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1 **The impact of the Covid-19 lockdown on the human experience of nature**

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8 **ABSTRACT**

9 The Covid-19 pandemic has resulted in extensive lockdowns implemented all around the world and
10 billion of people have been asked to stay at home for several weeks. Although this global confinement
11 has had potentially huge unintended consequences on the environment and on its associated wildlife,
12 this study shows that it has also impacted the human experience of nature. Based on an online
13 questionnaire, this study aims to assess how the significant changes in people’s everyday lives induced
14 by the French lockdown impacted their relationship with other species. Participants did not only
15 observe and interact more with non human species, but also discovered new traits characterizing them,
16 and felt less lonely thanks to them. The impact of the lockdown was stronger on people’s relationship
17 with their pets, farm animals, home plants and with birds than with other plants and animals. This study
18 further demonstrates that participants with different profiles have been affected differently. In
19 particular, women and people with better access to nature were clearly more sensitive to changes and
20 have been more positively impacted in their relationships with other species. Acting as a real world
21 experiment, the lockdown reveals to which extent our experience of nature is embedded in social,
22 cultural and political contexts.

23

24 **Keywords:** Experience of Nature - Covid-19 Lockdown – Human Perception - Global Change -

25 Biodiversity

26

27 INTRODUCTION

28 In December 2019, the Coronavirus SARS-CoV-2 appeared in China and spread worldwide before to
29 being declared on March 2019 by the World Health Organization as a pandemic. In order to face the
30 Covid-19 outbreak, governments around the world imposed strong restrictions to their populations such
31 as keeping physical distance, stopping non-essential activities and limiting the movements of people.
32 This global “lockdown” resulted in almost two thirds of the world population being asked to stay at
33 home and placed under a confinement by April 2020. Since then, in many parts of the world, such
34 drastic measures have also been reactivated to face the second and third waves of the pandemic.

35 Besides investigating the outbreak dynamics, researchers around the world studied the diverse
36 unintended consequences of the lockdown such as the impact on economy and finances (e.g Huo & Qiu
37 2020; Kanu 2020), mental health and psychology (e.g Guessoum et al. 2020; Singh et al. 2020),
38 education (e.g Mishra et al. 2020; Alvi & Gupta 2020) or social relationships (e.g Dewitte et al. 2020;
39 Sommerlad et al. 2020).

40 As suggested by Bates et al. (2020), the global confinement also represented a unique opportunity, a
41 world scale lab-in-the-field experiment, for environmental researches. Scholars have documented the
42 consequences of the lockdown on carbon emission (Evangelidou et al. 2020; Han et al. 2021), air and
43 water quality (Menut et al. 2020; Dutta et al. 2020; Chen et al. 2020), noise disturbances (Aletta et al.
44 2020; Basu et al. 2020) or light pollution (Bustamante-Calabria et al. 2020). They also assessed how
45 the Covid-19 crisis impacted biodiversity. In this perspective, their main interest was in understanding
46 of how non human species can adapt to rapid transformations of their environment and whether or not
47 nature has recovered from this unprecedented reduction of human activities. As for examples,
48 Derryberry et al. (2020) showed that the reduction in traffic noise led to a shift in song frequencies in a
49 bird species. Gordo et al. (2020) revealed that although birds detectability increased in Spanish urban
50 areas, the probability of their occurrence remained stable.

51 Overall, with the emergence of the Covid-19 zoonosis, the relationship between human and wildlife has
52 been placed under a global spotlight (Gaynor et al. 2020). The pandemic reveals the complex and
53 interacting pathways in which animal populations and habitats are intrinsically connected to human
54 health and livelihoods. Little has been said, however, regarding the impact of the lockdown on people's
55 relationship with nature, especially in terms of their daily interactions with the environment and living
56 creatures. How can this "anthropause", as a dramatic slow down in human activities (Stokstad 2020),
57 affect human experience of nature?

58 It is acknowledged that people in western societies have fewer and fewer direct contacts with natural
59 environments and their associated wildlife in their everyday lives (Turner et al. 2004; Soga & Gaston
60 2016). For instance, it has been shown that in Japan, older people had more frequent experiences
61 during their childhood with flowering plants and with more diverse species than younger ones (Soga et
62 al. 2018). Similarly, the proportion of US children participating in outdoor activities as well as the time
63 spent outdoors dramatically decreased over the last decades (Hofferth 2009).

64 Some authors recently claimed that the ecological crisis could be first of all related to a loss of
65 sensitivity of modern societies toward the living (Morizot 2020). Indeed, it is recognized that this
66 "extinction of experience" of nature (Pyle 2011) can have deleterious consequences not only on human
67 well-being but also on people's emotional, attitudinal, and behavioral relations to nature and
68 biodiversity (Turner et al. 2004; Chan et al. 2016; Prévot et al. 2018).

69 In that perspective, the Covid-19 crisis and its associated lockdowns provide an opportunity to
70 understand how a major change in society can impact human experience of nature. Only a few studies
71 have documented the effect of the lockdown on people interactions with their environments. Part of
72 them have been dedicated to demonstrate the importance of greenspace access for people living in
73 urban areas (Biswas & Sen 2020; Kleinschroth & Kowarik 2020; Derks et al. 2020; Venter et al. 2020;
74 Ugolini et al. 2020). Other studies have shown how the lockdown impacted birders behaviors and

75 activities (Randler et al. 2020), explored how digital instruments and virtual portals helped people to
76 connect to nature and reduce anxiety (Zabini et al. 2020; Jarratt 2020) or analyzed the impact of animal
77 ownership on mental health and loneliness (Bowen et al. 2020; Ratschen et al. 2020).

78 This study aims at understanding how the significant changes of people's lifestyle generated by the
79 french confinement impacted their experience of nature in terms of their relationship with other beings.

80 Based on an online questionnaire, I first assessed the impact of the Covid-19 lockdown on the way
81 people observed, interacted, learned from different species and how the latter helped them to feel less
82 lonely. I then evaluated whether people of different profiles were impacted differently.

83

84 **METHODS**

85 **Context of the study**

86 From March 17th 2020 to May 11th 2020, the French authorities established a state-wide lockdown
87 stopping all « non-essential activities ». Apart from food retail sector and healthcare institutions, most
88 of the other activities were brought to a halt. People were asked to stay home as much as possible and
89 were allowed out only to meet their basic needs. A one hour per day permission was also granted to
90 exercise, walk pets, get some fresh air within 1km maximum of one's place of residence.

91 **Questionnaire implementation**

92 Using the Limesurvey software (Limesurvey GmbH), I proposed an online questionnaire running from
93 the April 8th 2020 to May 11th 2020 (end of the first French lockdown). The questionnaire was written in
94 French and was available to anyone over 17 years old and living in France (mainland). The study was
95 fully independent and has not been commissioned by any public or private organisms.

96 The questionnaire was composed of a short preamble describing the aim of the study, some
97 explanations on how to answer it, and 24 questions. It has been released via social networks, emails,
98 and local media. The estimated time of answer was about 15 minutes.

99 The first part of the questionnaire (9 questions) focused on the participants' profiles. I asked people for
100 their gender, their age (between 18 and 40 years of age, between 40 and 60, above 60), their education
101 (higher than high-school degree or not), their geographic location (city, outskirts, countryside), their
102 access to nature (no access, access to parks, access to natural areas), whether they had a garden or not,
103 whether they were students/workers or not (unemployed, retired), whether they were confined alone or
104 not and since when (number of weeks) and whether they were familiar, through education, profession
105 or pleasure, with biodiversity study, management, or protection (note however, that, due to a mistake in
106 implementing the questionnaire online, only 575 participants answered this last question).

107 The second part of the questionnaire (15 questions) was dedicated to the effect of the lockdown on the
108 respondents' relationships with the species of 5 different groups: pets and farm animals of the
109 respondents ("Own animals"), indoor and outdoor plants and trees of the respondents ("Home plants"),
110 birds ("Birds"), plants and trees outside the respondents home ("Other plants"), animals which are not
111 considered as pets, farm animals or birds ("Other animals").

112 I assessed the impact of the lockdown on the respondent observation/interaction, learning, and
113 loneliness following three questions respectively: i) since the beginning of the lockdown, have you
114 been spending more time observing or interacting with [species group]? If yes, please specify where
115 and how. ii) since the beginning of the lockdown, have you discovered new behavioral, biological or
116 morphological traits from [species group]? If yes, please specify which ones. iii) since the beginning of
117 the lockdown, have you felt less lonely thanks to [species group]? For the first two questions, people
118 had four choices: "No, less than before", "No", "I don't know", "Yes". For the third question, people
119 had three choices: "No", "I don't know", "Yes".

120 **Participant profiles**

121 I obtained a total of 1292 complete answers (see appendix 1). Most respondents were women (70%),
122 did not live alone (83,2%) and had at least a high-school degree (81%). Forty one percent lived in the

123 countryside, 39% said they had a direct access to nature when going out, and 70% had a garden. When
124 they answered the questionnaire, more than half of the respondents had been confined for 4 to 5 weeks
125 whereas 11% had been confined for 1 to 3 weeks and 30% for 6 to 8 weeks. Fifty-four percent were
126 aged 18 to 40, 32% 40 to 60 and 14% above 60. Finally, 32% declared they were not familiar with
127 biodiversity study, management, or protection (estimation based on the 575 respondents who had
128 access to this question).

129 **Analyses**

130 All the analysis have been conducted for each group of species and function of each of the considered
131 impacts (observation/interaction, learning and loneliness). For the sake of simplicity, answers “I don’t
132 know” and “No, less than before” have been considered as “Not Available” and “No” respectively.
133 Indeed, only a small number of both types of answers were found (see appendix 1).

134 I first analyzed the proportion of the participants who declared they were positively impacted by the
135 lockdown as far as their relationship with other species were concerned (Figure 1). I also used the
136 qualitative information given by the participants (“if yes, please specify where and how”, “if yes,
137 please specify which ones”) to provide a complementary assessment of the lockdown impact.

138 I then analyzed the effect of the participants profiles (variables described in the previous section)
139 concerning the lockdown impact on their relationship with other species. For this part of the study, I
140 discarded the answers of people whose gender and nature access was “other” (n=6 and n=93
141 respectively). For each species group and each considered impact (i.e. observation/interaction, learning,
142 loneliness), I ran generalized linear models (GLM) in order to test for the effect of each variable,
143 holding the effects of the other variables constant. In all 15 models, as the categories of answers (i.e.
144 the dependent variables) were binary (“Yes” or “No”), I fitted the models using a binomial error
145 structure and logit link function (McCullagh & Nelder 1989). The models were fitted in R (version
146 3.6.3; R Core Team 2020) using the “glm” function.

147 For each model, the selection of the used variables was made according to a step by step descending
148 process. In such an approach, the performance of the model is iteratively increased by removing at each
149 step the least important variable. The selected model is the one for which the suppression of a new
150 variable does not increase its performance. The performance was assessed using the Akaike
151 Information Criterion (AIC). Such selection was made using the “step” function in R.

152 The detailed results of the different models are presented in appendix 3. For the sake of simplicity,
153 within the main manuscript (Table 2), I present only the significance of each variable ($p > 0,001$) for
154 each of the considered models.

155

156 **RESULTS**

157 **The impact of the lockdown**

158 Overall, the lockdown had a positive effect on people relationships with the other species (Fig. 1). The
159 most important effect was on the respondents observation and interaction with other species. More than
160 65% declared they observed and interacted more with their animals and plants as well as with birds and
161 more than 40% with other animals and plants. Fewer declared that they learned something new (from
162 20% and above for home plants, own animals and birds to 15% and less for other plants and animals).
163 While 30 to 40 % of the participants declared that other animals and plants, birds and home plants
164 helped them to feel less lonely, the effect was more significant concerning their own animals. Indeed,
165 60% of the respondents having animals felt less lonely thanks to them.

166 Of course such results should be used with caution since the pool of participants is biased toward
167 women, wealthy and educated people having a garden and familiar with biodiversity. Nonetheless, a
168 detailed analysis of the results (Appendix 1) reveals that positive impacts of the lockdown, although
169 with various intensity, were found for each profile. People declared they spent much more time taking
170 care of their animals and plants. They groomed their pets more, played more with their dogs, took time

171 to prune their trees, sow seeds, and water the garden. The participants mentioned that they got to know
172 their animals better : what do cats eat, when do dogs sleep during the day and for how long, how do
173 hamsters react to a new environment, how to recognize different types of hens. Some of them also
174 explained the impact of the lockdown on their pet behavior. Lot of people declared they observed their
175 plants and trees more. Thanks to the spring season, they mentioned for instance the growing of the
176 leaves and the appearance of the first flowers. Through their observation, they learn new things about
177 them: "... it's the first time I have the opportunity to observe the seedlings grow and to realize that there
178 are similarities and small differences between tomatoes and egg plants" (Answer n°786). Overall, the
179 respondents do not only say they interact and observe more but also that they do it better and with
180 much more precision: "I observe the slightest changes there can be, several times a day. I water them
181 regularly, I realize their speed of growth, their needs..."(Answer n°639).

182 People spend also more time observing and listening to birds, from their balcony, in their garden or
183 outside during their walk. Several people mentioned that they tried to communicate with them by
184 whistling: "Once or twice, when walking in the street, I answered to a bird. I think it was because there
185 were fewer people there and no cars" (Answer n°120). "I'm whistling and sometimes I got the
186 impression that they are answering" (Answer n°357). Participants also said they took more care of
187 birds by for instance protecting them from their cats, giving them food, water or building them a nest or
188 a feeder. People declaring that they learned new things about birds mentioned their feeding habits, the
189 variety of singing, behavioral differences and interactions between bird species. Interestingly, people
190 often mentioned how they observe, interact with and get to know specific, well identified individuals:
191 "One bird specifically comes back every day and several times a day to stand on close by the house.
192 When I'm reading, I often stop to observe and listen to him/her" (Answer n°830). "There is one pair of
193 birds of prey that fly always at the same time above the house and one pair of red-tailed birds that have
194 nested between the roof and the chimney" (Answer n°825).

195 People observe more the plants and trees in the greenspaces around their home or in their neighboring
196 gardens. Several respondents declared that they sketched them or took pictures of them and that they
197 learned more about their phenology: plant growth speed, leaf color changes and flowering. Although
198 some of the participants regretted the fact that they have only poor access to plants and trees within
199 their surrounding, others mentioned it as a reminder to pay more attention, to be more mindful: “there
200 is only a little greenery around my place. I walk there and understand how lucky I am as well as the
201 scarcity of these spaces. I take full advantage of it, with "gratitude"”(Answer n°819). They declared
202 how access to such greenspaces and interaction with plants and trees comforts them: “On a walk, I
203 touch the trees, hug them and sit against them. It regenerates me. I felt a strong lack of nature,
204 especially at the beginning of the confinement. My walks were life-saving” (Answer n°1062).

205 People who declared observing and interacting more with other animals mentioned species such as
206 snakes, different insects, rats, lizards, or squirrels. Observations focus mainly on behavior: I’ve spent
207 two weeks observing a bee in the holes of the veranda door. I really spent several hours observing it. I
208 think I would have never taken this time before” (Answer n°120). Although several people mentioned
209 they should leave such animals alone (“I don’t want to encroach on their territory and their lives”
210 (Answer n°975)), others mentioned how they took care of them by protecting one animal from the
211 other, by gently releasing insects which were trapped indoors. As for plants and trees, several
212 participants also declared they did not spend more time interacting with or observing such animals
213 because they have poor access to nature.

214 **The impact of the participant profiles**

215 My results reveal that the profile of the participants can play a part on how the lockdown influenced
216 their relationships with other species (Table 2). The gender effect is clearly the most important one. For
217 all species groups, the lockdown had more impact on women than on men regarding their

218 observation/interaction with non-humans as well as how the latter helped them fight loneliness. Women
219 also declared more than men that they learned new things from plants and from their animals.
220 Additionally, the degree of access to nature has also a strong positive effect on the respondents
221 observation/interaction with other animals and other plants, on their leaning from animals as well on
222 the way home plants, birds, other plants and animals helped participants feel less lonely. People who
223 have their own garden are also more positively impacted concerning their observation/interaction with
224 their home plants and birds as well as regarding their learning from birds and other animals. They also
225 declared fewer times than others that they were positively impacted regarding how their animals helped
226 them feel less lonely. People living in the countryside have been less impacted than others in their
227 observation/interaction with their animals. While they were also less impacted regarding what they
228 learn from the latter, they declared more than others that they learned from plants. Participants with
229 experience in biodiversity conservation, study or management overall have been more impacted by the
230 lockdown in terms of their observation and interaction with other species except concerning their
231 animals. Interestingly, they learned more than others from birds and said more often than others that
232 they felt less lonely thanks to them. Educated people as well have been more impacted regarding their
233 observation/interaction with their plants, birds and other plants but declared less than others that their
234 animals and the other animals helped them feel less lonely. Being active has only a positive effect on
235 the respondents observation and interaction with animals. Older people have been overall less impacted
236 than others regarding their observation/interaction with other species and declared less than others that
237 they learned something from plants or that they felt less lonely thanks to their animals. People living
238 alone have been less impacted in their observation/interaction with birds and other plants and their
239 learning from birds. Their animals and their plants helped them more to fight loneliness. Finally, people
240 being confined for a longer period declared more than others that the lockdown had an effect on what

241 they learned from their animals and from other plants. Compared to other participants, the other plants
242 helped them more overcome loneliness while their animals helped them less.

243

244 **DISCUSSION**

245 This study shows that the Covid-19 lockdown affected the human relationship with other species. The
246 questionnaire answers provide diverse stories about how people took more care of their pets, observed
247 the daily growth of plants, fed wild animals, rescued insects, got to know specific birds individually,
248 etc. People did not only declare that they observed and interacted more with non human species but
249 also that they learned new things about them and that they felt less lonely thanks to them.

250 If the pandemic has been considered as an opportunity to take a step back, to understand the “grave
251 consequences of causing an imbalance in natural processes shaped over millennia” (Bang & Khadakkar
252 2020), this study demonstrates that the zoonosis was first of all an opportunity in itself to concretely
253 reconnect with nature. Whereas several studies have shown how biodiversity clawed back spaces in
254 human-dominated landscape (e.g Pearson et al. 2020; Gordo et al. 2020; Silva-Rodríguez et al. 2020),
255 my work rather shows how the lockdown modified people attention towards other beings. Non-humans
256 species did not only recover spatially but as well in the everyday life of humans and this can also lead
257 to a positive impact on biodiversity. Indeed, it is recognized that an increased experience of nature is
258 likely to improve people commitment to protect wildlife (Chan et al. 2016; Prévot et al. 2018; Cazalis
259 & Prévot 2019).

260 This study demonstrates how new experiences can emerge from societal changes. Due to the lockdown,
261 movements and social interactions have been drastically reduced whereas time spent at home has
262 consistently increased. This transformation of the everyday life of people induced significant changes
263 in their relationship with other species. Nonetheless, this study further demonstrates that such major

264 changes do not equally impact people. Indeed, participants with different profiles have been affected
265 differently regarding their relationship with other beings during the lockdown.

266 In particular, there was a clear insight that women have been more positively impacted than men in
267 terms of their observation, interaction, learning regarding different species as well as how the latter
268 influences their loneliness. Although it is known that women have a different sensitivity for nature
269 (Merchant 1996), this study contributes to show that they are also more sensitive to changes. The
270 environment in which people live also appears to be determinant regarding how a major change can
271 impact their relationships towards nature. Although living in a city versus living in the countryside does
272 not seem to affect that much the respondents' sensitivity, people having a garden, access to a park or
273 living close to natural environments were more likely to change their relationship with other species
274 during the lockdown.

275 Other characteristics of the participants had an impact on their answers. For instance, older people were
276 overall less affected than others. Educated people seemed to be more sensitive in their
277 observation/interaction with plants and birds but less than others regarding how animals helped them to
278 feel less lonely. Participants being already familiar with biodiversity are more likely to be impacted and
279 have stronger sensitivity to birds. People living alone have been more affected regarding how their
280 plants and animals helped them fight against loneliness, but have been less sensitive in terms of
281 observation, interaction and learning from other species. People being confined for longer periods of
282 time seem to have developed a higher sensitivity to *a priori* less accessible species namely the plants.
283 Such observations generate a number of hypotheses and further studies would be valuable to fully
284 address the involved mechanisms. For instance, it would be interesting to understand whether educated
285 people are more rational toward nature whereas less educated people would be more emotional and
286 how being in a group and living collectively could facilitate the observation, interaction and learning
287 from wild species.

288 Of course, it is very unlikely that a 2 month confinement or even a 1 or 2 year pandemic will transform
289 human relation to other beings in the long term. But, while some authors claimed that the “concerted
290 and urgent global response to Covid-19 should pave the way for similar responses to global ecological
291 crises (Bang & Khadakkar 2020)”, the main interest of my study is to demonstrate how such responses
292 can also transform people experience of nature. Acting as a real world experiment, the lockdown does
293 not only reveal how a major change in society can trigger this experience but also who may be more
294 impacted. Experiences of nature are complex and diverse and are embedded in social, cultural and
295 political contexts (Clayton et al. 2017). One of the main conclusions of this study is that people are not
296 equal regarding changes such as the ones induced by the lockdown. Although it is globally accepted
297 that mankind needs to reconnect with nature and to develop a new sensitivity towards other beings, this
298 study contributes to demonstrate the importance of considering such issues in light of the social and
299 political organizations of human societies. In that respect, I identified key profiles that should be
300 considered when facing deep and global societal changes.

301

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FIGURES AND TABLES

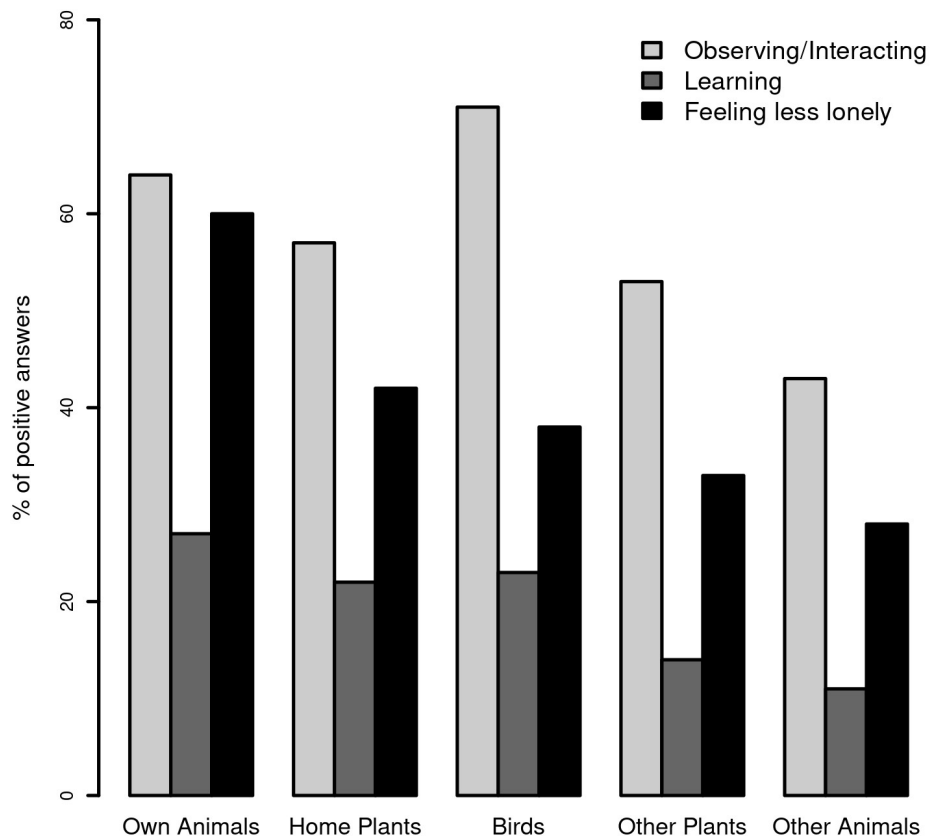


Figure 1. The impacts of the lockdown on people relationship with other species

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Table 1. The effects of the participants profiles on their answers. The results report the positive (black) or negative (grey) significant effects ($p > 0.001$) of the different variables on the three categories of answers (observing/interacting, learning, feeling less lonely) for each of the considered species groups. Results are extracted from the logistic binomial regressions which detailed results are presented in Appendix 2.

		Observing/Interacting					Learning					Feeling less lonely				
		Own animals	Home plants	Birds	Other plants	Other animals	Own animals	Home plants	Birds	Other plants	Other animals	Own animals	Home plants	Birds	Other plants	Other animals
Gender	Female	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
Worker/Student	Yes	■				■										
Alone	Yes			■		■			■			■	■			
Education	> High school degree		■	■	■							■				■
Age	Between 40 and 60	■	■	■	■		■	■				■				
	More than 60							■		■						
Nature expert	Yes		■	■	■	■			■					■		
Garden	Yes		■	■					■		■	■				
Nature access	Access to a park				■	■	■									
	Access to nature				■	■	■			■			■	■	■	■
Location	City outskirts		■													
	Rural	■				■	■			■						
Time confined							■			■		■			■	

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493 Appendix 1: Detailed results of the questionnaire

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495 Appendix 2: Detailed results of the logistic models run for each of the considered impacts according to
496 each species group.

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