


Please cite the Published Version

Assou, Délagnon, Elwin, Angie, Norrey, John, Coulthard, Emma, Megson, David , Ronfot, Delphine, Auliya, Mark, Segniagbeto, Gabriel H, Martin, Rowan O and D'Cruze, Neil (2021) Trade in African Grey Parrots for Belief-Based Use: Insights From West Africa's Largest Traditional Medicine Market. *Frontiers in Ecology and Evolution*, 9. 612355

DOI: <https://doi.org/10.3389/fevo.2021.612355>

Publisher: Frontiers Media SA

Version: Published Version

Downloaded from: <https://e-space.mmu.ac.uk/627213/>

Usage rights:  [Creative Commons: Attribution 4.0](https://creativecommons.org/licenses/by/4.0/)

Additional Information: This is an Open Access article published in *Frontiers in Ecology Evolution*, published by Frontiers, copyright The Author(s).

Data Access Statement: World Animal Protection

Enquiries:

If you have questions about this document, contact openresearch@mmu.ac.uk. Please include the URL of the record in e-space. If you believe that your, or a third party's rights have been compromised through this document please see our Take Down policy (available from <https://www.mmu.ac.uk/library/using-the-library/policies-and-guidelines>)



Trade in African Grey Parrots for Belief-Based Use: Insights From West Africa's Largest Traditional Medicine Market

Délagnon Assou^{1,2}, Angie Elwin³, John Norrey⁴, Emma Coulthard⁴, David Megson⁴, Delphine Ronfot⁵, Mark Auliya^{5,6}, Gabriel H. Segniabeto^{1,2}, Rowan O. Martin^{7,8} and Neil D'Cruze^{3,9*}

¹ Laboratory of Ecology and Ecotoxicology, Department of Zoology and Animal Biology, Faculty of Sciences, University of Lomé, Lomé, Togo, ² Togolese Society for Nature Conservation (AGBO-ZEGUE NGO), Lomé, Togo, ³ World Animal Protection, London, United Kingdom, ⁴ Department of Natural Science, Ecology and Environment Research Centre, Manchester Metropolitan University, Manchester, United Kingdom, ⁵ Department Herpetology, Zoological Research Museum Alexander Koenig, Bonn, Germany, ⁶ Department of Conservation Biology, Helmholtz Centre for Environmental Research GmbH-UFZ, Leipzig, Germany, ⁷ World Parrot Trust, Hayle, United Kingdom, ⁸ FitzPatrick Institute of African Ornithology, DST/NRF Centre of Excellence, Department of Biological Sciences, University of Cape Town, Cape Town, South Africa, ⁹ Wildlife Conservation Research Unit, Department of Zoology, Recanati-Kaplan Centre, University of Oxford, Abingdon, United Kingdom

OPEN ACCESS

Edited by:

Tien Ming Lee,
Sun Yat-sen University, China

Reviewed by:

George Olah,
Australian National University, Australia
Thorsten Johannes Skovbjerg Balsby,
Aarhus University, Denmark

*Correspondence:

Neil D'Cruze
neildcruze@worldanimalprotection.org

Specialty section:

This article was submitted to
Conservation and Restoration
Ecology,
a section of the journal
Frontiers in Ecology and Evolution

Received: 30 September 2020

Accepted: 12 January 2021

Published: 04 February 2021

Citation:

Assou D, Elwin A, Norrey J, Coulthard E, Megson D, Ronfot D, Auliya M, Segniabeto GH, Martin RO and D'Cruze N (2021) Trade in African Grey Parrots for Belief-Based Use: Insights From West Africa's Largest Traditional Medicine Market. *Front. Ecol. Evol.* 9:612355. doi: 10.3389/fevo.2021.612355

Over 1.2 million wild-sourced African Grey parrots (*Psittacus erithacus*) have reportedly been traded internationally since the 1970s, the majority of which were taken from the wild with serious implications for conservation, animal welfare, and biosecurity. While international trade has mostly been for the pet trade, in some West African countries, Grey parrots are also consumed for belief-based use. However, to date there has been little research into the scale and scope of this trade and its drivers. Here, we explore multiple facets of the trade in Grey parrots for belief-based use through interviews with five vendors at the largest “fetish” market of West Africa in Togo. We focus on understanding the purpose of medicinal and spiritual use of Grey parrots, and the socio-economic dimensions of this trade. Parrot heads were the most valuable and most frequently traded body part over the last year (2017), sold primarily for the medicinal purpose of helping to “improve memory.” Feathers were the most common transaction for spiritual use, largely purchased for “attracting clients”, “love”, and to “help with divorce”. Whole parrots and parrot heads had also been traded for spiritual use, mainly for “good luck” and “protection from witchcraft”. Our findings suggest ~900 Grey parrots were traded over the past 10 years in the market. Most vendors perceived an increase in the rarity of Grey parrot body parts over the past 5 years, which may reflect increased restrictions on international trade and/or the deteriorating state of wild populations. Although the sale of feathers collected from beneath roosting sites does not negatively impact wild populations, the relatively low value of these parts compared with other parrot derivatives and live parrots, suggests there may be minimal opportunity to leverage market mechanisms to protect

wild populations through sustainable use. We identify a need for further investigations to examine the complex relationship between capture to supply the international pet market, a process in which many parrots die, and the local trade in belief-based use of derivatives.

Keywords: animal welfare, belief-based use, conservation, *Psittacus erithacus*, wildlife trade

INTRODUCTION

Parrots (order *Psittaciformes*) have long been hunted and captured in large numbers in the wild (Beissinger, 2001). Highly desired for their intelligence, beautiful appearance, and remarkable ability to mimic (Pepperberg, 2006; Pires, 2012), thousands of wild parrots are captured and traded around the world each year (UNODC, 2016), largely destined for the exotic pet trade where they can fetch US\$100's–1000's (Bush et al., 2014; Yin et al., 2020). Since the 1980s, around 12 million live parrots have been legally traded globally, two thirds of which were either captured from the wild or were of unknown origin (UNODC, 2016). Along with the detrimental impact on wild parrot populations (Martin et al., 2014; Annorbah et al., 2016; Valle et al., 2018), trade in wild parrots also has human health and biosecurity implications, including the potential spread of infectious diseases (Fogell et al., 2018) and invasive species (Cassey et al., 2004). Trapping and trading of wild parrots is also a major animal welfare concern; the mortality rate from capture to market is estimated to be as high as 40–60% for some species, such as the Grey parrot (*Psittacus erithacus*) (Fotso, 1998; McGowan, 2001; Clemmons, 2003).

Grey parrots are native to the lowland moist forests of tropical West and Central Africa. The IUCN recognizes two distinct allopatric species belonging to the *Psittacus* genus; Grey parrots (*P. erithacus*) and Timneh parrots (*P. timneh*) and we follow this taxonomy here. However, other authors recognize a continental nominotypic species comprising *Psittacus e. erithacus* and *P. erithacus timneh* (e.g., Clements et al., 2019). Timneh parrots are native to Guinea-Bissau, Guinea, Sierra Leone, Liberia, and western parts of the Ivory Coast (BirdLife International, 2020), while Grey parrots are patchily distributed from eastern Ivory Coast eastwards through the forest of central Africa to Tanzania and Kenya, and south to northern Angola; the species is considered at very low numbers or extinct for Togo and Benin (Martin et al., 2014; BirdLife International, 2020). The recent assessment of the status of the species in Togo indicates that the presence of the species in the country is doubtful, with all breeding farms agreeing that specimens exported from Togo are of Nigerian or Cameroonian origin (Segniagbeto, 2016). Of the 3.3 million African parrots reported in international trade since 1975, Grey and Timneh parrots have been among the most exploited species (Martin, 2018a). Over this period, net exports of over 1.2 million wild-sourced Grey and Timneh parrots were reported to CITES (Martin, 2018b). Population declines have been reported in multiple areas driven largely by unsustainable harvesting and habitat loss (Martin et al., 2014; Annorbah et al., 2016; Hart et al., 2016; Lopes et al., 2019; Valle

et al., 2020). In some countries (such as Ghana), population declines have been in excess of 90% over the past 25 years (Annorbah et al., 2016). Due to this ongoing and rapid decline, and the facilitating role of trade, Grey parrots were listed as Endangered on the IUCN Red List of Threatened Species in 2016 (BirdLife International, 2017) and were transferred to Appendix I of CITES in 2017 ending international trade in wild-sourced specimens for commercial purposes (CITES Notification No. 2016/063), although the Democratic Republic of Congo (DRC) were reserved from this change in CITES status of the species. However, despite the reservation, the DRC remained under an existing trade suspension and no permits for exports of wild Grey parrots for commercial purposes have been issued (CITES Notification 2018/01).

While international trade of Grey parrots has mostly been for the pet trade (Bush et al., 2014), in some West African countries they are also consumed for belief-based use (e.g., Fotso, 1998; Sodeinde and Soewu, 1999; McGowan, 2001; Clemmons, 2003; Williams et al., 2014; Ajagun et al., 2017). The use and trade of animal body parts (such as feathers, head, bones, feet, scales, etc.) for belief-based use has been of cultural importance for many people across the world for millennia (Alves and Rosa, 2013). Such practices remain widespread and varied, involving a wide range of species across all taxonomic groups (e.g., Soewu, 2008; Williams et al., 2014; Svensson et al., 2015). Compared to other continents, hunting pressure on wild animals for belief-base use is thought to be more intense in Africa, especially in central (Pauwels et al., 2003), southern (Simelane and Kerley, 1998; Whiting et al., 2013), and western (Atuo et al., 2015; Ezenwa et al., 2019) African countries where the domestic consumer demand for wild animals and their derivatives is particularly thriving (e.g., Williams et al., 2014; Djagoun et al., 2018). For instance, at least 350 bird species are targeted across the African continent for belief-based use (Williams et al., 2014). Birds are often sought to bring luck, fertility, intelligence, and money (among other things) (Nikolaus, 2011). It has been suggested that belief-based healers are widely consulted in many African countries because of the low ratio of university-trained medical doctors to patients (Williams, 2007), particularly in rural areas where belief-based healers are much more accessible (Williams, 2007; Williams and Whiting, 2016).

Although some aspects of this trade might be carried out sustainably, albeit in lieu of official management plans, and provide economic opportunities for rural and urban communities, the trade of wildlife for belief-based use can put pressure on wild populations presenting challenges for biodiversity conservation (Alves and Rosa, 2013; Williams et al., 2014; Buij et al., 2016; Moorhouse et al., 2020). From capture

through to sale and slaughter, this trade can also be associated with negative animal welfare impacts (Baker et al., 2013). Predictions show that Africa will be responsible for more than half of human global population growth by 2050 (United Nations, 2018). Internationally, there are also concerns about the increasing sourcing of wildlife from Africa for use in belief-based medicine in other regions of the world [e.g., African pangolins (*Manidae* spp.) for use in China (Ingram et al., 2018) and rhino horn for use in Vietnam (Milliken et al., 2012)]. In the decades to come, it is clear that Africa will play an increasingly important global role in shaping the scope and scale of the use of wildlife in belief-based medicine (Williams et al., 2014).

In order to develop effective strategies to mitigate the threats posed to wildlife by trade for belief-based use, it is crucial to understand the patterns and drivers associated with the utilization of species of conservation concern, such as Endangered Grey parrots (Challender et al., 2015; Martin, 2018a). However, to date, there has been little research into the nature of this trade and its potential implications. For instance, while the trade in wildlife for belief-base use in Southern Africa is thought to be significant and widespread, the socio-economic context of this trade remains poorly understood (but see Simelane and Kerley, 1998; Whiting et al., 2013; Williams and Whiting, 2016; Djagoun et al., 2018; Dossou et al., 2018). In Togo and other West African countries, studies are particularly rare (but see Fretey et al., 2007; Segniagbeto et al., 2013; D’Cruze et al., 2020).

Here we explore multiple facets of the wildlife trade for belief-based uses through interviews with vendors in the “Marché des Fétiches” (French for fetish market), situated in Lomé (the largest fetish market in West Africa), Togo. We focus on understanding the purpose of belief-based use of Grey parrots, and the socio-economical context of this trade.

MATERIALS AND METHODS

Survey Area

The Marché des Fétiches is situated in Akodessewa in the eastern part of Lomé, the capital city of Togo (Segniagbeto et al., 2013). Since the late 1990s, the Marché des Fétiches has grown to be the biggest market for belief-based medicine in West Africa (Segniagbeto et al., 2013). As of 2018, there were 12 different stalls in operation at this location that were staffed by ~60 individuals. Eight of the stalls were involved directly in the sale of wildlife derivatives, and the others provided consultations for customers. Although wild meat is sold at other markets in Lomé, it has not been openly observed for sale at the Marché des Fétiches (D’Cruze et al., 2020). The market ultimately services the urban population from the city, as well as rural and urban healers and consumers from neighboring areas seeking to purchase products they are unable to source locally (Segniagbeto et al., 2013).

The market was moved from Bè market “Marché de Bè” to Akodessewa in 1998, and since 2013 has also operated as a tourist attraction. As such the throughput and turnover of some wildlife derivatives may be low in comparison to other markets elsewhere (with parts of some species remaining at stalls for years, serving as ornaments to draw tourist attention, with only small pieces being sold at irregular intervals). Wildlife trade is conducted openly

at the market even though some species are protected under national legislation (Segniagbeto et al., 2013; D’Cruze et al., 2020).

Data Collection

Interviews were conducted by four local field staff asking a set of predetermined questions that included open-ended, closed and multiple-choice questions (see **Supplementary Material**). Interviews were conducted in Ewe, Fon, and French and later translated into English. Interviews were carried out with vendors at five of the eight stalls that were in operation selling wildlife derivatives at the time, all of which had been previously observed to have sold parrot derivatives. Vendors were interviewed in September (22nd–23rd) 2018. Vendors that were willing to participate in the study were identified through a process of chain referral (Newing, 2010), whereby participants recommended other potential participants or asked others to take part.

In accordance with the British Sociological Association Statement of Ethical Practice (BSA [British Sociological Association], 2017), informed consent was obtained verbally from every survey participant prior to the interview, participants were made aware of their rights to voluntarily participate or to decline, no identifying participant or household data were collected and the database collated was entirely anonymous. In addition, vendor stands were coded in the database and names are not reported to further protect study participants from harm or discrimination (John et al., 2016).

Interviews involved questions focused on Grey parrots based on vendor recollections of their own trade activity (see **Supplementary Material**). Questions focused on specific body parts sold, purpose and price per item, source country, estimated number of animals sold, customer type [tourists (one visit), causal customers (<five visits per year), and regular customers (>five visits per year)], and species availability (a mean “availability score” was calculated based on respondents answers to the question on how available Grey parrots were now compared to 5 years prior) (see **Supplementary Material**).

Data Analysis

All data analysis was performed in R statistical software (R Core Team, 2020). Descriptive statistics were used to examine patterns in parrot sales, including part of parrot sold, cost, source, sales availability, and type of customer. The number of parrots sold per year per vendor across three time periods [last year (2017), 2–5 years ago (2013–2016), and 6–10 years ago (2008–2012)] was compared using an ANOVA (data were normally distributed: Shapiro-Wilk test, $P = 0.05$, $W = 0.88$) to assess any pattern of change in sales in recent years (e.g., whether sales were increasing or decreasing).

RESULTS

Interviews were conducted with five vendors (three men and two women), ranging between 17 and 45 years in age. Vendors indicated that they were from the Fon ($n = 3$) and Watchi tribes ($n = 2$), living in households of between two and six individuals, with between zero and four children. Some vendors were married ($n = 2$), others were single ($n = 3$), and all five were educated

TABLE 1 | Summary of respondent responses to questions regarding trade in Grey parrot (*Psittacus erithacus*) body parts.

Body part	Average cost (Medicinal)	Frequency	Average cost (Spiritual)	Frequency
Head	10.4 (9.0–14.5)	4	3.6	1
Feather (single)		0	2.2 (1.8–2.7)	5
Whole animal		0	10.8	1

Source	Where (Number of respondents)	Who (Number of respondents)
	Benin (4)	Hunter (2)
	Togo (3)	Middlemen (5)
	Ghana (1)	
	Nigeria (3)	

Sales period	Mean (range) parrot sales per year	Most frequent part sold
Last year (2017)	64 (10–100)	Head
2–5 years ago (2013–2016)	44 (16–90)	Feathers
6–10 years ago (2008–2012)	31 (2.5–92.5)	Feathers
Mean availability score	4.2	
Buyer (Number of respondents)	Regular Customer (5)	

Mean average cost (min–max) in USD and frequency reported by vendors is provided according to body part sold, type of use, source frequency (i.e., where and by who), along with estimated mean number of Grey parrots sold. The mean availability score (how available the species is compared to 5 years ago) could range from 1 (“a lot more”) to 5 (“a lot less”). West African CFA was converted to USD at an exchange rate of 0.0018.

to primary school level only. All five vendors were from Lomé, Togo, but had moved from Benin, and self-described themselves as belonging to the traditional religious belief (Vodou). All vendors described belief-base medicine as their primary source of income, and stated that they had been trading between 2 and 30 years, with an estimated income of between \$1,644 USD and \$20,552 USD per annum [this is compared to the annual minimum wage in Togo in 2017 (\$756 USD) and the average annual wage in 2018 (\$1,848 USD) (International Labour Organization, 2020), which suggests that this can be a lucrative business for some traders].

Table 1 provides an overview of vendor responses to questions related to Grey parrot trade for medicinal and spiritual use in Togo. Four of the five vendors mentioned the use of the “parrot heads” for medicinal purposes. All five vendors mentioned “feathers” in relation to spiritual use with one vendor referring to “parrot heads” and “whole parrots”. The red tail feathers (tail coverts) were the only feathers of the Grey parrot that the vendors referred to in terms of commercial value. Benin, followed by Togo, and then Nigeria were most cited as the main source country, with middlemen (cited by all five vendors) and

hunters ($n = 2$) cited as the main individuals used to source these body parts.

Vendors reported that “parrot heads” were the most frequently sold body part during the last year (2017), with feathers reported as being the most frequently sold body part in both the last 5 and 10 years prior to this. The most frequently cited type of buyer was “regular customers” ($n = 5$), rather than “people buying out of curiosity” ($n = 0$), and “tourists” ($n = 0$). The majority of vendors referred to the reduced availability of Grey parrot body parts [“a lot less” ($n = 3$), and “quite a few less” ($n = 1$)]. Although one vendor stated that there was “quite a few more” ($n = 1$).

One-way ANOVA revealed no significant difference in the number of Grey parrots sold (per vendor, per year) across the three different time periods (2017; 2013–2016; 2008–2012) ($F = 1.165$, $df = 2, 12$, $p = 0.345$). Pairwise Tukey *post-hoc* testing also revealed no significant differences between the time periods ($P > 0.05$). However, the estimated number of Grey parrots sold by vendors during 2017 was higher than the average per year reported both for the period 2013–2016 and 2008–2012, respectively (**Figure 1**).

The most frequent type of use reported by vendors was “parrot heads” for medicinal purposes to help “improve memory” ($n = 4$) (**Figure 2**). With regards to spiritual use, vendors stated that “feathers” were used by customers to help them with “attracting clients” ($n = 2$), “love” ($n = 2$), and to “help with divorce” ($n = 1$) (**Figure 2**). Vendors also reported that “whole parrots” ($n = 1$) and “parrot heads” ($n = 1$) were used as “protection from witchcraft” and for “good luck”, respectively.

DISCUSSION

Our study confirms that Grey parrots and their derivatives (heads and feathers) are being openly sold at the “Marché des Fétiches” in Togo for both medicinal and spiritual purposes (**Figure 3**). The vendors, all of which were from Benin, had in some cases relied on income from trade in wild animal derivatives for belief-based use for up to 30 years. According to the vendors, parrot heads were the most frequently traded Grey parrot body part over the last year (2017), the majority of which were sold for the medicinal purpose of helping to “improve memory”. With regards to spiritual use, Grey parrot feathers were the most common transaction, largely purchased for “attracting clients”, “love”, and to “help with divorce”. Parrot heads and whole parrots had also been traded for spiritual use over the past 10 years (2008–2018), the most cited purpose being for “protection from witchcraft” and for “good luck”, respectively. All transactions over the past 10 years had involved regular customers, indicating local demand for this trade, rather than purchases by tourists, despite the market operating as a tourist attraction since 2013. Vendors stated that parrot heads were the most valuable body part sold, and they could fetch several times the value of parrot feathers. The higher value of the head of birds (compared to other body parts) in belief-based medicine in Africa has also been documented for other bird species, such as vultures, eagles and hawks (e.g., Atuo et al., 2015). Interestingly, no vendors

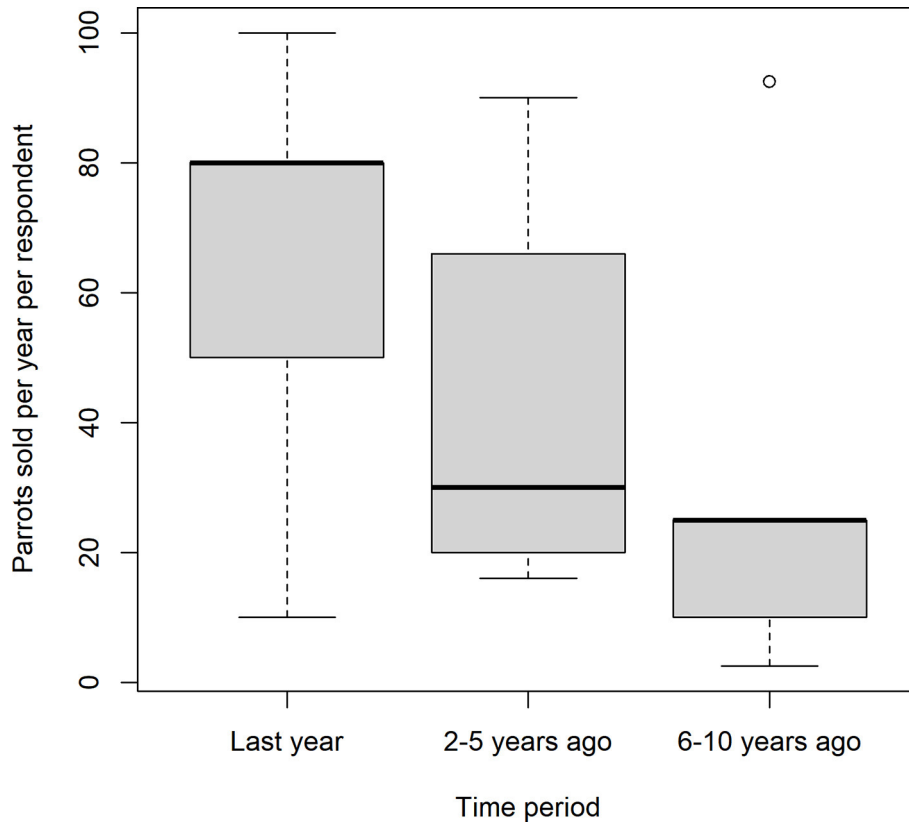


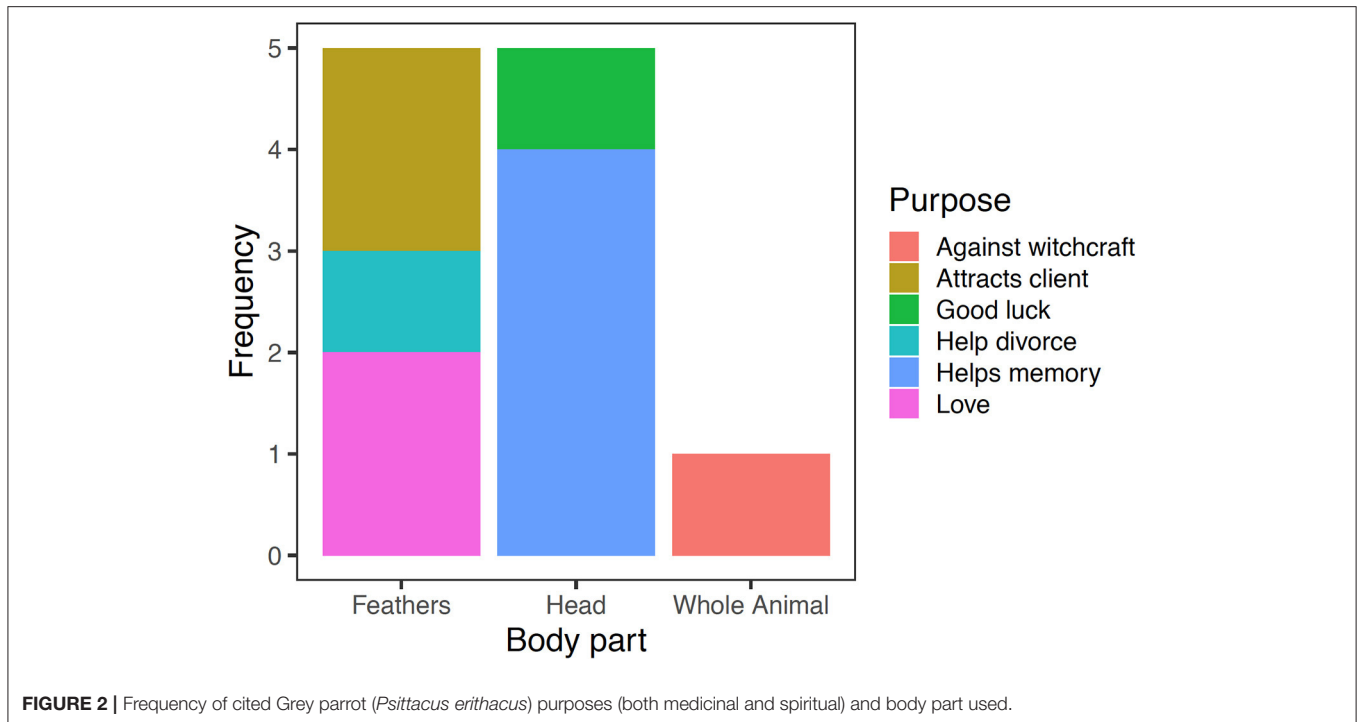
FIGURE 1 | Number of Grey parrots (*Psittacus erithacus*) sold per year per respondent across three periods [last year (2017), two to five years ago (2013–2016), and six to ten years ago (2008–2012)]. One-way ANOVA revealed no significant difference in the number of Grey parrots sold (per vendor, per year) across the three different time periods ($F = 0.98$, $df = 2, 12$, $p = 0.404$). Pairwise Tukey *post-hoc* testing also revealed no significant differences between time periods (2017: $P = 0.43$; 2013–2016: $P = 0.52$; 2008–2012: $P = 0.98$).

reported sales of parrot feathers for other cultural uses such as in traditional attire which is seen in other Grey parrot range states (Ezenwa et al., 2019).

Our findings highlight a number of conservation concerns associated with this type of trade in West Africa, given the Endangered status of Grey parrots (IUCN, 2020) due to rapid population declines, driven in part, by unsustainable capture and trade. Vendors stated that Benin and Togo were the main source countries for Grey parrot derivatives sold at the “Marché des Fétiches”. However wild populations in these countries are already considered to be negligible or extinct (CITES, 2016; Segniagbeto, 2016; BirdLife International, 2020) and there is currently no specific national legislation protecting Grey parrots in Togo. Even low levels of exploitation could be catastrophic for any remaining populations. Unsustainable harvesting in regions where populations are already drastically reduced could set Grey parrots on course for further extinctions locally (Valle et al., 2018). For example, in neighboring Ghana, populations have been estimated to have declined between 90 and 99% since the early 1990s (Annorabah et al., 2016). Concerningly, the majority of vendors perceived an increase in the rarity of Grey parrot derivatives over the past 5 years. Although this decline might reflect collapsing populations, it might also reflect

a reduced supply due to increased restrictions on international trade (Grey parrots were transferred to Appendix I of CITES in 2017, prohibiting cross border trade for commercial purposes). However, despite these increased restrictions, due to on-going consumer demand, it is possible that Grey parrot derivatives purchased by traders in the “Marché des Fétiches” may have been ultimately sourced from wild populations in Nigeria or central Africa, where Grey parrots are captured to supply the pet trade (Ezenwa et al., 2019).

There are also a number of animal welfare issues associated with the capturing and trade of wild parrots. Our results indicate that ~900 Grey parrots were sold at the “Marché des Fétiches” by the vendors in this study over the past 10 years. It is likely that many of the parrots whose derivatives were on sale at the market would have suffered to some degree, either during capture, transportation or slaughter (McGowan, 2001; Baker et al., 2013; Tamungang, 2016). While hunting and trapping methods may vary from country to country, inhumane capturing techniques have been reported in Cameroon, involving the use of glue to bind the feet and feathers of birds during capture (Tamungang, 2016). Furthermore, McGowan (2001) estimated that around 40% of Grey parrots trapped in Nigeria die before leaving their hunter. An additional 25% will die before reaching a market,



often because young birds are removed from their nest too early (McGowan, 2001). High mortality rates of captured Grey parrots are also reported during transportation in Cameroon, with parrots often dying in transit because of physiological stress, and lack of food and drinking water (Tamungang, 2016).

Although the majority of captured wild parrots are destined for the international pet trade (Bush et al., 2014), the high pre-export mortality rates of captured Grey parrots would indicate that this trade is likely integrated and interrelated with the trade for belief-based use, which is based on the sale of parrot derivatives (Williams et al., 2014). The extent to which parrots may be trapped specifically for belief-based use or are trapped for the exotic pet trade (with those that die being sold to belief-based medicine market vendors), is not yet fully clear. However, there is some evidence of a cross-over between these two trades. For example, seized Grey parrots in Cameroon have been found to have had their tail feathers removed (Martin, R.O. 2020, personal communication, 1 September). While this could be to make them harder to identify by enforcement agencies, it is possible that the tail feathers are removed from the parrots to sell separately, further adding to the suffering of the trapped parrots. Alternatively, there is evidence that some lethal techniques are used to hunt Grey parrots for belief-based use. In Cameroon, for example, the use of chemical substances and catapults to shoot Grey parrots have been documented, along with the use of handheld explosives to kill flocks of parrots at feeding sites (Tamungang, 2016). This suggests that some level of direct killing of parrots for the trade in parrot derivatives does occur. The extent to which these two trades are integrated is a significant knowledge gap that will need to be addressed to help determine the degree of threat it poses to wild populations. In particular, more research is needed to identify the extent to which the supply

and demand for Grey parrot derivatives for belief-based use is driven by the number of parrots dying during the process of capture and trade for the pet market. In addition, in order to fully understand the animal welfare implications of this trade, more research is needed to identify how Grey parrots used in belief-based medicine are slaughtered and prepared.

Establishing the impact of belief-based medicine on wildlife is no easy task (Williams and Whiting, 2016). In particular, information provided by interviewees reporting on wildlife trade should be approached with caution, especially when illegal and/or unsustainable aspects may be involved (Newton et al., 2008; D’Cruze et al., 2018). For example, we recognize it is possible that interviewees may have exaggerated or underestimated (either intentionally or unintentionally) the volume of trade or profits generated from their involvement in the trade of Grey parrots for belief-based use at the Marché des Fétiches in Togo. Similarly, it is important to note that, while the younger respondents stated that they had been involved in the trade for a number of years, they were also in part reporting on historical trade activity based on local knowledge passed to them by more experienced vendors (mostly their parents), rather than solely on their own direct experiences. However, the main aim of this study was not to establish the full impact of this particular trade activity on the conservation of wild populations or the welfare of individual parrots, rather it was to better understand what Grey parrots might be used for (by consumers) so as to better inform and direct future research and efforts to protect remaining wild parrot populations. Consequently, although our interview-based approach involved a relatively small number of vendors, we believe that our findings provide valuable insights that can be used to inform future efforts to protect Grey parrots.



FIGURE 3 | Top left—image of people searching for feathers under a parrot roost in Nigeria (Rowan Martin/World Parrot Trust); top right and bottom left—images of Grey parrot (*Psittacus erithacus*) intended for commercial sale, Togo, West Africa (Neil D’Cruze/World Animal Protection); bottom right Grey parrot tail feather in Nigeria (Rowan Martin/World Parrot Trust).

Some aspects of the trade in Grey parrot body parts might be entirely sustainable and potentially support conservation and be non-detrimental for animal welfare. For example, the scarlet red tail feathers of Grey parrots are gathered by local people from beneath roosts in Nigeria and it has been suggested that trade in tail feathers may provide important incentives for communities living near to roosts to protect parrots from trappers. However, recent surveys in Nigeria have found that roosts that were used in this way in the early 2000’s are no longer present (Ezenwa et al., 2019) suggesting that current market structures do not lead to site protection as a result of sustainable use. As this study has illustrated, the value of tail feathers is often very small compared to the live bird or other body parts, and it is not clear whether there may be any models of sustainable harvest of feathers from beneath roosts that could yield conservation benefits. Furthermore, while gathering of feathers from beneath roosts provides a small income for communities living near to roost sites, this practice is only sustainable if there are healthy Grey parrot populations in the wild (Ezenwa et al., 2019).

The demand for Grey parrot derivatives for belief-based use could potentially be reduced through interventions which

promote the use of herbal alternatives as has been proposed for trade in other wild animal species in West Africa (D’Cruze et al., 2020). This would require engaging with relevant stakeholders including representatives of traditional medicine associations to identify alternatives. The use of red tail feathers in traditional attire is likely to require a different approach. In Bolivia, where feathers of the Critically Endangered Blue throated Macaw are used for cultural activities, a community-based conservation initiative, aimed at increasing the use and production of alternative headdresses with artificial feathers, has been turned into an opportunity to enhance pride and engagement with parrot protection (Salvatierra da Silva et al., 2016). There may be opportunities to do something similar among some key consumer groups in West Africa. Studies have shown that communities living near to roost sites in West Africa are often unaware of the conservation status and plight of the Grey parrot (McGowan, 2001; Ezenwa et al., 2019). Working with local communities to raise awareness and to emphasize and promote the cultural and economic value of thriving wild populations of parrots in West Africa may help to reduce unsustainable hunting pressure, population declines (Ezenwa et al., 2019) and negative impacts on parrot welfare.

DATA AVAILABILITY STATEMENT

The raw data supporting the conclusions of this article will be made available by the authors, without undue reservation.

ETHICS STATEMENT

Ethical approval was not provided for this study on human participants because the study was conducted in accordance with the British Sociological Association Statement of Ethical Practice (BSA [British Sociological Association], 2017). Informed consent was obtained verbally from every survey participant prior to the interview, participants were made aware of their rights to voluntarily participate or to decline, no identifying participant or household data were collected and the database collated was entirely anonymous. In addition, vendor stands were coded in the database and names not reported to further protect study participants from harm or discrimination. Written informed consent for participation was not required for this study in accordance with the national legislation and the institutional requirements.

AUTHOR CONTRIBUTIONS

ND'C, DA, MA, and GS: conceptualization. ND'C, DA, and DR: methodology. EC, DM, and JN: formal analysis and visualization. DA and DR: investigation and resources. ND'C and DA: data

curation. AE: writing—original draft preparation. AE, ND'C, DA, and RM: writing—review and editing. ND'C and GS: supervision. All authors have read and agreed to the published version of the manuscript.

FUNDING

JN, DM, EC, DR, and MA received a grant from World Animal Protection to carry out this research.

ACKNOWLEDGMENTS

We wish to thank all of the vendors and Mark Dako (a local guide) at the Marché des Fétiches for their participation and patience during our study. We also thank all of the Masters students from the Ecology and Wildlife Management programme, from the Laboratory of Ecology and Ecotoxicology, Faculty of Sciences, University of Lomé (Kossivi Inès Akagankou, Afi Florence Konko and Ayaovi Doh Agomedje-Hounfodji) who helped us to conduct the survey. Finally, we sincerely thank Agbo-Zegue NGO for providing necessary logistics for the study.

SUPPLEMENTARY MATERIAL

The Supplementary Material for this article can be found online at: <https://www.frontiersin.org/articles/10.3389/fevo.2021.612355/full#supplementary-material>

REFERENCES

- Ajagun, E. J., Anyaku, C. E., and Afolayan, M. P. (2017). A survey of the traditional medical and non-medical uses of animals species and parts of the indigenous people of Ogbomoso, Oyo State. *Int. J. Herb. Med.* 5, 26–32. Available online at: <https://www.florajournal.com/archives/2017/vol5issue3/PartA/6-1-9-396.pdf> (accessed January 20, 2021).
- Alves, R. R. N., and Rosa, I. L. (eds.). (2013). *Animals in Traditional Folk Medicine: Implications for Conservation*. Berlin: Springer Berlin Heidelberg.
- Annorbah, N. N. D., Collar, N. J., and Marsden, S. J. (2016). Trade and habitat change virtually eliminate the Grey Parrot *Psittacus erithacus* from Ghana. *Ibis* 158, 82–91. doi: 10.1111/ibi.12332
- Atuo, F. A., Timothy, J. O., and Peter U. A. (2015). An assessment of socio-economic drivers of avian body parts trade in West African rainforests. *Biol. Conserv.* 191, 614–622. doi: 10.1016/j.biocon.2015.08.013
- Baker, S. E., Cain, R., Van Kesteren, F., Zommers, Z. A., D'Cruze, N., and Macdonald, D. W. (2013). Rough trade: animal welfare in the global wildlife trade. *BioScience* 63, 928–938. doi: 10.1525/bio.2013.63.12.6
- Beissinger, S. R. (2001). "Trade of live wild birds: potentials, principles, and practices of sustainable use," in *Conservation of Exploited Species*, eds J. D. Reynolds, G. M. Mace, K. H. Redford, and J. G. Robinson (Cambridge: Cambridge University Press), 182–202.
- BirdLife International (2017). *European Birds of Conservation Concern: Populations, Trends, and National Responsibilities*. Cambridge: BirdLife International.
- BirdLife International (2020). *Species Factsheet: Psittacus erithacus*. Available online at: <http://www.birdlife.org> (accessed September 29, 2020).
- BSA [British Sociological Association] (2017). *Statement of Ethical Practice*. Belmont: BSA Publications. Available online at: www.britisoc.co.uk/media/24310/bsa_statement_of_ethical_practice.pdf (accessed January 20, 2021).
- Buij, R., Nikolaus, G., Whytock, R., Ingram, D. J., and Ogada, D. (2016). Trade of threatened vultures and other raptors for fetish and bushmeat in West and Central Africa. *Oryx* 50, 606–616. doi: 10.1017/S0030605315000514
- Bush, E. R., Baker, S. E., and Macdonald, D. W. (2014). Global trade in exotic pets 2006–2012: exotic pet trade. *Conserv. Biol.* 28, 663–676. doi: 10.1111/cobi.12240
- Cassey, P., Blackburn, T. M., Russell, G. J., Jones, K. E., and Lockwood, J. L. (2004). Influences on the transport and establishment of exotic bird species: an analysis of the parrots (Psittaciformes) of the world. *Glob. Change Biol.* 10, 417–426. doi: 10.1111/j.1529-8817.2003.00748.x
- Challender, D. W. S., Harrop, S. R., and MacMillan, D. C. (2015). Understanding markets to conserve trade-threatened species in CITES. *Biol. Conserv.* 187, 249–259. doi: 10.1016/j.biocon.2015.04.015
- CITES (2016). "Convention on international trade in endangered species of wild fauna and flora," in *Seventeenth Meeting of the Conference of the Parties (Johannesburg)*. Available online at: <https://cites.org/eng/cop/17/doc/index.php> (accessed September 29, 2020).
- Clements, J. F., Schulenberg, T. S., Iliff, M. J., Billerman, S. M., Fredericks, T. A., Sullivan, B. L., et al. (2019). *The eBird/Clements Checklist of Birds of the World: v2019*. Available online at: <http://www.birds.cornell.edu/clementschecklist/download/> (accessed September 29, 2020).
- Clemmons, J. R. (2003). *Status Survey of the African Grey Parrot (Psittacus erithacus timneh) and Development of a Management Program in Guinea and Guinea-Bissau*. Geneva: CITES, 23pp. Available online at: <http://www.cites.org/eng/com/ac/22/E22-10-2-A1.pdf> (accessed August 10, 2020).
- D'Cruze, N., Assou, D., Coulthard, E., Norrey, J., Megson, D., Macdonald, D. W., et al. (2020). Snake oil and pangolin scales: insights into wild animal use at "Marché des Fétiches" traditional medicine market, Togo. *Nat. Conserv.* 39, 45–71. doi: 10.3897/natureconservation.39.47879
- D'Cruze, N., Singh, B., Mookerjee, A., Harrington, L. A., and Macdonald, D. W. (2018). A socio-economic survey of pangolin hunting in Assam, Northeast India. *Nat. Conserv.* 30, 83–105. doi: 10.3897/natureconservation.30.27379

- Djagoun, C. A. M. S., Sogbohossou, E. A., Kassa, B., Akpona, H. A., Amahowe, I. O., Djagoun, J., et al. (2018). Trade in primate species for medicinal purposes in Southern Benin: implications for conservation. *Traffic Bull.* 30, 48–56. Available online at: https://www.traffic.org/site/assets/files/11356/bulletin-30_2-benin-primates.pdf (accessed January 20, 2021).
- Dossou, E. M., Lougbegnon, T. O., Houessou, L. G., and Codjia, J. T. (2018). Ethnozoological uses of common hippopotamus (*Hippopotamus amphibius*) in Benin Republic (Western Africa). *Indian J. Tradit. Knowl.* 17, 85–90. Available online at: <http://nopr.niscair.res.in/bitstream/123456789/43146/1/IJTK%2017%281%29%2085-90.pdf> (accessed January 20, 2021).
- Ezenwa, I. M., Nwani, C., Ottosson, U., and Martin, R. O. (2019). Opportunities to boost protection of the grey parrot in Nigeria. *Oryx* 53, 212–213. doi: 10.1017/S0030605319000024
- Fogell, D. J., Martin, R. O., Bunbury, N., Lawson, B., Sells, J., McKeand, A. M., et al. (2018). Trade and conservation implications of new beak and feather disease virus detection in native and introduced parrots: BFDV in native and introduced parrots. *Conserv. Biol.* 32, 1325–1335. doi: 10.1111/cobi.13214
- Fotso, R. (1998). Survey Status of the Distribution and Utilization of the Grey Parrot (*Psittacus erithacus*) in Cameroon. Vernier: Secrétariat CITES.
- Fretey, J., Segniabeto, G. H., and Souma, M. (2007). Presence of sea turtles in traditional pharmacopoeia and beliefs of West Africa. *Mar. Turt. Newsl.* 116, 23–25. Available online at: <http://www.seaturtle.org/mtn/archives/mtn116/mtn116p23.shtml> (accessed January 20, 2021).
- Hart, J., Hart, T., Salumu, L., Bernard, A., Abani, R., and Martin, R. (2016). Increasing exploitation of grey parrots in eastern DRC drives population declines. *Oryx* 50, 16–16. doi: 10.1017/S0030605315001234
- Ingram, D. J., Coad, L., Abernethy, K. A., Maisels, F., Stokes, E. J., Bobo, K. S., et al. (2018). Assessing Africa-Wide pangolin exploitation by scaling local data: assessing African pangolin exploitation. *Conserv. Lett.* 11:e12389. doi: 10.1111/conl.12389
- International Labour Organization (2020). *Statistics on Wages*. Available online at: <https://ilostat.ilo.org/topics/wages/#> (accessed January 5, 2021).
- IUCN (2020). *The IUCN Red List of Threatened Species*. Available online at: <https://www.iucnredlist.org> (accessed September 29, 2020).
- John, F. A. V. St., Brockington, D., Bunnefeld, N., Duffy, R., Homewood, K., Jones, J. P. G., et al. (2016). Research ethics: assuring anonymity at the individual level may not be sufficient to protect research participants from harm. *Biol. Conserv.* 196, 208–209. doi: 10.1016/j.biocon.2016.01.025
- Lopes, D. C., Martin, R. O., Henriques, M., Monteiro, H., Cardoso, P., Tchanchalam, Q., et al. (2019). Combining local knowledge and field surveys to determine status and threats to Timneh Parrots *Psittacus timneh* in Guinea-Bissau. *Bird Conserv. Int.* 29, 400–412. doi: 10.1017/S0959270918000321
- Martin, R. O. (2018a). The wild bird trade and African parrots: past, present, and future challenges. *Ostrich* 89, 139–143. doi: 10.2989/00306525.2017.1397787
- Martin, R. O. (2018b). Grey areas: temporal and geographical dynamics of international trade of Grey and Timneh Parrots (*Psittacus erithacus* and *P. timneh*) under CITES. *Emu Austral Ornithol.* 118, 113–125. doi: 10.1080/01584197.2017.1369854
- Martin, R. O., Perrin, M. R., Boyes, R. S., Abebe, Y. D., Annorbah, N. D., Asamoah, A., et al. (2014). Research and conservation of the larger parrots of Africa and Madagascar: a review of knowledge gaps and opportunities. *Ostrich* 85, 205–233. doi: 10.2989/00306525.2014.948943
- McGowan, P. (2001). *Status, Management, and Conservation of the African Grey Parrot *Psittacus erithacus* in Nigeria*. Geneva: CITES.
- Milliken, T., Shaw, J., Emslie, R. H., Taylor, R. D., and Turton, C. (2012). *The South Africa-Viet Nam Rhino Horn Trade Nexus*. Cambridge: Traffic, 134–136.
- Moorhouse, T. P., Coals, P. G. R., D’Cruze, N. C., and Macdonald, D. W. (2020). Reduce or redirect? which social marketing interventions could influence demand for traditional medicines? *Biol. Conserv.* 242:108391. doi: 10.1016/j.biocon.2019.108391
- Newing, H. (2010). *Conducting Research in Conservation: Social Science Methods and Practice*, 1st Edn. Abingdon: Routledge.
- Newton, P., Nguyen, T. V., Robertson, S., and Bell, D. (2008). Pangolins in peril: using local hunters’ knowledge to conserve elusive species in Vietnam. *Endanger. Species Res.* 6, 41–53. doi: 10.3354/esr00127
- Nikolaus, G. (2011). The fetish culture in West Africa: an ancient tradition as a threat to endangered bird life. *Trop. Vertebr. Chang.* World 57, 145–150.
- Pauwels, O. S. G., Rödel, M. O., and Toham, A. K. (2003). *Leptopelis notatus* (Anura: Hyperoliidae) in the Massif du Chaillu, Gabon: from ethnic wars to soccer. *Hamadryad* 27, 271–273. Available online at: https://www.pauwelsolivier.com/docs/Leptopelis_Chaillu_Soccer.pdf (accessed January 21, 2021).
- Pepperberg, I. M. (2006). Cognitive and communicative abilities of Grey parrots. *Appl. Anim. Behav. Sci.* 100, 77–86. doi: 10.1016/j.applanim.2006.04.005
- Pires, S. F. (2012). The illegal parrot trade: a literature review. *Glob. Crime* 13, 176–190. doi: 10.1080/17440572.2012.700180
- R Core Team (2020). *R: A Language and Environment for Statistical Computing*. Vienna: R Foundation for Statistical Computing. Available online at: <http://www.r-project.org/index.html> (accessed January 20, 2021).
- Salvatierra da Silva, D., Jacobson, S. K., Monroe, M. C., and Israel, G. D. (2016). Using evaluability assessment to improve program evaluation for the Blue-throated Macaw Environmental Education Project in Bolivia. *Appl. Environ. Educ. Commun.* 15, 312–324. doi: 10.1080/1533015X.2016.1237904
- Segniabeto, G. H. (2016). *Study on four species of fauna subject to international trade in Togo. CITES SC67 Doc. 15 Annexe 3*. Lomé: Ministry of the Environment and Forest Resources, 52p.
- Segniabeto, G. H., Petrozzi, F., Aidam, A., and Luiselli, L. (2013). Reptiles traded in the fetish market of Lomé, Togo (West Africa). *Herpetol. Conserv. Biol.* 8, 400–408. Available online at: https://www.researchgate.net/publication/277130099_Reptiles_traded_in_the_fetish_market_of_Lome_Togo_West_Africa (accessed January 20, 2021).
- Simelane, T. S., and Kerley, G. I. H. (1998). Conservation implications for the use of vertebrates by Xhosa traditional healers in South Africa. *South Afr. J. Wildl. Res.* 28, 121–126.
- Sodeinde, O. A., and Soewu, D. A. (1999). Pilot study of the traditional medicine trade in Nigeria. *TRAFFIC Bull.* 18, 35–40.
- Soewu, D. A. (2008). Wild animals in ethnozoological practices among the Yorubas of southwestern Nigeria and the implications for biodiversity conservation. *Afr. J. Agric. Res.* 3, 421–427. Available online at: https://www.researchgate.net/publication/228671991_Wild_animals_in_ethnozoological_practices_among_the_Yorubas_of_southwestern_Nigeria_and_the_implications_for_biodiversity_conservation (accessed January 21, 2021).
- Svensson, M. S., Ingram, D. J., Nekaris, K. A. I., and Nijman, V. (2015). Trade and ethnozoological use of African loriforms in the last 20 years. *Hystrix Ital. J. Mammal.* 26, 153–161. doi: 10.4404/hystrix-26.2-11492
- Tamungang, S. A. (2016). Challenges and conservation implications of the parrot trade in Cameroon. *Int. J. Biol. Chem. Sci.* 10, 1210–1234. doi: 10.4314/ijbcs.v10i3.26
- United Nations (2018). *United Nations: Population*. Available online at: <https://www.un.org/en/sections/issues-depth/~population/> (accessed January 20, 2021).
- UNODC (2016). *World Wildlife Crime Report: Trafficking in Protected Species*. Vienna: United Nations Office on Drugs and Crime. Available online at: https://www.unodc.org/documents/data-and-analysis/wildlife/World_Wildlife_Crime_Report_2016_final.pdf (accessed September 1, 2020).
- Valle, S., Collar, N. J., Barca, B., Dauda, P., and Marsden, S. J. (2020). Low abundance of the Endangered timneh parrot *Psittacus timneh* in one of its presumed strongholds. *Oryx* 54, 74–76. doi: 10.1017/S0030605319000802
- Valle, S., Collar, N. J., Harris, W. E., and Marsden, S. J. (2018). Trapping method and quota observance are pivotal to population stability in a harvested parrot. *Biol. Conserv.* 217, 428–436. doi: 10.1016/j.biocon.2017.11.001
- Whiting, M. J., Williams, V. L., and Hibbitts, T. J. (2013). “Animals traded for traditional medicine at the faraday market in South Africa: species diversity and conservation implications,” in *Animals in Traditional Folk Medicine*, eds R. N. Alves and I. L. Rosa (Berlin: Springer Berlin Heidelberg,), 421–473.
- Williams, V. L. (2007). *The design of a risk assessment model to determine the impact of the herbal medicine trade on the Witwatersrand on resources of indigenous plant species* (Doctoral dissertation). University of the Witwatersrand, Johannesburg, South Africa.

- Williams, V. L., Cunningham, A. B., Kemp, A. C., and Bruyns, R. K. (2014). Risks to birds traded for African traditional medicine: a quantitative assessment. *PLoS ONE* 9:e105397. doi: 10.1371/journal.pone.0105397
- Williams, V. L., and Whiting, M. J. (2016). A picture of health? animal use and the Faraday traditional medicine market, South Africa. *J. Ethnopharmacol.* 179, 265–273. doi: 10.1016/j.jep.2015.12.024
- Yin, R.-Y., Ye, Y.-C., Newman, C., Buesching, C. D., Macdonald, D. W., Luo, Y., et al. (2020). China's online parrot trade: generation length and body mass determine sales volume via price. *Glob. Ecol. Conserv.* 23:e01047. doi: 10.1016/j.gecco.2020.e01047

Conflict of Interest: The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

Copyright © 2021 Assou, Elwin, Norrey, Coulthard, Megson, Ronfot, Auliya, Segniagbeto, Martin and D'Cruze. This is an open-access article distributed under the terms of the Creative Commons Attribution License (CC BY). The use, distribution or reproduction in other forums is permitted, provided the original author(s) and the copyright owner(s) are credited and that the original publication in this journal is cited, in accordance with accepted academic practice. No use, distribution or reproduction is permitted which does not comply with these terms.