



Invasive species: The categorization of wildlife in science, policy, and wildlife management



Susan Boonman-Berson^{a,*}, Esther Turnhout^{b,1}, Jan van Tatenhove^{c,2}

^a Wageningen University, Forest and Nature Conservation Policy Group/Environmental Policy Group, PO Box 47, 6700 AA Wageningen, The Netherlands

^b Wageningen University, Forest and Nature Conservation Policy Group, PO Box 47, 6700 AA Wageningen, The Netherlands

^c Wageningen University, Environmental Policy Group, PO Box 8130, 6700 EW Wageningen, The Netherlands

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ABSTRACT

Species categories commonly used in nature conservation, such as protected, endangered, reintroduced, or invasive, are open to various interpretations that can result in diverging and sometimes serious consequences. This is vividly apparent with respect to invasiveness because the categorization of species and individual animals as invasive impacts on how they are treated in practice. This article demonstrates how different constructions of invasiveness in science, policy, and wildlife management can be traced back to different assessments of the origin, behavior, and impact of the invasives. Specifically, the focus is on the different conceptions of *space* and the role of *data* in the *categorization* of invasives. We find that, in science and policy, invasiveness is constructed mainly in terms of the origin and impact of invasives but that these domains differ in how they treat space in their assessment of origin: whereas science uses ecological spaces, such as biogeographical regions, to assess whether a species belongs to, or is invasive in, a certain area, policy uses policy spaces such as countries or states to do so. In assessing the impact of invasives, science argues about including it in its definition, whereas policy requires detailed data about ecological, societal, and economic damage in order to take action. In wildlife management, the focus in the construction of invasiveness shifts from origin and impact to behavior of invasives. This requires detailed data about where the invasives are, where they are going, and what they are doing. By showing the dynamic and context-specific nature of the construction of invasiveness, the article contributes to ongoing research about classifications of nature, their difficulties and ambiguities, and their implementation and consequences in practice.

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Invasiveness: a contested topic

The issue of invasive species is high on the international conservation agenda and subject to debates and contestations. These debates focus on how to define invasive species and are connected with preferred courses of action considered necessary to mitigate the threat of invasive species for biodiversity conservation (Davis and Thompson, 2000; Colautti and MacIsaac, 2004; Valéry et al., 2008; Colautti and Richardson, 2009). Indeed, much of the scientific literature about invasiveness argues for the importance of the control or eradication of invasive (non-native) species in order to protect native species (Clavero and García-Berthou, 2005; Simberloff, 2005; Schüttler et al., 2009). This body of literature has

itself become the topic of scientific debate between, on the one hand, social scientists who criticize the use of war metaphors and xenophobic or racist motivations in the justification of eradication and control measures, and, on the other hand, invasive species biologists who deny these accusations (Peretti, 1998; Hettinger, 2001; Simberloff, 2003; Subramaniam, 2005; Larson et al., 2005; O'Brien, 2006).

In response to these – often rather polarized – debates, a growing body of social science literature has demonstrated the existence of different perceptions of invasiveness in science, policy, conservation management, and society (Peretti, 1998; Head and Muir, 2004; Robbins, 2004; Sagoff, 2005; Larson, 2005, 2007a; Weeks and Packard, 2009; Caplat and Coutts, 2011; Zisenis, 2012; Heger et al., 2013). For example, several studies have shown that citizens often have different views than scientific experts or management professionals on invasives and what should be done about them (Colautti and MacIsaac, 2004; Robbins, 2004; Larson, 2007a; Weeks and Packard, 2009). In addition, Heger et al. (2013) have shown that, even within science, different perspectives on and definitions of invasiveness prevail, ranging from historic-biographical, to conservation-oriented, to ecological-evolutionary perspectives.

* Corresponding author. Tel.: +31 317 487404.

E-mail addresses: susan.boonman-berson@wur.nl, shboonman@yahoo.com (S. Boonman-Berson), esther.turnhout@wur.nl (E. Turnhout), jan.vantatenhove@wur.nl (J. van Tatenhove).

¹ Tel.: +31 317 486205.

² Tel.: +31 317 482447.

These different perspectives are important because they are not just about definitions but also about action: deciding on what actions to take depends on the categorization of invasives – which need to be controlled – and their demarcation from non-invasives – which often need protection.³ In this context, social scientists have started to outline guidelines for achieving more clarity in communicating about invasiveness and designing legitimate management strategies (e.g. Larson, 2005, 2007b; Caplat and Coutts, 2011; Arts et al., 2012; Heger et al., 2013).

This article contributes to a further understanding of the different perspectives on invasiveness and their implications by offering an analysis of the different ways in which invasiveness is constructed in science, in policy, and in wildlife management practices. We focus specifically on three important criteria for the categorization of invasives: origin or nativeness – where did particular wildlife come from and does it belong here?; behavior – where is it, what is it doing, how is it moving or spreading?; and impact – is it causing damage to nature or society? (Head and Muir, 2004; Zisenis, 2012). In light of our discussion above, it is not surprising that these criteria are assessed differently in different practices, resulting in different categorizations of invasives and concomitant courses of action. For example, in some cases, invasiveness refers to species that are non-native, or alien, to an area, regardless of whether they rapidly colonize an area or have a negative impact on their environment (Richardson et al., 2000), whereas, in other cases, it refers to species that are considered damaging, irrespective of their origin (Davis et al., 2011). Thus, by presenting empirical detail about these three criteria, we gain an in-depth understanding of the different constructions of invasiveness and how these differ or overlap in science, policy, and wildlife management.

By detailing the construction of invasiveness not just in science but also in policy and in wildlife management, the article brings in the human and practical dimensions of invasiveness, including the importance of human–animal interactions. Building on studies in geography, amongst others, about human–nature relationships (Campbell, 2000; Waterton, 2002; Hinchliffe et al., 2005; Ingold, 2005; Turnhout et al., 2013), we aim to elucidate how, in wildlife management practice, the construction of invasiveness is not a distant academic or bureaucratic undertaking but involves, and is shaped by, multiple interactions between humans and invasives. This will enable us to demonstrate the dynamic and contingent character of invasiveness and illustrate the ways in which, in the process of categorization, wildlife managers and invasives continuously “make each other” (Hinchliffe, 2007, p. 176).

The next section presents the theoretical and methodological framework of the study. We focus specifically on three central concepts that we use to analyze the different constructions of invasiveness: categories, spaces, and data. To be more specific, our focus is on how different concepts of space and data affect the categorization of species or individual animals as invasive. Taken together, these concepts help us understand how different actors assess the origin, behavior, and impact of invasives. This is followed by three empirical sections about the construction of invasiveness in respectively science, policy, and wildlife management, and the article closes with a discussion and conclusion.

The construction of invasiveness: categories, spaces, and data

Debates about invasiveness show that different actors have different ways of interpreting and assessing the origin, behavior, and

impact of species or individual animals. These three criteria are informed by the occurrence – spatiality – of the species or individual animals and by the data used. This means, for instance that species or individual animals can be categorized as native or non-native depending on the assessment of their origin, which in turn is based on specific concepts of space (nation state, management area, ecosystem) and different types of data (population size, reproduction rates). Thus, different approaches to space and data may result in different categorizations of the same species or individual animals by different actors regarding not only invasiveness (invasive or non-invasive), but also other species categorizations (e.g. as protected, reintroduced, or endangered).

We start with the concept of category. Species categorizations, such as threatened, protected, reintroduced, endangered, or invasive, have emerged within the field of wildlife and habitat conservation for purposes of organization. These categorizations serve to make decisions about conservation priorities and management. More generally, we can say that, without categories, knowledge and action are impossible (Bowker and Star, 2000; Jones, 2009). Although categories of nature are often seen as derived directly from nature itself, they are manmade (Dean, 1979). However, as in the case of invasiveness, fitting the complexity of nature into distinct categories is not unproblematic as both nature itself and the categories are often ambiguous and multi-interpretable (Waterton, 2002; Morris, 2004; Soini and Aakkula, 2007; Turnhout, 2009; O'Rourke et al., 2012).

Additionally, it is important to recognize that categorization involves bootstrapping difficulties (Bowker, 2000). Despite the common view of categories as fixed containers that pre-exist the items that they intend to include, in practice, the boundaries of categories and the items that are classified into them are mutually constitutive (Jones, 2009). “The making of a category involves defining standards and criteria and in the process, the items that go into it are named, labeled, and remade as belonging to the category. Just as the development of [categories] requires preconceived ideas about [the items] that need to be classified, [the identification of these items] requires the existence of categories and classification systems” (Turnhout and Boonman-Berson, 2011, p. 35). Consequently, categories such as invasive are not static entities with clear-cut, self-evident boundaries and definitions, but ambiguous, multidimensional, and dynamic (Geertz, 1973; Gieryn, 1983; Bowker, 2000; Morris, 2004; Jones, 2009). In this article, we analyze how species and individual animals are categorized as invasive and on what grounds, focusing specifically on the role of space and data in these categorizations.

Space is the second central concept in our analysis. Conceptions of space are very important in categorizations of nature (Hinchliffe, 2007; Jerolmack, 2008; Selman, 2009; Payés et al., 2013). In the case of invasiveness, spaces of origin for example, or the characteristics of the spaces in which species or individual animals dwell, all influence how they are categorized. The categorization of invasives thus depends on where they are, where they came from, and what they do in these areas. Spaces can refer to ecological spaces, demarcated for example by geographical, climatic, or ecological criteria. In this case, species or individual animals will be categorized as invasive if they move from their native habitats to sites with different ecological characteristics, or if they cross geographical boundaries such as a mountain range, ocean, or river. Spaces can also refer to policy spaces such as countries or states, or to the designation of specific areas as conservation areas or as urban areas. In this case, species or individual animals will be categorized as invasive if they move from one country to another or from a conservation area to an urban area. Time needs to be explicitly included here, as the origin of species is very often also determined with reference to a specific date. If a certain species can be shown to have inhabited a certain area from which it later disappeared, it can be categorized as

³ Within the current debates about invasiveness and invasive species, we approach invasiveness in a very broad sense, whereby amongst other things both native and non-native species could be considered as invasive.

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