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# The Relative Role of Knowledge and Empathy in Predicting Pro-Environmental Attitudes and Behavior

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**Abstract:** Planet Earth is undergoing unprecedented levels of environmental degradation and destruction at a global scale. Incentivizing people to adopt behaviors that are compatible with a sustainable future will help address the current ecological crisis. However, it is first necessary to understand the psychological drivers of pro-environmental behavior. Here, we examined whether greater levels of environmental knowledge and empathy predicted higher levels of pro-environmental behavior in an Australian population sample. We aimed to advance our understanding of the psychological variables that motivate people to act in pro-environmental ways, while also advancing the ongoing debate amongst conservation scientists regarding the relative importance of fostering empathy. Correlational analyses revealed that objective, verifiable knowledge was a strong predictor of pro-environmental attitudes and behavior. Empathy also correlated positively with pro-environmental attitudes and behavior, but with a dissociation with respect to its cognitive and affective components. Multivariate analyses revealed that knowledge was a stronger predictor of both pro-environmental attitudes and behavior after controlling for individual variation in cognitive and affective empathy. This finding casts doubt on the claim by compassionate conservationists that fostering empathy is the key to solving the current environmental conservation crisis. Future research should aim to extend the present findings by testing whether a more exhaustive test of participants' environmental knowledge and other measures of empathy, including empathic competencies and the recently developed Emotional and Cognitive Scale of the Human–Nature Relationship (ECS-HNR), yield the same dominance of knowledge over empathy.

**Keywords:** pro-environmental behavior; environmentally friendly behavior; sustainable behavior; environmental knowledge; empathy; compassionate conservation; conservation psychology; conservation science; human-induced environmental change; anthropogenic environmental change



**Citation:** Ienna, M.; Rofe, A.; Gendi, M.; Douglas, H.E.; Kelly, M.; Hayward, M.W.; Callen, A.; Klop-Toker, K.; Scanlon, R.J.; Howell, L.G.; et al. The Relative Role of Knowledge and Empathy in Predicting Pro-Environmental Attitudes and Behavior. *Sustainability* **2022**, *14*, 4622. https://doi.org/10.3390/su14084622

Academic Editors: Iain J. Gordon and Víctor Jesús García-Morales

Received: 28 December 2021
Accepted: 2 April 2022
Published: 12 April 2022



## 1. Introduction

Human activity is having major detrimental impacts on the natural world [1–3]. Many causes of environmental degradation and destruction lie beyond an individual's level of control [4,5]. Nevertheless, making individual-level political and personal choices that are consistent with healthy ecosystems will help address the current environmental crisis [6]. For example, approximately 20% of household carbon emissions (i.e., 123 million metric tons) could be prevented each year by adopting sustainable behaviors [7], such as

recycling [8]. Households could support sustainable agricultural and consumer practices by shopping wisely from outlets and brands that engage in sustainable practices themselves [9] and could minimize emissions by choosing alternative means of transport to driving a car [10]. The essential natural resource of water could be conserved by simple actions such as shortening shower times and reusing grey water to wash cars and water gardens [11].

Experience with the natural world provides numerous benefits to wellbeing [12], including stress reduction [13], reduced blood pressure and improved mental health, and increased life satisfaction [14]. These benefits should incentivize individual actions that preserve nature. However, decades of research in health psychology have demonstrated that changing human behavior even when it benefits the individual remains surprisingly challenging [15,16].

Conservation psychology is a small but growing field of scientific research [17–19]. A strong focus has been to determine the interplay of internal and external factors that motivate pro-environmental behavior [20], also known as sustainable behavior [21] or environmentally friendly behavior [22]. One such factor is environmental knowledge. Environmental knowledge is, inarguably, a precondition for pro-environmental behavior as it is difficult to make environmentally sustainable choices and perform environmentally sustainable actions with incorrect or poor knowledge [23,24]. In general, the extent to which knowledge influences pro-environmental behavior has received far less attention than attitudinal and normative influences, despite its central relevance to environmental education and decision making [25,26]. Primary studies have found mixed evidence for direct versus indirect relationships between knowledge and behavior in the environmental domain [25,27–29]. Recently, Dietsch et al. [17] argued that key to demonstrating a direct relationship is to measure knowledge as objective, verifiable knowledge rather than self-report evaluations of how much one thinks one knows about environmental issues (perceived environmental informedness) or how much one perceives an environmental issue to be a problem (problem awareness). This distinction is akin to that between subjective knowledge (i.e., people's own perception of understanding about the environment) and objective knowledge (i.e., actual knowledge that people possess), which are often uncorrelated both within and outside of the environmental context [30–32]. Measured correctly, previous work has found that objective knowledge can explain between 3 and 24% of behavioral variance [33].

Another factor found to influence the expression of pro-environmental behavior is empathy for the natural world and its non-human inhabitants. Using Batson's [34] model of altruistic and pro-social behavior as a guiding theory, several primary studies have shown that individuals with high levels of empathy possess stronger pro-environmental attitudes and behavior than those with lower levels of empathy [35–37]. Empathy can be fostered by relating to nature on a personal level and this can help motivate sustainable behavior [14]. For example, a recent meta-analysis revealed that individuals with high scores on human–nature connection displayed more pro-nature behaviors than individuals with low scores on human–nature connection [38]. Personal connections with nature can be achieved by attributing human qualities to nature (i.e., anthropomorphizing) [39], invoking empathy through guilt [40], or alternatively through more altruistic or morally motivated means [41]. The more animals are perceived to have human qualities (e.g., suffering), the greater the increase in empathy-related responses towards animals [42]. Similarly, when one perceives nature as human, the social principles applied when interacting with others (e.g., respect) can be transferred to the environment [43]. Political decisions to allocate the status of personhood to ecosystems are founded on these effects [44,45].

A recent debate in the conservation community has brought empathy and its associated psychological phenomenon, compassion, to the forefront. Compassionate conservationists have founded a conservation movement based on fostering empathy and compassion for individuals and arguing, amongst other things, against conservation actions that intentionally harm individual animals and the policies that allow such actions [46–48]. Compassionate conservationists go further to advocate that decision-making in conservation needs to shift

from being rooted in consequentialism to one rooted in virtue ethics, with empathy and compassion at its core [47–49]. While not disregarding the well-accepted joint role of emotion and cognition in human decision making, opponents of compassionate conservation have counter-argued that empathy is too fraught with biases to serve as the primary lens through which to decide whether a conservation action is justified or not, mirroring a similar concern raised in the social policy domain [50–56]. While conservation psychology has demonstrated that compassion and empathy can promote nature conservation [57], these dimensions can also paralyze pro-environmental attitudes, thus leading to a 'do nothing' approach [53]. For these reasons, knowledge of the impacts of a given conservation action on the health of an ecosystem (e.g., predator control results in recovery of native species) should be retained as a more solid foundation [53]. Instead, compassionate conservationists argue that opposing a key role of empathy in conservation decision-making invokes an "antiquated and gendered trope of reason and emotion". Over and above the compassionate conservation debate, conservation practitioners and advocates on the ground often face logistic decisions about whether shifting people's attitudes and behavior towards more favorable orientations is more effectively achieved by engaging with people at a cognitive level, for example by enhancing their knowledge of environmental destruction, or at an emotional level, for example by eliciting empathic suffering for individual animals that have lost their homes to bushfire.

To advance our understanding of the psychological variables that motivate people to act in pro-environmental ways, while also advancing the compassionate conservation debate, the present research sought to determine the relative role of knowledge and empathy in predicting pro-environmental attitudes and behavior. As per the argument of Geiger et al. [33] about the importance of how knowledge is measured, we quantified environmental knowledge using a questionnaire designed to test the objective, verifiable knowledge of environmental issues. The questionnaire was designed for an Australian sample. Consequently, in the context of the current study, environmental knowledge was operationalized as specific verifiable knowledge of the natural world beyond that of general scientific literacy. Empathy is a psychological construct marred by definitional and measurement controversies, but most researchers now agree that empathy encompasses both an affective (e.g., 'I feel the suffering of others') and a cognitive component (e.g., 'I understand the suffering of others') [19,58,59]. The meta-analysis of Barragan-Jason et al. [38] revealed that measures of human–nature connection that encompassed both affective and cognitive dimensions had significantly higher effect sizes than measures that encompassed solely cognitive dimensions. In contrast, others have found that the relationship between personality and connectedness to nature is mediated by cognitive dimensions of empathy, including perspective taking and empathic concern [60]. Given the potential for a dissociation between the effects of cognitive and affective empathy on pro-environmental attitudes and behavior, we used the Questionnaire of Cognitive and Affective Empathy (QCAE) [61] as a scale of trait empathy because it measures both components. Although we did not measure empathy for the planet per se, the QCAE is a well validated and widely used empathy scale, with the advantage of decomposing empathy into its cognitive and affective components. This allowed us to test the prediction that any pattern of correlation between knowledge and pro-environmental behavior would be mirrored more closely by cognitive empathy than affective empathy.

While also contributing to the compassionate conservation debate, this research contributes more broadly to determining whether fostering empathy with the natural world should be given priority over enhancing objective knowledge of environmental issues for changing human behavior. This understanding is critical to designing effective innovative transdisciplinary education programs involving art and science [62] (https://ars.electronica.art/keplersgardens/en/starts/; https://www.biomes.art/, accessed on 31 March 2022). By studying an Australian sample, our study also helps address the lack of work in Oceania populations [19].

## 2. Materials and Methods

### *2.1. Participants*

A total of 878 participants attempted the online survey. After excluding participants who did not respond to one or more of the key measures (environmental knowledge, empathy, and environmental attitudes and behavior; $n = 266$) and participants who were under the minimum eligibility age of 15 ($n = 2$), the final sample consisted of 610 participants with a mean age of 40.13 years ($SD = 19.18$). Most participants (96%) were members of the Australian public who responded to a social media advertisement for the study (Facebook; $n = 381$); the rest were psychology students who completed the survey for course credit (SONA; $n = 229$). Table 1 below indicates participants' gender, ethnicity, and highest educational attainment. Human Ethics Protocol Approval: H-2019-0402.

**Table 1.** Participant demographics.

| **Gender** | ***n* (%)** |
|---|---|
| Female | 463 (75.9%) |
| Male | 137 (22.5%) |
| Non-binary | 4 (0.01%) |
| **Ethnicity** | |
| Caucasian | 417 (68.4%) |
| European | 110 (18.1%) |
| Asian | 19 (3.1%) |
| Aboriginal and/or Torres Strait Islander | 13 (2.1%) |
| Black/African | 5 (0.8%) |
| Arab | 3 (0.5%) |
| Other | 41 (6.7%) |
| **Highest Educational Attainment** | |
| No schooling completed | 2 (0.3%) |
| Primary school to year 6 | 3 (0.5%) |
| Some high school, no diploma | 14 (2.3%) |
| High school graduate | 140 (23.0%) |
| Some university credit, no degree | 138 (22.7%) |
| Trade/technical/vocational training | 48 (7.9%) |
| Bachelor's degree | 158 (26.0%) |
| Master's degree | 68 (11.1%) |
| Doctoral degree | 37 (6.1%) |

### *2.2. Procedure*

The study utilized a cross-sectional, within-subjects design. Participants completed a self-report online questionnaire. Participants completed the measures outlined below in a randomized order, with demographic questions presented at the end of the survey. The items within most measures were administered in their original sequence, except for the Environmental Knowledge Survey, in which the scale items were randomized.

The survey was advertised to members of the public through social media (i.e., Facebook and Twitter) throughout the data collection period and to university students who could complete psychological surveys for course credit towards an undergraduate psychology course. Members of the public who completed the survey were directed to a separate form to provide their contact details if they wished to enter a prize draw for the opportunity to win one of three e-Gift cards valued at $200, $120, and $80 (AUD).

### *2.3. Measures*

#### 2.3.1. Questionnaire of Cognitive and Affective Empathy

The QCAE (QCAE, see Appendix A) [61] is a 31-item self-report questionnaire with two subscales measuring the cognitive (19 items) and affective (12 items) components of empathy. Cognitive items include "before criticizing somebody, I try to imagine how I

would feel if I was in their place" and affective items include "people I am with have a strong influence on my mood". The cognitive empathy and affective empathy scores were obtained by summing participants' responses to the relevant items of a four-point scale between *strongly disagree* (1) and *strongly agree* (4). Researchers have reported the Cronbach $\alpha$ as between 0.65 and 0.86 in European and Asian contexts [63–66].

#### 2.3.2. Environmental Attitudes Inventory-24

The EAI-24 (EAI-24, see Appendix B) [67] is a self-report questionnaire assessing ecological perceptions and environmental attitudes, particularly those relating to cross-cultural beliefs around the value of the environment and nature. It is widely used [68] and has adequate test–retest reliability of 0.74 [69] and an internal consistency of Cronbach's $\alpha = 0.80$. It consists of 24 items that comprise two scales: preservation attitudes (i.e., protecting nature and natural species' diversity from human use and alteration) and utilization attitudes (i.e., the belief that it is appropriate to use natural phenomena for human objectives). Subscale 8 (i.e., personal conservation behavior) forms a part of the preservation attitudes subscale. However, the items refer to preservation *behaviors* (e.g., "whenever possible, I try to save natural resources") rather than *attitudes*. Therefore, this subscale was used as a two-item measure of preservation behaviors and was not included in the preservation attitudes scale. Therefore, three separate scores were calculated from the EAI-24: utilization attitudes, preservation attitudes, and preservation behaviors. Participants responded to each item on a Likert-type scale from *strongly disagree* (1) to *strongly agree* (7). The utilization attitudes, preservation attitudes, and preservation behaviors scores were obtained by averaging participants' responses to the relevant items.

#### 2.3.3. Environmental Knowledge Survey

To the best of our knowledge, there is no current species-specific knowledge questionnaire designed for an Australian audience. Therefore, a 19-item self-report Environmental Knowledge Survey was designed to measure participants' objective, verifiable environmental knowledge, including knowledge of the Australian environment, climate change, and the role of biodiversity more generally (see Appendix C). Although such a short survey does not provide an exhaustive test of a person's environmental knowledge, we aimed first and foremost to keep participation time short to maximize engagement. Our findings suggest that it was adequate to address our questions of interest. The survey consisted of 14 multiple-choice questions (e.g., "which is the leading cause of species extinction?") and five activity-style ($n = 5$) items. The activity-style items involved matching Australian species' names to their images for five different taxa (birds, mammals, reptiles, amphibians, and invertebrates). Five species from each taxon were randomly selected from each of the "Critically Endangered", "Endangered", "Vulnerable", "Near Threatened", and "Least Concern" categories featured on the IUCN Red List of Threatened Australian Species. Royalty-free images included in the survey for the selected species were sourced from WikiMedia Commons. Participants' total scores ranged from 0–38 with correct answers scored as +1 and incorrect answers scored as 0. Scores between 27–39, considered a high score, were indicative of an extensive environmental knowledge base. Scores between 14–26 were indicative of an intermediate knowledge of environmental and biodiversity issues, and scores between 0–13 indicated participants were uninformed on issues and information about the environment and biodiversity.

#### 2.3.4. Marlowe–Crowne Social Desirability Short Form-C

The MC Short Form-C (MC, see Appendix D) [70] is a 13-item self-report questionnaire measuring participants' social desirability bias. It was included because the need for social approval and appearing socially desirable correlates with positive or sensitive social trends [71], such as conservation movements and appearing environmentally conscious [72]. An example item includes "I've never intensely disliked anyone". Participants responded to each statement with either *true* or *false*. The social desirability scores were obtained by

summing the number of items participants marked as true (out of 13), with higher scores indicating higher levels of social desirability. Cronbach $\alpha$ for this measure ranged between 0.62 and 0.89 [73–75] and had a test–retest reliability of 0.74 [76].

## 3. Results

### *3.1. Preliminary Analyses*

#### 3.1.1. Normality

The skewness and kurtosis values for the key aggregate variables (i.e., environmental knowledge, utilization attitudes, preservation attitudes, preservation behavior, cognitive empathy, affective empathy, and social desirability) were no larger than $\pm$ 1.0. Age had skewness of 0.39 ($SE$ = 0.10) and kurtosis of $-1.16$ ($SE$ = 0.20). Therefore, the key variables were sufficiently normally distributed to perform a linear regression.

#### 3.1.2. Reliability

The means, standard deviations, and reliability values for the key variables are displayed in Table 2. Means and standard deviations for each item in the Environmental Knowledge Survey and the Environmental Attitudes Inventory are available in the Supplementary Materials. Because the reliability of the social desirability measure was low (Cronbach $\alpha$ = 0.41), this variable was not included as a control variable in the main analyses as originally intended.

**Table 2.** Key variables: means, standard deviations, and reliability.

| Variable | Mean | SD | Mean Percentage | Reliability Value |
|---|---|---|---|---|
| Environmental knowledge (/36) | 25.00 | 4.99 | 69.44% | 0.77 |
| Environmental utilization attitudes (/7) | 2.90 | 0.85 | 41.43% | 0.74 |
| Environmental preservation attitudes (/7) | 5.69 | 0.88 | 81.29% | 0.84 |
| Environmental preservation behaviors (/7) | 5.82 | 1.12 | 83.14% | 0.84 |
| Cognitive empathy (/74) | 58.07 | 8.17 | 78.38% | 0.90 |
| Affective empathy (/48) | 34.12 | 5.65 | 71.08% | 0.83 |
| Social desirability (/13) | 5.60 | 2.06 | 43.08% | 0.41 |

Note. The environmental knowledge scores were obtained by summing the number of correct answers on the environmental knowledge test (out of 36). The utilization attitudes, preservation attitudes, and preservation behaviors scores were obtained by averaging participants' responses to the relevant items on a seven-point scale between *strongly disagree* (1) and *strongly agree* (7). The cognitive empathy and affective empathy scores were obtained by summing participants' responses to the relevant items on a four-point scale between *strongly disagree* (1) and *strongly agree* (4). Cognitive empathy scores can range between 19 and 74 and affective empathy scores can range between 12 and 48. The social desirability scores were obtained by summing the number of items participants marked as "true" (out of 13). All reliability values are Cronbach $\alpha$s, except that the two-item environmental preservation behaviors measure was assessed for reliability with a split-half Spearman-Brown coefficient.

### *3.2. Main Analyses*

#### 3.2.1. Correlations

Table 3 shows the zero-order correlations between key variables. Consistent with prior research [67], there was a negative correlation between utilization attitudes and both preservation attitudes ($r(608) = -0.61$, $p < 0.001$) and preservation behaviors ($r(608) = -0.48$, $p < 0.001$).

#### Environmental Attitudes

Variation in both utilization and preservation attitudes was predicted by variation in environmental knowledge. Utilization attitudes were significantly negatively associated with environmental knowledge ($r$ (608) $= -0.37$, $p < 0.001$), whereas preservation attitudes were significantly positively associated with environmental knowledge ($r$ (608) = 0.44, $p < 0.001$). Neither utilization nor preservation attitudes were associated with cognitive nor affective empathy (all $p$s $\geq$ 0.051). Age and education were negatively associated with utilization attitudes ($r$ (606) $= -0.32$, $p < 0.001$; $r$ (606) $= -0.28$, $p < 0.001$ respectively) and positively associated with preservation attitudes ($r$ (606) = 0.23, $p < 0.001$; $r$ (606) = 0.35, $p < 0.001$, respectively).

**Table 3.** Zero-order correlations between key variables.

| Variables | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
|---|---|---|---|---|---|---|---|
| 1. Utilization attitudes | −0.61 ** | −0.48 ** | −0.05 | −0.01 | −0.37 ** | −0.32 ** | −0.28 ** |
| 2. Preservation attitudes | | 0.63 ** | 0.06 | 0.08 | 0.44 ** | 0.23 ** | 0.35 ** |
| 3. Preservation behaviors | | | 0.12 * | −0.04 | 0.37 ** | 0.31 ** | 0.30 ** |
| 4. Cognitive empathy | | | | 0.35 ** | −0.05 | −0.14 * | −0.05 |
| 5. Affective empathy | | | | | −0.07 | 0.35 ** | −0.19 ** |
| 6. Knowledge | | | | | | 0.19 ** | 0.30 ** |
| 7. Age | | | | | | | 0.47 ** |
| 8. Education | | | | | | | |

* $p < 0.01$; ** $p < 0.001$.

Environmental Behaviors

Environmental preservation behaviors were positively associated with environmental knowledge ($r$ (608) = 0.37, $p < 0.001$) and cognitive empathy ($r$ (608) = 0.12, $p < 0.001$), but not with affective empathy ($r$ (608) = 0.08, $p = 0.331$). Preservation behaviors were positively associated with age and education ($r$ (606) = 0.31, $p < 0.001$; $r$ (606) = 0.30, $p < 0.001$, respectively).

### 3.2.2. Linear Regression

For each regression analysis reported below, the control variables (i.e., age, education, and data source) were entered in Block 1 and all the key predictor variables were entered in Block 2. Regression assumptions were met for all three tested models. Variance inflation factors for each variable ranged between 1.05 and 1.84, indicating no evidence of multicollinearity issues. The skewness and kurtosis values of the residuals were well within ± 1 (skewness between 0.34 and −0.74 [$SE$ = 0.10] and kurtosis between 0.15 and 0.89 [SE = 0.89]), indicating a reasonably normal distribution. Durbin–Watson values were close to 2 (1.53–1.85 across the three models), indicating sufficient independence of errors.

All regression analyses were reconducted excluding outliers (i.e., values with a Cook's distance greater than three times the mean Cook's distance). The results of these sensitivity analyses are reported only when the pattern of significant and non-significant predictors or the relative magnitudes of the coefficients differed from the main analyses.

We further tested the equality of regression coefficients by comparing two regression models, one that held the two coefficients of interest to be equal with a model where both coefficients were allowed to freely vary. Significant chi-squared difference tests indicated that the regression coefficients of interest were significantly different from each other.

Predictors of Utilization Attitudes

The regression model including both the control and key predictors was significant ($F$(6, 601) = 31.94, $p < 0.001$, $R^2$ = 0.24, $f^2$ = 0.31), and explained more variance than Model 1 (which included only the control variables; $R^2$ change = 0.10, $f^2$ change = 0.11, $p < 0.001$). As shown in Table 4, environmental knowledge (β = −0.28), cognitive empathy (β = −0.09), and affective empathy (β = −0.13) were significant negative predictors of utilization attitudes, with environmental knowledge showing a larger effect than either cognitive ($f^2$ = 0.07 versus $f^2$ = 0.01, $\chi^2_{diff}(1) = 25.66$, $p < 0.001$) or affective empathy ($f^2$ = 0.07 versus $f^2$ = 0.01, $\chi^2_{diff}(1) = 10.48$, $p = 0.001$). Participant source (β = −0.16, $f^2$ = 0.01) and age (β = −0.20, $f^2$ = 0.02) also negatively predicted utilization attitudes, but education did not.

**Table 4.** Unstandardized and standardized regression coefficients for proposed predictors of utilization attitudes.

| Variable | Model 1 | | | | Model 2 | | | |
|---|---|---|---|---|---|---|---|---|
| | ***b* (SE)** | **β** | $f^2$ | ***p*** | ***b* (SE)** | **β** | $f^2$ | ***p*** |
| Age | −0.01 (0.00) | −0.15 | 0.01 | 0.003 | −0.01 (0.00) | −0.20 | 0.02 | <0.001 |
| Education | −0.06 (0.02) | −0.12 | 0.01 | 0.007 | −0.03 (0.02) | −0.06 | 0.00 | 0.209 |
| Participant source | −0.32 (0.09) | −0.19 | 0.02 | <0.001 | −0.28 (0.09) | −0.16 | 0.01 | <0.001 |
| Knowledge | - | - | - | - | −0.05 (0.01) | −0.28 | 0.07 | <0.001 |
| Cognitive empathy | - | - | - | - | −0.01 (0.00) | −0.09 | 0.01 | 0.021 |
| Affective empathy | - | - | - | - | −0.02 (0.01) | −0.13 | 0.01 | 0.002 |

Note. *b* = unstandardized regression coefficient; *SE* = standard error; β = standardized regression coefficient.

Predictors of Preservation Attitudes

The regression model including both the control and key predictors was significant ($F(6, 601) = 43.69$, $p < 0.001$, $R^2 = 0.30$, $f^2 = 0.44$), and explained more variance than Model 1 (which included only the control variables; $R^2$ change = 0.14, $f^2$ change = 0.17, $p < 0.001$). As shown in Table 5, environmental knowledge (β = 0.33) and affective empathy (β = 0.19) were significant positive predictors of preservation attitudes. In line with the pattern of predictors of utilization attitudes, environmental knowledge was a larger predictor of preservation attitudes than affective empathy ($f^2 = 0.10$ and $f^2 = 0.03$, respectively, $\chi^2_{diff}(1) = 10.582$, $p = 0.001$). However, cognitive empathy did not significantly predict preservation attitudes. Regarding control variables, participant source (SONA or Facebook; β = 0.23, $f^2 = 0.03$) and education level (β = 0.16, $f^2 = 0.02$) also negatively predicted preservation attitudes, while age did not. The pattern of results was the same for the sensitivity analyses, except that cognitive empathy became a significant predictor of preservation attitudes (β = 0.07, $p = 0.014$).

**Table 5.** Unstandardized and standardized regression coefficients for proposed predictors of preservation attitudes.

| Variable | Model 1 | | | | Model 2 | | | |
|---|---|---|---|---|---|---|---|---|
| | ***b* (SE)** | **β** | $f^2$ | ***p*** | ***b* (SE)** | **β** | $f^2$ | ***p*** |
| Age | −0.00 (0.00) | −0.05 | 0.00 | 0.344 | 0.00 (0.00) | 0.02 | 0.00 | 0.689 |
| Education | 0.13 (0.02) | 0.24 | 0.04 | <0.001 | 0.09 (0.02) | 0.16 | 0.02 | <0.001 |
| Participant source | 0.47 (0.09) | 0.26 | 0.04 | <0.001 | 0.42 (0.09) | 0.23 | 0.03 | <0.001 |
| Knowledge | - | - | - | - | 0.06 (0.01) | 0.33 | 0.10 | <0.001 |
| Cognitive empathy | - | - | - | - | 0.01 (0.00) | 0.07 | 0.00 | 0.056 |
| Affective empathy | - | - | - | - | 0.03 (0.01) | 0.19 | 0.03 | <0.001 |

Predictors of Preservation Behaviors

The regression model including both the control and key predictors was significant ($F$ (6, 601) = 36.62, $p < 0.001$, $R^2 = 0.27$, $f^2 = 0.37$), and explained significantly more variance than Model 1 ($R^2$ change = 0.10, $f^2$ change = 0.12, $p < 0.001$). Environmental knowledge (β = 0.27) and cognitive empathy (β = 0.19) were significant positive predictors of preservation behaviors (Table 6), with environmental knowledge having a larger effect than cognitive empathy ($f^2 = 0.07$ versus 0.03, respectively, $\chi^2_{diff}$ (1) = 12.207, $p < 0.001$). However, affective empathy did not predict preservation behaviors. Regarding control variables, participant source (SONA or Facebook; β = 0.25, f2 = 0.03) and age (β = 0.12, f2 = 0.01) were significant positive predictors, while education did not predict preservation behaviors.

**Table 6.** Unstandardized and standardized regression coefficients for proposed predictors of preservation behaviors.

| Variable | Model 1 | | | | Model 2 | | | |
|---|---|---|---|---|---|---|---|---|
| | ***b* (SE)** | **β** | $f^2$ | ***p*** | ***b* (SE)** | **β** | $f^2$ | ***p*** |
| Age | 0.01 (0.00) | 0.09 | 0.00 | 0.059 | 0.01 (0.00) | 0.12 | 0.01 | 0.008 |
| Education | 0.08 (0.03) | 0.12 | 0.01 | 0.006 | 0.03 (0.03) | 0.05 | 0.00 | 0.229 |
| Participant source | 0.61 (0.12) | 0.26 | 0.04 | <0.001 | 0.58 (0.11) | 0.25 | 0.03 | <0.001 |
| Knowledge | - | - | - | - | 0.06 (0.01) | 0.27 | 0.07 | <0.001 |
| Cognitive empathy | - | - | - | - | 0.03 (0.01) | 0.19 | 0.03 | <0.001 |
| Affective empathy | - | - | - | - | 0.01 (0.01) | 0.05 | 0.00 | 0.242 |

## 4. Discussion

This study sought to clarify the predictive relationships of both empathy and knowledge on environmental attitudes and behavior, as well as assess their combined effect on these measures. Correlational analyses revealed that objective, verifiable knowledge was the strongest predictor of both pro-environmental attitudes and behavior. The precedence of influence of knowledge over both cognitive and affective empathy remained present in linear regressions which controlled for individual variation in empathy. In linear regressions, empathy also predicted pro-environmental attitudes and behavior and with stronger effects than in straight correlations. Nevertheless, these effects remained smaller than those of knowledge. We also found a dissociation with respect to the cognitive and affective components of empathy. Affective empathy predicted attitudes, both with regards to utilization (i.e., the belief that it is appropriate to use natural phenomena for human objectives) and preservation (i.e., protecting nature and natural species' diversity from human use and alteration). In contrast, cognitive empathy predicted utilization attitudes and preservation behavior.

Environmental knowledge has been found to act both directly, and in other cases, indirectly on pro-environmental behavior. For example, Frick et al. [77] modeled the relationships between different types of knowledge and conservation behavior and showed that both action-related knowledge (i.e., knowledge about what can be done about a given environmental problem) and effectiveness knowledge (i.e., knowledge about the benefit of environmentally friendly action) exert direct influences on behavior. Similarly, Roczen et al. [78] found that action-related knowledge and systems knowledge (i.e., knowledge of how ecological systems operate) had a modest but direct effect on behavior. In contrast, two large meta-analyses have found that knowledge operates indirectly on attitudes and behavior via moral norm and intention [20,79].

Recently Geiger et al. [33] have argued that this among-study variation arises from variation in how environmental knowledge is measured. Finding direct relationships between knowledge and behavior requires measuring objective, verifiable knowledge rather than self-report evaluations of problem awareness and informedness. Consistent with this model, we found that verifiable knowledge was the most consistent and the strongest predictor of environmental utilization and preservation attitudes, and preservation behavior. That is, individuals who had more accurate knowledge of the environment were more inclined towards preserving, and less inclined towards using, environmental resources. Individuals with more accurate knowledge also acted to preserve environmental resources more. Our analysis approach cannot ascertain to what extent knowledge acted directly on attitudes and behavior or indirectly, for example via moral norms and intention [20]. Nevertheless, the influence of accurate environmental knowledge in our study sample is consistent with the existing body of meta-analytical and empirical work. Environmental education programs should therefore ensure that participants are not only exposed to information, but also that information is retained long term. Importantly, our finding extends existing work by showing that knowledge has stronger and more consistent effects on environmental attitudes and behavior than empathy.

An ongoing debate within conservation science has brought the role of empathy in promoting pro-environmental behavior to this discipline's foreground. Compassionate conservationists have been vocal in advocating the view that environmental policy makers, politicians and conservation scientists need to focus on promoting empathy and compassion for the natural world in order to address conservation conflicts [47]. Compassionate conservationists assert that: "Recognizing compassion as an aim in principle complicates conservation in practice, by calling to question actions that would dress callous disregard for life in a suit of scientific rationality." To advance this debate beyond rhetorical assertions [48,80–82], one can examine what is already known about empathy and its relationship with environmental behavior and/or conduct new empirical research to complete existing knowledge gaps [53]. While many studies have undertaken measures that might be influenced by, or related to, empathy, such as human–nature connection and human–nature relationship [38,39,83], fewer studies have measured empathy specifically.

While scales exist to measure empathy towards the planet and the connection humans feel towards nature (e.g., [14,83]), it is important to note that we found a predominance of knowledge over empathy using a scale that measured human-directed empathy [61]. We selected this empathy scale because it dissociates the cognitive and affective components of empathy [61]. Results revealed a dissociation, whereby affective empathy predicted attitudes but not behavior, while cognitive empathy predicted both attitudes and behavior, as for verifiable knowledge. This dissociation was in line with our prediction that the influence of cognitive aspects of empathy (perspective-taking) would mirror that of verifiable knowledge. In is not entirely clear why affective empathy only influenced attitudes in our results, but it is possible that it reflects a dissociation between emotion and action, whereby empathic concern is downregulated to protect against burnout [84]. Very recently, a scale encompassing both cognitive and affective dimensions of empathy for nature has been developed [85]. This significant development demonstrates the current interest in disentangling cognitive and affective components of empathy in conservation psychology and provides much-needed advancement to the field. Future research using this new tool will provide a means of testing whether the pattern of findings found here, namely the stronger and broader influences of cognition (i.e., knowledge and cognitive empathy) over affect, are also present when empathy towards the planet is measured rather than empathy towards humans. In addition to measuring human-directed empathy, the QCAE is also a self-assessment measure. It has been shown that the use of self-reported empathic habits and tendencies can yield different results to those obtained when using more objective measures of empathy [86]. Hence, another direction for future work is to test whether empathy becomes a stronger predictor of pro-environmental attitudes and behavior when more objective measures of empathic competencies within the environmental context are used. It should be noted that, to the best of our knowledge, this depends upon the future development of a validated measurement scale for this purpose.

The effect of empathy in conservation psychology has most often been measured by researchers who, guided by theories of altruistic and pro-social behavior [34], view pro-environmental behavior as primarily pro-social rather than self-interested. This line of work has shown that experimental manipulations of empathy can improve environmental attitudes [35], while manipulations of perspective-taking and the cognitive component of empathy, increase biospheric concern [36]. It has also been revealed that empathy-arousing appeals increase willingness to help [35,37] and that perceived suffering in personalized news stories elicits affective empathy, which is directly associated with donation intentions [87].

Although this research indicates that manipulation of empathy can elicit transient changes in attitudes and intentions to help, the focus of our study was to determine whether trait empathy was related to pro-environmental attitudes and behavior. This is because solving the current environmental crisis is likely to require consistent individual pro-nature tendencies rather than transient responses to calls of action, which might serve only to alleviate negative emotions associated with empathic suffering [88]. The alteration of

empathy in conservation approaches is lacking and although our finding that empathy is related positively to both attitudes and behavior is encouraging, what is now needed is to determine to what extent manipulations that increase state empathy generate stable changes in trait empathy.

A recent meta-analysis indicated that individuals with high scores for human–nature connection display more pro-nature behaviors than individuals with low scores [38]. More to the point, contact with nature and mindfulness practices increased human–nature connection, but the duration of such effects is not yet known. Human–nature connection is also a multifaceted construct that is influenced by an interplay of multiple psychological dimensions [38,39,83]. On the one hand, the narrow focus on fostering empathy and compassion, as proposed by compassionate conservationists, might overestimate the potential of these specific traits to drive consistent, long-term attitudinal and behavioral change towards the natural world. Indeed, our findings suggest that the power of environmental knowledge should not be overlooked. On the other hand, there are emerging lines of research identifying the predictors of empathy towards nature and suggesting that it might be possible to produce durable changes in empathy, particularly by leveraging people's capacity to anthropomorphize [39]. For example, empathic concern (i.e., cognitive empathy) appears to be a durable trait that predicts how much one feels affected by environmental crises, with the limitation that it is subject to downregulation and collapse when it becomes overwhelming [89], as pointed out by Griffin et al. [53]. The more animals are perceived to have human qualities (e.g., suffering), the greater the increase in empathy-related responses towards animals [42]. When one perceives nature as human, the social principles applied when interacting with others (e.g., respect) can be transferred to the environment [43]. Based on these kinds of research findings, the power of anthropomorphizing is gaining political traction [44,45], while also providing hopeful directions for the power of empathy to foster perhaps durable pro-environmental attitudes and behavior.

Our finding that knowledge, cognitive empathy, and affective empathy all influence pro-environmental measures to some extent demonstrates that cognition and emotion are joint contributors and that any narrow focus on eliciting emotion is likely to have limited effects. This interpretation is in line with evidence that pro-environmental behavior is best viewed as a mixture of pro-social and self-interested behavior. Indeed, in some lines of work, moral norms are considered a third predictor alongside attitudes and perceived behavioral control (i.e., one's capacity to perform behavior) and are themselves influenced by both cognition and emotional factors [20,79]. Other authors have modeled an interaction between affect and cognition more explicitly and argue that affect mediates the relationship between knowledge and behavior [90]. Using a cross-sectional design, Kim et al. [90] examined the determinants of environmentally friendly behavior amongst tourists on the island of Jeju (Korea), a Natural World Heritage Site listed amongst the New Seven Wonders of Nature. Structural equation modeling confirmed that environmental knowledge (both objective and subjective) influenced pro-environmental behavior via the mediating role of environmental affect [90]. Somewhat relatedly, Cheng and Wu [91] tested a cognition-affect-attitude-behavior model and showed that place attachment mediated the link between environmental knowledge and environmentally responsible behavior. In the present study, multiple regressions demonstrated that the influence of knowledge on attitudes and behavior was stronger than the influence of empathy, even when controlling for the effects of both cognitive and affective empathy, suggesting that any affect associated with empathy does not necessarily operate as an intervening variable. Future research is needed to test the role of other measures of empathy, including empathic competencies and empathy towards nature, on a larger sample of participants.

## 5. Conclusions

In the summer of 2019, the east coast of Australia was ravaged by unprecedented fires, which was estimated to have killed or displaced over three billion animals [92]. Unprecedented financial donations flowed to environmental charities during the fires and

in the months that followed [92]. Images of burnt koalas hanging to the top of one tree amongst a landscape or burnt trees were perhaps powerful triggers of empathic suffering, a negative emotion potentially alleviated by the action of donating [87,88]. However, Australia also has one of the highest prevalence of climate change deniers in the world and advocating for action on environmental issues has resulted in systematic political suicide [93]. To design interventions that effectively lead to long-term consistent individual tendencies and habits to behave sustainably [16], we need to achieve a better understanding of how objective knowledge and empathy interact to influence pro-environmental attitudes and behavior.

Overall, our study in an Australian sample suggested that verifiable environmental knowledge, and to a lesser extent empathy, are related to people's attitude towards the environment and their tendency to act sustainably. When considering the relative influence of both psychological dimensions, environmental knowledge was the stronger and more consistent predictor. At the very least, this indicates that focusing solely on fostering empathy and compassion as suggested by proponents of compassionate conservation is unlikely to achieve the far-reaching outcomes for which the movement argues [46–48]. More research is needed to extend the present findings by using a larger participant pool and testing whether other measures of empathy, including empathic competencies and empathy towards nature, yield the same dominance of knowledge over empathy.

## 6. Policy Implications

Our results suggest that environmental knowledge is a stronger and more consistent predictor of pro-environmental attitudes and behavior. This finding suggests that advocates of environmental protection and environmental policy makers need to ensure that people's environmental knowledge is increased and there is not a reliance solely on eliciting empathic suffering. More generally, developing policies that encourage and support pro-environmental engagement will benefit strongly from an in-depth understanding of the relative importance of affect and cognition in driving change, as well as of how this balance is moderated by internal (e.g., personality) and external factors.

**Supplementary Materials:** The following are available online at https://www.mdpi.com/article/10.3390/su14084622/s1, Table S1: Item Means and Standard Deviations for the Environmental Knowledge Survey, Table S2: Item Means and Standard Deviations for the Environmental Attitudes Inventory.

**Author Contributions:** Conceptualization, all authors; methodology, A.S.G., M.K., H.E.D., R.J.S. and M.W.H.; formal analysis, M.I., A.R., M.G., H.E.D. and A.S.G.; investigation, M.I. and A.R.; data curation, M.I., A.R., M.G. and H.E.D.; writing—original draft preparation, M.I., A.R., M.G. and A.S.G.; writing—review and editing, all authors; project administration, M.I., A.R., M.K., H.E.D. and A.S.G.; funding acquisition, A.S.G. and H.E.D. All authors have read and agreed to the published version of the manuscript.

**Funding:** This research was funded by the University of Newcastle.

**Institutional Review Board Statement:** The study was conducted in accordance with the Declaration of Helsinki, and approved by the University of Newcastle Human Research Ethics Committee, (H-2019-0402).

**Informed Consent Statement:** Informed consent was obtained from all subjects involved in the study.

**Data Availability Statement:** Raw data from this study are available in Mendeley Data: 10.17632/h96mgxm6v8.1.

**Conflicts of Interest:** The authors declare no conflict of interest. The funders had no role in the design of the study; in the collection, analyses, or interpretation of data; in the writing of the manuscript, or in the decision to publish the results.

## Appendix A

Questionnaire of Cognitive and Affective Empathy [63]

For each of the following statements, indicate the extent to which you agree or disagree.

**Table A1.** Response scale labels for the Questionnaire of Cognitive and Affective Empathy.

| Strongly Disagree | Somewhat Disagree | Somewhat Agree | Strongly Agree |
|---|---|---|---|
| 1 | 2 | 3 | 4 |

**Table A2.** Questionnaire of Cognitive and Affective Empathy items.

| | | | | | |
|---|---|---|---|---|---|
| 1 | I sometimes find it difficult to see things from the "other guy's" point of view. (R) | 1 | 2 | 3 | 4 |
| 2 | I am usually objective when I watch a film or play, and I don't often get completely caught up in it. (R) | 1 | 2 | 3 | 4 |
| 3 | I try to look at everyone's side of the argument before I make a decision. | 1 | 2 | 3 | 4 |
| 4 | I sometimes try to understand my friends better by imagining how things look from their perspective. | 1 | 2 | 3 | 4 |
| 5 | When I am upset at someone, I usually try to "put myself in his shoes" for a while. | 1 | 2 | 3 | 4 |
| 6 | Before criticising somebody, I try to imagine how I would feel if I was in their place. | 1 | 2 | 3 | 4 |
| 7 | I often get emotionally involved with my friends' problems. | 1 | 2 | 3 | 4 |
| 8 | I am inclined to get nervous when others around me seem to be nervous. | 1 | 2 | 3 | 4 |
| 9 | People I am with have a strong influence on my mood. | 1 | 2 | 3 | 4 |
| 10 | It affects me very much when one of my friends seems upset. | 1 | 2 | 3 | 4 |
| 11 | I often get deeply involved with the feelings of a character in a film, play, or novel. | 1 | 2 | 3 | 4 |
| 12 | I get very upset when I see someone cry. | 1 | 2 | 3 | 4 |
| 13 | I am happy when I am with a cheerful group and sad when the others are glum. | 1 | 2 | 3 | 4 |
| 14 | It worries me when others are worrying and panicky. | 1 | 2 | 3 | 4 |
| 15 | I can easily tell if someone else wants to enter a conversation. | 1 | 2 | 3 | 4 |
| 16 | I can pick up quickly if someone says one thing but means another. | 1 | 2 | 3 | 4 |
| 17 | It is hard for me to see why some things upset people so much. (R) | 1 | 2 | 3 | 4 |
| 18 | I find it easy to put myself in somebody else's shoes. | 1 | 2 | 3 | 4 |
| 19 | I am good at predicting how someone will feel. | 1 | 2 | 3 | 4 |
| 20 | I am quick to spot when someone in a group is feeling awkward or uncomfortable. | 1 | 2 | 3 | 4 |
| 21 | Other people tell me I am good at understanding how they are feeling and what they are thinking. | 1 | 2 | 3 | 4 |
| 22 | I can easily tell if someone else is interested or bored with what I am saying. | 1 | 2 | 3 | 4 |
| 23 | Friends talk to me about their problems as they say that I am very understanding. | 1 | 2 | 3 | 4 |
| 24 | I can sense if I am intruding, even if the other person does not tell me. | 1 | 2 | 3 | 4 |
| 25 | I can easily work out what another person might want to talk about. | 1 | 2 | 3 | 4 |
| 26 | I can tell if someone is masking their true emotion. | 1 | 2 | 3 | 4 |
| 27 | I am good at predicting what someone will do. | 1 | 2 | 3 | 4 |
| 28 | I can usually appreciate the other person's viewpoint, even if I do not agree with it. | 1 | 2 | 3 | 4 |
| 29 | I usually stay emotionally detached when watching a film. (R) | 1 | 2 | 3 | 4 |
| 30 | I always try to consider the other fellow's feelings before I do something. | 1 | 2 | 3 | 4 |
| 31 | Before I do something I try to consider how my friends will react to it. | 1 | 2 | 3 | 4 |

*Note*. (R) indicates the item is reverse scored.

## Appendix B

Environmental Attitudes Inventory-24 [69]

For each of the following statements, indicate the extent to which you agree or disagree.

**Table A3.** Response scale labels for the Environmental Attitudes Inventory.

| Strongly Disagree | Disagree | Somewhat Disagree | Neutral | Somewhat Agree | Agree | Strongly Agree |
|---|---|---|---|---|---|---|
| 1 | 2 | 3 | 4 | 5 | 6 | 7 |

**Table A4.** Environmental Attitudes Inventory-24 items.

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 1 | I really like going on trips into the countryside, for example to forests or fields. | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 2 | I think spending time in nature is boring. (R) | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 3 | Governments should control the rate at which raw materials are used to ensure that they last as long as possible. | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 4 | I am opposed to governments controlling and regulating the way raw materials are used in order to try and make them last longer. (R) | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 5 | I would like to join and actively participate in an environmentalist group. | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 6 | I would NOT get involved in an environmentalist organization. (R) | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 7 | One of the most important reasons to keep lakes and rivers clean is so that people have a place to enjoy water sports. | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 8 | We need to keep rivers and lakes clean in order to protect the environment, and NOT as places for people to enjoy water sports. (R) | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 9 | Modern science will NOT be able to solve our environmental problems. (R) | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 10 | Modern science will solve our environmental problems. | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 11 | Humans are severely abusing the environment. | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 12 | I do not believe that the environment has been severely abused by humans. (R) | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 13 | I'd prefer a garden that is wild and natural to a well groomed and ordered one. (R) | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 14 | I'd much prefer a garden that is well groomed and ordered to a wild and natural one. | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 15 | I am NOT the kind of person who makes efforts to conserve natural resources. (R) | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 16 | Whenever possible, I try to save natural resources. | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 17 | Human beings were created or evolved to dominate the rest of nature. | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 18 | I DO NOT believe humans were created or evolved to dominate the rest of nature. (R) | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 19 | Protecting peoples' jobs is more important than protecting the environment. | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 20 | Protecting the environment is more important than protecting peoples' jobs. (R) | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 21 | It makes me sad to see forests cleared for agriculture. | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 22 | It does NOT make me sad to see natural environments destroyed. (R) | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 23 | Families should be encouraged to limit themselves to two children or less. | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 24 | A married couple should have as many children as they wish, as long as they can adequately provide for them. (R) | 1 | 2 | 3 | 4 | 5 | 6 | 7 |

*Note*. (R) indicates the item is reverse scored.

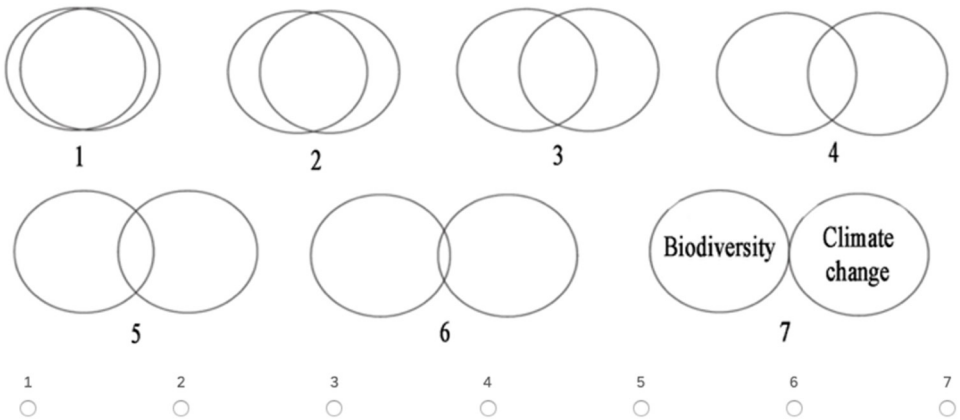
## Appendix C

Environmental Knowledge Survey

1. What is biodiversity?
   a. The variety of life on Earth in all its forms
   b. The number of species of frogs in one pond
   c. The number of varieties of mammals in one desert
   d. The variety of different plants and animals a forest
2. How many new species are found worldwide every year?
   a. 18
   b. 900
   c. 18,000
   d. 900,000
3. Which is the leading cause of species extinction?
   a. Habitat loss
   b. Unsustainable hunting and fishing

c. Pollution
d. Ozone depletion

4. Globally, do you think there is an economic value to increasing biodiversity?
   a. No, biodiversity costs us >$150 trillion per year
   b. No, costs of all of the pests and diseases balances out the benefit of charismatic animals (e.g., lion, panda, kangaroo)
   c. Yes, but only because technology is going to develop in the future to help biodiversity
   d. Yes. Biodiversity ecosystems are worth >$150 trillion per year
5. Which country has the worst rate of mammal extinction?
   a. Brazil
   b. United States of America
   c. Ecuador
   d. Australia
6. Which country has the highest rate of land clearing?
   a. Australia
   b. Nigeria
   c. Brazil
   d. India
7. Do zoos help biodiversity?
   a. Yes
   b. No
8. Where in Australia is biodiversity highest?
   a. Rainforests of QLD
   b. Tasmania
   c. Great Barrier Reef
   d. South Western Australia
9. Using the overlapping circles below, how related do you think the problem of biodiversity and climate change are (1 "*very related*"–7 "*not at all related*")?



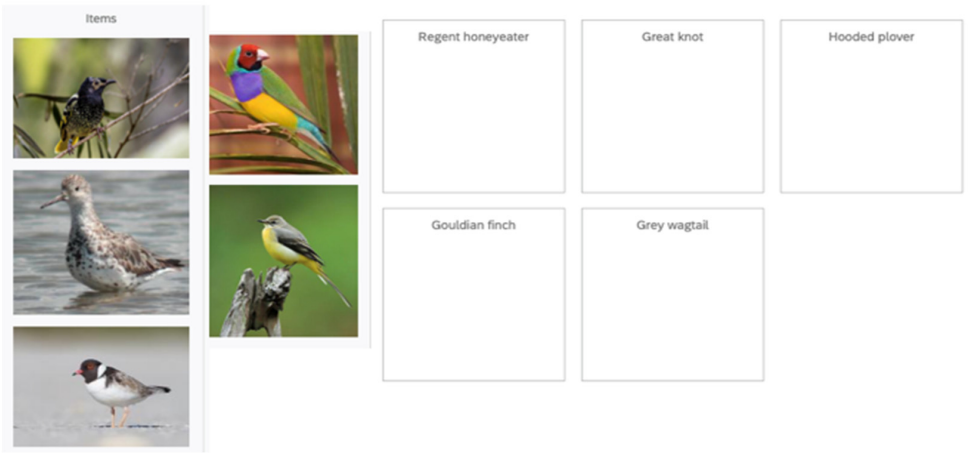

10. There is estimated to be 1,400,000,000 species on the earth, excluding bacteria, what percentage of species have been identified?
    a. 0.4%
    b. 14%
    c. 34%
    d. 74%
11. Can you name the last Australian animal to go extinct?
    a. The Northern White Rhinoceros
    b. The Tasmanian Tiger

c. Christmas Island Forest Skink
d. Bramble Cay Melomys (native rat)

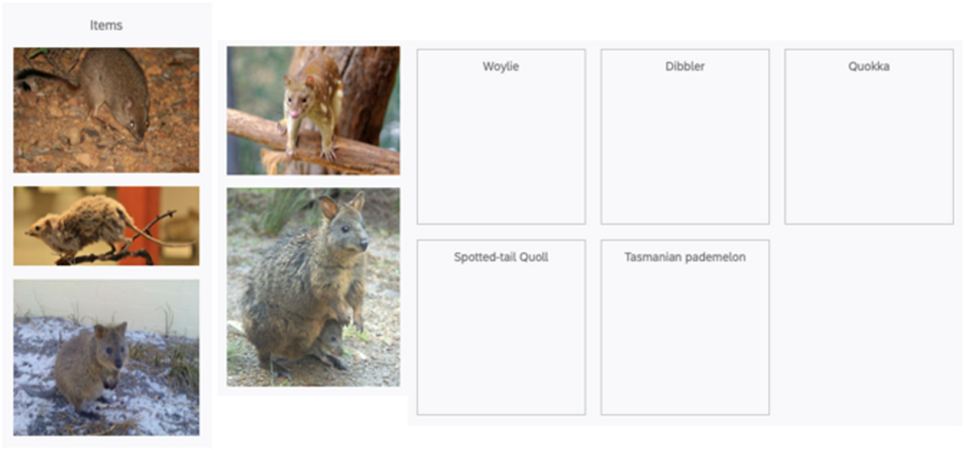
12. What is the largest predator in Australia?
    a. Tiger
    b. Dingo
    c. Shark
    d. Wedge-tailed Eagle
13. On a day to day basis, where are you most likely to see wildlife?
    a. In my backyard
    b. On the television
    c. At the park
    d. In bushland
14. Where do you get most of your information about the natural world from? (tick as many as needed **in order** from **most** relevant source to **least** relevant source).

- ☐ Books and magazines
- ☐ TV and online documentaries
- ☐ Word-of-mouth
- ☐ Social media
- ☐ Spending time in the natural world
- ☐ Other (specify if ticked)
- ☐ I do not get any information about the natural world

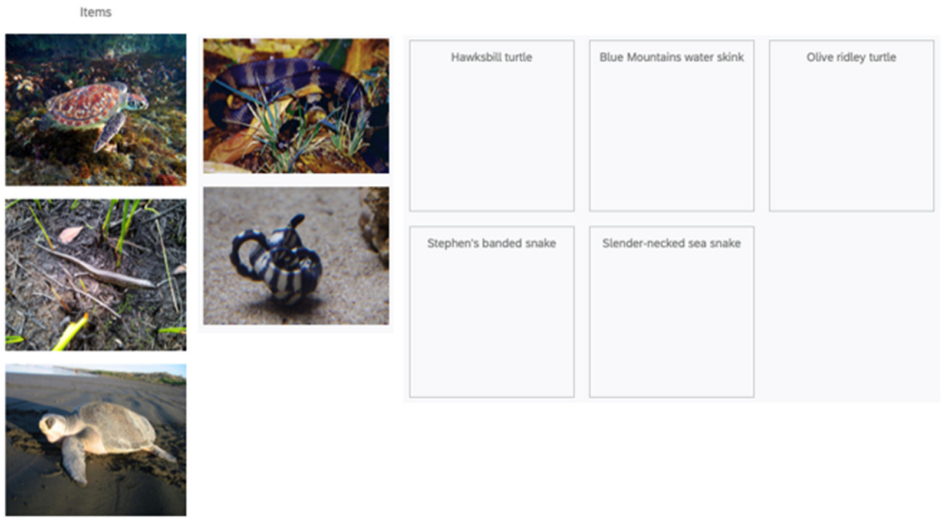
15. Match these names to these photos of birds.



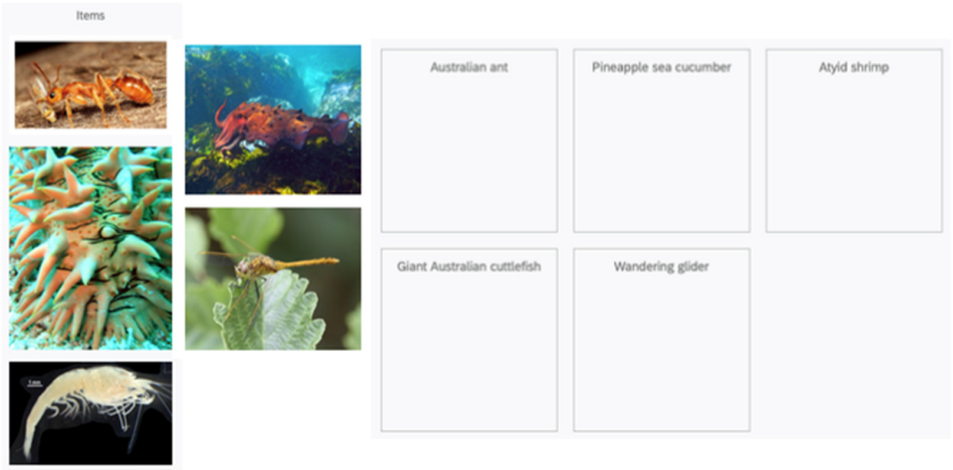

16. Match these names to these mammal photos.



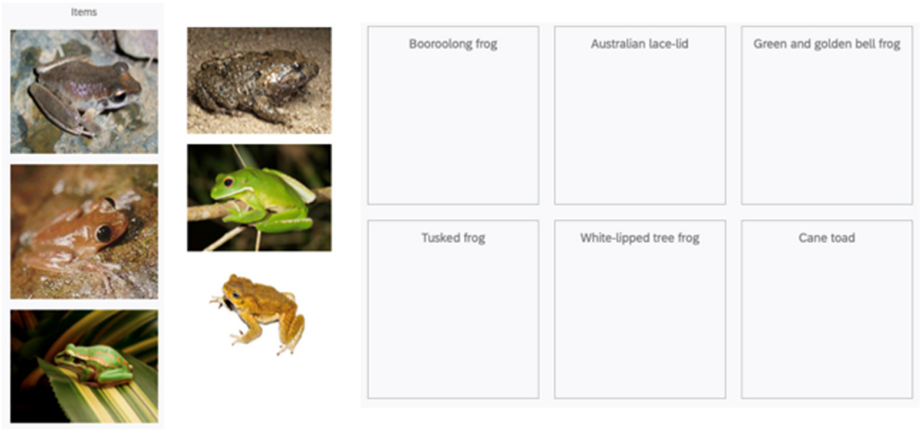

17. Match these names to these reptile photos.




18. Match these names to these amphibian photos.




19. Match these names to these invertebrate photos.




## Appendix D

Marlowe–Crowne Social Desirability Short Form-C [72]
Please answer the following questions using the true/false item options.

| | | | |
|---|---|---|---|
| 1 | I've never intensely disliked anyone. | True | False |
| 2 | Sometimes I feel resentful when I don't get my way. | True | False |
| 3 | I like to gossip at times. | True | False |
| 4 | There have been times when I felt like rebelling against people in authority even though I knew they were right. | True | False |
| 5 | I can remember "playing sick" to get out of something. | True | False |
| 6 | There have been occasions when I have taken advantage of someone. | True | False |
| 7 | Sometimes I try to get even rather than forgive and forget. | True | False |
| 8 | I am always courteous, even to people who are disagreeable. | True | False |
| 9 | There have been occasions when I felt like smashing things. | True | False |
| 10 | I have never been irked when people expressed ideas very different from my own. | True | False |
| 11 | There have been times when I was quite jealous of the good fortune of others. | True | False |
| 12 | I sometimes think when people have a misfortune they only got what they deserved. | True | False |
| 13 | I have never deliberately said something that hurt someone's feelings. | True | False |

*Note.* The Marlowe–Crowne Short Form-C questionnaire is scored by assigning one point to "true" responses on items 1, 8, 10, and 13, and one point to "false" responses on items 2, 3, 4, 5, 6, 7, 9, 11, and 12.

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