

SCUBA DIVERS CONTRIBUTION TO MARINE TURTLE MONITORING THROUGH PHOTO-ID

Claire Jean⁽¹⁾, Stéphane Ciccione⁽¹⁾, Elke Talma⁽²⁾, Katia Ballorain⁽¹⁾, Jérôme Bourjea⁽³⁾

(1) Kelonia, l'observatoire des tortues marines, 48 rue du Général de Gaulle 97430 Saint-Leu, La Réunion, France - Email: clairejean@kelonia.org, Tel: (00262) 262 348 110, Fax: (00262) 262 347 667
 (2) Marine Conservation Society Seychelles (MCSS), P.O. Box 1296, Victoria, Mahé, Seychelles
 (3) Institut Français de Recherche pour l'Exploitation de la Mer (Ifremer), Rue Jean Bertho, BP 60, 97522 La Pointe aux Français, La Réunion, France



INTRODUCTION:

Recognition and tracking of individual marine turtles is for the most part, currently achieved through invasive methods based on the deployment and recapture of artificial tags (e.g. plastic, metallic or PIT tags). These methods, that require capture and handling of the animal, may induce stress or injury, and are difficult to apply on large individuals foraging out on the reef or in deeper waters. Photo-ID, relying on unique and natural marks on the animal's body, can be used to complement these methods (e.g. if a tag is lost), or may eventually replace artificial tags. We investigated and validated the suitability of a new method of photo-ID, based on the coding of the facial profiles according to the position and the shape of the scutes, for green (*Chelonia mydas*) and hawksbill turtles (*Eretmochelys imbricata*) using photographs from Reunion, Mayotte, and Mahé, Seychelles (Western Indian Ocean). This method was originally designed to use photographs taken by Scuba divers to identify untagged individuals at foraging sites but can also be applied to tagged nesting turtles.

METHODS:

Profile photographs submitted by Scuba divers (photoid@kelonia.org) are visually transformed by trained personnel into "fingerprints" and saved in a MySQL Database, which allows the user to manage photographs and sighting reports. As each individual turtle does not display the same scute pattern in the right and left facial profiles, both sides are used to characterize an individual whenever possible.

Method for green and hawksbill turtles:

The "fingerprint" is composed of 2 sets of numbers:

- 1-digit code = the number of post-ocular scutes (striped scutes)
- a series of 3-digit codes = the "fingerprint" representing each scute in the profile posterior to the eye with:

- the 1st number = the row number
- the 2nd number = the position of the scute in the row
- the 3rd number = the number of sides of the scute.

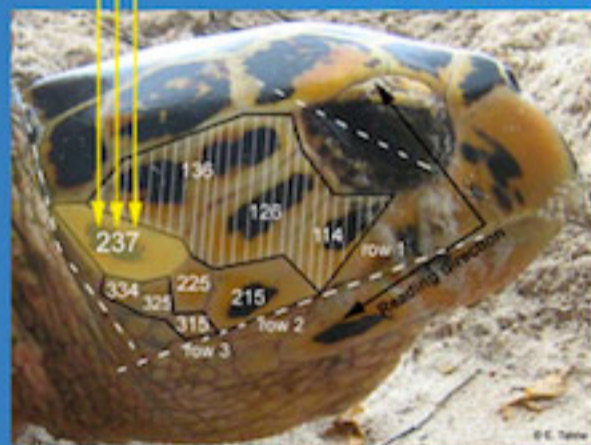
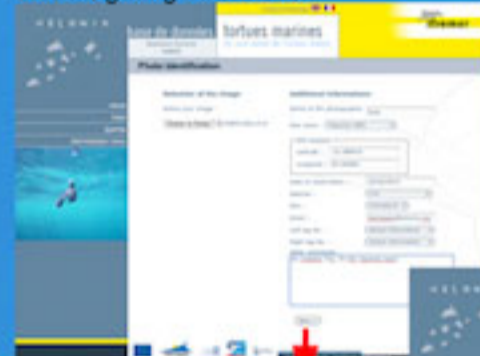


Photo-ID code: 3-114-126-136-215-225-237-315-325-334

First step:

The profile image is converted into a code by visual inspection and entered into the Database. This step takes about 2 minutes per profile, when done by trained personnel.

Turtle sighting information



Scute fingerprint



Post-ocular scutes count

Second step:

An automated search routine compares the "new" profile to the records held in the Database.

Search and match



The 20 best matches are presented in descending order of similarity, thus reducing the number of photographs to be visually compared to the query image.

Register the new profile



RESULTS:

The turtle photo-ID programme in Reunion currently includes nearly 400 photographs in the database captured by local Scuba divers since 2006. These turtles were observed foraging between 5 and 30m depth in commonly frequented diving spots. The longest interval between the first and last observation was 6 years for a juvenile green turtle encountered twice at the same diving spot located outside the reef barrier. Most of the turtles observed were juveniles (<80cm). Our results seem to indicate foraging site fidelity behavior in some juvenile turtles found in Reunion but this needs to be confirmed by further photo-ID or by acoustic or satellite telemetry in the future. Over 61 images have been processed from Seychelles, with preliminary results confirming that this application can be used on nesting turtles. The Database, however, is not yet accessible to users outside Reunion and as such, images from Mayotte have not yet been analyzed.

	Reunion		Mahé
	Green	Hawksbill	Hawksbill
identified	72	21	36
re-sighted	23	4	4

CONCLUSION:

The technique presented here is based on a **non-subjective process**, with a **computer-assisted sorting routine**, albeit requiring **personnel training** to assign accurate "fingerprints" to each photograph. From a practical point of view, field experience has indicated that photo-ID may be **more suited for underwater images** rather than for images taken on the beach as sand may obscure parts of the head, especially with hawksbill turtles which have fewer scutes for fingerprinting when compared to green turtles. One advantage for underwater fieldwork is that the entire profile is most often visible, as the head and the neck of the turtle are extended during feeding. In addition, digital technology provides easy acquisition of **high-resolution images** while allowing photographers to "capture" a turtle without **getting too close or disturbing the animal**. Unlike many automated image identification systems, which require standardized photographs with particular inclination and resolution, this method allows the use of a **wide range of photographs** provided that **post-ocular and bottom- central scutes in the profile are visible for green turtles**, and the entire profile of scutes is visible for hawksbill turtles. Special fieldwork and training for photographers is not required. The participation of scuba divers is a great opportunity to collect images over time and across a broad range of locations, allowing continuous and long-term studies.

It is also a good way to **increase public awareness** for the conservation status of these endangered species.

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