

PRESS RELEASE

Pond desiccation puts amphibians at risk in Doñana

- **Maintaining their genetic diversity is essential to the species and requires the conservation of a wide network of interconnected ponds**
- **Aquifer overexploitation, climatic change and invasive species threaten the aquatic ecosystems in Doñana**



Adult specimens of the Iberian waterfrog, *Pelophylax perezi* (left) and the Iberian ribbed newt, *Pleurodeles waltl* (right), dos two native amphibians of Doñana / Íñigo Martínez-Solano

Seville, 2nd June 2024. A study carried out by the Spanish National Museum of Natural Sciences (MNCN), the Doñana Biological Station (EBD), both research centres from CSIC, and the Leiden University (Netherlands) has revealed the vulnerable situation of the amphibians in one of the most valuable wetlands and, in theory, best protected in Europe, the Doñana National Park. The researchers focused on two species inhabiting their aquatic ecosystems: the Iberian ribbed newt (*Pleurodeles waltl*) and the Iberian waterfrog (*Pelophylax perezi*). The results published in the journal *Freshwater Biology* show that the genetic diversity of both species depends on a network of ponds that are increasingly scarce, smaller and more isolated from each other.

‘The study is based on DNA samples from more than 800 amphibians (waterfrogs and newts) that we compiled between 2011 and 2016. Barely a decade later, some of the ponds where we studied these populations have just disappeared. They have dried out completely’, explains Carmen Díaz Paniagua, a researcher at the Doñana Biological Station.

‘Amphibians need large, well-connected aquatic environments in order to maintain healthy populations’, says Íñigo Martínez-Solano, a researcher at the MNCN. ‘Our studies reveal that, although amphibians are still distributed around large areas in Doñana, their genetic diversity, essential to ensure their long-term survival, is centred where there is still a network with large enough and well-connected ponds’, says he.

'The greatest abundance of amphibians in Doñana is concentrated precisely in the northern part of the park, where the network of temporary ponds offers them a suitable environment for their survival. But even within this area, the ponds that are capable of harbouring the genetic diversity necessary to guarantee their viability are the larger and better-connected ones', explains Helena Martínez Gil, researcher at the MNCN. 'As if the reduction and eventual loss of these lagoons due to drought were not enough of a threat, these environments are also widely colonised by invasive species such as the American red crab, *Procambarus clarkii*, and the gambusia or mosquitofish, *Gambusia holbrooki*, which are highly harmful for the native amphibians', adds Iván Gómez Mestre, a scientist at the Doñana Biological Station.

The results of the study associate the health of Doñana's amphibians (and, by extension, of the biodiversity associated with its aquatic ecosystems) to the conservation of the networks of temporary and permanent ponds that give life to this protected natural area. 'In the southern part of the park, where the availability of aquatic environments is much lower, amphibians live in the locally called "zacallones", which are ponds artificially deepened to maintain water throughout the year, mainly for livestock use. However, these ponds are small and quite distant from each other. The data collected show that the amphibian populations living in them are genetically impoverished and isolated. It could be a warning of the future that awaits amphibians in their refuges in the north, if the current trend continues,' explains Gregorio Sánchez Montes, a researcher at the MNCN. 'Hopefully these data will be a new wake-up call so that we can finally achieve a rational use of the aquifer that breathes life into Doñana. Otherwise, they will remain as another testimony to the natural wonder we inherited and failed to protect,' Sánchez Montes concludes.



Sunset over one of the lagoons of Doñana, home to several species of amphibians / Gregorio Sánchez

The deterioration of the Doñana National Park

The water problem in Doñana is so dramatic that it has been brought to the attention of the Andalusian, Spanish and European Union governments. Despite this and the wide media coverage, including clear and forceful messages from the scientific and management staff who know the Park's natural dynamics best, Doñana continues to agonise before our eyes. The ponds, both temporary and permanent, whose biodiversity amazed naturalists from all over the world who promoted its declaration as a National Park in 1969, are rushing towards their disappearance. This is not an empty alarmist message; 'today woody vegetation has colonised hectares of land that, less than two decades ago, flooded annually,' says Díaz Paniagua.

In Doñana, the aquatic environments are dominated by its immense marshland, which floods with the winter and spring rains and dries out completely every summer. Summer drought is part of its natural regime; the problem is that it floods later and later, water reaches a smaller area and it dries up earlier and earlier. On the other hand, there are ponds that used to hold water throughout all the year, but have started to dry up in summer. In addition, Doñana holds a real treasure in its more than 3,000 temporary ponds, which are a sanctuary of biodiversity and are mainly located in the dunes of the northern area. Unfortunately, many of them are no longer flooded, and those that remain, as well as the marshes, are suffering increasingly intense and frequent droughts associated with the reduction in annual rainfall caused by climate change and the unsustainable overexploitation of the aquifer. The aquifer's reserves continue to be depleted every year due to human consumption, often illegally, in the face of the incomprehensible passivity of the administrations.

REFERENCE

Sánchez-Montes, G., Martínez-Solano, I., Díaz-Paniagua, C., Martínez-Gil, H., Arntzen, J. W. & Gomez-Mestre, I. (2024). Pond area and availability safeguard amphibian genetic diversity across Iberia's largest protected wetland. *Freshwater Biology*, 69: 917-931. <https://onlinelibrary.wiley.com/doi/full/10.1111/fwb.14255>