

First record of jaguar (*Panthera onca*) predation on a loggerhead sea turtle (*Caretta caretta*) in Tortuguero National Park, Costa Rica

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The loggerhead sea turtle *Caretta caretta* (Linnaeus, 1758) is considered a highly migratory species, distributed in tropical, subtropical and temperate waters (Bolten and Witherington, 2003; Wallace et al., 2010). It is categorized as a vulnerable species by the IUCN Red List, with the main threats being fisheries bycatch, coastal development, commercial exploitation (e.g. consumption of eggs), human disturbance (e.g. coastal lighting) and climate change (Casale and Tucker, 2015). However, the relative importance of these threats may vary throughout the geographic distribution of the species.

In Costa Rica sporadic nesting has been recorded along the Caribbean coast (Piniak and Eckert, 2011) including Pacuare, Playa Norte and Tortuguero beaches (L. Fonseca, pers. comm.). Tortuguero beach hosts a small population of loggerheads, characterized by very low numbers of females nesting sporadically throughout the year (Sea Turtle Conservancy, pers. comm.). At this site, jaguar *Panthera onca* (Linnaeus, 1758) predation upon nesting females could represent an additional threat for this species, as predation has been documented previously on the green turtle (*Chelonia mydas* Linnaeus, 1758), the leatherback (*Dermochelys coriacea* Vandelli, 1761) and the hawksbill (*Eretmochelys imbricata* Linnaeus, 1766) (Arroyo-Arce and Salom-Pérez, 2015). Herein, we present the first documented record of the predation of a loggerhead by a jaguar in Tortuguero National Park, Costa Rica.

Tortuguero National Park is located on the northeastern Caribbean coast of Costa Rica (10°32'28" N - 83°30'08" W). The park encompasses approximately 29 km of coastline, which extends from the Jalova River mouth in the South, to the Tortuguero River mouth in the North. The beach is bordered by Tropical Wet Forest (Holdridge, 1969). Elevation ranges from zero to 311 m above sea level. Average temperatures ranges from 25 to 30°C, with a mean annual precipitation of 6,000 mm (Bermúdez and Hernández, 2004).

Jaguar predation on marine turtles was incidentally recorded at Tortuguero beach since 1956 by the Sea Turtle Conservancy (Troëng, 2000), during their long-term turtle monitoring activities. However, in 2005 a systematic study was established by Global Vision International, who then entered into partnership with Coastal Jaguar Conservation in 2012, to further investigate this predator-prey interaction. Both study teams carried out weekly surveys along the beach to



Figure 1. A loggerhead sea turtle (*Caretta caretta*) preyed by a jaguar (*Panthera onca*) at Tortuguero National Park, Costa Rica. Photo by Emma Harrison.

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record the number of predated turtles. Jaguar predation was assumed upon the observation of unequivocal cues (e.g. bite marks and puncture wounds on the skull or neck, dragging evidence, jaguar tracks). For each jaguar predation event, the marine turtle species and coordinates were recorded. For a more detailed description of the methodology see Veríssimo *et al.* (2012), Guilder *et al.* (2015) and Arroyo-Arce and Thomson (2016).

On the 14 May 2014, a freshly predated loggerhead was discovered at Tortuguero beach (10°28'18.4" N - 83°27'57.9" W). The carcass was first encountered at the edge of the beach, with bite marks on the neck area of the animal, and jaguar tracks present around the carcass. The following day, the carcass had been dragged several meters into the vegetation adjacent to the beach. The organs of the turtle had been partially consumed, but the flippers and head of the animal were still intact (Fig. 1).

To our knowledge, this constitutes the first documented event of a loggerhead turtle predated by a jaguar, not just at Tortuguero beach but also throughout its entire geographical range. Since loggerhead nesting in the study area occurs very infrequently (1-2 females encountered per season; Sea Turtle Conservancy, pers. comm.), the probability for an encounter between loggerheads and jaguars, and therefore predation rate, should be very low in comparison with the other species of sea turtles that nest in larger numbers at the beach (Arroyo-Arce and Salom-Pérez, 2015). In the absence of additional evidence, it is difficult to ascertain the effect of jaguar predation on the nesting population of loggerhead turtles at Tortuguero beach.

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References

Arroyo-Arce, S., Salom-Pérez, R. (2015). Impact of jaguar *Panthera onca* (Carnivora: Felidae) predation on marine turtle populations in Tortuguero, Caribbean coast of Costa Rica. *Revista de Biología Tropical* **63**: 815-825.

Arroyo-Arce, S., Thomson, I. (2016). Coastal Jaguar Conservation Manual. Unpublished document, Heredia, Costa Rica.

Bolten, A.B., Witherington, B.E. (2003). *Loggerhead Sea Turtles*. Washington, USA, Smithsonian Books.

Bermúdez, F.A., Hernández, C. (2004). Plan de Manejo del Parque Nacional Tortuguero. Unpublished report. Ministerio del Ambiente y Energía, San José, Costa Rica.

Casale, P., Tucker, A.D. (2015). *Caretta caretta*. The IUCN Red List of Threatened Species 2015. Available at <http://dx.doi.org/10.2305/IUCN.UK.2015-4.RLTS.T3897A83157651.en>. Accessed on 27 September 2016.

Guilder, J., Barca, B., Arroyo-Arce, S., Gramajo, R., Salom-Pérez, R. (2015). Jaguars (*Panthera onca*) increase kill utilization rates and share prey in response to seasonal fluctuations in nesting green turtle (*Chelonia mydas mydas*) abundance in Tortuguero National Park, Costa Rica. *Mammalian Biology* **80**: 65-72.

Holdridge, L. (1969). *Ecología basada en zonas de vida*. San José, Costa Rica, Instituto Interamericano de Ciencias Agrícolas.

Piniak, W.E., Eckert, K. (2011). Sea turtle nesting habitat in the Wider Caribbean Region. *Endangered Species Research* **15**: 129-141.

Troëng, S. (2000). Predation of green (*Chelonia mydas*) and leatherback (*Dermochelys coriacea*) turtles by jaguars (*Panthera onca*) at Tortuguero National Park, Costa Rica. *Chelonian Conservation and Biology* **3**: 751-753.

Veríssimo, D., Jones, D.A., Chaverri, R., Meyer, S.R. (2012). Jaguar *Panthera onca* predation of marine turtles: conflict between flagship species in Tortuguero, Costa Rica. *Oryx* **46**: 340-347.

Wallace, B.P., DiMatteo, A.D., Hurley, B.J., Finkbeiner, E.M., Bolten, A.B., Chaloupka, M.Y., *et al.* (2010). Regional management units for marine turtles: a novel framework for prioritizing conservation and research across multiple scales. *PLoS ONE* **5**: e15465. doi/10.1371/journal.pone.0015465.