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Stakeholders' perceptions of plant invasions in Galicia, Spain

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Summary

The perceptions, knowledge and values of stakeholders are essential for effective implementation and support of policies against biological invasions. In this study we focus on deliberate introduction pathways of alien plants and their impacts in Galicia (northwest Spain). We interviewed 61 stakeholders representing the nursery trade, forestry and agricultural sectors, nature conservation, scientists and public administration in this area to elucidate their views on invasion risk and policy options. We compare their responses with respect to their own interests as well as for Galicia as a whole including questions about impacts, and private management actions. The results show that there is a greater social awareness and concern for certain species introduced for ornamental purposes and the forestry sector (*Acacia* spp., *Eucalyptus globulus*, *Carpobrotus edulis*, *Cortaderia selloana*), and that stakeholders have a positive attitude to different potential management measures.

Key words: Stakeholder, perception, policy, invasive species, alien plants, horticulture

Introduction

Over recent years, stakeholder involvement has become part of national and international environmental policy, as decision makers recognise the need to understand who is affected by the decisions and actions they take, and who has the power to influence their outcome (Reed *et al.*, 2009). Stakeholder involvement is now also part of policies aiming to prevent and manage biological invasions. For example in Britain, proposed changes in legislation have been subject to public consultation periods, e.g. to ban the sale of certain non-native species in England and Wales. Furthermore, the GB Non-native Species Risk Analysis Mechanism (www.nonnativespecies.org) includes a public comment period before risk assessments for individual species are finalised, and an annual stakeholder forum helps communication and networking between decision makers, NGOs, experts, and any organisation or company with an interest in invasive species. This recognition of the importance of stakeholders is also reflected at the research level with an increasing interest in the perceptions, knowledge and values of stakeholders that are involved in processes leading to biological invasions, are affected by their impacts, or are involved in their control. For example, Bremner & Park (2007) show that the support of the local population for eradication and control programmes of invasive species depends heavily on the familiarity of individuals with the problem of invasive species, indicating the importance of awareness and education policies. In Spain, stakeholder analysis has been used for example in the Doñana National Park to study the

social perceptions of stakeholders (e.g. tourists, residents) to invasive species introduction, impact and management (García-Llorente *et al.*, 2008). Andreu *et al.* (2009) surveyed environmental managers in national and regional environmental administrations in Spain with responsibility for biodiversity conservation and management.

The starting point for our study is the fact that most plant invasions are the result of deliberate introduction of species, mostly for ornamental purposes, but also for agriculture and forestry (Hulme *et al.*, 2008; Mack, 2003; Perrings *et al.*, 2005). In Galicia, a recent publication on invasive plants (Xunta de Galicia, 2007) lists 73 species, with 31 classified as posing a significant threat or having the potential to do so. Out of these, 74% are associated with introductions for ornamental use, demonstrating the great importance of this pathway also in Galicia. Our study therefore focuses on stakeholders involved in these deliberate pathways but also includes stakeholders affected by the impacts of invasive plants or involved in their management.

Materials and Methods

Stakeholders selected for our study were public or private institutions, companies or individuals (i) involved in the risk of introduction and spread of non-native plants in Galicia, (ii) affected by negative or positive impacts of these species, and/or (iii) involved in actions regarding the prevention, eradication or control of invasive plants. Stakeholders contacted represent the views of institutions related to agricultural, forestry, conservation, and water resources, corporate production of ornamental plants and forestry, gardening, agricultural unions, forest owners associations and forest industries, hunters, fishermen, environmental organisations, political parties and research institutions. All stakeholders were initially contacted by letter and subsequently by telephone to correctly identify the person to be interviewed in each institution and to formalise the date for the interview. The initial recipients of the letters and their contact details were identified through the internet, and by the snowball method by which existing contacts identified further potentially interested parties (Bardsley & Edward-Jones, 2006; Andreu *et al.*, 2009). The response rate was high resulting in 61 face to face interviews conducted between January and March 2010 (Table 1).

Table 1. *Stakeholder groups and the type and number of organisations included in each of the groups*

Stakeholder group	Organisations
Administration	Conservation (7) Forest management (1) Water management (2)
Agricultural and Forestry Associations	Forest owners' ass. and forest industry (4) Agrarian unions (3)
Environmental activities	Ecological organisations (3) Hunting and fishing organisations(3) Environmental consulting (3)
Political organisations (3)	
Research	Environmental Research Centres (5) Scientific Society of Natural History (1) Experts (5)
Ornamental sector	Producer associations (3) Nurseries and landscaping companies (15) Management of public gardens (3)

During the interview, stakeholders were at first informed about the aim of the questionnaire to collect the vision of the organisation they represent. The introductory section of the questionnaire included the conventional definition of invasive species and provided a list of 29 invasive plants which were selected according to their current and potential future impacts (Xunta de Galicia, 2007; Sáñez-Elorza *et al.*, 2004). The interview then proceeded to a series of questions to assess the interviewee's perception of (1) the most invasive plants in Galicia, (2) their impacts (3) knowledge and appreciation of measures implemented from the administration, and (4) to determine the perception of invasive species relative to other environmental problems. We used a scale of 1–5 to measure stakeholders' agreement and disagreement with invasive species management, degree of awareness, the importance of invasive plants mentioned, and impacts.

Results

Respondents named a total of 42 plants when asked about non-native invasive species with relevance to their organisations. The species mentioned most frequently was *Acacia* spp. (54 responses), with respondents referring to *A. dealbata* (42) and *A. melanoxylon* (12) the two species most widely distributed in Galicia (Xunta de Galicia, 2007; Romero, 2008). Other species frequently mentioned were *Eucalyptus globulus* (33), *Cortaderia selloana* (31) and *Carpobrotus edulis* (26). Considered less important, but also highlighted by the frequency cited, were *Stenotaphrum secundatum* (18), *Robinia pseudoacacia* (16), *Azolla filiculoides* (13), *Ailanthus altissima* (11), and *Tradescantia fluminensis* (11). With the exception of *S. secundatum*, all these species were deliberately introduced for ornamental use and forestry. Ten of the 42 species mentioned have not been included in the list of non-native plants published by the regional government (Xunta de Galicia, 2007) for various reasons. Two are weed species, *Rumex* spp. and *Chenopodium* spp., which were known by the respondents at the genus level only and cannot be categorised as native or non-native, others seem currently to be problematic in single localities only, for example *Baccharis halimifolia*, mentioned by one respondent (but not listed in Romero, 2008 for Galicia), or discrepancies in the perception of invasiveness between stakeholders and the regional government. The most striking example for the latter case is *Eucalyptus globulus*, the second most frequently mentioned species, which has not been included as invasive in the official list even though at the national level it is classified as invasive for this region (Sáñez-Elorza *et al.*, 2004). The results also show that respondents mentioned more than 90% of invasive non-native plants identified as the most widespread and problematic in Galicia (Xunta de Galicia, 2007).

Interviewees were then asked to select the six most important invasive plants and to value their importance on a scale from 1 (low) to 5 (extremely important). 80% of respondents position *Acacia* (*A. dealbata* and *A. melanoxylon*) as one of the six most important species affecting their organisation and almost half also placed it first in the ranking. Many respondents also placed *Eucalyptus globulus* (49% of respondents), *Cortaderia selloana* (48%), and *Carpobrotus edulis* (25%), in this category.

When asked about the impacts of invasive plants respondents highlighted environmental impacts in particular (88%) followed by economic (59%) and social impacts (37%). Health impacts were perceived as less relevant (16%). Environmental impacts mentioned include the increased danger of fire, adverse effects on the landscape, biodiversity loss and habitat destruction. Economic impacts mentioned include the losses incurred, increased management costs and negative effects on various sectors such as tourism.

Respondents valued the importance of a range of potential policy measures significantly different (Kruskal-Wallis, $H = 70.9$, $n = 427$, $P = 0.0001$). The policy most highly supported by the different stakeholder groups are strategies to increase education and social awareness; while the policy with the lowest support is “measures on risky activities e.g. a tax on sales” (Fig. 1). Approximately three quarters give an extremely high priority to the strategies based on providing more information

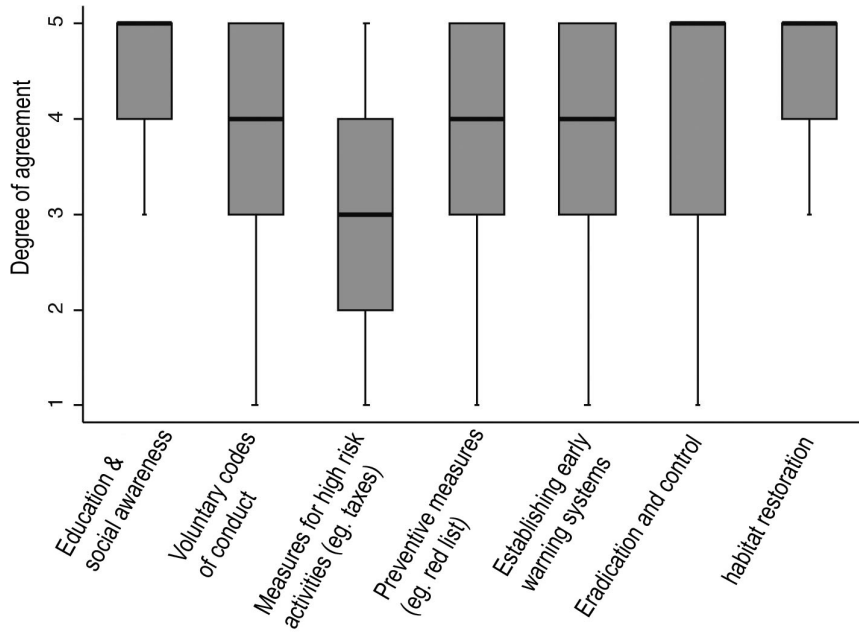


Fig. 1. Stakeholders' degree of agreement with different policy options on a scale from 1 (none) to 5 (extremely high).

to create greater awareness. In contrast there is a greater diversity of opinions about the use of economic instruments such as application fees for sale, with 18% of them not giving any priority to this measure, 30% valuing this as poor measure, 20% average, 15% higher, and 16% extremely high. Comparing the different stakeholder groups we found that they do not differ in their degree of acceptance of these policies and that there is no policy particularly preferred by any group.

When the stakeholders were asked about the current management of invasive plants in Galicia, they expressed their dissatisfaction with (a) policy makers' understanding of the stakeholder problems related to invasive plants; and with (b) policy makers' ability to adjust stakeholders' demands and needs in this area. In particular, stakeholders gave an average score of 1.7 and of 2.0 (on a scale of 1 to 5) to these two questions, respectively.

When asked to put invasive species in relation to other environmental problems significant differences were found between respondents' perceptions of different environmental issues, (Kruskal-Wallis, $H = 52.7$, $df = 427$, $P = 0.0001$). Stakeholders assigned more importance to forest fires and loss of natural habitats with 60% giving the highest score on a scale of 1 to 5, while only 20% gave the highest priority to climate change. The problem of invasive species was perceived as similar in severity to those of pollution or overfishing, reaching an average score of 3.7. 39% of respondents considered invasive species to be of high importance, and 28% extremely high. In contrast, this score is significantly different when asked about their views on how the general public in Galicia perceives invasive species problems, with an average value for the importance given to invasions of 1.9 (Wilcoxon test, $P < 0.0001$, two tailed). Thus, over 75% of respondents believe that the general public in Galicia cares little or nothing about the problem of invasive plants. However, this is in line with their perception of the public's general little concern about other environmental problems, with the exception of forest fires, which were placed high also in their importance for the general public.

Discussion

Our results show a high level of awareness of invasive plants and their impacts in Galicia among the 61 stakeholders interviewed. This is demonstrated by the fact that more than 90% of plants in the list of most problematic plants in Galicia are known to the respondents in this study. There

is particular concern for species introduced for ornamental purposes and the forestry sector. This is remarkable given the high number of stakeholders from the nursery industry included in the analysis. This overall consensus on the most problematic invasive plants also reveals that the non inclusion of *Eucalyptus globulus*, a species with important benefits for forestry, into the book of invasive alien plants in Galicia published by the regional government (Xunta de Galicia, 2007), is in stark contrast to the perception of this species by the majority of stakeholders.

Perceptions on different policy options show that the different stakeholder groups interviewed do not differ in their degree of acceptance of these policies with no policy particularly preferred by any group. This can be crucial for the facilitation of consensus between parties involved in the management of invasive species and is an important result for policy making. Stakeholders place particular emphasis on policies of education and increasing awareness on invasive plants, which is in line with their perception of the low level of interest of the general public in the topic. In addition, eradication, control and habitat restoration are preferred to preventive measures such as codes of conduct, red lists, or early warning systems. Environmental managers in public administrations in Spain also prefer direct control of species to entry prevention. However, in contrast with our results, they consider control and prevention more important than education and legislation which are placed in third and fourth position, respectively (Andreu *et al.*, 2009).

Our study also shows that stakeholder involvement could be part of an early warning system for newly established species or emerging problems from invasive species. Land managers may often be aware of any problems caused by invasive species at an earlier time than official authorities. In our study a water management company reported *Baccharis halimifolia*, a North American shrub species introduced as ornamental that has recently been identified as an emerging invasive alien plant for Mediterranean countries (Brunel *et al.*, 2010). Cacho *et al.* (2010) suggest this sort of knowledge should also be utilised in the general public and show that by offering incentives public administrations could set up a cost effective warning instrument. One step in this direction has been done recently by the regional government providing a webpage where findings of invasive plants in Galicia can be reported

(http://medioambiente.xunta.es/espazosNaturais/bio_plan_especiesinvasoras_form_cas.jsp).

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