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Segniagbeto, GH and Agbodji, KT and Leuteritz, TEJ and Dendi, D and Fa, JE and Luiselli, L (2020) Insights into the illegal ivory trade and status of elephants in Togo, West Africa. *African Journal of Ecology*. ISSN 0141-6707

Downloaded from: <https://e-space.mmu.ac.uk/626540/>

Version: Accepted Version

Publisher: Wiley

DOI: <https://doi.org/10.1111/aje.12748>

Please cite the published version

<https://e-space.mmu.ac.uk>

1 Original article

2 **Insights into the illegal ivory trade and status of elephants in**
3 **Togo, West Africa**

4

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26

27 **Abstract**

28 In Togo, the illegal trade of African elephant (*Loxodonta africana*) ivory is widespread despite efforts
29 made by the government to curtail these activities. By using data gathered from CITES institutions and
30 natural resource management authorities in the country we investigated the extent of ivory trafficking in
31 Togo. We also conducted surveys in villages around protected areas, which still contain elephant
32 populations to assess the species' current status in the country. Our surveys indirectly corroborated that
33 there are probably no more than 150 elephants collectively within the country's protected areas, most of
34 them in the Fazao-Malfakassa National Park. We also estimated that a minimum of 41.65 tons of ivory
35 (elephant tusks and carved objects) was intercepted in Togo between 2008-2018. Despite the fact that
36 presently illegal elephant hunting is unlikely in Togo, we show that this country is the entry point for
37 ivory from Central Africa (Cameroon and Gabon). We maintain that Togo's position as an intermediary
38 country in the illegal ivory trade is a tangible threat to elephants throughout their range countries, and is
39 also likely to affect the dwindling population of these animals in the country if adequate enforcement is
40 not implemented.

41

42 **Keywords** Ivory trade; elephant population size; protected areas; Togo; West Africa

43

44 **1 | INTRODUCTION**

45 West African populations of elephants (*Loxodonta (africana) africana* and *Loxodonta (africana)*
46 *cyclotis*) declined during the 20th century as a result of poaching. During the late 1800s and early
47 1900s, significant populations of elephants still remained in some West African countries (Benin,
48 Togo, Ghana, Nigeria, and Cameroon) (Mallon et al., 2015). Currently, wildlife populations in
49 the West African region are restricted to isolated pockets that face massive habitat loss as well as
50 illegal hunting (Henschel et al., 2014; Amori et al., 2016).

51 Across the region, the trade (both legal and illegal) in wild animals is noteworthy
52 (Segniagbeto, 2009; Segniagbeto et al., 2011, 2015; Aulyia et al., 2016; Luiselli et al., 2016)
53 making the region one of the most important in the world for the export of wildlife (Harwood,
54 2003; Aulyia et al., 2016). Though a number of drivers are responsible for this trade, the
55 development of air and sea transport over the past three decades has facilitated the movement of
56 animals and their products out of their region of origin (Roe et al., 2002; Aulyia et al., 2016). In
57 particular, the deep-water container port in Lomé, one of the largest in volume in West Africa
58 (MERF 2014; RBS EMEA, 2017), makes Togo an important transit country for wildlife
59 (Eurostat, 2015; Luiselli et al., 2016; CITES, 2018). Whilst undoubtedly trade volumes are very
60 high in southern Africa because these species are more abundant and trade is both legal and
61 illegal, nonetheless, for the remaining West African (and central African) wildlife, trade routes
62 through West Africa are a major concern (Mallon et al., 2015).

63 Available information on the illegal trade of animal products in West Africa shows this
64 activity is widespread and largely uncontrolled (Merem et al. 2018). In particular, ivory
65 trafficking in this region (and in other elephant range states) has increased so dramatically that
66 Africa's overall elephant population has declined severely in the past ten years, mainly due to
67 poaching (Thouless et al., 2016). As a result, many West African elephant populations were lost

68 during the 20th century (Roth and Douglas-Hamilton, 1991). Currently, elephant populations
69 have recently recovered in a few West African countries (for instance Burkina Faso; Hema et al.,
70 2010a, 2010b, 2018) while in others elephant numbers have declined sharply (Mallon et al.,
71 2015).. The largest West African elephant population (around 9000 individuals or about 80% of
72 the entire West African elephant population) is found in the “W”-Arli-Pendjari (WAP complex),
73 a transboundary Natural UNESCO World Heritage Site in Benin, Burkina Faso and Niger
74 (Thouless et al., 2016).

75 In Togo, elephants occur in scattered populations in which both taxa (*L. (africana)*
76 *africana* and *L. (africana) cyclotis*) are present (Amori et al., 2016). Since over 50 years ago, the
77 killing of elephants and trafficking of their ivory is illegal in the country under Togolese law
78 governing the conservation of biological resources and protection of threatened species
79 (Ordinance No. 4 of 16 January 1968). Under the provisions of Article 3 of this Ordinance, all
80 wildlife belongs to the State. Fully protected wild species (i.e. hunting forbidden without any
81 exception) are listed in Annex I Class A and partially protected species in Annex I Class B. The
82 African elephant is included in this list as a fully protected species listed in Annex I Class A.

83 Togo has a population of about 7.6 million people and has had a long history of political
84 instability. In recent times, the country’s economic wealth (annual GDP growth has averaged
85 5.5% in the last 10 years, higher than most Sub-Saharan economies) and democracy have
86 dramatically improved (World Bank, 2017). Despite these positive trends, the country remains a
87 hub for ivory smuggling, essentially because Lomé is the largest port in the region and because
88 of its much-improved transportation networks. Additionally, the lack of effective policies allows
89 wildlife and wildlife products smuggling to continue unabated (MERF, 2014).

90 In this paper, we (i) quantify the volume of ivory seized in the country, (ii) review
91 available information on the geographic origin of the ivory traded in, and in transit through,
92 Togo, (iii) determine by interviews with local communities whether illegal hunting of elephants
93 continues, and (iv) assess the current status of the elephant population in the country by using
94 field surveys data and interviews with local hunters.

95

96 **2 | METHODS**

97 This study is based on: 1) information on ivory trafficking obtained from the main wildlife
98 management institutions in the country (2012-2016), and from within communities bordering
99 protected areas known to contain elephant populations (2017), and 2) opportunistic field surveys
100 to assess the population status of elephants in protected areas where the species is known to
101 occur (2015-2017).

102

103 **Illicit ivory trafficking data**

104 We obtained quantitative data on cases of illegal seizures of elephant ivory from: (i) the
105 Togolese *Office Centrale de Répression du Trafic Illicite des Drogues et du Blanchissement*
106 (OCRTIDB), (ii) from the Togolese police operating at the Lomé port and at the Lomé
107 international airport (data also from MERF 2013), and (iii) from civil society organizations such
108 as the ANCE Togo ONG and AGBO-ZEGUE ONG. All these datasets were collected by the
109 Togo police during their investigations and included the following pieces of information: 1) date
110 of the operation; 2) name of the alleged trafficker/s; 3) offense details; 4) profile of alleged
111 trafficker/s; 5) nationality of alleged trafficker/s; 6) country of destination of confiscated
112 products, and 7) weight or quantity of seized ivory. For security reasons, police authorities did

113 not release details of how these operations were carried out. Moreover, we could not exclude that
114 the illegal ivory operations reported by the police were not biased towards the more easily
115 detectable ones. Nonetheless, the competent authorities have not reported this information to us.
116 By pooling the data from the different sources, shown above, we calculated the total volume of
117 ivory resulting from all seizures to provide a current estimate of the minimum amounts moved
118 through Togo during the research period.

119

120 Surveys within communities bordering protected areas

121 We carried out a number of structured interviews with local actors involved directly or indirectly
122 in the management or use of natural resources in the Oti-Keran and Oti-Mandouri Complex
123 (OKM), Fazao-Malfakassa National Park (FMNP), Djamdé Wildlife Reserve and Abdoulaye
124 Wildlife Reserve (Figure 1). These areas were selected because they were the only four protected
125 areas where wild elephants are presently known to occur within Togo (Amori et al., 2016). We
126 interviewed a total of 410 persons in the 20 localities bordering the four protected areas in the
127 country where elephants are known to be present (Table 1, Supplementary materials). We
128 targeted individuals within traditional chiefdoms and local communities but also forest resource
129 managers (checkpoint officers, prefectural and regional natural resources directors, national
130 parks managers, ecoguards and trackers). In selected villages, we organised public consultation
131 forums after receiving permission from the chief of each locality. These forums included hunters,
132 farmers and other village members; no minors, younger than 21 years were involved. Prior to the
133 start of each meeting, participants were informed of the aims of our discussions. Although
134 names, age and occupation of all participants were recorded, we reassured them that their
135 identities would not be revealed. We followed the ethical guidelines developed by the British

136 Sociological Association (British Sociological Association 2017). Acknowledging that
137 information on illegal elephant killing obtained from the villagers can be biased because of fear
138 of prosecution, we were careful how we introduced the topic. In any case, because the main aim
139 of this study was broad, we did not concentrate on determining levels of poaching. In our study
140 we did not attempt to establish the veracity of the answers given by interviewees. To uncover
141 false information coming from some interviewees, we would have had to use a method such as
142 unmatched count, or item count (Hinsley et al., 2019). This is a technique to improve, through
143 anonymity, the number of true answers to possibly embarrassing or self-incriminating questions.

144 Our research was undertaken on behalf of, and approved by, the Government of Togo
145 through its *Direction des Ressources Forestières, Ministère de l'Environnement et des*
146 *Ressources Forestières* in Lomé. We also had the full cooperation of the Togo Police. During
147 our forums we asked subjects about: 1) presence of elephants in the protected areas; 2) seasonal
148 movements; 3) periodicity of observations; 4) number of individual elephants regularly observed,
149 as well as 5) information on known illegal hunting events, if any. GPS coordinates were taken
150 for each locality (Appendix 1).

151

152 Field surveys

153 During both the dry season (Nov. – Mar.) and the wet season (Apr. – Sep.) in 2015-2017, we
154 made opportunistic observations of elephants during the course of our research on other
155 vertebrates within Togolese protected areas (see Segniagbeto et al., 2015, 2017, 2018). These
156 surveys included transects walked in forest and savannah habitats e.g. a total of 255.1 km in
157 Togodo National Park (for details of these transects, see Segniagbeto et al., 2018). Specifically,
158 the field team was composed of three people (G. H. Segniagbeto and two students), supported by

159 two trackers (local hunters, usually two hunters for each exit). The survey consisted of a vehicle
160 moving at a speed of 1 or 2 km/h to reduce the potential noise disturbances to the animals. This
161 traveling speed also made it possible to search for elephant dung. Field surveys started very early
162 in the morning (04–11 h) and/or in the late afternoon (15–19 h). We decided upon morning and
163 afternoon surveys to increase the probability of encountering elephants. Survey start and end
164 times were recorded to calculate observation effort. When an elephant was encountered, the
165 following information was noted: time, GPS location, group size (i.e. number of individuals) and
166 structure (males, females, subadults), behaviour (feeding, moving, eating, etc.), and the type of
167 habitat. Since surveys were repeated multiple times in the same protected area, with the potential
168 of pseudoreplication of individual elephant observations, in this paper we only refer to group
169 sizes (and not the total number of observed individuals) of elephants.

170

171 **3 | RESULTS**

172 Evidence of poaching of elephants in Togo

173 Data from OCRTIDB and other institutions involved in the fight against the illegal ivory trade
174 (Appendix 2) in Togo were classified as large (>100kg), medium (10-100kg) or small (\leq 10 kg)
175 seizures. Overall, ivory seizures were small (57.1%) 10.8% were medium, and 32.1% were large
176 seizures (see Appendix 2). We estimated that around 15.4 tons of ivory were seized between
177 January 2013 and August 2016 (Appendix 2). China was clearly the main destination country for
178 the illegal ivory (Figure 2).

179 Medium-sized seizures were reported in only a few cases, with ivory destined for Ghana
180 based on the shipping label. Given the often multi-country and complex routes involved in the

181 ivory trade, it is possible that Togo was only the intermediary destination. Perpertrators were
182 Togolese, Burkinabè, Ivorian and Guinean nationals (Figure 3).

183 Small ivory seizures involved small traders who kept the product in their shops either in
184 the raw form, but mostly as carved items (source: Togo police). Most traders claimed to be
185 unaware of the illegal status of ivory items. In most cases, the police would release them after
186 investigations were carried out to determine the severity of the crime (volume of ivory held) and
187 their complicity in trafficking operations. We were not able to obtain any information on the
188 destination of these products.

189 In addition, we obtained data on ivory objects originating from both Lomé port or airport
190 (data from MERF 2013 and from Togolese police) amounting to: 1) 24 tonnes of ivory from
191 1,500 objects seized by the CITES management authorities on 11 December 2012 in Malaysia on
192 a ship from Togo; 2) 70.5 kg of raw ivory, coming from Lomé and found on 12 September 2014
193 on board flight ET 608 at Hong Kong International Airport to Vietnam; and 3) 2,183.2 kg of
194 ivory pieces confiscated at the same airport on 22 July 2013. The total of ivory resulting from all
195 seizures was estimated at 41,651.5 kg of ivory during 2012-2016.

196 Although it is impossible to exclude the occurrence of other incidents, for all surveyed
197 protected areas in this study we only found evidence of one recent elephant poaching event
198 (Table 1). This was a solitary elephant that was illegally killed in 2014 in the Oti-Keran Park,
199 (Figure 4(B)). There was only one other known case of elephant killing in which a “problem”
200 animal (a very old individual no longer possessing tusks) was culled by the authorities, on 08
201 February 2017, in the village of Nangbani near Bassar (FMNP).

202

203 Presence and phenology of elephants in Togo

204 The presence of elephants was confirmed in the four protected areas by interviews and in
205 three by field surveys. Group sizes of elephants directly observed in surveys were similar to that
206 reported by interviewees within the same study areas (Table 1). However, in three parks (FMNP,
207 Djamdé and Abdoulaye), interviewees reported group sizes of between 2 and 17 individuals.
208 These numbers refer to individuals seen simultaneously by interviewees. Given that, in at least
209 some protected areas, the number of elephants is much higher than 17. For instance, in Fazao
210 Malfakassa National park, where during our surveys we encountered two individual elephants at
211 the Bounako checkpoint (00 ° 53'37.7"E, 09 ° 09'49.8"N; Figure 4 (A)), up to at least 50
212 individuals are consistently reported by interviewees. Elephant observations in most surveyed
213 localities were regular, occurring at least on a monthly basis, and, in some cases even on a daily
214 basis (Table 1). During fieldwork, we were informed that the most recent elephant sightings (2-3
215 individuals, including an adult female, an adult male and a young adult or a female with her calf)
216 at Osacré in the Oti-Keran National Park occurred in October and December 2016. Every year, at
217 least a group of two or three individuals can be found for some weeks around the Naboulgou
218 Barracks checkpoint in the Oti-Kéran National Park.

219

220 Interviews on poaching of elephants in Togo

221 All our interviewees (n = 410) in the twenty surveyed localities (Appendix 1) reported that
222 poaching did not occur anymore in the surroundings of their villages, although often referring
223 about recurrent cases of human-elephant conflict, especially in the buffer zones of FMNP (see
224 details in Atsri et al., 2019). 322 interviewees reported that elephant poaching is not ongoing
225 anymore because the tradition of using elephant parts has been totally lost in local medicine.

226

227

228

229 **4 | DISCUSSION**

230 Presence and recent history of elephants in Togo

231 Overall, about 9000 elephants are present in West Africa (Chase et al., 2016). According to the
232 last census (1991), a total of 200 savanna elephants were estimated in Togo, remaining in the
233 Fosse aux Lions, Oti-Keran and FMNP (MERF, 1996).

234 Based on interviewees from different villages, elephant poaching was currently perceived
235 as a rare event in Togo, independently of the surveyed region or protected area. Indeed, because
236 elephant population numbers are very low, poaching from outside the country is currently not
237 viable (too difficult to find animals for an adequate economic return). Confirmed information on
238 elephant illegal hunting dates back to the 1990s during the socio-political turmoil in Togo,
239 particularly in Oti-Kéran, Oti-Mandouri, Fosse aux Lions, and the Doungh Reserve. After this
240 period, there has been no confirmed elephant illegal hunting. In addition, despite the tradition of
241 using elephant parts in medicine, there is consensus that these practices are not used anymore.

242 None of the 410 people interviewed in the targeted villages had any knowledge of the
243 poaching of elephants. Nonetheless, in some local villages such as Takpapieni (Oti-Keran) and
244 Mandouri (Oti-Mandouri), villagers acknowledged that in the past other elephant parts, such as
245 bones and droppings, were used for traditional pharmacopoeia. These parts were used to treat
246 diseases such as measles, serious wounds, etc.

247 Habitats in the Fosse aux Lions, Oti-Keran and FMNP, have been affected by excessive
248 grazing, accentuated by the phenomenon of transhumance. This practice has accelerated the
249 degradation of these ecosystems and of their wildlife potential (Okoumassou et al. 2004, Bouché

250 et al. 2004; PNUD, 2012; Atsri et al., 2019). Also, some migratory corridors have now
251 disappeared (Fosse aux Lions and Doungh) due to human settlements and heavy deforestation,
252 with the consequent reduction of elephant habitat.

253 The Fosse aux Lions, a park located at the entrance to the town of Dapaong, had the
254 highest concentration of elephant despite its relative small size (1,650 hectares) in 1991 (MERF,
255 1996). However, elephants were systematically killed during the 1970s and 1980s, with a peak of
256 at least 14 illegally killed elephants in the 1990s (data from the former Regional Director for the
257 Environment and Forest Resources of the then Savannahs, the late Azote Hodabalo) and the near
258 total dispersal of the remainder to Ghana and Burkina Faso, including migration of those of the
259 Oti-Keran area to Burkina Faso (Hema et al., 2018).

260 The OKM, due to its strategic position, serves as a migration corridor for large mammals
261 traveling annually between the national parks "W" (Niger), Arly (Burkina Faso) and Pendjari
262 (Benin), and Ghana through the Fosse aux Lions and the Galangashie Reserve (Okoumassou et
263 al., 1998, 2004; Segniagbeto et al., 2014; Amori et al., 2016) , as is typical for elephants
264 elsewhere (Douglas-Hamilton et al., 2005).. This complex of Togolese protected areas no longer
265 contains resident elephant populations, since these were extirpated due to intense illegal hunting
266 in the 1990s.

267 Although the International Union for the Conservation of Nature (IUCN) actually only
268 recognises one species (*Loxodonta africana*), on the ground two species or subspecies are widely
269 recognized, thus we present data on the two taxa here. In the FMNP, there are still populations of
270 the two recognized subspecies of African elephants: *L. a. africana* and *L. a. cyclotis* (Atsri et al.,
271 2013; Amori et al., 2016). The coexistence of these taxa can be explained by the proximity of
272 this park to Kyabobo in Ghana, with the Koué River serving as a migration corridor for most

273 large mammals, including forest elephant. According to local residents, elephant herds
274 (comprised of 2-50 individuals) can be found along the buffer zone and even within the protected
275 area. However, there is no history of seasonal movements in this park with only very limited
276 local movements just to the outskirts of the park often in search of mangoes in the rainy season.
277 According to Thouless et al. (2016), there were about 600 elephants in FMNP in 2002, so the
278 population has dramatically declined in the last 15 years. However, the elephant-human conflicts
279 increased remarkably within the FMNP buffer zones during the last ten years (Atsri et al., 2019).

280 In the Abdoulaye Wildlife Reserve, a protected area of about 30,000 ha, there is a small
281 population of savannah elephants (4 individuals according to Thouless et al., 2016). During
282 fieldwork, the local people reported the presence of 3-5 individuals in the protected area that
283 mirrors Thouless et al.'s (2016) estimate. These animals were frequently seen by locals, even on
284 a monthly basis (Table 1).

285 Djamdè Wildlife Reserve is the smallest among the four surveyed protected areas (8 000
286 ha), situated close to FMNP in its northern part. Populations of savanna elephants move
287 seasonally in and outside the protected area. However, there is a group of three individuals who
288 are permanent in the reserve. Local communities observed these three individuals daily.

289

290 Importance of Togo in the illicit ivory trafficking

291 Our results concur with Milliken's et al. (2016) findings that Togo, alongside Malawi, Malaysia
292 and Singapore, are among the foremost countries involved in ivory trafficking i.e. where seized
293 quantities of ivory were in excess of 1000 kg between 2012 and 2016. These amounts are likely
294 to be underestimates. Nonetheless, our study confirms that Togo (and more specifically, the

295 international port of Lomé) is a clear exit point for ivory in West Africa, perhaps due to weak
296 law enforcement.

297

298 Origin of ivory traded in Togo

299 The relatively small population of elephants remaining in Togo, coupled with the evidence that
300 these animals are not, at least according to our surveys, subjected to intensive illegal hunting in
301 the country, lead us to believe that most of the seized ivory is not derived from Togolese
302 elephants. Under the authorization of the Togolese Government, a sample of 700.4 kg of tusk
303 ivory (seized from 06 August 2013) was genetically analysed and the results indicated that it
304 originated from several Central African countries, especially Cameroon and Gabon, that are two
305 of the countries hardest hit by the elephant poaching (Roca et al., 2015; Wasser et al., 2015).
306 However, radioisotope method analyses performed by Lawrence Livermore National Laboratory
307 in California (USA) on ivory from additional stocks showed that these included samples from a
308 few elephants killed in Togo. These elephants were certainly taken after 1990, and possibly as
309 recently as 2010. Thus, despite our field evidence, some illegal hunting may have been ongoing
310 up until recently in the country.

311 The apparent low intensity of illegal hunting of elephants in Togo is likely to have
312 resulted from the governmental political tools used to fight poaching, as well as the fact that
313 elephant numbers are so low that poaching from outside the country is currently not viable. One
314 of these tools is the control organized by the forestry services in collaboration with the security
315 services and which made it possible to seize several ivory objects from the company "Rose
316 ivoire" which specialized in the manufacture and sale of ivory art.

317

318 Conclusions

319 Our results suggest that the total population of elephants in Togo remains about 150 individuals.

320 Thouless et al. (2016) estimated that in 2006 there were 61 animals in Togo, and in 2015 between
321 74-114.

322 Our data has highlighted that currently Togo is a conduit for illegal ivory from West and Central
323 Africa to China as the main destination. The impact of the trade upon the Togo elephant
324 population appears to be limited at present. Nonetheless, we highlight the fact that even a very
325 limited offtake from the currently small population (especially if adults are targeted) can lead to
326 the extinction of the species in the country (Woodroffe & Ginsberg, 1998). This will have
327 considerable consequences on the functioning of the savannah habitats (Hema et al., 2017c) and
328 in turn affect the human communities (Gandwa et al., 2013; Challander & MacMillan, 2014).

329

330 **Acknowledgements.** This study was carried out in the framework of the master's studies of an
331 author (K.A.) at the University of Andalusia (Spain) on the management and conservation of
332 species subject to international trade (CITES). GHS was supported by funds from AGBO
333 ZEGUE ONG, and DD and LL by funds from IDECC (project 02/2016: 'dynamics of savannah
334 large mammals in West Africa'). This research project complied with the ethical guidelines
335 developed by the British Sociological Association, and was carried out under the support of the
336 Government of Togo through the 'Direction des Ressources Forestières, Ministère de
337 l'Environnement et des Ressources Forestières, Lomé', and with the cooperation of the Togo
338 Police. Five anonymous referees substantially improved the submitted draft.

339

340 CONFLICT OF INTEREST

341 The authors declare that they have no conflict of interest.

342

343 DATA AVAILABILITY STATEMENT

344 The data that supports the findings of this study are available on request from the corresponding
345 author. The data are not publicly available due to privacy or ethical restrictions.

346

347 **References**

348 AMORI, G., SEGNIAGBETO, G. H., ASSO, D., DECHER, J., GIPPOLITI, S. & LUISELLI, L. (2016) Non-
349 marine mammals of Togo (West Africa): an annotated checklist. *Zoosystema*, 38, 201 – 244.

350 ATSRİ, K.H., ABOTSI, K.E., KOKOU, K., DENDI, D., SEGNIAGBETO, G.H., FA, J.E. & LUISELLI, L.
351 (2019) Ecological challenges for the buffer zone management of a West African National
352 Park, *Journal of Environmental Planning and Management*, DOI:
353 10.1080/09640568.2019.1603844.

354 ATSRİ, H., ADJOSSOU, K., TAGBI, K., TCHANI, W., SEGLA, K., TEBONOU, G., ADJ ONOU, K., ABOUDOU,
355 M., KOUDANOU, M., AGBETI, M., BANLA, T. & KOMBATE, Y. (2013) *Inventaire faunique et*
356 *forestier, étude écologique et caractéristique du parc national de Fazao Malfakassa.*
357 *Rapport FFW/MERF Togo*, 96 p.

358 AULIYA, M., ALTHERR, S., ARIANO-SANCHEZ, D., BAARD, E.H., BROWN, C., BROWN, R.M.,
359 CANTU, J.C., GENTILE, G., GILDENHUYS, P., HENNINGHEIM, E., et al. (2016) Trade in live
360 reptiles, its impact on wild populations, and the role of the European market. *Biological*
361 *Conservation*. Doi <http://dx.doi.org/10.1016/j.biocon>.

362 BARNES, R.F.W. (1993) Indirect methods for counting elephants in forest. *Pachyderm* 16, 24–30.

363 BARNES, R.F.W. (1996) Estimating forest elephant abundance by dung counts. In: *Studying*
364 *Elephants (Ed. K. Kangwana)*. African Wildlife Foundation, Nairobi, Kenya.

365 BARNES, R.F.W. (2002) The problem of precision and trend detection posed by small elephant
366 populations in West Africa. *Afr. J. Ecol.* 40, 179–185.

367 BOUCHÉ, P., LUNGREN, C. G., HIEN, B. & OMONDI, P. (2004) *Recensement aérien total de*
368 *l'Ecosystème "W"-Arli-Pendjari-Oti-Mandouri-Kéran (WAPOK), rapport définitif.*
369 MIKE, Paris, 115 p.

370 BOUCHÉ, P., DOUGLAS-HAMILTON, I., WITTEMYER, G., NIANOGO, A.J., DOUCET, J.L. & LEJEUNE,
371 P. (2011) Will elephants soon disappear from West African savannahs? *PLoS One* 36,6,
372 e20619.

373 BRITISH SOCIOLOGICAL ASSOCIATION (2017). BSA Statement of Ethical Practice. Available at
374 https://www.britsoc.co.uk/media/24310/bsa_statement_of_ethical_practice.pdf.

375 Challander, W. S. & MacMillan, D.C. (2014) Poaching is more than an enforcement problem.
376 *Conservation Letters*, 7, 484–494.

377 CHASE, M.J., SCHLOSSBERG, S., GRIFFIN, C.R., BOUCHÉ, P.J.C., DJENE, S.W., ELKAN, P.W.,
378 FERREIRA, S., GROSSMAN, F., KOHI, E.M., LANDEN, K., OMONDI, P., PELTIER, A., SELIER,
379 S.A.J., SUTCLIFFE, R. (2016) Continent-wide survey reveals massive decline in African
380 savannah elephants. *PeerJ*. 4, e2354 <https://doi.org/10.7717/peerj.2354>.

381 CITES (2018) < https://www.cites.org/eng/prog/mike_etis.php>, last accessed 07 March 2018).

382 DOUGLAS-HAMILTON, I., KRINK, T. & VOLLRATH, F. (2005) Movements and corridors of African
383 elephants in relation to protected areas. *Naturwissenschaften*, 92, 158–163.

384 EUROSTAT (2015) *Import data for live reptiles (commodity group number 0106 20 00) to EU*
385 *member states, period 2004–2014.*
386 http://epp.eurostat.ec.europa.eu/portal/page/portal/statistics/search_database.

387 GANDIWA, E., HEITKÖNIG, I. M. A., LOKHORST, A. M., PRINS, H. H. T. & LEEUWIS, C. (2013)
388 Illegal hunting and law enforcement during a period of economic decline in Zimbabwe: A

389 case study of northern Gonarezhou National Park and adjacent areas. *Journal for Nature*
390 *Conservation* 21, 133-142.

391 HARWOOD, J. (2003) *West African Reptiles : species status and management guidelines for*
392 *Reptiles in international trade from Benin and Togo*. Report to the European Commission
393 prepared for the European Commission, Directorate General E - Environment, ENV E.3 -
394 Development and Environment, January 2003, UNEP-WCMC: i-v + 1-51.

395 HEMA, M.E., BARNES, R.F.W., DI VITTORIO, M., LUISELLI, L. & GUENDA, W. (2017c) Selective
396 disturbance by elephants (*Loxodonta africana*) on eight tree species in a West African
397 savannah. *Ecological Research*, 32, 205-214..

398 HEMA, M.E., BARNES, R.F.W. & GUENDA, W. (2010a) Distribution of savannah elephants
399 (*Loxodonta africana africana* Blumenbach 1797) within Nazinga game ranch, southern
400 Burkina Faso. *African Journal of Ecology*, 49, 141–149.

401 HEMA, M.E., BARNES, R.F.W. & GUENDA, W. (2010b) The seasonal distribution of savana
402 elephants (*Loxodonta africana africana* Blumenbach 1797) in Nazinga Game Ranch,
403 southern Burkina Faso. *Pachyderm*, 48, 33–40.

404 HEMA, E.M., DI VITTORIO, M., BARNES, R.F.W., GUENDA, W. & LUISELLI, L. (2017a) Detection
405 of interannual population trends in seven herbivores from a West African savannah: a
406 comparison between dung counts and direct counts of individuals. *African Journal of*
407 *Ecology*, 55, 609-617..

408 HEMA, E.M., DI VITTORIO, M., PETROZZI, F., LUISELLI, L. & GUENDA, W. (2017b) First
409 assessment of age and sex structures of elephants by using dung size analysis in a West
410 African savannah. *European Journal of Ecology*, 3, 1-8.

411 HEMA, E.M., SIRIMA, D., NIAGABARÉ, B., NAMA, N., PETROZZI, F., DI VITTORIO, M., GUENDA, W.
412 & LUISELLI, L. (2018) Raiding or not raiding: a study of the ecological correlates of
413 human-elephant conflict at Nazinga Game Ranch (Burkina Faso). *Revue d'Ecologie*
414 *(Terre et Vie)*, 73, 3-11.

415 HENSCHER, P., COAD, L., BURTON, C., CHATAIGNER, B., DUNN, A., MACDONALD, D., SAIDU, Y.
416 & HUNTER, L.T.B. (2014) The Lion in West Africa Is Critically Endangered. *PLoS One*
417 9:e83500. 10.1371/journal.pone.0083500.

418 HINSLEY, A., KEANE, A., ST. JOHN, F.A.V., IBBETT, H. & NUNO A. (2019) Asking sensitive
419 questions using the unmatched count technique: Applications and guidelines for
420 conservation. *Methods in Ecology and Evolution*, 10, 308-319.

421 HUNTER, N., MARTIN, E. & MILLIKEN, T. (2004) Determining the number of elephants required
422 to supply current unregulated ivory markets in Africa and Asia. *Pachyderm* 36, 116-128.

423 JACHMANN, H. & BELL, R.H.V. (1984) The use of éléphant droppings in assessing numbers,
424 occupance and âge structure: a refinement of the method. *African Journal of Ecology* 22,
425 127–141.

426 LUISELLI, L., STARITA, A., CARPANETO, G.M., SEGNIAGBETO, G.H. & AMORI, G. (2016) A short
427 review of the international trade of wild tortoises and freshwater turtles across the world
428 and throughout two decades, *Chelonian Conservation and Biology* 15, 167-172.

429 MALLON, D.P., HOFFMANN, M., GRAINGER, M.J., HIBERT, F., VAN VLIET, N. & MCGOWAN, P.J.K.
430 (2015) *Analyse de situation de l'UICN concernant la faune terrestre et d'eau douce en*
431 *Afrique centrale et de l'Ouest*. Document occasionnel de la Commission de la sauvegarde

432 des espèces de l'UICN n° 54. Gland, Suisse et Cambridge, Royaume-Uni : UICN. x +
433 162 pp.

434 MEREM, E. C., TWUMASI, Y., WESLEY, J., ISOKPEHI, P., FAGEIR, S., CRISLER, M., ROMORNO, C.,
435 HINES, A. OCHAI, G. S., LEGGETT, S., NWAGBOSO, E. (2018). Assessing the menace of
436 illegal wildlife trade in the Sub Saharan African Region. *Advances in Life Sciences* 8: 1-
437 25.

438 MERF (Ministère de l'Environnement et des Ressources Forestières) (1996) *Premier rapport*
439 *national de la Convention des Nations unies sur la Diversité Biologique*. Government
440 Press, Lomé, Togo.

441 MERF (Ministère de l'Environnement et des Ressources Forestières) (2014) *Cinquième rapport*
442 *national de la Convention des Nations unies sur la Diversité Biologique*. Government
443 Press, Lomé, Togo.

444 MILLIKEN, T. BURN, R.W., UNDERWOOD F.M. & SANGALAKULA, L. (2013) *ETIS Report of*
445 *TRAFFIC (CITES Document No. COP16 Doc. 53.2.2 (Rev))*. Geneva. CoP16 Doc. 53.2.2
446 (Rev. 1). 30p.

447 MILLIKEN, T., UNDERWOOD, F.M., BURN, R.W. & SANGALAKULA, L. (2016) *The Elephant Trade*
448 *Information System (ETIS) and the Illicit Trade in Ivory: A report to the 17th meeting of*
449 *the Conference of the Parties to CITES*. CoP17 Doc. 57.6 (Rev. 1) Annex. 29 p.

450 OKOUMASSOU, K., BARNES, R.F.W & SAM, M. (1998) The distribution of elephants in north-eastern of
451 Ghana and north of Togo. *Pachyderm*, 26, 52-60.

452 OKOUMASSOU, K., DURLLOT, S., AKPAMOU, K. & SEGNIAGBETO, H. (2004) Impacts humains sur
453 les aires de distributions et couloirs de migration des éléphants au Togo. *Pachyderm* 36,
454 69-79.

455 PNUD (2012) *Renforcement du rôle de conservation du système national d'aires protégées (AP)*
456 *du Togo*. PIMS PNUD FEM n° 4220, 62 p.

457 PFEFFER, P. (1996) *Pourquoi toutes les populations d'éléphants d'Afrique doivent rester en*
458 *annexe I de la CITES ?*. Ministère Français de l'Environnement, Paris-France.

459 RBS EMEA (2017) *Lomé Container Terminal in Togo*. [http://www.rbs-emea.com/success-](http://www.rbs-emea.com/success-stories/lome-container-terminal-in-togo/)
460 [stories/lome-container-terminal-in-togo/](http://www.rbs-emea.com/success-stories/lome-container-terminal-in-togo/) [accessed 16 August 2017]

461 ROCA, A.L., ISHIDA, Y., BRANDT, A.L., BENJAMIN, N.R., ZHAO, K. & GEORGIADIS, N.J. (2015)
462 Elephant natural history: a genomic perspective. *Annual Review of Animal Biosciences* 3,
463 139-167.

464 ROTH, H.H. & DOUGLAS-HAMILTON, I. (1991) Distribution and status of elephants in West
465 Africa. *Mammalia* 55, 489-527.

466 SEGNIAGBETO, G. H. (2009) *Herpétofaune du Togo: Taxinomie, Biogéographie*. Thèse de
467 doctorat. Univ. Lomé (Togo) & MNHN Paris (France). Tome I : 1-172 & Tome II : 1-
468 192.

469 SEGNIAGBETO, G. H. (2014) *Diagnostic sur la chasse et le prélèvement des gibiers dans les*
470 *zones périphériques rétrocedées du parc national Oti-Kéran*. Projet TC / IUCN-PACO,
471 Lomé, Togo.

472 SEGNIAGBETO, G. H., TRAPE, J-F., DAVID, P., OHLER, A-M, DUBOIS, A & GLITHO, I. A. (2011)
473 The snake fauna of Togo: systematics, distribution, and biogeography, with remarks on
474 selected taxonomic problems. *Zoosystema*, 33, 325-360.

475 SÉGNIAGBETO, G. H., ASSOU, D. & KODA, K. (2015). — *Evaluation du potentiel de mammifères dans le*
476 *Parc national de Togodo, la forêt sacrée de Godjinmé et les 5 mares d’Afïto*. Projet N°: 13.9003.8
477 de la GIZ-Togo, Lomé, Togo, 65pp.

478 SEGNIAGBETO, G. H., TRAPE, J-F., AFIADEMANYO, K, ROEDEL M-O., OHLER, A., DUBOIS, A.,
479 DAVID, P., MEIRTE, D., GLITHO, A., PETROZZI, F. & LUISELLI, L. A. (2015) Checklist of
480 the lizards of Togo, (West Africa), with comments on systematics, distribution, ecology,
481 and conservation. *Zoosystema* 37, 381 – 402.

482 SÉGNIAGBETO, G. H., ASSOU, D., KODA, K. D. AGBESSI, E. K. G., DENDI, D., LUISELLI, L., DECHER, J. &
483 MITTERMEIER, R. A. (2017) Survey of the status and distribution of primates in Togo (West
484 Africa). *Biodiversity* doi: <https://doi.org/10.1080/14888386.2017.1404930>.

485 SEGNIAGBETO, G.H., ATSRI, K.H., DELAGNON, A., ELIKPLIM, A.K., GBETEY, A.K., AMORI, G.,
486 DENDI, D., DECHER, J. & LUISELLI, L. (2018) Local distribution and density estimates of
487 primates in the Transboundary Reserve of the Mono river, Togo (West Africa). *Revue*
488 *d’Ecologie (Terre et Vie)*, in press.

489 THOULESS, C. R., DUBLIN, H. T., BLANC, J. J., SKINNER, D. P., DANIEL, T. E., TAYLOR, R. D.,
490 MAISELS, F., FREDERICK, H. L. & BOUCHÉ, P. (2016) *African Elephant Status Report*
491 *2016: an update from the African Elephant Database*. Occasional Paper Series of the
492 IUCN Species Survival Commission, No. 60 IUCN / SSC Africa Elephant Specialist
493 Group. IUCN, Gland, Switzerland.

494 TOGO (MINISTERE DE L'ENVIRONNEMENT ET DES RESSOURCES FORESTIERES) & USA (US FISH
495 AND WILDLIFE SERVICE) (2003) *Strategie pour conservation des populations d'elephants*
496 *au Togo*. IUCN, Gland, Switzerland. Available at:
497 https://cmsdata.iucn.org/downloads/str_wtg0305_fr.pdf

498 WASSER, S. K., BROWN, L., MAILAND, C., MONDOL, S., CLARK, W., LAURIE, C. & WEIR, B.S.
499 (2015) Genetic assignment of large seizures of elephant ivory reveals Africa's major
500 poaching hotspots. *Research Reports*, 349 (6243), 83 – 87.

501 WOODROFFE, R. & GINSBERG, J.R. (1998) Edge effects and the extinction of populations inside
502 protected areas. *Science*, 280, 2126-2128.

503 WORLD BANK (2017) data available at : <
504 <http://www.worldbank.org/en/country/togo/overview>>; last accessed : 30 december 2017
505

506 Table 1: Results of field surveys (performed during 2015-2017) and interview surveys
 507 (performed during 2017) on the presence of elephants in Togo's protected areas. Number of
 508 individual elephants and groups that were recorded directly in surveys are given in parentheses.
 509 All other data were obtained from interviews. Annual = once per year.

Protected area	Area (ha)	No. persons interviewed	Elephant presence	Seasonal displacements	Observation period	No. Individuals/group	Poaching
Oti-Kéran & Oti-Mandouri	179 000	140	Yes	Yes	Annual	2-3 (2)	No
Fazao-Malfakassa	192 000	190	Yes	Yes	Monthly/daily	2- 17 (2)	No
Djamdé	8 000	48	Yes	Yes	Daily	3 (3)	No
Abdoulaye	30 000	32	Yes	Yes	1-2 months per year	3- 5	No

510
 511

512 **FIGURE LEGENDS**

513

514 Figure 1. Distribution of study sites in relation to the main road network and to the protected
515 areas in Togo.

516

517 Figure 2. Quantity of seized ivory in Togo, by country of destination, 2013-2016. Source of data:
518 Togo police.

519

520 Figure 3. Nationality of traffickers in relation to the amount of seized ivory (years 2013-2016).
521 Note that Togolese, or joint ventures between Togolese and other nationals (for instance,
522 Chinese, Vietnamese, Beninese, etc), dominate in the illegal trafficking arena. Source of data:
523 Togo police. Abbreviations: CI = Côte d'Ivoire; Gu = Guinea; Bu = Burkina Faso.

524

525 Figure 4: (A) elephant seen in the Fazao-Malfakassa National Park (Bounako, photo Agbodji);
526 (B) elephant hunted in the Oti-Kéran National Park, year 2014 (photo Agbo-Zegue).

527