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### NOTE

#### ROADKILL RECORDS OF LOWLAND TAPIR

***TAPIRUS TERRESTRIS* (MAMMALIA: PERISSODACTYLA: TAPIRIDAE) BETWEEN KILOMETERS 06 AND 76 OF HIGHWAY BR-163, STATE OF PARÁ, BRAZIL**

Marco A. de Freitas, Rodrigo C. Printes, Eric K. Motoyama, Assor E. Fucks & Diogo Veríssimo

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Road networks are major vehicles for development but have important consequences for the populations of wildlife that come into contact with them (Laurance et al. 2014). Roads can act as barriers or filters, fragmenting habitats, but also have more direct impacts on wildlife such as road kills (Cáceres 2011; Ascensão et al. 2017). Yet, despite this crucial role, most roads in the world's most biodiverse areas are laid without adequate planning and often with only rudimentary processes of environmental impact assessment (Laurance et al. 2014). A good example of this reality is Brazil, one of the world's most biodiverse countries (Mittermeier et al. 1998). Brazil has an extensive road network, including some of the world's most environmentally destructive roads (Laurance et al. 2009). Despite road ecology growing as a field throughout the last decade, the environmental licensing process is largely guided by an outdated resolution of the National Environmental Council of 1997 (CONAMA 1997; Cáceres 2011; Teixeira et al. 2013a,b; Carvalho et al. 2014; Machado et al. 2015; Deffaci et al. 2016). In Brazil, road ecology studies have focused on the center-west, southeast and south of the country, without much attention given to the roads of the Amazon, which began to be built in the 1970s.

Direct mortality caused by road traffic has been repeatedly highlighted as a major threat to biodiversity (Laurance et al. 2009, 2014). This threat can be particularly problematic for species with slow reproduction rates and long generation times which may take them longer to recover (Medici & Desbiez 2012; Ascensão et al. 2017). One such species is the Lowland

## ROADKILL RECORDS OF LOWLAND TAPIR *TAPIRUS TERRESTRIS* (MAMMALIA: PERISSODACTYLA: TAPIRIDAE) BETWEEN KILOMETERS 06 AND 76 OF HIGHWAY BR-163, STATE OF PARÁ, BRAZIL

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Tapir *Tapirus terrestris*, a species that is classified as Vulnerable in Brazil based on estimated decreases of more than 30% in area of occurrence and abundance (Medici et al. 2012).

Here we present multiple records of tapir road kill, registered on a section of the BR-163 highway that runs along the west border of the Biological Reserve (REBIO, in its Portuguese acronym) Nascentes Serra do Cachimbo, in the state of Pará, Brazil (Fig. 1). This is a fully protected area within the Amazonian biome, with an area of 3424.78km<sup>2</sup>. It includes parts of the municipalities of Altamira e Novo Progresso, Pará state, and border areas managed by the Panará and Menkragnotire indigenous

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peoples as well as the Cachimbo Brazilian Air Force base. Our goal is to highlight the dimension of this threat to the local tapir population and emphasize the need for mitigation measures.

As part of the law enforcement activities carried out by the Instituto Chico Mendes de Conservação da Biodiversidade (ICMBio), since 2013 its employees have started regularly using road BR-163, to travel the approximately 640km between the municipalities of Itaituba (Pará state) and Guarantã do Norte (Mato Grosso State). The records of tapir road kill were collected opportunistically in the 70km section of the BR 163 road that runs along the west side of the REBIO Nascentes Serra do Cachimbo, between May and July 2016 (records 1–9) and in June 2017 (records 14–19). Each record was geo-referenced, with several being documented photographically (Fig. 1). Fifteen Lowland Tapirs were found road killed between kilometer six and 76 of the BR-163 highway (Image 1).

While road ecology is still a fledgling research field in Brazil, there are a few published records of tapir road kill in the Brazilian Amazon biome, with some papers hypothesizing that the species avoids roads (Cáceres et al. 2010). We could find only a few published reports of tapir road kills within the Amazon biome (see Ascensão et al. 2017), the same where our records originate from, and where the species is widely distributed (see Pereira et al. 2006; Gumier-Costa & Sperber 2009; Turci & Bernarde 2009; Junior et al. 2012; Pinheiro & Turci 2013). The most robust study is that of Ascensão et al. 2017 who monitored several roads in the state of Mato Grosso do Sul for about a year, finding 36 road-killed tapirs. Our records suggest, therefore, that road kill of tapir is a continued and widespread issue in the region.

Regarding this particular section of the BR-163 however, our records are not the first. The Brazilian Centre for Road Ecology (CBEE, in its Portuguese language acronym) developed a citizen science web platform named Sistema Urubu ([http://cbee.ufpa.br/portal/sistema\\_urubu/](http://cbee.ufpa.br/portal/sistema_urubu/)), where the public can upload geo-referenced photos of road killed species, which are then validated by experts and made available to the public. Of the thousands of records available, there is one (UM-2015/07-000.025) that relates to a road killed Lowland Tapir in the same road section of the BR-163, although this record was registered prior to ours, on the 27 of June 2015. This additional record puts the total number of tapir road kill records for that 70km section of road at 16. Furthermore, the same web platform also contains a further three records to the north, where the highway BR-163 intersects the Jamaxim National Park

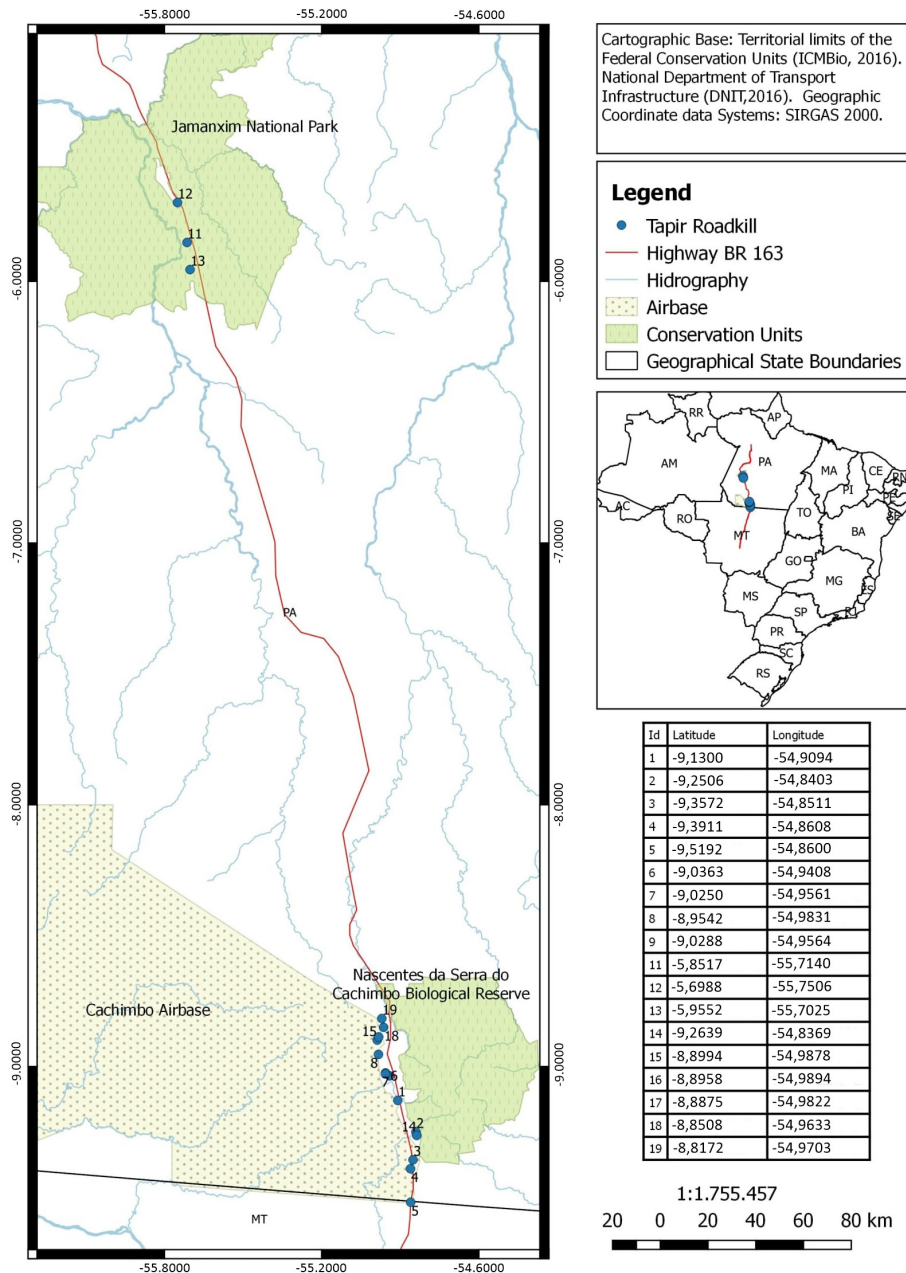
(Fig. 1)

While it is clear that the BR-163 highway is an important economic channel, allowing much of the cereal production of the region to be taken to the sea for export (Fearnside 2007), it is also true that the impacts of this road have been known for decades (Nepstad et al. 2002), with Laurance et al. (2009) placing it among the “most environmentally destructive roads in the tropics”. The potential for environmental damage has increased in the last decade, as the Brazilian government continues to pave and expand the BR-163 highway (Viegas 2015). This means not only that vehicles can reach higher speeds but also that more vehicles will use the highway. At the same time, the necessary measures to mitigate the environmental impacts of BR-163 have not been implemented, despite the need for them being clearly acknowledged in the environmental assessment studies conducted on the highway (Souza et al. 2002). In the particular case of the tapir, the species is very vulnerable to road kill and even low levels of mortality can tip populations towards extinction (Medici & Desbiez 2012). Thus, it is key for the conservation of the species in the region that mitigation measures are put into place.

In the case of BR-163, it is urgent that systematic wildlife monitoring is undertaken in order to understand the degree to which populations are being affected. Monitoring efforts should focus on the dry season (May to November), when the animals are more active and the highway better suited for truck traffic. May also corresponds to the beginning of the soybean harvest, when truck traffic in BR-163 increases by 17.5% (G1-MT 2017).

The mitigation measures should consider both infrastructure and behavioral aspects and be guided by the result of prior research (Teixeira et al. 2016; Ascensão et al. 2017). In terms of infrastructure, the potential to create aerial and/or underground wildlife crossings and the use of fences to keep wildlife from crossing in particular problematic highway sections should be examined (Lokschin et al. 2007; Teixeira et al. 2013a). In terms of driver behavior, enforcement agencies need to be given the necessary means to monitor and enforce speed limits in key areas, and road signaling should be updated to inform drivers of speed limits and areas where wildlife crossing is particularly common (Ascensão et al. 2017). At the same time, tools such as social marketing could play a critical role in influencing driver behavior and generate voluntary behavior change (Veríssimo 2013).

It should be noted that beyond considerations around biodiversity conservation, reducing the chances



**Figure 1.** Map of road killed Lowland Tapirs in a section of the BR-163 road, Pará state, Brazil. Records 1 to 10, during May, July and August 2016, records 14 to 19 during June 2017. Records number 10–13 were obtained from Sistema Urubu.

of collision with wildlife, particularly large bodied species such as the tapir, should also be a priority for both passenger and commercial drivers using the highway. For these vehicles a collision with an animal the size of a tapir can cause enormous damage and potential loss of life (Dornas et al. 2012). In a country like Brazil, where nearly two-thirds of federally protected areas are intersected by roads, and the number of roads both paved and unpaved is projected to continue to grow quickly (Bager et al. 2015), the issues we raise are likely to become increasingly important. It is urgent that future research goes beyond documenting the problem

to investigate the potential of different approaches to mitigate the risks to biodiversity brought on by roads. An important part of this process will be to ensure the implementation of the mitigation and compensatory measures identified the environmental impact assessment exercises conducted at the time of licensing of any large scale roadwork such as the BR-163 highway.

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Image 1. Photographic records of eight Lowland Tapirs recorded road killed in a section of the BR-163 highway, Pará state, Brazil, during May and July 2016. Numbers correspond to location in Figure 1. © Marco A. de Freitas

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**from the Small Indian Mongoose *Herpestes auropunctatus***

**(Mammalia: Carnivora: Herpestidae) in Jammu & Kashmir, India**

-- Sanku Borkataki, Pankaj Goswami, Rajesh Katoch, Sahil Kumar & Pratiksha Raghuvanshi, Pp. 10980–10982

#### Book Review

**Requisite for long term studies in ecology**

-- S. Suresh Ramanan, Pp. 10983–10984