable for nesting. For example, around the Beyin coastline, over 600 m of the 10 km beach are now considered unsuitable habitat for nesting sea turtles. Many coastal West African countries have created protective barriers or beach nourishment programs to prevent severe erosion, however, Ghana has not had the resources to invest in sea defences. Over time this may mean that the only suitable beaches left for sea turtle nesting are those in front of the villages, which are currently being reduced by sand extraction.

Local communities. Currently, education on sea turtles is being linked to art. This teaches children about the conservation of sea turtles while teaching art and craft techniques using recycled rubbish, like plastics from the beach. This makes sea turtle education fun, gives children a trade that they can use in later life, and may influence the parents via their children's views.

In many areas of Ghana, poverty is high, with families living on an annual income of much lower than the national average (\$210.38 USD per annum at the current exchange rate of GHC1.90 to \$1) (Ghana statistical service 2008). Sea turtle conservation may possibly help the poverty situation by creating more local jobs and by bringing tourism into the area. Long-term projects have the potential to become well known and visited by tourists and volunteers. Both types of visitor would be spending money for local accommodations, pubs, shops, public transport and souvenirs sold by the locals. With constant visitors, small villages might gain a reliable income that could replace existing destructive jobs, such as sand extraction, and could support fishermen at times when the algae is too substantial to fish.

Locals are employed as guides by conservation projects to assist with night walks. This allows better communication with locals met on the surveys, as although most speak English they may not speak it well and misunderstandings can occur. It also reduces conflict with local communities as the survey area is within their local community and they need to be included for any conservation to work.

Illegal Conservation. Although conservation education and local support is essential to any project success, this may sometimes be taken to the extreme. Illegal conservation is where acts of conservation are undertaken by an individual or group without the appropriate licences or governmental permission. In sea turtle conservation this normally involves relocating nests to a private hatchery, buying eggs for a hatchery, buying live sea turtles from fishermen, or picking up hatchlings to move them closer to the sea. Although these are all done with positive intentions, these actions should be regulated.

In the past, hotels and privately run (illegal) conservation projects have paid for eggs found by local people, which is against the law. This, although helping the local people, brought with it a lot of misunderstanding and conflict. The payment of eggs gave the local people the impression that easy money could be made from the sea turtle project. This began to create a

“hostage” situation of live sea turtles, where if fishermen found or caught a sea turtle in their nets, they would demand money for the release of the sea turtle, threatening to kill it if no payment was made. This situation was perpetuated by various hotel owners continuing to pay for turtle releases and eggs so that their tourists could see live sea turtles. This behavior was not in the best interests of the locals or conservation efforts. Paying money for sea turtles or eggs only helped a minority of local people, i.e., those who actually handed over the animals. Meetings with various communities in the western region, including Sekondi-Takoradi, Axim, Dixcove, and Beyin, showed that they would rather give their joint co-operation to the project in return for financial help building a community centre. This arrangement would foster a better relationship with the local people. Paying for eggs does not help sea turtles. When relocated by scientists, eggs are only out of the sand for a maximum of two hours. Periods longer than this are thought to affect the development of the embryos due to temperature and humidity differences. Local people are unaware of this and will tend to leave a clutch of eggs out of the sand until the morning when they bring them to the centre. Therefore, these eggs tend to have a reduced hatching rate.

When locals try to take conservation into their own hands, they have the best intentions but they may not always be doing the right thing for the species. By collecting eggs in an area without cooperating with an existing sea turtle conservation project, any biological data that could have been collected would be lost. If these individuals worked with the legal sea turtle conservation programs, they could be educated in the proper protocol and methods, such as the depths to bury relocated nests and how to identify different species, and their private hatchery could contribute to the main project, legalizing their efforts, accumulating data and providing for local participation. This would improve hatchery success, which is especially important for leatherback eggs, as they need to be buried at a depth almost double that of olive ridley eggs. In general, rather than discouraging local participation in sea turtle conservation, thus creating conflict, it would be better to regulate illegal conservation efforts while incorporating them into existing legal programs.

Sea turtle conservation faces many ongoing challenges that are especially taxing on new projects in the western region. Although much progress has been made in specific villages such as Beyin, Axim and Eikwe to prevent poaching, efforts like this need to be extended to all villages along the coast. Education will help local communities to understand sea turtle conservation, but incentives may be needed to change current behaviors that negatively affect sea turtles, as in many cases those behaviors are related to livelihoods. At present only a small area of beach in the western region is being patrolled and monitored, although it is hoped that this will eventually be extended further along the coast. Expansion of conservation efforts will require time and many more people (volunteers, staff and local guides). Although sufficient laws are already in place for the protection of sea turtles in Ghana, poaching continues to be an alternative source of income when it is needed. Beyin’s success in curbing poaching gives hope to future conservation in the western region and illustrates that cooperation is achievable in situations where both parties benefit, and conflict can be avoided. Future problems may occur however, if locals continue poaching without the chief’s permission. It is important to note that lack of law enforcement continues to be a problem.

For future sea turtle conservation programs to succeed, collaboration between the Western Region and other regions of Ghana and West African countries is needed. Since sea turtle populations present in West Africa could all be from one closed population across the entire West African coast, accurate sea turtle population counts may require pooling data from all of these regions. Collaboration could also facilitate conservation efforts by enabling various

conservation projects to exchange ideas and methodologies. Collaboration is the key to effectively protecting West African sea turtles thus decreasing their risk of extinction.

Future research in the western region of Ghana should include the tagging of nesting females in order to better survey population trends, determine whether females display site fidelity, estimate longevity and discourage poaching. Research quantifying the effects of beach erosion on sea turtle nesting should include comparing the distance between nesting sites and the high tide line across years. Erosion studies should be designed relative to the amounts of erosion per year to provide insights into how current erosion rates may affect nesting success.

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