| Title | Stakeholder perceptions of recreational and management impacts on protected coastal dune systems: A comparison of three European countries |
|---|---|
| Author(s) | Kindermann, Gesche; Gormally, Michael |
| Publication Date | 2013 |
| Publication Information | Gesche Kindermann, Mike Gormally (2013) 'Stakeholder perceptions of recreational and management impacts on protected coastal dune systems: A comparison of three European countries'. Land Use Policy, 31 :472-485. |
| Link to publisher's version | http://dx.doi.org/10.1016/j.landusepol.2012.08.011 |
| Item record | http://hdl.handle.net/10379/3390 |

Volume 31        March 2013        ISSN 0264-8377

ELSEVIER

# Land Use Policy

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# Stakeholder perceptions of recreational and management impacts on protected coastal dune systems: A comparison of three European countries

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ABSTRACT

Coastal dune systems are particularly susceptible to destabilisation through recreational pressure and because of this, conflicts frequently arise between those who want to use the dunes for recreational purposes and those who wish to see these fragile ecosystems protected. In addition, a range of approaches to resolving this conflict are being used in different countries with differing levels of success. To study this conflict, an approach based on the Q-method was applied to three European Union Member States, i.e. Ireland, Scotland and Germany to determine the degree to which there are differences in opinion regarding recreational management in coastal conservation areas and to assess whether there are examples of perceived best management practice that could be applied to some or all of these countries. The Q-method involved using semi-structured interviews of stakeholders (conservationists and non-conservationists, i.e. landowners, locals and landusers) to yield a set of statements relating to recreational and management impacts on protected coastal dune systems in each of the selected countries. Selected statements were then submitted to former interviewees for rating on a seven point scale from complete agreement to complete disagreement. Principle components analysis (PCA) of these ratings (Q-sorts) indicated that while there is much agreement overall (particularly relating to the protection of dune systems while still supporting recreation), stakeholder opinion can be separated according to country of origin. In general, this separation is reflected in the intensive recreational management regime (strict zonation and access restrictions) at the German sites compared to the Scottish (less recreational management) and Irish (absence of recreational management) sites. Significant differences in opinion are most apparent in the sections concerned with restricting access for recreation and the provision of facilities (less acceptable in Scotland and Ireland). We suggest that given Irish stakeholder opinions regarding the potential loss of naturalness through strict recreational management, the Scottish rather than the German model would be more suitable in the Irish context.

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## Introduction

Coastal areas, the interfaces between land and sea, constitute a region of great diversity, both physically and biologically (Westhoff, 1985). There are many different habitats found in coastal zones, but a particularly large diversity of habitat types is found in coastal dune systems, including embryonic dunes, shifting or mobile dunes, many different types of fixed dunes, dune scrub and woodland, dune slacks and machair (Fossitt, 2000; Nairn, 2005; Ranwell, 1959, 1960; Rodwell et al., 2000). Dunes by their nature are dynamic systems and some disturbance is essential for habitats in coastal dune systems (Klijn, 1990). However, costal sand dune systems are also fragile and prone to erosion by wind and water, which can be worsened by human impacts.

### Coastal dune systems and their conservation under European legislation

Coastal areas are, and have been for a long time, a focus for human settlement, placing demands on these areas particularly as a result of housing and infrastructure as well as more traditional landuses such as agriculture (Verhagen, 1990; Westhoff, 1985). In the last 60 years coastal areas have also been targets for the tourism and recreation industries (Cabot, 1977; Catto, 2002; Gormsen, 1997; Helsenfeld et al., 2008; Lemauviel et al., 2003). As a result, coastal areas have become increasingly exposed to new developments such as hotels, campsites and golf courses. In many cases sand dune systems have become transformed to such an extent that they can no longer be considered natural systems (Lemauviel et al., 2003).

However, even in the absence of intense tourism and recreational facilities, dunes are particularly susceptible to

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destabilisation through recreational pressure involving humans, animals and vehicles (Andersen, 1995; Burden and Randerson, 1972; Curr et al., 2000; Hylgaard and Liddle, 1981; Kerbiriou et al., 2008; Kindermann and Gormally, 2010; Liddle and Greig-Smith, 1975a,b; Luckenbach and Bury, 1983; Quigley, 1991; Sun and Liddle, 1993). Because of this, conflicts frequently arise between those who want to use the dunes for recreational purposes and those who wish to see these fragile ecosystems protected. The European Habitats Directive (92/43/EEC) protects habitats across Europe, including many habitats in coastal dune systems. Habitats of European importance are listed in Annex I of the Habitats Directive and some, such as fixed coastal dunes with herbaceous vegetation ('Grey Dunes') and Irish machairs, have been awarded priority conservation status under the directive. The majority of habitats listed in the directive which require special measures to be taken for their protection are designated as Special Areas of Conservation (SACs) in each Member State (MS). There is a requirement for site management so that habitats and species therein are "maintained at, or restored to, a favourable conservation status, while still allowing for human activity to take place" (Bundesministerium für Umwelt, 2008). However, the establishment and management of SACs in the different MS has encountered a number of problems, especially at local level (Krott, 2000; Visser et al., 2007). Problems include a general delay in implementation of the Habitats Directive, resulting in fines from the European Court (Krott, 2000), as well as controversies relating to the designation of SACs without prior consultation with landowners and landusers (Krott, 2000; Visser et al., 2007; Weber and Christophersen, 2002). In many MS, the implementations of SAC designations have met with opposition, which caused delays notably in the establishment of SACs, but also in the implementation of appropriate management strategies.

*Conservation and recreation management in coastal dune systems*

The use of coastal conservation areas for recreational purposes is considered to be legitimate, and the challenge for conservation managers is to balance conservation goals with impacts from human use (Kerbiriou et al., 2008). Although MS (under EU regulation) are obliged to conserve habitats in SACs while allowing for human activity to take place, these two uses can be in conflict with each other (Young et al., 2005).

Orams (1995) lists four possible visitor strategies for the management of wildlife tourism which may be applied to the management of recreational activities in natural areas in general (I-Ling, 2002): (a) physical management; (b) regulatory management, which refers to the introduction of rules and regulations; (c) economic management, where charges are introduced for the use of an area; and (d) educational management, also referred to as soft management. Physical management is a regularly utilised form of management when it comes to areas which are prone to physical stresses such as erosion damage through trampling (Orams, 1995). In relation to educational management, Hughes and Morrison-Saunders (2005) stress the importance of employing the correct level of intensity when it comes to on-site interpretation in particular. An excessively high level of interpretation may have negative effects on site visitors in that it may ruin the experience for visitors by overwhelming them. On the other hand, too little information may leave visitors dissatisfied in that they feel the full meaning or importance of site features cannot be accessed. A similar problem governs the use of regulatory management strategies. Over-regulation may give the visitor the impression that they are prevented from fully experiencing all a site has to offer, while too little regulation may not serve conservation aims (Holden, 2000).

Public participation in conservation management is considered to be a key feature when it comes to successful management, for both recreation and conservation. This approach is increasingly being taken into account in relation to coastal conservation (Cassar, 2003; Johnson and Dagg, 2003; Milligan et al., 2009; O'Mahony et al., 2009; Power et al., 2000), with the need for public participation reiterated in the Aarhus Convention (1998) and by the European Council Directive on public participation (2003/35/EC). Integrated Coastal Zone Management (ICZM), which aims to deliver sustainable development of coastal zones through an integrated planning and management approach for the entire coastal zone, further advocates public participation (European Commission, 2007). While not all European countries have a national strategy, ICZM projects are advocated in all counties and call for an integrated process that provides the opportunity for stakeholders at all levels to participate in the management process (European Commission, 2007; O'Hagan and Ballinger, 2010; McKenna et al., 2008; Rupprecht Consult, 2006). By involving the public in the management process, rules and regulations are not imposed top-down and people are more willing to adhere to them (Johnson and Dagg, 2003). Broadhurst (2001) points out that areas managed with the involvement of the public have a higher success rate than those which exclude the public.

When it comes to management of coastal conservation areas that are being used for recreational activities, all of the above management strategies need to be considered to ensure that the optimal approach is found. While it is important to employ the correct level of management to ensure successful conservation of sites (I-Ling, 2002), this can be difficult to implement and over- or under-management can result in conservation management that is ineffective or perceived to be so (Holden, 2000).

Following a detailed study of the impacts of recreational activities on a coastal dune system in Ireland (Kindermann and Gormally, 2010; Kindermann, 2011), the need for careful management of recreation in such areas was recognised, especially where dune systems in SACs are concerned. In order to establish the best possible strategy for management, the conflict between management of conservation and recreation in Ireland and in two other MS (Scotland and Germany) was assessed. Scotland was chosen because it has similar coastal habitats (particularly machair) to Ireland and similar recreational pressures. Germany was chosen because recreational pressure exceeds that in Ireland as a result of which management intervention is more extensive. Stakeholders' opinions in the three EU countries were explored on the topic of SAC designation and management, with a focus on the application of conservation legislation at ground level. Further investigation followed regarding the impacts of recreation on coastal dune systems in SACs and the effectiveness of management in dealing with these impacts. This included investigating the opinions of stakeholders on the conflict between habitat protection and recreational activities in coastal conservation areas in those three countries.

The aims of this study are to: (1) investigate the degree to which there are differences in opinion between stakeholders (A: between countries overall, B: between conservationists in all three countries, C: between non-conservationists in all three countries, D: between conservationists and non-conservationists overall and in each country) and (2) determine whether there are examples of perceived best management practice in resolving conflict that could be applied to some or all of these countries.

**Materials and methods**

*Site description*

Coastal sites in three European countries, i.e. Ireland, Scotland and Germany were included in this study (Fig. 1). Three coastal dune systems on the Slyne Head Peninsula, Co. Galway, Ireland, were selected, in addition to two dune systems in the Outer Hebrides off the Scottish west coast and two dune systems in the

**Fig. 1.** Location of study sites in Europe.

Niedersächsischen Wattenmeer, Germany. The sites, ranging from 0.75 to 1.5 km$^2$ in size, are all used for recreation and contain sand dune systems designated under the European Habitats Directive (92/43/EEC).

The sites differ in the degree and type of management carried out as well as in the extent of recreational facilities present at each site (Table 1). Additional site information such as distance to population centres and facilities are included in Table 2.

## Methods

The method used to gain further insights into the conflict of conservation and recreation in coastal dune systems and to assess stakeholders' opinions on this conflict was inspired by Q-methodology. Q-Method was first devised in 1935 by William Stephenson, a British psychologist (Brown, 1996). It was originally developed for the scientific study of subjectivity (McKeown and Thomas, 1988), as a means of revealing the subjectivity involved in any given situation (Brown, 1996; Ellis et al., 2007). Its advantages over other methods are that it combines the strengths of both qualitative and quantitative research methods by providing insights into attitudes while providing statistical rigour (Addams and Proops, 2000; Brown, 1996; Webler et al., 2009). Q-Methodology benefits are that it is replicable and provides empirical rigour while being participant driven (Ellis et al., 2007; Frantzi et al., 2009; Guimaraes, 2009), in addition to which it 'involves a statistical multivariate analysis of opinions with minimal researcher's bias' (Visser et al., 2007). Yet, despite being a very valued tool in the analysis of stakeholder opinion, Q-methodology has its limitations. Although the method is straightforward, the research design and the initial stages of the method are time-consuming and laborious (Frantzi et al., 2009; Guimaraes, 2009). In addition, while Q-methodology has the benefit of providing statistically

**Table 1**
Overview of coastal study sites in Ireland, Scotland and Germany in 2006.

| Sites | Physical measures | Regulatory measures | Economic measures | Educational measures | Additional features |
|---|---|---|---|---|---|
| **Ireland** | | | | | |
| Aillebrack | Car park (50 cars) | – | – | – | Goal posts (2 sets) Camp site nearby (<100) |
| Truska Doonloughan | – | – | – | – | Surf beach Archaeological remains |
| Mannin | Fenced 2 unlocked gates | – | – | – | Goal posts Caravans |
| **Scotland** | | | | | |
| Clachan Sands | Parking bay (3–4 cars) Picnic benches | – | – | – | Cemetery |
| Traigh na Berie | Car park (<10 cars) Parking bay (3–4 cars) Partially fenced Public toilets Rubbish bins Picnic benches | Warning signs to prevent vehicle access | – | – | Camp site on site (<100) |
| **Germany** | | | | | |
| Schillig | Car park (>250) Rubbish bins Public toilets | Sign-posted usage zones Restricted access Rangers | Sun chair (*Strand-korb*) rental | Information panels Guided walks | Play ground Changing facilities Camp site adjacent (>1500) |
| Norderney | Car park (>100) Rubbish bins Public toilets Riding tracks Cycle paths Boardwalks | Sign-posted usage zones Restricted access Rangers | Sun chair (*Strand-korb*) rental | Information panels Guided walks Self guided education path: '*Bar-kenpad*' | Play ground Changing facilities Camp site nearby (~200) |

**Table 2**
Distances from the coastal study sites in Ireland, Scotland and Germany to the nearest towns, hotels, camp sites and public transport rounded to the nearest kilometre.

| Distance to nearest | Town (km) | Hotel/hostel (km) | Camp site (km) | Bus stop (km) | No. of busses (per day) |
|---|---|---|---|---|---|
| **Ireland** | | | | | |
| Aillebrack | 15 | 6 | <1 | 5 | <5 |
| Truska/Doonloughan | 14 | 5 | 5 | 6 | <5 |
| Mannin | 12 | 2 | 7 | 2 | <5 |
| **Scotland** | | | | | |
| Clachan Sands | 10 | 12 | 12 | ~2 | >30 |
| Traigh na Berie | >50 | 5 | On site | ~2 | 20–30 |
| **Germany** | | | | | |
| Schillig[*] | <1 | <1 | On site | <1 | 5–10 |
| Norderney | 3 | <1 | <1 | On site | 20–30 |

[*] A small train runs on roads offering sightseeing tours and a connection to nearby facilities. This train stops at the Schillig site up to 9 times a day.

significant results without requiring a large sample population, a small sample size can also mean that the results cannot be seen as statistically representative of the whole population (Doody et al., 2009). However, while it cannot be used to determine exactly what proportion of the population hold a particular view, Q-methodology provides an accurate reflection of the different perspectives that exist within the population and the differences that exist between stakeholder groups (Urquhart et al., 2012).

The initial uses of Q-methodology were predominantly in social sciences, however its use in the assessment of opinions on environmental management and policy has become more frequent (Addams and Proops, 2000; Brodt et al., 2006; Frantzi et al., 2009; Guimaraes, 2009; Urquhart et al., 2012; Visser et al., 2007). Five distinct stages are recognised (Fig. 2).

*Q-Methodology*

1. The first step was to choose a theme, discourse or conflict to study which in this case was the management of coastal conservation sites subject to recreational activity. Following this, stakeholders who represent different sides and levels of the conflict were identified. Within the context of the present study these constitute landowners, conservation managers, archaeologists, NGO members and landusers including farmers and members of the tourism and recreation industry.

2. Having identified the stakeholders, the next step was to investigate the concourse, the communication around the conflict (Brown, 1996) and statements expressing the opinions of the stakeholders were collected. This was done by meeting the stakeholders and conducting semi-structured interviews where the topics of conservation but not the exact questions were predefined. The topics discussed in the interviews ranged from conservation legislation and conservation management to landuses such as recreation and agriculture. Overall, 31 stakeholders (12 in Ireland, 9 in Scotland and 10 in Germany) were interviewed between January 2006 and August 2006 to gather statements for the final Q-sort (Step 4). While written records were made during all interviews, most interviews were recorded to provide a comprehensive account of all the different stakeholders' views on the conflict matter.

3. The recordings were then annotated using Annotape, computer software that aids the selection and transcription process, and from this and the written accounts, 320 statements were extracted. From this, 63 statements were chosen to represent the full spectrum of opinions surrounding the conflict relating to recreational activities in coastal conservation areas, specifically dealing with conservation legislation, conservation management and recreation in coastal conservation areas.

Following the statement selection process is the main focus of a study using Q-methodology in that participants are asked to undertake a 'Q-sort', i.e. a process in which individual stakeholders are asked to order the set of statements according to their own opinion. This is done by first asking participants to order the statements according to whether they agreed with the statements or disagreed with them, with the remainder being left in a third category. Having ordered the statements into these three categories, the participants were then asked to rank the statements along a five-point scale ranging from 'most agree' (+3) to 'most disagree' (−3), with 0 representing 'neutral/don't know'. Before the main Q-sort was administered, the 63 selected statements were used in a Q-sort trial, administered to a subset of Irish stakeholders. Having completed the Q-sort trial, participants were asked to comment on the Q-statements, with particular focus on whether the statements were easy to understand and if there was any repetition, i.e. if there were any statements they felt expressed the same opinion. Based on the comments and
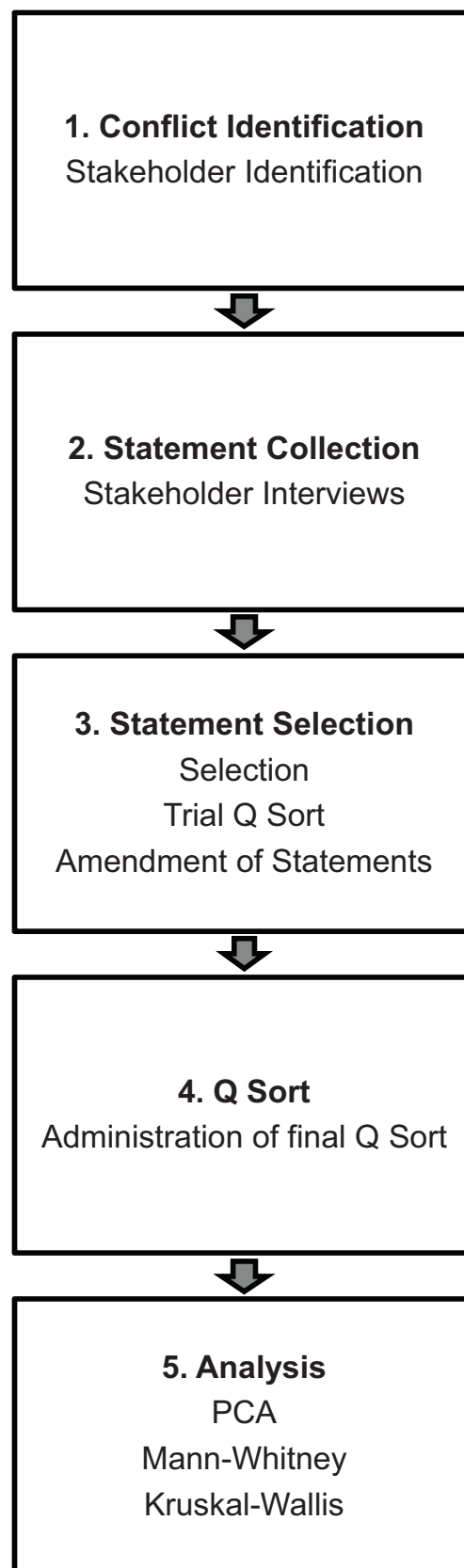


**Fig. 2.** Stages 1–5 involved in Q-method.

**Table 3**
Number stakeholders involved in Q-method.

| Stakeholder category | Country | | |
|---|---|---|---|
| | Ireland | Scotland | Germany |
| **Conservationists** | | | |
| Conservation managers | 2 | 2 | 2 |
| Local conservation rep/ranger | 2 | 1 | 2 |
| NGO | 2 | 2 | 1 |
| **Non-conservationists** | | | |
| Landowners | 4 | 4 | – |
| Landusers | 2 | 3 | 7 |
| Total | 12 | 12 | 12 |

suggestions received, the selected statements were amended and reviewed before a final selection was made. This lead to the number of Q-sort statements used in the Q-sort process being reduced to 36. It was considered that this was an adequate number to avoid overburdening participants while also ensuring that all sides of the conflict were represented. These statements can be divided into the following categories: conservation (12), recreation (12) and management (12) (Table 3).

4. The 36 statements chosen were then used in the final Q-sort procedure. This was administered to 36 stakeholders, 12 in each country (Table 3). Both stakeholders previously interviewed and stakeholders additionally selected (to ensure all stakeholder groups were adequately represented) were asked to participate in this process. The Q-sorts were carried out either by direct assistance, using an A1 scoring sheet and statement cards with the same researcher present for all Q-sorts, or electronically, due to geographical distances involved in the study, with all necessary information provided to the stakeholder. The final Q-sorts for every participant were recorded for analysis. Upon completion of the Q-sort procedure, participants were asked to elaborate and explain their statement ratings further, with special attention being paid to those statements ranked +3 or −3. This additional information was recorded for use in the discussion.

5. The Q-sort results were entered into a matrix with 36 columns representing the Q-sorts and 36 rows for the statements. Using Brodgar (version 2.6.5), Principal Components Analysis (PCA) was then carried out on the matrix, resulting in a correlation matrix which indicated the similarities between the different Q-sorts. The aim was to group stakeholders with similar opinions together, based on agreement or disagreement with the chosen statements, and to determine patterns in the responses given. This was followed by analysis of the scores for each individual statement, which was done using GraphPad Instat (version 3) to analyse the scores awarded to statements between groups of stakeholders. The stakeholders were grouped according to country to compare: (1) all stakeholders overall (O); (2) comparisons of conservationists (C) across countries; and (3) all non-conservationists (N) across countries. Then conservationists and non-conservationists were compared to each other, first overall and then for each of the three countries. This analysis was done using non-parametric tests (Kruskal–Wallis followed by post hoc tests (Nemenyi and Dunn's multiple comparisons tests) for comparisons between countries and Mann–Whitney for comparisons between conservationists and non-conservationists) on non-transformed ratings, which were also used to analyse counts of zero ratings per statement (converted to proportions of group size).

## Results

The Q-sort process was successful and although many of the stakeholders who carried out the Q-sorts had comments on
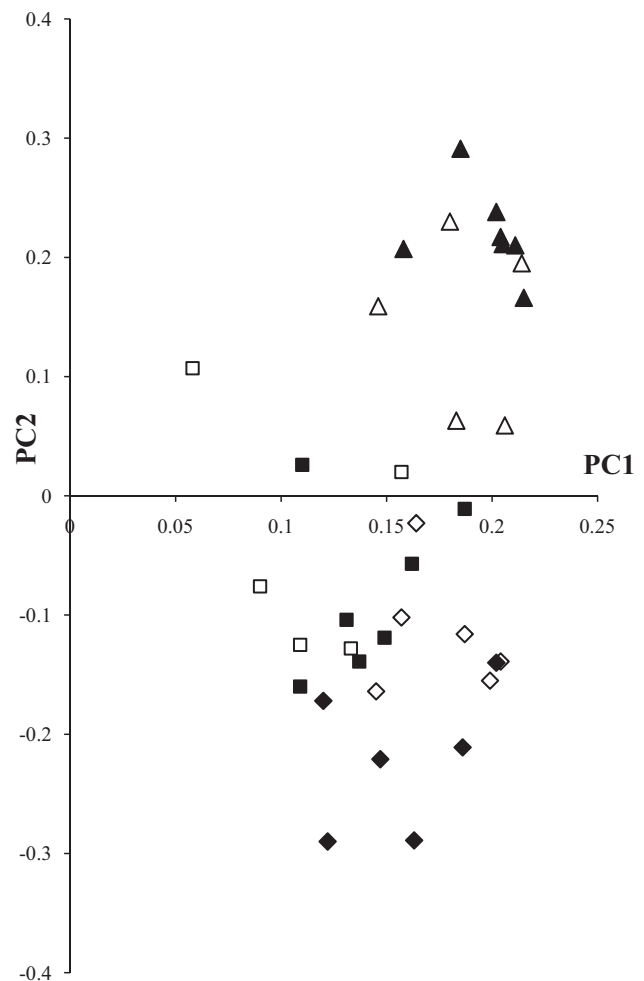


**Fig. 3.** Loading plot of original Q-sorts for Ireland (◇/◆), Scotland (□/■) and Germany (△/▲) on PC1 and PC2. Q-Sorts are labelled as conservationists (white) and non-conservationists (black).

individual statements, there were no difficulties with the overall process and there was no recurring common observation on the Q-sorting process or on individual statements.

The PCA carried out on the Q-sorts yielded eight components with an Eigenvalue >1, but only the first two principal components (PC1 and PC2) carry a significant proportion (58.3%; PC1 = 48.7% and PC2 = 9.6%) of the total variation (Fig. 3). All Q-sorts have positive PC1 scores, while the PC2 scores are both positive and negative. The PC2 scores divide the Q-scores into distinct groups, differentiating roughly between countries. All German and Irish Q-sorts have high positive and negative scores respectively, while nine of the Scottish scores are negative and three are positive. Overall the results indicate that there are distinct differences as to how the stakeholders in the three countries view the conflict between conservation and recreation in coastal areas in their own countries.

The spread of Q-sorts (Fig. 3) indicates that it is differing opinions between countries rather than conservationist versus non-conservationist stakeholder groups that is mostly responsible for the differences. Nonetheless, the spread of scores does indicate that it is non-conservationists rather than conservationists both in Germany and particularly in Ireland who yield the most extreme scores along PC2.

A majority of overall stakeholders (O) rated a large proportion of the statements (64%) in the same way (Fig. 4) with 56% of statements being rated positively by all stakeholders (high density of statements towards the positive side of PC1) and 8% of statements

**Fig. 4.** Score plot of statements (S) on PC1 and PC2. Statements are grouped according to positives and negative scores awarded by stakeholders.

being rated negatively by all stakeholders (located towards the negative side of PC1). This agreement (positive and negative) among stakeholders defines PC1 and accounts for the positive PC1 loadings of all Q-sorts in Fig. 3.

Tables 4a–4c give full P-values to interpret the significance of difference between the median ratings for each statement but Visser et al. (2007) states that P-values can be interpreted using conventional thresholds (as given in Tables 4a–4c) or with the condition that the averages are at least one unit apart. Tables 4a–4c indicate that only those medians significant at $P < 0.01$ are at least one unit apart and therefore, P-values >0.01 will be deemed as non-significant for the purposes of this study. Fig. 5 indicates the differences ($P > 0.05$; $0.001 < P < 0.01$; $P < 0.001$) between the overall scores awarded to statements by stakeholders in the Q-sort process, where for only 11 statements P is less than 0.01 indicating that there is much agreement between stakeholders which is supported by Fig. 4. Points at the extreme ends of PC2 in Fig. 5 are those statements which have the greatest range of scores from the positive to the negative and account for the spread of points along PC2 in Fig. 3.

For each statement median response ratings (Tables 4a–4c) were compared between countries, comparing overall results (O) and results for each stakeholder group (i.e. conservationists (C) and non-conservationists (N)). These results are grouped under issues relating to conservation, recreation and management. Of the 36 statements, 11 show significant differences between the overall scores (O) (Fig. 5), while 12 show significant differences between non-conservationists (N) (Tables 4a–4c), of which two statements (hereafter referred to as S) (S31 and S32) have P-values less than 0.001.

## Discussion

The results (Fig. 3) of the Q-sort analysis show that there are clear differences between countries (PC2), and while there are significant differences between scores, there is a substantial amount of agreement between stakeholders (PC1). Agreement among stakeholders can be found on issues such as the need for conservation, the need for access to coastal areas and public participation. The disagreement between the different stakeholders is centred on issues relating to conservation legislation and to benefits gained from tourism and recreation and site management (e.g. imposing of restrictions and the provision of facilities). While 58.3% of the spread of Q-sorts are explained by the first two PCs, the high standard deviation for some statements with no significant differences in opinion indicate that 41.7% of the variation between Q-sorts does not fit any predefined groups and that there are differences of opinion within these groups as well.

### Agreement among stakeholders

The highest common agreement between all stakeholders (O) was for S1 ('Coastal amenities are part of our national heritage, they must be protected for future generations as well as for their tourism value.') and S11 ('It is everybody's responsibility to protect a coastal conservation site, irrespective of ownership.'). These statements which also showed strong agreement from the conservationists (C) and non-conservationists (N) indicate that there is an agreement among all stakeholder groups that there is a need for conservation of coastal habitats not solely for their conservation value but also for tourism and recreation which takes place within them. This is further supported by common overall (O) agreement with S16, which emphasises the economic benefits from tourism and recreation. There is also agreement that access should be granted (S13) and damage caused by recreationists is recognised in all three countries studied (S21 and S22). With regard to the management of the sites, there is common agreement that this should be done using long-term planning (S30) with clear guidelines (S33) which ensure conservation, but not at the expense of other landusers (S14 and S26). There is agreement that management should involve the prevention of damaging activities (S27), should include public participation (S11) and the use of signs and information panels (S34).

For five statements there was common (dis)agreement between most stakeholder groups with significant differences between scores for at least one of the stakeholder groups, indicating significant differences in the levels of agreement or disagreement with

**Table 4a**
Results for the *q*-sort analysis of statements on conservation.

| | Statements: conservation | Statistics[a] | $P_{(diff)}$ |
|---|---|---|---|
| 1 | Coastal amenities are part of our national heritage; they must be protected for future generations as well as for their tourism value. | O | 0.8639 |
| | | C | 0.5169 |
| | | N | 0.3205 |
| 2 | If the plants and animals were there 100 years ago and they are still here now, then surely they are not under threat? | O | 0.0141 |
| | | C | 0.2748 |
| | | N | 0.0121 |
| 3 | It is our obligation to comply with European conservation legislation, even if that means upsetting a few people. | O | 0.001* |
| | | C | 0.0859 |
| | a: *q* = 3.86, *P* < 0.05; b: *q* = 4.85, *P* < 0.01; c: *Q* = 2.54, *P* < 0.05; d: *Q* = 2.95, *P* < 0.01 | N | 0.0041* |
| 4 | The national conservation body has been negligent in its responsibilities to designate and protect priority habitats. | O | 0.0218 |
| | | C | 0.5318 |
| | | N | 0.0213 |
| 5 | Most damage is done through ignorance rather than deliberate action. | O | 0.3746 |
| | | C | 0.3873 |
| | | N | 0.1695 |
| 6 | The conservation body has the power to stop people from doing something they are not supposed to do and they exercise this power. | O | 0.0472 |
| | | C | 0.9508 |
| | e: *Q* = 3.04, *P* < 0.01 | N | 0.0062* |
| 7 | The Government's lack of action has meant that the protected area designations aren't worth the paper they are printed on and precious sites are being lost every day. | O | 0.0717 |
| | | C | 0.8129 |
| | | N | 0.0754 |
| 8 | Conservation designations make life more difficult for landowners as they involve a lot of paper work. | O | 0.8104 |
| | | C | 0.1798 |
| | | N | 0.0856 |
| 9 | All landowners and local residents were consulted in the designation process. | O | 0.0759 |
| | | C | 0.021 |
| | | N | 0.812 |
| 10 | There are no problems between landusers and landowners here. | O | 0.5542 |
| | | C | 0.2536 |
| | | N | 0.9493 |

Table 4a (*Continued*)

| | Statements: conservation | Statistics[a] | | $P_{(diff)}$ |
|---|---|---|---|---|
| 11 | It is everybody's responsibility to protect a coastal conservation site, irrespective of ownership. | O | | 0.3367 |
| | | C | | 0.5161 |
| | | N | | 0.5051 |
| 12 | There is no point in trying to involve the public in the management process, people in general have no interest in getting involved. | O | | 0.8811 |
| | | C | | 0.1136 |
| | | N | | 0.6001 |

[a] Scales show median scores for Ireland (♦), Scotland (■) and Germany (▲) overall (O), for conservationists (C) and non-conservationists (N) and *P*-values of the difference between the scores of the three countries.($P_{(diff)}$) was calculated using Kruskal–Wallis (corrected for tied ranks) and Nemenyi ($q$) and Dunn's ($Q$) multiple comparison tests for even and uneven sample sizes respectively. Countries with the same superscript letter indicate significant differences between the medians.

[*] $P < 0.01$.

these statements. Overall, stakeholder groups in all countries (O) agree with S15 ('Tourists are the greatest asset to this coastal area.') but the level of agreement for Germany is significantly more positive than either Scotland or Ireland. While in all three countries the tourism and recreation industry plays an important role, in Germany the visitor numbers to the sites are much larger (as capacity figures for car parks and camp sites in Table 1 show) and all the German non-conservationist respondents benefit directly from the tourism and recreation industry, as they are all involved in either a tourism or recreation related business. This was not the case in Ireland and Scotland where landowners without direct links to this industry were involved in the survey. With regard to facilities, there is agreement that toilet facilities are required at coastal conservation sites (S23), however less so in Ireland than in the other two countries. This is probably related to the lack of facilities at any of the Irish sites while both German and one of the Scottish sites did have toilet facilities. There are also differences in opinions regarding the provision of facilities in general (S24, see "Disagreement among stakeholders" section), which have an influence on the opinions of Irish stakeholders with regard to S23.

In addition to these statements, S25 shows that there is agreement that the conservation approach taken needs to be flexible, taking local conditions into consideration. However, German scores

(O and N) are significantly weaker than those in Ireland (O and N) and Scotland (O), showing differences in the strength of agreement with this statement. The weaker German response can possibly be explained by the fact that in Germany there is much higher pressure on the coastal sites with higher visitor numbers to the area (Norderney: 426,533 visitors in 2007, Schillig: 255,302 visitors in 2007) (Staatsbad Norderney, 2010; Wangerland, 2010 respectively) than in Ireland (visitor centre in Cilfden (nearest town, ~15 km): 61,670 visitors in 2007) (Failte Ireland, 2010) and Scotland (Outer Hebrides overall: 195,766 visitors in 2006) (VisitScotland, 2007), requiring stricter management measures that cannot always be fine-tuned to local conditions. Comments by German respondents suggest that they felt that a more flexible approach might be insufficient in responding to the present visitor pressures. In addition, Scottish and Irish sites also incorporate some agricultural landuse (absent in Germany), for which flexibility in land management is an important consideration. Yet, despite the call for a flexible management approach, all agree that some restrictions need to be in place and Scotland (O and N) shows a significantly stronger response to this than its Irish counterparts (S28). Comments by Scottish respondents indicate they feel there is a need for restrictions, to control recreation on their sites, yet they would like to see these restrictions tailored to meet the individual requirements of specific sites.
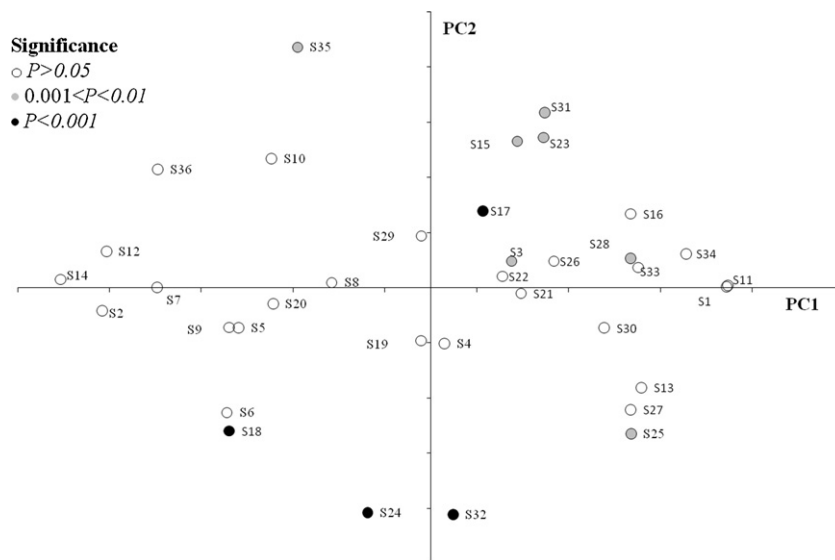


**Fig. 5.** Score plot of statements (S) on PC1 and PC2. Statements are grouped according to significance levels between overall scores of the three countries.

**Table 4b**
Results for the *q*-sort analysis of statements on recreation.

| | Statements: recreation | Statistics[a] | $P_{(diff)}$ |
|---|---|---|---|
| 13 | There has to be access to beaches as they are a common amenity. | O  | 0.0155 |
| | | C | 0.0807 |
| | | N | 0.1693 |
| 14 | I would like to see recreationists being denied access to coastal conservation areas by strict conservation rules. | O | 0.0671 |
| | | C | 0.4972 |
| | | N | 0.1021 |
| 15 | Tourists are the greatest asset to this coastal area. | O | 0.0062* |
| | | C | 0.1375 |
| | a (◆): $q = 3.36$, $P < 0.01$; b (■): $q = 4.04$, $P < 0.05$ | N | 0.0429 |
| 16 | An intact natural dune landscape, with its complete fauna and flora is the best advertisement for an area and results in higher visitor numbers and more money for the area. | O | 0.2035 |
| | | C | 0.8449 |
| | | N | 0.1695 |
| 17 | Money brought by visitors into the area can be used to effectively protect the dunes. | O | 0.0004* |
| | | C | 0.0654 |
| | c (◆): $q = 4.38$, $P < 0.01$; d (■): $q = 4.66$, $P < 0.01$; e: Q (◆) $= 2.58$, $P < 0.05$; f (■): $Q = 2.69$, $P < 0.05$ | N | 0.005* |
| 18 | The increased visitor numbers to our beaches have caused a lot of damage and the beaches are no longer as attractive as they used to be. | O | 0.0008* |
| | | C | 0.1545 |
| | g: $q = 5.03$, $P < 0.01$; h: $q = 3.64$, $P < 0.05$; i: $Q = 2.83$, $P < 0.05$; j: $Q = 2.47$, $P < 0.05$ | N | 0.0062* |
| 19 | There is always a problem with erosion in sand dunes, it has nothing to do with tourists and recreationists. | O | 0.5346 |
| | | C | 0.2957 |
| | | N | 0.7282 |
| 20 | Recreation doesn't damage the environment where carrying capacities are managed in a sustainable manner as they are here. | O | 0.0621 |
| | | C | 0.9591 |
| | k: $Q = 2.99$, $P < 0.01$ | N | 0.005* |
| 21 | Surfers, bikers and other visitors are causing untold damage to fragile protected dune systems. | O | 0.229 |
| | | C | 0.7471 |
| | | N | 0.2919 |
| 22 | It is quad bikes in particular that cause the damage, they tear up the grass and they should be banned. | O | 0.4261 |
| | | C | 0.1458 |
| | | N | 0.1512 |

Table 4b (*Continued*)

| | Statements: recreation | Statistics[a] | | $P_{(diff)}$ |
|---|---|---|---|---|
| 23 | There should be facilities such as toilets provided. | O | | 0.003[*] |
| | | C | | 0.1967 |
| | l: $q = 4.66$, $P < 0.01$; m ($\blacklozenge$): $Q = 2.99$, $P < 0.01$ | N | | 0.0071[*] |
| 24 | The danger is that once you provide all the facilities more people will come and you create a snowball effect. | O | | 0.0002[*] |
| | | C | | 0.0343 |
| | n: $q = 3.81$, $P < 0.05$; o: $q = 5.56$, $P < 0.001$; p ($\blacklozenge$): $Q = 2.98$, $P < 0.05$ | N | | 0.0061[*] |

[a] Scales show median scores for Ireland ($\blacklozenge$), Scotland ($\blacksquare$) and Germany ($\blacktriangle$) overall (O), for conservationists (C) and non-conservationists (N) and P-values of the difference between the scores of the three countries. ($P_{(diff)}$) was calculated using Kruskal-Wallis (corrected for tied ranks) and Nemenyi ($q$) and Dunn's ($Q$) multiple comparison tests for even and uneven sample sizes respectively. Countries with the same superscript letter indicate significant differences between the medians.

[*] $P < 0.01$

An example mentioned in this context was that while recreationists should be prevented from driving onto the sites, landowners should be permitted to do so to maintain essential farming activities.

The responses for S31 ('By sacrificing some areas to recreationists other areas can be protected for nature conservation.') indicate agreement with the need for management and with the restriction of recreationists to certain areas. This is already done in Germany where there are different usage zones (Table 1), with some for recreational usage only, while in others these activities would not be permitted. The German management strategy even includes designations of specific areas for specific activities, such as special areas for children to play, camping areas, areas designated for flying kites or other sports and parts of beaches designated only for visitors with dogs. Scotland partly employs this approach as well, but only in relation to camping at one of the sites, where camping is now restricted to a camp site to protect the remainder of the site from damage through camper vans, tents, camp fires and vehicular traffic. In Ireland this approach has not been used so far which could explain the significantly lower levels of agreement among the Irish (O and N) and Scottish (N) compared to their German counterparts.

*Disagreement among stakeholders*

There are eight statements for which respondents show opposite opinions and where responses are significantly different ($P \leq 0.01$) for at least one of the stakeholder groups (Tables 4a–4c). The division of significantly different statements according to categories show that in the conservation section there are only two statements (S3 and S6) triggering significant levels of disagreement. S3 ('It is our obligation to comply with European conservation legislation, even if that means upsetting a few people.') shows a mixed overall response (O), with the positive responses of Ireland and Germany being significantly different from the neutral Scottish response, which is also mirrored in the non-conservationist response (N). Scottish non-conservationist stakeholders, in particular, feel that it is important to consider local conditions and adapt the implementation of rules to them, as indicated in the results for S25 (see "Agreement among stakeholders" section). A recurring comment from Scottish respondents was that broad European legislation did not take into consideration the presence of a special coastal habitat (machair), unique to Scotland and Ireland. Scottish stakeholders felt national legislation was more adapted to local conditions and special habitats than European legislation.

For S6 ('The conservation body has the power to stop people from doing something they are not supposed to do and they exercise this power.') the scores show that the Irish negative responses

by non-conservationists (N) differ significantly from the German (N) positive ones. Conversations with Irish non-conservationist stakeholders indicate that they felt the Irish conservation body does not have a strong presence on conservation sites and hence there is no control of damaging activities. In Germany, on the other hand, rangers are present at the sites (Table 1) and stakeholders feel that they deal adequately with damaging activities.

In the recreation section (Table 4b) there were three issues for which responses were significantly different among stakeholders: issues dealing with the use of money brought by recreationists for conservation (S17), the loss of attractiveness due to increased visitor numbers (S18) and the provision of facilities for recreationists (S24). With regard to the use of the money brought into the area to effectively conserve the sites (S17), there was agreement between all Scottish and German overall (O) and non-conservationists (N) scores, which differed significantly from the neutral Irish scores (O and N). In both Scotland and Germany some of the money coming into the area was used to provide information and facilities for visitors, such as information and directional signs, parking facilities, toilets or camp sites, while none of these facilities are present at the Irish sites (Table 1), and this may have influenced the strength of the Irish response to this statement.

While the German and Scottish respondents did not agree that their beaches had lost attractiveness due to increased tourist numbers, the overall German negative response was, nevertheless, significantly stronger than that of the Scots and the Irish (O and N). In particular, the Irish (unlike the Scots) agreed with S18, a response which may have been influenced by damage which has already been incurred on the Irish sites by recreationists (Kindermann and Gormally, 2010). Nevertheless, in response to S20, the Germans indicate that they are aware of the damage that can be caused by recreationists. The statements concerned with the provision of facilities at the sites triggered significant differences between stakeholders. S24 (and S23 as discussed in "Agreement among stakeholders" section) stands out (Fig. 4) as having strong influence on the distribution of stakeholders along PC2 (Fig. 3). S24 ('The danger is that once you provide all the facilities more people will come and you create a snowball effect.') produced significantly negative scores for German respondents (O and N) compared to positive scores in Ireland (O and N) and Scotland (O). The provision of facilities was a worry especially for Irish respondents. None of the Irish sites has facilities, with the exception of one which has a golf course car park close by, while the sites in both other countries have at least parking facilities specifically for visitors to the sites (Table 1). The opinion expressed by German respondents in conversation was that the facilities present were essential to

**Table 4c**

Results for the *q*-sort analysis of statements on management.

| | Statements: management | Statistics[a] | $P_{(diff)}$ |
|---|---|---|---|
| 25 | Conservation may be important, but a flexible approach taking local conditions into account when carrying out specific measures is essential. | O | 0.0083[*] |
| | | C | 0.1083 |
| | a (♦): *q* = 3.72,*P* < 0.05; b (■): *q* = 3.38, *P* < 0.05; c: *Q* = 2.93,*P* < 0.05 | N | 0.0086[*] |
| 26 | There has to be a balance, only thinking about birds and conservation to the exclusion of the other landusers is not on. | O | 0.5511 |
| | | C | 0.1505 |
| | | N | 0.3625 |
| 27 | The ideal management for coastal zones is to stop the main damaging activities while still letting people use the site (that way everybody benefits). | O | 0.0127 |
| | | C | 0.3277 |
| | | N | 0.0361 |
| 28 | Some restrictions need to be in place to control people who come into coastal conservation areas. | O | 0.0071[*] |
| | | C | 0.6685 |
| | d: *q* = 3.85, *P*<0.01; e: *Q* = 2.97*P*<0.01 | N | 0.0056[*] |
| 29 | Ideally dunes and grasslands should be policed or protected by the landowners. | O | 0.748 |
| | | C | 0.2775 |
| | | N | 0.4641 |
| 30 | Dune management, dune conservation and damage control needs to be done using long-term planning. | O | 0.0801 |
| | | C | 0.1729 |
| | | N | 0.181 |
| 31 | By sacrificing some areas to recreationists, other areas can be protected for nature conservation. | O | 0.0059[*] |
| | | C | 0.9817 |
| | f (♦):*q* = 4.15, *P*<0.01; g (♦): *Q* = 3.39, *P*<0.001; h (■): *Q* = 2.44, *P* < 0.05 | N | 0.0008[*] |
| 32 | In relation to access, the emphasis should be on responsible behaviour by the public, not on restriction. | O | <0.0001[*] |
| | | C | 0.0779 |
| | i (♦): *q* = 5.03,*P*<0.01; j (■): *q* = 5.58, *P*<0.001; k (♦): *Q* = 2.79, *P*<0.05; l (■): *Q* = 3.67,*P*<0.001 | N | 0.0003[*] |
| 33 | There is a need for clear guidelines to reduce conflict between different users and to ensure recreation is carried out in a responsible and environmentally sensitive way. | O | 0.0674 |
| | | C | 0.2935 |
| | | N | 0.1284 |
| 34 | Signs and other forms of information and education are required to inform people that they are visiting a conservation site and how to behave. | O | 0.0624 |
| | | C | 0.3933 |
| | | N | 0.0297 |

Table 4c (*Continued*)

| | Statements: management | Statistics[a] | $P_{(diff)}$ |
|---|---|---|---|
| 35 | Most people respect the dunes; there is no need for further fencing and signposting. | O | 0.002[*] |
| | | C | 0.2852 |
| | m (♦): q = 3.96,P < 0.05; n (■): q = 4.38P < 0.01; o (♦): Q = 2.63P < 0.05;p (■): Q = 2.97, P<0.01 | N | 0.0038[*] |
| 36 | There are so many signs and rules, it is no longer an enjoyable experience to come to the beach. | O | 0.0176 |
| | | C | 0.0181 |
| | | N | 0.1766 |

[a] Scales show median scores for Ireland (♦), Scotland (■) and Germany (▲) overall (O), for conservationists (C) and non-conservationists (N) and P-values of the difference between the scores of the three countries. ($P_{(diff)}$) was calculated using Kruskal-Wallis (corrected for tied ranks) and Nemenyi (q) and Dunn's (Q) multiple comparison tests for even and uneven sample sizes respectively.Countries with the same superscript letter indicate significant differences between the medians.

[*] $P < 0.01$.

prevent of damage to sites and to ensure clean and safe beaches and they were not seen as something which would decrease the attractiveness of the site to visitors. The most significant differences in relation to management (Table 4c) are triggered by S32 ('In relation to access, the emphasis should be on responsible behaviour by the public, not on restriction.'). Here German responses are negative compared to the positive scores for Scotland and Ireland with overall (O) and non-conservationist (N) results in the latter two countries being significantly different from those in Germany. This difference in opinion is supported by S31 (see "Agreement among stakeholders" section). These statements show that in relation to access by recreationists to the sites, German respondents agree that restriction should always be considered a possible management option. Scottish and Irish respondents are of the opinion that responsible behaviour should be emphasised in protecting sites. This difference can, in part, be attributed to the differences in visitor numbers to the sites (see "Agreement among stakeholders" section). In Germany, there are much higher demands placed on the sites as visitor numbers are considerably higher. Therefore the potential for damage to sites (Andersen, 1995; Burden and Randerson, 1972; Cole, 1995; Sun and Liddle, 1993) would also be higher and consequently restriction is seen as the only way to control this.

The other statement that triggered significantly different responses is S35 ('Most people respect the dunes; there is no need for further fencing and signposting.'). While information signs and panels are regarded by all respondents as an effective way to inform visitors of the conservation status of sites and of appropriate behaviour when visiting (S34), only German stakeholders (O and N) agree that there is no further need for additional signs and panels at their sites (S35). This was not the case in either of the other two countries where to date no signs or information boards are displayed (Table 1). In Germany there are many signs, information boards and education paths as well as rangers available to provide information to visitors (Table 1). However, in conversation with German non-conservationists, excessive signage was seen as something that could possibly hamper the enjoyment of visitors who came to the site. Similar concerns were voiced during conversations with stakeholders in Ireland and Scotland, where stakeholders, despite agreeing that information was required, had reservations concerning excessive interpretation facilities and fencing leading to over-regulation of sites. A comment frequently made by stakeholders in Ireland and Scotland was that they feared there would be a loss of naturalness of the site if management was too excessive and that this would not only spoil the site for locals but also for visiting

recreationists who appreciated the sites being 'untouched', an observation corroborated by other studies (McKenna et al., 2011).

The comparison between conservationists (C) and non-conservationists (N) showed that there are only two statements (S8 and S29) for which responses are significantly different for Irish stakeholders, with opposite scores (positive and negative) for individual stakeholder groups. S8 ('Conservation designations make life more difficult for landowners as they involve a lot of paper work.') shows negative scores from conservationists (C) and positive scores for non-conservationists (N). In Ireland, in particular, the designation and subsequent management of coastal conservation sites are perceived by non-conservationists, landowners in particular, as making life more difficult (S8, Table 4a). Non-conservationist stakeholders mentioned that they feel that the conservation body is not always successful in its conservation effort, while at the same time causing difficulty for landowners, restricting their use of the land and adding unnecessary paperwork. The Irish conservationists disagree significantly with the non-conservationists that protected areas should be policed and protected by the landowners (S29). Conservationists commented that the co-operation of landowners is essential to successful conservation management, but in relation to conservation, the advice and support of the conservation body is also critical, without which the protection of habitats could not be achieved. However, a common comment made by non-conservationists was that they feel excluded from the management process.

**Conclusion**

Q-Methodology helped clarify the different positions held by the different stakeholder groups vis-à-vis stakeholder perceptions of recreational and management impacts on protected coastal dune systems in three European countries. While the results do not provide a view of what proportion of the population hold a particular view, the results do reflect the existing spectrum of different opinions and clearly differentiate the different patterns within the stakeholder groups.

The results of this study show firstly that while there is much agreement overall (particularly relating to the protection of dune systems while still supporting recreation), stakeholder opinion can be separated according to country of origin. In general, this separation is reflected in the intensive management regime at the German sites compared to the Scottish and Irish sites where significant differences in opinion are most apparent in the sections concerned with restricting access for recreation, the

provision of facilities and the role of the responsible conservation body.

For Germany, the results of this study suggest that current management strategies are successful in meeting both conservation and recreation needs. Regulatory management, such as access restrictions and zonation are considered to be successful, while educational and physical management facilities present are considered effective by all with no perception of these measures attracting excessive visitor numbers or diminishing the attractiveness of the site. The other end of the spectrum, i.e. no management measures whatsoever can be seen in the Irish study sites. There is a complete absence of facilities and information signs at the Irish sites and there is documented evidence of severe damage to the sites, with vehicle tracks having increased fivefold for one of the sites between 1973 and 2007, while at the other two sites track numbers doubled and tripled for the same period (Kindermann and Gormally, 2010). Despite this, over-regulation and over-management are, nevertheless, of particular concern to the Irish and Scottish stakeholders. Despite its effectiveness in Germany, applying the same level of management to Irish and Scottish sites would, at this stage, be inappropriate. Neither country has the visitor pressures present in Germany, therefore less intensive approaches are required. The Scottish situation provides somewhat of a medium between the other two countries in that it has a limited amount of regulatory and physical measures in place. The restrictions of activities such as camping to limited areas and the provision of parking areas have reduced past problems of damage at the sites (May and Hansom, 2003). This level of management and provision of facilities would be much more appropriate for Ireland where visitor numbers are comparable to those in Scotland and levels of damage would have been comparable. What both countries are lacking to date are educational measures on site to inform visitors of the status of the sites and inform them of appropriate behaviour. Respondents in Ireland and Scotland considered these important and providing them in addition to physical measures, such as car parks, toilets and camp sites, should increase the protection of sites. Rangers are essential in the overall management of sites and particularly in the monitoring of sites. In comparison to Scotland and Germany, Ireland is at a disadvantage in that ranger coverage of the sites has been intermittent over the last few years, with changes in staff and periods during which the ranger position for the area (approx. 450 km$^2$ in total) was vacant due to staffing difficulties within the conservation body. Improving this is essential, especially in Ireland where there are issues between conservationists and non-conservationists which need to be resolved.

Ireland stands out as being the only country in which there are significant differences between conservationists and non-conservationists. These differences indicate that Irish conservationists do not recognise the perceived increase in workload for landowners due to conservation designations. There are additional differences of opinion in respect to who should be in charge of site management. This should be addressed when devising a management strategy for Irish sites as this is likely to be a cause for potential conflict. However, there is a lot of common ground between the two groups that can be built on to achieve successful dune management. With the overall agreement that conservation is essential, the first step for the conservation of coastal dune systems has been achieved. The presence of rangers at ground level to engage with landowners and issues arising on site, as well as overall co-operation between conservationists and non-conservationists, landowners in particular, will help overcome the remaining issues between the two groups and will ensure the required levels of management, essential to ensure the successful conservation of sites, are achieved.

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