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First account of armadillo burrow use by *Caiman yacare* in Brazil

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Burrow-creating species are considered ecosystem engineers, and armadillos are one of the most important burrow digging animals in the Neotropics (Rodrigues et al., 2019). Their burrows can be used by other animals as shelter from fire (Friend, 1993), predators (Layne & Jackson, 1994; Waterman & Roth, 2007), as foraging sites (Desbiez & Kluyber, 2013), and can be used as a thermal refuge to escape from extreme environmental conditions (Walde et al., 2009; Pike & Mitchell, 2013). Even in some areas where armadillos are considered invasive species, 33 native species have been reported to use their burrows (Butler, 2020).

Many species of reptiles may exhibit hibernation-like behaviours, when faced with lack of food or drought, remaining inactive for long periods (Fagundes et al., 2016; Campos et al., 2004). This behaviour has already been recorded for many crocodilian species during droughts, including the yacare caiman *Caiman yacare* (Campos, 2020). The yacare caiman is a medium-sized crocodilian that occurs throughout the Pantanal wetlands, in Brazil, Bolivia and Paraguay (Campos et al., 2010). They can bury themselves in mud, hide in leaf litter, and remain in a comatose state for long periods as a way to save energy (Campos et al., 2004; Campos & Magnusson, 2011; Farias et al., 2013).

On 14 February 2022 at about 21:40 h, during fieldwork in the southern Pantanal, we found an individual *C. yacare* (Fig. 1) deep inside an armadillo burrow. This was at Pousada Aguapé, in the municipality of Aquidauana, state of Mato Grosso do Sul, Brazil at (20° 5'7.9296" S, 56° 1'36.8436" W). The armadillo burrow was likely made by either *Dasypus novemcinctus* (nine-banded armadillo) or *Euphractus sexcinticus* (six-banded armadillo). The burrow identification was based on the size of the hole, and that these are the most common armadillo species in the region (Abba & Superina, 2010; Rodrigues, 2002). The burrow was only 84 m away from a vazante (a drainage field) (Bazzo, 2012; Leite, 2021). It is well known that February is not the usual time for *C. yacares* to aestivate (Campos 2020), since it is one of the wetter and rainy months of the year (Faria et al., 2010). Nonetheless, the lack of rainfall in the last three year's rainy season could trigger such behaviour. The Pantanal has been facing one of the worst droughts in its history (Marengo et al., 2021; Naumann et al., 2022), which is consequently affecting the population of Pantanal caimans, which depend on water for their food, reproduction, and development.

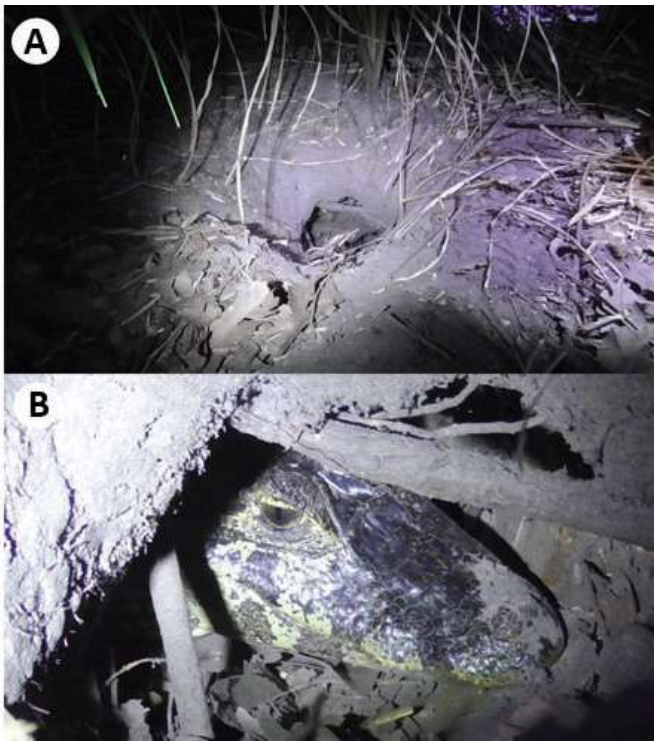

Figure 1. Use of an armadillo burrow by a *Caiman yacare* - **A.** General view of the burrow **B.** Medium sized *C. yacare* taking refuge in the armadillo burrow

Behaviours such as burying in mud or under leaf litter have already been recorded for *C. yacare* (Campos & Mourão, 2020; Campos et al., 2003). However, this is the first record of a *C. yacare* using an armadillo burrow as a refuge. The nearby vazante, which would normally be at least 30 cm deep in water at this time of year, was completely dry (Bazzo et al., 2012; Leite et al., 2021). It was so dry that there was no mud for the caiman to bury itself. We believe that the presence of the caiman in the burrow was an attempt by the animal to protect itself

from this irregular dry period, avoiding hot temperatures, and minimising energy expenditure until its environment becomes more favourable. Since both *D. novemcinctus* (nine-banded armadillo) and *E. sexcinticus* (six-banded armadillo) are common in the region, their burrows may represent an important landscape feature for caimans, and even other Pantanal ectothermic species, during this severe drought.

REFERENCES

Abba, A.M. & Superina, M. (2010). The 2009/2010 armadillo red list assessment. *Edentata* 11(2): 135–184.

Bazzo, J.C., de Freitas, D.A.F., Silva, M.L.N., Cardos, E.L. & Santos, S.A. (2012). Aspectos geofísicos e ambientais do pantanal da Nhecolândia. *Revista de Geografia (Recife)* 29(1): 141–161.

Butler, Z.P. (2020). *Assessing the ecological roles of nine-banded armadillos (Dasypus novemcinctus) on Georgia's Barrier Islands*. Master of Science Thesis, Fort Lewis College, Athens Georgia. 96 pp.

Campos, Z., Llobet, A., Piña, C.I. & Magnusson, W.E. (2010). Yacare Caiman *Caiman yacare*. In *Crocodiles. Status Survey and Conservation Action Plan*. Third Edition. 23–28 pp. Manolis S.C. & Stevenson C. (Eds.). Crocodile Specialist Group: Darwin.

Campos, Z., Coutinho, M. & Magnusson, W. (2003). Terrestrial activity of caimans (*Caiman crocodilus yacare*). *Copeia* 3: 628–634.

Campos, Z., Coutinho, M.E. & Magnusson, W. (2004). Estivação de jacarés no Pantanal Sul. *Comunicado Tecnico Embrapa* 39: 1–3.

Campos, Z. & Magnusson, W.E. (2011). Emergence behavior of yacare caimans (*Caiman crocodilus yacare*) in the Brazilian Pantanal. *The Herpetological Journal* 21(1): 91–94.

Campos, Z. & Mourão, G. (2020). Como o jacaré-do-pantanal, *Caiman yacare*, resiste a períodos secos na região central do Pantanal. *Comunicado Técnico Embrapa* 165: 1–17.

Desbiez, A.L.J. & Kluyber, D. (2013). The role of giant armadillos (*Priodontes maximus*) as physical ecosystem engineers. *Biotropica* 45(5): 537–540.

Fagundes, A.C.A., Oliveira, A.C.L., Carmo, A.G.B., Carneiro, J.O.S. & Chagas, R.B. (2016). Mecanismo de sobrevivência dos animais no nordeste do Brasil. *Anais do Congresso Nordestino de Biólogos* 6: 439–442.

Faria, T.G., Cardoso, M.R.D. & Melo, D.C.D.R. (2010). Chuvas no Pantanal brasileiro: análise histórica e tendência futuro. In *Anais 3º Simpósio de Geotecnologias no Pantanal*, Cáceres, MT, 16-20 de outubro, Embrapa Informática Agropecuária/INPE. 170–180 pp.

Farias, I.P., Marioni, B., Verdade, L.M., Basseti, L., Coutinho, M.E., Mendonça, S.H.S.T., Vieira, T.Q., Magnusson, W.E. & Campos, Z. (2013). Avaliação do risco de extinção do jacaré-do-pantanal *Caiman yacare* (Daudin, 1802) no Brasil. *Biodiversidade Brasileira* 3(1): 21–30.

Friend, G.R. (1993). Impact of fire on small vertebrates in mallee woodlands and heathlands of temperate Australia: a review. *Biological conservation* 65(2): 99–114.

Layne, J.N. & Jackson, R.J. (1994). Burrow use by the Florida mouse (*Podomys floridanus*) in south-central Florida. *American Midland Naturalist:* 17–23.

Leite, E.F., de Carvalho, E.M., de Moraes, E.M.V. & Farias, F.R. (2021). Uso e ocupação da terra, aspectos físicos e econômicos do município de Aquidauana-MS. *Revista Pantaneira* 19: 1–19.

Marengo, J.A., Ambrizzi, T., Barreto, N., Cunha, A.P., Ramos, A.M., Skansi, M., Carpio, J.M. & Salinas, R. (2021). The heat wave of October 2020 in central South America. *International Journal of Climatology* 42: 2281–2298.

Naumann, G., Podesta, G., Marengo et al. (2022). *O episódio de seca extrema de 2019-2021 na bacia de La Plata*. Serviço das Publicações da União Europeia, Luxemburgo. 50 pp.

Pike, D.A. & Mitchell, J.C. (2013). Burrow-dwelling ecosystem engineers provide thermal refugia throughout the landscape. *Animal Conservation* 16(6): 694–703.

Rodrigues, F.H.G., Medri, I.M., Tomas, W.M. & Mourão, G.D.M. (2002). Revisão do conhecimento sobre ocorrência e distribuição de mamíferos do Pantanal. *Embrapa Pantanal-Documentos* (INFOTECA-E).

Rodrigues, T.F., Mantellatto, A.M.B., Superina, M. & Chiarello, A.G. (2019). Ecosystem services provided by armadillos. *Biological Reviews* 2019: 1–21

Walde, A.D., Walde, A.M., Delaney, D.K. & Pater, L.L. (2009). Burrows of desert tortoises (*Gopherus agassizii*) as thermal refugia for horned larks (*Eremophila alpestris*) in the Mojave Desert. *The Southwestern Naturalist* 54(4): 375–381.

Waterman, J.M. & Roth, J.D. (2007). Interspecific associations of Cape ground squirrels with two mongoose species: benefit or cost? *Behavioral Ecology and Sociobiology* 61(11): 1675–1683.

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