

Giant otter *Pteronura brasiliensis* density and abundance in Llanos Orientales de Colombia in the Orinoco basin

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Abstract The giant otter *Pteronura brasiliensis*, categorized as Endangered on the IUCN Red List, was once widely distributed throughout South America. By the middle of the 20th century the giant otter had become locally extinct along the main rivers of the Orinoco basin. Although some populations seem to have recovered, the paucity of information available does not permit a full evaluation of the species' conservation status. The objective of this study was to estimate the abundance and density of the giant otter population along the Orinoco river in the municipality of Puerto Carreño, Vichada, Colombia, where there is important commercial and recreational fishing. Thirty-nine linear km were surveyed, repeatedly, with a total of 315 km of surveys. Population size was estimated by direct counts of individuals. All individuals detected were photographed and identified individually from their throat pelage patterns. In total, 30 otters were identified, giving a minimum density of 0.77 individuals per km, one of the highest reported for the species in Colombia. Given the high density in this well-developed area, our results highlight the importance of this population for the conservation of the species.

Keywords Colombia, density estimation, giant otter, Orinoco river, *Pteronura brasiliensis*, survey

The giant otter *Pteronura brasiliensis*, categorized as Endangered on the IUCN Red List (Groenendijk et al., 2015), was once widely distributed throughout South America from northern Argentina to Colombia and Venezuela (Carter & Rosas, 1997). However, because of the commercial value of its fur, overhunting in the 1950s and 1960s led to the collapse of its populations and extinction over a large part of its original range (Carter & Rosas, 1997). In the 1960s in Llanos Orientales de Colombia (Orinoco Basin) the species was present only in the remote upper reaches of the rivers (Medem, 1968). More recent

studies have shown that the species is now present throughout the area (Carrasquilla, 2002; Díaz, 2007). However, the methods used in these studies did not provide information that permits an evaluation of the species' conservation status. Our objective therefore was to estimate the abundance and density of the giant otter population along the Orinoco river, and its tributaries and lagoons, in the municipality of Puerto Carreño, in Vichada, Colombia.

This study was carried out along the Orinoco river in the municipality of Puerto Carreño in the north-east of the Department of Vichada (Fig. 1). This department lies at altitudes of 50–100 m, has a mean annual temperature of 28 °C, and the mean total annual precipitation is 2,176 mm, with dry (December–March) and rainy (April–November) seasons (IGAC, 1996). The study area includes the Bojonawi private nature reserve, and lies in the El Tuparro Biosphere Reserve. Important commercial and recreational fishing activities occur in this area.

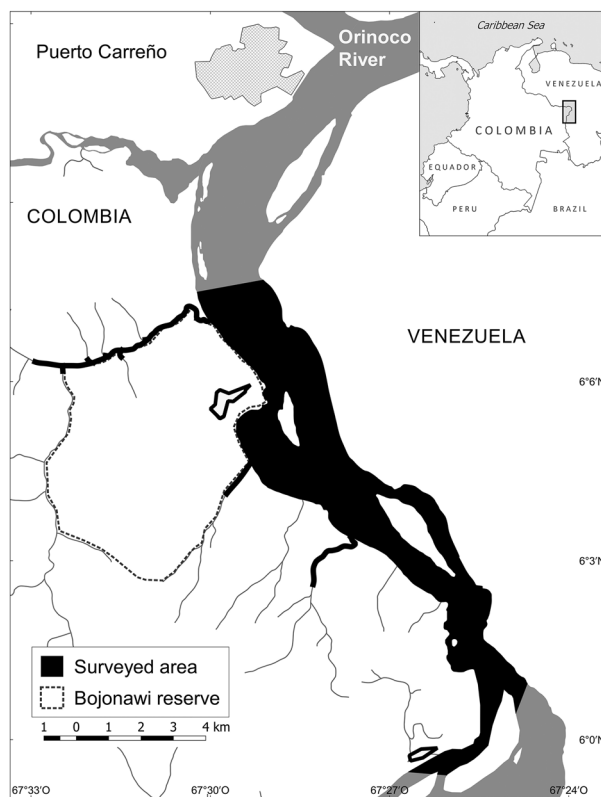


FIG. 1 The study area in eastern Colombia, showing river sections and lagoons surveyed.

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Received 16 May 2019. Revision requested 13 September 2019.

Accepted 9 January 2020. First published online 25 November 2020.

TABLE 1 The six sectors surveyed for the giant river otter *Pteronura brasiliensis* in Colombia (Fig. 1), with type of water body, survey method, length of each sector, number of surveys of each sector, and total survey effort.

Sector	Water body	Method	Length (km)	No. of surveys	Total effort (km)
Orinoco	Principal river	Boat	21.30	9	191.70
San José	Tributary	Foot	2.40	5	12.00
Tesoro	Tributary	Foot	2.10	4	8.40
Negro	Tributary	Boat	11.20	8	89.60
India	Lagoon	Canoe	0.70	10	7.00
Pañuelo	Lagoon	Canoe	1.17	5	5.85
<i>Total</i>			38.87	41	314.55

Giant otters are territorial, diurnal, live in groups and have irregular pale patterning on their throats that allows individuals to be identified (Duplaix, 1980), facilitating estimation of population size by direct counts of groups and individuals (Groenendijk et al., 2005). Given the logistical impossibility of sampling continuously, the area was divided into six sectors, which were sampled independently (Table 1). Depending on accessibility, each sector was sampled using either a 9-m motorized aluminium boat with a 25-hp engine or a canoe, or on foot along the banks of streams where access by boat was impossible. Surveys were conducted by three experienced observers during 7.30–18.00. When we detected an individual or group of otters, we

followed them until the pale throat patterns of each individual could be photographed and the size of the group established. We recorded group sizes and locations using a GPS, which we also used to calculate the length of each transect. The surveys were carried out during 15 January–9 March 2018 during the dry season, when the otters are easiest to detect (Groenendijk et al., 2005).

The study area comprised a total of 38.87 linear km, including the main river, its tributaries and lagoons. Each sector was sampled repeatedly, giving a total survey effort of 314.55 linear km (Table 1). Six groups of giant otters and two solitary individuals were detected. The groups consisted of 2–11 individuals, with a mean of $4.67 \pm \text{SD } 3.39$ individuals per group. In total, 30 otters were identified, yielding a minimum density of 0.77 individuals per km.

Our results show that the giant otter density along the river Orinoco and its tributaries and lagoons in the Puerto Carreño area is among the highest reported for the species in Colombia (Table 2), similar to the 0.8 individuals per km in the Apaporis river in the Amazon Basin (Botello, 2000) and greater than the 0.17 individuals per km in the Inirida Fluvial Star and the tributaries of the upper Orinoco river (Suarez, 2010). Compared to elsewhere in South America, the density we recorded is similar to the highest densities reported for the species in the Brazilian Pantanal (0.74–1.00 individuals per km; Tomas et al., 2015) but lower than in the river San Martín in Bolivia (3.87 individuals per km; van Damme et al., 2002) and Suriname (1.2 individuals per km; Duplaix, 1980). However, the latter two areas are remote,

TABLE 2 Compilation of studies of the giant otter, with length of water body surveyed (effort) and density of individuals observed.

Country	Study area	Survey effort (km)	Density (individuals per km)	Source
Colombia	Orinoco-Bojonawi	39	0.77	This study
Colombia	Inirida Fluvial Star, Guaviare	217	0.17	Suárez (2010)
Colombia	Caño Limón, Arauca	39	0.17	Armas & Padilla (2010)
Colombia	Río Apaporis, Amazonas	30	0.83	Botello (2000)
Bolivia	Río Verde, Noel Kempff National Park	22	0.09	Fraser et al. (1993)
Bolivia	Río Paucerna, Noel Kempff National Park	46	0.20	Fraser et al. (1993)
Bolivia	Río Itenez Guaporé, Noel Kempff National Park	225	0.12	Fraser et al. (1993)
Bolivia	Río Paragua, Noel Kempff National Park	291	0.26	van Damme et al. (2001)
Bolivia	Río Negro	168	0.26	Painter et al. (1994)
Bolivia	Río San Martín, Itenez Reserve	23	3.87	Ten (unpubl. data, 2001), in van Damme et al. (2002)
Bolivia	Río Itenez Guaporé, Itenez Reserve	45	0.89	Ten (unpubl. data, 2001), in van Damme et al. (2002)
Bolivia	Río Madidi, Madidi National Park	21	0.18	Ayala & Wallace (2009)
Brazil	Río Aquidauana, Pantanal	324	0.30	Tomas et al. (2015)
Brazil	Canal Riozinho, Pantanal	23	0.74	Tomas et al. (2015)
Brazil	Río Negro, Pantanal	36	1.00	Tomas et al. (2015)
Brazil	Jauaperi river, Xixuáú Reserve, Roraima	40	1.00	Evangelista & Rosas (2011)
Peru	del Manu National Park	179	0.22	Mendoza et al. (2017)
Peru	Las Piedras	309	0.05	Mendoza et al. (2017)
Peru	Los Amigos	116	0.04	Mendoza et al. (2017)
Suriname			1.20	Duplaix (1980)

with few people. Otters occur in lower densities in areas where they are killed by fishers, or prey is scarce because of poor river productivity or overfishing (Trujillo et al., 2015).

The Orinoco is a highly productive river with high fish densities (Lasso et al., 2010) and consequently supports healthy giant otter populations. Nevertheless, this abundance of fish in an accessible area close to a population centre also encourages fishing. During our study, we identified at least eight fishers' camps on the rivers Orinoco and Caño Negro, and the city of Puerto Carreño is host to c. 1,000 recreational fishers every fishing season (December–March). Given that killing by fishers is one of the main threats to this otter throughout much of its range (Rosas, 2004; Recharte et al., 2009; Trujillo et al., 2015), we would expect this to occur in a popular fishing area. However, a study carried out amongst fishers in Puerto Carreño in 2018 indicated that 93% believed that otters were not harmful to fishing activity (Garrote, 2019).

Nevertheless, there is pressure on fish stocks: both the number of fish caught and their mean size have fallen significantly since 2000 (Trujillo et al., 2015). This could potentially lead to a decrease in the carrying capacity for the giant otter, and to increased competition between otters and fishers, jeopardizing the positive perception that fishers have of this species (Lavigne, 1997). Further threats to the species in the Puerto Carreño area include the illegal trade of skins and the capture of cubs as pets (Cruz Antía et al., 2010; Trujillo et al., 2015).

Given the high density of the giant otter in this well-developed area, our results highlight the importance of this population for the conservation of the species. We will continue to monitor this population, seeking to improve our understanding of the dynamics driving the relative high density and the fishers' favourable perception of the species.

Acknowledgements This study was carried out within the framework of the project 'Population monitoring and strategies for the conservation of the giant otter (*Pteronura brasiliensis*) in the Bojonawi Reserve', funded by the Fundación Barcelona Zoo and Ayuntamiento de Barcelona.

Author contributions Study conception and design: GG, FT; data collection and analysis: GG, BC, JME, LP, JT, BM; writing: all authors.

Conflicts of interest None.

Ethical standards This research abided by the *Oryx* guidelines on ethical standards.

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