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"Let me tell you your problems". Using Q methodology to elicit latent problem perceptions about invasive alien species

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ABSTRACT

From a participatory governance perspective, managing changes in ecosystems requires involvement of stakeholders. However, when the impacts of such changes are unclear or unknown, problem perceptions are latent and stakeholders cannot be identified. To elicit perceptions of an ecosystem change despite unknown impacts, we employed Q methodology regarding landscape values. From these perceptions we derived stakeholder stances on the ecosystem change constituted by the invasive alien plant Coralita (*Antigonon leptopus*) on the Caribbean Netherlands islands of St. Eustatius and Saba. Ecologists view Coralita as a clear threat, but the exact impacts of the plant are unknown and therefore locals do not have manifest problem perceptions. Nevertheless, we derived three perspectives on the value of nature per island, which in turn yielded insights into stakeholders' views on Coralita management. Our approach can be applied for other management questions regarding changes in ecosystems when the impacts on humans are unclear and hence problem perceptions latent.

1. Introduction

Biodiversity decline and ecosystem degradation are causing great worry to ecologists and environmental scientists, some of whom believe they herald the onset of the earth's sixth mass extinction (Barnosky et al., 2011). However, the impacts on people of many of the changes to ecosystems are unclear, and therefore problem perceptions among actors are latent. An example is the decline in insect abundance, for which the impacts on people are hard to define, resulting in little priority being given to slowing the decline (Brugh, 2017; Vogel, 2017). Another example: changes to the nitrogen cycle, which affect processes like eutrophication and acidification whose impacts on people are difficult to define precisely (Galloway et al., 2014; Reis et al., 2016). The impact of an ecosystem change can be unclear due to the complexity of the phenomenon or uncertainty about its materialisation (Renn et al., 2011). It could be that if the impacts were clarified, people would be able to articulate their perception and stakeholders could be identified. But in this article, we work on the premise that these impacts cannot be clarified and that this hampers people from articulating a perception, rendering their perceptions latent. This latency makes it difficult to identify stakeholders that could be engaged in governance activities, resulting in a significant problem from a participatory governance perspective. We propose a method for identifying stakeholders despite latent problem perceptions, which we test on the case of invasive alien species (IAS) management in the Caribbean Netherlands.

Participation of stakeholders is crucial for IAS management for several reasons. One is that problem perceptions of IAS are not defined by factual knowledge but by value orientations, attitudes and underlying belief systems (Verbrugge et al., 2013; Humair et al., 2014; Stokes et al., 2006). For example, feral hogs on Hawaii are considered by scientists as an IAS that needs to be eradicated, whereas locals view the hogs as bounty and as important in cultural practices (Weeks and Packard, 2009). If these different perceptions are not represented, policy processes are hindered (Sharp et al., 2011; Shackleton and Shackleton, 2016). A second reason is that management of IAS requires unanimous cooperation given its weakest-link public good character (Niemiec et al., 2016). This becomes a challenge when impacts of species are unclear (Hulme, 2006), as is the case for coral vine (*Antigonon leptopus*) on the Caribbean Netherlands islands Saba and St. Eustatius. Little research exists on the impacts of the vine, but it has been documented to rapidly cover vast areas and as very tough to remove due to its tuberous roots (Burke and diTommaso, 2011). It is deemed a threat to biodiversity, including to the native iguana (van der Burg et al., 2012), and is generally considered a serious risk in the Caribbean

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Netherlands by ecologists (Smith et al., 2014; Jongman et al., 2010). But impacts are very hard to specify further, and there's even uncertainty about which impacts might occur (Sweeney, 2018). Hence, stakeholders' problem perceptions are latent and there are no prospects of providing them with information to enable them to articulate their perceptions.

We propose and test an approach to identify stakeholder groups despite latent problem perceptions. It consists of two main elements: Q methodology to map the range of extant perspectives, and focusing the analysis on landscape values rather than invasive species. From the resulting perspectives on landscape values, we elicited problem perceptions about IAS, as well as views on the appropriateness of conservation efforts. Thus, this article contributes to the participatory governance literature by exploring how to identify stakeholders even in cases of latent problem perceptions. This can be of value in similar cases of ecosystem changes whose impacts on people are unknown.

2. Participatory governance and invasive alien species

Participatory governance is increasingly advocated for and applied to environmental and ecological challenges (Armitage, 2009; Folke et al., 2005; Papadopoulos and Warin, 2007). Participatory governance promotes more inclusive and less top-down forms of management and stresses the involvement of actors who would normally not be engaged in decision-making, such as locals (Newig et al., 2018). Arguments for increased participation of stakeholders can be categorised as being normative, substantive or instrumental (Glucker et al., 2013). Normative arguments include, for example, that participation has an emancipatory effect on otherwise underrepresented groups (Dietz and Stern, 2008), fosters social learning and allows those affected by a decision to influence it, increasing the democratic value of a process (Glucker et al., 2013). Substantive arguments expect greater effectiveness of participatory governance, since stakeholders are a valuable source of local, experimental and value-based knowledge and insights (Glucker et al., 2013; Bulkeley and Mol, 2003). Instrumental arguments hold that acceptance and compliance are higher in actors who have been involved in the decision-making process, and that the legitimacy of a participatory process is greater (Koontz and Thomas, 2006; Dietz and Stern, 2008). These alleged strengths of participatory governance have resulted in different practices of stakeholder involvement in management of ecosystems and natural resources: for example, communities managing resources through collective institutions (Dietz et al., 2003; Ostrom, 1990), through adaptive co-management (Berkes, 2009), community-based natural resource management (Dressler et al., 2010), or as collaborative networks in ecosystem-based management (Bodin et al., 2017).

Naturally, participatory governance is not a panacea and shortcomings and threats have received ample attention in the literature. For example, Dressler et al. (2010) showed for several cases of community-based natural resource management how the resource was not managed more sustainably or more equitably. When conservation was prioritised, communities sometimes ended up with less of a say in the management of their resource than before the programme (Dressler et al., 2010). Fletcher (2017) stresses the importance of analysing governance strategies and structures through which conservation is enacted, since stakeholders' positions are grounded in different "governmentalities". "Governmentality" is a portmanteau term coined by Foucault from "governing" and "mentality" (see Hanson, 2012); it designates strategies, discourses and structures through which power is enacted (Buseth, 2017; Fletcher, 2017). There exist multiple governmentalities (e.g. neoliberal, disciplinary, truth), and conservation practices come about through their interplay (Montes and Bhattarai, 2018; Fletcher, 2017). Participatory governance thus does not guarantee that governance will be either sustainable or equitable if the governmentalities of the actors involved lead to different positions on what is appropriate environmental management. On a more practical level, several shortcomings have been pointed out as well. Bockstael et al. (2016) provide an overview of criticisms of participation made in the development literature. Factors they mention are: local elites capturing the rights that are devolved to a decentral level; power imbalances not being taken into account; a technocratic approach to participation; too strong a focus on the local situation and neglecting the broader institutional context; assuming every local community is similar; co-opting participation to promote different interests; and devolving responsibilities without the corresponding resources (Bockstael et al., 2016). Mentioned regularly is the limited capacity of participatory approaches to solve situations with strong conflicts (Newig and Fritsch, 2009); it might increase conflicts (Walker and Hurley, 2004) or serve merely a symbolic purpose (Sotirov et al., 2015).

Thus, participation is in itself not a guarantee for making environmental governance socially and ecologically successful. But the literature does point towards a few conditions and contextual factors that can enhance the performance of participatory governance. Based on Natura2000 experiences, Blondet et al. (2017) confirm the claims made by Turnhout et al. (2010) and Van der Arend and Behagel (2011) that extant conservation practices mediate the materialisation of participation. As a result, Blondet et al. (2017) find that participation mainly affects the usual suspects but does really grant them more influence. This is what the risk of elite capture is grounded in. Crucial to prevent that are local leadership and the integration of multiple perspectives and processes to resolve conflicts (Mc Morran et al., 2014). Also pointed out frequently is the importance of taking the community's livelihood into account, and how conservation efforts would affect the resources the community depends on (Gardner et al., 2016; Bluwstein et al., 2016). For communities to participate successfully, there must be substantial benefits for them from the proposed conservation efforts and decision-making must be well-informed (Bluwstein et al., 2016). Additionally, they should be involved in management tasks related to the area or resource (De Pourcq et al., 2015). Sometimes contradictions arise as well: for example, Bluwstein et al. (2016) assert that real power needs to be devolved to democratically elected bodies, while Ece (2017) shows how such a devolvement of responsibility can actually make an institution less capable of representing its constituents. Similarly, trust and other aspects of social capital are often mentioned as conducive to participatory governance (De Pourcq et al., 2015; Blondet et al., 2017), while strong bonds among participants can also result in coalitions that exclude others (Mc Morran et al., 2014). Lastly, it has been suggested we change our perspective or frame of reference when looking at participatory governance. Bouamrane et al. (2016) discuss biosphere reserves in Africa and France, arguing that when trying to reconcile developmental and conservation efforts, ecological solidarity is a more appropriate frame than human–nature interdependency. De Pourcq et al. (2015) argue that effectiveness of participatory governance should be assessed in terms of conflict prevention, and their study shows good outcomes for co-management of that issue.

Overall, while participation may have its shortcomings and pitfalls, involvement of the local community is in principle preferable over no involvement at all (Lührs et al., 2018; Turnhout et al., 2010). To that end, there is a wide range of literature available on stakeholder analysis and involvement methodology (e.g. Vasslides and Jensen, 2016; Lopes and Videira, 2016). We argue that for our case, the applicability of such approaches is limited given the unclear impacts on people of the ecosystem change at hand. This is because even when the stakeholder involvement approaches acknowledge that stakeholders' preferences are often unarticulated, the approaches assume that stakeholders can be identified and their preferences elicited (e.g., Tompkins et al., 2008). We contend that when impacts on people are unclear, problem perceptions are latent and hence stakeholders cannot be identified. The objective of this article is therefore to develop and validate a method to ascertaining stakeholder stances in such situations, in order to allow for proper stakeholder involvement notwithstanding latent problem perceptions. Specifically, we aim to show how Q methodology can be used

for eliciting latent problem perceptions. First, however, we discuss some details of the case.

3. Invasive alien species on Saba and St. Eustatius

Ecologists list IAS as one of the major threats to biodiversity, with cost estimates ranging from €12 billion a year for the EU to €120 billion a year for the USA (Shine et al., 2010; Pimentel et al., 2005). On islands they are generally assumed to be an even larger threat to biodiversity because island ecosystems are fragile (Reaser et al., 2007; Kairo et al., 2003), although not everyone agrees (see Vilà et al., 2011; Sax, 2008). Notwithstanding, there is a lot to be lost on Caribbean islands, as one of the world's 25 global biodiversity hotspots with about 60% of the region's 12,000 plant species being endemic (Kairo et al., 2003; Mittermeier et al., 1998).

We conducted our study on Saba and St. Eustatius (commonly known as Statia), part of the Caribbean Netherlands: see Fig. 2 for a map. Saba measures 13 km^2 and as such is the smallest of the two. It is the northernmost island of the volcanic inner arc of the Lesser Antilles and was formed about 500,000 years ago, making it younger than other islands in this region. The peak of the dormant volcano, surrounded by a few domes, rises out above the Caribbean sea to 872 m. There is still a lot of geothermal activity, and because of the steep rocky coastline, erosion is an issue in many places. The slopes are steep, sometimes exceeding 60° or are even nearly vertical, making agriculture difficult. Thus, the largest source of income is tourism (de Freitas et al., 2016; CBS, 2017). Statia is located about 30 km southeast of Saba, has a population of 3200 people and is slightly larger: 21 km^2. It has a dormant volcano known as The Quill, which forms the highest point of the island at 600 m. During the colonial period it accommodated about 70 plantations, mainly located on the flat areas in the centre of the island. Currently, some agriculture still takes place, but the main economic activity is the oil terminal of the US company NuStar (DLG, 2011; de Freitas et al., 2012; CBS, 2017).

On both islands the invasive alien plant Coralita (*Antigonon leptopus*) is known to smother native vegetation and overgrow the nesting sites of the already endangered native *Iguana delicatissima* (van der Burg et al., 2012). On Statia the plant is estimated to cover 15–20% of the island (van der Burg et al., 2012), predominantly former agricultural land but also land on the borders of the national parks. On Saba, Coralita is starting to creep up the mountain that is crowned with a unique elfin forest which attracts many tourists (van de Kerkhof et al., 2014a, 2014b). Reports written to support Coralita management so far have not taken stakeholders' perspectives into account (e.g., Smith et al., 2014; van der Burg et al., 2012), perhaps because there are no identifiable stakeholder groups.

Although the Coralita invasion is a very visible phenomenon, during previous fieldwork we were repeatedly confronted with the absence of clear stakeholder groups. Locals all know the plant: some regard it a nuisance in their garden, while others find the flower beautiful. But a lack of knowledge about the vine's impacts was often mentioned as obstructing decision-making. Given the limited scientific understanding and knowledge of impacts of IAS, this gap cannot easily be filled (Barney et al., 2013). Thus, people are hampered in articulating their perceptions of the change to the ecosystem, and these latent problem perceptions make it impossible to identify stakeholders to involve in Coralita management. In this article we aim to elicit problem perceptions so that stakeholder groups can be identified and involved in the decision-making process regarding Coralita.

4. Methodology

4.1. Q methodology and landscape values

Q methodology was introduced by William Stephenson in the 1930s (Stephenson, 1953), applying ideas from quantum physics to the study of subjectivity. Wanting to diminish the influence of the researcher on data gathered from respondents, Stephenson proposed a method to collect self-referent expressions and find order across them. The underlying assumption is that such self-referent expressions can be understood as a form of behaviour and are an adequate representation of subjective meanings (McKeown and Thomas, 2013). This is considered an improvement over approximating respondents' subjectivity through objective traits and characteristics, which is at the centre of conventional R analysis, (Steelman and Maguire, 1999). More concretely, this means that while covariation between variables across participants is usually the object of interest, what is of interest for Q is covariation between persons' perspectives (i.e. their Q sorts) across statements (Webler et al., 2009). Though initially applied in psychology, Q methodology is increasingly being applied in environmental research to understand human perspectives regarding, for example, conservation issues: topics range from the necessity of conservation (Sandbrook et al., 2011) to the why and how of climate adaptation (Uittenbroek et al., 2014). A recent review of 52 articles applying Q methodology on nature conservation discerned four general aims of Q methodology: addressing conflict, devising management alternatives, gauging policy acceptability, and reflecting on values implicit in research and practice (Zabala et al., 2018). Such different aims can be realised because of the structured and in-depth representation of people's thoughts generated through Q methodology. Structured, since the methodology forces people to order each thought in relation to every other thought; and in-depth, because it queries people's thinking about a topic through a variety of statements (Webler et al., 2009). Q can be applied for understanding human perspectives on three analytical levels. One, to simply map perspectives in a qualitative manner, revealing perspectives on a certain topic (Uittenbroek et al., 2014), is frequently used as a proxy for discourses (Webler et al., 2009). Two, because of the structured and in-depth approach, Q is used to uncover value patterns underlying people's attitudes, explaining why people hold certain perspectives (Ellis et al., 2007). Three, building on that, a shared value system can be developed among stakeholders, which is considered crucial for community-based governance (Gruber, 2011). Q has, for example, been used to find common ground between contradictory problem narratives about the much contested issue of large carnivore conservation (Mattson et al., 2006). We aim to employ the capacity to uncover underlying value patterns for eliciting stakeholders' latent problem perceptions.

This is a new use of Q methodology, and different from the application by Mazur and Asah (2013) to reveal latent agendas fuelling conflict about the recovery of the grey wolf in Washington State. Their Q study showed that people asserting that wolves and society are incompatible in fact express discontent about the conditions under which wolf recovery projects would be executed. By also acknowledging marginalised or hidden views (Zabala et al., 2018), Q methodology has brought to the fore beliefs that a regular survey might have missed. Based on their finding, Mazur and Asah (2013) assert that addressing the seemingly peripheral apprehension about legal arrangements of the project will ameliorate people's stance on incompatibility. The latency addressed in that article differs from ours, in that their topic in itself is much contested and one about which actors have strong opinions. We, however, are interested in a topic on which views are not strong, which brings us to the second innovative aspect of our approach. Q has been applied sporadically in invasive species research (e.g. Falk-Petersen, 2014; Hamadou et al., 2016), but never regarding what Zengeya et al. (2017) refer to as "inconsequential species". We assume that although perceptions about Coralita are latent, people are capable of articulating their opinion about nature's value, and this can be linked to potential impacts of Coralita. We therefore used the landscape services typology proposed by Van Riper and Kyle (2014) as the basis for our Q statements, which has not been applied this way before.

Before explaining how we designed our study, we would like to draw attention to some important limitations of Q methodology. The most important is that it reveals the diversity of opinions present across

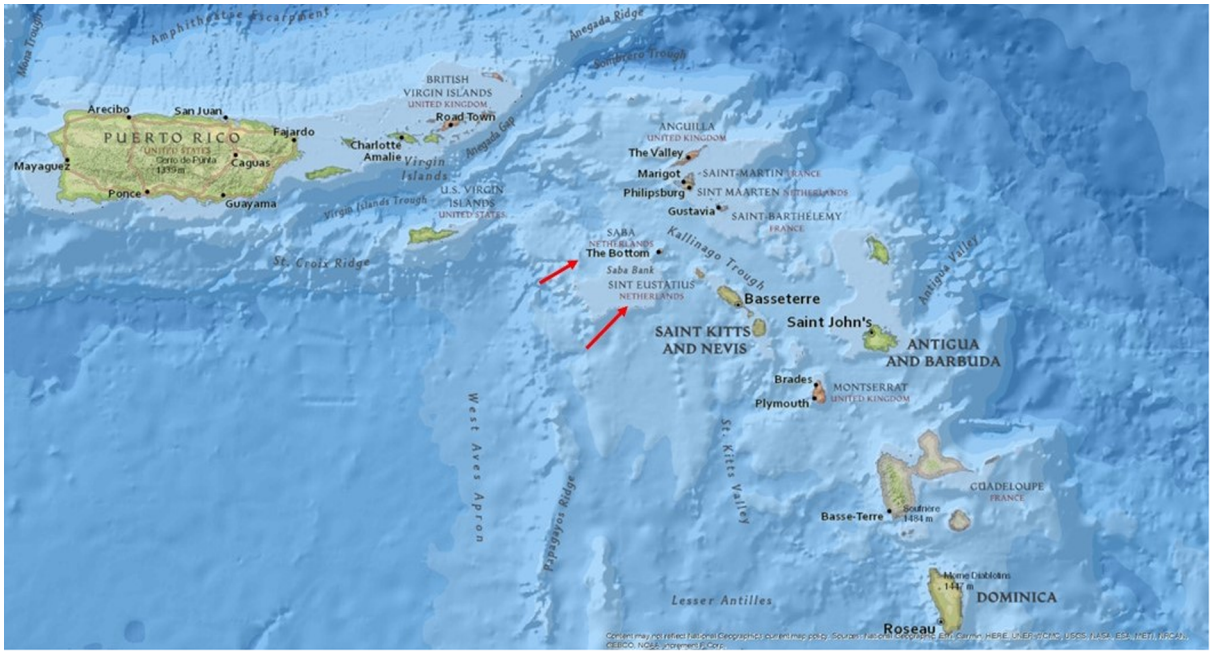

Fig. 1. Map of the research locations.
Source: National Geographic, Esri.

participants, but not their relative prominence. That is to say, at the end of a Q study you know the ways in which people think, but not how many people think in a certain way (Sandbrook et al., 2013). This could be remedied by combining it with a large-scale survey, for which Danielson (2009) offers several approaches. Moreover, the method is cognitively rather demanding for participants, and the researcher needs to construct a set of statements that is comprehensive, yet for respondents is possible to grasp and sort in a reasonable time span (Mukherjee et al., 2018). In the following we will explain how we dealt with these concerns in the design of our Q study, followed by its application.

4.2. Designing the Q study

The ability of Q to uncover underlying values in a relational manner is due to the structured way in which participants are asked to relay their opinion. Each participant receives a set of statements on cards and is asked to place them on a normal-curve-shaped grid according to their own views on the topic, as depicted in Fig. 1. Allowing more cards to be placed in the middle than towards the extremes forces the participant to articulate their opinion. The result is called a Q sort (McKeown and Thomas, 2013; Webler et al., 2009).

The statements can be gathered in two ways: structured or unstructured. Unstructured approaches aim to collect an all-encompassing "concourse" (Q-terminology for corpus) of statements from which a representative sample is taken. Structured approaches are appropriate when the research is based on a theory that entails certain concepts and views, for example, or when it is not feasible to collect an all-encompassing concourse (Watts and Stenner, 2012). Because there has been scant public debate in the Caribbean Netherlands about invasive species, there was no extant concourse to draw from and so we constructed the sample. As mentioned earlier, we used the landscape services typology, which has been promoted as being appropriate for assuring stakeholder involvement, since it reflects local relevance and centres around values to humans (Fagerholm et al., 2012). We used the values discerned by Van Riper and Kyle (2014), based on Raymond and Brown (2006). We adapted the values to make them applicable for Saba and St. Eustatius: see Table 1. Overlap between the values as seen by participants is discussed in Section 5. We take the concern raised by Mukherjee et al. (2018) regarding bias in the selection of statements to heart, and therefore included every landscape value, irrespective of our expectations regarding its relevance.

Pertaining to each substantive value, we formulated four statements following Dryzek and Holmes' (2002) typology of discursive claims that

Table 1
Landscape values for Saba and St. Eustatius, contextualised based on Van Riper and Kyle (2014).

Landscape values	
Aesthetics	Attractive scenery, sounds and smells
Agriculture and livestock	Agriculture[1] and livestock providing income and food
Biodiversity	The variety of plants, wildlife, marine life and other living beings
Future value	Allowing future generations to experience Saba/Statia the way I experience it
Intrinsic	The importance of nature in and of itself
Medicine	Plants or animals with medicinal and therapeutic powers
Recreation and relaxation	Undertaking outdoor activities to recreate and unwind
Science and learning	Scientific activities and learning about Saba's/Statia's nature and culture
Spiritual and religious	The spiritual or religious meaning of Saba's/Statia's nature
Supporting cycles	The cycles that produce clean air, soil and water
Tourism	Attracting tourism which provides employment and income
Utilities	Clean drinking water and electricity generation through solar and wind power

[1] By agriculture, we mean the growing of crops and fruit.

Table 2
Four discursive claims and their translation to our cases, based on Dryzek and Holmes (2002).

Discursive element	Meaning of element	Translation into statement
Definitive	Concerned with the meaning of terms	This is an important value of Saba's/Statia's nature
Designative	Concerned with matters of fact	This value is under pressure
Evaluative	Concerning the worth of something that exists or might exist	If Coralita would impact this value, I would be worried
Advocative	Concerning something that should or should not exist	We should protect this value

Table 3
Discourse typology with the corresponding landscape values.

Discourse	Definition (Frouws, 1998; Hermans, Horlings, Beers and Mommaas, 2010; Elands and Wiersum, 2001)	Landscape values
Agri-ruralist	Farming is the main value of the landscape, supplying society with a wide range of amenities such as food, drinking water, attractive landscapes and recreational facilities.	Aesthetics; agriculture and livestock; recreation and relaxation; utilities
Utilitarian	Landscape is a production area, an integral part of the economy, and not necessarily just for food. Governed by market forces.	Agriculture and livestock; tourism; science and learning; utilities
Hedonist	Landscape contributes to the quality of life through quietness and naturalness, as opposed to the crowdedness of the urban, providing an escape.	Aesthetics; biodiversity; recreation and relaxation; spiritual and religious; tourism
Community sustainability	Landscape should support the rural society by offering goods and services, and be managed by government rather than be market-driven.	Aesthetics; agriculture and livestock; utilities
Nature conservation	Ecological integrity should be maintained, wilderness retained. A balance should be found between use and conservation.	Aesthetics; biodiversity; tourism

make up a perception, as described in Table 2. We thus had 48 cards with statements regarding the value of nature on the respective islands, which we think is still within the limits of what respondents are able to grasp in one interview.

4.2.1. Discourse typology

To have some handles for interpreting the perspectives yielded by the Q sort, we link them to five discourses identified for rural landscapes in Europe (Hermans et al., 2010; Elands and Wiersum, 2001). Table 3 shows which landscape values we consider to be connected to each discourse, given the description of the discourse in the literature. We do not aim to link each perspective we identified to one of the perspectives discussed below but have characterised them heuristically by comparing them to this typology.

We expected to find different perspectives on the two islands, due to some conspicuous differences between them. Saba attracts approximately 22,500 tourists a year, making tourism the most important economic sector. For Statia this figure is much lower at 10,000 a year, with the oil terminal as the most important economic sector. In addition, over 70% of the visitors to Saba go for a hike, compared with less than 40% on Statia, where diving is the main tourist attraction (van de Kerkhof et al., 2014a, 2014b). On Statia, the Department of Agriculture has set up a farm for use by locals, aiming to reignite interest in agriculture (The Daily Herald, 2017). Saba has barely any flat land, so farming is much more small-scale. Hence, for Saba we expected to find perspectives resembling the *hedonistic* and *natural conservation* discourses, emphasising the landscape values of tourism, aesthetics, relaxation and recreation, and biodiversity. For Statia we expected to find perspectives resembling the *agri-ruralist* and *utilitarian* discourses, with agriculture and livestock, utilities and medicinal values of the landscape featuring most prominently. Looking for these differences is relevant for two reasons. One, to see if our approach is nuanced enough to pick up on such differences and bring them to the fore in the results. The differences in perspectives are important to ensure management efforts can be attuned to the local priorities, which is the second reason why we wanted to check for such differences.

4.3. Conducting Q sorts

Having constructed the Q statements, the next step is to define the sample of participants, which differs in two important ways from other common stakeholder analyses. One is that since the purpose is to relay the breadth of opinions, the sampling is purposive rather than random (Zabala et al., 2018). This entails selecting participants whose opinions the researcher expects to be diverse, and the aggregate of which can be assumed to be representative of the population (Webler et al., 2009). Secondly, due to the inverse statistical analysis mentioned earlier, the need for a large sample size applies to the Q statements, whereas the sample of participants should be smaller (López-i-Gelats et al., 2009; Zabala et al., 2018). Webler et al. (2009) mention a ratio of 1:3 for the number of participants to the number of statements. Also restricted by the earlier-mentioned cognitively demanding sorting process for the statements, we collected sorts from 16 participants on Saba, and 32 on Statia from which we randomly selected 16. The larger number of interviews on Statia reflects the island's larger population and our wish to represent all their perspectives. We selected participants whom we expected to have a range of very different thoughts about the value of nature, to make sure we would elicit the breadth of opinion regarding the value of nature. Hence our participants were as much as possible evenly distributed across nature management organisations, the agricultural sector, government, education and tourism, and we also included citizens with no clear stakes regarding nature. Two other important selection criteria were their availability (since the interview took close to an hour) and their cognitive capacities (sorting 48 cards with hypothetical statements in a relative manner requires a high level of abstract thinking).

Participants were instructed to sort the cards by placing each statement in a column ranging from −5 ("least in line with my thinking") to +5 ("most in line with my thinking") as shown in Fig. 1. We explained which statements to expect beforehand and suggested the participants first divide them in two stacks: agree or disagree. Some of them did so. We gave no specific information regarding Coralita or the state of nature on the islands, since we were interested in extant perceptions. If a participant asked us, for example, about Coralita's impact on biodiversity, we shared our knowledge on that. During the ordering process we engaged in conversation about the participant's thoughts, to clarify interpretations of the statements. We have integrated our notes in the result section, along with the factor analyses of the Q sorts.

4.4. Analysing the Q sorts

We conducted a Principal Component Analysis (PCA) with Varimax rotation on the sorts, using PQmethod (Schmolck, 2014). PCA is applied frequently in environmental research to extract uncorrelated axes of

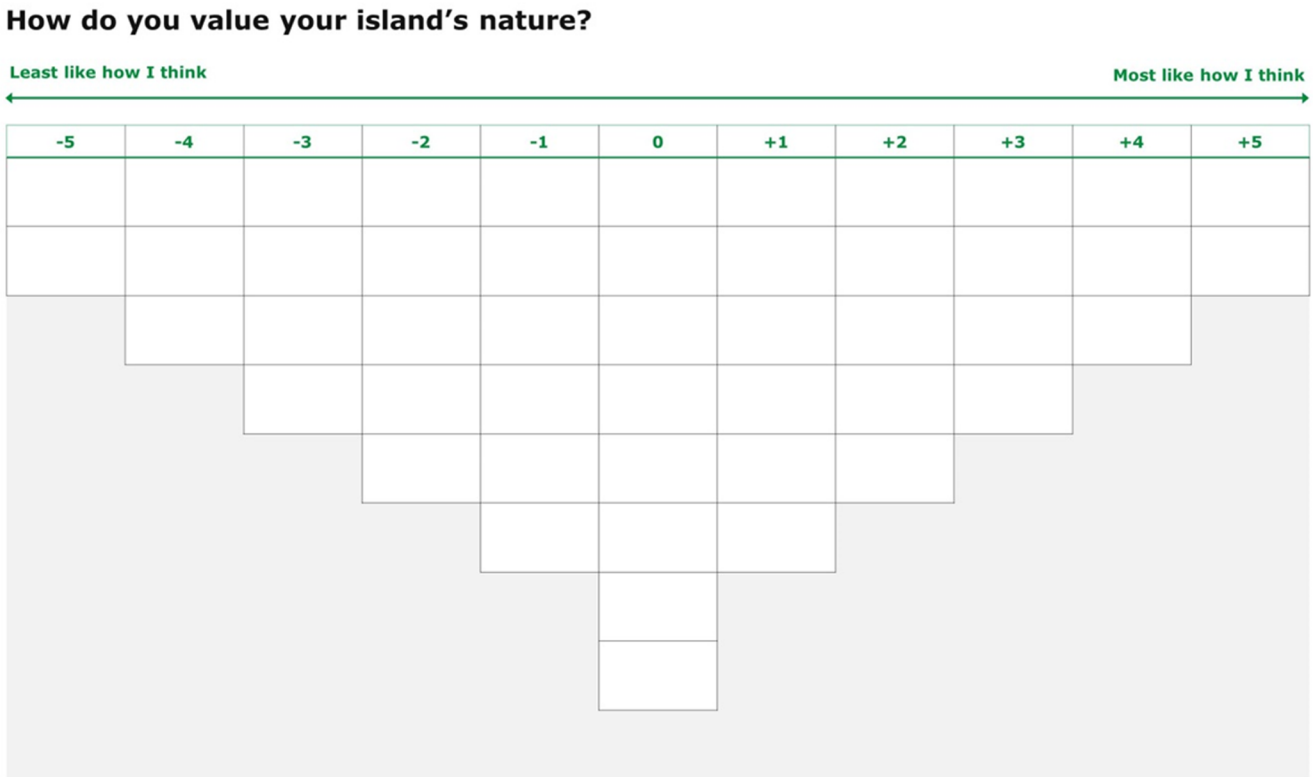

Fig. 2. Board used for Q sorts.

variation (Spruijt et al., 2016; Falk-Petersen, 2014; Cheng and Mattor, 2006). Concerning factor extraction, Kaiser's criterion of including all factors with an Eigenvalue > 1.00 and looking at the scree plot of the Eigenvalue of the factors resulted in big differences in the factors included. As suggested by Peter Schmolck via e-mail (p.c. Schmolck, 30 April 2017), we therefore adhered to a more iterative selection method, by looking at the resulting factor loadings and the amount of significant sorts for different factor solutions. Significant loading is established with help of the formula $ABS(2.58SE) = ABS(\frac{2.58}{\sqrt{N}})$. SE is the standard error, calculated through $1/\sqrt{N}$, where N is the amount of statements, i.e. 48. Thus, every loading greater than ABS(0.37), i.e. loading > 0.37 or loading < -0.37 is significant ($p < 0.01$) (McKeown and Thomas, 2013, 53). Following Schmolck, during the flagging procedure, the correlation between factor scores was kept as low as possible, confounding sorts were not flagged and a minimum of three significantly loading sorts per factor was pursued. This resulted in three factors for each island, which we regard as proxies for perspectives, representing views held about a certain topic. They are discussed below.

5. Results

5.1. Saban perspectives on the value of nature

The data from the Saban participants yielded three main perspectives on the value of nature: *future-oriented nature conservation*, *modern utilitarian* and *optimistic agri-ruralist*. These titles are inspired by the discourses presented in Table 3. We discuss them one by one below and conclude by assessing their implications for reaching agreement on Coralita management. The ranks the participants attributed to the statements are shown in Table 4, organised by landscape value. In Table 4 we have abbreviated the statements as follows: "Important Saba: X" means "X is an important value of Saba's nature"; "Pressure Saba: X" means "X is under pressure on Saba"; "Coralita Saba: X" means "If Coralita would impact X, I would be worried"; "Protect Saba: X" means "We need to protect X on Saba". Tables 1–6 in the Supplementary material show the ranks per discursive element and per factor, and Table 7 the consensus statements.

5.1.1. Future-oriented nature conservation

This perspective contends that nature has an intrinsic value and should be safeguarded for the future; hence it is strongly protection-oriented, while having an optimistic view of the state of nature. In this perspective, nature's intrinsic value and value for future generations are considered to be very important and worthy of protection (scored $+5$ and $+4$). Concerns about a brain drain of young and talented Sabans surfaced in some of the interviews. The perspective strongly rejects any pressure, including Coralita's, on nature's medicinal and spiritual or religious value (both -5). The spiritual and religious value of nature is mostly seen as finding peace of mind. In general, this perspective does not believe that much pressure is being exerted on nature – not even on the aspects that it strongly feels should be protected, namely its intrinsic value and value for future generations. In line with this, Coralita does not raise much concern either, except slightly in relation to aesthetics and biodiversity (both $+2$). Given the perception that neither pressure nor threats are problematic, it is interesting that this is the most protection-oriented factor, with the highest ranks for protection overall. The values specifically deemed to need protecting are tourism, nature's intrinsic value and nature's value for future generations; they are considered important values, but not really under pressure. During the interviews, respondents often mentioned tourism as necessary, but only in a certain way. Large-scale formats with zip lines etcetera are deemed inappropriate for Saba. Values found to be unimportant, such as medicinal value or spiritual value, do not need to be protected. An explanation for the protection focus despite the optimistic view on the condition of nature could be that participants believe that the protection of intrinsic value and values for future generations requires the preventive protection of other values as well. And a protection focus may be inherent to the focus on future generations.

Table 4
Ranks per statement for the factors resulting from the Saban Q sorts.

Statement	Nat. cons.	Mod. util.	Agri-rur.
Important Saba: scenery, sounds and smells	4	5	2
Pressure Saba: scenery, sounds and smells	−1	2	−5
Coralita Saba: scenery, sounds and smells	2	4	−1
Protect Saba: scenery, sounds and smells	2	1	1
Important Saba: agriculture and livestock	−2	4	4
Pressure Saba: agriculture and livestock	−2	3	−1
Coralita Saba: agriculture and livestock	0	3	5
Protect Saba: agriculture and livestock	−1	0	0
Important Saba: variety of animals and plants	3	2	4
Pressure Saba: variety of animals and plants	0	−1	−1
Coralita Saba: variety of animals and plants	2	1	4
Protect Saba: variety of animals and plants	2	0	1
Important Saba: future generations experiencing	4	2	1
Pressure Saba: future generations experiencing	−1	1	−3
Coralita Saba: future generations experiencing	1	1	1
Protect Saba: future generations experiencing	4	1	−4
Important Saba: nature intrinsically	5	0	3
Pressure Saba: nature intrinsically	0	−1	−2
Coralita Saba: nature intrinsically	1	0	−2
Protect Saba: nature intrinsically	5	−1	2
Important Saba: medicine	−3	−1	1
Pressure Saba: medicine	−5	−4	−5
Coralita Saba: medicine	−3	−2	0
Protect Saba: medicine	−2	−3	0
Important Saba: recreation and unwinding	3	−2	−1
Pressure Saba: recreation and unwinding	−3	−2	−3
Coralita Saba: recreation and unwinding	0	−3	−3
Protect Saba: recreation and unwinding	2	−3	0
Important Saba: science and learning	1	2	0
Pressure Saba: science and learning	−2	−3	−2
Coralita Saba: science and learning	−1	−1	−2
Protect Saba: science and learning	1	2	−1
Important Saba: spiritual and religious	0	−5	2
Pressure Saba: spiritual and religious	−5	−4	−2
Coralita Saba: spiritual and religious	−4	−4	0
Protect Saba: spiritual and religious	−3	−5	0
Important Saba: clean air, water and soil	0	1	2
Pressure Saba: clean air, water and soil	−4	0	−3
Coralita Saba: clean air, water and soil	−2	3	1
Protect Saba: clean air, water and soil	1	0	3
Important Saba: tourism opportunities	3	−1	3
Pressure Saba: tourism opportunities	1	−1	−4
Coralita Saba: tourism opportunities	0	0	0
Protect Saba: tourism opportunities	3	−2	2
Important Saba: drinking water and renewable energy	0	5	5
Pressure Saba: drinking water and renewable energy	−4	4	−4
Coralita Saba: drinking water and renewable energy	−1	−2	−1
Protect Saba: drinking water and renewable energy	−1	3	3

5.1.2. Modern utilitarian

This perspective stands out from the others in its articulate rejection of the spiritual or religious value of nature: it is not important, does not need to be protected, Coralita does not affect it, and it is not under pressure. Medicinal and recreational values are neither under pressure nor need to be protected. Instead, this perspective has a modern view of nature, emphasising the utility value of nature: drinking water and renewable energy provision are important (+5), under pressure (+4) and need to be protected (+3). Agriculture is also important (+4), and under pressure from, among others, Coralita, but interestingly enough is seen as not needing to be protected (0). All interviewees stressed the need for Sabans to take up agriculture again to supply themselves. They regard growing crops differently from keeping livestock; whereas crop growing is applauded, livestock are considered a menace, because free roaming goats damage nature and gardens. All interviewees also mentioned the need to involve future generations, expressing both disappointment in current youth and concern about the future available for them. Aesthetics is seen as important (+5) and the potential impact of Coralita is considered to be worrisome (+4). However, the interviews show that Coralita is seen both as enhancing and decreasing aesthetics. Next to aesthetics, Coralita raises worry regarding the supporting cycles of nature (+3). Yet despite acknowledging pressure on agriculture and aesthetics, interviewees with this perspective do not see protection as being a very important concern. This suggests they have a somewhat exploitative view of nature in which nature serves several purposes that are recognised as exerting pressure, but without resulting in interviewees being inclined to protect nature.

5.1.3. Optimistic agri-ruralism

This perspective is explicitly worried about Coralita's impact on agriculture (+5) and on biodiversity (+4), which are considered very important values of nature (both +4), although again a distinction is drawn between keeping livestock and growing crops. Utilities and supporting cycles need to be protected even though they are not under pressure. They are, however, important; a combination that also applies to intrinsic and touristic value. This perspective is the least concerned with pressure on nature, placing all pressure statements at the negative end of the continuum, particularly those concerned with aesthetics (−5), tourism (−4) and future generations (−3). However, in the interviews, the burning of garbage and diesel generators were mentioned as detrimental for the environment. Coralita is explicitly not considered to be a threat to recreational (−3) and scientific (−2) values of nature, since these values are not considered to be important. These are almost the only two values considered to be unimportant. This perspective is rather optimistic: nature is very important in many ways and under little pressure. Yet its adherents do have a clear view on the potential impacts of Coralita and feel quite strongly about protecting important values in a preventive way, whether or not they are under pressure.

5.2. Statian perspectives on the value of nature

In Statia we obtained 32 Q sorts, from which we drew a random sample, as discussed in Section 4.3. This sample yielded three perspectives: *nature conservation for tourism, utilitarian scientists* and *bright future for community sustainability*. The titles are again based on the discourses presented in Table 3. The ranks the participants attributed to the statements are shown in Table 5, organised by landscape value. In Table 5 we have abbreviated the statements as follows: "Important Statia: X" means "X is an important value of Statia's nature"; "Pressure Statia: X" means "X is under pressure on Statia"; "Coralita Statia: X" means "If Coralita would impact X, I would be worried"; "Protect Statia: X" means "We need to protect X on Statia". Tables 8–13 in the Supplementary material show the ranks per discursive element and per factor, and Table 14 the consensus statements.

5.2.1. Nature conservation for tourism

This factor sees the intrinsic value of nature, as well as biodiversity, as being under pressure and therefore requiring protection. Coralita's potential impact on biodiversity and supporting services is worrisome. This perspective scores the importance of tourism conspicuously high (+5) and contends that it warrants protection. Nature thus seems to serve as a tourist attraction, and as neither recreation nor aesthetics score high, tourism for outsiders as a source of income seems most important. Any spiritual or religious value is strongly rejected by this factor, which scores very negatively on all four discursive elements. Pressure on nature scores rather low for most values, with the most negative scores assigned to pressure on medicinal and scientific values (both −5). Somewhat surprisingly, of the three perspectives this one is the most worried about Coralita's potential impacts. The worry focuses on biodiversity and the intrinsic value of nature, seeing both values in need of protection. This would suggest that in this perspective,

Table 5
Ranks per statement for the factors resulting from the Statian Q sorts.

Statement	Nat. cons.	Util. scient.	Comm.sust.
Important Statia: scenery, sounds and smells	2	3	0
Pressure Statia: scenery, sounds and smells	0	1	−3
Coralita Statia: scenery, sounds and smells	0	2	0
Protect Statia: scenery, sounds and smells	1	1	1
Important Statia: agriculture and livestock	−2	1	4
Pressure Statia: agriculture and livestock	−3	−2	0
Coralita Statia: agriculture and livestock	−1	0	1
Protect Statia: agriculture and livestock	−2	−1	3
Important Statia: variety of animals and plants	3	2	1
Pressure Statia: variety of animals and plants	2	−1	−2
Coralita Statia: variety of animals and plants	4	3	−1
Protect Statia: variety of animals and plants	4	3	0
Important Statia: future generations experiencing Statia	1	−2	4
Pressure Statia: future generations experiencing Statia	−1	−1	−2
Coralita Statia: future generations experiencing Statia	2	0	2
Protect Statia: future generations experiencing Statia	1	1	3
Important Statia: nature intrinsically	3	4	2
Pressure Statia: nature intrinsically	4	−5	0
Coralita Statia: nature intrinsically	2	−2	−1
Protect Statia: nature intrinsically	5	0	1
Important Statia: medicine	−2	−3	2
Pressure Statia: medicine	−5	0	−5
Coralita Statia: medicine	−1	−2	0
Protect Statia: medicine	−1	2	−3
Important Statia: recreation and unwinding	1	2	1
Pressure Statia: recreation and unwinding	−3	0	−4
Coralita Statia: recreation and unwinding	0	0	−5
Protect Statia: recreation and unwinding	1	1	−2
Important Statia: science and learning	−1	5	1
Pressure Statia: science and learning	−5	3	−3
Coralita Statia: science and learning	−2	1	−3
Protect Statia: science and learning	0	5	0
Important Statia: spiritual and religious	−4	−1	3
Pressure Statia: spiritual and religious	−4	−3	−2
Coralita Statia: spiritual and religious	−4	−4	−4
Protect Statia: spiritual and religious	−3	−5	3
Important Statia: clean air, water and soil	0	4	5
Pressure Statia: clean air, water and soil	−2	4	0
Coralita Statia: clean air, water and soil	3	0	−1
Protect Statia: clean air, water and soil	0	2	2
Important Statia: tourism opportunities	5	−4	2
Pressure Statia: tourism opportunities	−1	−3	−2
Coralita Statia: tourism opportunities	0	−4	−1
Protect Statia: tourism opportunities	3	−1	−1
Important Statia: drinking water and renewable energy	1	−2	4
Pressure Statia: drinking water and renewable energy	−3	−1	−4
Coralita Statia: drinking water and renewable energy	2	−3	−1
Protect Statia: drinking water and renewable energy	0	0	5

protection is a prevention-oriented approach. Yet, supporting cycles and future generation are seen as only minimally important, not under pressure and scarcely worthy of protection. So, for these values the worry about Coralita is not accompanied by a desire to take preventive measures. In sum, this factor seems to have a rather optimistic view about the state of nature, and sees nature as a major tourist attraction and hence requiring protection.

5.2.2. Utilitarian scientists

This is the only factor on both islands for which science and learning scores very high in importance and is considered to be under pressure (both +5). Interviewees stressed the importance of science for understanding nature and knowing how to take care of it or use it properly. Local knowledge is seen as a kind of science as well. In addition, supporting cycles are seen as very important and under pressure (which the other factors do not think is the case), but do not score very high on protection (+2). More conspicuously, the intrinsic value of nature is very high (+4), but does not require protection (0), presumably due to the pressure on this value and potential impact of Coralita being perceived as low. Biodiversity does require protection, potential impact of Coralita on biodiversity raises worry, and this value is seen as somewhat important (+2). More important is aesthetics (+3), but given low pressure and Coralita-induced worry, no protection of this value is required. This perspective thus clearly sees protection as a measure for abating rather than preventing pressure. Tourism scores very low within this perspective, as do the spiritual and religious values. Interviewees indeed expressed a dislike of tourism as an economic sector for Statia, and a preference for science as a source of income. There is a scientific research station on the island, and some of the interviewees expressed the hope that this would attract an increasing influx of researchers, which would boost the economy. Coralita does not pose much worry in this perspective, except for its impact on biodiversity (+4). This perspective sees two clear uses for nature, one through the supporting cycles that enable life, and the other to contribute to science and learning.

5.2.3. Bright future for community sustainability

This is a perspective of extremes: it is the perspective that scores highest on importance and protection and lowest on pressure and Coralita-induced worry. The perspective appears to be very optimistic; nature is seen as important because of its supporting cycles, its significance for future generations, utilities and agriculture, and even for its spiritual dimension. Like their Saba counterparts, the Statian participants viewed free-ranging cattle as making livestock husbandry undesirable, as opposed to growing crops. This is the only perspective to attach importance to the spiritual and religious value and want it protected (both +3). This factor scores all the important values also high on protection, which suggests a preventive view of protection. Protection is seen as needed most to secure nature's value for utilities, future generations and agriculture and to ensure nature retains its spiritual value. The interviews reveal that the impact of Coralita on aesthetics is not clear-cut and elicited urgent calls to make Statia self-sufficient (again). No value is considered to be under pressure (all scores 0 or lower), and Coralita induces only slight worry for future generations' experience of Statia (+2), which is very important (+4). Conspicuously, this factor is the only factor that thinks the utility value of nature requires protection (+5), while rejecting the idea that the value is under pressure (−4). Thus, this factor sees nature as being of great use to society in every way; utilitarian, via supporting cycles, utilities and agriculture, but also metaphysically for future generations, and spiritually.

6. Discussion

6.1. Comparison of Statia and Saba

From the Q analysis we expected to find *hedonistic* and *natural conservation* perspectives on Saba, emphasising the landscape values of tourism, aesthetics, relaxation and recreation, and biodiversity. On Statia we expected *agri-ruralist* and *utilitarian* perspectives, with agriculture and livestock, utilities and medicinal values of the landscape featuring most prominently. In Table 6 you find an overview of what we actually found.

Before going into our findings, we would like to stress that our

Table 6
Overview of perspectives with their most conspicuous ranks (positive ranks underlined). We only show the scores of +/−5 and +/−4. E.g. no pressure = −5/−4; pressure = +5/+4.

Perspective	Saba			Statia		
Land-scape value	Future-oriented nature conservation	Modern utilitarian	Optimistic agri-ruralist	Nature conservation for tourism	Utilitarian scientists	Bright future for community sustainability
Aesthetics	Important	Important; Coralita worry	No pressure			
Agriculture and livestock		Important	Important; Coralita worry			Important
Biodiversity			Important; Coralita worry	Coralita worry; Protect		
Future generations	Important; Protect		No protection			Pressure
Intrinsic	Important; Protect			Pressure; Protect	Important; Pressure	
Medicine	No pressure	No pressure	No pressure	No pressure		No pressure
Recreation and relaxation						No pressure; No Coralita worry
Science and learning				No pressure	Important; Protect	
Spiritual and religious	No pressure; No Coralita worry	No protection; Not important; No pressure; No Coralita worry		Not important; No pressure; No Coralita worry	No Coralita worry; No protection	No Coralita worry
Supporting cycles	No pressure				Important; pressure	Important
Tourism			No pressure	Important	Not important; No Coralita worry	
Utilities	No pressure	Important; Pressure	Important; No pressure			Important; Protect

method did indeed bring differences between the islands to the fore. This is an important achievement, showing that the approach is capable of picking up nuances. What we found differed slightly from what we expected, though. Aesthetics do indeed feature prominently in one of the Saban perspectives, but not on Statia. Supporting cycles are important to two of the Statian factors, which fits with the utilitarian perspectives. Contrary to our expectations though, agriculture and livestock features prominently in two of Saba's perspectives but in only one of Statia's perspectives. Also unexpectedly, tourism does not feature prominently in any of the Saban perspectives, but does in one of the Statian perspectives. The unfavourable conditions for agriculture on Saba (steep slopes and land scarcity) could make people more aware of its importance. Or, Statians might see agriculture not as a value provided by nature, since the national parks and farms are at quite far apart. Lastly, the negative sentiments regarding livestock may have prompted participants to score the agriculture cards low, which they indeed commented on frequently. Do these insights help us with participatory governance of IAS?

6.2. Eliciting latent problem perceptions with Q

The aim of this research was to develop and validate a method to ascertain stakeholder stances and thus deployed Q methodology to elicit latent problem perceptions, making stakeholders identifiable. We accrued four types of insights.

One type comprises very straightforward insights into views on hypothetical Coralita impacts, as elaborated in Table 7. One Statian factor rated all Coralita-worry statements very low, while another factor would be very worried if Coralita were to impact biodiversity. This is however not where Q's strength lies, since other methods (e.g. a Likert-scale survey) could yield this data too.

The second type of insight is a clear merit of Q: the relative importance of values, both those that are substantive and those that are discursive. Regarding the discursive values, those that scored highest overall were about values being important, the lowest-scoring statements concerned values being under pressure; worry about Coralita scored moderately. Remembering that Q sorts reveal thoughts in a relative manner, this does not necessarily mean that stakeholders do not think nature is under pressure, only that it features less prominently in their thinking than nature's importance. When promoting Coralita management, an argument in terms of the importance of nature might resonate better with stakeholders than arguing that pressure on nature needs to be abated. In addition to the discursive aspects of thought, our approach also elicited substantive aspects that offer handles for Coralita management. For example, within the *nature conservation for tourism* perspective on Statia, protection of biodiversity and the intrinsic value of nature are called for, both of which are considered to be under pressure. Thus, if impact of Coralita on biodiversity can be demonstrated, these stakeholders would presumably support management. However, spiritual and religious statements all scored very low, so arguments linking Coralita to such considerations will not resonate with many.

As mentioned before, our approach proved capable of reflecting differences between contexts of the elicite//d perspectives, in this case revealing differences between Statia and Saba attributable to environmental and socio-economic differences between the islands. This makes it valuable for designing locally appropriate management approaches. However, all this assumes a rather straightforward link between people's perspectives on nature and their susceptibility to certain arguments relating to management measures. The exact relation between concepts such as perceptions, attitude and behaviour is still a heavily debated topic in environmental science and invasive species literature alike. See for example Estévez et al. (2015), who present a tiered system of values, attitudes, risk perceptions and behaviour. Shackleton et al. (2018) point out that we do not even really understand how perceptions come about, and make a first effort to remedy this. The relation between the stakeholder perceptions elicited and behaviour or willingness to manage is outside the scope of this article, but any management effort should definitely take these findings into account.

The third type of insight is into the structure of perspectives by

Table 7
Insights on Coralita management per island and perspective.

Perspective	Insight
Saba	*On Saba, two perspectives' support would be available in the case of impact on agriculture or on biodiversity. Aesthetics is also mentioned as a concern by two perspectives, but the ambiguous effect of Coralita on this value probably in practice limits the potential for agreement on what action should be taken. Two of the perspectives would support preventive measures.*
Future-oriented nature conservation	The only pressure on nature is on tourism, so Coralita impacting on tourism might garner their support. They would also be worried by an impact on aesthetics and biodiversity, so this could offer a hook for Coralita management.
Modern utilitarians	They see large pressure on nature, but are not very protection-oriented. They do assign a high score to potential worry about Coralita's impact on aesthetics, agriculture and supporting cycles. Should impact on any of these values be shown, then they would probably call for Coralita to be managed.
Optimistic agri-ruralists	They worry about the impact of Coralita on agriculture and biodiversity, so Coralita impacting on these might garner their support.
Statia	*Two perspectives share a concern for biodiversity, and two others for supporting cycles and the utility value of nature. Linking Coralita management to these values might resonate. The perspectives would probably not converge in relation to the spiritual and religious meaning of nature, or to its value to science and learning, which are found very important by one perspective, and explicitly not by the other two perspectives. Two of the perspectives would support preventive measures.*
Nature conservation for tourism	Coralita management would be supported if it were found to impact on biodiversity, or to be disliked by tourists, or simply because tackling it would help protect nature in general.
Utilitarian scientists	Protection is not seen as a preventive measure, so Coralita management would presumably only be supported if it were shown to negatively impact biodiversity, as biodiversity is seen as worth protecting.
Bright future for community sustainability	Coralita explicitly induces worry when considering future generations. Since this perspective finds nature's spiritual and religious value to be important too, Coralita management might be perceived as called for, given the responsibility to protect nature for future generations to ensure it can provide all its services to them as well. Also, impacts of Coralita on nature's utility value would probably resonate.

looking at links between values. For example, within one perspective a high score for the importance of biodiversity is combined with attaching high importance to tourism, while in another perspective it is combined with attaching high importance to nature's intrinsic values. Two very different pictures emerge from that: one of biodiversity serving a tourism purpose and one of biodiversity being important per se. For the former, Coralita management would gain strength when somehow involving tourism, while for the latter, arguments around Coralita threatening biodiversity would resonate most. Also insightful is relating discursive values, especially regarding protection. When an important value is not considered to be under pressure but is considered to need protection, it seems that protection is interpreted to mean preventing. This is very different from when an important value is considered to be under pressure but not to need protection.

Lastly, taking the deep understanding of the valuation of nature yielded by Q method combined with the different discursive elements revealed potential (dis)agreement between perspectives. In Table 7 we indicate where overlap and dissonance can be found for both islands.

Our approach certainly resulted in a lot of data, yet some questions arise that merit further investigation. For example, are some landscape values linked to others, such as aesthetics to recreation or tourism? And what use are supporting cycles if not to support other values? They were sometimes nevertheless rated highly without any other value being linked to them. By contrast, intrinsic value of nature was frequently scored highly, but together with other values. So, what does "intrinsic" mean in this case? These paradoxes might have to do with the landscape value typology, or with Q method itself, which assumes that participants have opinions that are arranged in a sequence that can be elicited through the Q sort. The forced nature of Q sorting might, however, also assume a thought-through arrangement where there is none. Prudence should therefore be exercised when interpreting a Q sort, so as not to "see" more than there is. Moreover, the understanding of perspectives as static identities is increasingly challenged, the argument being that it results in entrenched stakeholders (Turnhout et al., 2010) and perspectives should rather be understood as performative practices (Gonzalo-Turpin et al., 2008).

Another question still to be answered is who holds which perspective. The small number of participants and the statistics involved make the results from a Q study unsuitable for relating the participants' traits to the perspectives elicited. A follow-up study could use our results as the basis for a stakeholder analysis, to find out the prominence of the different perspectives and, for example, for analysing the potential for conflict between perspectives (e.g., Brown and Reed, 2012). And of course, some stakeholders might never want to participate in decision-making regarding Coralita, simply for lack of interest. Our method should not be seen as a way to change people's opinion or create problem perceptions where there are none. Stakeholders could be uninformed and therefore not engaged but might also simply not be interested in the topic at hand (Turnhout et al., 2010). Lastly, it is important to stress that our results do not argue for or against participatory governance. Attempts have been made to identify conditioning variables for successful participatory governance (e.g., Newig et al., 2018), and these could be assessed for Coralita on Saba and Statia to see if participatory governance would indeed be appropriate. However, we worked within the general belief in participatory governance literature that stakeholder involvement is beneficial (Lührs et al., 2018). This exercise has resulted in insights into problem perceptions that have so far been latent – particularly insights into the structure of people's perceptions. Understanding structures of thought is very important for stakeholder engagement in participatory governance; it has spawned interesting methods such as cognitive mapping (e.g., Moon and Adams, 2016; Santo et al., 2017). However, such an approach would not work for the case where actors cannot articulate their perceptions because impacts of an ecosystem change are unknown. By combining Q methodology with a nature value typology as we have done, stakeholder perceptions can nevertheless be elicited, and stakeholder engagement be worked towards.

7. Conclusion

Although participation is no guarantee for socially and ecologically successful environmental governance, it is often applied and a large body of literature addresses its optimisation. We found a gap in that literature when it comes to cases where problem perceptions are latent and stakeholders are therefore difficult to identify, which we worked on in this article. As such, we have reported on how we deployed Q methodology to elicit the latent problem perceptions of the inhabitants of Saba and Statia about the invasive alien plant Coralita. To enable participatory governance of ecosystem changes, stakeholders need to be identified, but that is hampered when no clear impacts on people's livelihoods are known. Our approach offers a way around that limitation by combining Q methodology with landscape values and allowed us to identify three perspectives per island of which Table 6 gives an overview. On both islands, some of the perspectives are very nature-

conservation oriented, seeing an intrinsic value in nature, wanting to protect biodiversity and worrying about the impact of Coralita. In addition, there are perspectives which see nature as providing economic services, such as drinking water, electricity or agriculture. Some of the perspectives see protection as a means of abating extant pressure, while others regard protection as a preventive measure. These are all valuable insights for facilitating participatory governance of this issue.

Quite comprehensive impressions are obtained thanks to Q methodology forcing participants to disclose the relative importance of aspects of their views. This is much more insightful than, for example, a Likert-scale survey in which a participant can assign every statement equal weight. Moreover, our approach proved capable of eliciting comprehensive insights into people's thinking about a topic that they have trouble articulating their views on. This is the merit of combining Q methodology, which forces people to express their views in a relative manner, with the landscape value typology. By addressing Coralita via potential impacts on nature, we circumvented the gap in knowledge on the vine's impact. Thus, we identified stakeholders' perceptions regarding Coralita management. This enables their participation in decision-making, and these insights can be taken into account in future research and policy exercises.

We think our approach is also applicable in similar cases where the articulation of perceptions about a change in an ecosystem is hampered because the impacts are not clear but participation of stakeholders is nevertheless required. Future research can build on our insights by furthering our understanding of how to identify stakeholders in such cases, which in turn facilitates participatory governance of complex environmental challenges for which stakeholder involvement is key.

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Appendix A. Supplementary material

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