

1 *Data Descriptor*

2 **Preprint: Data from a Systematic Review of**
3 **Crowdsourcing of Research Data from Wildlife**
4 **Tourism Photographs and Comments Shared on**
5 **Social Networking Sites**

6 **Greg D. Simpson**^{1,2,†,*} - <https://orcid.org/0000-0003-4926-5491>

7 **Obelia Walker**^{1,2,†} - <https://orcid.org/0000-0001-8567-786X>

8 ¹ College of Science, Health, Engineering, and Education-Environmental and Conservation Sciences,
9 Murdoch University, Perth 6150, WA, Australia

10 ² Sukau Ecotourism Research Center (SERC), BEST Society, Lot 1, Pusat Perindustrian, Kolombong Jaya,
11 Jalan Kolombong, 88450 Kota Kinabalu, Sabah, Malaysia.

12 † Co-First Authors

13 * Correspondence G.Simpson@Murdoch.edu.au

14 **Abstract:** This data descriptor summarizes the process applied and data gathered from 50
15 publications/papers reporting on the use of photography generated by tourists, tour operators and
16 members of the public, with a particular focus on the crowdsourcing of photographs through
17 online platforms and social networking sites (SNSs) as a method of research for wildlife
18 conservation and ecotourism. The papers were collected in a systematic literature review to inform
19 a pilot study of the feasibility of using SNSs to crowdsource georeferenced photographs of
20 endangered Bornean Pygmy Elephants (*Elephas maximus borneensis*) taken by ecotourists along the
21 Lower Kinabatangan River region of Sabah, Malaysia. Papers were sourced using the Murdoch
22 University Findit online-search tool to search over 100 databases, including Proquest, Scopus and
23 Web of Science. The criteria for a paper to be included in the review (and shared via the dataset
24 attached to this this data descriptor) were that it was peer-reviewed, published in English, between
25 1997 and the 31 December 2017, had the full text accessible online and reported on a study or
26 studies that utilized photographs that tourists, tour operators and/or members of the public
27 generated and shared via SNSs or online platforms.

28 **Dataset:** Dataset submitted for publication as a supplement to this Data Descriptor.

29 **Dataset License:** CC-BY

30 **Keywords:** Citizen Science; Crowdsourced Data; Ecotourism; Natural Resource Management,
31 Social Media; Photo-elicitation; Photovoice; Wildlife Conservation; Wildlife Tourism

32
33

34 1. Summary

35 Wildlife tourism is a global industry that has evolved from the inherent human desire to see
36 and interact with wildlife in natural environments [1-5]. Wildlife tourism is, generally, regarded as a
37 non-consumptive activity, with human-wildlife interactions ranging from observing and feeding
38 wildlife thorough to photographing free roaming wild animals [7-10]. As the economic and social
39 significance of wildlife tourism and ecotourism continues to grow [5,11-13], understanding the
40 ecological and social interface of these experiences is critical for achieving long-term sustainability
41 [14,15]. Effective management of wildlife tourism experiences should not only consider the views
42 and perceptions of visitors but should also monitor for impacts on the wildlife that are targeted by
43 these experiences [5,14,16-18]. To achieve management of wildlife tourism that is both responsive
44 and adaptive, it is necessary to have contemporaneous information relating both the visitor
45 experience and the conditions under which the human-wildlife interactions occur [5,16,19]. Such
46 data is, however, often limited [5,9].

47 Traditionally, obtaining information on how tourists interact with wildlife in natural areas has
48 involved methods such as surveys and interviews, which can be laborious, time-consuming and
49 costly [13,15,16,20-23]. The emerging techniques of modern citizen science and crowdsourcing data
50 can provide an effective alternative to traditional, centralized research methods, particularly when
51 resources and funding are limited [18,24]. Over the past two decades, the combination of and almost
52 ubiquitous connection to the internet, the development of smart devices equipped with geographic
53 positioning system (GPS) services and high quality cameras, and the exponential growth in the
54 willingness of people to share personal information online through social media and other social
55 networking sites (SNSs) has expedited wildlife conservation and tourism research based on
56 collecting data in this way [24-27]. The new alternative of using widespread and readily available
57 data uploaded to social media can provide a rapid and cost-effective way to explore nature-based
58 tourist experiences and activities [13,20,21,28,29]. The dataset shared via this data descriptor
59 informed both the systematic quantitative literature review reported by Walker and others [27] and
60 a pilot study that explored the feasibility of using SNSs to crowdsource georeferenced photographs
61 of endangered Bornean Pygmy Elephants (*Elephas maximus borneensis*) taken by ecotourists along the
62 Lower Kinabatangan River region of Sabah, Malaysia. For that reason, the primary function of the
63 systematic quantitative literature review reported by Walker and others [27] was to explore how
64 ecotourist-generated photographs, sourced through existing SNSs, might be used in wildlife
65 conservation and tourism research. The techniques and eligibility criteria used to source and select
66 papers included in the shared dataset and the metadata for the information extracted from those
67 papers are reported in the following sections.

68 2. Data Description

69 The identification and screening procedures described in the Methods below identified 48
70 peer-reviewed papers, one paper published in conference proceedings, and one Masters Thesis that
71 were included and analyzed to produce the dataset shared via this data descriptor. Hereafter, those
72 publications are all referred to as papers. The 50 papers included in the systematic review of Walker
73 et al. [27] were analyzed to provide a structured quantitative overview of the published literature.
74 The data extracted from each paper (Table 1) included publication information, type of article
75 (research, review, or a combination of both), research approach, style of study, geographic
76 information, target species, summary of how the study was conducted, who generated the
77 photographs, what online platform/SNS was used to access the photographs, sample size, if
78 geotagged (GPS referenced) crowdsourced data was discussed, a summary of the main findings of
79 each study and any recommendations for additional research.

80 It is important to note that in a number of papers, the data crowdsourced from online platforms
81 related to study locations that were different to location(s) published in the researcher attributions.
82 Subsequently, for the purposes of the dataset shared via this data descriptor, the reported location

83 was defined to be the locality in which the research occurred. The metadata for the variables
84 reported in the Excel spreadsheet associated with this data descriptor are detailed in Table 1.

85 3. Methods

86 3.1 Systematic Quantitative Literature Review Method

87 The dataset shared via this data descriptor was generated from a systemic review of the recent
88 literature regarding the application of photographs crowdsourced from tourists, tour operators
89 and/or members of the public in order to research wildlife conservation and ecotourism. In the style
90 of the reviews reported by Patroni and others [9] and Parker and others [3,4,30], the systematic
91 literature review of Walker et al. [27] utilized a combination of the approaches of Pickering et al. [31]
92 and the Preferred Reporting Systematic Review (PRISMA) guidelines of Moher et al. [32]. Applying
93 this systematic approach in the identification and screening of the literature, the shared dataset
94 provides a comprehensive overview of the current peer reviewed publications in this field of
95 research.

96 Table 1: Variables extracted from articles included in the systematic review

Variable	Description/ List of Categories	Data Type
Author (YEAR)	APA In-Text Citation	Text
Year	Year Paper Was Published	Numeric
Journal	Full Name of Peer Reviewed Journal	Text
Location of Study (Country)	If Specified in Paper or N/A = Not Applicable	Text
Location of Study (Continent)	If Specified in Paper or N/A = Not Applicable	Text
Target Species	If Specified in Paper or N/A = Not Applicable	Text
Focus of Study	Descriptive Summary of Research Reported	Text
Type of Research	Ecological, Social or Both	Categorical
Photographs Taken/ Uploaded By	General Public, Tourists, Tour Operators, General Public & Researchers, Tour Operators & Researchers	Categorical
Online Platform - Dedicated and/or SNS	Dedicated, SNS, Other, Dedicated & SNS, Dedicated & Other, SNS & other or N/A = Not Applicable	Categorical
Name of Dedicated Platform	Wildbook, Wildbook for Whale Sharks, iNaturalist, eBird, Pic4Turtle, TORSOOI, Waarnemingen, Whale shark photo library or N/A = Not Applicable	Text
Name of SNS	Flickr, Youtube, Instagram, Facebook, Vimeo, TripAdvisor, Twitter, Panoramio, LinkedIn, combinations thereof or N/A = Not Applicable	Text
Name of Other Platforms	Wikipedia, PPGIS, OpenStreetMap, Google Earth, GBIF, Map of Life, NBN or N/A = Not Applicable	Text
Method of Research	Quantitative, Qualitative or Both	Categorical
Research or Review Article	Review, Research or Both	Categorical
Sample Size (Num. of Photographs Reported)	As Reported or N/A = Not Applicable	Text
Sample Size (Num. of Photographs Classified)	Less than 50, 50-100, 100-500, 500-1000, 1000-10000, Greater than 10000 or	Categorical
Sample Period	As Reported or N/A = Not Applicable	Categorical
Sample Period	Less than 1 month, 1-6 months, 6 months - 1 year, 1-2 years, 2-5 years, greater than 5 years	Categorical
Geotagged Photographs	Yes or No	Binary
Main Findings	Descriptive Summary of Key Findings	Text
Future Research	Descriptive Summary of Recommended Research or N/A = Not Applicable	Text

98 3.2 Identification, Screening and Exclusion of Papers

99 Academic publications were identified using the Murdoch University Findit online-search tool
100 to perform a global search of over 100 databases, which included Scopus, Web of Science. The Findit
101 search tool also provided access to paper made available through the BONUS+ and ArticleReach
102 databases.

103 The initial search parameters were specified as being peer reviewed material published in the
104 five years period from 1 January 2011 to 31 December 2017 with the full text of the paper available
105 online. Given the nature of the crowdsourced volunteered geographic information as being a
106 relatively new field of research, these criteria captured a high proportion of the most relevant
107 literature. The Findit online tool was first searched in May 2017 and again in February 2018 using the
108 search terms *wildlife* and *tourism* in combination with the terms/phrases *photo* or *social media* using
109 Boolean searches of (wildlife AND (photo or social media)) and (tourism AND (photo or social
110 media)). The inclusion of the search term *photo* was useful in not only capturing studies that utilized
111 photographs, but also studies that used photovoice and photo-elicitation approaches (see Simpson
112 and Walker [18] for discussion of those research methods in the context of research utilizing SNSs).

113 The preliminary search identified 422 papers (Figure 1) that were screened to reject papers that:

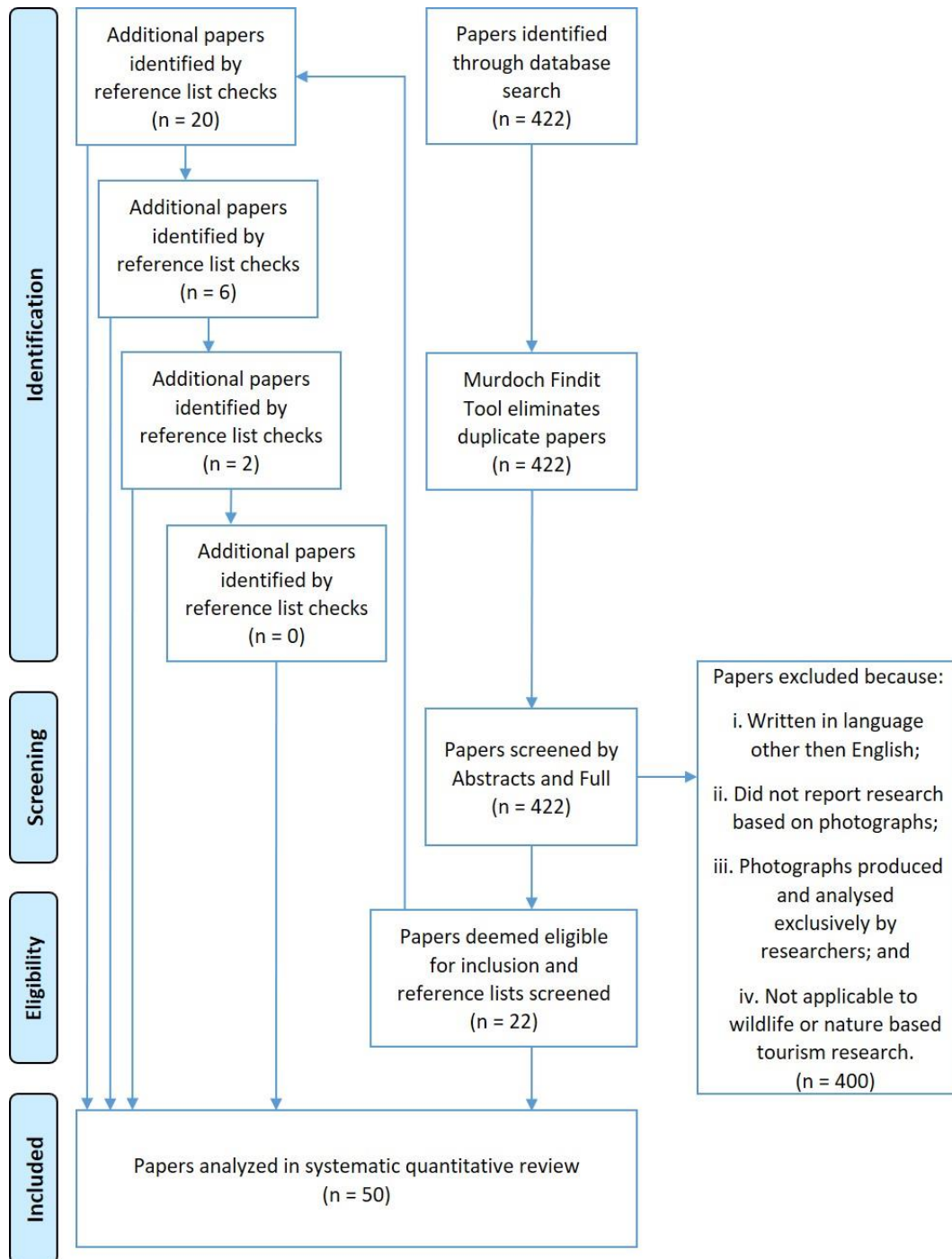
- 114 1. Were written in a language other than English;
- 115 2. Did not incorporate the use of photographs;
- 116 3. Incorporated the use of photographs gathered and analyzed exclusively by researchers; or
- 117 4. Could not be applied to wildlife tourism or nature-based tourism research.

118 The screening process identified 22 papers that were relevant to the research focus of the
119 systematic review. The reference lists of these 22 papers were then crosschecked to locate additional
120 and older foundation publications not identified by the electronic database search that were relevant
121 to the focus of the systemic review. Reference lists of these additional papers were similarly
122 crosschecked, until no additional papers were identified, which implies that all the relevant
123 literature had been identified (Figure 1).

124 Whilst the application of ecotourist generated photography to wildlife tourism research was the
125 primary focus of the systematic review of Walker et al. [27], papers discussing nature-based tourism
126 were also included, due to the strong overlap in those fields of research. Newsome, Moore and
127 Dowling [3,33] highlight the important role that wildlife observation plays in the recreational
128 experience of visitors to natural areas, which validates the decision to include such papers in the
129 systemic review. The decision to reject papers that reported research based on photographs gathered
130 and analyzed by researchers was necessary to exclude the large volume of wildlife studies that
131 utilize techniques such as camera-trapping [34,35]. Such papers were not relevant to the focus of the
132 review of Walker et al. [27], as that research does not specifically incorporate the use of photographs
133 generated by tourists, tour operators or members of the public. In addition, it is a requirement of the
134 photovoice method adopted for the research informed by this review that photographs be
135 participant generated, further supporting the need to exclude papers based on researcher generated
136 photographs [18,36-38].

137 After the reiterative crosschecking of reference lists (Figure 1), 50 papers were deemed eligible
138 for inclusion in the systematic review and were included for further analysis [27]. Those 50 papers
139 provide the basis for the dataset shared via the Excel® worksheet attached to this data descriptor.

140



141

142

Figure 1. Systematic literature review process that generated the data shared via this data descriptor.

143

Supplementary Materials: Dataset shared in *Official Lit Review (Version 4) 3-4-2018 - Preprint Supplementary Materials.xls*

144

145

Author Contributions: G.D.S. & O.W. made equal contributions to this article and as such are co-first authors.

146

Funding: This research received no external funding.

147

Acknowledgments: We wish to thank Professor Albert Teo of Borneo Eco Tours, Sukau Ecotourism Research Centre (SERC) and the Universiti Malaysia Sabah for his encouragement and support for the research project that generated this article. We similarly thank Associate Professor David Newsome from Murdoch University for his guidance and support for the research project that generated this article and for his feedback on an early draft of the text that provided the foundation for this article.

148

149

150

151

152

Conflicts of Interest: The authors declare no conflict of interest.

153 **References**

- 154 1. Curtin, S. Wildlife tourism: The intangible, psychological benefits of human-wildlife encounters. *Current*
 155 *Issues in Tourism* **2009**, 12(5-6), 451-474. <https://doi.org/10.1080/13683500903042857>
- 156 2. Curtin, S.; Kragh, G. Wildlife tourism: Reconnecting people with nature. *Human Dimensions of Wildlife*.
 157 **2014** 19(6), 545-554. <https://doi.org/10.1080/10871209.2014.921957>
- 158 3. Parker, J.; Simpson, G. Public Green Infrastructure Contributes to City Liveability: A Systematic
 159 Quantitative Review. *Land* **2018**, 7, 161, 1-26, pages. <https://doi.org/10.3390/su11113182>.
- 160 4. Parker, J.; Zingoni de Baro, M.E. Green Infrastructure in the Urban Environment: A Systematic
 161 Quantitative Review. *Sustainability* **2019**, 11(11), 3182. <https://doi.org/10.3390/su11113182>
- 162 5. Patroni J.; Newsome D.; Kerr D.; Sumanapala D.P.; Simpson G.D. Reflecting on the human dimensions of
 163 wild dolphin tourism in marine environments. *Tourism and Hospitality Management* **2019**, 25(1), 141-160.
 164 <https://doi.org/10.20867/thm.25.1.8>
- 165 6. Simpson, G.; Newsome, D. Environmental history of an urban wetland: From degraded colonial resource
 166 to nature conservation area. *Geo: Geography and Environment* **2017**, 4(1), e00030.
 167 <https://doi.org/10.1002/geo2.30>
- 168 7. Cong, L.; Wu, B.; Morrison, A.M.; Shu, H.; Wang, M. Analysis of wildlife tourism experiences with
 169 endangered species: An exploratory study of encounters with giant pandas in Chengdu, China. *Tourism*
 170 *Management* **2014**, 40, 300-310. <https://doi.org/10.1016/j.tourman.2013.07.005>
- 171 8. Newsome, D.; Moore, S.A.; Dowling, R.K. *Natural Area Tourism: Ecology, Impacts and Management* 2nd ed.;
 172 Channel View Publications: Bristol, United Kingdom, 2013.
- 173 9. Patroni, J.; Simpson, G.; Newsome, D. Feeding wild fish for tourism - A systematic quantitative literature
 174 review of impacts and management. *International Journal of Tourism Research* **2018**, 20(3): 286-298.
 175 <https://doi.org/10.1002/jtr.2180>
- 176 10. Simpson, G.; Newsome, D.; Day, A. Data from a survey to determine visitor attitudes and knowledge
 177 about the provisioning of wild dolphins at a marine tourism destination. *Data in Brief* **2016**, 9, 940-945.
 178 <https://doi.org/10.1016/j.dib.2016.11.020>
- 179 11. Mintel. *Wildlife Tourism International*. Mintel International Group Ltd: London, United Kingdom 2008.
- 180 12. Patroni, J.; Day, A.; Lee, D.; Chan, J.K.L.; Kerr, D.; Newsome, D.; Simpson, G.D. Looking for evidence that
 181 place of residence influenced visitor attitudes to feeding wild dolphins. *Tourism and Hospitality*
 182 *Management* **2017**, 24(1), 87-105. <https://doi.org/10.20867/thm.24.1.2>
- 183 13. Wood, S.; Guerry, A.D.; Silver, J.M.; Lacayo, M. Using social media to quantify nature-based tourism and
 184 recreation. *Scientific Reports* **2013**, 3, 2976, 1-7. <https://doi.org/10.1038/srep02976>
- 185 14. Newsome, D.; Rodger, K.; Pearce, J.; Chan, K.L.J. Visitor satisfaction with a key wildlife tourism
 186 destination within the context of a damaged landscape. *Current Issues in Tourism* **2019**, 22(6), 729-746.
 187 <https://doi.org/10.1080/13683500.2017.1312685>
- 188 15. Parker J.; Simpson G.D. Visitor Satisfaction with a Public Green Infrastructure and Urban Nature Space in
 189 Perth, Western Australia. *Land* **2018**, 7(4), 159, 1-17. <https://doi.org/10.3390/land7040159>
- 190 16. Hansen, A.S. Testing visitor produced pictures as a management strategy to study visitor experience
 191 qualities – A Swedish marine case study. *Journal of Outdoor Recreation and Tourism* **2016**, 14, 52-64.
 192 <https://doi.org/10.1016/j.jort.2016.05.001>
- 193 17. Orsini J.P.; Newsome D. Human Perceptions of Hauled Out Seal Lions (*Neophoca cinerea*) and Implications
 194 for Management: A Case Study from Carnac Island, Western Australia. *Tourism in Marine Environments*
 195 **2005**, 2(1), 129-132. <https://doi.org/10.3727/154427305774865769>
- 196 18. Simpson, G.D.; Walker, O. Grounding Social Network Data for Ecological and Tourism Research in
 197 Photo-Elicitation and Photovoice. *Informatics*. **In Review**.
- 198 19. Walden-Schreiner, C.; Rossi, S.D.; Barros, A.; Pickering, C.; Leung, Y. Using crowd-sourced photos to
 199 assess seasonal patterns of visitor use in mountain-protected areas. *AMBIO* **2018**, 47(7), 781-793.
 200 <https://doi.org/10.1007/s13280-018-1020-4>
- 201 20. Heikinheimo, V.; Minin, E.D.; Tenkanen, H.; Hausmann, A.; Erkkonen, J.; Toivonen, T. User-Generated
 202 Geographic Information for Visitor Monitoring in a National Park: A Comparison of Social Media Data
 203 and Visitor Survey. *ISPRS International Journal of Geo-Information* **2017**, 6(3), 85, 1-14.
 204 <https://doi.org/10.3390/ijgi6030085>

- 205 21. Richards, D.R.; Friess, D.A. A rapid indicator of cultural ecosystem service usage at a fine spatial scale:
206 Content analysis of social media photographs. *Ecological Indicators* **2015**, *53*, 187-195.
207 <https://doi.org/10.1016/j.ecolind.2015.01.034>
- 208 22. Simpson, G.; Parker, J. Data for an Importance-Performance Analysis (IPA) of a Public Green
209 Infrastructure and Urban Nature Space in Perth, Western Australia. *Data* **2018**, *3*, 69, 1-9.
210 <https://doi.org/10.3390/data3040069>.
- 211 23. Tenkanen, H.; Di Minin, E.; Heikinheimo, V.; Hausmann, A.; Herbst, M.; Kajala, L.; Toivonen, T.
212 Instagram, Flickr, or Twitter: Assessing the usability of social media data for visitor monitoring in
213 protected areas. *Scientific Reports* **2017**, *7*, 17615, 1-11. <https://doi.org/10.1038/s41598-017-18007-4>.
- 214 24. Di Minin, E.; Tenkanen, H.; Toivonen, T.; Prospects and challenges for social media data in conservation
215 science. *Frontiers in Environmental Science* **2015**, *3*, 63, 1-6. <https://doi.org/10.3389/fenvs.2015.00063>
- 216 25. Barry, S.J. Using social media to discover public values, interests, and perceptions about cattle grazing on
217 park lands. *Environmental Management* **2014**, *53*(2), 454-464. <https://doi.org/10.1007/s00267-013-0216-4>
- 218 26. Silvertown, J. A new dawn for citizen science. *Trends in Ecology & Evolution* **2009**, *24*(9), 467-471. <https://doi.org/10.1016/j.tree.2009.03.017>
- 220 27. Walker, O.; Simpson, G.D.; Teo, A.C.K.; Newsome, D. Preprint: Crowdsourcing and Analysing Wildlife
221 Tourism Data from Photographs Shared on Social Media. *Preprints*, **2019**. 2019080226.
222 <https://doi.org/10.20944/preprints201908.0226.v1>
- 223 28. Hausmann, A.; Toivonen, T.; Slotow, R.; Tenkanen, H.; Moilanen, A.; Heikinheimo, V.; Di Minin, E. Social
224 media data can be used to understand tourists' preferences for nature-based experiences in protected
225 areas. *Conservation Letters* **2017**, *11*(1), 1-10. <https://doi.org/10.1111/conl.12343>
- 226 29. Prakash, S.L.; Perera, P.; Newsome, D.; Kusuminda, T.; Walker, O. Reasons for visitor dissatisfaction with
227 wildlife tourism experiences at highly visited national parks in Sri Lanka. *Journal of Outdoor Recreation and*
228 *Tourism* **2019**, *25*, 102-112. <https://doi.org/10.1016/j.jort.2018.07.004>
- 229 30. Simpson, G.; Parker, J. Data on Peer Reviewed Papers about Green Infrastructure, Urban Nature, and City
230 Liveability. *Data* **2018**, *3*, 51, 1-10. <https://doi.org/10.3390/data3040051>
- 231 31. Pickering, C.; Grignon, J.; Steven, R.; Guitart, D.; Byrne, J. Publishing not perishing: How research students
232 transition from novice to knowledgeable using systematic quantitative literature reviews. *Studies in Higher*
233 *Education* **2015**, *40*(10), 1756-1769. <https://doi.org/10.1080/03075079.2014.914907>
- 234 32. Moher, D.; Liberati, A.; Tetzlaff, J.; Altman, D.G. Preferred reporting items for systematic reviews and
235 meta-analyses: The PRISMA statement. *PLoS Med.* **2009**, *6*(7), e1000100, 1-28.
236 <https://doi.org/10.1371/journal.pmed.1000100>.
- 237 33. Newsome, D.; Moore, S.A.; Dowling, R.K. *Wildlife Tourism*. Channel View Publications: Bristol, United
238 Kingdom, **2005**.
- 239 34. Meek, P.; Fleming, P.; Ballard, G.; Banks, P.; Claridge, A.; Sanderson, J.; Swann, D. *Camera Trapping:*
240 *Wildlife Management and Research*. CSIRO Publishing: Melbourne, Australia, **2014**.
- 241 35. Meek, P.D.; Ballard, G.A.; Vernes, K.; Fleming, P.J. The history of wildlife camera trapping as a survey tool
242 in Australia. *Australian Mammalogy* **2015**, *37*(1), 1-12. <https://doi.org/10.1071/AM14021>
- 243 36. Given, L.M.; Opryshko, A.; Julien, H.; Smith, J. Photovoice: A participatory method for information
244 science. *Proceedings of the Association for Information Science and Technology* **2011**, *48*(1), 1-3.
245 <https://doi.org/10.1002/meet.2011.14504801209>
- 246 37. Wang, C.; Burris, M.A. Photovoice: Concept, methodology, and use for participatory needs assessment.
247 *Health Education & Behavior* **1997**, *24*(3), 369-387. <https://doi.org/10.1177/109019819702400309>
- 248 38. Yi-Frazier, J.P.; Cochrane, K.; Mitrovich, C.; Pascual, M.; Buscaino, E.; Eaton, L.; Panlasigui, N.; Clopp, B.;
249 Malik, F. Using Instagram as a modified application of photovoice for storytelling and sharing in
250 adolescents with Type 1 Diabetes. *Qualitative Health Research* **2015**, *25*(10), 1372-1382.
251 <https://doi.org/10.1177/1049732315583282>