

ISoWiF 2017

BOOK OF ABSTRACTS

Book of Abstracts
of the Xth
International
Symposium on
Wild
Fauna (ISoWiF
2017)

Xth INTERNATIONAL SYMPOSIUM ON WILD FAUNA

21 to 23 September 2017

UTAD, Vila Real , PORTUGAL



TITLE

Book of abstracts of the Xth International Symposium on Wild Fauna (ISOWIF 2017), 21st and 23rd of September 2017, University of Trás-os-Montes e Alto Douro, Vila Real, Portugal.

Editors

Aurora Monzón, Raquel Chaves, Amilcar Teixeira, Carlos Venâncio, Domingos Amaro, Estela Bastos, Filipe Silva, João Carrola, José Júlio Martins, MadalenaVieira-Pinto

Printed by: Maquifer, de Carlos Manuel de Jesus Fernandes, Vila Real, Portugal

Number of copies: 180

ISBN: 978-989-704-245-4

ISBN online: 978-989-704-246-1

Depósito Legal: 431520/17

1^a edição.

Waves Portugal - SOCIEDADE EUROMEDITERRÂNICA DE VIGILÂNCIA DA FAUNA SELVAGEM - is a non profit organization- whose purpose is to enhance the scientific and technical training of its members and other professional associations related to the management and conservation of wildlife in the Euro-Mediterranean countries.

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FRESHCO: Multiple implications of invasive species on Freshwater Mussel decline and coextinction processes

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Abstract

Freshwater mussels (FM) are among the most threatened faunistic groups worldwide. FM depend on fish to complete their life cycle, where mussel larvae (glochidia) use a specific range of fish hosts. This trait makes them particularly threatened by invasive alien species (IAS) since changes on the host fish populations may eventually lead to the decline or co-extinction of the dependent species. The Iberian Peninsula holds a high level of threatened freshwater species, including fish and mussels. Furthermore, Iberian freshwater systems are among the most heavily invaded ecosystems in the world. Under those considerations, FRESHCO project aims to estimate the direct and indirect impacts of selected highly IAS belonging to distinct functional groups (from plants to vertebrates) on the native Iberian FM and its fish host fauna. Five tasks (T) will be executed: T1 will use field and lab experiments to assess the possible competition between the IAS *C. fluminea* and native FM; T2 will be composed of a series of lab experiments to assess host fish suitability of native FM; T3 will use molecular and classical detection tools to analyze the diets of selected IAS and assess their predation on FM larvae, juveniles and adults; T4 will use a battery of field and lab experiments to assess the impact of massive annual die-offs of the invasive aquatic plant *E. crassipes* on the native FM; and in T5, 150 sites of the Douro river basin will be surveyed where mussel and fish assemblages and their habitats will be characterized, in order to evaluate and distinguish the impacts of IAS and habitat degradation on the native fauna. From an ecological point of view, expected results from this project would help to elucidate the real impacts of the most prominent IAS on the threatened native FM and fish species in Iberia. From a management point of view, this project will facilitate a more effective allocation of resources spent on both native species conservation and IAS management.

Key words: invasive alien species; host fishes; native mussels; rivers; impacts

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Introduction:

Freshwater ecosystems are highly threatened, with biodiversity declines far greater than those on marine and terrestrial ecosystems. This is especially true for freshwater mussels (FM: Bivalvia: Unionoida), which are responsible for important ecological functions and services and are among the most threatened faunistic groups worldwide. The introduction of invasive alien species (IAS) is one of the most important threats to the conservation of FM. In this project we aim to evaluate: i) the competition for food resources of the invasive bivalve *Corbicula fluminea* and the native FM; ii) the ability of invasive fish (including *Lepomis gibbosus*) to act as host substitutes of native FM; iii) the predation by IAS (including *Procambarus clarkii* and *Pacifastacus leniusculus*) on native FM; iv) the impacts of the highly invasive aquatic plant *Eichhornia crassipes* on native FM; and v) select the most suitable areas of the River Douro basin for conservation/restoration of FM and fish habitats.



Conclusion:

From an ecological standpoint, expected results from this project would help to elucidate the real impacts of the most prominent IAS on the threatened native FM and fish species in Iberia. From a management perspective, main results will facilitate a more effective allocation of resources spent on both native species conservation and IAS management.