Project Update: April 2018

A 2nd RSG, starting in February 2018, was secured to investigate the adaptation and resilience of marine turtle nests to climate change. The work is build on the standard of marine turtle monitoring programme that is being (and has been ongoing for the past 4 years) carried out on the Ebodje nesting zone through the Tube Awu Association, and also partly aligns with my PhD research under the University of Valencia, Spain since 2016/17. The Atlantic coastline stretch of Ebodje, with sandy beaches having different nesting characteristics subjected to different environmental factors, provides an ideal platform for incubation experiments.

Marine turtle research in Cameroon is largely being limited to annual routine monitoring surveys of nesting beaches; factors such as abundance, habitat use, and impact of threats (both anthropogenic and climate change) have only been assessed systematically in a few cases. Research on the developmental, nesting habitats, and migratory routes of the species populations is still growing. This work will be having an additional dimension to ongoing turtle monitoring programme; a comprehensive baseline study of the temperature inside the nests that is known to determine the sex ratio of hatchlings. It should be recalled that warmer temperatures produce more females and cooler temperatures give more males. Integrating this knowledge in the different habitats used by individuals within a marine turtle population is indispensable when elaborating conservation programmes.

To investigate nest temperatures in both *in-situ* and hatchery, this will demand the use of data loggers to be placed within nests at the time of laying / transplanting and nest temperature recorded at hourly intervals. As a build up to this work, we started embarking on the project's preparatory phase.

Pre-fieldwork implementation

Prior to the commencement of project activities, we developed a plan to optimise the use of time in the field and take the best advantage of the low tide cycle and nesting season of the turtle species. We proceeded with the following important preliminary tasks for the study:

Survey timetable

With the advice from supervisors, decision was made to start fieldwork recording of sand temperature in July 2018 as this will help to back-track the study area in order to pick up all of the features within the area both in and out of season. It should be recalled that nesting season in area runs from October to April of each year.

Survey equipment

Considering the delay experienced in the delivery of some accessory equipments of the data loggers and pluviometer, and the gradual close of the nesting season, placement of the data loggers into the nests were advised to be done prior to the start of the nesting season. It should be recalled that this delayed equipment is now secured thanks to the personal effort of the Principal Investigator during his trip to Spain. This equipment includes; the necessary connecting accessories for the data

loggers; HOBO Tidbit v2 aUTBI-001 (COUPLER2-D, Optic USB connecting cable and Base Station) and accompanied accessories for the Pluviometer; Rain-O-Matic Professional Rain Gauge. Other equipment purchased in Spain includes ; Garmin GPS unit, electronic balance, laptop, calipers, waterproof HD camera, field notebook (waterproofed) and pencil for recording notes, surveyors tape measure (30 m), compass for taking bearings, black marker with permanent ink and data sheet (one/transect).

Working base map

Based on inventory, existing information and literature review from previous study, we identified and mapped some sensitive nesting habitats along the 25 km stretch of the Atlantic coastline of Ebodje, specifically on the south of the Kribi deep seaport operations. Decision for the selection of these sites were based on the following; nests must be easily accessible from the ocean, be high enough to avoid being inundated frequently by high tides, have enough sand cohesion to allow construction, and the sand must facilitate gas diffusion and have temperatures conducive to egg development. Thus, these were sites ear-marked for high reproductive success due to successful incubation.

We collected five principal types of information in order to differentiate the nesting beaches:

- Verification of the boundaries and classification of the physical shoreline type.
- Across shore profiles of the physical and biological characteristic of the intertidal and backshore portions of those physical shoreline types.
- Intertidal and backshore areas with sensitive habitat.
- Locations of significant intertidal and backshore physical, biological, anthropogenic and cultural features.
- Biological (flora and fauna) features and characteristics.

Time-series plot

In this present study, an effort will be made to examine the seasonality relationship between sea surface temperature (SST) and nesting behavior of turtles, by considering SST as a potential dynamic stimulus that could affect reproductive behavior (incubation temperature and period) of species nests. A monthly time-series plot of SST (^{0}C) from 2010 to 2018 has been developed from satellite data in the open ocean near the nesting beaches for the study. This will assist us to better understand the variability of SST and nesting effort and phenology of the species in the Ebodje nesting zone.

Survey form (data collection form)

An innovative item to this work is the collection of additional data of the hatched eggs that will be used to analyse nesting success for the species. Eggs hatched by the species will henceforth be sub-divided up into categories according to their morphological features and contents; hatched (empty shell fragments from which a hatchling would have hatched and emerged from the nest), shelled albumin globs or inert eggs (reduced in size with a clear viscous interior) and unhatched (complete full sized eggs). A new column has been introduced to study unhatched complete eggs which were often being excluded by our staff. Thus for this study, we will be

recording data for the following; non-fertilized (clear albumen with a clean and separate yolk), dead-in-shell (egg containing an embryo of any size which had died during development), bacterially infected (no clear embryo with a yellow or pink material with a 'cheesy' consistency or a particularly offensive smell) and a disintegrated (containing a near fully developed hatchling that has started to disintegrate within the egg). Thus, unhatched eggs will be sub-divided into five categories according to their developmental stages : early, mid, late, undeveloped and unknown. These forms are further refined in consultation with supervisors and other monitors concerned during in-country training prior to the start of surveys.

Training

The Principal Investigator; Abi Henry Nibam is programmed for June to receive training on operation and calibration of data loggers and pluviometer in the Marine Zoology Unit-ICBiBE, University of Valencia, Spain. This will permit him to acquire important guidelines for the placement, retrieval, and documentation of temperature data loggers inside individual beach nest at various sites/zones and subsequent temperature data handling. This will be important in order to reduce sampling variability in our method of working with data loggers before, during, and after placement and how to process the resulting data. The various skills to be acquired include:

Pre-Placement Procedures

- Identify data collection objectives.
- Develop a quality assurance project plan and a field sampling plan.
- Select data loggers and other equipment.
- Perform data logger accuracy checks and calibration.

Field Placement Procedures

- Launching the logger.
- Placing the logger.
- Documenting the location.

Site Visits, Field Audits, and Data Retrieval

- Data Handling;
    - Data validation.
    - Uploading data to a database.

Alternative Livelihoods

In a bid to deter coastal residents from poaching, we have developed two project proposals on their alternative livelihoods and are already seeking for avenues to outsource funds;

- Strengthening the economic value of marine turtle-based ecotourism in the Atlantic coastline of Ebodje.
- Promoting improved agricultural seed multiplication project in Ebodje e.g. Food crop farming with maize, plantain and cassava seeds.

Conclusion

The proposed action from this research has a big role as there is need to stop environmental damage in the area especially south of the deep seaport of Kribi whose ongoing construction/operation is already observed to be causing destruction of some important nesting beaches of marine turtles. Hence, there is a quest for more information to design an effective conservation of the species ecology, migration routes, population demographics and habitat use faced with threats. This is very much in keeping with the conservation will by the soon to be created "*Manyangue na Elombo Campo*" Marine National Park (first ever proposed in Cameroon and 5th largest in West Africa).