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## The death of manatees reveals the need for control and surveillance of human activities and the strengthening of capacities in the attention of strandings in Izabal, Guatemala

In Guatemala, manatees face threats from some human activities that take place in their range. Hunting for the consumption of meat is a current problem, despite its prohibition by national laws (CONAP 2004). Bycatch, by trawls and fishing nets, is also harmful to manatees, causing wounds that become infected over time, or death from suffocation when they become entangled in them (UNEP 2010; Machuca-Coronado & Corona-Figueroa 2019). Another threat is collision with vessels that travel at high speeds, especially in areas such as Río Dulce, where traffic is more intense (Corona-Figueroa 2012). Likewise, the loss of habitat caused by deforestation, sedimentation, and water pollution affects this species' habitat (CONAP 2004). Previously, cases of manatee strandings have been reported, indicating that poaching is the main cause, followed by undetermined causes, bycatch, and boat collision (Machuca-Coronado & Corona-Figueroa 2019; Machuca-Coronado et al. 2023). Here we report the most recent cases of strandings that occurred in Izabal Lake and Río Dulce in 2023, one of these involving a pregnant manatee.

On June 13, an adult and pregnant female manatee (total length = 215 cm) was found in San Felipe de Lara, Livingston (Figure 1). The manatee had advanced decomposition, exposing intestines and placenta with a developing female fetus (Figure 2A). As far as is known, this is the first case of death of a pregnant female reported for Guatemala. It is speculated that the cause of death was asphyxiation

because the manatee had fishing net marks on its snout and body (T. Sandoval, Pers. Obs.). According to the people who attended the stranding, there was another smaller manatee near the corpse, so follow-up was done to find out if it was a calf or a juvenile. Days later, the individual was not found, so it is presumed that the manatee moved to another location. The fetus was collected by personnel from the Consejo Nacional de Áreas Protegidas (CONAP) and is stored in the offices of CONAP Nororiente, in Puerto Barrios.

On July 21, community members from Chapín Abajo, El Estor (Figure 1), found a dead female calf near the beach. However, the report was made three days after the event. Although staff from the Fundación Defensores de la Naturaleza (FDN) tried to search for the body, it could not be found. Therefore, no further information is available.

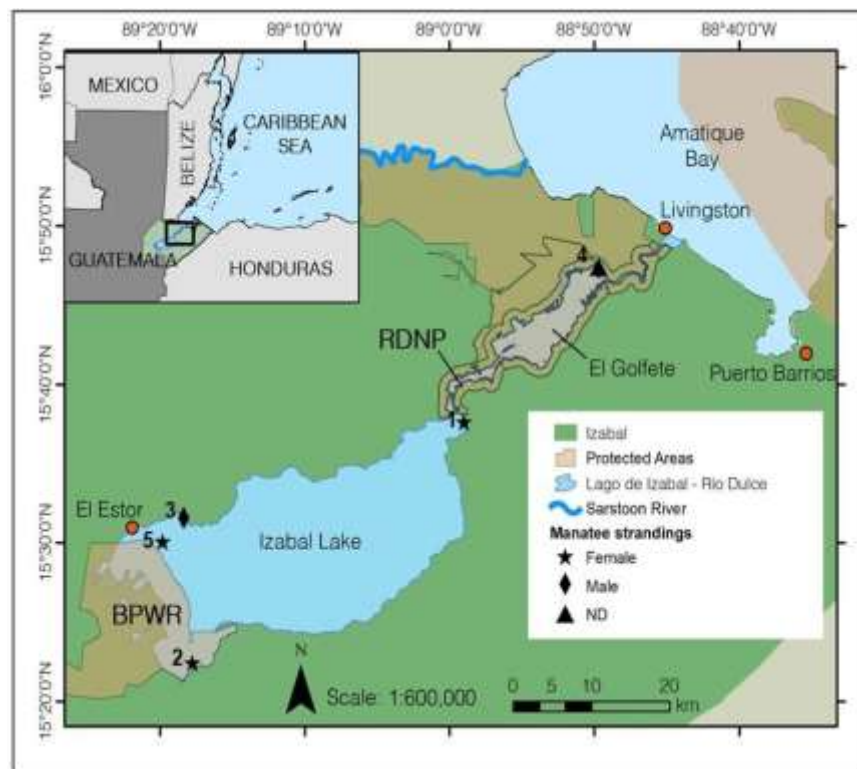


Figure 1. Location of stranded manatees in Izabal Lake, Bocas del Polochic Wildlife Refuge (BPWR) and Río Dulce National Park (RDNP).



Figure 2. Manatees found in the area: A) fetus (female) found in the stranded manatee in San Felipe de Lara, B) male manatee found in El Estor, C) attention to the stranding of the female manatee in El Estor; D) the swollen nipple is observed on the manatee's left fin. Photos: T. Sandoval, Brigada de Infantería Marina (BIM) and A. Bravo.

On August 28th, an adult male manatee (total length = 290 cm) was found in El Estor (Figure 1). The manatee was in an advanced state of decomposition (Figure 2B), but there were wounds on the caudal fin and a hole in the back, possibly caused by a harpoon, so it can be deduced that the manatee's death was due to poaching. The personnel who attended to the manatee buried it on a beach near the stranding site (R. Paz, Pers. Obs.).

On September 7th, the community of Creek Jute, in the Río Dulce National Park, reported the stranding of a manatee found dead floating near the area (A. Caal, Pers. Comm., 2023). However, the manatee could not be attended to, so no further information is available.

On September 8th, the stranding of an adult female manatee (total length = 314 cm) was attended to in El Estor (Figure 1 and 2C). The manatee showed advanced decomposition, although it could be seen that both breasts were swollen, so it could have been a lactating or pregnant female (Figure 2D). However, no nearby manatees or the presence of any fetus were observed. It is presumed that the cause of death was due to a fishing net, due to the marks and lacerations that the body had on both sides (R. Paz, Pers. Obs.). Tissue samples (vibrissae, hair, skin, nails, muscle, and intestine fragments) were collected for future analysis, which were stored in the offices of the Fundación de Defensores de la Naturaleza (FDN). Finally, the manatee was buried on a beach near El Estor.

Poaching of manatees is considered opportunistic and is strongly related to fishing activities in Izabal (Machuca-Coronado & Corona-Figueroa 2019). These activities are carried out even during the closed season, despite the fact that it is recognized that this contributes to overfishing and low economic profits (Andrade-Rodríguez 2015). In addition to this, there is a hypothesis that manatees that die when accidentally caught in fishing nets or trawls are used while they are still fresh and, if they show advanced decomposition, they are untangled and sunk or set adrift (T. Sandoval, Obs. Pers.). The five recent strandings that we report here occurred in a period of three months (June to September 2023), which is worrying as it is a species within Category 1 (Critically Endangered) of the List of Threatened Species of the CONAP (DCA 2021; CONAP 2022) and that three of these cases were females, one of them carrying another female fetus.

Strandings occurred within or near protected areas (Figure 1), with the Bocas del Polochic Wildlife Refuge (RVSBP) being one of the most important habitats for manatees in Izabal (Quintana-Rizzo 1993). It is important that the administrative entities of the protected areas, as well as the Dirección de Normatividad de la Pesca y Acuicultura (DIPESCA), strengthen the control and surveillance activities of fishing gear, especially those whose use is not permitted in the Izabal Lake and in the Río Dulce National Park (PNRD). Given that fishing is an important activity for subsistence and for local sales (FDN 2003; CONAP 2019), we recommend strengthening training on the use of fishing gear that is sustainable with the ecosystem so that it does not represent a risk to the population of manatees and other fauna species (e.g. American crocodile, Neotropical otter, etc.) that inhabit these water bodies, which also become entangled with fishing nets and trammel (J. Benitez-Moreno and F. Corona-Figueroa, Pers. Obs.). Likewise, we recommend the development of education and awareness strategies on manatee conservation aimed mainly at the fishing and tourism sectors. For example, participatory monitoring of manatees has been an effective awareness and conservation strategy in Campeche, Mexico (Guevara-Porras et al. 2019), which could be replicated in the future.

Finally, these reports demonstrate the effort and commitment of local entities and communities in addressing these cases. However, they also reflect the need for training for immediate reporting, adequate data capture, performance of necropsies, collection of tissue and bone samples, and storage in scientific collections for research. In this sense, we recommend carrying out periodic training on stranding attention aimed at technicians, park rangers, community members, and key people in Izabal.

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