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1 **Modest levels of interpretability of the term ‘biodiversity’, mediated by**
2 **educational level, among the Australian public**

3

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15

16 **Abstract** Effective worldwide efforts to conserve flora and fauna rely on engaging
17 the public, and thus on public appreciation of the object of conservation activities
18 (most commonly, ‘biodiversity’). We examined alignment of interpretation of the
19 term ‘biodiversity’ with generally accepted definitions in a representative sample (n =
20 499) of the public from the state of Victoria in Australia, , a country with an explicit
21 biodiversity conservation strategy (which defines the term) and the capacity to invest
22 heavily in conservation. However, almost half of respondents did not know what
23 ‘biodiversity’ meant, 32% and 18% expressed an ecological and conceptual
24 interpretation, respectively. The probability of having at least some interpretation of
25 the term was higher among university-educated respondents, but otherwise did not

26 vary with gender or income. Broadening the base of conservation efforts would likely
27 be facilitated by better aligning interpretations of the term 'biodiversity' among the
28 public or by adopting more intuitive language when engaging with the public.

29 **Additional Keywords** awareness, biological diversity, conservation, gender, income,
30 interpretation, survey

31

32 **Introduction**

33 Engaging with the general public in conservation efforts is a critical aspect of
34 successful conservation of flora and fauna (Ainsworth *et al.* 2016). Given that
35 developed countries may invest more in conservation and theoretically may be able to
36 reduce environmental impacts (Bradshaw *et al.* 2010), it might be expected that
37 engagement of citizens would be highest amongst these countries. One such country
38 is Australia, a continent with a history of vertebrate extinctions and environmental
39 challenges, and with a high standard of living and capacity to invest in conservation
40 solutions (Common and Norton 1992).

41 Key to any broad-based conservation efforts is a common interpretation of the
42 objectives and, specifically, the entity to be conserved (Wilson *et al.* 2009).

43 ‘Biodiversity’ is a term used commonly to describe and argue for the conservation of
44 biological diversity (Bugter *et al.* 2018). However, defining the term is problematic
45 and usage of the term varies widely among conservation decision-makers, such that
46 people exhibit different ‘interpretations’ of the word (DeLong 1996; Hamilton 2005;
47 Habib 2015). The Australian Government’s ‘Biodiversity Conservation Strategy
48 2010-2030’ identifies ‘engaging all Australians’ in biodiversity conservation as a
49 priority, and proposes that the concept of biodiversity protection needs to be
50 ‘mainstreamed’ but acknowledges that biodiversity is ‘poorly understood and
51 communicated’ (Natural Resource Management Ministerial Council [NRMMC]
52 2010). Its own definition of ‘biodiversity, or biological diversity, is the variety of all
53 life forms’, and includes three levels: genetic, species and ecosystem diversity
54 (NRMMC 2010; p12). Public interpretations of biodiversity are commonly evaluated
55 based on scientific definitions, but people express a variety of social representations
56 of biodiversity regarding conservation objectives (Fischer and Young 2007; Buijs *et*

57 *al.* 2008). Therefore, greater insight into the interpretations (meanings and ideas) the
58 public currently assigns to biodiversity is likely to be an important step towards
59 increasing public awareness and engagement in biodiversity conservation goals
60 (Bright and Stinchfield 2005). While a body of literature deals with clarifying
61 definitions of biodiversity, and how to share these interpretations in educational
62 settings (e.g., Lindemann-Matthies *et al.* 2009; Moss *et al.* 2017), little research goes
63 directly to interpretations held by the general public, an aspect which may help
64 identify opportunities to better engage the public around conceptions of biodiversity
65 (Meinard and Quétier 2013).

66 We examine what the term ‘biodiversity’ means to the general public using
67 data collected as part of a larger study on public perceptions and attitudes towards
68 different ecosystems in the Australian State of Victoria (Kiley *et al.* 2017). We also
69 examine whether having some interpretation was associated with respondent gender,
70 education or income, factors which influence various measures of environmental
71 awareness and concern (Miller 2000; Zelezny *et al.* 2000; Franklin 2007).

72 **Methods**

73 This social science research used an online survey delivered to a representative
74 sample of 503 members of the Victorian general public (see Kiley *et al.* 2017).
75 Respondents registered with a professional survey company which delivers surveys to
76 a demographically representative sample of Victorians from a database of over
77 550,000 Australians (PermissionCorp. 2015). As 86% of Australians have broadband
78 access (ABS 2018), any sampling bias in that regard would be limited. Participants
79 were invited to answer (in their own words) the question “*What does the term*
80 *‘biodiversity’ mean to you?*” Responses that were nonsensical were excluded from
81 the analysis leaving 499 respondents. To examine associations with gender, income

82 and education, we removed respondents who did not provide specific responses to the
83 relevant questions (thus, n = 439). Income was coded as: 1. I am not a paid worker, 2.
84 Up to \$40,000 per year, 3. \$41,000 to \$80,000 per year or 4. \$81,000 or more per
85 year. The highest level of education attained was coded as: 1. non-university (e.g.
86 secondary school or trade certificate), or 2. university. A binary logistic model of
87 interpretation (none versus at least some, i.e. ecological or conceptual interpretation)
88 against gender, income and education was run in SPSS.

89 **Results**

90 Just under half the respondents (49.9%) stated that they did not know the meaning of
91 the term ‘biodiversity’ or gave an answer that did not reflect the scientific definition
92 given by NRMMC (2010). Answers that included mentions of multiple species,
93 insects, genes, microorganisms or ecosystems were categorised as ‘ecological
94 interpretation’ and were expressed by 32.1% of respondents. Responses that included
95 either plants or animals (but not both), or that were expressions of more conceptual
96 notions of biodiversity, such as harmony, balance and interconnectedness, were
97 interpreted as ‘conceptual interpretation (18.0%)’. Some examples of responses that
98 demonstrated a conceptual notion of biodiversity are presented in Table 1.

99 Regression analysis revealed that the only significant association with having
100 at least some interpretation of ‘biodiversity’ was university education (Table 2), with
101 65.2% of university-educated respondents having at least some interpretation
102 compared with 41.5% who had not attended university.

103

104 **Discussion**

105 We report modest and varying levels of interpretation of the term ‘biodiversity’ by the
106 Victorian public, calling into question the utility of the term when engaging with the
107 public. It seems clear that this term can have different connotations to the public than
108 when used by specific groups, such as conservation practitioners or scientists
109 (Dallimer *et al.* 2012). This is perhaps linked to the different ways that people value
110 biodiversity, for example conservation decision-makers typically argue for the moral,
111 intrinsic and ecological importance of biodiversity and its conservation, raising the
112 salience of these perspectives among target groups (Berry *et al.* 2018).

113 We report no difference in whether or not respondents had some or no
114 interpretation of the term, between genders or income. However, enhanced awareness
115 was evident among the university educated. Many Australian Universities incorporate
116 environmental sustainability into core curricula (see Pérez *et al.* 2018), so this effect
117 is unsurprising but heartening. Evidently, formal education can effectively (but not
118 universally) bestow greater appreciation of the use of the term biodiversity as defined
119 by the NRMCC.

120 Perhaps, like commercial marketing campaigns, governments and the science
121 community need to express the concept of biodiversity in a variety of ways to
122 maximise engagement. Tailoring of messages to specific audiences during
123 conservation decision-making processes is key to delivering effective arguments for
124 biodiversity (Bugter *et al.* 2018).

125 It seems prudent for communicators to use ‘biodiversity’ cautiously. At the
126 very least, anyone using this term should provide a definition with it. More radically,
127 the term could be avoided when engaging with the public. The efficacy of re-framing
128 ‘biodiversity’ and talking about it in terms that might resonate more with the ideas

129 people associate with biodiversity (e.g. protecting the balance of nature) warrants

130 further research.

131

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205

Table 1. Some examples of themes that emerged in conceptual interpretations of biodiversity.

Harmony

Where many animals or plants live in harmony or cooperation.

To me, it's about being aware of the different types of life on this earth whether it be human, animal, vegetable or mineral and being aware of the impacts change has on this life. We need to find a way to co-exist.

In harmony with nature and all natural things.

Balance

Being aware of all forms of life and being able to mix and maintain all together whether it be human life, plants, animals etc.

A wide range of plants and animals co-existing in a mutually beneficial balance.

Everything coming together, living and existing peacefully.

Care for the environment

Biodiversity means preserving the natural environment even though it may be diverse.

Essential to the health of the landscape / environment. Implies keeping different areas and types of land cover which occur naturally without human intervention ... in order to preserve flora and fauna and insects which belong there.

Table 2. Binary logistic regression analysis of having at least some interpretation of the term ‘biodiversity’ (conceptual or ecological) against demographic variables.

209

Predictor	B	SE	Wald	Df	P
Gender	0.288	0.203	2.015	1	0.156
Income	0.027	0.119	0.050	1	0.823
University Education	-1.971	0.214	20.632	1	< 0.001
Constant	0.420	0.392	1.149	1	0.284

210