






Public perceptions of an avian reintroduction aiming to connect people with nature

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Funding information

University of Brighton, Grant/Award

Number: Rising Stars scheme 2020-2021

Handling Editor: Arjen Buijs

Abstract

1. Species reintroductions are an increasingly popular conservation tool, typically aiming to achieve direct conservation benefits. Socio-cultural drivers also exist but have, to date, received very little attention in research and policy.
2. As a case study, we focus on the recent and ongoing reintroduction of the white stork *Ciconia ciconia* to England, key drivers of which include connecting people with nature, providing local socio-economic benefits and inspiring environmental restoration.
3. We surveyed 3531 people in Britain to establish and explore baseline perceptions toward white storks and their reintroduction, including their cultural salience. Findings were compared and evaluated between (i) self-selecting and nationally representative samples and (ii) residents living close to release sites versus non-locals.
4. In contrast to self-selecting participants, most of the nationally representative sample had never heard of nor seen a white stork and were unaware of the reintroduction. Attitudes were more positive in the self-selecting sample and neutral or uncertain in the nationally representative sample. Consequently, to assess views of both engaged communities and wider publics, we recommend reintroductions adopt a similar two-mode sampling strategy to that used here when undertaking social feasibility assessments/public consultations.
5. Eighty-six percent of participants supported the reintroduction overall. Reasons provided for support were diverse, relating to perceived or experienced socio-cultural benefits and values, general biodiversity enrichment, and moral impetus to restore formerly native species. Criticisms, raised by a minority, related to uncertainty/disagreement about the white stork's formerly native status; rigour of the ecological risk assessment; and a perceived lack of transparency regarding how the project supports conservation efforts.
6. Given that reintroductions have underexplored potential to (re)establish socio-cultural relationships between people, wildlife and landscapes, and these are

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increasingly cited as justifications for reintroductions, we encourage further discussion and research in this area.

KEYWORDS

birds, *Ciconia ciconia*, conservation translocation, cultural salience, nature connection, public opinion, reintroduction, white stork

1 | INTRODUCTION

Species reintroductions, or 'the intentional movement and release of an organism inside its indigenous range from which it has disappeared' (IUCN/SSC, 2013), are an increasingly popular conservation tool (Bubac et al., 2019; Seddon et al., 2014). The primary objective of most reintroductions is to achieve a direct, measurable conservation benefit, either for (i) species conservation, where the goal is to re-establish a viable population to improve its status locally or globally or (ii) as part of wider initiatives aiming to restore natural ecosystem functions or processes (IUCN/SSC, 2013; Seddon et al., 2014). However, reintroductions can also be motivated by social, cultural and political factors. Ancillary objectives of reintroductions have included, for example, public relations benefits for the acting organisation (Converse et al., 2013) and establishing species in new sites away from areas of existing human-wildlife conflict (Marino et al., 2023). Another driver that is often mooted, but rarely evaluated, is to utilise reintroductions of charismatic species to re-engage or 'connect' people with wildlife and the natural world (van Heezik & Seddon, 2018). These alternative drivers have, to date, received very little attention in research and policy. Furthermore, while ecological feasibility assessments and monitoring are commonplace, consideration and evaluation of social factors remain relatively rare (Dando et al., 2022). As a case study, here we examine public perceptions toward the recent and ongoing white stork *Ciconia ciconia* reintroduction in Britain, primary motivations of which have been to inspire, engage and connect people with wildlife and natural landscapes, provide socio-economic benefits for local communities and for the species to act as an emblem for environmental restoration.

1.1 | Socio-cultural dimensions of reintroductions

Although species reintroductions primarily seek ecological outcomes, they are inherently social processes, influenced by organisational, political, economic and cultural dynamics, and exerting impacts upon human communities (Crowley et al., 2017; O'Rourke, 2014; Sutton, 2015). Overlooking or failing to consider these human social dimensions risks jeopardising success (Consorte-McCrea et al., 2022). The *IUCN Guidelines for Reintroductions and Other Conservation Translocations* provide an internationally recognised framework of best practice for planning and delivering reintroductions (IUCN/SSC, 2013), and some countries, including England, have produced

complementary, nationally focused guidance (Defra, 2021). These emphasise that the inclusion of social factors is a key component of planning, design and monitoring any reintroduction. Yet, Dando et al. (2022) found that conservation translocation projects regularly fail to assess social feasibility (i.e. 'socioeconomic factors that influence the likelihood of achieving stakeholder acceptance and realising stated conservation objectives') and that when assessments were attempted they were often narrow in scope or implemented reactively, frequently leading projects to fail to identify or address (potential) issues. Generally, there is limited wider public awareness about specific reintroductions (Hiroyasu et al., 2019); however, others are controversial, generating social conflicts (Coz & Young, 2020; Crowley et al., 2017; O'Rourke, 2014). Beyond the avoidance of damaging conflicts, adequate consideration of social aspects is important because local communities in or around a release area will have legitimate and varied interests. For example, local communities are unlikely to have any experience of or connection with species that have been absent for, sometimes hundreds of years, and may therefore have concerns about their release. Indeed, irrespective of their status as 'former natives', reintroduced species may be responded to as intruders or invaders (Crowley et al., 2017; Holmes et al., 2022; Jørgensen, 2013).

Beyond identifying concerns, challenges and potential for conflict, it is important to understand positive social, economic and cultural effects that species reintroductions might have. A recent and understudied driver for some reintroductions has been to connect people with nature. In addition to the White Stork Project (see Section 1.2 below), such efforts include the 'Birds on the Edge' project in Jersey (Channel Islands), which aims to use reintroduced red-billed choughs, *Pyrrhocorax pyrrhocorax*, as a flagship species to increase nature connectedness and support for coastal habitat restoration (Lord, 2018). Similarly, in Tajima, Japan, an ongoing initiative to reconnect people and nature centres on the reintroduction of the Oriental stork *Ciconia boyciana* (Ezaki & Sagara, 2014; Kikuchi, 2018). Reintroductions aiming to improve nature connectedness as a core motivation have arisen largely in response to the 'extinction of experience' (Pyle, 1993; Seddon et al., 2013; Soga & Gaston, 2016). Measures of nature connectedness have been positively associated with health and wellbeing (e.g. Martin et al., 2020; Pritchard et al., 2020), and engagement in both pro-environmental and pro-nature conservation behaviours (e.g. Richardson et al., 2020; Whitburn et al., 2020). The promise of social, as well as ecological, benefits from reintroductions make these concepts appealing to those building a

case for a reintroduction project. However, how reintroductions actually affect people's relations with the rest of the natural world remains an underdeveloped area of research (although see recent discussions pertaining to beaver reintroductions: Auster, Barr, et al., 2020; Gandy & Watts, 2021; Ulicsni et al., 2020).

While there is considerable variation in how public consultations for reintroductions are conducted, most obtain a self-selecting sample (e.g. Auster, Puttock, et al., 2020; Hawkins et al., 2020; Mayhew et al., 2016; Worthington et al., 2010). This approach is informative for soliciting the opinions of those interested and/or knowingly affected but does not necessarily reflect the views of wider publics. Arguably, more geographically extensive consultations should be conducted for species that are likely to expand their ranges. One national consultation exercise for a proposed reintroduction (lynx to the UK) was found that had collected views from both self-selecting and nationally representative samples (Smith et al., 2016); however, the implications of such an approach were not evaluated. Longitudinal studies monitoring the social dimensions of species reintroductions are also vital to evaluating progress within an adaptive management framework (Consorte-McCrea et al., 2022), but very few such efforts exist (e.g. Brazier et al., 2020; Delibes-Mateos et al., 2022; Treves et al., 2013). Furthermore, adopting a mixed-methods approach—that is collecting and analysing quantitative and qualitative data—albeit underutilised, has been shown to be most appropriate for comprehensively understanding the range and prevalence of different perspectives concerning a reintroduction (Bavin et al., 2020).

1.2 | White Stork Project

The white stork is a large, long-lived migratory bird, with a breeding distribution spanning Europe, northwestern Africa and southwestern Asia. Most individuals winter in sub-Saharan Africa and the Indian subcontinent but increasing numbers are resident in Europe (Flack et al., 2016; Gilbert et al., 2016). There is historical evidence that white storks were present in Britain in the past (Gow & Edgcumbe, 2016), though whether or not they were abundant or regular breeders is contested (Carter, 2020).

In the 20th century, white storks suffered a sharp decline range-wide, in part caused by habitat destruction from agricultural intensification, specifically wetland drainage (Deinet et al., 2013). Since the 1980s, the European population has steadily increased, largely due to targeted conservation efforts including reintroductions. The species is classified as *Least Concern* by IUCN (BirdLife International, 2016).

The white stork, with its long history of human coexistence, combined with distinctive physical and behavioural traits, has cultural associations throughout its range (Cocker et al., 2013; Gow et al., 2017). Across central and eastern Europe, storks are believed to bring harmony, health and good luck to a family on whose property they nest, and the species is known internationally as a symbol of new life and fertility. European 'stork villages'—sites of colonial

nesting—are a source of both local pride and income generation via ecotourism (Czajkowski et al., 2014).

The White Stork Project, comprising a partnership of private landowners and nature conservation organisations, aims to restore a self-sustaining free-living population of white storks in southern England by 2030 (Gow et al., 2017). The project also aims to 'ignite the public's passion for wildlife and provide social-economic benefits for local communities', arguing that 'in a time of increasing disengagement with nature in the UK, bringing back white storks could be a means by which we can reignite our affection for the natural world and it could act as an emblem for environmental restoration' (White Stork Project, 2023). However, limited research has investigated people's relationships with either naturally occurring or reintroduced white stork populations anywhere within their distribution range (but see Czajkowski et al., 2014; Kronenberg et al., 2017; Frątczak et al., 2020), and none within Britain.

Prior to any releases, a feasibility study for the White Stork Project was conducted (Gow et al., 2017). The report's risk assessment concluded no known anticipated ecological or socio-economic risks of significance. Despite plans for a public consultation being outlined in the report, no formal assessment of public attitudes or support was undertaken prior to the birds' release: '...based on public reactions across mainland Europe and the iconic nature of this species, majority support is assumed' (Gow et al., 2017). A phased release programme began in 2016 to establish local populations at three private sites in Sussex and Surrey, of which the primary release site is the Knepp Estate (Figure S1). Between 2019 and 2023, captive-bred juveniles were released to facilitate a migratory population. Release sites were identified for ecological and cultural reasons (see Gow et al., 2017); for example, the Sussex town of Storrington's name is derived from the Old English for 'homestead with storks' and uses the species as their emblem. Successful breeding of wild white storks in Britain has occurred since 2020.

1.3 | Study aims

Here, we establish and explore baseline perceptions, among the British public, of the white stork and its recent and ongoing reintroduction in Southern England. Using a mixed-methods approach, comprising an online survey, we aimed to address the following questions: (1) What is the cultural salience (awareness, knowledge, associations) of white storks in a landscape from which, until recently, they have long been absent? (2) What factors are associated with positive or negative attitudes toward white storks and their reintroduction? (3) What is the level of, and reasoning for, support/opposition to white stork reintroduction to the UK?

We compared responses between (i) a 'local' and 'non-local' survey sample, to account for any effect of the recent reintroduction and its communications efforts on public engagement and support, and (ii) a 'self-selecting' and 'nationally representative' sample, as a means of evaluating these methods as tools in social

feasibility studies. The baseline study presented here initiates a longitudinal monitoring effort to track any change over time in public perceptions toward the white stork, whose British range and population size are predicted to increase, and which may result in the establishment of nests in close proximity to people. We highlight findings and lessons learned from this case study that are relevant and transferable to future conservation translocations worldwide.

2 | METHODS

2.1 | Sampling and dissemination

We distributed an online survey using the JISC Online Surveys platform (www.onlinesurveys.ac.uk). Anyone aged 18 or over living within Great Britain was eligible to participate. The survey was national in scale because white storks are likely to expand their range naturally as populations grow, and to inform potential future releases affiliated, or not, with the White Stork Project. Ethical approval was granted by the University of Brighton's Life, Health and Physical Sciences Cross-School Research Ethics Committee (Reference: 2020-7064-White).

Two sampling approaches were used to obtain 'self-selecting' and 'nationally representative' samples. Here, we define the self-selecting sample as people who actively seek to express their opinions about white storks and their reintroduction given the means and opportunity: these participants tend to be from 'interested and/or affected' communities. Obtaining a separate, nationally representative sample allowed us to obtain results that are generalisable to the wider British population, and explore opinion prevalence.

The survey for the self-selecting sample was open from 14 September to 15 November 2020. The survey was advertised using a combination of social media, mailing lists, and a press release circulated to local and national media outlets by the University of Brighton press office. Due to our interest in responses from local communities, we particularly targeted people who lived within 15 km of the white stork release sites (Figure S1). This was primarily achieved by advertising the survey via local community Facebook groups. All recruitment materials were created to ensure impartiality (Figure S2). Upon completing the survey, participants could enter a prize draw to win one of ten £20 gift vouchers, sign-up to receive a summary of the pooled survey results and/or be involved in future follow-up studies to help track if opinions change over time.

An online market research panel provider (Bilendi) was used to obtain a nationally representative sample of the British population, stratified by age, gender and region of residence (Office for National Statistics (ONS), 2016). Participants in Bilendi's online panel sign-up voluntarily and then receive invitations to participate in surveys in return for a small monetary reward. To avoid selection bias, potential participants were not told about the topic of the survey during

recruitment. The target number of responses was 1000 and the survey was open between 1 and 6 February 2021.

2.2 | Survey design

A full copy of the survey is available in [Supporting Information 2](#), including the welcome page where participants were informed about the survey structure, highlighting all knowledge-levels and views regarding the white stork and its reintroduction were welcome; that participation was voluntary and anonymous; and that they could exit at any time. Participants were required to confirm their consent before proceeding. No backtracking was allowed between sections to avoid participants changing their answers once new information was provided to them. The survey was piloted by 12 individuals, comprising social scientists, environmental psychologists, conservation scientists and practitioners, and the public. Subsequently, minor adjustments to wording and survey logic were made.

2.2.1 | Awareness and knowledge of white storks

To assess participant awareness of the white stork, we asked the dichotomous question 'Had you heard of a white stork before taking this survey?'. Seven trivia questions measured natural history knowledge and potential misconceptions about white storks (spanning appearance, diet, habitat, distribution and rarity). Furthermore, participants were asked 'Is the white stork native to England?' and provided with the option to explain their answer. This was in order to see how people interpret the term 'native' and because the historical UK-breeding status of this species is debated by some.

2.2.2 | Experience of white storks and awareness and knowledge of their reintroduction

Participants were shown a photo of a white stork and then asked whether they had seen the species before. If they had seen them in the wild, they were asked—UK, outside the UK or both—and given the option to briefly describe how they felt about their encounter(s). Several questions then focused on if, what and how participants had heard about white stork reintroduction efforts taking place in southern England. Between this section and the next, participants were provided with a bullet-point summary of the White Stork reintroduction status.

2.2.3 | Attitudes toward white storks and their reintroduction

Participants were asked to write up to three words that came to mind when they thought of the white stork. Following this were 14 Likert items developed to test attitudes toward the white stork and

its reintroduction, and one that asked about general support for reintroducing the UK's lost species and restoring its natural systems (see Table S1 and Data Sources). Participants were then asked to indicate their level of support for the white stork reintroduction, with the option to explain their answer.

2.2.4 | Relationship with nature and demographic questions

Participants were asked a series of questions to take measures of time spent in nature, nature connectedness, environmental concern, engagement in pro-nature conservation behaviours, and bird interest. We further asked whether they were a member of an environmental organisation or had visited the Knepp Estate. We also asked participants' age, gender, locality and urbanity of residence, highest level of completed formal education, and occupation.

2.3 | Data analysis

Data cleaning (see Appendix 1), quantitative and word frequency analyses were conducted in R 4.0.4 (R Core Team, 2021). When comparing data collected between local communities (i.e. residents living within 15km of a white stork release site) and non-locals, we used the postcode information participants provided (see Appendix 2).

Altogether, 3531 complete survey responses were obtained after data cleaning. Of these, 1143 participants constituted the nationally representative sample and the remaining 2388 the self-selecting sample. The demographic and geographic distribution of all participants are provided in Table 1 and Figure S3, respectively.

2.3.1 | Quantitative analysis

We produced descriptive statistics for closed-ended questions regarding participant awareness, knowledge, experience and attitudes toward white storks and their reintroduction to compare responses between the self-selecting and nationally representative samples, and between local and non-local participants within the self-selecting sample. Composite variables comprising multiple Likert items were constructed to measure white stork knowledge, attitude toward white storks and their reintroduction (i.e. 'attitude score'), nature connectedness, environmental concern, pro-nature conservation behaviour, and bird interest. Where appropriate, internal consistency for composite scores were assessed using Cronbach's alpha and all scored above the 0.8 threshold (see Appendix 3 and Data Sources for full details regarding composite variable construction).

We used Mann-Whitney *U* tests to analyse the significance of the effect of survey type and proximity to white stork release sites on participant white stork knowledge scores. We then compared the significance of multiple predictors in explaining variation in participant attitude score by fitting a generalised linear model (GLM)

with Gaussian distribution and logit-link function. The predictors included in the global model were grouped into awareness, knowledge and experience of white storks; nature experience and connectedness; concern for nature and pro-conservation behaviour; location and demographics; and survey sample (see Table S2 for full predictor list). Predictor variables were selected a priori for the model based on the findings from published studies investigating attitude toward birds and/or reintroduced species. 'Prefer not to answer' and poorly represented groups (i.e. factor levels with under 5% of participants) were excluded from the model dataset to improve statistical inference. Therefore, we did not include those who stated 'Prefer to self-describe' ($n = 14$) for gender. Generalised Variance Inflation factors were used to check for multicollinearity between predictors and found to be within acceptable norms, with values < 2 (Zuur et al., 2010).

Due to the large number of predictors (18), multiple candidate models were feasible and traditional null hypothesis testing methods were not optimal. We instead used an information theoretic approach through model selection and averaging, using the 'MuMIn' package (Barton, 2020). Prediction accuracy is maximised using the Akaike Information Criterion (AIC). Consequently, ΔAIC values were used to rank candidate models for the attitude score response variable. Models with a ΔAIC value of < 2 were retained as a 'confidence set' of models (Burnham & Anderson, 2002; Harrison et al., 2018). As multiple candidate models had similar levels of support, a model averaging approach was taken (Grueber et al., 2011). Averaging was conducted on selected models where $\Delta_i < 2$, to consider an effective combined multimodel inference. Model averaged estimates were not calculated for variables that did not occur in the confidence set of models.

2.3.2 | Qualitative analysis

A single coder analysed free-text responses using NVivo 11 for two open-ended questions, investigating (a) perceptions of whether white storks are native to England and (b) reasons behind level of support for the white stork reintroduction. All responses were coded through an inductive, iterative process of close reading, labelling responses in relation to thematic categories, and then refining the groupings. When quoted, participants are identified here as self-selecting (Ss) or nationally representative (Nr) and local (l) or not local (nl). Further details of the coding categories are provided in Section 3.3.

The descriptive words participants associated with white storks and feelings of those who had seen the species in the wild were analysed separately using word frequency analysis to create word clouds and find associations between frequently used words with the 'tm' (Feinerer & Hornik, 2020), 'tidytext' (Silge & Robinson, 2016) and 'wordcloud' (Fellows, 2018) packages. Prior to these analyses, the text was cleaned to remove stop words (e.g. 'and', 'the'), punctuation and numbers, and lemmatisation performed to group the inflected forms of each word (e.g. 'big', 'bigger', 'biggest').

TABLE 1 Participant sample size and demographic information, separated according to proximity to white stork release site (local or not local) and survey sample (self-selecting or nationally representative).

| | Nationally rep. | | Self-selecting | | Overall | |
|--------------------------|-------------------|-------------------------|---------------------|-------------------------|---------------------|-------------------------|
| | Local (N = 18) | Not local (N = 1125) | Local (N = 1014) | Not local (N = 1374) | Local (N = 1032) | Not local (N = 2499) |
| Age | | | | | | |
| 18–24 | 1 (5.6%) | 124 (11.0%) | 21 (2.1%) | 112 (8.2%) | 22 (2.1%) | 236 (9.4%) |
| 25–34 | 1 (5.6%) | 172 (15.3%) | 82 (8.1%) | 251 (18.3%) | 83 (8.0%) | 423 (16.9%) |
| 35–44 | 4 (22.2%) | 178 (15.8%) | 166 (16.4%) | 229 (16.7%) | 170 (16.5%) | 407 (16.3%) |
| 45–54 | 5 (27.8%) | 199 (17.7%) | 241 (23.8%) | 247 (18.9%) | 246 (23.8%) | 446 (17.8%) |
| 55–64 | 3 (16.7%) | 190 (16.9%) | 264 (26.0%) | 314 (22.9%) | 267 (15.9%) | 504 (20.2%) |
| 65+ | 4 (22.2%) | 262 (23.3%) | 235 (23.2%) | 214 (15.6%) | 239 (23.3%) | 476 (%) |
| Prefer not to answer | 0 (0%) | 0 (0%) | 5 (0.5%) | 7 (0.5%) | 5 (0.5%) | 7 (0.3%) |
| Gender | | | | | | |
| Female | 10 (55.6%) | 568 (50.5%) | 690 (68.0%) | 748 (54.4%) | 700 (67.8%) | 1316 (52.7%) |
| Male | 8 (44.4%) | 554 (49.2%) | 314 (31.0%) | 603 (43.9%) | 322 (31.2%) | 1157 (46.3%) |
| Prefer to self-describe | 0 (0%) | 2 (0.2%) | 2 (0.2%) | 10 (0.7%) | 2 (0.2%) | 12 (0.5%) |
| Prefer not to answer | 0 (0%) | 1 (0.1%) | 8 (0.8%) | 13 (0.9%) | 8 (0.8%) | 14 (0.6%) |
| Education | | | | | | |
| University graduate | 7 (38.9%) | 471 (41.9%) | 595 (58.7%) | 1025 (74.6%) | 602 (58.3%) | 1496 (59.9%) |
| Secondary school/College | 10 (55.6%) | 600 (53.3%) | 363 (35.8%) | 312 (22.7%) | 373 (36.1%) | 912 (36.5%) |
| No formal qualifications | 1 (5.6%) | 35 (3.1%) | 16 (1.6%) | 15 (1.1%) | 17 (1.6%) | 50 (2.0%) |
| Other | 0 (0%) | 1 (0.1%) | 24 (2.4%) | 11 (0.8%) | 24 (2.3%) | 12 (0.5%) |
| Prefer not to answer | 0 (0%) | 18 (1.6%) | 16 (1.6%) | 11 (0.8%) | 16 (1.6%) | 29 (1.2%) |
| Occupation | | | | | | |
| Nature/Wildlife | 0 (0%) | 5 (0.4%) | 54 (5.3%) | 285 (20.7%) | 54 (5.2%) | 290 (11.6%) |
| Natural resource mgmt. | 0 (0%) | 9 (0.8%) | 34 (3.4%) | 43 (3.1%) | 34 (3.3%) | 52 (2.1%) |
| Retired | 4 (22.2%) | 261 (23.2%) | 171 (16.9%) | 211 (15.4%) | 175 (17.0%) | 472 (18.9%) |
| Unemployed | 2 (11.1%) | 105 (9.3%) | 22 (2.2%) | 40 (2.9%) | 24 (2.3%) | 145 (5.8%) |
| Other | 12 (66.7%) | 712 (63.3%) | 710 (70.0%) | 771 (56.1%) | 722 (70.0%) | 1483 (59.3%) |
| Prefer not to answer | 0 (0%) | 33 (2.9%) | 23 (2.3%) | 24 (1.7%) | 23 (2.2%) | 57 (2.3%) |
| Area type | | | | | | |
| Rural | 7 (38.9%) | 214 (19.0%) | 609 (60.1%) | 435 (31.7%) | 616 (59.7%) | 649 (26.0%) |
| Sub-urban | 6 (33.3%) | 534 (47.5%) | 305 (30.1%) | 551 (40.1%) | 311 (30.1%) | 1085 (43.4%) |
| Urban | 5 (27.8%) | 277 (33.5%) | 100 (9.9%) | 388 (28.2%) | 105 (10.2%) | 765 (30.6%) |

Notes: Occupation: 'Nature/Wildlife' = 'Environment, nature & wildlife' category; 'Natural resource management' = includes the original categories: 'Farming & Agriculture', 'Fisheries & Aquaculture', 'Forestry & Woodland Management', and 'Horticulture/Gardening/Landscaping'; 'Other' = all other occupations.

3 | RESULTS

3.1 | Awareness, knowledge and experience of white storks

The majority of self-selecting participants (92.1%) had heard of a white stork before taking the survey and 53.9% had seen the species in the wild (29.6% in the UK and 36.3% elsewhere; Table S3). In comparison, only 46.5% of nationally representative participants had heard of a white stork, with 5.6% and 8.9% reported seeing the

species in the wild in the UK or elsewhere, respectively. Most local participants had seen wild white storks only in the UK and most non-local participants outside of the UK.

Ability to identify a white stork did not vary by proximity to release sites, with 87.8% of self-selecting participants choosing the correct photo (Table S4). The most common misidentification for both samples was the little egret (*Egretta garzetta*), with 49.6% of the nationally representative sample selecting this species. While most self-selecting participants were aware of white stork wing-span and migration, and selected correct options for questions relating to white stork diet, feeding habitat and nest location, 32.3%

of local and 23.8% of non-local participants incorrectly believed the species to be globally rare, and the majority (43.4%) selected 'Do not know' (Table S4). 'Do not know' was the most frequent response from the nationally representative sample for four of the six natural history questions, but most correctly selected fish (57.0%) to be part of the white stork's diet and shallow wetlands (57.8%) as one of their preferred feeding habitats (Table S4). Within the self-selecting sample, non-local participants possessed a higher knowledge score than local participants (Table S5). Irrespective of locality, participants in the self-selecting sample showed significantly higher knowledge scores than those in the nationally representative sample (Table S5).

3.2 | Awareness and knowledge of the white stork reintroduction

57% of self-selecting participants believed the white stork to be native to England, while the majority of nationally representative participants selected 'Not sure' (62.2%) (Table S3). When asked to explain perceptions of nativeness ($n = 1762$), the most prominent viewpoint considered the species 'formerly native', with variability in the perceived number of years since white storks were last 'native' in England, ranging from 300 to 700 years ago ('It depends what you mean by native. They used to breed here but were locally extinct until recently' [Ss, nl]). Of those who selected 'no' (it is not native), lack of evidence of 'nativeness' was the most prominent theme ('The one claimed breeding record is extremely dubious' [Ss, nl]), while multiple participants thought white storks should be considered a vagrant or showed confusion over the term 'native'.

Most self-selecting participants (68.9%) had heard of the White Stork Project, and 75.6% reported to know at least 'something' about the reintroduction (Table S3). Conversely, 92.6% of the nationally representative sample were unaware of the reintroduction project. Across all participants who explained what they had heard about the reintroduction ($n = 2024$), 66.1% mentioned Knepp, but very few responses mentioned the other release sites. Furthermore, despite the term not being included in the survey's wording, more than 100 participants referred to 'rewilding' as part of the project. Eighty responses contained misconceptions about the project, concerning: (i) location and/or bird species, (ii) captive breeding efforts, (iii) timings (e.g. 'I heard it was being considered but didn't know it had taken place.' [Ss, nl]) and (iv) how 'habitat restoration has encouraged them back naturally' [Nr, nl]. However, other participants indicated acute interest and knowledge of the project and surrounding discussions (e.g. 'I had heard about the project in the news and travelled to Knepp from Scotland this summer with my children especially to see the Storks.' [Ss, nl] and 'Ian Carter's article in British Birds [Carter, 2020] arguing they're not native, and it's not a "REintroduction", which I find convincing.' [Ss, nl]).

3.3 | Attitudes toward white storks and the reintroduction project

Across all participants, the top ten words used to describe white storks were predominantly positive (i.e. beautiful, elegant, majestic, graceful, impressive and interest[ing]) or focussed on physical attributes (i.e. large, big and tall); the third most commonly used word was 'rare' (Figure 1).

The sentiment of responses from participants describing their wild white stork encounter(s) ($n = 1229$) was generally positive, with 'excited' and 'happy' among the most commonly used words, regardless of the sighting location (Figure S4). White storks had been seen in over 20 countries, in both the recent and distant past, flying, nesting and feeding in multiple habitats, inspiring both positive reminiscence, reflection (e.g. 'It made me think that all the old tin mine chimneys here in Cornwall are crying out for storks' nests.' [Ss, nl]) and uncertainty:

I have seen white storks a number of times in Europe. I think they are magnificent birds. The first time I saw their incredible, huge nests I was very excited... I have seen them at Knepp in the UK. I enjoyed watching them but the fact they were not wild birds and my reservations about their introduction made it a less exciting experience. [Ss, nl].

The above quote also highlights that the locality of the encounter can influence the experience. For some, they prefer a 'wilder' experience abroad, whereas for others it is more 'special' to see storks in the UK (e.g. 'I saw them in Poland and they were beautiful but very common there. Was more amazing to see them at Knepp because I know how rare they are and I felt honoured.' [Ss, nl]).

For each of the 14 Likert item statements that comprise the composite attitude score toward white storks and their reintroduction, most participants from each survey sample selected (strongly) agree for positively framed statements and (strongly) disagree for negatively framed statements (Figure S5). This finding is also reflected by a high level of support for the reintroduction of white storks to southern England across both samples (self-selecting = 91.2%, nationally representative = 74.8%; Table S6). However, overall, attitudes are more positive in the self-selecting sample and more neutral or ambivalent in the nationally representative sample (Figure S5, Table S6).

Model selection (see Table S7 for top models) and averaging estimates (Figure 2, Table S8) indicate that attitude scores toward white storks and their reintroduction were significantly higher for those who support reintroductions in general, were previously aware of the existence of white storks, were within the self-selecting sample, and older in age (65+). Attitudes were also significantly higher for those who selected 'retired', 'unemployed' or 'other' occupations, compared to those employed in 'Nature/Wildlife'-focussed professions. Weak but significant positive

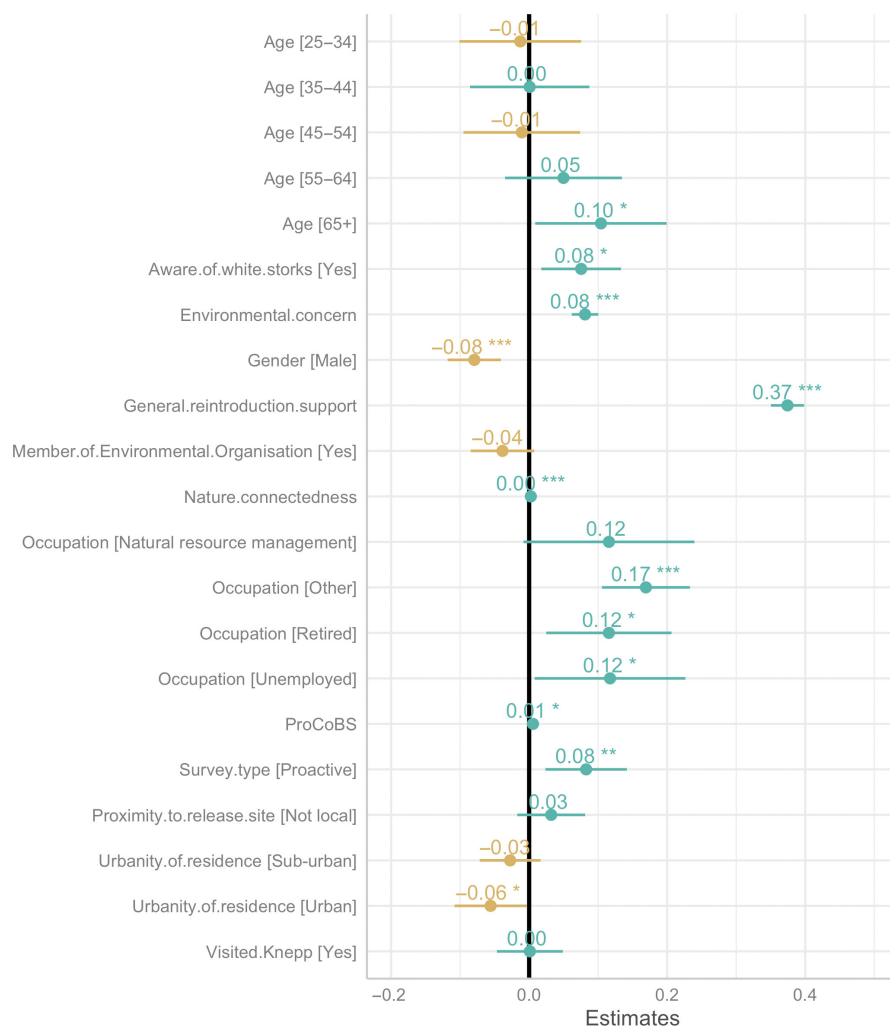


FIGURE 2 Forest plot of model averaged estimates and 95% confidence intervals (CI) to explain the factors associated with variation in participant's attitude scores toward white storks and their reintroduction ($n = 2330$). Significant estimates are signified by stars ($* = p < 0.05$, $** = p < 0.01$, $*** = p < 0.001$). Averaged estimates were only calculated for variables occurring in the confidence set of models (Table S7). See Table S8 for full predictor names and model-averaged results. Sample size is lower than the total number of participants ($n = 3531$) as the composite attitude score (i.e. the response variable) can only be calculated if all 14 associated Likert items are answered without a 'don't know' response. Reference level for each factor: Age = 18–24; Urbanity of residence = Rural; Gender = Female; Occupation = Nature/Wildlife; Survey type = Nationally representative (note 'Proactive' here refers to the self-selecting survey type); Proximity to release site = Local; Visited Knepp = No. 'ProCoBS' = Pro-Conservation Behaviour Score.

knowledge of the species, and knew nothing about the White Stork Project. Limited knowledge is quite common in similar studies (e.g. Greenspan et al., 2020; Hanson et al., 2020; Hiroyasu et al., 2019), and is unsurprising here given that the species has been a scarce visitor in recent times and, prior to the reintroduction, had not bred in Britain for around 600 years (Harrison, 1988). However, the inability to identify this species among the nationally representative sample is interesting considering the assumed cultural significance the species has as a symbol of fertility and birth (Cocker et al., 2013), suggesting instead that the image of this species lacks contemporary cultural salience in Britain (Jarić et al., 2022).

A considerable number of participants from both samples were unsure of the white stork's biogeographical status. The wording of the question itself, 'Is the White Stork native to England', may have caused some confusion, as evidenced by a number of participants stating that the species was (potentially) formerly native but not currently native. This reflects a wider issue concerning diverse definitions and perceptions of 'nativeness' (Kaplan et al., 2022). However, uncertainty about the species' nativeness, did not hinder most participant's support for its reintroduction. This reflects wider research showing that conservation, including reintroductions, may be increasingly motivated by species popularity, rather

than threat status (Colléony et al., 2017; Díaz et al., 2018; Sampson et al., 2020; Seddon et al., 2005), and that species 'belonging' is not primarily judged by the public on their origins (Van Der Wal et al., 2015).

Overall, we found no association between white stork natural history knowledge and attitudes toward the species and its reintroduction. A mixed relationship between knowledge and attitudes exists in the wider context of reintroductions (Brooks et al., 1999; Hiroyasu et al., 2019; Reading & Kellert, 1993; Worthington et al., 2010). Among the self-selecting sample, knowledge was lower for local participants than non-locals, which indicates that, as yet the reintroduction has not substantially increased local scientific understanding of this species. For some participants, attitudes and level of support are forming in a 'low knowledge environment' (Hiroyasu et al., 2019). For example, less than half of local residents knew that white storks typically nest on roofs, chimneys and telegraph poles (this drops to 9%–18% of participants within the nationally representative sample), and it is possible that this information might affect attitudes toward reintroduction in either a favourable or unfavourable manner. This demonstrates that understanding of knowledge, while not predictive of support, is

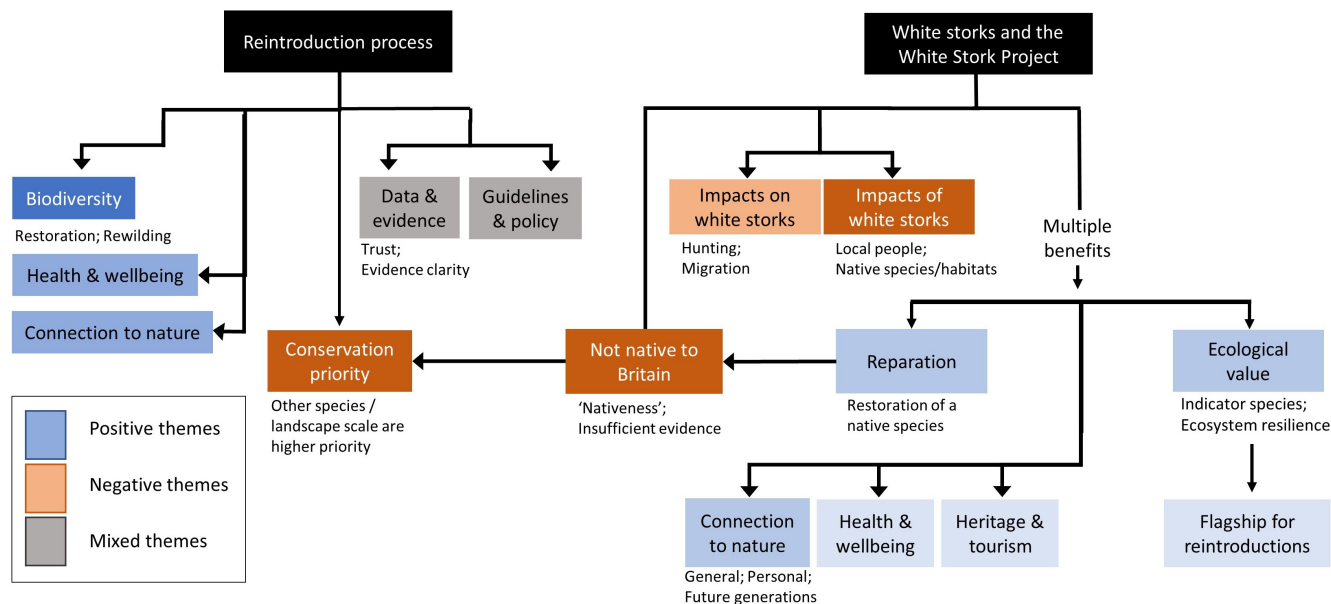


FIGURE 3 Flow diagram showing range of participants' qualitative perspectives on support for white stork reintroduction. Colour intensity reflects the relative number of mentions of each perspective. See the text for details and Table 2 for coding structure and example quotes.

valuable for designing engagement strategies and ensuring informed decision-making.

4.2 | Attitudes toward species reintroductions

In popular literature, there is an assumption that white storks are a universally popular species; for example, 'One of the world's most familiar and beloved birds' (Cocker & Mabey, 2005) and 'Storks are creatures that are unequivocally liked' (Barnes, 2020). Correspondingly, we found participants overwhelmingly view the species positively. The most frequent adjectives used to describe storks referred to their large size, attractiveness, comparative rarity, and cultural salience—traits all contributing to their charisma (Lorimer, 2007). 'Rare' was frequently mentioned when describing white storks, even though the species has a large global range and increasing population (BirdLife International, 2016). Consequently, 'rare' in this study is either (i) an accurate perception of the species' status within Britain or (ii) an assumption that any species subject to reintroduction must be rare (i.e. synonymous with threatened).

Despite differences between samples (see below), overall 86% of participants supported the reintroduction. This evidence supports the prediction of the feasibility report (Gow et al., 2017), and is comparable with support levels found for other UK species reintroductions (e.g. Ambrose-Oji et al., 2018; Auster, Puttock, et al., 2020; Dennis et al., 2019; Mackrill et al., 2021; Smith et al., 2016; Worthington et al., 2010) and a recent YouGov poll reporting 82% of the British public support wildlife reintroductions in general (YouGov, 2020). Reasons provided for support were diverse, and often related to perceived or experienced socio-cultural benefits and

values; general biodiversity enrichment; and a moral impetus to restore formerly native species, rather than species conservation or restoring ecosystem functions/processes.

Attitudes toward the species and its reintroduction were most positive in the self-selecting sample and more neutral or uncertain in the nationally representative sample, which likely reflects a general lack of awareness, and potential disinterest, among the wider population. Attitudes did not differ with proximity to release sites. The strongest predictor of attitudes by far was support for reintroductions in general. However, attitudes for most participants were formed without, or with limited, first-hand encounters of white storks. Many had not seen them in the wild, including residents local to release sites, which may explain why encountering a white stork was not a predictor of attitudes. Participants may therefore have been influenced, in part, by media coverage, which to date has been largely positive: this could be an interesting avenue for further study.

Lack of support for the project, or active criticism, was voiced by a minority of participants. This largely stemmed from uncertainty or disagreement about the white stork's formerly native status and, consequently, whether the species should be considered introduced or reintroduced. These concerns have been voiced in opinion pieces (e.g. Carter, 2020; Tout, 2019) and an ethnographic case study (Dempsey, 2021) about the project, and in relation to other reintroduction efforts (e.g. Hanson et al., 2020; and, in 2022, the release of European bison [*Bison bonasus*] to Kent, UK). Indeed, use of the term 'reintroduction' in the survey was inflammatory for some who classify the white stork as an alien species and/or who would be more supportive if they arrived naturally, mirroring findings from Cranston et al. (2022). Such doubts about nativeness, in turn, contributed to concerns about the effect that the white stork's release may have on existing species, including

TABLE 2 Coding structure for the question asking participants to explain their answer to 'Do you support the reintroduction of white storks to southern England?'. Themes represent the structure of responses across all participants that answered the question ($n=1914$) and the description explains the rationale for the categorisation of each response into each theme. Themes are coloured according to positive (blue), negative (orange) or mixed (grey) sentiment and match the colours in the associated [Figure 3](#).

| Parent theme: Reintroduction process | | Example quotes |
|---|--|--|
| Theme | Response description | |
| Biodiversity | Referring to biodiversity conservation, the balance of nature and rewilding | Balance: 'It is good to have diversity in nature particularly if one species which used to live in the area is reintroduced as this can impact positively on the surrounding natural environment'. [Nr, n] Rewilding: 'Any rewilding to restore the balance of the natural world is beneficial'. [Ss, n] |
| Health and wellbeing | Referring to the role of reintroductions in health and wellbeing | 'Nature, including animals and plants and trees, can be calming and good for your mental health'. [Nr, n] |
| Connection to nature | Referring to the role of reintroductions in nature connectedness | '...they [reintroductions] help engage audiences, new and old, to the wonders of the natural environment'. [Ss, n] |
| Conservation priority | Referring to prioritisation of alternative conservation or reintroduction projects with a focus on other species, habitats or ecosystems | Habitat: 'Too much focus on iconic species and not enough on habitat creation'. [Ss, l] Other species: 'I think there is too much obsession with reintroducing large, iconic species and that we should concentrate more on conserving our less glamorous, but perhaps more internationally important, habitats and species'. [Ss, n] |
| Data and evidence | Referring to the need for, or dependency on, data, monitoring or evidence | Research: 'I trust those experts involved to undertake all the necessary checks and select the best methods for reintroduction'. [Ss, n] Monitoring: 'I hope the reintroduction of the bird will be monitored'. [Ss, n] |
| Guidelines and policy | Concerning IUCN guidelines, and other policies for species reintroductions | '...releases ride roughshod over internationally agreed guidelines for reintroductions...may encourage other more controversial species to be released without following IUCN best practice'. [Ss, n] 'Fulfilling our legal commitment to restoring biodiversity'. [Ss, n] |
| Parent theme: White storks and the White Stork Project | | |
| Connection to nature | Referring to connectedness to nature derived from the white stork reintroduction | Widening engagement: '...there has been a lot of interest in the white storks from friends who I would not normally expect to be interested in local nature'. [Ss, n] Future generations: 'Especially for youngsters that want to feel some connection to nature, that the realism that an extinct natural bird can be reintroduced, after so long, would drive them to explore more of our natural wonders'. [Nr, n] |
| Health and wellbeing | Referring to mental and physical health and wellbeing as a benefit of white stork reintroduction | 'Seeing them on many visits to Knapp Estate during the coronavirus pandemic played a significant role in improving my mental wellbeing during a challenging period of time'. [Ss, n] |
| Heritage and tourism | Referring to heritage, history or tourism as a benefit of white stork reintroduction | Tourism: 'White storks are an iconic species. They are the sort of animal which will bring in tourists and which people will be excited to see in the wild'. [Ss, n] Heritage: 'I feel they are part of our native environment and our cultural heritage'. [Ss, l] |
| Ecological value | Referring to the ecological value of white storks, for example as an indicator species | Indicator species: 'They are an indicator that natural habitats for many species are improving'. [Ss, l] Resilience: '...they will still be able to contribute to the health of those ecosystems and build resilience'. [Ss, n] |
| Flagship for reintroductions | Responses that value white storks as a flagship for future species reintroductions | Public engagement: 'They will encourage and engage the public which is vital in order to develop interest and sustain motivation for this type of project'. [Ss, n] Future reintroductions: 'Success could clear a path for reintroduction of other lost species'. [Ss, n] |
| Reparation (Restoration of native species) | Referring to former native status or human driven declines as a reason for their reintroduction | Human-driven loss: 'Humans wiped them out and have a duty to change that'. [Ss, n] Previously native: 'If the stork was originally native to the South of England and now it is extinct in Britain, then a reintroduction is correct to do'. [Ss, n] |

(Continues)

TABLE 2 (Continued)

| Parent theme: Reintroduction process | |
|--------------------------------------|---|
| Theme | Response description |
| Not native to Britain | Referring to debate over the nativeness of white storks and lack of (sufficient) evidence for former breeding populations |
| Impacts of white storks | Referring to the potential negative impacts of white storks on other species, habitats or local people |
| Impacts on white storks | Referring to possible impacts of hunting, migration or lack of habitat on the white stork |

| Example quotes |
|---|
| <p>Nativeness: 'I am not convinced that they are native. It's an introduction of what is basically an alien species...It's a gimmick, undermining scientific efforts on non-native species and rewilding'. [Ss, nl]</p> <p>Evidence: 'This is not a reintroduction but an introduction - there is no evidence of previous breeding in southern England'. [Ss, nl]</p> <p>Species: 'They are quite likely to cause problems to wild Orthoptera and reptiles'. [Ss, nl]</p> <p>People: 'It [Knepp White Stork reintroduction] had a hugely detrimental effect on local life, pollution, traffic (OMG the traffic!)'. [Ss, l]</p> <p>Habitat: 'I worry about the unpredictability of reintroducing species into an already severely depleted / strained environment'. [Ss, nl]</p> <p>Hunting/shooting: 'Farmers and pheasant shooting landowners need to agree with the reintroduction of white storks and not kill them'. [Ss, nl]</p> <p>Migration: 'As a migratory species with a limited ability to cross wide expanses of water the introduction to an island off the coast of Europe is foolhardy, and will lead to the death of a number of these fine birds'. [Ss, nl]</p> <p>Habitat/food: 'The dung beetle larvae are the most important food of this bird and 99.9% of Britain has poisoned the beetles to death!'. [Ss, nl]</p> |

protected ground nesting birds and reptiles (as it is a generalist carnivore), with some questioning the rigour of the ecological risk assessment. This raises a broader set of questions around how confident practitioners need to be about a reintroduction candidate's 'former nativeness' before they proceed.

A perceived lack of transparency regarding the White Stork Project's motivations and how this supports conservation was also voiced, with some questioning the focus on white storks rather than other species struggling at both local and national levels. The particular profile of participants opposed to reintroductions - in this case, often those with high interest and engagement in wildlife conservation - will be an important group to engage with going forward, with an emphasis on open discussion and relationship building (Consorte-McCrea et al., 2022; Niemiec et al., 2022).

This survey is intended to form the start of a longitudinal monitoring effort to track any change over time in public perceptions toward the white stork and impact of 'renewed coexistence' (Auster et al., 2022). The white stork's range and numbers are currently small in Britain and, consequently, the potential for substantive positive or negative impact is low. However, as the population and its distribution grow, increased interactions with people are likely to occur and hence attitudes may change (e.g. Červený et al., 2019; Dressel et al., 2014; Treves et al., 2013). Longitudinal studies monitoring the social dimensions of species reintroductions are uncommon but should be an integral monitoring component, in turn facilitating adaptive management.

4.3 | Socio-cultural drivers of reintroductions

As noted by critics of the project, the white stork is arguably a non-traditional reintroduction candidate, as it is not globally threatened nor a keystone species. Primary motivations for this reintroduction effort have been improving people's connections to nature and bringing local economic benefits, making its ambitions more socio-culturally than ecologically focused. Our findings at this early stage of the reintroduction suggest that there are good reasons to believe that white storks inspire positive responses among those who encounter them. For example, regardless of sighting location, 'excitement', 'happiness' and 'amazement' were commonly voiced in relation to encounters with white storks. Furthermore, we noted affective responses to white storks expressed through tales of personal encounters with the species, a desire to see them in the wild, and belief that they symbolise the beauty of nature. Collectively, these findings align with some of the core 'pathways to nature connection' (i.e. contact, emotion, meaning, compassion and beauty, Lumber et al., 2017), and mirror those from the species' mainland European range where, consequently, they can be of significant cultural and economic value to local communities—the latter via tourism (e.g. Czajkowski et al., 2014; Kronenberg, 2016; Kronenberg et al., 2017). The white stork in England fulfils a number of criteria that could make it a focus of wildlife tourism by creating memorable wildlife encounters (Curtin, 2010; Reynolds

& Braithwaite, 2001). Specifically, it is a large and distinctive bird that has the potential to possess 'super local abundance', including as part of nesting congregations. In addition, the white stork is currently conspicuous yet rare in England (i.e. a 'novelty'), which is typically attractive for birdwatchers (Booth et al., 2011; Steven et al., 2017), although some view released birds, and up to a few generations afterward, as 'plastic' (i.e. not wild or permitted on sighting lists).

Although understudied, evidence suggests that reintroductions have the potential to (re)establish important socio-cultural connections between people, wildlife and landscapes (e.g. London & Root-Bernstein, 2015; Wilkins et al., 2019). Auster, Barr, et al. (2020) suggest that positive emotions generated by seeing certain reintroduced species or signs of their presence could lead to mental health benefits. While some of our qualitative responses suggest mental health and wellbeing benefits from watching storks, evidence and an understanding of the mechanistic pathways for any such effects are lacking. We also did not explicitly consider, in this study, how both responses to, and interactions with, white storks might be framed and understood more relationally (Chan et al., 2016; Riechers et al., 2021); for example, in terms of care/stewardship for nature, or how the presence of a reintroduced species affects people's relations with place. We therefore encourage further discussion and research on the socio-cultural roles and effects of conservation translocations more broadly, in terms of how reintroduced species are considered to have instrumental value (by providing benefits to people, e.g. through ecotourism), intrinsic value (e.g. as 'former natives' and/or 'rare' species) and/or relational value (e.g. in terms of facilitating 'nature connectedness' or other effects on human-nature relations and environmentally-mediated social relations). Conservation organisations and statutory bodies are increasingly interested in ideas from social sciences; however, it can take time for advances in academic theory/contemporary framings to enter practice. Consequently, adopting a more pluralistic understanding of values with respect to reintroductions will require support for practitioners and sharing best practice (Eyster et al., 2023).

Socio-cultural and other non-ecological motivations are not currently recognised justifications for conservation translocations (Defra, 2021; IUCN/SSC, 2013). This highlights a mismatch between the focus of current conservation guidance and the practices of species reintroductions, which increasingly refer to a broader set of drivers, including those that are economic, political, cultural, and ethical. This shifting focus is likely to influence the choice of candidate species toward those that are not necessarily threatened but are charismatic, engaging and visible. This, in turn, raises questions concerning what constitutes a legitimate or priority driver for a wildlife translocation. While there might be good grounds for reintroducing species for their socio-cultural value or significance, this is potentially problematic if it creates an opportunity cost for other (less charismatic but more threatened/ecologically important) conservation reintroductions.

4.4 | Procedural lessons for reintroduction projects

The absence of a pre-reintroduction public consultation reduced opportunities for interpersonal communication between the public and the project partners, and prevented some concerns—including insufficient engagement—from being pre-emptively addressed. Retrospective consultation and promotion have occurred in other reintroductions (e.g. Auster, Puttock, et al., 2020; O'Rourke, 2014; Sharp et al., 2010), causing controversy among stakeholders and reduced likelihood of success (Dando et al., 2022). Nevertheless, undertaking social engagement processes at any stage is better than not doing any at all (Dando et al., 2022). Through this study, those interested and/or affected by the reintroduction (including individuals local to release sites) were provided with a platform and voice to directly engage with, and therefore inform, this long-term reintroduction effort.

We compared and contrasted responses from self-selecting and nationally representative samples. Such an approach identified marked differences between the two samples in awareness, knowledge and experience of, and attitudes toward white storks and their reintroduction. We recommend future conservation translocation efforts utilise a similar two-mode sampling strategy to that used here when undertaking social feasibility assessments. Historically, such a sampling approach has not been widely adopted but securing both sample types considerably strengthens the validity of assessments and, as showcased in this study (and Smith et al., 2016), can return strikingly different responses. The dual sample approach is useful because it is able to assess the views of both engaged communities (who may be better informed, more invested and more likely to be affected) and wider publics on the same issue. Consultation surveys are likely to obtain skewed and potentially biased results if they only use a self-selecting sample (in this case, in favour of reintroduction, but in other cases perhaps inversely), so these should not be relied upon alone as reflective of public attitudes.

5 | CONCLUSION

White storks are a little-known but popular reintroduction candidate and there appear to be no significant public objections to their reintroduction to Britain. However, our two-mode sampling approach did identify differences in awareness, knowledge, experience and attitudes between self-selecting and nationally representative samples, which should be accounted for in future social feasibility studies. White storks are an interesting example of a species that is being reintroduced primarily for its charisma and potential role in engaging people with nature and providing ecotourism benefits, rather than for a direct conservation benefit or particular ecological function. These socio-cultural drivers of reintroductions have not been adequately explored and we recommend further research and monitoring in this area.

AUTHOR CONTRIBUTIONS

Rachel L. White, Rosalind J. Kennerley, Lucy Groves and Michael A. Hudson conceived the research idea. Rachel L. White led the design of the study, including the online survey. Sarah L. Crowley supported the development of the methodology. Sarah L. Crowley, Rosalind J. Kennerley, Lucy Groves and Michael A. Hudson supported the refinement of the research questions. Rachel L. White distributed the survey and collected responses. Lizzie P. Jones led the data analysis. Rachel L. White, Sarah L. Crowley and Lizzie P. Jones contributed to the interpretation of the data. Rachel L. White led the writing of the manuscript. All authors contributed critically to the drafts and gave final approval for publication.

ACKNOWLEDGEMENTS

The authors would like to thank all participants of the online survey for their contribution to this research, and all pre-testers who helped strengthen the final survey instrument. We thank Bilendi for their recruitment of the nationally representative participant sample. This research was supported by the University of Brighton Rising Stars scheme 2020-2021. Durrell Wildlife Conservation Trust, for which three of the study authors work (L.G., M.A.H., and R.J.K.), was one of the partner organisations of the White Stork Project between 2018 and 2022, with a focus on post-release monitoring and public engagement. However, the work is that of the authors and is independent from the White Stork Project and the opinions of its partner's.

CONFLICT OF INTEREST STATEMENT

The authors declare no competing interests. Sarah L. Crowley is an Associate Editor for People and Nature, but was not involved in the peer review and decision making process.

DATA AVAILABILITY STATEMENT

Raw data (quantitative and qualitative) and the annotated R code used for this study can be accessed via Zenodo at <https://doi.org/10.5281/zenodo.5574357> (White et al., 2023).

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DATA SOURCES

The following references relate to the sources for the composite predictor variables used in this study as described in Appendix 3 and Table S1 within 'Supporting Information 1: Supplementary methods and results'.

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SUPPORTING INFORMATION

Additional supporting information can be found online in the Supporting Information section at the end of this article.

Supporting Information S1: Supplementary methods and results.

Supporting Information S2: Annotated survey.

How to cite this article: White, R. L., Jones, L. P., Groves, L., Hudson, M. A., Kennerley, R. J., & Crowley, S. L. (2023). Public perceptions of an avian reintroduction aiming to connect people with nature. *People and Nature*, 5, 1680–1696. <https://doi.org/10.1002/pan3.10538>