

COMMENT

Origin might matter; people matter, too (a response to the comment by Rejmánek and Simberloff (2017))

We appreciate Rejmánek and Simberloff's (2017; henceforth R&S) response to our paper, as well as their review of the biological studies showing that non-native species are a 'non-random' group of species that are more likely to cause problems at some point in time than would be expected by chance. We note that the focus of their response lies almost exclusively on recently introduced species, which suggests that their argument might be less defensible for established introductions such as the ones covered by our study (Van der Wal *et al.* 2015). Moreover, R&S appear to have missed the major point of our paper, which is socio-cultural rather than strictly biological, so we briefly respond here in order to clarify our objective and results.

Our aim was to address the empirical, social scientific question of "the extent to which nativeness influences attitudes and decision-making in natural resource management" (Van der Wal *et al.* 2015). We show empirically that people – both the public and experts – *often* do not consider origin; R&S's response to this finding seems to be that "the public may be wrong, and so may some ecologists," certainly where it concerns novel invasions. However, the aim of our study was not to determine who is right or wrong – in line with most social scientific research – but to contribute to a better understanding of how people develop their views on non-native invasive species and their management.

It is critical to engage with perspectives held by a wide range of people, not least because empirical research has shown that invasion biologists themselves hold highly variable beliefs about non-native and invasive species (Young & Larson 2012; Humair *et al.* 2014; see also Chew & Hamilton 2011 for a historical perspective). After in-depth interviews with invasion biologists, Humair *et al.* (2014, pp. 14 & 17) express surprise at "the lack of consistency in the use of basic concepts amongst invasion biologists ... [even] in their understanding of what a native species is." Given that such inconsistency exists among experts, it is all the more important for continued, empirically based inquiry into how people perceive species and evaluate management needs.

Our findings provide insights into how attitudes to species management are linked to beliefs about species. They clearly suggest that it is not non-nativeness per se that matters to people (both lay and expert; see also Fischer *et al.* 2014): abundance, harm caused by a species – whether native or non-native – and the human role in its introduction play more significant roles. Our point is that these underpinning considerations (i.e. attitudes formed on the basis of perceived

harm, abundance and the human role) should not be forgotten in decision-making about species management, whether this concerns established or novel introductions, or indeed native species. We recognize that in many cases (apart from established introductions), the 'gold standard' of public involvement in the management of invasive species – which has been shown to contribute to more effective solutions (e.g. Larson 2007; Liu *et al.* 2011; Moon *et al.* 2015; Novoa *et al.* 2016) – may be impractical. It may also be that case-specific ecological research (or complementary insights from similar environments elsewhere) is unavailable and cannot be obtained due to financial and time constraints, so that management decisions may have to be made based on heuristics such as 'non-nativeness' for pragmatic reasons. However, our study lends support to the conclusion that the arguments underlying this coarse (see Van der Wal *et al.* 2015) heuristic, at least in the minds of many members of the public and professionals, should always be kept salient: decisions over species management are essentially based on a consideration of harm, abundance and the human role played in their arrival and/or expansion, and not primarily on the nativeness of the species. The examples of introductions reviewed by R&S are strong cases in point.

We next ask whether invasive species management will progress more through somehow inculcating a generalized concern about origins (which appears to be R&S's recommendation) or through more open social debate and dialogue about the response to particular instances of invasive species (ideally supported through governmental policies that foster deliberation). We suggest that the latter path more appropriately incorporates the perspectives of diverse audiences, including non-academics, those who fund academic research (i.e. 'the public') and those who might oppose proposed eradications. Most importantly, however, these more open debates will encourage a diversity of perspectives that will help to prevent a pragmatic decision heuristic based on origin from becoming a cognitive simplification that omits consideration of the other factors mentioned above. As we indicate in our paper, nativeness is a key criterion in many policy documents guiding the management of invasive species around the world; our study suggests that these documents may not speak to the actual concerns of the public and funders.

As to the contentious notion of a species' origin, it is heartening to read that R&S – who take a position on one end of this debate – claim that "all invasion biologists would

agree with VdW that the origin of a species should not be the sole criterion for management options, and whether this criterion should be used at all depends on the stages of a non-native taxon along the introduction–naturalization–invasion–impact continuum.” This acknowledgment, combined with the shared view that it is human modification of ecosystems that makes them prone to invasion, suggests that the debate about a species’ origin is starting to bring formerly distant camps closer.

For a final comment, we again turn to empirical evidence from Humair *et al.* (2014, p. 21), who state that “despite their intention not to use non-nativeness as a value, many experts revealed an implicit bias against non-native species in their answers to interview questions.” R&S cite many ‘facts’ about the effects of non-native species, but this does not negate the influence of ‘values’ on how they and other stakeholders involved in this debate (including ourselves) view those facts and what to do about the situation. In our experience, while invasion biologists tend to view invasive species as a subset of non-native ones, they also tend to let their negative views of the former seep into their views of the latter. We again call for broader engagement of diverse stakeholders in order to seek appropriate solutions to the challenges posed by invasive species.

CONFLICT OF INTEREST

None.

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