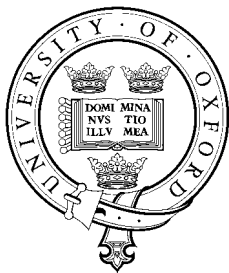


Departmental Coversheet



UNIVERSITY OF OXFORD

BIOLOGICAL SCIENCES

Candidate Number	1 0 1 7 3 4 0
Supervisor or Advisor	E . J . MILNER - GULLAND
Title	AN INVESTIGATION OF THE RELATIONSHIP OF THE JERSEY PUBLIC WITH THE CONSERVATION PROJECT BIRDS ON THE EDGE, AND THE CHOUGH AS A FLAGSHIP SPECIES
Type of Submission (Project Dissertation, Course Assignment Extended Essay or Course Assignment Abstract for Oral Presentation)	PROJECT DISSERTATION
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Abstract

The public's nature connection has been shown to influence conservation support and is a focus of the conservation project Birds on the Edge, Jersey (Channel Islands). This project utilises the reintroduced red-billed chough *Pyrrhocorax pyrrhocorax* as a flagship species to achieve increased awareness and nature connection. Determining the effectiveness of the flagship chough, attitudes towards rewilding, and relationships between knowledge, attitudes, behaviours and nature connection allows the development of targeted, more effective outreach. Data regarding nature connection, knowledge, attitudes and behaviours relating to conservation was collected from 118 adult Jersey residents using questionnaires. Hypotheses derived from an implied theory of change of Birds on the Edge were tested. Nature connection was higher in residents reporting greater rewilding support, knowledge about the chough, time immersed in nature, and rural residency. It was not associated with project knowledge or age, but age was positively correlated with overall knowledge and rewilding attitudes. Most respondents felt positively towards rewilding and the chough reintroduction. Knowledge of chough was higher than that of the project and increased the likelihood of associating the species with Jersey's wilderness. Observing wild choughs generated more positive experiences than captive birds. Overall awareness of Birds on the Edge was low, indicating current outreach is not effective. A new theory of change was constructed based on the results of the study recommending greater utilisation of wild choughs to generate an emotive connection, and focussing on immersion rather than knowledge to better influence nature connection and as a result, conservation support.

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1 Introduction

Public involvement with nature and conservation has long been cited as beneficial for human wellbeing and health, both psychological and physical (e.g. Frumkin 2001, Ulrich 1993, McMahan 2018). Individuals reporting a higher nature connection experience greater levels of vitality, life satisfaction and happiness (Capaldi et al 2014). In addition to its impact on health, the public's relationship with the natural world has more recently been recognised as having potential to affect the success of conservation projects (Restall & Conrad 2015). A greater nature connection positively and consistently correlates with pro-environmental attitudes and interest in environmental protection, engagement in environmentally responsible behaviour, and concern about the seriousness of anthropogenic impact on the environment (Nisbet et al 2009, Capaldi et al 2014, Restall & Conrad 2015), all of which generate public pressure on governments to commit to conservation strategies. However, almost 90% of the UK population now lives in cities, which Miller (2005) suggests leads to increased biological impoverishment and apathy towards the natural environment. Indeed, inhabitants of urban areas are more likely to report a lower nature connection than rural residents, as well as decreased support for conservation and a weaker preference for more natural environments (e.g. Schroeder 1983). Evidence regarding the influence of age on nature connection and conservation attitudes and behaviours varies (e.g. Johansson & Heningsson 2011 and Payne et al 2002, Scannell & Gifford 2013 and Gronhoj & Thogerson 2009), but Richardson (2018) and Montag (2015) suggest that increasing technology use is both concentrated in younger demographic groups and markedly reduces connection. This is unsurprising; individuals who engage less with the natural world show a decreased affinity with, interest in and love of nature, and are less likely to perceive the benefits of spending time in nature (Soga & Gaston 2016). This is therefore a growing concern as the public progressively views nature as less relevant to their lives, leading to the question of whether people will be prepared to invest in its protection (Miller 2005).

Considering the threat of 'extinction of experience' posed to biodiversity conservation and human wellbeing, the importance of understanding the public's relationship with nature and associated influencing factors is increasingly acknowledged. Scales measuring individuals' nature connection (e.g. Nisbet et al 2009, Mayer and Franz 2004, Shultz 2002 and Bragg 2013) can be used to provide insight into how personality, including nature connection, attitude, and knowledge, predict pro-environmental behaviour and conservation support (Nisbet et al 2009). Theoretical constructs predicting behavioural change may also be useful in understanding how to design more effective interventions to influence behaviours relevant to nature connection (St John et al 2010). Azjen's Theory of Planned Behaviour (1991) models the interaction of three elements in determining

behaviour: attitudes (beliefs about a behaviour), subjective norms (pressure to conduct a behaviour due to normative beliefs and motivation to comply with these) and perceived behavioural control (a measure of control over a behaviour, formed from the availability of appropriate resources and the perceived power of the resources to achieve the behaviour). Studies have demonstrated the model's effectiveness in predicting intention from attitudes (López-Mosquera et al 2014 and Hrubes et al 2001), and behaviour from intention (Kaiser et al 2005) in a conservation context. Similarly, KAP theory hypothesises a linear relationship between knowledge acquisition, attitudes, and practice or behaviour and, although more prevalent in fields such as public health (Su-I Hu 2014), has also been utilised in conservation studies (e.g. USAID Wildlife Asia 2017).

Many studies have demonstrated a relationship between elements of these models. For example, higher reported nature connection is frequently associated with greater immersion in nature and engagement in nature-based practices such as volunteering, working and recreation (Nisbet et al 2009). Outdoor experiences may be vital in fostering pro-environmental behaviour; wildlife recreationists may be up to five times more likely to engage voluntarily in conservation and environment-related activities (Cooper et al 2015). Knowledge of natural history and conservation may also be key: the number of bird species identifiable by an individual positively correlates with the strength of their nature connection whilst observing garden birds (Cox & Gaston 2015), participation in environmental education programmes can lead to short-term increase in nature connection (Liefländer et al 2013), and exposure to awareness campaigns can induce positive changes in attitudes and behavioural intention relative to conservation concerns (Howe et al 2011). Education should convey positive conservation messages; feeling inspired to act is often a more effective motivator than the threat of environmental degradation (Ruiter et al 2014, Schaffner et al 2015).

Nature connection may be facilitated through the association of an identifiable and inspiring flagship species with conservation campaigns. These species are chosen to increase awareness, financial support or action for conservation efforts and thus must appeal in some way to the public and engage a target audience (Walpole & Leader-Williams 2001). Although popular charismatic vertebrates are typically considered most effective as a focal point of campaigns (Thomas-Walters & Raihani 2017), studies have shown that traditionally uncharismatic species have the potential to positively influence public preferences for wildlife-friendly practices (Home et al 2009). Areas without extant megafauna may therefore utilise 'alternative' flagships to the same effect (Walpole & Leader-Williams 2001, Bowen-Jones & Entwistle 2002), particularly in conjunction with appropriate outreach and education.

Birds are increasingly used as 'alternative' flagship species (Entwistle 2000, Thomas-Walters & Raihani 2017). Watching birds and listening to bird song can positively affect psychological wellbeing (Cox &

Gaston 2015), so avian flagships may be particularly effective in increasing positive associations with nature if the species chosen are both easily identifiable and often encountered (Schlegel & Rupf 2009). Indeed, nature connection of urban Australian residents is positively related to the abundance of local birds (Luck et al 2011). Using birds as flagships may also promote birdwatching behaviour in target groups. Individuals participating in this activity are up to five times more likely to engage in conservation activities including habitat enhancement and local environmental group participation (Cooper et al 2015), increasing practical engagement with conservation, thus contributing to the development of nature connection.

Birds on the Edge is a long-term conservation collaboration between the States of Jersey Department of the Environment, National Trust for Jersey and Durrell Wildlife Conservation Trust (Durrell) which has chosen the reintroduced red-billed chough *Pyrrhocorax pyrrhocorax pyrrhocorax* as its flagship species (Durrell 2013). The chough has been returned to Jersey, Channel Islands, as part of an effort to restore declining and extirpated bird species to the island. The subspecies *P. pyrrhocorax pyrrhocorax* is endemic to coastal Britain, Ireland and Brittany, France, and has declined severely across its range due to modern farming practices (Corry 2012). Breeding pairs were last recorded in Jersey in 1902 but the species has since become locally extinct from the Channel Islands. In 2013, when Birds on the Edge began, there were thought to be only 500 breeding pairs of *P. pyrrhocorax pyrrhocorax* in the wild across its entire range (Corry 2012). As a result of a captive breeding programme and subsequent release into restored short-grazed pastures on Jersey's north coast, in November 2017 there were 35 individuals in the wild in the island and several successful wild breeding pairs (Corry 2017).

Birds on the Edge literature reports a negative local perception of corvids as farmland pests, including the carrion crow *Corvus corvus* and the magpie *Pica pica* (Corry 2012), so the chough is an interesting choice of flagship for this conservation project. However, partner organisations proposed any negative associations could be offset by an education and awareness strategy as well as the creation of an aviary in Jersey Zoo, where the public could engage with the chough during the programme (Corry 2012). A study of the public near a proposed reintroduction site in Wildwood Park, Kent, supports this idea: individuals generally showed increased support for the reintroduction after viewing choughs in the Park (Sampson et al 2016).

Nature connection may also be fostered through rewilding programmes which aim to restore wilderness areas and increase the public's experience of wild nature (Rewilding Britain 2018). Birds on the Edge comprises many elements associated with rewilding projects: relatively large-scale habitat restoration, introduction of grazing herbivores for scrub management and disturbance on the north

coast, and the reintroduction of extirpated species such as the chough. However, public perceptions of rewilding in Jersey are largely unknown. Even among conservation practitioners, there is significant divergence in understanding of the term 'rewilding' and scientists, conservationists and researchers cannot agree on the aims or endpoint of rewilding (Deary & Warren 2017). Opposition to the term 'rewilding' has been found in areas of Scotland, where public perception of the concept is that it is too American, of little relevance to the small and islandic UK, and too heavily focussed on the reintroduction of large carnivores such as wolves and lynx (Deary & Warren 2017). However, there is general support for habitat restoration and a nature driven, ecosystem approach as laid out by organisations such as Rewilding Britain (rewildingbritain.org.uk) when they are not described under the term 'rewilding' (Brown et al 2011). Taylor (2015), whilst recognising the potential for rewilding as a social movement capable of transforming the public's relationship with nature, cautions against the popularisation of a rewilding concept which focusses only on broad-scale projects involving ambitious reintroductions, particularly where there may be considerable social or political issues relating to affected communities. In light of this, it is important to determine the general understanding of and attitude towards rewilding in Jersey so conservation projects may be 'marketed' with optimum efficacy. This is of particular relevance to a small, increasingly urbanised island community with a growing population, experiencing apparently conflicting objectives of development and conservation (States of Jersey Statistics Unit 2012).

Birds on the Edge identified and published as part of a project strategy several public engagement objectives which aimed to generate support for the project and create a sense of achievement and ownership in the community (Durrell 2013, Corry 2012, Corry 2017). The chough, as the project flagship, is the vehicle for these aims. As the wild population of choughs disperses over a greater area of Jersey's coast, it has become increasingly important to engage with the wider 'lay' audience to encourage citizen science monitoring across the island. Such programmes may have the capacity to change behaviour and attitudes of participants through providing the opportunity for nature-based experiences and increasing knowledge of basic natural history (Shuttler et al 2018). This would therefore contribute to both the connection objectives set out above, and to more effective tracking of the choughs, facilitating further directives regarding appropriate habitat provision to support the increasing population (Corry 2017).

Despite the public engagement aims of Birds on the Edge, there has been no investigation to date regarding public attitudes or knowledge levels of the chough and project. This study frames the outreach aims of Birds on the Edge within the three facets of KAP theory: knowledge, attitudes and practice. Figure 1 displays the hypothesised relationships between these elements.

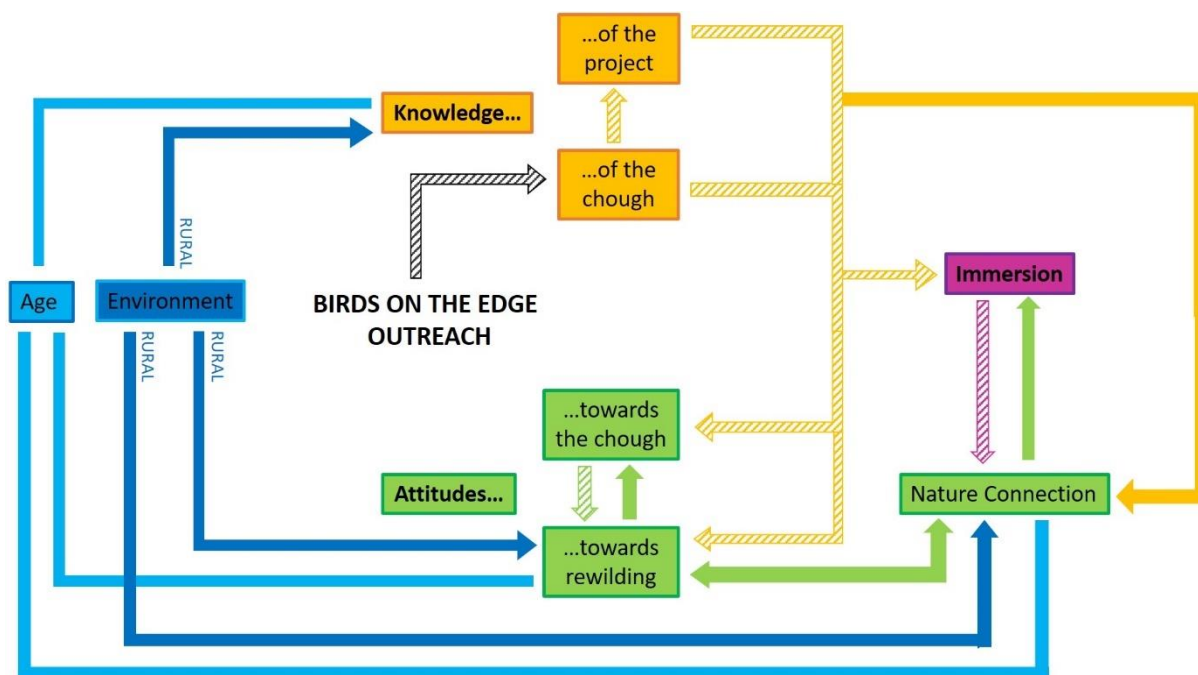


Figure 1. Conceptual framework presenting hypothesised relationships between the elements of KAP theory and nature connection, environment and age Arrows indicate a hypothesised positive correlation or association. Dashed arrows represent an implied Theory of Change derived from Birds on the Edge strategy literature. Bold arrows represent additional hypothesised relationships based on existing research. Lines without arrowheads indicate a hypothesised relationship but one which is not identifiable from the literature.

Although KAP theory hypothesises a sequential change through knowledge, attitudes and practice, this study does not aim to establish causal links but instead to understand the interrelationships between these aspects in the Jersey public in relation to Birds on the Edge and wider conservation. Rather, it seeks to gather data regarding public knowledge of Birds on the Edge, wider conservation and natural history, attitudes towards rewilding and levels of nature connection, and individuals' level of immersion in nature. These factors are measured by tools developed for this study and existing scales and typologies, which are used to determine nature connection (Natural England 2017) and attitudes towards the chough reintroduction and rewilding (Kellert 1982). This study also aims to understand how age and environment of residency impact the three facets of KAP. The population density of Jersey varies widely from 100 to 23,800 people/km² (States of Jersey Statistics Unit 2012), making it an ideal study site to investigate differences between urban and rural residents.

Birds on the Edge provides an opportunity to investigate the conceptual elements of knowledge, attitudes and practice in relation to a rewilding-style project and the role of demographic factors in

determining nature connection and its relationship to KAP, in the context of a recent and ongoing conservation project which has explicit outreach objectives. This study therefore aims to:

- i) identify relationships between knowledge, attitudes and practice in the Jersey public, with an emphasis on nature connection and rewilding;
- ii) identify how age and environment affect knowledge, attitudes and practice in the Jersey public, including nature connection and rewilding;
- iii) establish the current knowledge and attitudes regarding rewilding, the chough and the wider project in the Jersey public;
- iv) draw conclusions which will aid further development of outreach strategies by the organisations involved in Birds on the Edge and which may be applicable to broader conservation strategies.

2 Methods

The survey was carried out in June – July 2018 using questionnaire-based interviews to collect qualitative and quantitative data on awareness, attitudes and behaviours relating to Birds on the Edge, the chough, and conservation and nature more generally. Durrell acted as the host collaborator. Guidance on questionnaire design and sampling methods was obtained from Bernard (2000).

2.1 Questionnaire design

A pilot questionnaire was administered during the first three days of sampling to test phrasing and length and to develop a consistent interviewer approach. The final questionnaire is shown in Appendix 1. A series of laminated cards was used throughout the questionnaire as supplementary material for questions, visual representation of scales and to sustain participant interest (Appendix 2). Open questions were used where appropriate to prevent biasing or limiting responses.

The questionnaire was designed to obtain information on four key areas: knowledge, attitudes, behaviours and demographics. Natural history knowledge was tested through the identification of six bird species of varying rarity, including the chough (Appendix 2A). Conservation knowledge and awareness of Birds on the Edge were assessed through a combination of open questions and a six-statement 'True/False' test (Appendix 3A). Statements from the Nature Connection Index (NCI) (Natural England 2018) and statements based on the Kellert typology (Kellert 1982 & Schofield 2005) were used with a Likert scale to assess attitudes towards nature and rewilding respectively (Appendix 2B & 2C). A 5-point scale was chosen, being easier for participants to understand and respond to, potentially producing more meaningful results. In addition, a 10-point scale from -5 (Strongly Negative) to +5 (Strongly Positive) was used to determine the level of positivity towards rewilding.

Information regarding respondent behaviours relating to the countryside was obtained through questions determining the frequency and location of visits and activities (Appendix 2B & 2C). Sightings of the six bird species in the supplementary material were also recorded (Appendix 2A). A species not found in Jersey (the European green woodpecker *Picus viridis*) was included to validate responses. Finally, respondent age, parish of residency and education level were recorded. Respondents were given the opportunity to add further information or opinions at the end of the questionnaire.

2.2 Sampling methods

Low numbers at the rural location (Sorel Point car parks) during the pilot resulted in its abandonment as part of the study. The urban location (King Street, St Helier) and attraction location (Jersey Zoo) proved appropriately busy and were used throughout. Systematic sampling was used to avoid the potential for personal bias in convenience sampling. Every 5th person in St Helier and every 5th table in the café were approached. Sampling at each location covered all days of the week over several different time slots to reduce the possibility of excluding particular demographics. Individuals who responded positively to a short introductory statement (Appendix 4A) were given a Participant Information Sheet (Appendix 4B) and the chance to ask any questions before deciding to take part. The researcher conducted the questionnaire and recorded participant consent and respondent answers in writing on the questionnaire. The respondent was given a slip with contact details on after finishing the questionnaire (Appendix 4C). This process was approved by the Ethics Committee. A total of 118 responses were recorded.

2.3 Analysis

2.3.1 Categorisation of response data

Three main facets of respondent data were developed through drawing on KAP theory. Knowledge of conservation and natural history, attitudes towards nature and rewilding, and practice (in this study represented by immersion in nature), were represented either through additive calculation of count data or through proxy scores generated from a Principal Component Analysis.

A score representing the level of respondents' immersion in nature was calculated additively from four factors measured by the questionnaire (Appendix 5A). Respondents were divided into two knowledge score categories, 'Less Informed' and 'More Informed' (Appendix 5B) and into two categories of rewilding support, 'Reserved Support' and 'Full Support' (Appendix 5C). A Principal Component Analysis (PCA) conducted on the six NCI statement responses generated a Principal Component 1 (PC1) score, which was then used as a proxy for overall NCI score and represented

attitudes towards nature (Appendix 5D). Respondents were also divided into 'Urban' or 'Rural' categories using the recorded parish of residence (Appendix 5E).

2.3.2 Statistical methods

Simple descriptive analysis was used to determine the number of respondents who knew of choughs in Jersey and who were aware of Birds on the Edge, as well as respondent attitudes towards the chough. It was also used to infer attitudes towards rewilding and species reintroduction using statements from the Kellert typology and the 10-point rewilding scale.

Pearson's χ^2 tests were used for count data to test for independence or association between responses of interest and explanatory factors including urban/rural, age category, immersion, knowledge, and whether respondents saw choughs in the wild or the aviary. A Wilcoxon test, t-tests and ANOVAs (followed by post hoc Tukey tests) were used for further analysis of count data and of the PC1 scores.

All statistics were performed in RStudio (2016) using R version 3.4.2 (2017-09-28). Packages used include 'stats' (R Core Team 2017), 'vegan' (Oksanes et al 2018), 'ggplot2' (Wickham 2009), 'Hmisc' (Harrell & Dupont 2018) and 'arm' (Gelman and Su 2016). Information regarding performing statistical tests and creating figures in R was obtained from R Studio (2018), Kabacoff (2018) Basic Statistics and Kabacoff (2018) Graphs.

3 Results

3.1 Predictors of Nature Connection – Knowledge, Rewilding Attitudes and Immersion

Component 1 of the NCI principal component analysis (NCI PC1; nature connection) explained 58.5% of the variance in NCI scores. The variables contributing most strongly to PC1 were statements i), ii) iii) and iv) (Appendix 6A).

3.1.1 Knowledge

Nature connection scores were significantly higher in those with a prior knowledge of the chough ($w = 1170$, $p = 0.0321$), but not in those with a prior knowledge of Birds on the Edge ($w = 112.5$, $p = 1$); knowledge of the project as a whole was independent of nature connection, whereas knowledge of the chough as a flagship species was not.

3.1.2 Rewilding attitudes

Rewilding attitude results are summarised in Table 1.

Respondents with a lower nature connection are inferred to support rewilding less strongly than those with a higher nature connection. Nature connection scores were significantly higher for respondents

recording 'Full' rather than 'Reserved' support for rewilding, and for those who responded 'Strongly Agree' rather than 'Agree' to the statement 'Overall, I would support a project which aimed to reintroduce Jersey's lost species and restore its ecosystem' (Fig. 2v).

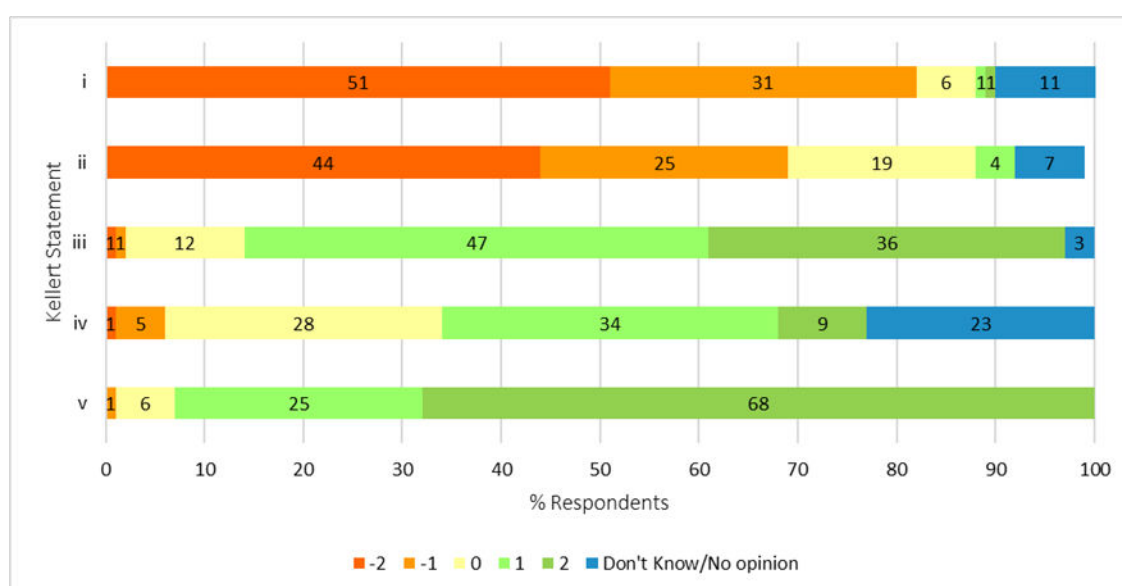


Fig. 2 Responses to the Kellert Typology Statements, in the order of reference in the main text: i) I feel that reintroduced choughs may have a negative impact on my life or something I care about; ii) I like the idea of reintroducing choughs, but I wouldn't want them in my parish; iii) It would be thrilling to see choughs soaring around the cliffs; iv) I feel that choughs symbolise the beauty and wilderness of nature on Jersey; v) I feel that reintroducing lost species in Jersey is important to restore the natural balance of the environment. Responses reported on a Likert scale (where -2 Strongly Disagree, -1 Disagree, 0 Neutral, 1 Agree, 2 Strongly Agree) with a Don't Know/No Opinion option.

These respondents were also more likely to hold humanistic attitudes towards rewilding programmes and species reintroductions, with a significant difference in nature connection for those who recorded 'Strongly Disagree', 'Disagree' and 'Don't Know' for the Kellert typology statement 'I feel that reintroduced choughs may have a negative impact on my life or something I care about'. A post hoc Tukey test found there to be a significantly higher nature connection scores for those who answered 'Strongly Disagree' rather than 'Don't Know'.

Table 1. Comparisons of NCI PC1 for rewilding attitudes. Corresponding letters in the Tukey Result column indicate response categories which are not significantly different for that Rewilding Attitude. Different letters indicate a significant difference between responses for that Rewilding Attitude.

Rewilding Attitude	Response	Mean NCI PC1	Difference?		Tukey Result
Rewilding Support	Full	0.316896	t = 2.61, df = 70.1	P < 0.05	n/a
	Reserved	-0.65673			
Overall, I would support a project which aimed to reintroduce Jersey's lost species and restore its ecosystem	Strongly agree	0.375161	t = 2.42, df = 71.2	P < 0.05	n/a
	Agree	-0.53398			
I feel that reintroduced choughs may have a negative impact on my life or something I care about	Strongly disagree	0.489809	F = 5.486, df = 2	P < 0.01	a
	Disagree	-0.27456			a, c
	Don't know	-1.01462			c
I like the idea of reintroducing choughs, but I wouldn't want them in my parish	Strongly disagree	0.686672	F = 7.84, df = 2 and 114	P < 0.001	a
	Disagree	-0.23275			b
	Agree/ Don't know	-0.8207			b
I feel that the money spent on a chough reintroduction programme would be better spent elsewhere	Strongly disagree	1.177093	F = 17.001, df = 2 and 114	P < 0.01	a
	Disagree	-0.15977			b
	Agree/ Don't know	-0.31447			b

Respondents with lower nature connection were more likely to hold NIMBY attitudes towards conservation. Nature connection was found to be significantly different for the levels 'Strongly Disagree', 'Disagree' and 'Don't Know/Agree' in response to the statement 'I like the idea of reintroducing choughs, but I wouldn't want them in my parish' (Fig. 3). A post hoc Tukey test revealed a significantly lower nature connection for those who recorded 'Do Not Know', 'Agree' or 'Disagree' relative to 'Strongly Disagree'.

Those with a lower nature connection were more likely to hold negativistic attitudes and may therefore be less likely to provide financial support for conservation and species reintroduction programmes; the nature connection scores differed significantly for the statement 'I feel that the money spent on a chough reintroduction programme would be better spent elsewhere'. A Tukey test found a significantly lower nature connection in those responding 'Agree/Don't Know' relative to 'Strongly Disagree', and 'Disagree' relative to 'Strongly Disagree'.

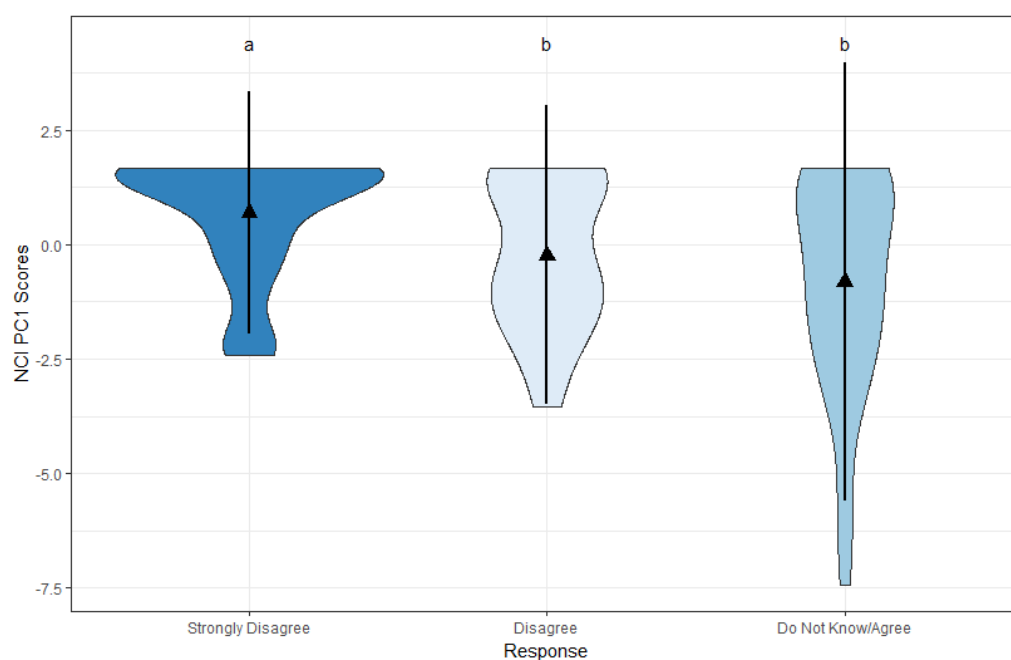


Figure 3. Violin plot showing the NCI PC1 (nature connection) scores for responses to the Kellert typology statement 'I like the idea of introducing choughs, but I wouldn't want them in my parish'. Mean, standard deviation and kernel density plot of responses are represented by ▲, I and blue shaded areas respectively. See Table 1 for statistical results.

3.1.3 Immersion

Respondents with a higher immersion score also tend to have a higher nature connection; this is significantly different for immersion levels, where I0 is least immersed and I9 most immersed ($F = 3.39$, $df = 9, 107$, $p = 0.000311$, Fig. 4). A Tukey test performed on the ANOVA analysis revealed significant or almost significant differences between the immersion level I0 and I4, I5, I6, I7, I8 and I9, and between the immersion level I1 and I5, I6, I7, I8 and I9. The nature connection scores were significantly lower only for only I0 and I1 relative to immersion levels ≥ 4 , suggesting only those with very low levels of immersion have a significantly weaker nature connection.

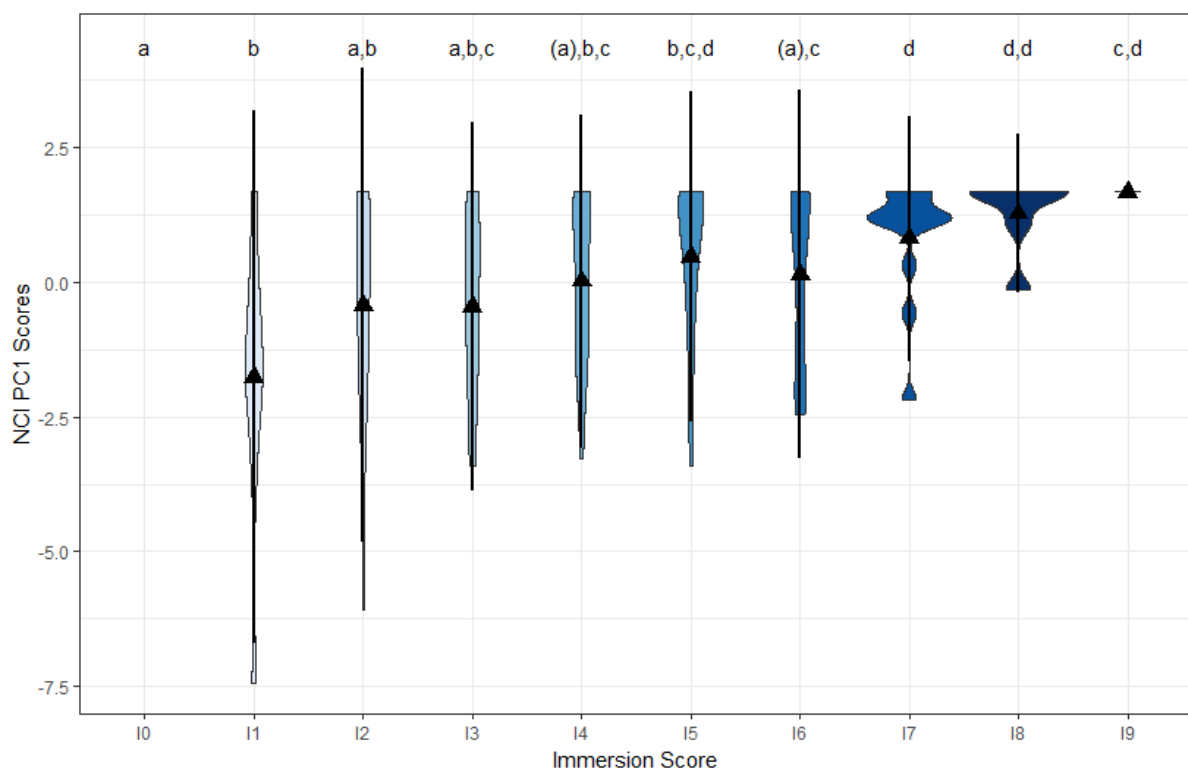


Figure 4. Violin plot showing the NCI PC1 (nature connection) scores for immersion levels I0 (least immersed) to I9 (most immersed). Mean, standard deviation and kernel density plot of responses are represented by \blacktriangle , $|$ and blue shaded areas respectively. Corresponding letters indicate immersion levels which are not significantly different in nature connection. Different letters indicate a significant difference in nature connection for those levels. (a) indicates an almost significant difference from levels marked with a. A Tukey test revealed significant or almost significant results for the following immersion levels: I4-I0 ($p = 0.0638$), I5-I0 ($p = 0.0305$), I6-I0 ($p = 0.0516$), I7-I0 ($p = 0.0196$), I8-I0 ($p = 0.0133$), I9-I0 ($p = 0.0100$), I5-I1 ($p = 0.0375$), I7-I1 ($p = 0.0208$), I8-I1 ($p = 0.0262$), and I9-I1 ($p = 0.0298$).

3.2 Perceptions of and attitudes towards rewilding and wilderness

When asked to describe what the term 'rewilding' meant to them, the most frequently reported idea was that of species reintroduction (42%) particularly in the case of declining, endangered or extirpated species (26%). However, the release of captive or zoo animals into the wild was also often mentioned (26%). More respondents suggested rewilding involves increased human connection with nature (8%) rather than the absence of humans entirely from the rewilding site (4%). The National Trust site Plémont, Jersey was suggested as an example of rewilding by 5% respondents, but 4% respondents thought rewilding was not relevant to Jersey, giving examples of extensive reforestation, Eurasian lynx *Lynx lynx* and European bison *Bison bonasus* in mainland Europe and of the grey wolf *Canis lupus* in Yellowstone National Park, US.

The overwhelming majority expressed some degree of support for rewilding projects as evidenced by the response to the statement 'I feel that reintroducing lost species on Jersey is important in order to restore the natural balance of the environment of Jersey'; 68% respondents recorded a (+2) score, and a further 25% respondents recorded (+1). Only 7% respondents gave a score of 0 or less (Fig. 2v). Similarly, 65% of respondents recorded (+5) on the rewilding scale; a further 22% recorded (+4) or (+3). Only one respondent gave a negative score. Seeing choughs in the wild was associated with fewer negative or neutral responses than observation of choughs in the aviary at Jersey Zoo ($\chi^2 = 9.982$, $df = 1$, $p = 0.00158$) suggesting that members of the public have a more emotionally positive experience of 'wild' nature (Fig. 5A and 5B).

Concerns expressed by those scoring 'Reserved' support for rewilding were most commonly related to unintended consequences of species reintroduction (6%), including negative impacts on other native species, agriculture or fishing, or the uncontrolled growth of a population of reintroduced species, especially predators. The prioritisation of further housing and development was expressed (3%) as well as a concern for financial implications of rewilding projects for members of the public (3%). A further 3% were concerned about accessibility of rewilded areas and the need to maintain areas which can be utilised by local communities.

Significant associations were found between scoring 'Full' support for rewilding and including either the idea that we benefit from nature ($\chi^2 = 8.28$, $df = 1$, $p = 0.004$) or a concern about the detrimental impact of humans on the environment ($\chi^2 = 5.57$, $df = 1$, $p = 0.0183$) in the reported explanation for the score. However, there was no association found between scoring 'Full' support for

rewilding and including the concept that we need to return nature to a balanced state, or that a rewilded state is how nature 'should' be ($\chi^2 = 2.44$, $df = 1$, $p = 0.117$).



Figure 5. Word Clouds composed of the responses to 'How did you feel when you saw the choughs?' (A) depicts the responses for the wild choughs at Sorel and (B) the Zoo aviary. Orange, blue and green colours represent negative, neutral and positive responses respectively. Words are scaled in size to represent frequency of response. Respondents reported no negative and fewer neutral responses to seeing choughs in the wild at Sorel (A) than seeing choughs in the aviary in the Zoo (B). Additionally, a higher proportion of the most frequently reported responses were positive when choughs were seen in the wild (A).

3.3 Age and urban/rural residency, and knowledge and attitudes

Demographics were also analysed in relation to knowledge and attitude towards rewilding and nature (Table 2). The chough test score category and attitude towards rewilding (as given by the rewilding scale category) were significantly associated with age, with older respondents scoring more highly, but not parish of residence. Conversely, nature connection was significantly higher in respondents with rural parishes of residence, but did not differ with age groups. Thus increasing age is inferred to be an important factor in higher knowledge of conservation and support for rewilding, and parish of residence a contributor to respondents' personal nature connection.

Table 2. Knowledge, rewilding attitude and NCI PC1 scores for respondents by age and residency.

	Respondent		%	Difference?	
	Category		Respondents		
Chough Test Score	≤45	Informed	7	$\chi^2 = 7.61$, df = 1	p < 0.01
		Not Informed	38		
	>45	Informed	19		
		Not Informed	36		
	Urban	Informed	14	$\chi^2 = 0.237$, df = 1	P ≥ 0.05
		Not Informed	49		
	Rural	Informed	10		
		Not Informed	25		
Rewilding Support	≤45	Full	25	$\chi^2 = 5.076$, df = 1	p < 0.05
		Reserved	19		
	>45	Full	39		
		Reserved	14		
	Urban	Full	34	$\chi^2 = 1.30e-30$, df = 1	p ≥ 0.05
		Reserved	18		
	Rural	Full	31		
		Reserved	15		
Mean NCI PC1	18 – 25	-0.144	11	F = 0.692, df = 5 and 110	p ≥ 0.05
	26 – 35	-0.429	19		
	36 – 45	-0.130	14		
	46 – 55	0.231	16		
	56 – 65	0.535	19		
	>65	-0.13558	19		
	Urban	-0.30434	64	t = -2.63, df = 109.7	p < 0.01
	Rural	0.543465	36		

3.4 Awareness of the chough and Birds on the Edge

There were low levels of awareness of Birds on the Edge among respondents; only 16% respondents had heard the name 'Birds on the Edge', but 89% of those knew something about what Birds on the Edge do. Also, there is disparity in the knowledge about choughs and about Birds on the Edge, with a significant difference between mean average scores of 'Chough' based knowledge (0.322) and 'Project' based knowledge (0.225) in respondents ($w = 1968.5$, $p = 0.00354$). Additionally, few

respondents made the connection between the chough and the project it represents. Of the descriptions of Birds on the Edge given, 71% mentioned 'chough', 53% contained knowledge of the project beyond the presence of choughs on the island, but only 29% mentioned 'chough' and some additional knowledge of the project.

The chough was the species most commonly associated with conservation in Jersey, but only 14% participants mentioned it in response to 'Have you heard about any conservation projects in Jersey?', followed by the agile frog (11%), hedgehog (8%) and bats (5%). Similarly, only 14% respondents could identify a chough from the photograph provided in the supplementary material (Appendix 2A) and only 38% of these had mentioned choughs in response to the above question.

3.5 Attitudes towards the chough reintroduction and the chough as a flagship species

Most respondents were open to the reintroduction programme and did not hold 'NIMBY' opinions about the chough: 82% respondents disagreed with the statement 'I feel that reintroduced choughs may have a negative impact on my life or something I care about' (Fig. 2i) and 69% disagreed with 'I like the idea of reintroducing choughs, but I wouldn't want them in my parish' (Fig. 2ii).

The majority (83%) of respondents also agreed with the statement 'It would be thrilling to see choughs soaring around the cliffs' (Fig. 2iii), including respondents who did not know about the chough prior to the questionnaire. This suggests most respondents anticipated positive personal experiences observing choughs in the wild. If respondents were aware of the chough in relation to conservation in Jersey, they were more likely to agree that the choughs were a symbol of Jersey's wilderness. Less than half of respondents (45%) agreed with the statement 'I feel that choughs symbolise the beauty and wilderness of nature in Jersey' (Fig. 2iv). However, mentioning choughs in response to 'Have you heard of any conservation projects in Jersey?' and agreeing with this Kellert statement were almost significantly associated ($\chi^2 = 3.66$, $df = 1$, $p = 0.0557$). Thus, knowledge of the chough prior to the questionnaire may have been necessary for respondents to feel that it is appropriate as a symbol of Jersey's wilderness.

4 Discussion

Figure 6 presents a summary of the results for comparison with the contextual framework in Figure 1.

4.1 Relationship between knowledge, rewilding and nature connection attitudes

Existing research indicates relationships between increased knowledge and positive attitudes towards conservation (Capaldi et al 2014, but see Mobley et al 2010) as well as a higher level of nature connection (Liefländer et al 2013), as represented in Figure 1. This supports results showing that respondents required knowledge of the chough prior to the questionnaire in order to have formed a

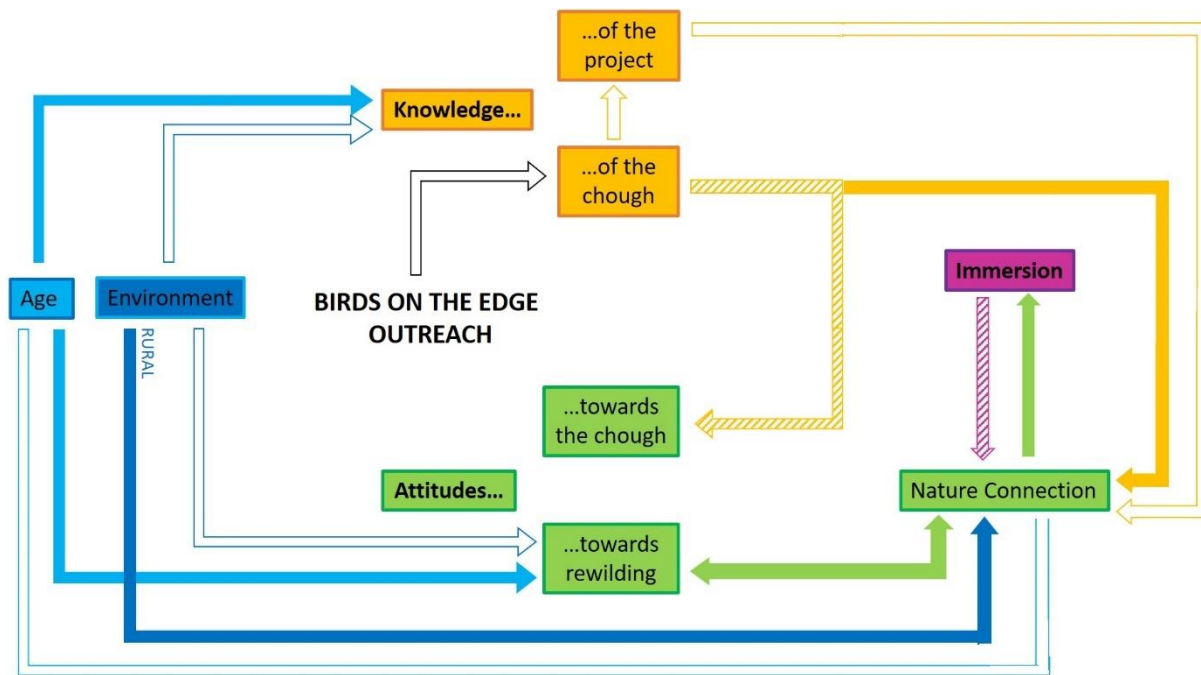


Figure 6. Relationships between the elements of KAP theory and nature connection, environment and age in the context of Birds on the Edge. Arrows represent investigated relationships. Empty arrows indicate a weak or absent relationship or association between two elements. Bold and dashed arrows indicate a positive correlation. Additionally, dashed arrows represent aspects of the implied Theory of Change supported by results of this study.

positive association between the chough and Jersey's wilderness. Additionally, those with prior knowledge of the chough reported a higher nature connection. However, the results also indicate that knowledge of Birds on the Edge is not associated with a higher level of nature connection, which does not support the hypothesis derived from previous studies indicating education and outreach programmes increase participants' nature connection (e.g. Liefländer 2013 and Shuttler et al 2018). The requirement for knowledge of the chough but not the project suggests that the flagship species may be more important either in increasing nature connection or engaging those with an already high nature connection. An identifiable species – the chough – may be more likely than the project to generate compassion and empathy (Thomas-Walters & Raihani 2017), developing the affective component of nature connection (Schultz 2002). This suggests a potential explanation for higher knowledge levels of the chough, which is more emotive, than of the project. It also emphasises the potential for the public to develop an emotional relationship with the chough, which could then be used as a vehicle for wider conservation messages.

4.2 Relationship between immersion, rewilding and nature connection attitudes

The results of the study support the hypothesis of a positive correlation between immersion and nature connection. This is particularly pronounced in those with a very low immersion score, suggesting amongst those who currently do not spend time in nature, nature connection may become significantly higher with a comparatively small increase in immersion. This is unsurprising as a higher immersion in nature increases the relevance of the environment to individuals (Miller 2005), fostering both the cognitive and affective aspects of nature connection (Schultz 2002).

‘Wild’ experiences were shown to be more effective than exposure to zoo-based choughs in forming positive experiences with nature which in turn may develop the affective component of nature connection (Schultz 2002). Future outreach should therefore include events or activities which provide such experiences for the community, capitalising on the relationship between personal experience, nature connection and rewilding support and generating benefits for people, conservation organisations and nature.

4.3 Attitudes towards rewilding

Many respondents, prior to being given the questionnaire definition of rewilding (Appendix 1), thought reintroductions and captive breeding programmes were its main components. This could explain the concerns of those who reported ‘Reserved’ support for rewilding after the definition was read: these often centred on unintended consequences of species reintroduction and a perceived need for predator control, with particular reference to the marsh harrier *Circus aeruginosus*. Although increasing numbers of this species in Jersey is a success in the eyes of conservation organisations (National Trust 2016b), several respondents regarded the current population size as excessive. This should be considered during the development of Durrell’s ‘ReWild Our World’ project strategy which includes habitat development for the red kite *Milvus milvus* (Durrell 2018), which could be subject to similar opinions.

People’s experience of nature was not mentioned by most respondents in their definitions of rewilding, which again may explain the reservations about lack of accessibility to rewilding sites, despite the focus of popular rewilding campaigns on increasing nature connection (e.g. Rewilding Britain 2018, Durrell 2018). Several respondents, though, described the conservation work at Plémont, Jersey (National Trust 2018) and the associated puffin colony as a positive example of rewilding. This may therefore offer an outreach opportunity to promote the relevance and benefits of rewilding to Jersey’s local communities and combat accessibility concerns. However, Plémont may also typify objections to using taxpayers’ money to buy land for conservation and the perceived conflict between

rewilding and housing demand, as the land was up for development before being bought by the National Trust for Jersey with public donations (National Trust 2018).

The correlation between 'Full' rewilding support and expressing either the idea that humans benefit from nature or concern about the detrimental impact of humans on the environment suggests that the community's relationship with nature is key in developing positive support for rewilding and conservation. Future outreach should include ecosystem services relating to health, culture and wellbeing (Millennium Ecosystem Assessment Board 2005) to promote the idea that conservation and human wellbeing are positively rather than negatively correlated.

4.4 How do age and environment affect knowledge and attitudes?

In line with the mixed results of previous studies, increasing age was correlated with higher knowledge and support for rewilding, but was not related to nature connection. A potential explanation for the pattern of relationships found here is the popularity of nature photos and videos on social media (e.g. Instagram 2018). The use of smartphones and social media is widely reported to be higher in younger people (Montag et al 2015). Although this has been linked to a decreased nature connection (Richardson et al 2018), studies have also shown that viewing nature-based media can have the opposite effect, but that this has no impact on conservation related behaviours (Soliman et al 2017). This means younger people may be forging connections to nature virtually without the positive effects of real-world nature on knowledge and behaviour (Nisbet et al 2009, Capaldi et al 2014, Restall & Conrad 2015).

Similarly, the relationships between environment (i.e. urban or rural residency) and knowledge and attitudes found in this study are only partially congruent with results of previous research. Rural residents were more likely to report a high nature connection as predicted by this study's hypothesis, but, in contrast to the hypotheses derived from the results of Schroeder (1983) and Hind (2008), they did not display higher knowledge or support for rewilding. It is possible that results were confounded by the impact of childhood environment (which was not recorded), which can have a significant impact on pro-environmental behaviour into adult life (e.g. Kellert 2002, Hinds & Sparks 2007, Soga & Gaston 2016). Future research should control for immersion levels, which may provide a more accurate representation of the relationship between nature connection and environment in Jersey residents. It is also possible that Jersey's small size (States of Jersey 2019) decreases the difference between 'urban' and 'rural' areas to the extent that residency does not have a significant effect on knowledge and conservation support.

4.5 Attitudes towards and current awareness of the chough and Birds on the Edge

There is no baseline data regarding awareness levels in the Jersey public, but the level of media attention, information dissemination through social media and internet sites, and signage at the aviary and on the North coast suggested that respondents would have heard of the choughs or of Birds on the Edge. However, awareness levels are relatively low, which implies current outreach strategies are not achieving the project's objectives; the initial step in the implied theory of change of Birds on the Edge has not been successful. Given that older residents scored more highly in the Chough Knowledge Test, it appears that information has disproportionately reached this demographic group. Future outreach should focus on developing strategies appealing to younger residents, such as capitalising more strongly on social media (Montag et al 2015) as an effective way of spreading awareness of conservation messages (Parsons et al 2013).

Widespread support for the chough reintroduction was unexpected given the reported dislike for corvids (Corry 2012). This could be due to a lack of knowledge: 'corvid' and 'crow' are both absent from the main outreach material developed by the National Trust for Jersey and Durrell (e.g. birdsontheedge.org.uk & National Trust 2016a) and were not explicitly communicated to respondents during the questionnaire. It is also possible that predictions of a negative connotation were premature and that this will not be an issue. Alternatively, demographic groups such as farmers who are most negatively impacted by crows and view them as pests (Corry 2012) may not have been well represented in the sample. Future research regarding Birds on the Edge should identify these groups through inclusion of a question for 'Occupation' so that targeted outreach could address any concerns.

Bowen-Jones and Entwistle (2002) proposed criteria to assess the potential effectiveness of a locally appropriate flagship species, including i) local geographical distribution; ii) conservation status; iii) charisma; iv) positive associations and v) ease of recognition. Choughs in Jersey automatically fulfil i) and ii): the released birds have formed a stable and increasing population local to Jersey, typifying an important coastal habitat, and although the species is of Least Concern globally (Bird Life International 2016), it was previously extinct in the Channel Islands and so contextually possesses the appeal of a rare species, as described by MacDonald et al (2017). The results of this study demonstrate that the chough also fulfils iii) to v). Respondent attitudes towards the chough suggest it is sufficiently charismatic to appeal to the public imagination and many respondents feel pride and optimism about the chough due to the success of the reintroduction programme. Low respondent identification of the chough shows ease of recognition is the only criteria not fulfilled. This may be achieved through increasing awareness and emphasis of the species' distinct characteristics in outreach material. Overall, the species seems an appropriate choice of flagship, but is not currently utilised effectively to

convey a wider conservation message about the project: the disparity between knowledge levels of the chough and of the project suggest that outreach being received by residents fails to firmly link the chough with Birds on the Edge. According to Leader-Williams and Dublin (2000), a good flagship must raise support for wider issues than the preservation of the flagship itself, an idea reflected in the outreach objectives of Birds on the Edge (Durrell 2013) but which is not being achieved. Future outreach must maximise the chough's potential by bridging the gap between knowledge of the chough and knowledge of the project, establishing it more firmly as a symbol of the coastal habitats it typifies and the related restoration work of Birds on the Edge. A suggested Theory of Change for future Birds on the Edge outreach based on the results of this study is proposed in **Figure 7**.

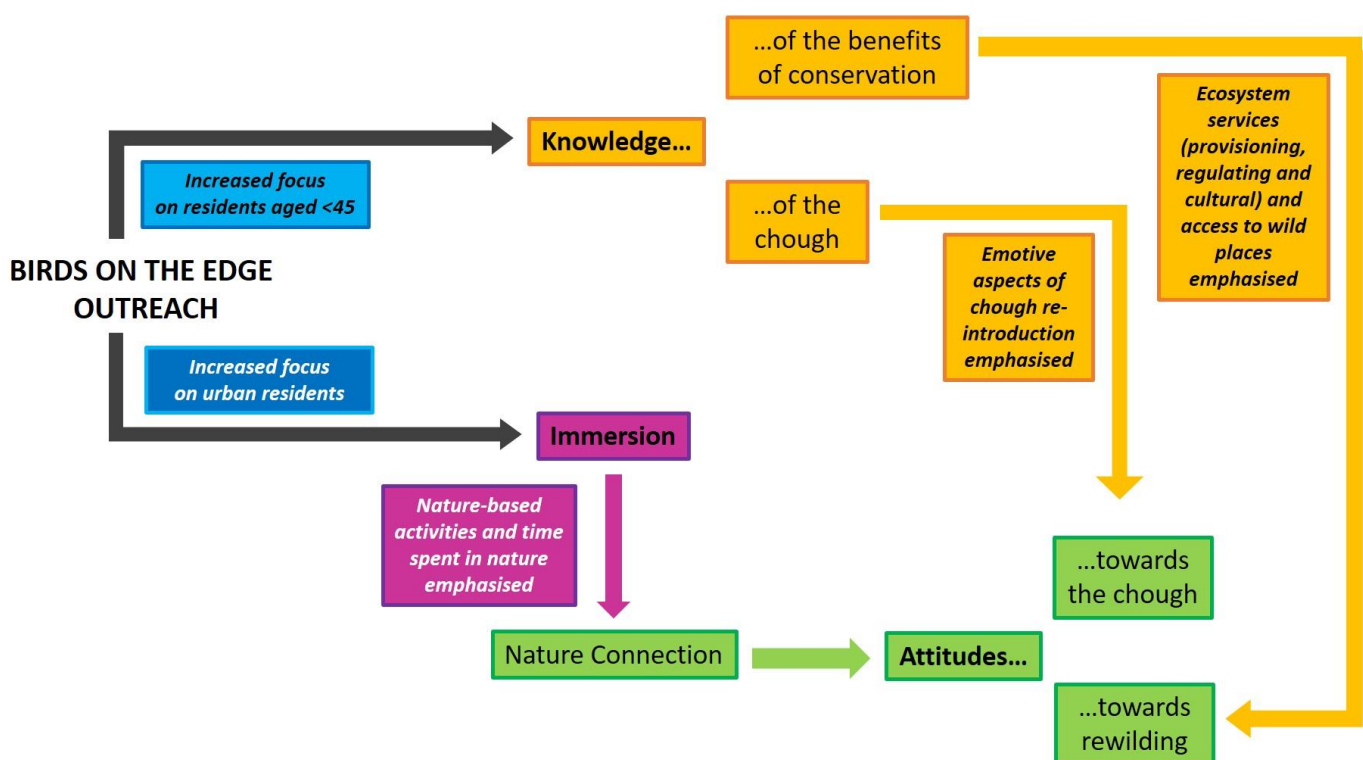


Figure 7. Proposed Theory of Change for future Birds on the Edge outreach based on the results of this study. Focus shifts from a mainly knowledge-based approach to one which includes a strong emphasis on increased immersion, particularly for urban residents. This approach capitalises on the relationship between nature connection and positive attitudes towards conservation. Knowledge-based outreach targets residents aged <45 and alters its focus to i) emotive aspects of the project to appeal to the affective element of nature connection ii) ecosystem services to increase rewilding support and iii) access to wild places to communicate the relevance of conservation to Jersey residents.

5 Conclusions

This study has demonstrated that, in order to achieve the outreach objectives of Birds on the Edge regarding the project and the chough as a flagship species, partner organisations need to improve the efficacy of outreach strategies, targeting specific demographic groups, utilising different communication channels and crafting key messages about the aims of conservation in Jersey and the ways in which conservation increases human well-being. The project should also utilise more fully the chough's appeal to the public. The study raises interesting questions regarding outreach methods: if higher immersion is correlated with higher nature connection, and higher nature connection is correlated in turn with support for rewilding, should the core focus of outreach strategies shift from a knowledge-based approach to one which prioritises increasing involvement? A key limitation of this study, due to the absence of any prior impact assessment, is that only correlative relationships can be elucidated. Future research into outreach and conservation in Jersey should focus on establishing causal relationships suggested by this study. Comparative case studies collecting longitudinal data before and after the new outreach strategy begins and which control more specifically for confounding variables may achieve this. Addressing these relationships may provide further information for the development of outreach programmes as well as a framework for assessing the impact of conservation outreach strategies focussed on knowledge, nature connection and practice.

6 Acknowledgements

I would like to thank my supervisor in Oxford, E.J. Milner-Gulland, for her support and constant enthusiasm throughout. I am also grateful to my external supervisor Eluned Price at Durrell Wildlife Conservation Trust, as well as Liz Corry and Glyn Young, who provided me with guidance and local knowledge in Jersey and the opportunity to study their conservation project Birds on the Edge. Thanks also to Jesse van der Grient for help with statistics and R. Questionnaires were conducted in Jersey with the permission of the Parishes of St Helier, St John and Trinity. Fieldwork was funded through generous grants from the Heron-Allen Committee, Lady Margaret Hall, and the University of Oxford Zoology Department. Finally, I am exceptionally grateful to my mother Rosalind and my partner Dan, whose unfailing levelheadedness and support made the completion of this project possible.

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Walpole M. J. and Leader-Williams N. (2002) *Tourism and flagship species in conservation* Biodiversity and Conservation 11: 543–547

Wickham. H (2009) *ggplot2: Elegant Graphics for Data Analysis* Springer-Verlag New York

8 APPENDICES

APPENDIX 1

Full Questionnaire

Location:
Record of informed oral consent ☐

Date:

Time:
Pilot? ☐

1a) How often do you usually visit the countryside in Jersey? This includes the beach, other coastal areas, woodlands, and other rural areas.

Daily ☐ Weekly ☐ Fortnightly ☐ Monthly ☐ Less than Monthly ☐ Never ☐

Present participant with Activity Sheet; do not read answer options

1b) Which of these activities do you do while you are in the countryside in Jersey?

Dog Walking ☐ Walking ☐ Running/Cycling ☐ Golf ☐
Other sports ☐ Bird watching ☐ Other nature activity ☐
Visiting a beach ☐ Visiting an attraction e.g. garden centre ☐ Working/volunteering ☐
Other (please specify):
I don't go to the countryside ☐

Present participant with Habitat Sheet; do not read answer options

1c) Which of the following types of places on Jersey have you visited in the last 6 months?

Sandy Beach ☐ Stony/Pebbly Beach ☐ Farmland ☐ Coastal Cliffs ☐
Woodland ☐ Rivers, lakes, or wetland areas ☐ Golf Course ☐
Other (please specify):

2) Can you tell me how much you agree or disagree with the following statements, using the scale shown on the card? Present participant with scale card.

In these questions, nature refers to all types of natural environment and all the plants and animals living in them. It can be close to where you live in towns as well as the countryside or wilderness areas further away.

	SD	D	N	A	SA	DK/NO
I find being in nature amazing						
Spending time in nature is important to me						
Being in nature makes me happy						
I find beauty in nature						
I treat nature with respect						
I feel part of nature						

Now I'm going to ask you some questions about conservation on Jersey.

3a)i) Have you heard about any current wildlife conservation projects on Jersey?

Yes ☐ No ☐ Don't Know ☐

3a)ii) If Yes Description/name of projects

.....

3a)iii) If Yes, present participant with Outreach Sheet Where did you hear about it/them?

Social Media ☐ Leaflet ☐ Magazine ☐ Information Board ☐ Word of Mouth ☐
Other

3b) Which organisation(s) implement(s) the projects you have mentioned?

.....

Don't Know ☐

Present participant with Logo Sheet 1

3c)i) These are logos of conservation organisations you may have heard of – can you name any of them?

Bird Life International ☐ Durrell ☐ WWF ☐ RSPB ☐
Birds on the Edge ☐ National Trust ☐ National Trust Jersey ☐

Present participant with Logo Sheet 2

Here are the full logos.

3c)ii) Are you a member of any of these organisations?

Bird Life International ☐ Durrell ☐ WWF ☐ RSPB ☐
Birds on the Edge ☐ National Trust ☐ National Trust Jersey ☐

3d)ii) Are you a member of any other conservation organisation not listed here?

.....

4a) If Birds on the Edge not recognised: This one is the logo for Birds on the Edge. Have you heard that name?

Yes ☐ No ☐ Don't Know ☐

4b) Do you know anything about what Birds on the Edge do?

Yes ☐

.....

No ☐ Don't Know ☐

Birds on the Edge is based on Jersey and implements conservation projects.

Present Participant with Bird Sheet

5a) Have you seen any of these birds on Jersey in the last 12 months?

Little Egret ☐ Blackbird ☐ Kestrel ☐
Green Woodpecker ☐ Chough ☐ Dartford Warbler ☐

5b) Can you tell me the name of these birds?

Little Egret ☐ Blackbird ☐ Kestrel ☐
Green Woodpecker ☐ Chough ☐ Dartford Warbler ☐

If chough is not recognised: This is a chough.

6a) If chough has been seen: Where did you see the chough?

Jersey Zoo ☐ Sorel ☐ Corbiere ☐ Grosnez ☐ Plemont ☐
Les Landes (race course and cliffs) ☐ Other ☐

6b)i) Have you heard anything about choughs on Jersey? Yes ☐ No ☐ Don't Know ☐

6b)ii) If Yes: What have you heard?

.....

7) The chough is a flagship species for Birds on the Edge, the conservation project I mentioned earlier. I'm going to read some statements about choughs – can you answer True, False, or Don't Know? Don't worry if you don't know – for the purpose of the research, I'd rather you didn't guess.

	T	F	DK
The chough is a type of crow			
The chough is not native to Jersey			
There are three chough release sites on Jersey			
Choughs have been released at Sorel			
Choughs were released in 2013			
There are over 100 choughs in the wild on Jersey			

Now I'm going to ask you some questions about your experiences of choughs on Jersey.

8a)i) Have you visited Sorrell in the last 12 months? Yes ☐ No ☐

8a)ii) If Yes: Did you see any choughs when you went? Yes ☐ No ☐

8a)ii) If Yes: How did you feel when on seeing the choughs?

.....

8b)i) Have you visited the chough aviary in Jersey Zoo? Yes ☐ No ☐

8b)ii) If Yes: Did you see any choughs when you went? Yes ☐ No ☐

8b)iii) If Yes: How did you feel on seeing the choughs?

.....

8c) Have you attended a keeper talk at the chough aviary at Jersey Zoo? Yes ☐ No ☐

If Yes: How did you find the talk, from -5 as Very Boring to +5 as Very Interesting, or Can't Remember? Can't Remember ☐

-5 ☐ -4 ☐ -3 ☐ -2 ☐ -1 ☐ 0 ☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐

9) For the following statements, please can you indicate how you feel about them, using the scale shown on the card? *Present scale card.*

	SD	D	N	A	SA	DK/NO
I feel that choughs symbolise the beauty and wildness of nature on Jersey						
I feel that reintroducing lost species on Jersey is important in order to restore the natural balance of the environment of Jersey						
I feel that reintroduced choughs may have a negative impact on my life or something I care about						
I like the idea of reintroducing choughs, but I wouldn't want them in my parish						
I find nature to be a strong source of inspiration						
I feel that reintroducing the chough on Jersey would bring more money through tourism to Jersey						
It would be thrilling to see choughs soaring around the cliffs						
I feel that the money spent on a chough reintroduction program would be better spent elsewhere						
Overall, I would support a project which aimed to reintroduce Jersey's lost species and restore its ecosystem						

10a) The term "rewilding" is sometimes used nowadays. In a few words, what does that term mean to you?

.....

.....

.....

Rewilding can be described as the practice of returning areas of land to a more naturally wild state, including the reintroduction of species that are no longer found there.

10b)i) Given that definition, how do you feel about rewilding? From -5 (Negative) to +5 (Positive), or Don't Know

-5 ☐ -4 ☐ -3 ☐ -2 ☐ -1 ☐ 0 ☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐

Don't Know ☐

10b)ii) Briefly, can you tell me why you feel that way?

.....

.....

Finally I will ask you some questions about yourself. For all these questions there is a 'Rather Not Say' option.

Sex to be filled in by me M ☐ F ☐

11a) Present participant with Age Band card Can you tell me which age band you fall into?

A 18-25 ☐ B 26-35 ☐ C 36-45 ☐ D 46 - 55 ☐ E 56 - 65 ☐ F >65 ☐

Rather not say ☐

11b) Which parish do you live in?

Saint Helier ☐ Grouville ☐ Saint Brelade ☐ Saint Clement ☐
Sant John ☐ Saint Lawrence ☐ Saint Martin ☐ Saint Mary ☐
Saint Queen ☐ Saint Peter ☐ Saint Saviour ☐ Trinity ☐ Rather not say ☐

11c) What is your highest level of education?

GCSE ☐ A-Level ☐ College ☐ BA/BSc or equivalent ☐
Masters ☐ PhD ☐ Rather not say ☐

12) Do you have any more things you would like to tell me about any of the topics we've talked about?

.....

.....

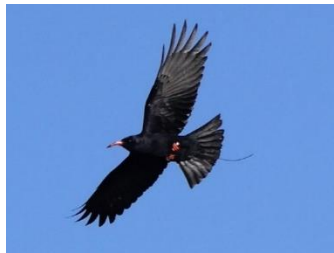
.....

.....

Thank you very much for your time! Here is a sheet with some contact details for you in case you have any concerns or would like to contact someone about the questionnaire.

APPENDIX 2A

Supplementary Material: Bird Species (Used with Questions 5a and 5b)



The pictures of six bird species used in the questionnaire. From top left, clockwise: **Little Egret** *Egretta garzetta*, **Common Blackbird** *Turdus merula*, **European Green Woodpecker** *Picus viridis*, **Dartford Warbler** *Sylvia undata*, **Red-billed Chough** *Pyrrhocorax pyrrhocorax pyrrhocorax* and **Common Kestrel** *Falco tinnunculus*.

Photographs were chosen using the following criteria:

- i) Depicts the bird in its typical habitat, position or activity;
- ii) Depicts the most distinctive sex in the cases of species with sexually dimorphic plumage;
- iii) Clearly depicts key identification features of the bird (e.g. red bill and legs of the chough, long legs and heron-like bill of the little egret, cocked tail of the Dartford warbler).

Species were chosen through consideration of geographical distribution and rarity to capture a range of habitats and abundance. The European Green Woodpecker is not native to Jersey and was included to validate responses.

Little Egret [https://commons.wikimedia.org/wiki/File:Egretta_garzetta - Little Egret, Mersin 2016-11-19 01-1.jpg](https://commons.wikimedia.org/wiki/File:Egretta_garzetta_-_Little_Egret,_Mersin_2016-11-19_01-1.jpg)

Common Blackbird https://commons.wikimedia.org/wiki/File:Blackbird_singing.JPG

European Green Woodpecker https://commons.wikimedia.org/wiki/Picus_viridis#/media/File:03_vgrue-10-11.jpg

Dartford Warbler https://commons.wikimedia.org/wiki/File:Dartford_Warbler_1.jpg

Red-billed Chough *courtesy of Elizabeth Corry, Durrell Wildlife Conservation Trust*

Common Kestrel https://commons.wikimedia.org/wiki/File:Common_kestrel_in_flight.jpg

APPENDIX 2B

Supplementary Material: Habitat Types (Used with Question 1c)



River, lake or wetland area



Farmland



Woodland



Coastal cliffs



Golf course



Stony or pebbly beach



Sandy beach or dunes

Other

Pictures and captions of habitats used in the supplementary material. Habitats were chosen to cover the range of environments present in Jersey. An 'Other' option was included.

River, lake or wetland area https://farm1.static.flickr.com/586/32576722421_1979c8c0f0_b.jpg

Farmland <https://www.dreamstime.com/stock-images-brecon-beacons-image6657104>

Woodland https://i.telegraph.co.uk/multimedia/archive/02692/wentworthForest_2692456b.jpg

Coastal cliffs http://www.pembrokeshirecandles.co.uk/uploads/2/8/2/9/2829807/7166149_orig.jpg

Golf course https://www.fairwayproductsonline.co.uk/images/products/regulation_golf_flag_pole.JPG

Stony or pebbly beach <https://www.gettyimages.co.uk/detail/photo/waves-crashing-on-the-beach-at-worbarrow-bay-royalty-free-image/184913696>

Sandy beach or dunes <https://www.saga.co.uk/contentlibrary/saga/publishing/verticals/home-and-garden/pets/dogs/dog-friendly-beaches/dog-friendly-beaches-camber-sands-east-sussex-328931357-768.jpg>

APPENDIX 2C

Supplementary Material: Activities (For use with Question 1b)



Walking or hiking



Dog walking



Golf



Cycling/biking or running/jogging



Working or volunteering



Bird watching



Other nature or wildlife-based activity



Visiting an attraction (e.g. garden centre, historic house or gardens)

Visiting the beach



Pictures and captions depicting activities used in the supplementary material. Activities were chosen to include a broad range of respondent age, mobility and interest.

Walking or hiking <https://cdn.xl.thumbs.canstockphoto.com/canstock2534160.jpg>

Dog walking <http://archive-uy.com/wp-content/uploads/2018/02/absolutely-smart-dog-walker-clipart-online-on-the-app-store.jpg>

Golf <http://worldartsme.com/images/mini-golf-clipart-1.jpg>

Cycling/biking <https://www.1001freedownloads.com/free-clipart/yellow-speed-bike>

Running/jogging <https://clipartimage.com/images/clipart-236486.html>

Working or volunteering <https://www.flickr.com/photos/49676862@N03/4559605732>

Bird watching <https://www.kisscc0.com/clipart/drawing-binoculars-coloring-book-cartoon-binocular-lpc64/>

Other nature or wildlife-based activity <http://sasolo.annafora.co/tree-photo/tree-png-transparent-clip-art-image-gallery-yopriceville-high.html>

Visiting an attraction <https://www.123rf.com/clipart-vector/orangery.html?sti=miauw57u5berhrngdk&mediapopup=94459924>

Visiting the beach <https://www.canstockphoto.co.uk/a-view-of-the-beach-22423010.html>

APPENDIX 3A

Development of Chough and Project Knowledge Test Questions (Used in Question 6)

Six statements designed to test participant's knowledge of the chough *P. pyrrhonorax pyrrhonorax* as a species and in the context of the Jersey reintroduction programme.

Six statements about the chough and the project were gathered from the Birds on the Edge project strategy (Durrell 2013), the project plan for the reintroduction of the red-billed chough (Corry 2012) and the red-billed chough reintroduction project work plan 2017 (Corry 2017). These were:

- i) *The chough is a corvid*
- ii) *The chough is native to Jersey*
- iii) *There is one chough release site in Jersey*
- iv) *Choughs have been released at Sorel*
- v) *The first choughs were released in 2013*
- vi) *There were 35 choughs living in the wild in Jersey as of November 2017*

Several of the statements were reversed or modified in order that there would be a mixture of true and false statements in the finished set. Language was also adjusted to make the wording as accessible as possible. The final statements are as follows:

- i) *The chough is a type of crow*
- ii) *The chough is not native to Jersey*
- iii) *There are three chough release sites in Jersey*
- iv) *Choughs have been released at Sorel*
- v) *Choughs were released in 2013*
- vi) *There are over 100 choughs in the wild in Jersey*

Participants were encouraged not to guess if they did not know the answer in order that their responses were an accurate reflection of their knowledge as possible. This was achieved through reassurance from the researcher that it did not matter if they did not know the answer and that it was preferred if they were honest.

APPENDIX 3B

Development of Kellert Typology Statements (Used in Question 9)

Nine statements were developed to test attitudes towards rewilding. These were modified from attitude statements used in a study of the context of mammal reintroductions in Scotland (Schofield 2005) which drew on Kellert's typologies of attitudes towards animals (Kellert 1982). The typologies characterise the main component of an individual's relationship with the natural world. The statements used (with typologies they represent) are:

- i) *I feel that choughs symbolise the beauty and wildness of nature on Jersey* (Naturalistic)
- ii) *I feel that reintroducing lost species on Jersey is important in order to restore the natural balance of the environment of Jersey* (Ecologistic)
- iii) *I feel that reintroduced choughs may have a negative impact on my life or something I care about* (Humanistic)
- iv) *I like the idea of reintroducing choughs, but I wouldn't want them in my parish* (NIMBY)
- v) *I find nature to be a strong source of inspiration* (Aesthetic)
- vi) *I feel that reintroducing the chough on Jersey would bring more money through tourism to Jersey* (Utilitarian)
- vii) *It would be thrilling to see choughs soaring around the cliffs* (Naturalistic)
- viii) *I feel that the money spent on a chough reintroduction program would be better spent elsewhere* (Negativistic)
- ix) *Overall, I would support a project which aimed to reintroduce Jersey's lost species and restore its ecosystem* (n/a)

The corresponding Kellert typologies are described below (Kellert 1982):

- i) *Naturalistic* Primary interest and affection for wildlife and the outdoors
- ii) *Ecologistic* Primary concern for the environment as a system, for interrelationships between wildlife species and natural habitats
- iii) *Humanistic* Primary interest and strong affection for individual animals, principally pets
- iv) *NIMBY* Not In My Back Yard; interested in nature but not prepared to deal with direct consequences (NOT a Kellert typology)
- v) *Aesthetic* Primary interest in the symbolic characteristics of animals
- vi) *Utilitarian* Primary concern for the practical and material value of animals
- vii) *Naturalistic* See i)
- viii) *Neutralistic* Primary orientation an avoidance of animals due either to indifference or dislike
- ix) n/a

APPENDIX 3B (cont.)

Statement *iv*) was added to measure the NIMBY attitudes towards chough reintroductions. It was hoped this would enable differentiation between individuals who disliked the idea in its entirety and those who were supportive in principle but had a negative perception of the chough's impact on them or their lives.

Statement *vii*) was initially intended to be representative of a Dominionistic typology (Primary satisfactions derived from mastery and control over animals, typically in sporting situations) and was modified from the original statement 'I would find it a stimulating and exciting experience to hunt and kill a wild boar' (Schofield 2005). However, unlike the potential use of hunting in population control of reintroduced mammals in Scotland (Schofield 2005), as occurs in Sweden, for example (Ericsson 2004), controlled hunting or culling is not a component of the chough reintroduction. Thus the Dominionistic typology was not necessarily relevant to the project and the statement instead was used to measure Naturalistic typology.

APPENDIX 3C

Development of Nature Connection Index Statements (Used in Question 2)

Six statements regarding nature connection were taken from Natural England's 2017 Commissioned Report which developed the Nature Connection Index (Natural England [online] (2017)). This measure of nature connection was chosen upon request from Durrell Wildlife Conservation Trust, which is utilising the Nature Connection Index in other studies.

The statements were prefaced with the following definition of nature, also taken from the Natural England report (Natural England [online] (2017):

"In these questions, nature refers to all types of natural environment and all the plants and animals living in them. It can be close to where you live in towns as well as the countryside or wilderness areas further away."

The six statements used (in this order) are (Natural England [online] (2017):

- i) *I find being in nature amazing*
- ii) *Spending time in nature is important to me*
- iii) *Being in nature makes me happy*
- iv) *I find beauty in nature*
- v) *I treat nature with respect*
- vi) *I feel part of nature*

Participants were shown a visual representation of a five-point Likert scale ranging from Strongly Disagree (-2) to Strongly Agree (+2), with an option for No Opinion/Don't Know, as responses for the statements:

A.	B.	C.	D.	E.	F.
Strongly	Disagree	Neutral	Agree	Strongly	Don't
Disagree				Agree	Know
					or
					No
					Opinion

The statements are designed to test the three components of nature connection as described by Schultz (2002):

- i) *Cognitive* How integrated an individual feels with nature
- ii) *Affective* An individual's emotive sense of care for nature
- iii) *Behavioural* An individual's commitment to protecting nature

APPENDIX 4A

Material for Participants: Recruitment Script

Hello, my name is Miriam. I'm currently doing my undergraduate degree at Oxford University in Zoology. I'm conducting some research about conserving wild places and the natural environment in Jersey. I am carrying out a 5 – 10 minute questionnaire for residents on Jersey and I was wondering if you are interested in taking part.

If yes: First I need to ask if you are 18 or over, and a resident on Jersey?

If no: Thank you for your time, but I'm conducting my research on adults who live on Jersey.

If affirmative: Here is some information about the research. Please feel free to read it now, or take it away with you. I can also take you through it if you'd like.

Do you have any questions?

Are you happy to take part?

Do you give your permission for me to record your answers on this questionnaire?

Ok, thanks, in which case let's start.

APPENDIX 4B

Material for Participants: Participant Information Sheet

Participant Information Sheet

CUREC Ethics Reference for this study:

R58322/RE001

Department of Zoology
University of Oxford
New Radcliffe House
Radcliffe Observatory Quarter
Woodstock Road
Oxford OX2 6GG



This study aims to understand how to protect Jersey's wild places by collecting information on Jersey residents' feelings and perceptions towards nature and conservation. The research is being conducted as a research project for the BA course in Biological Sciences at the University of Oxford. It has been reviewed and approved by an Oxford University ethics committee.

Why have I been invited to take part? You have been invited to take part because you are an adult resident on Jersey.

Do I have to take part? Before deciding whether to participate, you can ask questions about the study. You don't have to agree to take part; you can ask me any questions you want before or throughout; you can also withdraw at any stage without giving a reason. If you decide to withdraw, you can do so without penalty and without giving a reason by advising the researcher of your decision. Your data will be discarded from the research project. You can easily withdraw your data before September 2018 (please use the contact details below if you wish to do so).

What will happen in the study? Once you have given your consent to participate in the study, I will conduct a 10 minute questionnaire with you in person, asking a range of questions about nature and conservation on Jersey, and recording your answers in written format. This research is anonymous, which means that in any publications your name will not be used. The answers you give will form the basis of my undergraduate research project.

Are there any potential risks in taking part? There are no risks associated with taking part.

What happens to the research data provided? Research data will be recorded anonymously. Results will be used in an undergraduate thesis which will be stored in the University Archive and may be available publicly. They project may also be published in magazines or websites of conservation organisations on Jersey.

How will the research data be handled? The University of Oxford is responsible overall for ensuring the safe and proper use of any personal information you provide, solely for research purposes. Further information about your rights to information you provide is available from the University's data protection web site. More information can be found here: <http://www.admin.ox.ac.uk/councilsec/compliance/gdpr/individualrights/> .

The researcher and the supervisor of the project will have access to research data. Your anonymous answers will be stored safely and confidentially, electronically on encrypted documents, and the researcher will keep the research data for 3 years after publication. The researcher would like to be able to use your anonymised information/data in future studies, and to share this information/data with other researchers.

Who has reviewed this study? This project has been reviewed by, and received ethics clearance through, the University of Oxford Central University Research Ethics Committee. It has also been reviewed by the project supervisor, Professor EJ Milner-Gulland. The CUREC Ethics Reference can be found at the top of this document.

APPENDIX 4C
Material for Participants: Debriefing Slip

Contact Details

CUREC Ethics Reference for this study:

R58322/RE001

Department of Zoology
University of Oxford
New Radcliffe House
Radcliffe Observatory Quarter
Woodstock Road
Oxford OX2 6GG



Thank you for taking part in my research. Your answers will be important in developing understanding of how best to conserve wild places on Jersey.

If you have any questions or concerns about the research you have participated in today, please do not hesitate to speak to the relevant researcher, Miriam Lord (+44 (0) 7591103057, miriam.lord@lmh.ox.ac.uk) or their supervisor, EJ Milner-Gulland (+44 (0) 1865 271 260). The researcher should acknowledge your concern within 10 working days and give you an indication of how he/she intends to deal with it.

If you remain unhappy and wish to make a formal complaint, please contact the chair of the Research Ethics Committee at the University of Oxford (using the contact details below) who will seek to resolve the matter in a reasonably expeditious manner:

Chair, **Social Sciences & Humanities Inter-Divisional Research Ethics Committee**

Email: ethics@socsci.ox.ac.uk

Address: Research Services, University of Oxford, Wellington Square, Oxford OX1 2JD

The CUREC Ethics Reference for this study can be found at the top of the page.

APPENDIX 5

Data Analysis

5A Immersion Score

'Immersion' was calculated additively from several factors measured by the questionnaire:

- i) *Immersion frequency (Question 1a)* Visiting the countryside daily gave 1 point; visiting less than daily gave 0 points
- ii) *Participation in immersive activities in the countryside (Question 1b)* 1 point for each of walking, dog walking, working or volunteering, birdwatching, other nature activity, or fishing (recorded in 'other')
- iii) *Bird sightings (Question 5a)* 1 point for each of the bird species in the supplementary material seen in the last 12 months, excluding the chough and the green woodpecker
- iv) *Chough sightings (Question 5a)* 1 point if seen in the last 12 months

The maximum Immersion Score is 12. The highest Immersion Score of any respondent was 9; the lowest was 1.

5B Chough Test Score Category

Respondents were divided into two categories based on their score in the Chough Knowledge Test (Question 7). In the Chough Knowledge Test, statements were either Chough-Based (relating to the chough as a species) or Project-Based (relating to the chough in the context of Birds on the Edge):

- i) *The chough is a type of crow* (Chough-Based)
- ii) *The chough is not native to Jersey* (Chough-Based)
- iii) *There are three chough release sites in Jersey* (Project-Based)
- iv) *Choughs have been released at Sorel* (Project-Based)
- v) *Choughs were released in 2013* (Project-Based)
- vi) *There are over 100 choughs in the wild in Jersey* (Project-Based)

5B (cont.)

This division was utilised in two ways during the analysis:

- 1) The mean score for Chough-Based statements and Project-Based statements was calculated to remove the effect of the unequal number of statements in each category. The mean scores were then used in further statistical analysis.
- 2) To score ≥ 3 in the Chough Knowledge Test, respondents must have answered at least one Project-Based statement correctly (as there are only 2 Chough-Based statements). Thus, scores of ≥ 3 were inferred to represent a greater level of knowledge than those of < 3 . Respondents were divided correspondingly into 'More Informed' and 'Less Informed' for the purpose of further statistical analysis.

5C Rewilding Attitude Category

Respondents were divided into two categories based on the rewilding scale score recorded (Question 10b)i). The 10-point scale ran from -5 (Very Negative) to +5 (Very Positive). The main divide in responses was between $\leq +4$ and +5; 77 respondents scored +5 and so the remaining 39 respondents (excluding 2 respondents who recorded 'Don't Know') were grouped together to perform meaningful statistics between categories:

- i) *Score +5* 'Full' support for rewilding
- ii) *Score < 5* 'Reserved' support for rewilding

As only one respondent gave a negative score (-5), a score of < 5 was considered to be 'Reserved' support rather than representative of only negative beliefs about rewilding.

5D Nature Connection Scores

The Nature Connection Index statements (Natural England 2017) were scored on a 5-point Likert scale from -2 to +2 (see Appendix 2C). A Principle Component Analysis was conducted on the scores of every respondent for each of the statements (see Appendix 6A). Principle Component 1 explained 58.5% of the variance in Nature Connection Index scores and so was used as an objective and parametric proxy for overall NCI score. PC1 score signs were reversed in order that higher PC1 scores corresponded with a higher NCI score for more intuitive interpretation and presentation of analysis.

5E Urban/Rural Respondents

Respondents were divided into 'Urban' or 'Rural' categories based on the population density of the parish they inhabited in the 2011 Jersey Census (States of Jersey Statistics Unit 2012). As this study aimed to compare the relative urban-ness and rural-ness of Jersey residents, a definition of 'Urban' and 'Rural' derived from population densities of Jersey was considered more appropriate than absolute definitions developed by other organisations (e.g. GOV.UK 2016).

Parishes with a density of ≥ 1000 people/km² were categorised as 'Urban':

- i) *St Helier* (3541)
- ii) *St Clements* (2142)
- iii) *St Saviour* (1471)

Parishes with a density of < 1000 people/ km² were categorised as 'Rural':

- | | |
|-------------------------------|---------------------------|
| i) <i>St Brelade</i> (803) | vi) <i>St John</i> (320) |
| ii) <i>Grouville</i> (594) | ix) <i>St Oeun</i> (270) |
| iii) <i>St Lawrence</i> (552) | x) <i>St Mary</i> (267) |
| iv) <i>St Peter</i> (425) | xii) <i>Trinity</i> (253) |
| v) <i>St Martin</i> (368) | |

APPENDIX 6

Statistical Results

6A PCA Loadings and Summary Table

PCA For NCI

Summary Table:

	Comp.1	Comp.2	Comp.3	Comp.4	Comp.5	Comp.6
Standard deviation	1.8744054	0.8994370	0.75610291	0.68673642	0.58503406	0.5404204
Proportion of Variance	0.5855659	0.1348312	0.09528194	0.07860115	0.05704414	0.0486757
Cumulative Proportion	0.5855659	0.7203971	0.81567901	0.89428016	0.95132430	1.0000000

Loadings:

	Comp.1	Comp.2	Comp.3	Comp.4	Comp.5	Comp.6
NCI.1	-0.422	0.129	0.504	0.509	0.424	-0.336
NCI.2	-0.453	0.250	0.150	0.146	-0.254	0.790
NCI.3	-0.458			-0.156	-0.723	-0.489
NCI.4	-0.426			-0.790	0.430	
NCI.5	-0.278	-0.936		0.160		0.122
NCI.6	-0.385	0.206	-0.840	0.215	0.218	

The six statements are shown in the loadings table and are referenced below (Natural England (2017):

- i) *I find being in nature amazing* (NCI.1)
- ii) *Spending time in nature is important to me* (NCI.2)
- iii) *Being in nature makes me happy* (NCI.3)
- iv) *I find beauty in nature* (NCI.4)
- v) *I treat nature with respect* (NCI.5)
- vi) *I feel part of nature* (NCI.6)

6B ANOVA Tables and Corresponding Tukey Tests

NCI PC1 ~ Immersion

```
#aov1 = NCI PC1 ~ Immersion
> summary(aov1)
          Df Sum Sq Mean Sq F value    Pr(>F)
Immersion    9   100.3   11.144    3.837 0.000311 ***
Residuals  107   310.8    2.904
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
1 observation deleted due to missingness
```

```
#tukey test for NCI PC1 ~ Immersion
> tukeytest1
Tukey multiple comparisons of means
 95% family-wise confidence level
```

```
Fit: aov(formula = Data$PC1 ~ Immersion)
```

```
$Immersion
      diff      lwr      upr      p adj
I1-I0 -3.71883785 -9.494835  2.05715926 0.5451085
I2-I0 -5.04912163 -10.736930  0.63868714 0.1276954
I3-I0 -5.02792666 -10.728417  0.67256397 0.1333626
I4-I0 -5.50208531 -11.160193  0.15602191 0.0638179
```

I5-I0	-5.95913350	-11.617241	-0.30102629	0.0304985
I6-I0	-5.63026520	-11.280530	0.01999987	0.0516155
I7-I0	-6.29417975	-12.026252	-0.56210721	0.0196487
I8-I0	-6.75847847	-12.706931	-0.81002567	0.0133169
I9-I0	-7.15861430	-13.315848	-1.00138069	0.0100844
I2-I1	-1.33028378	-3.578588	0.91802004	0.6609795
I3-I1	-1.30908881	-3.589285	0.97110744	0.6985412
I4-I1	-1.78324746	-3.955315	0.38882040	0.2067885
I5-I1	-2.24029565	-4.412364	-0.06822780	0.0374802
I6-I1	-1.91142735	-4.062984	0.24012949	0.1270282
I7-I1	-2.57534190	-4.933383	-0.21730095	0.0208444
I8-I1	-3.03964062	-5.883545	-0.19573623	0.0262287
I9-I1	-3.43977645	-6.697878	-0.18167467	0.0297597
I3-I2	0.02119497	-2.025344	2.06773374	1.0000000
I4-I2	-0.45296367	-2.378296	1.47236870	0.9989648
I5-I2	-0.91001187	-2.835344	1.01532050	0.8781576
I6-I2	-0.58114357	-2.483306	1.32101910	0.9924278
I7-I2	-1.24505812	-3.377986	0.88787017	0.6781256
I8-I2	-1.70935683	-4.369586	0.95087213	0.5479831
I9-I2	-2.10949267	-5.208566	0.98958029	0.4635447
I4-I3	-0.47415864	-2.436639	1.48832183	0.9987225
I5-I3	-0.93120684	-2.893687	1.03127363	0.8756207
I6-I3	-0.60233854	-2.542093	1.33741600	0.9914841
I7-I3	-1.26625309	-3.432773	0.90026669	0.6765561
I8-I3	-1.73055180	-4.417789	0.95668525	0.5447820
I9-I3	-2.13068764	-5.252975	0.99159967	0.4597943
I5-I4	-0.45704819	-2.292781	1.37868419	0.9983836
I6-I4	-0.12817989	-1.939597	1.68323708	1.0000000
I7-I4	-0.79209444	-2.844506	1.26031676	0.9626700
I8-I4	-1.25639316	-3.852511	1.33972448	0.8622093
I9-I4	-1.65652899	-4.700747	1.38768878	0.7591689
I6-I5	0.32886830	-1.482549	2.14028528	0.9998749
I7-I5	-0.33504625	-2.387457	1.71736495	0.9999488
I8-I5	-0.79934497	-3.395463	1.79677267	0.9919896
I9-I5	-1.19948080	-4.243699	1.84473697	0.9574611
I7-I6	-0.66391455	-2.694607	1.36677740	0.9877150
I8-I6	-1.12821327	-3.707195	1.45076809	0.9203943
I9-I6	-1.52834910	-4.557966	1.50126802	0.8303706
I8-I7	-0.46429872	-3.217897	2.28929986	0.9999327
I9-I7	-0.86443455	-4.044016	2.31514721	0.9968171
I9-I8	-0.40013583	-3.955016	3.15474465	0.9999979

NCI PC1 ~ Age

```
#NCI PC1 ~ Age
> aov2<-aov(PC1~Age)
> summary(aov2)
```

	Df	Sum Sq	Mean Sq	F value	Pr(>F)
Age	5	12.4	2.470	0.682	0.638
Residuals	110	398.5	3.623		

2 observations deleted due to missingness

NCI PC1 ~ Kellert Statemen Ct: I feel that the chough would have a negative impact on my life or something I care about

```
aov3<-aov(Kellert.C$PC1~Kellert.C$Statement.Response)
> summary(aov3)
```

	Df	Sum Sq	Mean Sq	F value	Pr(>F)
Kellert.C\$Statement.Response	2	36.7	18.334	5.486	0.00534 **
Residuals	112	374.3	3.342		

Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

```
tukey3<-TukeyHSD(aov3)
```

```
> tukey3
```

```
Tukey multiple comparisons of means
95% family-wise confidence level
```

```
Fit: aov(formula = Kellert.C$PC1 ~ Kellert.C$Statement.Response)
```

```
$`Kellert.C$Statement.Response`
```

	diff	lwr	upr	p adj
DK-Disagree	-0.7400695	-1.9714300	0.4912909	0.3302620
Strongly Disagree-Disagree	0.7643637	-0.1510990	1.6798264	0.1210691
Strongly Disagree-DK	1.5044332	0.3613101	2.6475564	0.0063408

NCI PC1 ~ Kellert Statement D: I like the idea of reintroducing choughs, but I wouldn't want them in my parish

```
#NCI PC1 ~ Kellert D
```

```
aovD<-aov(Kellert.D$PC1~Kellert.D$Statement.Response)
```

```
> summary(aovD)
```

	Df	Sum Sq	Mean Sq	F value	Pr(>F)
Kellert.D\$Statement.Response	2	49.7	24.86	7.843	0.000644 ***
Residuals	114	361.3	3.17		

```
---
```

Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

```
tukeyD
```

```
Tukey multiple comparisons of means
95% family-wise confidence level
```

```
Fit: aov(formula = Kellert.D$PC1 ~ Kellert.D$Statement.Response)
```

```
$`Kellert.D$Statement.Response`
```

	diff	lwr	upr	p
adj				
Do Not Know/Agree-Disagree	-0.5879425	-1.63986727	0.4639822	0.3830470
Strongly Disagree-Disagree	0.9194247	-0.04989555	1.8887449	0.0668834
Strongly Disagree-Do Not Know/Agree	1.5073672	0.58299563	2.4317387	0.0005253

NCI PC1 ~ Kellert Statement H: I feel that the money spent on a chough reintroduction programme would be better spent elsewhere

```
aov4<-aov(Kellert.H$PC1~Kellert.H$Statement.Response)
```

```
> summary(aov4)
```

	Df	Sum Sq	Mean Sq	F value	Pr(>F)
Kellert.H\$Statement.Response	2	34.0	17.001	5.14	0.00729 **
Residuals	114	377.1	3.308		

```
---
```

Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

```
tukey4<-TukeyHSD(aov4)
```

```
> tukey4
```

```
Tukey multiple comparisons of means
95% family-wise confidence level
```

```
Fit: aov(formula = Kellert.H$PC1 ~ Kellert.H$Statement.Response)
```

```
$`Kellert.H$Statement.Response`
```

	diff	lwr	upr	p adj
Disagree-Agree/DK	0.1546991	-0.7246178	1.034016	0.9083598
Strongly disagree-Agree/DK	1.4915601	0.3551972	2.627923	0.0064937
Strongly disagree-Disagree	1.3368610	0.1762067	2.497515	0.0196449

9 Management Report

I became aware of the work of the Interdisciplinary Centre for Conservation Science (ICCS) in the summer vacation before 2nd Year whilst looking for project supervisors interested in the interface between conservation and social science. Having conducted preliminary reading regarding conservation optimism, rewilding and people's relationship with conservation I arranged to meet Prof. E.J. Milner-Gulland early in Michaelmas term to discuss potential project options.

Being greatly interested in birds and their potential as a conservation engagement tool, I was delighted in the resulting opportunity to work with Durrell Wildlife Conservation Trust (Durrell) on their conservation programme Birds on the Edge, which utilises the chough as a flagship species. In mid-Michaelmas, I discussed project options with both my external supervisor Eluned Price (Durrell) and E.J. Milner-Gulland, and decided to conduct my project focussing on the awareness of the chough and of the wider project in the Jersey public. After further reading I decided to incorporate the Kellert typology and the Nature Connection Index into my research to determine the influence of nature connection and rewilding attitudes on conservation support. At this point I also created a timeline of my planning and research, which included preparatory work in Hilary and Trinity terms and fieldwork in July.

In Hilary term, I applied for funding from my college Lady Margaret Hall and from the University Zoology Department to cover the cost of travel and accommodation. Both supervisors also approved my project proposal, and I began preparing for a preliminary meeting with Durrell in Jersey over the Easter vacation. The aim of this meeting was to visit the conservation site, and discuss the subject and design of my questionnaire. This meeting was very productive but coincided with a decline in my health and the majority of questionnaire design and ethics approval was put on hold while I concentrated solely on my Part I examinations.

In Trinity term I received funding and made the appropriate booking for travel and accommodation. After exams, I was able to focus on the development of the questionnaire, the creation of supplementary material, and the submission of the Human Ethics form through meetings and email contact with my supervisor. I conducted a pilot of the questionnaire at university and made minor adjustments, including the addition of further supplementary material. I also designed a fieldwork timetable to ensure I was able to sample each site in Jersey appropriately.

In July 2018 I travelled to Jersey for four weeks to conduct the questionnaires. In the first three days I conducted a further pilot in Jersey Zoo, which again resulted in minor amendments. Over the following 24 days I conducted questionnaires at Jersey Zoo, Sorel Point and St Helier, with several adjustments

to my fieldwork schedule. I had not anticipated the difficulty of travelling to Sorel Point by bus, nor how quiet this area could be (my external supervisor had advised it could be relatively busy), and so I decided it was not time effective to conduct questionnaires at that site. I had also not anticipated how tiring the research could be, particularly dealing with the refusals (up to 90%). Unfortunately, in addition to this, I developed an allergy to UV, which made working outside in a heatwave very difficult, and I had to miss some of my scheduled days. However, I still managed to collect 118 responses, and finish all my data entry, by the time I returned home.

Over the remainder of the Summer vacation I wrote up my field methods and was ready to begin my analysis at the beginning of Michaelmas term. I conducted further reading for my literature review and met with my supervisor to discuss the initial descriptive analysis and cementing my research questions before carrying out the statistical analysis. I found using R to do this particularly difficult, but I learnt a huge amount from manipulating my own data and feel that I developed my competence in this significantly.

By the end of Michaelmas 9th week I had completed the remainder of my methods section, written up my results, and conducted a significant proportion of further reading for my literature review. Over the rest of the Christmas vacation I wrote the introduction and discussion, and created figures and appendices, completing a full draft. Improvements were made after receiving feedback from my supervisor in early January before submission.

The completion of my project dissertation has been an immensely enjoyable experience. I found it rewarding to conduct research in an area I am passionate about and I am now excited about future opportunities to pursue further research.