Ecological Economics 105 (2014) 330–341

Contents lists available at ScienceDirect

Ecological Economics

journal homepage: www.elsevier.com/locate/ecolecon

Explaining the rank order of invasive plants by stakeholder groups

Julia Touza [a,*], Alicia Pérez-Alonso [b], María L. Chas-Amil [c], Katharina Dehnen-Schmutz [d]

[a] Applied Economics Department, University of Vigo, Campus As Lagoas-Marcosende, 36310 Vigo, Spain
[b] Research Group in Economic Analysis, University of Vigo, Campus As Lagoas-Marcosende, 36310 Vigo, Spain
[c] Department of Quantitative Economics, University of Santiago de Compostela, Avda Xoán XXIII s/n, 15782 Santiago de Compostela, Spain
[d] Centre for Agroecology and Food Security, Coventry University, Priory Street Coventry, CV1 5FB, United Kingdom

ARTICLE INFO

Article history:
Received 1 February 2013
Received in revised form 23 May 2014
Accepted 29 June 2014
Available online 18 July 2014

Keywords:
Invasive plants
Stakeholder choices
Rank ordered logit
Factor analysis
Galicia
Spain
Media coverage

ABSTRACT

Debates surrounding the use of policies to avoid further spread of invasive species highlight the need to establish priorities in public resource allocations. We explore the consistency or discrepancy among stakeholder groups involved in the risk and control management of invasive species to identify the extent to which different factors influence stakeholder choices of major relevant plant invaders. Based on stakeholder ranking of invasive plants, we explore the reasons behind stakeholders' support for policy management. Data were collected in Galicia, Spain. A national catalogue of prohibited entry and trade of invasive species has been recently approved. We estimate a rank ordered logit model using information from semi-structured interviews conducted with respondents from four stakeholder groups: public administration sector, ornamental sector, research and social groups. The characteristics of plant invaders that provoke stakeholders to rank a species more highly are wide distribution of plant invaders, existence of public control programmes, use and sale of species in the ornamental sector and media coverage. The influence these aspects have in the selection of top-ranked invaders varies across different stakeholder groups and with stakeholders' level of knowledge, awareness and attitudes towards different potential policy measures. A small group of invaders are perceived as top rated by all stakeholder groups.

1. Introduction

The prevention and control of biological invasions are important elements for the conservation of biodiversity and ecosystem services (MEA, 2005; Perrings et al., 2010; Vilà et al., 2011), and are the subject of an increasing number of policy responses (Butchart et al., 2010). The success of control and eradication of invasive species, as well as the policies governing their management in general (e.g. inspection regulations, codes of conduct, or economic incentives to reduce threats), are highly dependent on the acceptance and support by all affected stakeholders (Bremner and Park, 2007; Fischer and van der Wal, 2007; Ford-Thompson et al., 2012; García-Llorente et al., 2008; Sharp et al., 2011). The high percentage of invasive species that are either deliberately or accidentally introduced for socio-economic reasons linked to commerce (e.g. Carrete and Tella, 2008; Dehnen-Schmutz et al., 2007; Hulme, 2009; Mack and Erneberg, 2002; Pyšek et al., 2002; Westphal et al., 2008), and the rising social costs of invaders (e.g. Pimentel et al., 2005; Xu et al., 2006) illustrate the need for stakeholder analysis when managing invasions. In fact, stakeholder analysis is increasingly recognised as a key factor in the success of managing natural resources (Reed et al., 2009; White and Ward, 2010), as stakeholders are not only affected by policy decisions but they also have the power to influence their outcome.

Invasive species that are often deliberately introduced for commercial purposes provide a particularly interesting example of how stakeholders with conflicting interests from a wide range of backgrounds may be affected. This is the case for ornamental plants where the horticultural industry and consumers benefit from the use of non-native plants, which in some cases are invasive species or at risk of becoming invasive if widely planted (Barbier and Knowler, 2006; Dehnen-Schmutz et al., 2007; Pemberton and Liu, 2009). Different perceptions towards ornamental plants may develop over time when highly regarded species become invasive and develop into an expensive management problem (Bailey and Conolly, 2000; Dehnen-Schmutz and Williamson, 2006; Starfinger et al., 2003). However, policy challenges become more acute when species could generate income for some stakeholder groups (e.g. nurseries, gardening firms or forestry owners), while imposing damage and management costs on other stakeholder groups, or when generating both income and costs within a stakeholder group. A study in Belgium found that even though nursery owners were aware of the problem of invasive species in general, and 45% of them reported that they did not sell any invasive species, all of them were selling at least one species listed in the Belgian invasive species inventory (Vanderhoeven et al., 2011). With an increasing number of invaders and limited financial resources,

* Corresponding author. Current address: Environment Department, University of York, Heslington Road, YO10 5DD, UK. Tel.: +44 1904 324246; fax: +44 1904 322998.
E-mail addresses: julia.touza@uvigo.es, julia.touza@york.ac.uk (J. Touza), apereza@uvigo.es (A. Pérez-Alonso), marisa.chas@usc.es (M.L. Chas-Amil), Katharina.Dehnen-Schmutz@coventry.ac.uk (K. Dehnen-Schmutz).

http://dx.doi.org/10.1016/j.ecolecon.2014.06.019
0921-8009/

policy-makers have a critical interest in understanding how stakeholders differ in their level of concern about biological invasions and how different stakeholder groups perceive key invaders.

We focus particularly on invasive plants given the prevalence of their deliberate introduction, mainly through ornamental trade, as a key pathway for the establishment of non-native plant species as has been shown in other countries (Bradley et al., 2012; Hulme, 2009; Perrings et al., 2005). Several papers have analysed different stakeholder perceptions regarding invasive species. Previous studies that focused on stakeholders in the horticultural industry have aimed to decipher, for instance, stakeholders' levels of awareness about invasions (Vanderhoeven et al., 2011), acceptance and support for existing management and potential new policies (Coats et al., 2011) or voluntary measures (Burt et al., 2007). Some papers also include a stakeholder analysis on invasive species issues that are not specific to the horticultural trade. These may analyse questions regarding specific species, for example, ability to name known invasive species or ability to identify species from a list provided. It is important to understand how stakeholder knowledge and perceptions regarding biological invasions at the species level are formed, as this may influence policy coherence and the identification of key management criteria. Bremner and Park (2007) illustrated that the level of support for control and eradication programmes is influenced by specific species that are currently being managed. Bardsley and Edward-Jones (2007) illustrated certain levels of consensus across stakeholders in the Mediterranean islands (Sardinia, Mallorca, Crete) when asked to name five invasive plants. While on the other hand, García-Llorente et al. (2008) showed that stakeholder groups (local users, tourists and conservation professionals) varied in the number and particular species they mentioned, as well as in their willingness to pay for eradication programmes for given species. These studies conclude that people are more aware of species that have been the subject of information or education campaigns. Andreu et al. (2009) focused more on the species-level criteria for management and concluded that according to interviews undertaken with natural resource managers, the most frequently managed species are the most widespread in each region and the ones perceived as causing the highest impacts. Eiswerth et al. (2011) measured invasion awareness by local residents' ability to name at least one invasive aquatic species.

In this paper, we study the determinants of stakeholders' preferences over an open list of invasive plant species. We use survey data to analyse how stakeholders involved in the deliberate introduction and spread of non-native plants, as well as stakeholders affected by invasions, select key invasive plant species and prioritise them in order of importance. In the classical choice experiment setup, individuals are asked to select their most preferred option out of a fixed set of alternatives, but additional information about relative preferences can be obtained if individuals are asked to rank a set of alternatives instead. We therefore asked stakeholders to name and rank up to six of the most important invasive plants from the perspective of their working organisation, and we econometrically evaluated the factors that influenced these rankings. A rank ordered logit analysis was used to explain the stakeholders' ranking of plant invaders influenced by: species life-form (e.g., tree, shrub, herb, annual), its use in the ornamental sector, public control activities and media coverage. We identify consistencies and discrepancies in the perceptions and rankings by stakeholders, who represent the interests of the public sector environmental management, the ornamental plant sector, research institutions and experts, and also social groups (e.g. agricultural unions, forestry associations, environmental NGOs). Thus, we adopt a multi-stakeholder framework. We also acknowledge that perceptions may vary within institutions and/or across individuals in each of these groups and therefore, a re-estimation of the rank ordered logit for stakeholder groups is required, classified by individual stakeholders' general knowledge of invasions, their level of awareness and concern, and their interest in the development of policy measures. This allows us to explore the variability in awareness and prioritisation of particular invaders across different social groups, taking into account the influence of differing stakeholder perceptions of the problem of biological invasions in general. This study contributes to the development of invasive species management practices by assessing stakeholders' perceptions towards invasive species and the determinants of their preferences in their selection of key plant invaders.

2. Material and Methods

2.1. Study Area

This study takes place in Galicia, in the northwest of Spain, where over the period 2005–2011 the Galician government spent about 1.1 million Euros on control and eradication measures for invasive plants in protected nature conservation areas.[1] The government has also funded the publication of a report of invasive plants in the region (Xunta de Galicia, 2007). This report considers 73 plant species of which 31 are classified as posing a significant threat or as having the potential to do so. Out of those 31 species, 68% are associated with introductions for ornamental use, suggesting that the ornamental trade is a significant pathway for potential plant invasions in Galicia.

The Spanish Law 42/2007, on Natural Heritage and Biodiversity, establishes a basic legal framework for nature conservation and proposes the creation of a national catalogue of invasive species; while also entitling different Spanish regions to establish their own catalogues. This law specifies that the inclusion of any species in the catalogue implies the general prohibition of possession, transportation, traffic or trade in such species. The Royal Decree 1628/2011[2] regulates the Spanish List and Catalogue of Invasive Species, containing two annexes, a catalogue of invasive species and a list of alien species with invasive potential. However, this Royal Decree was fully in force only for a few months. Stakeholder pressure from hunting and fishing groups, led to the exclusion of certain invaders from the catalogue, and claims from certain Spanish regions led to the cancellation of the list of potentially invasive species.[3] The new Royal Decree 630/2013 regulating the Catalogue of Invasive Species[4] has been recently approved, therefore the effectiveness of current legislation is difficult to assess. Moreover, Galicia does not have its own catalogue of alien species to which legally binding limitations would specifically apply. In fact, only Valencia (southeast of Spain) has so far succeeded in establishing regional regulation of exotic alien species.[5]

2.2. Survey Design and Administration

This study was conducted by personal interviews using a semi-structured questionnaire in order to study the determinants of stakeholder prioritisation of the most relevant invasive plants, as well as general information about stakeholders' awareness and perceptions. Four stakeholder groups were interviewed: the ornamental plant sector, public sector environmental management, research institutions and experts, and representatives of different social groups (e.g. environmental NGOs, agricultural unions, forest managers, hunting and fishing associations, and political parties). Thus, the respondents were public or private organisations/individuals (i) involved in the introduction or

[1] Information received from Nature Conservation Department of the regional government (Xunta de Galicia).

[2] http://www.boe.es/boe/dias/2011/12/12/pdfs/BOE-A-2011-19398.pdf http://www.magrama.gob.es/es/biodiversidad/legislacion/real_decreto_1628_2011_listado_exoticas_invasoras_tcm7-211976.pdf.

[3] http://www.boe.es/diario_boe/txt.php?id=BOE-A-2012-8569.

[4] https://www.boe.es/boe/dias/2013/08/03/pdfs/BOE-A-2013-8565.pdf.

[5] http://www.cma.gva.es/web/indice.aspx?nodo=73375&idioma=C.