

TCOT Advice Note 2:

Monitoring of Marine Turtle Populations in Foraging Grounds

NB TCOT advice notes will be updated periodically. Please contact us if you have any comments/queries or you would like to receive the most up-to-date version:

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Nesting beach monitoring is important but data generated may not be a very sensitive index of the health of the whole population as they only give an index of the numbers of one sex (female) and one life stage (adult). To really find out how turtle populations are doing we need to get into and above the water. We can then start to determine their relative abundance and gain insights into population trends when they are in the foraging grounds. After all, this is where they spend the vast majority of their lives and often when they are most under threat. One of the TCOT aims is to have a minimum of two index foraging sites subject to regular monitoring in each OT by the end of the project.

A tremendously good review of relevant methodologies and their relative strengths and weaknesses has been produced in a multi-author publication edited by Bjorndal and Bolten (2000). **Anyone who does not have a copy of this key publication should contact the TCOT team and we will endeavour to make sure a copy reaches you.**

Three main groups of methodologies are outlined in this publication:

A. NON-TRANSECT METHODS that generate “Catch Per Unit Effort (CPUE)” Statistics:

- Netting techniques
- Standard swim snorkelling techniques
- Standard boat-based searching
- Bycatch recording techniques

B. TRANSECT-BASED METHODS that generate “Catch Per Unit Effort (CPUE)” Statistics

- Aerial surveying techniques
- Boat-based surveying techniques

C. CAPTURE-MARK-RECAPTURE METHODS

For definitions of all these terms you are referred to Bjorndal and Bolten (2000).

NB: Transect Methods: Transect methodologies are unlikely to be of wide utility within TCOT. They assume that one can monitor a narrow strip of a habitat and extrapolate to generate wider estimates. Most of the habitats we are dealing with are created of many small patches of different substrata types and variable depths.

NB: Capture-Mark-Recapture Studies: The generation of estimates by these methods are not possible during the time-span of TCOT. Through tagging initiatives supported by WIDECASST flipper tags and TCOT PIT tags, the foundation will be set for long-term mark and recapture studies. There is a wide range of issues regarding tag types, tagging locations and databases which were touched upon during the TCOT workshop. These will be explored more fully within the WIDECASST tagging programme, which is open to all TCOT project partners.

The habitats that TCOT partners in the Caribbean are working within are usually not expansive or homogeneous and the human and material resources for such work are limited. Thus, in choosing methods to assess the relative abundance in our foraging grounds, we must be cautious and choose the correct methodology that will give worthy results within the many methodological and logistical constraints that exist (e.g. availability of personnel, availability of equipment and the suitability of each method to the habitat in question). TCOT staff will discuss the various methodologies available and help project partners decide on a methodology that is best suited on a case by case basis. This note is designed to be the first step in contribution to this process.

Before exploring specific methods that could be used as part of TCOT it is worth exploring a few cautionary notes:

Caution: Over-interpretation

Although rigorously collected data can give an index of abundance at a given site we must always be careful not to over-interpret these data and put too much stock in comparisons with other sites in the same OT or similar sites in other countries. What we can aspire to is to gather our data at one site in a manner that can be replicated in subsequent years allowing comparisons in the “relative abundance” at the same site to be made over time.

Caution: Choice of study site

We must not only choose areas with high density of turtles as our study sites. What if these are already full to carrying capacity? If the wider population increased the change might not be detected at these sites. Additionally, if population decreased, a decline may not be detected if these sites were re-colonised by individuals from less suitable areas. It may be ideal to tie in with concurrent monitoring programmes and use the same sites in turtle monitoring as used in pre-existing efforts such as seagrass and/or coral reef monitoring. It is unlikely that surveying can be carried out at the same time for both turtles and coral/seagrasses but at least any changes in habitat quality can be linked with changes in turtle numbers.

Caution: Setting achievable goals

Given personnel and resource constraints, we should not be choosing index sites that are logistically difficult to monitor. It is likely that monitoring of these sites will be accomplished so intermittently that meaningful data sets cannot be gathered. It is impossible to give an a priori definition of how often to survey a site. In general, the more often the better. If data are highly variable in the short term then it means that it will take longer to detect any trends in relative abundance. Variability may be lowered by increasing the survey effort i.e. net soak time, length of transects or by combining several separate sites which are likely to be linked e.g. sections of the same reef or seagrass complex. Once the TCOT surveys are up and running it will be possible to look at data and evaluate the likely “statistical power” of the methods, allowing methodologies to be refined for best long-term benefits.

Caution: Choosing timing of surveys

Timing: When in the year should we do our surveys?

Superimposed on the availability of personnel and resources, there are likely to be seasonal patterns in abundance of turtles, (e.g. more near a nesting beach in the breeding season, certain foraging areas being preferred at certain times of the year)

and seasonal patterns in detectability (resulting from e.g. sea state, underwater visibility). These factors need to be borne in mind. It is suggested that a concerted effort be made at the same time annually. The timing of this will depend on logistics and sea state etc. Where possible, useful insights will be gained from, at least in the first few years, carrying out additional limited surveying throughout the year.

Timing: When in the day should we do our surveys?

Sea turtles have been shown to have marked patterns in behaviour and there may be greatly varying patterns of detectability at different times of day/tidal states. It is recommended that in initial stages of survey work, intensive studies are undertaken to find out if there are patterns that need to be taken into consideration whether they be tide state or time of day. Input from local fisherman may be invaluable in that regard. Obviously the time of day/state of tide when individuals are detected is the preferable time to be designated as the target study period. Once these conditions are set, wherever possible surveys should be carried out at similar times of day/tidal state. Where tidal differences are small, it may be more practicable to select a standard time of day. The angle of reflection on the sea surface can obscure visibility in otherwise-clear waters from above. It is recommended that aerial and boat surveys take place as close to midday as possible, when the angle of incidence of rays from the sun is nearly perpendicular to the sea surface. The exact time and tidal state should be recorded for each survey.

Timing: What about the weather?

The proportion of cloud cover/sea state/in water visibility are all factors that are likely to have considerable effect on the detectability of turtles by most methods. At minimum, these conditions should be recorded as part of the routine data collection. This can allow the assessment of bias in the future.

METHODS: RECORD THEM FOR OTHERS

Before we elaborate specific methodologies, it is worthy of noting the extreme importance of recording methodologies in detail. Biological monitoring is a field in which there is often a high turnover of staff. To ensure your efforts achieve maximum possible legacy, it is important to record your overall methodologies in great detail (location, timings, effort) and store these in central files back at your office. All these data should be recorded for each survey at each site. A useful exercise would be to draft a within-house monitoring protocol. Assistance can be given during TCOT field visits or by e-mail.

RESULTS: RECORD THEM WITH CLARITY

Regardless of the methodology used it is important to clearly record data to make sure efforts are best spent. Undoubtedly, the design of a datasheet for each monitoring site will be useful. The data being recorded will be different for different methods. On the TCOT Workshop CD we include the form used by the Bermuda Turtle Project and the one used by Cayman Islands Department of Environment. It is important to record all the data for turtles observed/captured as well as environmental and methodological data. TCOT staff will help design customised forms with partners during field visits if needed.

WHAT METHODS FOR TCOT?

The methods that are most likely of use for TCOT are those in group A that generate CPUE data.

Method 1: Snorkelling observations generating CPUE data

EXAMPLE 1 - along the face of a reef, along the edge of a seagrass bed, across coral gardens or possibly even across seagrass beds in deeper water. The snorkeller then records number of turtles, species and size. Attributes of this methodology that must be kept constant are:

- The number of observers on a swim
- The route, direction and speed of a swim
- The time of day/tidal state

The power of this technique is that it is cheap and means many replicates of the survey can be carried out throughout the year. An important note should be made that swimming for assessment of abundance should be kept separate from efforts to capture turtles for genetic sampling i.e. this can be at the same site but not on the same days. This will allow observers to keep as many factors as possible constant.

EXAMPLE 2 - The TCOT diver participation initiative, *Caribbean Turtlewatch* aims to use a modified version of this technique to obtain indices of abundance at dive sites around the OT's.

Method 2: Boat-based observations generating CPUE data

EXAMPLE 1 - across the middle of a seagrass bed or through a set of inshore lagoonal habitats. The observer(s), preferably not the skipper, record number of turtles and where possible species and size. Attributes of this methodology that must be kept as constant as possible are:

- The type of boat/engine
- The number of observer (s)
- The position of observer (s)
- The route, direction and speed
- Time of day

EXAMPLE 2 - A modification of the swimming method involves towing swimmers behind a boat on a rope to allow them to observe turtles across large swathes of habitat. This can be modified into a transect based methodology if careful logging of distance all turtles are observed from the transect line is recorded.

Method 3: Netting generating CPUE data

EXAMPLE 1 - Floating turtle nets or large turtle seine. There are a number of advantages of these methods as turtles are captured, can be measured and sampled for genetics. This method gives also a very good opportunity of involving turtle fishermen in the TCOT process. Factors to be kept constant where possible:

- Location of set and depth of water
- Timing and tidal state of set
- Length, depth and type of net used
- Soak time
- Sea state/underwater visibility

Obviously, not all of these factors can be kept constant at all times but they should, at minimum, be recorded.

Method 4: Fishery CPUE statistics

Useful ideas regarding the abundance of turtles can be obtained from fishing records and from accounts of fishermen themselves regarding captures have been accidental or directed. The TCOT socio-economic questionnaire-based survey will allow insights in this regard.

References

Bjorndal KA & Bolten, AB (Editors) 2000. Proceedings of A Workshop on Assessing Abundance and Trends for In-Water Sea Turtle Populations. U.S. Dep. Commer. NOAA Tech. Memo. NMFS-SEFSC-445, 83pp. Available on-line as A Pdf From: <http://www.sefsc.noaa.gov/PDFdocs/Pop_Assess_Workshop_report.pdf>

Acknowledgements: We are grateful to those who gave useful input into early drafts of this advice note: Janice Blumenthal, Matthew Godfrey, Nick Pilcher, Jeff Seminoff, Kartik Shanker, Lorna Slade.