

Drones for Turtles: Controlling Poaching of Nesting Loggerhead Sea Turtles with Night Vision Unmanned Aerial Vehicles on Boavista Island, Cabo Verde

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Nearly all the nesting of the North East Atlantic subpopulation of the loggerhead sea turtle, *Caretta caretta*, occurs in the Cabo Verde Archipelago, where it forms the world's third largest nesting population of this species (López Jurado *et al.* 2007). According to recent reports by local NGOs, about two-thirds of this population nest on the island of Boavista. However, this subpopulation is ranked among the 11 most threatened populations in the world (Wallace *et al.* 2011) and is also rated by the IUCN Red List as “endangered”. The main reason is rampant poaching of nesting females, albeit multiple anthropogenic influences such as incidental bycatch or direct poaching at sea take their toll too. In 2007 alone about 1,200 turtles were killed on the beaches of Boavista (Marco *et al.* 2012). Now, four NGOs on the island are currently actively protecting sea turtles, mainly by night time beach patrols, social and educational activities among the local population, and advocacy. Nocturnal patrols on the nesting beaches with mixed groups of rangers and international volunteers were initially successful, reducing documented poaching incidences by 90–100%, compared to the situation in 2007, on most of the approximately 55 km of beach that could be monitored regularly.

However, poaching has increased again in recent years as poachers have learned the working scheme of the beach patrols, and again more patrol groups have been added in response to this increase in poaching incidents. However, it turned out that a continuous increase in patrol groups to prevent poaching on over 50 km of nesting beach will be too expensive and therefore, not sustainable in the long run.

In order to increase the effectiveness of nesting beach protection on Boavista, the Turtle Foundation in collaboration with the Government of Cabo Verde and local NGOs developed two new protection techniques: one based on conservation dogs and the other on night vision drones. Both projects are designed to deliver technical and logistical support to the local police for the enforcement of a new law that has made the offense of killing, trade and consumption of sea turtles a criminal act, and which obliges judicial authorities and the police to prosecute offenders. These projects are part of a new anti-poaching strategy aimed to replace the prevention-oriented method, of keeping poachers away from the beaches by just the presence of patrols, with a three-step approach of detection, intervention, and prosecution of poaching activity.

In the course of major technological advances in the recent years, unmanned aerial vehicles (UAVs) or drones are being increasingly adopted as a cost-efficient method for conservation activities – not only for research and conservation-relevant data, but also for direct monitoring and protection activities (for sea turtle conservation, see Rees *et al.* 2018). During the 2018

turtle nesting season, a task force was established consisting of two local drone operators and two policemen. The team was equipped with a commercial long-range quadcopter (DJI Inspire 1 V2.0) carrying a bolometric infrared camera (Zenmuse XT 640) detecting the thermal radiation of objects.



Training of the drone operators at the beach of Boa Esperança under daytime conditions.

During the 2018 nesting season, the drone task force regularly operated on those beaches especially threatened by poaching due to their proximity to local villages, accessibility, and high nesting numbers. Drone missions were planned and carried out taking into account various local and temporal conditions as well as strategic aspects. For each mission, a target area was randomly selected and adjacent beaches were covered by repeated, several kilometres-long surveillance flights during the night. The policemen were on standby to intervene immediately if suspicious activity was detected.

Between the beginning of August and end of October 2018, more than 70 missions with around 400 individual drone flights were carried out while managing various environmental, technical, and logistical challenges that came along with this new technique. No poachers could be caught, but poaching rates dropped considerably compared to the previous years despite unusually high nesting activity in 2018. We attribute this to the combined effect of the new law increasing the local protection status of sea turtles and the publicly known, but unpredictable, presence of the drone task force and its police officers.



Preparation for a night mission at dawn at Ponta de Roque at the eastern end of Boavista. The tarp in front of the car serves as take-off and landing pad for the drone. Landing the drone on the tarp at night, guided only by the thermal image of the drone's infrared camera, is particularly challenging and required extensive training. To enable a clandestine operation of the drone team, the use of light during night operations was avoided as much as possible, and also the position lights of the drone were covered to make it invisible.



Setting up the drone for a night operation that started near Turtle Foundation's field station at Cruz do Morto Beach.

However, the pure deterrent effect might not be sustainable in the long run if persistent poachers are not captured and prosecuted. Therefore, the method is now being evaluated and will be adapted accordingly so that it develops into an efficient supplement or even an alternative to conventional beach patrolling in the future. To our knowledge, this is the first application of thermal night vision drones in an anti-poaching strategy for the protection of sea turtles.



Thermal drone image showing two rangers of the NGO Cabo Verde Natura 2000 measuring and tagging a nesting loggerhead turtle at Praiona beach. More nesting turtles are indicated by arrows. Drone height was approximately 60 m above the ground. During surveillance operations, people on the beach could be recognised from distances of several 100 m while the drone remained unnoticed.



Thermal drone image: The drone returns to the home base at Ponta de Roque (arrow). The landing tarp (front) and the car are clearly distinguishable; distance approximately 400 m.

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Literature Cited

López Jurado, L.F., P. Sanz, and E. Abella. 2007. Loggerhead nesting on Boa Vista, República de Cabo Verde. SWOT Report – State of the World’s Sea Turtles 2.

Marco A., E. Abella, A. Liria-Loza, S. Martins, O. López, S. Jiménez-Bordón, M. Medina, C. Oujo, P. Gaona, B. J. Godley, and L. F. López-Jurado. 2012. Abundance and exploitation of loggerhead turtles nesting in Boa Vista Island, Cabo Verde, their only substantial rookery in the Eastern Atlantic. *Animal Conservation* 15: 351–360.

Rees A., L. Avens, K. Ballorain, E. Bevan, A. Broderick, R. Carthy, M. Christianen, G. Duclos, M. Heithaus, D. Johnston, J. Mangel, F. Paladino, K. Pendoley, R. Reina, N. Robinson, R. Ryan, S. Sykora-Bodie, D. Tilley, M. Varela, E. Whitman, P. Whittock, T. Wibbels, and B. Godley. 2018. The potential of unmanned aerial systems for sea turtle research and conservation: A review and future directions. *Endangered Species Research* 35: 81–100.

Wallace B.P., A.D., DiMatteo, A.B. Bolten, M.Y. Chaloupka, B.J. Hutchinson, F. A. Abreu-Grobois, J.A. Mortimer, J.A. Seminoff, D. Amorocho, K.A. Bjorndal, J. Bourjea, B.W. Bowen, R. Briseño Dueñas, P. Casale, B.C. Choudhury, A. Costa, P.H. Dutton, A. Fallabrino, E.M. Finkbeiner, A. Girard, M. Girondot, M. Hamann, B.J. Hurley, M. López-Mendilaharsu, M.A. Marcovaldi, J.A. Musick, R. Nel, N.J. Pilcher, S. Troëng, B. Witherington, and R.B. Mast. 2011. Global conservation priorities for marine turtles. *PLOS One* 6: e24510.

