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# Heterogeneous preferences for use and non-use values provided by insects

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## Abstract

1. Public support is essential for reversing insect declines, yet conservation efforts often focus on instrumental values, particularly pollination and pest regulation, while overlooking the many and varied cultural ecosystem services that may underpin broader public support for conservation. Incorporating the diversity of cultural services into conservation decisions requires a deeper understanding of the use and non-use values provided by insects.
2. Our work disentangles a non-consumptive use value (encountering insects), and two non-use values (existence and bequest), within a choice experiment delivered across Britain and a validated self-reported well-being scale (BIO-WELL). We focused on three diverse insect taxonomic groups (bees, beetles, and wasps) as a model system.
3. We found that public preferences were heterogeneous. A latent class model demonstrated that 42% of respondents were pro-insect, and these respondents had a positive willingness to pay (WTP) for increases in the area managed for insects across all taxa; 26% were insect-averse with consistent negative WTP, and 32% were ambivalent with insect-specific preferences.
4. Across all latent classes, respondents distinguished between use and non-use values. For example, our pro-insect class reported higher WTP for the bequest value of preserving insects for future generations than for encountering insects today.
5. We show that WTP for changes in the area managed for insects shifted from negative to positive for those respondents who derived higher well-being from current insect populations, especially for our ambivalent class.
6. Our study makes two contributions. Methodologically, we characterise the heterogeneity of public preferences among these use and non-use values derived from insects. Practically, our results suggest that public support for conservation decisions may be enhanced by emphasising longer-term, intergenerational benefits, even for uncharismatic or unfamiliar taxa.

KEYWORDS
bequest, choice modelling, cultural ecosystem services, encountering, existence, insects, non-use values

## 1 | INTRODUCTION

Insects are the most numerous and diverse groups of animals in the world and provide important ecosystem services, including pollination (e.g. Potts et al., 2016) and pest regulation (e.g. King, Robinson, et al., 2025; Zhang et al., 2018). Insects can have significant economic value through, for example, their role in underpinning food production. However, thus far, quantifying these instrumental values alone has not provided enough incentive to drive insect conservation (e.g. Kirchweger et al., 2020) and globally, insect populations are still in decline (Powney et al., 2019). Thus, there is a need to better capture the full spectrum of values, moving beyond provisioning and regulating services to include a greater range of use and non-use values associated with insects. Indeed, there is an evidence gap around quantifying and comparing the use and non-use values (often thought of as cultural ecosystem services—the 'non-material ... outputs of ecosystems that affect physical and mental states of people'; Haines-Young & Potschin, 2018) the public holds for insects, despite the rich qualitative work on the cultural meaning of insects (Duffus et al., 2021).

Compared to other ecosystem services, the inclusion of cultural ecosystem services in policy has proceeded more slowly (Chan, Guerry, et al., 2012; Chan, Satterfield, & Goldstein, 2012; Díaz et al., 2018; Maund et al., 2020). Insect-based studies have examined the use values generated by cultural ecosystem services including recreation for example fly fishing (Macadam & Stockan, 2015) and the aesthetics benefits of for example wildflower assemblages in pollinator conservation (Breeze et al., 2015). Although cultural ecosystem services also include non-use values (Hirons et al., 2016; IPBES, 2022; MEA, 2005), their non-material nature makes them harder to theoretically or practically value (Dickinson & Hobbs, 2017; Fish et al., 2016; Milcu et al., 2013).

Many studies of cultural ecosystem services have bundled together two non-use values, often explicitly using the phrase 'existence and bequest' value (e.g. Brander et al., 2023, 2024; Harris & Defeo, 2022; Stanford et al., 2025). Conceptually, this bundling has existed since Krutilla (1967), who initially considered bequest as a motivation for existence value rather than a distinct value (e.g. King et al., 1988; Walsh et al., 1984). Subsequent work, however, distinguished between them (Haines-Young & Potschin, 2018; Loomis & White, 1996; IPBES, 2022). Existence value is the self-oriented, intrinsic value of knowing that a good exists now, although the nature of the good means that direct use value is not possible (e.g. IPBES, 2022; Jobstvogt et al., 2014; Walsh et al., 1984). In contrast, bequest value is the other-oriented, altruistic satisfaction of knowing that a good exists for future generations (cf. Chan, Guerry, et al., 2012; Chan, Satterfield, & Goldstein, 2012; Davidson, 2013; López de la Lama et al., 2024; United Nations et al., 2021). Bequest value may encompass either the option for future use, for example future generations visiting a habitat, or future existence independent of use, for example future generations knowing a species persists. Here, we focus on the bequest of non-use values that is the satisfaction of knowing that future generations will have knowledge that species exist, regardless of whether they interact with them. Despite evidence on the existence value of threatened species (e.g. Decker & Watson, 2017), and habitats (Kaikkonen & van Putten, 2021; Turpie, 2003; Xuan et al., 2021), estimates of bequest values for future generations are scarce in comparison. Contemporary reviews of cultural services in urban nature have failed to isolate or incorporate bequest values (Cheng et al., 2021; Dushkova et al., 2020; Zambrano-Monserrate & Tarupi-Montenegro, 2024) and bequest values were specifically elicited in fewer than 10% of studies on non-use values across IPBES (2022) systematic review, Wood et al. (2024) review, and the Ecosystem Service Value Database (Brander et al., 2023).

Both monetary and non-monetary studies have struggled to disentangle these non-use values. From a non-monetary perspective, for example, Echeverri et al. (2019) investigated bequest but not existence values, finding that participants in Costa Rica scored the protection of local birds for future generations highly across all species, even for species otherwise perceived as providing cultural disservices (c.f., Shackleton et al., 2016). Among the studies that have attempted to express bequest values for biodiversity in monetary terms (e.g. Diafas et al., 2017; O'Garra, 2009; Oleson et al., 2015), many have focused on developing countries, where cultural and contextual factors can have a strong influence over non-use values for nature. This reinforces the observation that how people relate to, and value nature is culturally and contextually specific (Díaz et al., 2018). However, both Diafas et al. (2017) and O'Garra (2009) described their recovered values as a bequest of use values, rather than a bequest of non-use values. Bundling existence and bequest values therefore risks obscuring public support for intergenerational conservation. Yet separating these non-use values in practice remains a challenge.

In this study, we address these evidence gaps by investigating three use and non-use values derived from the cultural ecosystem services provided by insects in Great Britain. Differences in insect form and function are mirrored in species-specific public preferences, which can be shaped by past encounters, morphology and perceived ecological roles (e.g. Austen et al., 2021; Lockwood, 2013; Sumner et al., 2018). Valuing all insects as a single category would, therefore, obscure meaningful variation in their perceived use and non-use values. Consequently, we selected three insect taxonomic groups that are resident in Britain to understand the full spectrum of public perception: bees, wasps (both *Hymenoptera*), and ground beetles (*Carabidae*). Our study makes three main contributions. Firstly, we address a common limitation in cultural ecosystem services valuation by disentangling a non-consumptive use value (encountering insects) and two non-use values (existence and bequest). Our key innovation is to do so across both monetary (choice experiment) and non-monetary (well-being scale) methods. This provides quantitative evidence on the public's preferences for intergenerational conservation. Secondly, we provide novel evidence on how contingent these cultural values are on the types of insect providing them. By recovering preferences for different types of insects (bees, beetles and wasps), we move beyond the typical focus on charismatic or iconic species with symbolic values (e.g. Noriega et al., 2018; Potts et al., 2016). Finally, we examine the extent to which our non-monetary assessment of value influenced the monetary estimates.

# 2 | METHODS

## 2.1 | Study site

The study was conducted across Great Britain (England, Scotland, Wales), which provides a timely and policy-relevant context for our study. Institutionally, Britain has moved from the EU's Common Agricultural Policy toward new Environmental Land Management schemes, with implications for land allocated to long-term biodiversity goals, including insect conservation (DEFRA, 2023). Ecologically, Britain has experienced well publicised insect declines (e.g. Powney et al., 2019) particularly across species that provide economically meaningful pollination and/or pest regulation services (e.g. Beynon et al., 2015; Breeze et al., 2015). Finally, British residents report a range of attitudes toward insects, shaped by high urbanisation levels, and awareness of pollinator-friendly practices (e.g. Breeze et al., 2015; Sumner et al., 2018).

## 2.2 | Study species

A priori we expected strong insect taxonomic group-specific preferences (e.g., Sumner et al., 2018) driven by differences in shape, colour and functional roles (Austen et al., 2021). We, therefore, selected three taxonomically diverse and widely recognisable insect groups. We chose two widely recognised *Hymenoptera*, bees and wasps. Bees, which are viewed positively given their associated with pollination (Breeze et al., 2015), are often contrasted with wasps, which are commonly viewed more negatively (Sumner et al., 2018). As a comparison, we used ground beetles (*Carabidae*), which provide economically valuable pest regulation services (e.g. Dainese et al., 2017; Östman et al., 2003) but are not as noticeable to the general public as bees or wasps. To represent intra-taxon diversity, each group was depicted using illustrations of three different species from a standard field guide (Olsen et al., 2001), each selected to capture some of the visual variety within each taxon. Further, by including illustrations of three different species per taxon, we may have limited respondents' negative reactions to the taxon's name, particularly for wasps, instead enabling respondents to value a range of species within the taxon more objectively. The same illustrations were used across both the choice experiment and the well-being scale to ensure a common interpretation across all tasks. Our survey responses indicate that most respondents were familiar with these insects. Future work with other commonly mentioned insects, such as ants, may broaden our understanding of preferences for insect conservation.

## 2.3 | Monetary and non-monetary methods

To value these cultural services, we used both monetary and non-monetary methods. While monetary valuation is essential for quantifying preferences in willingness to pay (WTP) terms relevant for policy (e.g. Breeze et al., 2015; Oleson et al., 2015), non-monetary approaches, such as those measuring aspects of well-being (Irvine et al., 2023), can shed light on the diverse perspectives around non-use values, especially where these are challenging to monetise (Kenter, 2016). An increasing body of work has begun to explore how the outcomes from these different methods relate (e.g. Dallimer et al., 2014; Papastergiou et al., 2023; Vondolia et al., 2021). Our contribution is to concurrently use monetary (choice experiment) and non-monetary (well-being scale) methods to (a) provide a robust understanding of the diversity of these use and non-use values provided by insects, and (b) understand how self-reported well-being shapes preferences for conservation.

## 2.4 | Choice experiment

Choice experiments, where respondents choose their utility-maximising alternative from a set of alternatives that vary along the levels of different attributes, can examine respondents' preferences for trading-off between attributes (Hoyos, 2010; Mariel et al., 2021; Train & Weeks, 2005). Choice experiments have been used in a wide variety of contexts to recover preferences in WTP-terms, including widely for biodiversity (e.g. Jacobsen et al., 2008; King, Dallimer, et al., 2025; King, Robinson, et al., 2025; Meyerhoff & Liebe, 2009) and less commonly for insects (e.g. for pollinators, Breeze et al., 2015). For non-use values more widely, Jobstvogt et al. (2014) used a choice experiment ($N=397$) to recover Scottish household preferences for option and existence non-use values from deep-sea ecosystems. Their existence attribute was described as the number of protected species across multiple taxa. As their setting was the deep-sea, these values were explicitly non-use. Moreover, these values were implicitly unrelated to bequest as the benefits accrued to current, not future, generations. Similarly, Jacobsen et al. (2008) study of Danish households ($N=739$) also used the number of species preserved to recover existence values, with a split-sample testing the effect of mentioning extinction risk. Although they isolated existence value from use values, they did not recover any other aspects of non-use such as bequest values. Finally, Oleson et al. (2015) used a choice experiment with $N=195$ respondents in Madagascar to show that preserving the Vezo fishing lifestyle for additional future generations was a highly valued attribute, although they did not benchmark this against any existence values. Our choice experiment design is, therefore, novel in separating existence and bequest values.

To improve our choice experiment's perceived policy consequentiality (Zawojska et al., 2023), we informed respondents that a plan to manage the population of insects was being developed by relevant Government bodies and stakeholders. We described three different alternatives: two hypothetical plans 'Plan A' and 'Plan B' where insect populations were managed with an associated increase in funding, and a no-change 'Plan C' where insect populations and funding were unchanged. Compared to a binary choice between the status quo and a single plan, the use of three alternatives may improve the precision of the estimates (Jacobsen et al., 2008; Mariel et al., 2021). The inclusion of a no-change status quo plan was necessary to reflect whether respondents' utility was highest without changing any attributes (Meyerhoff & Liebe, 2009).

Our three alternatives were described by five different attributes; a task-specific attribute presenting the insect type the plan would apply to; a monetary attribute to link funding to changes in insect management; and three non-monetary attributes representing our non-use values. We used scenario variables to vary the insect type between, but not within, the choice tasks (ChoiceMetrics, 2012). This allowed us to uniquely identify preferences in WTP terms for bees, wasps and ground beetles. The payment vehicle used for our monetary attribute was an additional amount in monthly income tax for 10 years, which pre-testing revealed to be a credible approach to link funding to insect management plans. We used a seven-item bid vector, similar to Börger et al. (2023), King, Dallimer et al. (2025) and King, Robinson et al. (2025) with the values £0 (only for Plan C), £0.50, £2.00, £6.00, £12.00, £25.00 and £50.00, with three levels below £10 to improve precision in the left-hand tail of the distribution.

The non-monetary attributes in the choice experiment then reflected a use value (encountering), and two distinct non-use values, existence and bequest. We used consistent language across each attribute that is changes in the amount of 'area managed for insects' to ensure that preferences for these attributes were solely attributable to different use and non-use values we were interested in. An example of the choice tasks presented to respondents is provided in Figure 1.

As a core tenet of cultural ecosystem services is human-nature interaction (c.f., Chan, Guerry, et al., 2012; Chan, Satterfield, & Goldstein, 2012; Fish et al., 2016), the choice experiment included an attribute called 'area managed so that you are more likely to encounter insects now'. This attribute recovered the 'use' value of interacting, encountering and observing the pictured insect type. Although use values encompass a broad range of activities, we focused on 'encountering', which captures a mode of direct interaction which is non-consumptive, and represents only a subset of the total use value, which may include other values, such as education or option. Encountering was defined as seeing, hearing and interacting with insects to reflect how nature interactions can be multi-sensory (e.g. Austen et al., 2021; King, Dallimer, et al., 2025; King, Robinson, et al., 2025). Respondents were informed that the likelihood of encountering insects now, as distinct from the future, could be increased due to creating wildflower meadows and hedgerows (e.g. Image et al., 2023). We did not specify exactly where these would be created to allow us to generalise across the spatially variable sample but explicitly mentioned that it would be 'land near them' and most respondents indicated that they understood the description of attribute (Figure B1). Attribute levels were the same across all three of our use and non-use values to minimise variation that was not due to the types of values themselves and were described as 'no change' for plan C, a 'small increase' meaning 15% more land managed this way, and a 'large increase' meaning 30% more land.

Our final two attributes attempted to delineate between existence and bequest (IPBES, 2022; United Nations et al., 2021). Our attribute descriptions differed in the amount of grassland and woodland area managed for insects to exist either 'now' (existence) or 'in the future' (bequest). The attribute descriptions in Table B1 thus differed in (a) the temporal scope of shorter versus longer-term with specific dates to avoid conflating existence now for existence in the future, and (b) the beneficiary: the respondent's own knowledge that insects exist now versus future generations' ability to know that these insects exist. We ensured that these were explicitly non-use (Haines-Young & Potschin, 2018; Hirons et al., 2016) by informing respondents that the areas managed for these attributes were explicitly not near them, not publicly accessible, and that they would not personally encounter these insects. Instead, the attribute

Please consider each question individually as they are different possible combinations.

In similar surveys, it was found that people tend to overestimate how much they are actually willing to pay. When choosing among the following plans, please bear in mind that the tax to fund the management of these insect populations will reduce your available income and you would have less money to spend on other expenses.

| | Plan A | Plan B | Plan C |
|---|---|---|---|
| **This plan focuses on these insects:** | Wasps<br>[Illustrations of three wasp species] Sourced from Olsen et al. (2001); not reproduced for copyright reasons] | Wasps<br>[Illustrations of three wasp species] Sourced from Olsen et al. (2001); not reproduced for copyright reasons] | Wasps<br>[Illustrations of three wasp species] Sourced from Olsen et al. (2001); not reproduced for copyright reasons] |
| **Area managed for insects to be encountered by people now.** | Small increase (+15%) | Small increase (+15%) | No change (+0%) |
| **Area managed for insects to exist now.** | No Change (+0%) | Small Increase (+15%) | No change (+0%) |
| **Area managed for insects to exist in the future.** | No Change (+0%) | No Change (+0%) | No change (+0%) |
| **Additional income tax per month for 10 years.** | £6 | £12 | £0 |
| **Which would you choose?** | ○ | ○ | ○ |

FIGURE 1 Example of the choice experiment exactly as shown to participants. Note that this version is about one of the three insects we showed to participants; the other two were 'Bees' and 'Beetles', which also had three illustrations of different species. The illustrations were sized and presented similarly and were from the same illustrator.

descriptions stressed that respondents would only have the knowledge (Gee & Burkhard, 2010) that these insects would have area for them to exist now (existence) or be preserved for the long-term future (bequest). By describing these attributes in terms of the land in question not being publicly accessible, we thus ensured that we refer to a bequest of non-use values rather than a bequest of use values (e.g. Diafas et al., 2017; O'Garra, 2009). These attributes otherwise shared similar language and the same levels. In our pre-testing we explored whether it was credible to elicit the value of extinction risk, which is related to both existence and bequest values (c.f., Brander et al., 2024), but it was not thought credible to describe a scenario where the insect types we included were at risk of going extinct in the UK. We reproduce the choice experiment in Figure 1, with further details in Table B1.

## 2.5 | Well-being

To complement our monetary valuation, we included a self-reported well-being scale in the survey. We recovered well-being using an adapted form of the BIO-WELL (Irvine et al., 2023) scale, a formalised and validated psychometric scale designed to recover participant well-being from biodiversity. This validated theory-driven scale assuages Mariel et al. (2024) criticisms around using non-validated ad hoc scales in complex models. Consistent with Irvine et al. (2023), we used the same five well-being domains, physical, emotional, cognitive, social and spiritual, but rephrased the biodiversity stem questions to match our insect context and align with our choice experiment attributes. The stem questions were specific to the three insects, *Bees*, *Beetles* and *Wasps*, and types of values covered in our choice experiment: an interaction/recreation use value *('Knowing that I can encounter [insect] when I am outside makes me feel…')*, an existence value stem question ('*Knowing that [insect] exist now makes me feel*…'), and one regarding bequest value ('*Knowing that [insect] will exist in the future makes me feel*…'). We, therefore, recovered well-being derived from, and WTP for changes in, three specific use and non-use values provided by insects. As the well-being tasks followed the choice experiment, our efforts therein to disambiguate the precise definitions of existence and bequest values in our context may have helped respondents to distinguish between these two non-use values.

Each respondent was asked to report their well-being using a visual analogue scale measured from 0 to 100 using a sliding scale response. We then averaged the participant score across the five domains of well-being to recover their score per stem question. To use these stem questions as indicators of latent variables, we then mean-centred the participant scores to be distributed with zero mean across the sample to facilitate parameter identification (Boyce et al., 2019; Hess & Beharry-Borg, 2012). We visualised the distribution of respondent responses per stem question in Figure 3. The varying shape of the distributions and locations of the medians indicates that respondent well-being was sensitive to both the type of value and the insect providing it.

## 2.6 | Study design

The survey was designed from April 2023 to October 2024 and involved discussion with inter-disciplinary experts and one to one think-aloud interviews with lay people from the target population. We completed two pilot rounds with 50 participants each from the target population ($N=100$) to evaluate how participants understood the presented information. There was a final pilot round (N = 100) to verify that the Ngene priors and design were updated correctly. The choice experiment design was designed using the software Ngene (ChoiceMetrics, 2012) and consisted of 18 choice cards divided into two blocks. An initial design used uniform priors to allow for heterogeneous preferences. From our pilot survey, we updated the bid vector and priors and generated a subsequent design. The Ngene code optimised the D-error for a multinomial model with a D-error of 0.866 for the final design. We verified that dominated alternatives were removed for theoretical validity (Mariel et al., 2021; Rakotonarivo et al., 2016).

After introductory sociodemographic questions (age, gender, country, urban, ethnicity, location, occupation and income), the survey assessed attitudes towards insects in three ways. Firstly, we asked respondents to list three insect types, and three feelings associated with the word 'insect'. These were open-text responses to prompt respondents to think about their preferences for insects. Secondly, we then provided background information on insects in Britain, their roles in the ecosystem, and the potential causes of insect declines. We also included a short insect identification quiz where respondents specified whether one of six pictured insect species was an 'ant, bees, beetle, wasp, I don't know'. Following Welling et al. (2023), respondents were informed whether they identified the six insect types correctly to ensure that we understood how well respondents could identify the species being valued, and helped respondents engage with the later choice tasks (Welling et al., 2023). Finally, we asked respondents about their involvement with citizen science (Duffus et al., 2021); citizen scientists can be involved with insects, although this may be more pronounced for charismatic species rather than the beetles and wasps we study here (Schmack et al., 2024; Sumner et al., 2018).

We used a range of tools from the literature to improve comprehension of the choice tasks. Firstly, the survey featured seven pictures which highlighted and explained each part of the choice tasks. In the pilot surveys, we asked respondents to indicate how strongly they agreed or disagreed that they understood this information and after working on the descriptions, most respondents indicated that they understood the descriptions of these attributes. Consistent with Zawojska et al. (2023) approach to mitigate hypothetical bias, we asked about perceived policy consequentiality before the choice tasks and recovered self-reported response certainty for the CE and BIO-WELL tasks after their completion for example, '*I am certain about the answers I gave*'. During the choice tasks, we provided a small 'cheap talk' treatment with an 'opt-out' reminder on each choice task page, following Börger et al. (2023). Together, these two devices may improve attribute attendance, perceived consequentiality and reduce cost vector effects. Stated attribute non-attendance was also elicited post-choice tasks for each attribute (Breeze et al., 2015).

After the monetary and non-monetary valuation sections, we used a monetary payment ladder to elicit individual time preferences (Appendix A). We did not estimate these jointly with risk preferences (Coller & Williams, 1999; Harrison et al., 2002; Sauter & Mußhoff, 2018). We included this to better understand respondents' preferences for shorter or longer-term values. However, we did not interpret discount rates directly as they may be erroneous in our context given the non-material benefits of bequest values. Instead, we created a dummy variable equal to one for present-biased respondents that is those who chose £0 in 1 month over any reward in 1 year' time. We included this variable in our class allocation model to explore whether present bias influenced class membership.

Finally, after the choice tasks and the well-being scale, we asked respondents a series of debriefing questions. We used a sliding scale from strongly disagree to strongly agree and scored as 0–100 to ask respondents how often they spent time outdoors as a child, a teenager, and as an adult (Taye et al., 2019). Further, we asked about visit frequency and walking distance to both green (forests, grasslands, parks, gardens) and blue spaces (lakes, coasts, rivers) as the types of areas that insects may be encountered (Schmack et al., 2024).

## 2.7 | Modelling approach

Our econometric approach sought to recover WTP for existence, bequest, and use value provided by insects, and explain how this WTP was linked to well-being from insects. As we found distinct clusters of preferences in the distribution of BIO-WELL responses (Figure 3), pooling the respondents in the common mixed logit approach (e.g. King, Dallimer, et al., 2025; King, Robinson, et al., 2025), would produce unreliable and imprecise estimates. To account for these clustered and heterogeneous preferences, we estimated a latent class mixed multinomial logit model (Greene & Hensher, 2013). In effect, we segmented the sample and then estimated different mixed models for each class. This approach provided an improved model fit, more fully characterised heterogeneity, and more plausible WTP estimates compared to a pooled mixed logit. Rather than using the wellbeing to explain class-allocation (e.g. Mariel et al., 2015), we used additive interaction terms between the recovered wellbeing and the mean of the random distributions to describe how changes in wellbeing shifted mean WTP.

A further econometric choice was to not estimate a hybrid or structural model which use separate structural and measurement models to link latent variables to their indicators and determinants (Vij & Walker, 2016). While a hybrid choice model may be appropriate in our context, where we sought to link variation in WTP to well-being from insects, which could be treated as a latent variable (c.f., Hess & Beharry-Borg, 2012), such models also have limitations including challenges in interpretation and computational expense (Mariel et al., 2024). In our case specifically, with 1476 respondents nine tasks, three classes and three insect-related attributes with nine well-being indicators, any hybrid specification would require hundreds of estimable parameters (c.f., Mariel et al., 2024). Further, the accompanying number of random draws given our complex choice experiment would also need to be sufficiently high to provide desired precision in the estimates (e.g. Czajkowski & Budziński, 2019). As such, while a hybrid approach would be a candidate method, using latent classes was sufficient to describe how WTP was specific to the type of value and insect providing it, and how it was influenced by well-being without being computationally unfeasible. Although a hybrid model could reduce bias arising from including endogenous latent indicators (Czajkowski & Budziński, 2019), WTP estimates are unlikely to be affected (Cohen et al., 2021; Mariel et al., 2024; Mariel & Meyerhoff, 2016).

### 2.7.1 | Choice model

We analysed choices in the choice experiment by using random utility models (Train & Weeks, 2005). We specified the utility $U$ to be plan ($A$), class ($C$) and respondent ($i$) specific. We specified each of the three non-monetary attributes to be randomly distributed around the normal distribution to allow for heterogeneous preferences within-classes. Thus, for each $\beta$ for the three non-monetary attributes, we estimated the class-specific mean $(\mu_c)$ and standard deviation $(\sigma_c)$ for the distribution of preferences for these attributes. We then estimated interaction terms between each attribute and whether the insect pictured was a beetle (the main effect), a bee, or a wasp. The model was estimated in WTP-space for ease of inference (Equation 1).

$$
\begin{gathered}
U_{A,c,i} = -\beta_{tax,c} * ( \\
\beta_{Encountering_{small},c} * \left(Encountering_A == small\right) + \\
\beta_{Encountering_{large},c} * \left(Encountering_A == large\right) + \\
\beta_{Existence_{small},c} * \left(Existence_A == small\right) + \\
\beta_{Existence_{large},c} * \left(Existence_A == large\right) + \\
\beta_{Bequest_{small},c} * \left(Bequest_A == small\right) + \\
\beta_{Bequest_{large},c} * \left(Bequest_A == large\right) + \\
Interaction_{Encountering_{small},bee,c} * \left(Encountering_A == small\right) * Bee + \\
Interaction_{Encountering_{large},bee,c} * \left(Encountering_A == large\right) * Bee + \\
Interaction_{Existence_{small},bee,c} * \left(Existence_A == small\right) * Bee + \\
Interaction_{Existence_{large},bee,c} * \left(Existence_A == large\right) * Bee + \\
Interaction_{Bequest_{small},bee,c} * \left(Bequest_A == small\right) * Bee + \\
Interaction_{Bequest_{large},bee,c} * \left(Bequest_A == large\right) * Bee + \\
Interaction_{Encountering_{small},wasp,c} * \left(Encountering_A == small\right) * Wasp + \\
Interaction_{Encountering_{large},wasp,c} * \left(Encountering_A == large\right) * Wasp + \\
Interaction_{Existence_{small},wasp,c} * \left(Existence_A == small\right) * Wasp + \\
Interaction_{Existence_{large},wasp,c} * \left(Existence_A == large\right) * Wasp + \\
Interaction_{Bequest_{small},wasp,c} * \left(Bequest_A == small\right) * Wasp +
\end{gathered}
$$

$$Interaction_{Bequest_{large},wasp,c} * (Bequest_A == large) * Wasp - Tax_A) \tag{1}$$

Within each class we kept an alternative-specific constant (ASC) for the opt-out alternative (labelled 'Plan C'), and the tax parameters as fixed within-class, but variable between-classes, to reduce the number of parameters to estimate. While allowing the cost parameter to be randomly distributed may have added fidelity to our model, our aim was to minimise complexity wherever possible. Future work may allow for heterogeneity in these parameters or even introduce interactions of the socioeconomic variables against the ASC to investigate status quo bias/aversion.

A core feature of our work is the interaction terms between well-being and the attributes (Equation 2). Rather than using the well-being as explanatory variables (Abate et al., 2020), interactions with the ASC (Meginnis et al., 2022), or in the class-allocation function (Mariel et al., 2015), we followed the approach of Boyce et al. (2019) and Faccioli et al. (2020) of interacting the well-being with the mean of the random parameters. Thus, the interaction terms can be interpreted as shifts in mean WTP.

$$\begin{aligned} Interaction_{Bequest,large,Bee,Class} = (&\mu_{Bequest,large,Bee,Class} + \\ &\sigma_{Bequest,large,Bee,Class} * \eta_{bequest,large,Bee,Class} + \\ &Interaction_{Wellbeing,Bequest,large,Bee,Class} * Wellbeing_{Bequest,Bee}) \end{aligned} \tag{2}$$

### 2.7.2 | Class allocation

To determine class allocation, we included socioeconomic variables including respondent age, income, gender and country of residence, which have been previously documented as influences on choices (Faccioli et al., 2020). We also included a dummy for citizen science involvement (Duffus et al., 2021). Finally, we also included a dummy variable for present bias in our discounting task. While other studies interact socioeconomic factors with the ASC (e.g. Meginnis et al., 2022), using them as class allocation parameters provided insight into the types of respondents likely in our latent classes and reduced the number of estimable parameters. The number of latent classes to model was iteratively determined according to goodness-of-fit criteria (Chen & Cho, 2019), finding that a three-class model was the most appropriate for our sample. Once estimated, we modelled the posterior probability of a respondent being a member of each class (Kassahun & Jacobsen, 2015).

### 2.7.3 | Willingness to pay

To evaluate preferences for each insect and service, we used the Krinsky-Robb bootstrap method (Krinsky & Robb, 1986) drawing from the variance–covariance matrix of our estimated model. This is a common approach to simulating the insect, attribute, level and class-specific WTP (Matthews et al., 2017) over different levels of well-being (Boyce et al., 2019).

## 2.8 | Study sample

Data were collected September to October 2024 using the online survey platform SurveyEngine (https://surveyengine.com/). The comparison of our sample to the target population is encouraging for the external validity of our sample (Table B2). Ethical approval for data collection was granted by the School of Earth and Environment Ethics Committee, University of Leeds (Ref: BESS+ FREC 2023-0769-1031). Informed consent was obtained for all participants through the first question of the survey (Supporting Information S1). The full sample of $N = 1684$ excluded respondents under 18, those who did not provide consent, incomplete responses, and those failing survey quality checks. Data analysis was undertaken using R 4.4.1 with Apollo version 0.3.4 (R Core Team, 2020; Hess & Palma, 2019). The model was estimated with 2000 Sobol draws (c.f., Czajkowski & Budziński, 2019). Replication materials including Ngene design, survey design, R code and data are available at https://doi.org/10.5281/zenodo.20799845.

# 3 | RESULTS

We used quota sampling to ensure a sample that was broadly representative of the population of Great Britain. The quotas were consistent with the results of the 2021 census for England and included: age (18–24: 11%, 25–34: 17%, 35–44: 16%, 45–54: 18%, 55–64: 15%, 65+: 23%), gender (male: 49%, female: 51%, any other: 1%), urbanicity (rural: 17%, urban: 83%) and country (England: 88%, Scotland: 8%, Wales: 4%). From 2586 invitations, 1684 (65.12%) respondents completed the survey. We truncated the sample for theoretically valid (Rakotonarivo et al., 2016) choice experiment responses by dropping 208 respondents (12.35%) who did all of the following: state that they did not attend to any attribute, serially chose the status quo only (von Haefen et al., 2005) and chose a protest statement when asked about serial status quo behaviour. This left $N = 1476$ (87.65% of completed responses) for analysis. All model results and diagnostics are reported in supporting information (e.g. Tables C1 and C2).

## 3.1 | Class allocation

We explained class allocation as a function of socioeconomic factors. We found that our model performed best when separating respondents into three distinct classes of respondent: 'pro-insect' (41.84%), 'insect-averse' (25.73%) and 'the ambivalent' (32.43%). We found that age and gender were significant predictors of class membership, with younger respondents more likely to be in the pro-insect class. Female respondents were much more likely to be in the insect-averse class; 86% of respondents predicted to be in this class were female. Citizen scientists were highly likely to be in the pro-insect class, as were respondents who were not present biased in our discounting task. While income and self-reported CE certainty did not have statistically significant effects on class membership, the ambivalent class (class 3) was the most certain about their CE choices and most likely to believe that their answers would have any impact on policy decisions. Finally, respondents who were strongly present biased in the discounting task were significantly more likely to belong to the ambivalent class than the pro-insect class (Table 1).

## 3.2 | Willingness to pay for use and non-use values

In Figure 2 we visualise the simulated mean WTP per attribute, level, insect, and class, with the mean and 95% confidence intervals reported in Table C1 and visualised in Figure C1. In both, we additionally provide a WTP measure that aggregated all classes WTP and weighted by class size to report the general preference in the sample. We used the estimated WTP to characterise the latent classes. The largest class was 'pro-insect' as they reported uniformly positive WTP for a large increase in the area managed for insects for all three taxa and attributes. Consistent with our non-monetary well-being results, their highest WTP was typically for bequest value and lowest for encountering. Pro-insect respondents were generally scope-sensitive as they were willing to pay more for larger proposed changes. There was a notable non-linearity as pro-insect respondents were WTP more for small increases in encountering wasps compared to bees, but this pattern was reversed for larger increases, highlighting the nuanced preferences within our sample.

Our second class was characterised as 'insect-averse' as they reported negative preferences to encounter any of the three insect taxa and had negative WTP for existence or bequest values. Although mean WTP for a small increase in bee existence was marginally positive for this class, the underlying distribution (Figure C1) was highly heterogeneous. For example, while the right-hand tail of the distribution suggests that some insect-averse respondents held positive existence values for bees, the large left-hand tail reflects that others derived disutility for the existence of bees.

Finally, we found evidence of a third class who were ambivalent as their WTP was contingent upon the insect taxon and the specific attribute. For instance, they preferred the encountering value of wasps over their existence and bequest values but had the opposite relationship between the non-use values for bees. However, across all attributes and taxa, mean WTP in this class was generally smaller than our pro-insect class.

## 3.3 | Effect of well-being on WTP

The distribution of respondent well-being scores (Figure 3) suggests that respondents derived more well-being from bees than beetles or wasps. The highest well-being scores were derived from bequest values, followed by existence values and then more mixed well-being scores derived from encountering insects. Furthermore, these distributions were clustered and multimodal, rather than unimodal.

To evaluate how our non-monetary metric was inter-related to the monetary preferences, our model interacted the well-being scores with the mean of the random parameters in the WTP model. The estimates in Table C3 are thus interpretable as the change in mean WTP from a one standard deviation increase in well-being. Results suggest that well-being had a positive, albeit rarely statistically significant, effect on preferences. While we found that WTP for bees was not influenced by well-being, WTP for beetles and wasps was more likely to be significantly higher when respondents reported higher well-being. Within our pro-insect class, WTP was the least sensitive to changes in well-being scores, possibly as respondents in that class were already willing to pay a positive amount for these insects. Conversely, WTP within the ambivalent class was the most sensitive to changes in well-being scores. The encountering use-value of insects was most strongly related to its corresponding well-being scores, whereas the non-use values of existence and bequest were less so.

In Figure 4, we illustrate how the WTP for hypothetical increases in the non-use values provided by insects may be influenced by well-being derived from their existing provision of these services. Consistent with our model estimates, we show that the effect of wellbeing on WTP is typically positive as respondents who derived higher well-being from insect-provided services had higher WTP for increases in their provision. Increased well-being for the ambivalent class can result in WTP changing sign. This suggests that support for insect conservation may be influenced by the level of well-being that respondents derive from existing insect populations.

# 4 | DISCUSSION

We used monetary and non-monetary methods to show that the public in Great Britain holds distinct, quantifiable preferences across both non-consumptive use value (encountering insects) and two non-use values (existence and bequest) provided by insects. We show that these values were highly heterogeneous and varied significantly across different taxa (bees, wasps, and beetles). Well-being scores indicated that some of the public responded positively, some negatively and some not at all to these cultural ecosystem services. Latent class models of WTP revealed three classes, 'pro-insect' (41.84%), 'insect-averse' (25.73%) and 'the ambivalent' (32.43%), with membership influenced by socioeconomic factors and well-being. Across all three latent classes we showed that the public distinguished between the non-use values of existence and bequest.

Previous findings of a universal love of bees and dislike of wasps (Sumner et al., 2018) were not replicated here. Instead our results revealed that preferences are more heterogeneous.

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**TABLE 1** Results from a class-allocation model used to explain membership in each latent class as a function of selected socioeconomic factors.

| Variable | Mean (Std. dev.) | Class 1 (42%) 'pro-insect' | Class 2 (26%) 'insect-averse' |
|---|---|---|---|
| Age: years of age | Class 1: 33.89 (11.41)<br>Class 2: 56.29 (14.24)<br>Class 3: 59.66 (11.29) | −0.03*** (0.01) | 0.00 (0.01) |
| Female: female (1), any other (0) | Class 1: 0.46 (0.50)<br>Class 2: 0.87 (0.34)<br>Class 3: 0.43 (0.50) | −0.31* (0.18) | 0.48*** (0.18) |
| Income: mean-centred monthly gross income | Class 1: 0.22 (1.04)<br>Class 2: −0.33 (0.84)<br>Class 3: −0.16 (0.94) | 0.05 (0.08) | −0.03 (0.09) |
| England: living in England (1) vs. living in Scotland or Wales (0) | Class 1: 0.93 (0.26)<br>Class 2: 0.64 (0.48)<br>Class 3: 0.91 (0.29) | 0.22 (0.27) | −0.31 (0.24) |
| Self-reported CE response certainty: 'I am certain about the answers I gave' | Class 1: −0.10 (1.06)<br>Class 2: −0.14 (1.03)<br>Class 3: 0.19 (0.87) | −0.17 (0.11) | 0.13 (0.11) |
| Consequentiality: 'I am confident that my choices in this survey will be considered in decision making' | Class 1: 0.07 (0.94)<br>Class 2: −1.07 (1.10)<br>Class 3: 0.29 (0.76) | 0.12 (0.12) | −0.30*** (0.11) |
| Citizen science: involved (0) or not involved (1) | Class 1: 0.68 (0.47)<br>Class 2: 0.99 (0.07)<br>Class 3: 1.00 (0.04) | −1.32*** (0.31) | 0.29 (0.52) |
| Discounting: Present biased (1) or not present biased (0) | Class 1: 0.72 (0.45)<br>Class 2: 0.97 (0.17)<br>Class 3: 1.00 (0.00) | −1.73*** (0.39) | −0.67 (0.46) |
| Class allocation model intercept | NA | 4.40*** (0.72) | 0.00 (1.05) |

*Note*: Covariate name with information on how it was coded for analysis, the variable means and standard deviation per class according to the class a respondent was most likely to be in, and the model estimate with standard error in parentheses with asterisks to indicate statistical significance against the null hypothesis that the true coefficient value is zero. Estimates for classes 1 and 2 were against a reference level of class 3 to permit identification. $N = 1476$. Please note that class membership is only probabilistic and not definite.

*$p$ value < 0.10. **$p$ value < 0.05. ***$p$ value < 0.01.

Indeed, our pro-insect class held higher WTP for a small increase in encountering wasps than bees, which may be motivated by a desire to implement some conservation measures for wasps, but not a wider preference for encountering them often. Our attribute framing did not mention the pollination services that bees are popularly associated with (e.g. Breeze et al., 2015), and without these instrumental cues, pro-insect respondents may have perceived a greater benefit of recovering a more maligned taxon (wasps) than increasing the conservation of the already culturally popular bees. However, we also demonstrate that this effect was limited to smaller changes. Whereas encounters with bees yielded strictly increasing positive utility, the pro-insect class's non-linear WTP for wasps may have reflected two competing motivations. The positive WTP for smaller increases suggests that respondents signal pro-insect preferences by supporting a relatively unpopular taxon. However, the negative WTP for larger increases possibly reflecting disutility from the higher likelihood of encountering wasps. This distinction is relevant for land managers as we show that public support for uncharismatic taxa can be sensitive to the size of proposed changes.

We found that the magnitude of utility and disutility varied both between and within classes, reflecting two factors. Firstly, there may be class-specific threshold effects. Insect-averse respondents may tolerate smaller changes but view larger increases as unacceptably increasing unwanted insect presence (i.e. wasps as pests that provide ecosystem disservices e.g. Shackleton et al., 2016; Von Döhren & Haase, 2015). By contrast, pro-insect respondents may have perceived small increases as insufficient to meaningfully benefit insect

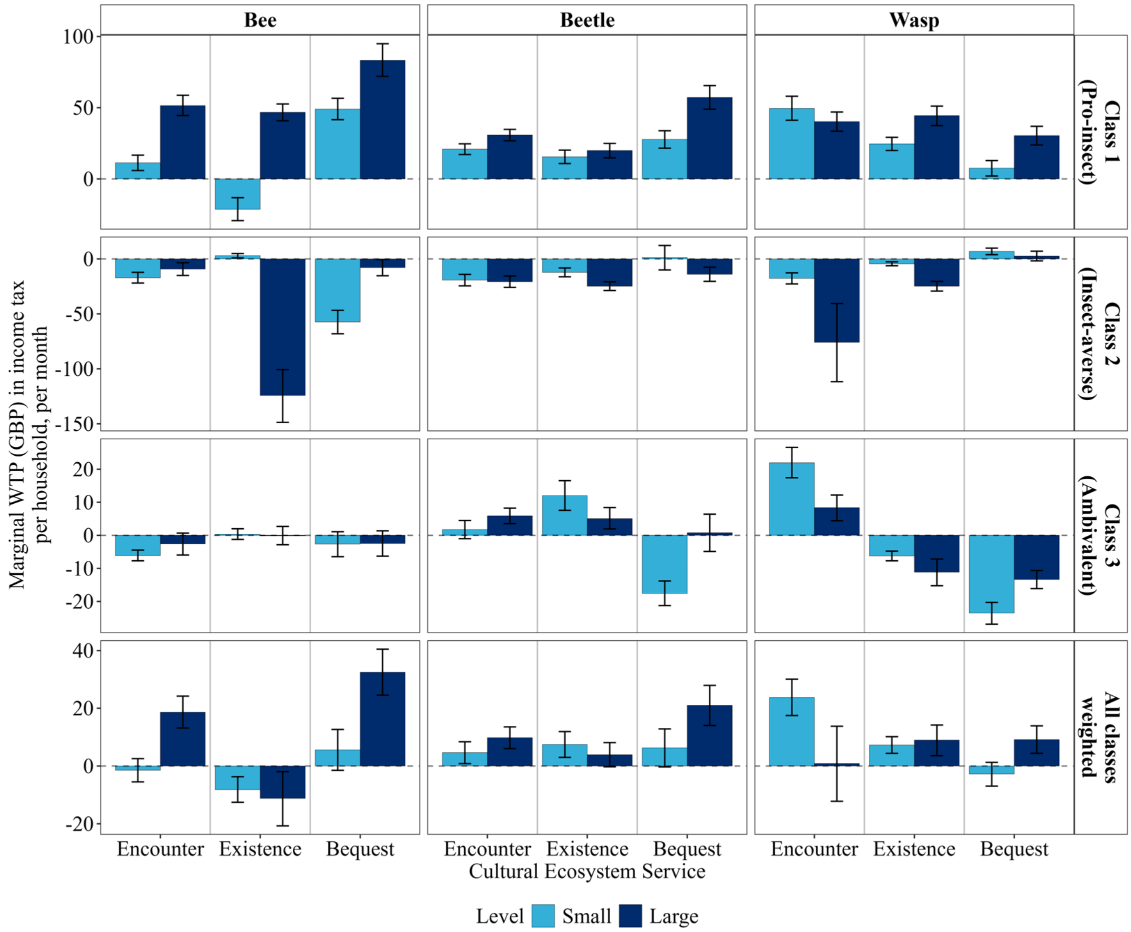


**FIGURE 2** Bar chart with the top of the bar representing the mean WTP and error bars visualising the 95% confidence interval of simulated mean WTP per insect, latent class, level and attribute. A horizontal dashed line is drawn at zero WTP. The label 'All classes weighted' refers to the weighted mean WTP calculated from all classes according to the predicted class sizes from the model. Y axis is unique to each class to better represent the class-specific range of WTP. Full distributions of WTP are reported in Figure C1.

populations, whereas larger increases cross a threshold where conservation is perceived as more ecologically meaningful. Secondly, within-class heterogeneity may be underpinned by different levels of well-being derived from insect ecosystem services (Figure 3). Respondents who derived higher well-being from current insect populations reported significantly more positive WTP, even within the insect-averse class, suggesting that while class membership captured broad preference patterns, individual-level well-being scores moderated the intensity of those preferences. For our insect-averse class specifically, the observed negative WTP across encountering, existence, and bequest values reflects genuine disutility rather than task misunderstanding, given high reported comprehension and our truncation rules.

The ambivalent class exhibited mixed preferences. While their preferences for bees were as expected, this class also showed willingness to pay for small increases in the existence and bequest values from wasps. These findings echo Schmack et al. (2024), who suggest that such heterogeneity reflects perceptions of wasps' ecological roles. Indeed, Sumner et al. (2018) argued that public bias towards bees arises from their well-known contributions to pollination services (e.g. Potts et al., 2016), whereas wasps are largely seen as pests despite their role in pest regulation services (e.g. Ortega-Ramos et al., 2022). While bees are generally preferred to wasps, many respondents still valued wasps and the types of values they may provide.

Although ground beetles provide valuable ecosystem services (e.g. Beynon et al., 2015) without the negative stereotypes around wasps, our insect-averse class valued their use, existence, and bequest negatively. Conversely, the pro-insect and ambivalent classes were willing to pay more for the non-use values of beetles compared to wasps. Together, our results indicate that preferences for insects are both class- and taxon- specific with evidence that many respondents value insects beyond bees, challenging simplistic characterisation of preferences around insects.

Whereas many prior studies have bundled bequest and existence non-use values (e.g. Brander et al., 2024; Gee & Burkhard, 2010; Martin et al., 2016), we delineated between them. Separating bequest and existence values is a methodological challenge even in studies with no explicit use values such as deep-sea mining (Chen et al., 2022; Jobstvogt et al., 2014). A particular difficulty is whether existence in the future implies existence now and thus the extent to which existence value is nested in bequest value. To overcome

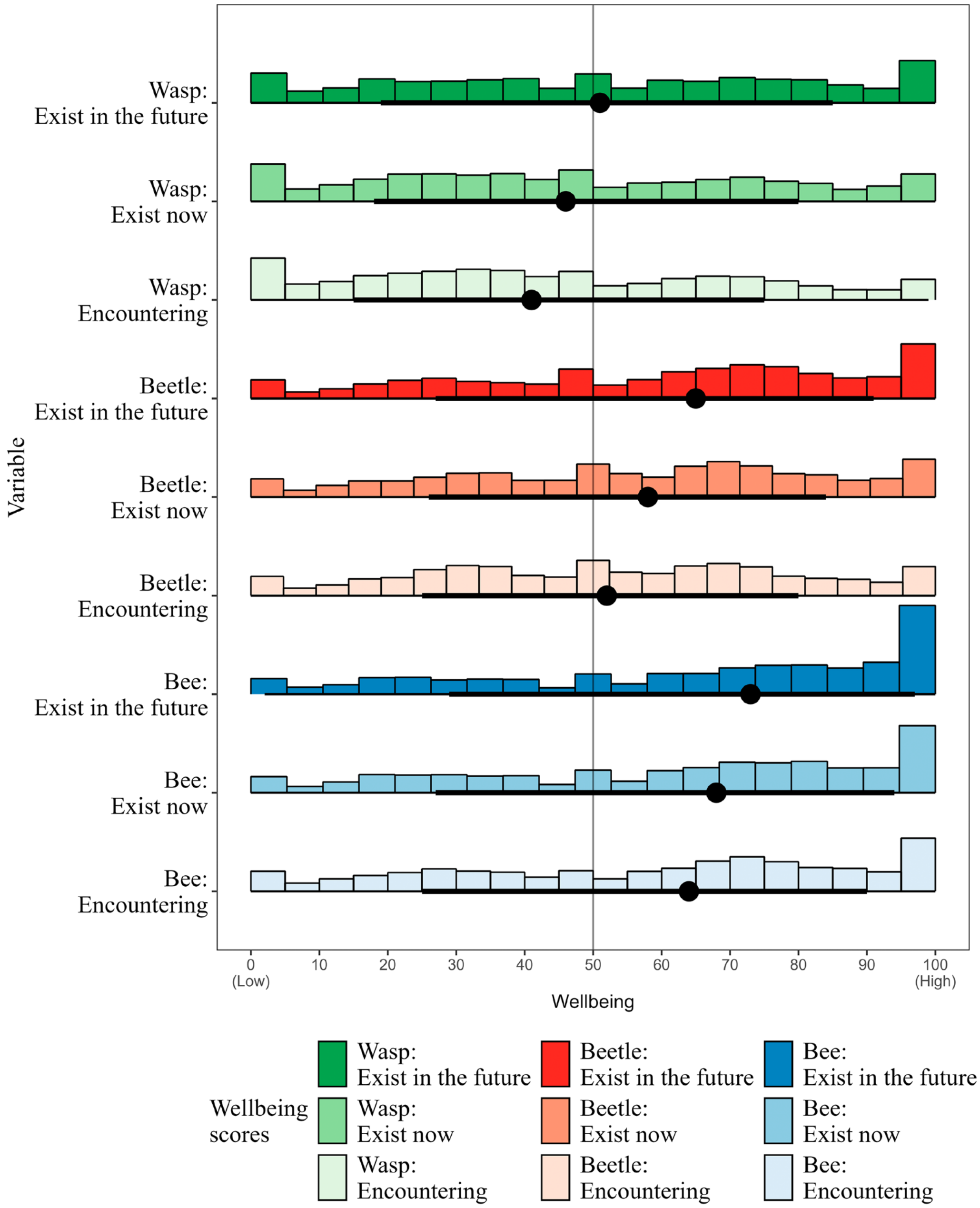


**FIGURE 3** Histograms of the BIO-WELL well-being responses per insect, and per stem question. Each stem question corresponded to our three non-monetary attributes in the choice experiment, which directly recover encountering, existence, and bequest value. The median of each distribution is indicated on the histograms by the black circle. A vertical black line is drawn at 50 on the X axis to indicate neither positive nor negative well-being. The scores here are the individual-specific means of the five well-being domains per stem question.

these challenges, we framed existence as shorter-term (i.e. knowing that species exist now) while bequest emphasised 'longer-term' preservation for future generations (Echeverri et al., 2019). We also explicitly distinguished between the beneficiaries to reflect the notion of existence as a self-oriented value of the knowledge that species exist now (e.g. IPBES, 2022; Jobstvogt et al., 2014), whereas bequest is more altruistic in that those in future would have the benefits (cf. López de la Lama et al., 2024; United Nations et al., 2021). In both monetary (WTP) and non-monetary (well-being) measures, we revealed that respondents distinguished between the non-use values (c.f., Echeverri et al., 2019) and their preferences were more nuanced and heterogeneous than the simple nesting of bequest and existence. For example, while two of our three classes reported positive WTP for insect existence values, consistent with prior studies demonstrating public WTP for existence independent of use (Kaikkonen & van Putten, 2021; Xuan et al., 2021), respondents' relative bequest values were insect taxon-specific. Our results extend previous studies (Diafas et al., 2017; O'Garra, 2009; Oleson et al., 2015), who recovered monetary estimates of bequest value in developing countries, by showing that respondents in developed countries also highly valued the knowledge that these insect taxa will exist in the future. This suggest that conservation interventions

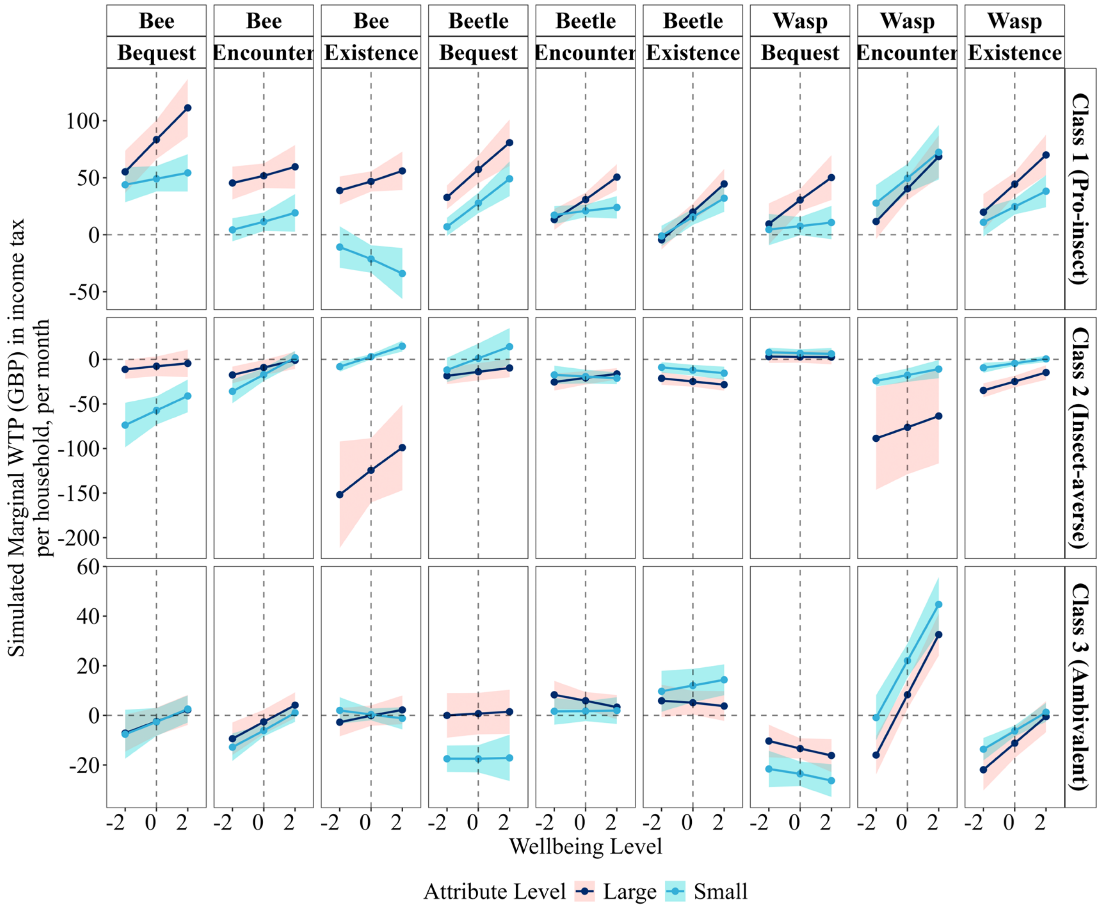


**FIGURE 4** Mean WTP per insect, attribute, level and class at five levels of well-being. The X axis represents up to ±2 standard deviations from the mean-centred well-being scores. The vertical dashed line indicates mean well-being (zero) and the horizontal dashed line indicates zero WTP. Points drawn to show mean WTP at each well-being level, connected by lines to illustrate how WTP varies with well-being. Shaded regions represent ±1 standard deviation of mean WTP at each point. Darker blue lines reflect preferences for a large change, lighter blue for a smaller change in the corresponding attributes. The Y axis scale is unique to each class to better represent class-specific variation in WTP.

designed for, and justified by, longer-term benefits explicitly for future generations are likely to align more closely with public preferences and generate more robust support than those focusing on shorter-term use values. In practical terms, failing to isolate bequest values may lead to conservation strategies that prioritise shorter-term population maintenance (e.g. existence values) while under-investing in longer-term habitat restoration (e.g. providing bequest values).

## 5 | CONCLUSION

Using insects in Great Britain, we explicitly delineated between a non-consumptive use value of encountering insects and two non-use values (existence and bequest) using monetary and non-monetary methods. By doing so we were able to capture distinct but complementary dimensions of value, as well as demonstrate that a well-being metric can help to explain heterogeneity in WTP. Both approaches show that bequest values frequently exceeded both the existence value from knowing that these insects exist now and the use value from non-consumptive encounters with insects. Further, both methods demonstrated that preferences were highly heterogeneous and broadly clustered around three latent classes: pro-insect (42%), insect-averse (26%) and ambivalent (32%). This heterogeneity demonstrates that values are nuanced and taxon-specific.

The findings of our work highlight the viability of diversifying messaging around insect conservation. Past research has held the idea that key species ('flagship species') are important to focus public attention on broader biodiversity issues (e.g. Breuer et al., 2015). Bees and other pollinators have been the primary focus of much discourse around insect conservation because of their key role in ecosystem functioning and crop production (e.g. DEFRA, 2023; IPBES, 2022). However, while a stronger understanding of the other ecosystem services provided by these taxa (e.g. pest control; Howard et al., 2025; Zhang et al., 2017) is important to assessing the trade-offs for land managers (Kirchweger et al., 2020), our results suggest that the majority of the public are receptive to insect conservation measures more broadly, even for species considered by many as pests (Sumner et al., 2018). Thus, greater publicity for the impact that conservation measures can have on multiple insect groups, regardless of their ecosystem service provision, could add value to a large section of the public.

## AUTHOR CONTRIBUTIONS

**Peter King:** Methodology, formal analysis, investigation, data curation, writing—original draft, writing—review & editing. **Tom Breeze:** Methodology, writing—original draft, writing—review & editing, supervision, project administration, funding. **Theresa Robinson:** Formal analysis, investigation, writing—review & editing. **Martin Dallimer:** Conceptualisation, methodology, writing—original draft, writing—review & editing, supervision, project administration, funding.

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## CONFLICT OF INTEREST STATEMENT

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper. Martin Dallimer is an Associate Editor for People and Nature but was not involved in the peer review and decision-making process.

## DATA AVAILABILITY STATEMENT

Replication materials including Ngene design, survey design, R code and data are publicly available at https://doi.org/10.5281/zenodo.20799845.

## STATEMENT ON INCLUSION

All authors are from the country where the study was conducted.

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## DATA SOURCES

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## SUPPORTING INFORMATION

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

**Appendix A.** Survey instrument.

**Appendix B**. Information about the choice experiment and the sample.

**Table B1**. Choice experiment attributes, levels, and descriptions. Further details in Appendix 1 with the full survey print out.

**Figure B1**. Histogram of responses for respondents understanding of each element of the choice experiment measured using 5-item Likert scales. Vertical black line drawn at 'neither agree nor disagree' to better indicate the how many respondents were at each level. The black dots represent the mean score per question and demonstrate a high level of agreement with the statement that respondents understood each part of the choice experiment. The labels 'Plan A, B, C' and 'Insect' asked respondents whether they understood that there were three different plans with one being the no-change Plan C and that these plans were the same across each insect. One facet per probabilistically allocated latent class of respondent.

**Table B2**. G test statistic and $p$ value against the null hypothesis that our full sample ($N=1684$) was not statistically different to the GB population across these five quota variables.

**Appendix C**. Further Latent Class Model results.

**Table C1**. Distribution of simulated WTP per attribute, level, class and insect in GBP per household per month terms. The values are the mean and 95% confidence intervals (lower—higher) in parentheses. We also report a weighted WTP which is the class-specific WTP weighted by the calculated class sizes. This aggregate measure describes the whole-sample preferences insect-provided cultural ecosystem services.

**Table C2**. Latent class model ($N=1476$) estimates per attribute, level, class and insect. The estimates refer either to the mean of the distribution or the standard deviation. Standard errors in parentheses and $p$ values against the null hypothesis of no significant difference from zero indicated with asterisks. Diagnostic measures reported as

22762.979 (AIC), 24156.922 (BIC), 0.210 (Adjusted R2), −11195.489 (log-likelihood).

**Table C3**. Latent class model ($N=1476$) insect-specific well-being interaction terms. Well-being from each category appears to positively influence most attribute levels across all insects, although the sign of the effect varies by class. We report the estimated coefficient with standard error in parentheses and asterisks indicating the statistical significance against the null hypothesis that the true coefficient value is not different to zero.

**Figure C1**. Histograms representing the distribution of class, insect, attribute and level-specific simulated mean WTP. Grey point plotted at the mean of each distribution. Histogram bins drawn using the Sturges algorithm. X axis is unique to each class to better represent the class-specific range of WTP.

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