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Perceptions and risk behaviors regarding biological invasions in inland aquatic ecosystems

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ABSTRACT

Public engagement is vital to effectively manage Invasive Alien Species (IAS) and biosecurity campaigns directed to stakeholders are decisive to raise awareness regarding IAS regulations and problems. To design and implement adequate communication plans, stakeholders' perceptions and risk behaviors regarding IAS need to be monitored by surveys. IAS do not recognize borders and most countries are not biogeographically isolated. Therefore, international information and consensus are necessary when applying measures at a biogeographic scale. Our bilingual survey was performed at the Iberian Peninsula, targeting the general public, decision-makers and other stakeholders, covering all taxa associated to inland aquatic ecosystems. We found differences in IAS' awareness between countries, and between different stakeholder groups. Results showed that the awareness of socio-economic and human health impacts is substantially lower when compared with impacts on biodiversity. We found that the perception regarding the predation impacts is consistent across groups and countries, while other perceptions differ. The negative socioeconomic impact on angling due to IAS introductions is widely recognized. However, angling is also the activity most referred as positively impacted by IAS due to fish introductions. Most responders knew what IAS are, providing correct species examples. For all three awareness types (Biodiversity, Socio-economic and Human health) the model regressions showed that the most important predictor was the country of provenance of the respondent, followed by Education level for the socio-economic and biodiversity regressions and the stakeholder group in the Human health regression. We can conclude that in Portugal and Spain the general public and other key target-groups have reduced understanding of some threats posed by IAS. We highlight that raising awareness about IAS impacts on humans, namely on socio-economic aspects and human health, may be more effective and it is certainly needed in education campaigns towards IAS.

1. Introduction

Invasive alien species (IAS) are defined as species introduced by humans into places out of the natural range of distribution, where they establish, disperse and cause negative impacts, on biodiversity, socio-economy and human health (CBD, 2002). Evaluation of the impacts of IAS depends on both objective scientific evidence and subjective value definitions of impact. Disagreement over impacts, leads to disagreement in classification of an alien species as an IAS and perception uncertainties regarding negative impacts may weaken the legitimacy of distinguishing invasive from other alien species (Russell and Blackburn,

2017). Currently, this is a growing challenge in biological invasions science, making scientific consensus fundamental face to an increasing science denialism (Russell and Blackburn, 2017). IAS (i.e. established alien species with significant negative impacts) are a minority among alien species but a precautionary approach to all alien species is needed (Essl et al., 2011), since there is a wide consensus that IAS are a major threat to biodiversity (e.g. Emery-Butcher et al., 2020; Ricciardi and MacIsaac, 2011; Sala et al., 2000) and to the economy (Lovell et al., 2006; Vilà et al., 2010), especially in inland waters (Flood et al., 2020).

A large number of non-native species (Hulme, 2009), have established in European freshwater and terrestrial ecosystems, along with

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