1   **Wildlife tourism in Latin America: Taxonomy and conservation status**

2

3   **Abstract**

4   We provide an initial insight into the extent, occurrence and characteristics of wildlife
5   tourism involving close interactions with free-ranging, non-domesticated, animals
6   outside of formal captive environments (e.g. zoo and aquaria) across Latin America.
7   Using information provided online via TripAdvisor, we found this type of tourism
8   was occurring across the region (advertised on 249 wildlife tourist attraction
9   webpages across 21 countries) and involved a diverse range of wild animals (73
10 species, including 19 currently considered as Threatened by the IUCN). Opportunities
11 for direct contact with wild animals were particularly prevalent (54% of all wildlife
12 tourist attraction webpages). Despite the potential economic benefits, studies have
13 indicated that these types of wildlife ecotourism are potentially having net negative
14 impacts on wild animal conservation and welfare. We found that mammals classified
15 as Least Concern featured most commonly in tourist photos, but our analyses suggest
16 that mammals and species classified as Vulnerable on the IUCN Red List were most
17 likely to occur in these types of wildlife tourist attractions (WTAs). Amphibians and
18 species classified on the IUCN Red List as Data Deficient or Critically Endangered,
19 were least likely. Given the growing nature of the wildlife tourism sector, we provide
20 recommendations to help effectively balance and manage wider wildlife protection
21 goals and growing tourist interest in wildlife.

22

23 **Key Words:** Animal Welfare; Animal-Visitor Interactions; Conservation;
24 Sustainability; Wildlife Tourism

25

26 **Introduction**

27 Wildlife tourism, defined here as tourism based on encounters with free-ranging, non-
28 domesticated animals, is a very profitable endeavor (UNWTO, 2014). Although
29 reliable global measures of its economic impact are lacking, one study concluded that
30 wildlife tourism might account for 20–40% of all international tourism (Filion et al.,
31 1994). As such, it already represents a significant proportion of a huge global market

32   (UNWTO, 2014). In 2013, tourism was worth over a trillion US dollars, accounted for

33   9% of global GDP, and provided 1 in 11 jobs worldwide (UNWTO, 2014). Wildlife

34   tourism is the leading foreign exchange earner in several countries (Ballantyne et al.,

35   2009), remains a prime tourist motivation (Higginbottom et al., 2004) and is predicted

36   to increase in the coming decades (UNWTO, 2014).

37   Wildlife tourism, involves tourism based on encounters with non-domesticated (non-

38   human) animals (Higgenbottom et al., 2004). Although extremely diverse,

39   Higginbottom et al. (2004) split it into four main categories: (1) wildlife-watching

40   tourism (viewing or otherwise interacting with free-ranging animals; such as bird

41   watching); (2) captive-wildlife tourism (viewing animals in human-made

42   confinement; principally zoos, wildlife parks, animal sanctuaries and aquaria, but also

43   circuses and shows by mobile wildlife exhibitors); (3) hunting tourism; and (4) fishing

44   tourism. Generally, wildlife tourism is considered to be either non-consumptive

45   [wildlife watching tourism and captive-wildlife tourism (Ballantyne et al., 2011)] or

46   consumptive [hunting and fishing (Freese, 1998)]. The latter involves the deliberate

47   killing or removal of wild animals either for sport or to obtain their body parts for

48   subsequent use (Higginbottom, 2004). However, wildlife watching and other forms of

49   non-lethal tourism have been considered to be consumptive exploitation, understood

50   in terms of sub-lethal anthropogenic stress and energetic impacts (Higham et al.,

51   2014).

52   Wildlife tourism creates revenue by transforming natural resources into goods that

53   can be marketed to tourists, who are willing to pay to see and experience specific

54   landscapes and wild animals (Brockington and Duffy, 2010). This revenue can be

55   used to secure the continuation of these same natural resources, for example through

56   practical efforts by operators or tourists (Higginbottom et al., 2001), local economic

57   income generation (Kontigeorgopoulos, 2009) and education initiatives (Powell et al.,

58   2008). For this reason, wildlife tourism is often viewed, and marketed, as creating a

59   win-win in providing livelihoods whilst simultaneously protecting wildlife;

60   compensating for the potential negative impacts, on species conservation and on

61   subject animals' individual welfare (Brockington and Duffy, 2010; Moorhouse et al.,

62   2015;17).

63   However, there can also be negative impacts on wildlife which may include altered

64   feeding and reproductive behaviour, stress and other physiological responses, injury,

65   disease or death (Moorhouse et al., 2015, D'Cruze et al., 2017). Efforts aimed at

66   avoiding, or at least minimizing, any of these potential negative impacts are hindered

67   by the fact that currently there is no global regulatory body for wildlife tourism

68   (Moorhouse et al., 2017). Standards vary, not only on a country level in terms of

69   wildlife-relevant laws and degree of enforcement thereof; but also between types of

70   wildlife tourism (Moorhouse et al., 2015). For example, wildlife tourism activities

71   taking place in protected areas may fall under the remit of the relevant national parks

72   authority, those occurring in a sanctuary may fall under the remit of the Global

73   Federation of Animal Sanctuaries (GFAS), whereas those in undesignated areas may

74   have no practical regulation beyond general national and international legislation

75   (Moorhouse et al., 2017). In the absence of effective regulation, there is a risk that

76   tourist revenue becomes the ultimate arbiter of what constitutes acceptable use of

77   wildlife (Moorhouse et al., 2017).

78   The ability to effectively regulate wildlife tourism, whether through designated

79   authorities or by educating tourists directly, is also partly dependent on information

80   regarding the extent, occurrence and characteristics of the activities being offered at a

81   local, national and international scale. Recent studies have reviewed the impacts of

82   individual wildlife tourist attractions (WTAs) (e.g. Alves et al., 2011; D'Cruze et al.,

83   2014), and a recent detailed audit produced a non-exhaustive list of 48 types of (non-

84   consumptive, non-zoo) WTAs globally (Moorhouse et al., 2015), but information

85   regarding their full scope and scale is still lacking. In particular, Latin America

86   represents a relatively understudied region, already recognized for its iconic wildlife

87   (Lohmann and Dredge, 2012) and landscapes – which have been identified for

88   potential wildlife tourism expansion [e.g. the Amazon region (Hoefle, 2016)].

89   The aims of this study were to: (1) describe the characteristics of a subset of WTAs

90   advertised online for Latin America; (2) identify the species involved in these WTAs

91   across this region; and (3) determine whether particular taxa or conservation threat

92   categories of species are more or less likely to occur in these WTAs across this

93   region. We hoped that the findings of our study would help to identify certain taxa

94   and conservation threat categories of species that are potentially more at risk from the

95   negative impacts or to benefit from any positive impacts that may be associated with

96   this type of eco-tourism, and that therefore warrant particular attention.

97   We used information provided by tourist operators and tourists online on TripAdvisor

98　(www.tripadvisor.co.uk) a global online review platform with over 400 million

99　unique visitors every month, covering 7 million 'restaurants, accommodations and

100　attractions' (TripAdvisor, 2017) to characterise WTAs. We specifically focused on a

101　particular non-consumptive WTA subset as defined by Higginbottom et al. (2004) and

102　Moorhouse et al. (2015). This WTA subset is WTAs advertising close interactions

103　[feeding, swimming and direct contact (i.e. holding)] with free-ranging non-

104　domesticated non-human animal taxa outside of formal captive environments (e.g.

105　zoological collections, aquaria and sanctuaries).

106

Methods

107

108　We used predetermined standardised criteria, applied by a single researcher, to

109　systematically search TripAdvisor's public webpages between August and November

110　2016, for information about the different WTAs being offered. First, we used the

111　TripAdvisor search tool to generate a list of relevant TripAdvisor public webpages.

112　Given the large number of WTA webpages available, we restricted our search by

113　entering the term 'wildlife photo' into the 'find' field and the country of interest (e.g.

114　'Brazil') into the 'near' field. We only included results provided under the heading

115　'attractions' in our analyses (i.e. we excluded results provided under the headings

116　'holiday rentals', 'lodgings', 'restaurants' and 'tours and tickets').

117　Webpages were screened for eligibility by reading the text used to describe each

118　WTA, and the first 40 reviews provided by tourists. To aid this process we

119　specifically searched for terms including (but not restricted to) 'touch', 'pet', 'hold',

120　'held', 'feed' 'feeding' 'fed', 'swim' 'swimming' and 'swam'. We only included

121　WTAs in our subsequent analyses if the WTA: (1) was listed using English text on an

122　official TripAdvisor webpage; (2) operated in a mainland Central or South American

123　country; (3) enabled tourists to have close and/or direct interaction with wild animals

124　(i.e. non-domesticated species) that appeared to be non-enclosed and free-ranging (i.e.

125　we excluded zoological collections, aquaria and sanctuaries).

126　We gave each selected WTA a unique identification code noting: (1) the TripAdvisor

127　webpage address; (2) the name of the WTA; (3) the country of operation; (4) the

128　taxonomic class [Amphibia (amphibians), Aves (birds), Chondrichthyes (sharks and

129　rays), Reptilia (reptiles) and Mammalia (mammals)] and order of the vertebrate wild

130 animal(s) involved, excluding Actinopterygii ('bony' fish); and (5) the type of

131 information used by tourists to describe their interactions with wild animals when

132 possible (either image, text or both).

133 We also examined any associated images uploaded by tourists for these WTAs, where

134 available. Species were identified (where possible) directly from the photograph;

135 otherwise, genus was determined from the photograph and species identity inferred on

136 the basis of the country in which the photograph was taken and information on species

137 distribution in the IUCN Red List species entries (three species could not be identified

138 on this basis, see Supplementary Table 1). If there was more than one species, we

139 concentrated on the animal(s) in focus or at the foreground of the image.

140 For all species, binomial nomenclature and information regarding their conservation

141 status was gathered from the international version of the IUCN Red List of

142 Threatened species (IUCN, 2016) because national level assessments are not available

143 for all countries. Threat status was recorded in accordance with the 2001 IUCN Red

144 List categories and criteria system (version 3.1) as Critically Endangered (CR),

145 Endangered (EN), Vulnerable (VU), Near Threatened (NT), Least Concern (LC), or

146 Data Deficient (DD), species not evaluated by the IUCN Red List (NE) are listed in

147 Supplementary Table 1, and were excluded from the analyses. Comparable data were

148 collated for all vertebrate species in mainland Latin America from the IUCN Red List

149 website (www.iucnredlist.org).

150 Using the text when information was available, relevant tourist reviews were

151 categorised either as: (1) 'feeding' [text directly described or implied the opportunity

152 to have direct contact with live free-ranging wild animals via the provision of food

153 (via use of term 'baited', 'feed', 'feeding' or 'give food')]; or (2) direct contact [text

154 directly described or implied the opportunity to have direct contact with captive live

155 wild animals typically via some form of physical restraint over a given period of time

156 (via use of term 'touch', 'hold', 'held', 'pet', 'caught', 'grabbed' or 'stroked')]; or (3)

157 'swim with' (text directly described or implied the opportunity to swim with free-

158 ranging wild animals with no specific reference to direct contact). Using text provided

159 on each WTA webpage, we also categorised the type of WTA, either as 'unguided'

160 tour (tourists attended independently) or 'guided' (tourists attended accompanied by

161 an official paid guide).

162   We described tabulated categorical data using descriptive statistics, including

163   percentages, pie charts and bar charts. We used X^2 (chi-square) to test whether

164   endangerment or legislative classes were distributed similarly among taxonomic

165   groups of target animals and compared with a database of all species recorded from

166   mainland Central and Latin America [as provided by the IUCN Red List (IUCN,

167   2016)] to test whether the patterns observed differed from expectation. Finally, we

168   used binomial logistic regression to test whether Class or threat status influenced the

169   probability of a species occurring in a WTA. Statistical analyses were carried out in R

170   (version 3.3.3, R Core Team 2017). For chi-square tests, we combined conservation

171   status into 4 groups: 'Endangered' (CR and EN), Vulnerable (VU), 'Not Threatened'

172   (NT and LC), and Data Deficient (DD), and obtained simulated p-values (based on

173   2000 replicates) for tests with low expected values. Pairwise post-hoc chi-square tests

174   were performed with the package "fifer" (Fife, 2017), p-values adjusted for multiple

175   comparisons. Variable odds ratios were plotted with package "sjPlot" (Lüdecke,

176   2017).

177

178   **Results**

179   A total of 249 different webpages hosted on TripAdvisor featured WTAs that involve

180   close and or direct interactions with live free-ranging wild animals in Latin America

181   (Figure 1; Appendix I, sheet A). Of these 220 (88%) referred to guided WTAs and 29

182   (12%) to unguided WTAs (Appendix I, sheet A). These WTAs were geographically

183   located in 17 of the 21 countries that constitute mainland Latin America (Figure 1).

184   The highest number of these webpages refers to WTA listings in Mexico ($n = 52$;

185   21%), Belize ($n = 45$; 18%), Brazil ($n = 40$; 16%) and Costa Rica ($n = 36$; 15%)

186   (Figure 1). We found no webpages advertising this type of WTA in El Salvador,

187   Guyana, Suriname or Uruguay (Figure 1).

188   According to these WTAs' webpages, in Latin America mammals were the most

189   commonly advertised taxon (Figure 2; Appendix I, sheet A). Reference to this

190   taxonomic group was made on 166 (67%) of the webpages reviewed (Appendix I,

191   sheet A). Reptiles were the second most commonly advertised vertebrate class ($n =$

192   126; 51%), followed by sharks and rays ($n = 68$; 27%), birds ($n = 39$; 16%) and

193   amphibians ($n = 19$; 8%). Primata (primates) were the most commonly advertised

194 vertebrate taxa (Figure 2; Appendix I, sheet A). This group featured on 148 (45%) of

195 the webpages reviewed. Crocodilia was the second most commonly advertised taxa (*n*

196 = 86; 35%), followed by Squamata (snakes and lizards) (*n* = 70; 28%), Cetacea

197 (whales and dolphins) (*n* = 59; 24%) and Selachimorpha (sharks and rays) (*n* = 56;

198 23%) (Figure 2; Appendix I, sheet A).

199 [Insert figure 1]

200 [Insert figure 2]

201 [Insert figure 3]

202 A total of 743 tourist reviews across 204 WTAs was included as text data sources in

203 our analyses, ranging between 1 – 11 data reviews per WTA (mean ± SD = 4.0 ± 2.3;

204 Appendix I, sheet C). Within these data sources, we found 817 separate references to

205 close interactions with free-ranging wild animals (Appendix I, sheet C). Overall,

206 direct contact was most frequently referenced by tourists in these online reviews

207 (54%; *n* = 442), followed by feeding of free-ranging wild animals (35%; *n* = 287) and

208 swimming with free-ranging wild animals (11%; *n* = 88).

209 A total of 982 tourist photos was also included as potential data sources in our

210 analyses, ranging between 1 and 17 photos per WTA (mean ± SD =4.6 ± 3.4;

211 Appendix I, sheet B). Using these photos, it was possible to identify most vertebrates

212 to genus (*n* = 913; 93%) and species level (*n* = 880; 90%) respectively. Overall, we

213 identified 69 distinct species, inferred the identity of 8 additional species, and

214 identified one vertebrate only to genus level, across 65 genera, 46 families, 24 orders

215 and 5 classes (Supplementary Table 1). A total of five NE species was excluded from

216 subsequent analysis resulting in a final dataset of 73 species recorded in WTAs.

217 With regards to conservation status, taxa considered to be Least Concern (LC) were

218 recorded in the majority of photos (59%; *n* = 495) followed by Data Deficient (DD)

219 (19%; *n* = 162); Vulnerable (VU) (11%; *n* = 86); Endangered (EN) (9%; *n* =79);

220 Critically Endangered (CR) (1%; *n* = 11); and Near Threatened (1%; *n* = 11). Overall,

221 21% (*n* = 176) of photos recorded images of wild animals that are classified as

222 Threatened according to the IUCN Red List. This figure increases to 40% (*n* = 338) if

223 all species considered to be Data Deficient are also included (operating under the

224 precautionary assumption that DD species might also be threatened). A total of 376

225 (38%) photos recorded species that could not be identified to a sufficient taxonomic
226 level or are not currently listed on the CITES appendices.

227 Of the 73 species recorded in WTAs, more than half were mammals (52%; $n = 38$),
228 followed by birds (26%; $n = 19$) and reptiles (14%; $n = 10$); there were few sharks and
229 rays (6%; $n = 4$), or amphibians (3%, $n = 2$) (Figure 4a). Species were predominantly
230 classified as LC (60%; $n = 44$), followed by VU (18%; $n = 13$), NT, EN and DD
231 [(8%; n = 6) (7%; n = 5) (6%; n = 4) respectively], whereas there were very few CR
232 species (1%, $n = 1$) (Figure 4b). Overall, 26% of species in WTAs were 'threatened',
233 with reptiles in WTAs having the highest proportion of threatened species (60%),
234 followed by mammals (24%) and birds (11%, $n = 2$).

235 In comparison with a collated dataset of 11,395 vertebrate species that occur in
236 mainland Latin America, occurrence of a species in a WTA was significantly
237 associated with their taxonomic class ($\chi^2 = 88.7$, df = 4, p = 0.0005) (Figure 4a). It
238 appears mammals (and to a lesser extent sharks and rays) occur in WTAs more than
239 might be expected, amphibians (and to a lesser extent birds) less than expected and
240 reptiles approximately in proportion with their relative occurrence in the region
241 (Figure 4a). Occurrence in a WTA was also significantly associated with threat status
242 ($\chi^2 = 14.60$, df = 3, p = 0.0022), with Vulnerable species more likely to occur in
243 WTAs than DD (χ^2 post-hoc tests, adjusted p = 0.0030), 'not threatened' (adjusted p =
244 0.0220) or 'endangered' species (adjusted p = 0.0220) (Figure 4b).

245 Both taxonomic class (p < 0.001) and threat status (p = 0.011) were statistically
246 significant predictors of occurrence in a WTA [Binomial logistic regression, with no
247 statistically significant interaction between the two (p = 0.255)]. This result suggests
248 that patterns in threat status in relation to occurrence in WTAs were consistent among
249 taxa]. Using reptiles as the reference class and LC as the reference threat status,
250 mammals (p < 0.001) and Vulnerable species (p = 0.0043) were significantly more
251 likely to occur in WTAs, whereas amphibians (p = 0.012) were significantly less
252 likely, and DD species marginally less likely (p = 0.066, Figure 5). There also
253 appeared to be a trend towards Critically Endangered species being less likely to
254 occur in WTAs but the difference was not statistically significant (p = 0.460, Figure
255 5).

256 Considering separately Belize [for which a high number of WTA webpages were
257 found on TripAdvisor (Figure 1)] and Peru [for which a high number of species were
258 identified in WTAs (Supplementary Table 1)], there appeared to be some country-
259 level differences in the relationship between conservation threat status and occurrence
260 in a WTA. Whilst the patterns in Peru were consistent with those found in the Latin
261 American region as a whole [with Vulnerable species more likely to occur in WTAs

262 than Not Threatened (LC and NT, χ^2 post-hoc tests, adjusted p = 0.042)], there was

263 some evidence that in Belize 'Endangered' (CR and EN) species were also more

264 likely to occur in WTAs ('Endangered' species vs. 'Not Threatened' species, χ^2 post-

265 hoc tests, adjusted p = 0.003).

266

267 **Discussion**

268 From a taxonomic perspective, our study shows that there is a significant preference

269 for mammals, and to a lesser extent sharks and rays, in non-consumptive WTAs

270 involving close interactions with free-ranging wildlife being advertised for Latin

271 America via the online travel platform TripAdvisor. Whilst recognizing that our study

272 represents only a 'snapshot' of the extent, occurrence and characteristics for a

273 particular WTA subset, this trend suggests that these taxa may be particularly at risk

274 from any negative impacts associated with these types of WTA (including

275 morbidities, mortalities and extinctions). Likewise, this trend also suggests that they

276 may also be more likely to benefit from any positive impacts. Increased economic

277 revenue to improve habitat protection and a reduction in human-wildlife conflict

278 events due to increased tolerance levels within resident human communities is one

279 such example.

280 From a conservation perspective, whilst we found no evidence that endangered

281 species were being specifically targeted for use in these types of WTA across Latin

282 America, species classified as Vulnerable (IUCN, 2016) did appear to be significantly

283 targeted. One possible explanation for this might be that their abundance in the wild is

284 such that these animals are sufficiently rare to be of eco-tourism 'interest' but not so

285 rare that visitors cannot reliably encounter them. Given that wild populations are

286 thought to be decreasing for all but one [the American crocodile (*Crocodylus acutus*;

287 increasing)] of the 13 Vulnerable species recorded in these WTAs (Appendix I),

288 adopting a precautionary approach, their over-representation in WTAs represents a

289 potential conservation concern.

290 At a country-level, the apparent preference for endangered species in Belize [e.g. the

291 green sea turtle (*Chelonia mydas*), the hawksbill sea turtle (*Eretmochelys imbricata*)

292 and howler monkey (*Alouatta* spp.)] is also of potential concern in terms of potential

293 negative impacts. In addition, from an animal welfare perspective, even though

294 reptile, bird, and Not-Threatened species (across all taxonomic classes) were

9

295 advertised online in proportion with their relative occurrence in the species

296 composition of the region, it is likely that the number of individual wild animals

297 subject to potential negative impacts could be considerable. For example, a quarter of

298 the species identified as being involved in these types of WTAs were birds ($n = 19$),

299 reptiles were advertised on half of all the webpages examined during our study and

300 together non-threatened taxa in these WTAs comprised a total of 54 different species.

301 Similarly, the fact that over half of all tourist reviews ($n = 442$) referred to direct

302 contact with free-ranging wild animals is also of potential concern.

303

A Delicate Balance

305 Wildlife tourism can and does have positive impacts on wildlife (Brockington and

306 Duffy, 2010), but can also have neutral and negative impacts (Green and

307 Higginbottom, 2001; Higginbottom, 2004; Moorhouse et al., 2015). A specific

308 assessment for each of the 249 WTAs we describe, and their impact on animal

309 welfare and species conservation in Latin America, is beyond the scope of the present

310 study. Similarly, the overall benefits or dis-benefits of these WTAs for either species

311 conservation or animal welfare were not directly assessed.

312 However, in the context of previous work, it is likely that a substantial proportion of

313 the WTAs we describe have negative net impacts on wildlife. A recent informative

314 global audit of 24 different WTA types found that 14 (involving 120,000– 340,000

315 animals) were likely to have net negative conservation impacts and 18 (involving

316 230,000–550,000 animals) were likely to have net negative welfare impacts

317 (Moorhouse et al., 2015). Based on this audit, researchers estimated that

318 approximately 50%–60% of the animals involved in, and >60% (2.3–3.7 million) of

319 tourists visiting these WTAs, were participating in wildlife ecotourism detrimental to

320 individual animals and species involved (Moorhouse et al., 2015).

321 Of the 24 selected WTA types previously examined by Moorhouse et al. (2015) only

322 five had positive scores for both the conservation and welfare impacts on the subject

323 taxa and individuals, and all five types were sanctuaries (WTAs that source animals

324 from other captive institutions with the aim of improving their welfare and/or

325 conservation status). Of the remaining 19 WTA types, only one other wild WTA type

326 (gibbon watching – without any feeding by, or direct contact with, tourists) had a

327 positive conservation impact score and a neutral animal welfare impact score
328 (Moorhouse et al., 2015).

329 None of the WTAs included in our study self-identified as wildlife sanctuaries
330 [already broadly identified as potentially having net positive animal welfare and
331 conservation impacts (Moorhouse et al., 2015)]. Instead, they represent a particular
332 WTA subset that involve close interactions, such as feeding to attract, swimming
333 close to, and direct physical contact with free-ranging wild animals in their natural or
334 semi-natural habitat (i.e. outside of formal captive environments such as zoo and
335 aquaria). The value and benefits relative to the costs and negative impacts that result
336 from this particular WTA subset is subject to ongoing debate (e.g. Ballantyne et al.,
337 2009; Karanth et al., 2012).

338 For example, regular close proximity of tourists with free-ranging wildlife can have
339 an adverse impact on an array of animal behaviours such as breeding (Jacobson and
340 Lopez, 1994) and foraging (Meissner et al., 2015). Direct contact with wild caught
341 wildlife can also lead to the unintentional death of individuals belonging to
342 Threatened species; e.g. in 2016 media attention focused on a La Plata river dolphin
343 (*Pontoporia blainvillei*) that died after beachgoers in Argentina hauled it out of the
344 water to pose with it for photos (National Geographic, 2016). There are also concerns
345 that in some cases WTAs that advertise wild animals as free ranging actually involve
346 captive individuals provided with poor welfare conditions away from public view
347 (D'Cruze et al., 2017; National Geographic, 2017).

348 However, previous studies have also drawn attention to the overall net positive
349 impacts of this WTA subset. For example, the feeding of and swimming with free-
350 ranging pink river dolphin (*Inia geoffrensis*) in the Amazon region poses significant
351 risks to the well-being of individual dolphins (Alves et al., 2011). Yet on a broader
352 scale, strong public desire for close interactions with this iconic 'flagship' species
353 could aid wider wildlife protection efforts in the region through income generation for
354 enhanced management of protected areas (Alves et al., 2011). Similarly, there are
355 cases where it is also possible that close interactions with 'ambassador animals'
356 represent compelling experiences that enable tourists to gain and maintain personal
357 connections with wildlife imbuing an improved sense of stewardship (Moss et al.,
358 2014).

359   To minimize the negative and facilitate the positive impacts of these WTAs, tourism
360   operators must effectively balance and manage wider wildlife protection goals and
361   growing tourist interest in wild animal species (Karanth and DeFries, 2012).
362   Arguably, this task is set to become more challenging in future; globally wildlife
363   tourism is growing as a result of increasing disposable incomes, improved
364   accessibility for urban citizens and greater publicity for, and generation of public
365   interest in, wild places and species (Kruger, 2005; Karanth and DeFries, 2012). In
366   order to help meet this growing challenge, a full and proper understanding of the
367   scope and scale of the WTAs being offered, how they are being regulated (if at all)
368   and their potential impacts on wildlife is required.

369   In this context, rather than specifically assess the impacts of each WTA advertised on
370   TripAdvisor's public webpages, the aim of the present study was to provide an initial
371   baseline account of a particular WTA subset [those involving close interactions with
372   free-ranging wildlife (outside of formal captive environments)] for a relatively
373   understudied region, already recognized for its iconic wildlife. Although wildlife
374   tourism at key sites in this region remain underdeveloped [e.g. the Amazon (Lohmann
375   and Dredge, 2012)], we found this type of commercial activity is already occurring
376   across the region and involved a diverse range of wild animals (at least 73 different
377   species, including 19 currently considered as threatened by IUCN Red List).

378   *Limitations*

379   Our study was necessarily descriptive and could not be exhaustive. Specifically, we
380   restricted our analyses to a particular subset of WTAs advertised on TripAdvisor and
381   so operators without an online presence do not feature in our findings. Equally, we
382   recognize that information regarding the factors responsible for motivating operators
383   and tourists to provide content on TripAdvisor [e.g. the influence of species rarity and
384   charisma (Macdonald et al., 2015)] and how this differs across demographic groups is
385   also lacking.

386   We also recognise that WTAs advertised via online platforms do not represent a full
387   or unbiased depiction of this sector for a number of reasons, including the fact that
388   they (and any associated content provided by visitors) do not represent a random
389   sample: visitors do not patronize WTAs in equal numbers, self-select to provide
390   information, and are potentially influenced by other reviews if and when they do

391   (Moorhouse et al., 2017). Furthermore, operators are not always accurate, or honest,
392   when describing their WTAs to the public (Moorhouse et al., 2017).

393   However, notwithstanding these caveats, TripAdvisor is the world's largest travel
394   website, providing over 4 million reviews covering upward of 6 million
395   accommodations and attractions in 49 countries (TripAdvisor, 2017). As such,
396   information hosted here represents one of the most current, complete and accessible
397   sources of information currently available regarding the extent of, and available
398   activities in, Latin American WTAs. It is not possible to determine whether the 249
399   WTAs included in our study represent the full complement, or whether they represent
400   just a the 'tip' of a far greater 'iceberg' but to our knowledge, this study represents
401   one of the most comprehensive WTA reviews, focussed on Latin America, carried out
402   to date.

403   *Recommendations*

404   Currently there is no global body regulating standards at WTAs, which has enabled
405   tourist revenue to become the ultimate arbiter of what constitutes acceptable use of
406   animals in this context (Moorhouse et al., 2017). Tourists, however, are not adequate
407   assessors of WTAs' animal welfare and conservation impacts as they typically lack
408   the specialist knowledge required, and are subject to a number of psychological biases
409   that obscure the ethical dimensions of decisions to attend particular WTAs
410   (Moorhouse et al., 2017). This lack of regulation has resulted in a status quo in
411   which tourists' reviews are overwhelmingly positive, even for WTAs with objectively
412   poor standards (Moorhouse et al., 2015), which may encourage other tourists to attend
413   these venues.

414   There are a number of potential approaches to alter this detrimental status quo. For
415   example, independent ground-level WTA audits using direct observations and
416   interviews with staff focused on both conservation and animal welfare aspects (e.g.
417   Aves, 2011; Arena et al., 2012; Schmidt-Burbach et al., 2015; Carder et al., 2016;
418   D'Cruze et al., 2017) could help reduce the prevalence of WTAs with negative
419   impacts and also increase those with positive impacts on wildlife (Table 1), especially
420   if the results are displayed in the fora where tourists make their consumption choices.

421   It is unclear, however, who would conduct such audits, how they would be funded
422   and where they would be hosted. An obvious choice for hosting would be online

423 travel review sites. As an example, TripAdvisor linked their entire online WTAs to an

424 "information portal" designed to help tourists to make informed decisions regarding

425 their potential patronage (TripAdvisor, 2016). It is however, currently uncertain

426 whether tourists can be sufficiently informed so that their reviews form an accurate

427 representation of the ethical outputs of WTAs. Therefore, adopting a precautionary

428 approach, we suggest that it is wildlife professionals, with expertise both in

429 conservation and animal welfare, who should conduct such WTA auditing.

430 Targeted legislative reviews to address non-existent, ambiguous, inaccessible or

431 conflicting state level regulations could also be highly impactful (Table 1). However,

432 these will only be effective if agencies are provided with the resources and training

433 required to effectively enforce legislation relating to WTAs operating illegally

434 (TRAFFIC, 2008) and to deal with any confiscated wildlife in a humane manner that

435 maximizes their conservation value (D'Cruze and Macdonald, 2016) (Table 1).

436 [Insert table 1]

437

438 **Conclusion**

439 Our research suggests that wildlife tourism involving close interactions with free-

440 ranging, non-domesticated, animals outside of formal captive environments in Latin

441 America is both widespread and diverse. From a taxonomic perspective, our study

442 shows that there is a significant preference for mammals, and to a lesser extent sharks

443 and rays, in these types of WTAs advertised online for this region. From a

444 conservation perspective, whilst we found no evidence that endangered species were

445 being specifically targeted for use in these types of WTA across Latin America,

446 species classified as Vulnerable (IUCN, 2016) did appear to be significantly targeted.

447 At a country-level, the apparent preference for endangered species in Belize is also of

448 potential concern in terms of potential negative impacts. We recommend that future

449 research in this relatively understudied region should include independent ground-

450 level WTA audits using direct observations and interviews with staff focused on both

451 conservation and animal welfare aspects. Given their prevalence, our study suggests

452 that mammals and species classified as Vulnerable on the IUCN Red List may be of

453 particular interest in this regard. Such efforts could help to reduce the pervasiveness

454 of WTAs with negative impacts and also increase those with positive impacts on

455 wildlife. We also suggest that this study could be used as a model for similar reviews
456 focused on other geographical areas and types of WTA. Such efforts could form
457 useful components of broader initiatives to help effectively balance and manage wider
458 wildlife protection goals that may be achieved in association with growing tourist
459 interest in wild animal species.

460

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587

Concern	Continuing challenge	Recommendation
Legislative measures	Non-existent, ambiguous, inaccessible and/or conflicting legislation and associated regulatory measures	Each country reviews existing legislation and incorporates appropriate measures to ensure effective and clear legal guidance
Law enforcement	National enforcement agencies lack the financial resources and / or skilled staff for effective enforcement actions	Each country reviews current capacity and provides appropriate resources and / or training to relevant enforcement agencies
Confiscated wildlife	National agencies lack the financial resources and / or skilled staff for effective and humane management of	Each country reviews current capacity and provides appropriate resources and / or training to relevant

	confiscated wildlife	agencies and NGOs
Tourism industry	Growing international tourism, and increased profits associated with demand for photo opportunities with wild animals	Each tourism provider reviews policies and incorporates appropriate measures to ensure effective and clear guidance
Consumer demand	Growing international tourism, and increased associated consumer demand for photo opportunities with wild animals	Each country initiates new international human behavior change focused interventions to reduce consumer demand

588

589 Table 1. The main concerns, continuing challenges and recommendations for
590 stakeholders surrounding issues of legislative measures, law enforcement, confiscated
591 wildlife, and consumer demand.

592

593 **Figure Captions**

594 Figure 1. The frequency of WTA webpages included in our study by mainland
595 country in Central and South America (Latin America).

596 Figure 2. The proportion of taxonomic classes and orders promoted across 249 WTA
597 webpages included in our study.

598 Figure 3. Example images found on the 249 WTA webpages reviewed during this
599 study, as provided by tourists. A: Direct contact interaction with a brown-throated
600 sloth (*Bradypus variegatus*); B: Direct contact interaction with a spectacled caiman
601 (*Caiman crocodilus*); C: Baiting and direct contact interaction with an Amazon river
602 dolphin (*Inia geoffrensis*); and D: Swim with interaction with a whale shark
603 (*Rhincodon typus*).

604   Figure 4. Percentage of species by (a) taxonomic class, and (b) IUCN Red List threat

605   status, in WTAs (*n* = 73) compared with all vertebrate species in mainland Latin

606   America (*n* = 11,395).

607   Figure 5. Odds ratios (depicting likelihood) of species occurring in a WTA in relation

608   to their taxonomic class and IUCN Red List threat status; amphibians (A); birds (B);

609   mammals (M); sharks and rays (S) Reference classes for comparison are 'reptiles' and

610   'LC, Least Concern' species – selected on the basis that both appeared to occur in

611   WTAs in proportion with their occurrence in the region (see Figure 5a, 5b, and

612   Results). Odds ratios are plotted on a logarithmic scale; horizontal lines indicate 95%

613   CIs. ORs to the right of the horizontal line indicate species that are significantly more

614   likely to occur in WTAs than the reference classes, ORs to the left of the dotted line

615   indicate species that are significantly less likely to occur in WTAs than the reference

616   classes; ORs are statistically significant (at $p<0.1$) when they do not cross the line (do

617   not = 1). Statistical significance: *** $p < 0.001$, ** $p < 0.01$, * $p < 0.05$. Note that for

618   DD, Data Deficient species, $p = 0.066$, for all other comparisons shown $p > 0.1$.

619   **Supplementary Table Legend**

620   Table showing the taxa identified by scientific name, common name in the

621   TripAdvisor photos of WTA webpages (*n* = 982) and their presence by country;

622   Argentina (AR); Belize (BZ); Bolivia (BO); Brazil (BR); Chile (CL); Colombia (CO);

623   Costa Rica (CR); Ecuador (EC); French Guiana (GF); Guatemala (GT); Honduras

624   (HN); Mexico (MX); Nicaragua (NI); Panama (PA); Paraguay (PY); Peru (PE); and

625   Venezuela (VE). For the identified taxa, IUCN listings are also shown [CR; EN; VU;

626   NT; LC; DD; or not evaluated (NE)].

627   **Appendix I**

628   Vertebrate species in Latin America provided as an excel file. Includes species class,

629   order, family, genus, species, authority, synonyms, common names (in English,

630   French and Spanish), Red List status, Red List version used for assessment,

631   population trends (where given in Red List entry), and whether or not it was recorded

632   in a WTA (0 – no, 1 – yes). Details: Downloaded from the IUCN Red List of

633   Threatened Species (version 2017.2, www.iucnredlist.org) all extant species

634   belonging to the following classes – mammals, reptiles, amphibians, cartilaginous fish

635   (sharks and rays), and birds – in the 21 mainland countries of South America and

636   Central America. Threat status was recorded in accordance with the 2001 Categories

637   and Criteria system (version 3.1): CR, EN, VU, NT, LC. Most species had been

638   assessed under this system - 54 reptiles had been assessed using the 1994 (version

639   2.3) system, in which case, the categories LR/lc, LR/nt and LR/cd were reclassified as

640   LC, NT and NT, respectively. Three additional species identified as occurring in

641   WTAs and listed in the IUCN Red List but not detected in the original search were

642   added: *Alouatta seniculus* (red howler monkey, listed under the names of three *A.*

643   *seniculus* subspecies, but no overall species entry), *Cebus capucinus* (white-fronted

644   capuchin monkey; as for *Alouatta seniculus*, listed only as two *C. capucinus*

645   subspecies, but no overall species entry), and *Pithecia pithecia* (white-faced saki

646   monkey, not detected because the range description had not been completed in the

647   IUCN red list); three other *Pithecia* species lacking range descriptions, not recorded

648   as occurring in WTAs, were also added to the database for completeness. Five

649   species (all reptiles) identified as occurring in WTAs (see Supplementary Table 1) but

650   not evaluated (NE) in the IUCN Red List were excluded from the database to avoid

651   overestimating the occurrence of NE species in WTAs (on the basis that it was not

652   possible to include all NE species that were not recorded in WTAs for comparison).

653   Species names were listed as in the IUCN Red List. See Methods and Supplementary

654   Table 1 for further information on identification of species recorded in WTAs.