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Invasion of fluvial ecosystems by red swamp crayfish, *Procambarus clarkii*

Francisco J. Oficialdegui, Luz Boyero, Ciro Rico, Andy Green, Miguel Clavero, Christophe Lejeusne, Jaime Bosch, Javier Diéguez, Paloma Alcorlo, Brendan McKie, Ing-Marie Gren, Fernando Álvarez, Cang Hui, Raquel López, Miguel A. Bravo, Marta Sanchez.

Wetland Ecology Department. Estación Biológica de Doñana, CSIC. C/ Américo Vespucio s/n 41092 Sevilla, Spain.

fran_oficialdegui@usal.es

Biological invasions are one of the biggest threats to biodiversity and conservation of native species, playing a key role in global change. To try to control them, it is important to understand two types of phenomena: mechanisms that allow a species to successfully establish in a new environment, and the ecological, evolutionary and socio-economic consequences of an invasion. We will address both types of phenomena using a multidisciplinary approach and multi-scale research, employing as study model an invasive species of global importance, which has invaded many inland waters: the red swamp crayfish, *Procambarus clarkii*. In its native area, this species mainly lives in marshes; nevertheless, it has been able to invade a new environment, streams, in invaded areas (in our case: West Andalusia in South Western Spain). Since its introduction over 40 years ago, this invasion is causing serious damage to native species like the European freshwater crayfish, *Austropotamobius pallipes*. We have five main objectives in this study: (1) to compare the genetic diversity of invasive populations with the native area, identifying patterns of introduction, propagation and gene flow; (2) to determine what mechanisms (at the level of gene expression in different tissues) allow *P. clarkii* to adapt to new conditions or environmental stress: identify genes and loci responsible for local adaptation; (3) to explore the ecological effects of *P. clarkii* in streams, in terms of structure and ecosystem functioning, and interactions with populations of native crayfish (*A. pallipes*) and native amphibians and fishes. To do this, we will compare the ecological effects of stream populations (which have potentially evolved in response to the new environment) with those of founding populations from marshes; (4) to compare the ecological effects of *P. clarkii* with those of *A. pallipes* and determine whether the invasive species is occupying the same ecological niche as the native species which has displaced; and (5) to examine the prevalence of *Aphanomyces astaci* in the red swamp crayfish, given that this invasive species is a chronic carrier of the crayfish plague, *aphanomycosis*, causing the death of European freshwater crayfish; and that of the fungus that causes *chytridiomycosis* in amphibians. In this project, we expect to find mechanisms that allow the red swamp crayfish to successfully establish in a new environment and the consequences that this entails for native species.