

this individual could be part of a previously unrecorded relictual population. Genetic analysis of fecal samples could shed light on this.

Using camera traps, we have identified the animal as a male and found no evidence of other accompanying giant otters. To ensure the survival of this individual, it is paramount that deforestation around the Park is halted and any poaching in the Bermejo River deterred. Federal and provincial governments need to work together to increase patrolling in the lands around the Park and along rivers. Conservation translocations of captive-bred and wild individuals could be considered, to increase the likelihood of establishing a founding population.

CAROLINE LEUCHTENBERGER ([ORCID](https://orcid.org/0000-0002-1639-2593)) *Federal Institute of Education Science and Technology of Farroupilha, Santa Maria, Brazil*

SEBASTIÁN DI MARTINO, GERARDO CERÓN ([ORCID](https://orcid.org/0000-0003-2723-4205)), ALEJANDRO SERRANO-SPONTÓN ([ORCID](https://orcid.org/0000-0002-6048-4583)) and EMILIANO DONADIO ([ORCID](https://orcid.org/0000-0001-5257-4100)) *Fundación Rewilding Argentina, Buenos Aires, Argentina*
E-mail edonadio@rewildingargentina.org

This is an Open Access article, distributed under the terms of the Creative Commons Attribution licence [CC BY 4.0](https://creativecommons.org/licenses/by/4.0/).

Giant otters are negatively affected by a new hydropower dam in the most protected state of the Brazilian Amazon

The giant otter *Pteronura brasiliensis* is endemic to South America and categorized as Endangered on the IUCN Red List. The Amazon basin is one of the last strongholds for this species, yet recent human expansion across Amazonia has led to an increase in the number of hydropower dams, which negatively affect both freshwater and terrestrial biodiversity. Although areas with low human population density that held giant otters before dam construction may have potential for the conservation of the species (Rosas et al., 2007, *Oryx*, 41, 520–524), there has been no previous robust documentation of the impacts of hydropower developments on the species.

We conducted a before–after control–impact study to evaluate the effects of a new run-of-river hydropower dam on giant otters in the State of Amapá, eastern Brazilian Amazon. This state has the lowest deforestation rates and the highest territorial coverage of protected areas among all states of the Legal Brazilian Amazon, and has low human population densities. In surveys before (2011–2013 and 2015) and after (2016–2020) the construction of a large run-of-river hydropower dam (219 MW, height 20.6 m, reservoir covering 47.99 km²) we surveyed a total of 9,356 km along 139 km of rivers by boat.

There was a relatively constant detection rate in the control zone > 70 km upstream of the dam (0.11 and 0.10 detections/10 km before and after, respectively). In the directly impacted zone (< 50 km upstream of the dam, as established in the environmental impact assessment) the detections declined (0.03 and 0 detections/10 km before and after, respectively), with no evidence that giant otters remained in the impacted zone. Considering this region has a high coverage of protected areas, low deforestation rates (forest cover > 90% in the control zone) and a low human population density, it is imperative to emphasize the importance of mitigation to minimize the negative effects of new and planned hydropower dams. We expect that, in the absence of effective mitigation actions, the increasing number of new hydropower dams across Amazonia are likely to cause further reductions in giant otter populations. Contrary to portrayal in the media, run-of-river dams are not necessarily eco-friendly. Government efforts for more sustainable energy generation using a combination of technologies (e.g. in-stream turbines, solar and wind power) need to be reinforced.

FERNANDA MICHALSKI ([ORCID](https://orcid.org/0000-0002-8074-9964)) *Ecology and Conservation of Amazonian Vertebrates Research Group, Federal University of Amapá, Macapá, Amapá, Brazil, and Pro-Carnivores Institute, Atibaia, São Paulo, Brazil. E-mail fmichalski@gmail.com*

DARREN NORRIS ([ORCID](https://orcid.org/0000-0003-0015-8214)) *School of Environmental Sciences, Federal University of Amapá, Macapá, Amapá, Brazil*

This is an Open Access article, distributed under the terms of the Creative Commons Attribution licence [CC BY 4.0](https://creativecommons.org/licenses/by/4.0/).

Biodiversity hotspot and Ramsar site under threat

Ndumo Game Reserve in South Africa, bordering Mozambique, is facing an existential threat and may not make its 100th anniversary in 2024. Ndumo, gazetted to protect the Vulnerable hippopotamus *Hippopotamus amphibious*, lies within the Maputaland–Pondoland Centre of Endemism and Biodiversity Hotspot. The northern and eastern borders were originally the Usuthu and Phongolo Rivers, respectively, but the Usuthu has since shifted course to flow through the Reserve. Mozambique now has claims on Reserve land north of the river, and Mozambicans have access to unfenced Reserve land.

An additional problem is illegal farming on the Phongolo floodplain in the eastern part of the Reserve. Ndumo protects 10% of the 13,000 ha floodplain, a major reason why Ndumo is a Ramsar Wetland of International Importance. This floodplain has the richest fish fauna of any river system in South Africa. Fishes breed there and migrate into the surrounding

pans, where an estimated 500,000 kg are harvested annually, sustaining cultural traditions such as fonya basket fishing.

Ndumo is also an Important Bird Area, with over 400 species. Hippopotamuses breed there, and it is one of only three sanctuaries for wild Nile crocodiles *Crocodylus niloticus* in South Africa. The main crocodile nesting area is now disrupted by farming and gill-netting. This area formerly provided winter grazing for antelope species, the rhinoceros (now all gone) and hippopotamus, and also protects rare plants, including sand forest endemics on its fringes.

Reasons why the Mbangweni/Bhekabantu communities cut Reserve fences in 2008, and perhaps for the farming since then, revolve around a disputed land claim dating from 2000. There are allegedly two agreements: one confers co-management with benefits but no occupation, the other (which cannot be located) allegedly grants right to occupy Reserve land. Apparently, compensation remains unpaid. Exacerbated by poor relations between conservation authorities and communities—causes of which include historical evictions and violent encounters in poaching incidents—agreement on co-management has proved elusive.

Dispute resolution efforts have been made, and plans developed to support local livelihoods outside the Reserve. However, failure of one funded plan, continuing lack of resources, local disagreements, and political interference with re-establishing the fence mean conflict persists. There is a danger this long-running occupation will become accepted as the status quo.

In the face of political instability, apparent immunity for expanding illegal land conversion, local poverty and an untenable conservation management situation, the Reserve's future is threatened, with potentially negative consequences for other protected areas in KwaZulu-Natal Province. The conservation authority Ezemvelo KZN Wildlife has indicated these complex issues of encroachment require multi-agency intervention, and as such Ezemvelo has requested that Ndumo Game Reserve be identified as a priority for a national support and intervention programme.

SIMON POOLEY (ORCID orcid.org/0000-0002-0260-6159)
Department of Geography, Birkbeck University of London,
London UK, and School of Life Sciences, University of
KwaZulu-Natal, Pietermaritzburg, South Africa
E-mail s.pooley@bbk.ac.uk

This is an Open Access article, distributed under the terms of the Creative Commons Attribution licence [CC BY NC SA 4.0](https://creativecommons.org/licenses/by-nc-sa/4.0/).

Endangered Australian marsupial species survive recent drought and megafires

The 2019–2020 megafires burned vast swathes of south-eastern Australia—almost 12.6 million ha (Wintle et al., 2020, *TREE*, 35, 753–757). For some areas on Australia's east coast that escaped burning, prolonged drought

preceding the fires had placed plant and animal populations under duress for several years.

Across this period, we have monitored two nationally Endangered carnivorous marsupial species that occur patchily in restricted high-elevation wet forests of eastern Australia (Environment Protection and Biodiversity Conservation Act 1999; undergoing IUCN Red List assessment). The black-tailed dusky antechinus *Antechinus arktos* has been severely affected by drought. The silver-headed antechinus *Antechinus argentus* has been both affected by drought and directly impacted by the megafires. We found both antechinus species persisting in mid 2020, after the megafires, but populations of each have suffered in different ways.

Although only limited known habitat of *A. arktos* was burned, our annual monitoring since 2014 shows this species has suffered major declines since 2019 at its type locality and former stronghold of Springbrook National Park, Queensland. Not only have we failed to catch *A. arktos* there in the past 3 years (in 2015, we had 30 captures), but our captures of co-occurring once common species, such as the brown antechinus *Antechinus stuartii* and native rodents, have declined by up to 10-fold. However, as well as live capture and camera traps, we have employed a canine detection team to help study this population. Although general findings indicate detections have diminished since 2017, the dog team found *A. arktos* at Springbrook in 2019 and 2020; unfortunately, most of the 2021 surveys were cancelled because of the COVID-19 pandemic.

Antechinus argentus has suffered major impacts to its habitat from the extensive bushfires of 2018 and the 2019–2020 megafires. In Queensland's Bulburin National Park, which may support the largest population, over 3,000 ha of rainforest and wet eucalypt forest burned in 2019 (Melzer et al. (2020) *Post-Fire Assessment Report — Natural Values: 2019/2020 Bushfire, Bulburin National Park, South East Queensland Region*. Department of Environment and Science, Queensland Government, Brisbane, Australia), c. one-third of suitable *A. argentus* habitat in Bulburin.

Dog and trapping surveys in 2020 and 2021 found *A. argentus* at several regenerating burnt sites at Bulburin. We had hoped for recovery of the *A. arktos* population after the return of rain this past summer, but three rounds of trapping in June–August 2021 at Springbrook failed to capture any individuals.

This research is supported by the Australian Government's Bushfire Recovery for Wildlife and their Habitats programme, the National Environmental Science Programme, the New South Wales Government's Saving our Species programme, and WWF-Australia.

ANDREW M. BAKER (ORCID orcid.org/0000-0001-8825-1522)
Queensland University of Technology, Brisbane, Australia, &
Biodiversity and Geosciences Program, Queensland Museum,
Brisbane, Australia. E-mail am.baker@qut.edu.au