



Women and urban wildmeat trafficking in the Republic of Congo

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ABSTRACT

As a result of declining biodiversity and increasing rates of urbanization, the illegal urban wildmeat trade is projected to become an integral sector of the wildlife crime industry. Adequate assessment of urban wildmeat trafficking requires investigation into the roles and behaviors of individuals who engage in wildlife crimes. However, akin to much of wildlife crime literature, women's engagement within the urban wildmeat trade have received little investigation. The objectives of our investigation were to (1) explore relationships between women and wildlife products across the supply chain, and (2) determine whether a significant relationship exists between women and specific wildlife products. Through systematic social observations, we evaluate the gendered dimensions of urban wildmeat trafficking in the Republic of Congo between the urban centers of Brazzaville and Pointe-Noire. We place particular emphasis on species of conservation concern, namely great apes, African pangolins, and dwarf crocodiles. Results indicate that there are gendered variations at the species and the geographic level, indicating that women are sourcing and sending their products to different locations than men, and that women are specializing in trade of different species. We attest that urban wildmeat trafficking prevention strategies implement a gender-aware approach due to the unique ways that individuals engage with the industry and how that engagement is gendered.

1. Wildmeat consumption in megacities

Wildmeat was, and remains, a significant contributor to west and central African economies (Bowen-Jones et al., 2003). For centuries, wildmeat (also referred to as bushmeat) has been consumed by diverse peoples around the world, for diverse purposes, and often at sustainable levels. Today, urban wildmeat consumption represents a prestigious option for many consumers, with many willing to pay for this luxury meat despite having access to other affordable animal protein sources (see Nguyen et al., 2021; van Vliet et al., 2011). Wildmeat products, as a luxury urban good, have high sensitivity to consumer income (McNamara et al., 2019); higher levels of disposable income and demand can encourage illegal approaches to obtaining wildmeat. In particular, the rise and distribution of *megacities* (i.e., cities larger than 10 million people, Folberth et al., 2015) is of relevance to wildmeat conversations, and conservation, because it has paralleled the shift towards the unsustainable harvest (e.g., Alarape et al., 2021), and often illegal trade (e.g., Meseke et al., 2020) of wildmeat species. Research on illegal urban wildmeat trade (UWT) is growing, perhaps because illegal UWT has seen

a significant increase in local participation and geographic breadth in recent years (Akella and Allan, 2011; Brown et al., 2020). In the search for solutions to unsustainable and illegal UWT, the conservation community now views urban wildmeat trafficking as one form of wildlife crime (e.g., McEvoy et al., 2019). This research contributes to the extant literature by advancing discussion about the gendered roles of the illegal UWT.

2. Gendered roles and the urban wildmeat trade

Evaluation of UWT to date has suffered a severe lack in gender representation and analysis, perhaps due to the intricate structure of the UWT supply chain, but also dominant narrative of women being associated with committing “soft” crimes associated with the industry (i.e., food preparation), and men committing the “hard” crimes (i.e., trafficking). This dominant narrative of gender roles and expectations within UWT may have contributed to making it difficult to wholly examine the influence and role gender plays within this industry. We do know that gender roles may discourage or prohibit women from hunting

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wildmeat species, thus restricting women to other positions within the UWT supply chain. More detailed exploration into the motives underlying women's participation in wildlife crime, of which illegal UWT is one manifestation, does not appear to have been conducted based on our review of literature, nor has insight been gleaned into women's engagement in positions within the sector.

Wildlife crime research sometimes includes a gendered dimension, for example in advancing understanding about some gender-blind dimensions of counter wildlife trafficking policy implementation (Gore and Bennett, 2021; Haas and Ferreira, 2018), how crimes are committed in time and space (Kurland et al., 2017), where crimes may occur (Faulkner et al., 2018), and species-specific wildlife crime details (Masés-García et al., 2021; Ripple et al., 2016). The urban wildmeat trafficking (UWT) literature has also sometimes included a gendered dimension, for example in profiled case study explorations on the source and destination components of the supply chain; spaces and places where most offenders are known to be men (Tagg et al., 2018; Lindsey et al., 2013). The literature documents that men may hold majority roles in activities such as hunting and women serve multiple and complementary roles in other parts of the UWT supply chain, with one study finding that approximately 85 % of retail sales were associated with women-held roles such as wholesalers, market traders, and chop shop owners (Mendelson et al., 2006). Some women depend on UWT as a source of income; one study found approximately 85 % of 249 individuals identifying wildmeat trafficking as their primary occupation were women (Edderai and Dame, 2006), while Ngolela et al. (2023) found that the majority of profits from wildmeat sales among women went to medical expenses (90 %) and school fees (83.3 %). Women may serve as logisticians and organizers of UWT, helping to move wildmeat along trade routes alongside movement of gold, drugs, and ammunition in connection with military officers (De Merode and Cowlshaw, 2006). Lowassa et al. (2012) concluded that the gaps in knowledge about wildlife crime assume that men and women have conflicting, rather than complementary roles in wildlife trafficking. Research herein contributes insight about the roles of women in the illegal UWT with a focus on the species commonly used for non-essential consumption within megacities.

2.1. Women and urban wildmeat trafficking

Although women can constitute a minority group in criminal justice systems, essentializing conservation crime with men can result in women offenders—and their concerns, struggles and remedies—being ignored (Booth et al., 2021). This male-dominate bias in research also generally exists within the conservation crime literature (see Sollund, 2020a for examples and discussion). In some instances, the implications of the male-only focus results in processes of contrasting occupations of women to men pervasively reinforcing patriarchal expectations for workplace involvement within the wildlife crime sector (Sollund, 2013; Eagly and Steffen, 1984). Gender and power are interlocked and contribute to social operations across systemic and individual scales (Brubaker, 2021). Carpenter (2020) goes so far as to classify all conservation actions as an exercise of power. Within the context of illegal wildlife use, gender relations are often adjusted, contested, repeated, and re-oriented through governance processes that influence wildlife use across social and systemic scales (Nightingale, 2017). This ingrained patriarchal bias can have an impact on analyses of women's involvement in wildlife crimes which often take place within the household or private sphere (e.g., Davis, 2022; Seager, 2021), as well as further contribute to women's marginalization within society (e.g., Ntuli et al., 2021; Sollund, 2020b). Further, Shao et al. (2021) contested that overt male-focused generalizations of the wildlife crime workforce can also negatively influence offender assessments, particularly when it comes to men who commit wildlife crimes in China due to social contextualization of masculinity.

If sustainable conservation solutions are a goal and solutions are

based on evidence, it is logical to research *all* conservation crime offenders to understand, for example, what factors sustain wildlife crime in the face of intervention (Ayling, 2013), adversities that lead to wildlife crime engagement (Anagnostou et al., 2021; Peterson et al., 2017), or how alternative sentences such as restorative justice might be more widely used (Booth et al., 2021). Importantly, 'equal treatment of men and women does not result in equal outcomes' (Corston, 2007:16). Recognizing that women have different vulnerabilities and needs has implications for how the roles of women in wildlife trafficking are understood by conservation social science and subsequently addressed in sustainability-minded programs and policies.

In summary, prior research into the gendered dimensions of wildmeat trafficking has investigated the rural trade (Oso et al., 2023; Van Velden et al., 2020); health implications (Gaubert et al., 2024; Odo, 2022); and consumption patterns and preferences (Khongsavanh and Vang, 2020; Morsello et al., 2015), but has significantly lacked in gendered urban analyses. Moreover, the existing literature is insufficient to address the gendered dynamics of species handling, UWT roles, and the intersections. Therefore, we analyzed the complementary and contrasting relationships between men and women who engaged in the UWT industry in Brazzaville and Pointe Noire, Republic of Congo. Our hypothesis was that gender would be a factor of influence on the species being handled, the roles being performed, and on where products were being sourced and sent. To test this hypothesis, we analyzed the roles of gendered study participants, from a sample of 22 wildmeat markets in Pointe Noire and Brazzaville, Republic of Congo. The studied region provides an ideal setting for assessing the gendered dimensions of UWT because of the high population concentration in Brazzaville and Pointe Noire, as well as the growing consumer demand for wildmeat within these urban centers. Indeed, both cities are classified as megacities (population > 10 million), putting the wildmeat markets into the region's main urban hubs.

3. Methods

3.1. Species of conservation concern

Three groups of wildlife known to be involved in the UWT and serving as species of conservation concern were included in this research (see Table 1). First, great apes were considered any primate that was not a monkey. As such, we identified great apes as being either (1) Eastern Gorilla (*Gorilla beringei*), (2) Western Gorilla (*Gorilla gorilla*), (3) Bonobo (*Pan paniscus*), or (4) Chimpanzee (*Pan troglodytes*). All four of these species are listed as either critically endangered or endangered under the IUCN Red Book (IUCN, 2022). All species are listed as Appendix I species under the Convention on International Trade in Endangered Species (CITES) (CITES, n.d.). The African pangolin species include the white-bellied pangolin (*Phataginus tricuspis*), black-bellied pangolin (*Phataginus tetradactyla*), giant ground pangolin (*Smutsia gigantea*) and Temminck's pangolin (*Smutsia temminckii*) (IUCN, 2022). Pangolin trafficking in Africa is typically destined for meat or traditional African medicine (Zanvo et al., 2021). However, evidence suggests the existence of significant pangolin scale exports to Asian countries and the United States (Heinrich et al., 2016). Little data exists for pangolin populations, but the CITES trade in African pangolin species has continued to increase since 2000 (Heinrich et al., 2016). The expansion of the international trade of the four African pangolin species has resulted in all being listed as either endangered or vulnerable on the IUCN Red Book (IUCN, 2022). All pangolin species are listed under Appendix I under CITES (CITES, n.d.). The African dwarf crocodile (*Osteolaemus tetraspis*) is a small, reclusive crocodilian that has historically resided in wetlands across West and Central Africa (Eaton, 2010). The dwarf crocodile is important for rural inhabitants of Central Africa as both a food and economic resource (Eaton et al., 2009). Because of the dwarf crocodile's small size, non-aggressive nature, and survivability, it is routinely sought after to fuel the wildmeat demand in urban areas (Zoer, 2012). The dwarf

Table 1

Dwarf crocodiles, great apes, and pangolins were the species of interest for this research because they are species of conservation concern and are known to be trafficked into urban areas to meet non-essential demand for wildmeat in Brazzaville and Pointe Noire, the Republic of Congo.

Species	International Union for Conservation of Nature's Red List Profile	Wildmeat poaching and trafficking-related concerns
Eastern Gorilla (<i>Gorilla beringei</i>) (Plumptre et al., 2019)	Listed as <i>critically endangered</i> , included in international legislation, subject to international trade controls and management, threatened by residential and commercial development, agriculture, energy production and mining, transportation and service corridors, biological resource use, human recreation, civil unrest, fire, disease, and climate change.	Illegal hunting in connection to the wildmeat trade, mining and the commercial trade threaten the species' population.
Western Gorilla (<i>Gorilla gorilla</i>) (Maisels et al., 2018)	Listed as <i>critically endangered</i> , included in international legislation, subject to international trade controls and management, threatened by agriculture, energy production and mining, transportation and service corridors, biological resource use, disease, and climate change.	Illegal hunting that explicitly targets the species is minimal, with much of the poaching being opportunistic. The use of snares for other species poses a threat to Western Gorillas.
Bonobo (<i>Pan paniscus</i>) (Fruth et al., 2016)	Listed as <i>endangered</i> , included in international legislation, subject to international trade controls and management, threatened by residential and commercial development, agriculture, energy production and mining, biological resource use, civil unrest, disease, and climate change.	Taboos against bonobos exist in some regions, however, these taboos can be ineffective if poachers are not local.
Chimpanzee (<i>Pan troglodytes</i>) (Humle et al., 2016)	Listed as <i>endangered</i> , included in international legislation, subject to international trade controls and management, threatened by residential and commercial development, agriculture, energy production and mining, transportation and service corridors, biological resource use, disease, and climate change.	Illegal hunting explicitly for chimpanzees with the intention of obtaining wildmeat or sourcing infants for the pet trade. Chimpanzees can also be intentionally poisoned through retaliation for crop raiding.
White-bellied pangolin (<i>Phataginus tricuspis</i>) (Pietersen et al., 2019)	Listed as <i>endangered</i> , included in international legislation, subject to international trade controls and management, threatened by agriculture, energy production and mining, transportation and service corridors, biological resource use, and climate change.	Pangolins are typically trafficked internationally for traditional medicine in Asian markets, and domestically for cultural practices.
Giant ground pangolin (<i>Smutsia gigantea</i>) (Nixon et al., 2019)	Listed as <i>endangered</i> , included in international legislation, subject to international trade	Species is subject to extreme exploitation at both international and domestic scales.

Table 1 (continued)

Species	International Union for Conservation of Nature's Red List Profile	Wildmeat poaching and trafficking-related concerns
	controls and management, threatened by residential and commercial development, agriculture, energy production and mining, transportation and service corridors, biological resource use, civil unrest, and climate change.	Specifically, the pangolins are commonly found in wildmeat markets and used for traditional medicine. The full scale of the illegal trade is unknown.
Temminck's pangolin (<i>Smutsia temminckii</i>) (Pietersen et al., 2019)	Listed as <i>vulnerable</i> , included in international legislation, subject to international trade controls and management, threatened by agriculture, energy production and mining, transportation and service corridors, biological resource use, and climate change.	Species is threatened by hunting for local and increasingly international wildmeat markets and traditional medicine.
African dwarf crocodile (<i>Osteolaemus tetraspis</i>) (Crocodile Specialist Group, 1996)	Listed as <i>vulnerable</i> , included in international legislation, subject to international trade controls and management, with unclassified threats and trade uses.	N/A

crocodile is listed as vulnerable (VU A2cd) in the IUCN Red Book and considered an Appendix I species under CITES (Eaton, 2010; Crocodile Specialist Group, 1996).

3.2. Study area

The Republic of Congo is a highly urbanized country relative to other countries in Central Africa. More than half of the population of approximately 6 million people lives in cities. Urban donor projects in Brazzaville and Pointe-Noire have focused on increasing the proportion of paved and access to all-season roads, improving access to urban water and electricity services (World Bank, 2022). The urban growth rate exceeds that of the country mostly because of internal migration, which in turn supports strong rural-urban ties. Brazzaville and Pointe-Noire are the two largest cities by population size in the Republic of Congo, and both reflect French colonial influence in their urban planning.

Table 2

Characteristics of Brazzaville and Pointe Noire, Republic of Congo.

Characteristic	Brazzaville	Pointe Noire
Adjacent natural areas ^a	Congo River	Atlantic Ocean, Conkouati-Douli National Park
Climate	Tropical	Tropical
Approximate population (people/km ²) ^b	2,724,566	1,379,368
Ethnic group composition (%) ^c	Kongo (Bakongo) (40.5 %), Teke (16.9 %), Mbochi (13.1 %), foreigner (8.2 %), Sangha (5.6 %), Mbere/Mbeti/Kele (4.4 %), Punu (4.3 %), Pygmy (1.6 %), Oubanguiens (1.6 %), Duma (1.5 %), Makaa (1.3 %), Other and Unspecified (1 %)	
Size (km ²)	263.9	2130
International export partners (%) ^c	China (49 %), United Arab Emirates (15 %), India (6 %), Italy (5 %)	

^a Adjacent natural areas come from New World Encyclopedia.

^b Population estimates come from the World Population Review <https://worldpopulationreview.com/world-cities/pointe-noire-population>.

^c Ethnic group composition and international export partners comes from CIA World Factbook.

Brazzaville sits across the Congo River from Kinshasa, Democratic Republic of the Congo, a megacity with a 2023 population of over 17 million people. Brazzaville's administrative core city center is surrounded by residential section (Britannica, 2023).¹ The Republic of Congo is not densely populated and remains covered by tropical forests. The oil sector accounts for >80 % of the country's exports, and there remains a wealth of under-tapped mineral resources (World Bank Group, 2024). For more information about the composition of Brazzaville and Pointe Noire see Table 2.

3.3. Research approach

This research used systematic social observation (SSO) to help achieve its objectives. Systematic social observation of disorder is a criminological method for measuring disorder in public spaces, born out of the Chicago School of Urban Sociology (Sampson and Raudenbush, 1999). SSO was historically lauded as being a key measurement strategy for natural social phenomena; to be systematic, Reiss (1971) advocated for observation and recording that permits replication, and the means of observation must be independent of what is being observed. One alternative measurement strategy to SSO would be focus group discussions or surveys that ask residents or other stakeholders how much of a problem they perceive a disorder to be. However, one advantage of SSO over focus groups is that the former can be focused on different levels of social organization (e.g., people, markets, neighborhoods). The literature on drug trafficking reiterates that more direct observation of [drug seller] tactics significantly contributes to the literature because direct observation is fundamental to the advancement of knowledge (e.g., Piza and Sytsma, 2016). Observation offers a unique opportunity because recording procedures provide a permanent record amenable to later coding and reinterpretation based on emergent insights. Practically, disorder can be thought of as a direct cause of crime or part and parcel of crime itself. This latter conceptualization provides an opportunity to observe and systematically measure important manifestations of crime-related processes. Not all observations tap disorder, to be sure (Sampson and Raudenbush, 1999).

3.4. Data collection

Forty-five SSO events were carried out in 22 markets across Republic of Congo, particularly the two urban centers of Brazzaville and Pointe Noire. The markets surveyed were all within the city limits for both cities, within a 4-mile radius of the city center at a variety of compass point locations. The SSOs occurred between November 2018–February 2019 by a team of two trained observers who were randomly assigned to observe a market on a weekly basis. Sixty data collection measures (e.g., date, location, time, product) were predetermined by a team of researchers, law enforcement authorities, and conservationists with expertise and experience with wildmeat trade, women in conservation, and wildlife crime in Brazzaville. Observers were trained according to identical data collection procedures, responsible conduct in research, and field safety. The team were residents of the city and fluent in French; both were male and conducted observations together. Each member of the SSO team used identical protocols to independently debrief with a lead researcher after completing a market observation; the leader was solely responsible for transcribing data into a centralized password protected and encrypted database using callsigns for observers to minimize potential risks from breach of confidentiality or privacy to individuals working in markets, the observers, and researchers. Only data unlinked from callsigns were shared with the authors for analysis. To protect the identity of all individuals involved and comply with approved human subjects research protocols, markets cannot not be

identified in this manuscript. In total, 160 SSO were available for analysis. From this, we identified 145 study participants, representing 55 female participants and 90 male participants.

3.5. Research ethics and statement on gender

Gender is defined as a socio-cultural construction that is influenced by the lived experiences of individuals. This can be attributed to the notion that gender-based roles are not universal, whereas sex-based roles are (Seager, 2021). Biological sex and gender are separate entities but interact in ways that can be analyzed in the form of gender roles, gender identity, gender-based relationships, and gendered power dynamics. For the purposes of this study, we adhered to a binary categorization of gender for study participants. This was not done to ignore the existence of non-gender conforming individuals. This was done as the socio-cultural dynamics of our study site (1) did not allow for intimate conversations regarding individuals' gender identity, and (2) is not reflective of the sociocultural dynamics seen in other countries as they pertain to gendered expression beyond the binary. To these ends, we recognize that biological sex and gender are not synonymous and identify an opportunity for future studies to expand beyond the binary categorization of gender within wildlife crime spaces.

This study did not involve research that met the criteria for human subjects research and thus was determined to be exempt under 45 CFR 46.101(b) 2, 4 by the Michigan State University Human Subjects Protection Program.

3.6. Analysis

We used SSO data that was imported into STATA B.E. for analysis (Jakobsen and Mehmetoglu, 2022). We used frequency weights in our analysis to account for the multiple participant observations from the reports. Descriptive statistics were computed for wildlife trafficking activities, roles, species, and market locations by name. Nonparametric statistics were used because the nature of SSO renders data that is not normally distributed (Kraska-Miller, 2013). Contingency tables were constructed to analyze the relationships between gender and study variables pertaining to city location, UWT roles, and species handled. Chi-square and means comparisons were used to characterize women's roles in wildlife trafficking across source, transit, and destination geographies. Specifically, we utilized a pairwise correlation analysis to assess the strength of the relationships between gender and study variables of species, roles, and geographic location. These were further complemented with chi square tests to investigate whether a relationship existed between gendered study participants and other identified categorical variables within our study such as species, roles, and geographic location. Normality was assessed using the Kolmogorov-Smirnov test which is based on the maximum difference between a hypothetical and an empirical cumulative distribution (Massey Jr., 1951).

4. Results

4.1. City-level analysis

We first assessed whether there was a correlation between gender, UWT, and city location. Through pairwise correlation, with Bonferroni correction, we found that there was a significant positive correlation between gender and the city of Pointe Noire ($r(143) = 0.433, p < 0.01$) and a significant negative correlation between gender and the city of Brazzaville ($r(143) = -0.542, p < 0.01$). From this finding, we found that men were more likely to participate in UWT activities in Brazzaville than women ($\chi^2(1, N = 145) = 42.42, p = 0.00$). Alternatively, women were more likely to participate in UWT activities in Pointe Noire than men ($\chi^2(1, N = 145) = 27.14, p = 0.00$).

¹ <https://www.britannica.com/place/Republic-of-the-Congo/Demographic-trends>.

4.1.1. Brazzaville

One of the most notable source observations was the strategic use of public transportation for wildmeat movement and trafficking into Brazzaville city center. It was stated that on a public bus enroute to Brazzaville, just prior to the last pelage before the city, the bus stopped short, and several passengers jumped out, and began stashing meat from boxes into bags (Plowman, *personal communication*). This seems anecdotally typical of opportunistic wildmeat trafficking. Bushmeat is transported to specific location point, where it is then hidden to avoid the attention of law enforcement or other guardians. The source in this case stated that the driver did not seem to initiate this transition, but an assumption is that he was paid to stop.

4.1.2. Pointe Noire

Two types of wildmeat trafficking were noted for Pointe Noire. The first occurred between hunters and facilitators, who took the meat directly to Pointe Noire. This transportation was conducted overtly, and the meat was intended be smoked and chopped (i.e., parceled) before transportation. Once the facilitator arrived in the city, they sold the meat directly to a wholesaler or merchant. The other method of wildmeat trafficking was through “poaching to order” agreements between wealthy middle class wildmeat consumers and hunters.

4.2. Gender & UWT

To address our first objective, we sought to assess the relationships between gender and UWT roles and activities (Table 3).

We conducted a pairwise correlation, with Bonferroni correction, to assess the relationship between participant gender and the identified roles of buyer, facilitator, trafficker, and seller. From this, we found a moderately positive correlation between gender and the role of seller ($r(143) = 0.1817, p < 0.1$). We found a stronger negative correlation between the roles of seller and buyer ($r(143) = -0.323, p < 0.01$), facilitator ($r(143) = -0.432, p < 0.01$), and trafficker ($r(143) = -0.522, p < 0.01$).

To expand on these findings, we then conducted a chi square test to evaluate the relationship between gender and UWT activities. We found that there was no significant correlation between gender and UWT activities. However, we did find that there was a negative correlation between the sale of wildmeat and the facilitation of UWT ($r(143) = -0.342, p < 0.01$) and the sale of IWT ($r(143) = -0.482, p < 0.01$).

4.3. Traded species

In the illegal UWT, fresh, uncooked wildmeat commands a much higher price compared to meat that is already smoked. Fresh wildmeat can be stored by wholesalers for years in freezers, which are accessed or rented by the wholesalers themselves to ensure the longevity of their products. Given the findings above in Section 3.1, we wanted to assess whether there was a correlation between the two cities of Brazzaville and Pointe Noire, and the observed species. The species of interest that were observed, with the Lingala translation, from the SSOs include: pangolins (*kakolo*), porcupines (*nsimbilik*), monkeys (*makako*), African gray parrots (*kukulu* or *tchaku*), gorillas (*mokomboso*) and dwarf crocodiles (*likolo*). However, the range of possible species found throughout

wildmeat markets in the study area include chimpanzees (*mpumpu*), sea turtles (*nkoba* or *nzenze*), boas (*mboma* or *nguma*), and antelopes (*mboloko*, *ngandi*, or *mbuli*), among various species of insects. All prices for wildmeat products are sourced from key informants and SSOs.

Through Pearson’s chi square tests, we found that there was a significant negative correlation between Brazzaville and the following species/groups: insects ($r(143) = -0.345, p < 0.01$), porcupines ($r(143) = -0.422, p < 0.01$), and snakes ($r(143) = -0.3918, p < 0.01$). These findings indicate that these species were less likely to be destined for trade in Brazzaville. We also found a significant positive correlation between Pointe Noire and pangolins ($r(143) = 0.4028, p < 0.01$), insects ($r(143) = 0.636, p < 0.01$), porcupines ($r(143) = 0.805, p < 0.01$), snakes ($r(143) = 0.723, p < 0.01$), and turtles ($r(143) = 0.608, p < 0.01$). The cheapest wildmeat found in our study were ungulates, such as antelopes, and the most sought after and expensive were bushpigs. Bushpig meat is particularly profitable as the meat can be purchased in rural villages for as little as FCFA 1000–1500 (~1.60–2.40 USD), and then resold to rich consumers in the cities for up to FCFA 25000–35,000 (~40.81–57.13 USD) for a whole animal.

4.3.1. Dwarf crocodiles

Dwarf crocodiles were hunted by groups of 5–6 individuals, and in villages around the Lac Tele area, there are approximately 5–10 of these groups per village. Each of these groups went out hunting 6 times a month, and average 5 crocodiles per trip. Per month, this equated to roughly 4000 crocs from the villages around Lac Tele, all of which were taken alive. After harvesting, the crocs were sorted for sale by size, and bunched into bundles, referred to in Lingala as ‘mopiko’. Each ‘mopiko’ is between 4 and 5 crocs and are sold by the hunters for around 40–50,000 FCFA (~64.00–81.00 USD). These crocs were sold for their meat and were transported to Brazzaville via boat. In some of the observed markets, pieces of dwarf crocodiles would be sold for 1000 FCFA (~1.63 USD) and up to 18,000 (~29.38 USD) for a whole animal.

4.3.2. Pangolins

In the study area, awareness of pangolin scale value was highly variable. At the lower end of the Congo trade of pangolins, there was very little awareness of the alleged value of pangolin scales. Some hunters would even sell a pangolin (the entire animal, with scales) for FCFA 1000 (~1.62 USD). This differs going up the supply chain, as once the animal reaches the market end in urban centers, the pangolin could be sold for between FCFA 4500–8000 FCFA (~7.00–13.00 USD). This variation in price depended largely on the condition of the pangolin, whether it was fresh, scaled/unscaled, cooked, or chopped. Price variation was further reflected in the intricacies of Chinese presence in the area and increasing awareness of pangolin scale value. For instance, Etoumbi in Northern Congo, just south of Odzala, is a known hub of pangolin, wildmeat and other illegal wildlife trafficking activities. In Etoumbi, some restaurants have collected bags of pangolin scales and sold them to Chinese traders or Chinese construction workers.

In Brazzaville, the meat of pangolins is seen as a luxury item, and the trade here was generally orchestrated by women traders. The women in the Brazzaville UWT in pangolins would travel extensively to known locations in the north of the country where they would buy pangolin meat, and then travel back to Brazzaville where they would sell directly to restaurants and hotels. It is important to emphasize that this is not pre-ordered meat, but there existed a regular market for pangolin meat at high-end restaurants and hotels. The trade in pangolins in Brazzaville markets was very limited because of this direct relationship between traders and restaurants.

4.3.3. Gorillas

The trade of primates, particularly of gorillas, is a uniquely complex and carefully orchestrated operation. Gorilla poachers, who are a part of organized groups, will often spend 2–3 weeks in the bush, particularly around the Cabinda, Angola region. These organized poaching groups

Table 3
Weighted summary of UWT roles and study participants.*

Market	Women		Men	
	Frequency	Percentage	Frequency	Percentage
Buyer	1	25	3	75
Facilitator	1	14.3	6	85.7
Seller	38	33.3	76	66.7
Trafficker	5	50	5	50

* Women (n = 55), Men (n = 90), Total (n = 145).

would often have a communications link to the facilitator or group organizer using satellite phones. The weapons were either rented or supplied by village or community-based facilitators. When renting, the rent was paid in wildmeat, with a gorilla or chimpanzee carcass being accepted as payment for the rental of a firearm. Typically, poachers would take out entire gorilla troops because of gorilla behavior to collectively fight back on the ground, and would kill, smoke, and cut up the carcasses in the bush. The wildmeat would then either be (1) sold at the source, where an entire gorilla carcass could be sold for FCFA 35000–40,000 (~56.86–65.00 USD), or (2) be transported to Pointe Noire, where the price of the carcass, or pieces of the carcass, would increase exponentially. Gorilla skins and bones would often be used in traditional medicines, and oftentimes the poachers will keep the skins of the gorilla as a “trophy” of the hunt.

4.4. Gender & handled species

To address Objective 2, we first wanted to summarize the species that were being handled by our study participants in relation to their gender (Table 4).

We next conducted a pairwise correlation, with Bonferroni correction, to assess the relationship between participant gender and species. There was a positive correlation between participant gender and the handling of insects ($r(143) = 0.275, p < 0.1$), pangolins ($r(143) = 0.432, p < 0.01$), porcupines ($r(143) = 0.279, p < 0.1$), snakes ($r(143) = 0.313, p < 0.1$), and turtles ($r(143) = 0.285, p < 0.1$). There was a negative correlation between participant gender and the handling of dwarf crocodiles ($r(143) = -0.428, p < 0.01$).

We then conducted a chi-square test of independence to examine the relationship between gender and species handled. The relation between these variables were significant for pangolins ($X^2(1, N = 145) = 27.09, p = 0.00$), in which men were more likely than women to handle pangolins. This trend was further observed in men's handling of insects ($X^2(1, N = 145) = 10.99, p = 0.001$), porcupines ($X^2(1, N = 145) = 11.28, p = 0.001$), snakes ($X^2(1, N = 145) = 14.18, p = 0.00$), and turtles ($X^2(1, N = 145) = 11.77, p = 0.001$). Alternatively, women were more likely to handle dwarf crocodiles ($X^2(1, N = 145) = 26.55, p = 0.00$).

5. Discussion

Understanding the role and motivations of women in the wildlife crime sector can ultimately lead to more gender-aware intervention strategies which more adequately address biodiversity decline. In order to build the knowledge base and reduce risks to animals and people from UWT, the behavioral trends of wildlife crime offenders, accounting for their gender, can be delineated. Current wildlife crime analysis, by both conservationists and criminologists alike, often utilize the male experience as a baseline (Agu and Gore, 2020). This approach can be beneficial

in some cases such as developing poaching hotline programs (Leavitt et al., 2020) or policy implementation (Home, 2013), as men are often the ones doing the poaching (e.g., Lunstrum and Givá, 2020; Compaore et al., 2020). However, generalizing trends of engagement across the UWT or IWT supply chain, can lead to misinformation on the engagement of women within the industry.

Our primary contribution to the conservation literature is twofold: first, we advance knowledge about the ways that gender is an integral layer of analysis for wildlife crime investigations. Indeed, previous studies have mainly focused on gendered differences pertaining to income distribution and use (Coat et al., 2010), with little investigation into the complementary roles of men and women (Lowassa et al., 2012), or into the influence of broader systemic gender roles on wildlife crime involvement and impacts (e.g., Massé et al., 2022; Agu et al., 2021). Second, according to Kahler and Rinkus (2021), <1 % of articles addressing wildlife crime mention gender identity as either an integral part of the research or the gender identity of those involved in wildlife crime. Our study contributes to the literature of the gender dimensions of UWT and wildlife crime literature at large.

One of our most significant findings, and one most pressing for conservation, is that gendered differences in IWT and UWT product handling exists at the species level. For example, following the arrest of a female study participant, she was found to be in possession of a quantity of African Gray parrot feathers, some of which were packed into empty bottles, along with cooked parrot meat and parrot heads. The feathers are commonly used in traditional clothing and headdresses for local chiefs, while the heads are used in traditional voodoo or fetish practices, with the meat being locally consumed. Although this woman's trade of African Gray parrots is just one example, it illustrates an important element of the IWT of avian species that has not been well defined in the literature. Specifically, there is a dimension of IWT, particularly through the trafficking of endangered species, that is being practiced by women but is missing from broader analysis. Further, the trade in pangolin scales is highly masculinized (e.g., Shao et al., 2021; Malimbo et al., 2020), with exception for consumption practices or avoidance (e.g., Olmedo et al., 2022; Mouafo et al., 2021).

Sweeping generalizations often prove to be counterintuitive and thus counterproductive. In our investigation, we found that the engagement of women within the trafficking of pangolin meat and pangolin scales varied across markets, an insight that was only illuminated because of our gender-aware investigation. Understanding wildlife crime engagement through a gender-aware analysis at the species level can lead to more effective and intentional conservation interventions which more adequately account for women's engagement in the wildlife trade. Gender-awareness can help lead to insights into the myriad ways that women can be impacted by the UWT/IWT, from being unintended victims (e.g., Massé et al., 2021) to primary beneficiaries (e.g., Nana, 2022). These insights would not be accounted for if we had not implemented a gender-aware approach. Evidence about whether gender is a confounding factor of influence can enable more strategic capacity mitigation tactics that account for the motivations of the gendered offenders.

This investigation tells only a fraction of the case study story of UWT/IWT trafficking, as much of the trade is covert and requires further investigation. For instance, sources stated that much of the gorilla products were destined for trade in Pointe Noire. This observation, however, was not confirmed through chi square analysis, which revealed an *insignificant* correlation between the handling of primates and the city of Pointe Noire ($p > 0.5$). This lack of significance indicates that (1) the trade of gorillas, as well as other primates, is covert, thus requiring advanced and technical further investigation for any conclusion, or (2) gorillas, as well as other primates, are being sent to other locations. In either aspect, the tightening of security and increase in law enforcement activities in efforts to deter traffickers and trafficking, particularly for great ape meat, may have made many traffickers hide their operations to evade arrest. Additional research could help

Table 4
Weighted summary of observed species handling by study participants.*

Species	Women		Men	
	Frequency	Percentage	Frequency	Percentage
Birds	1	50	1	50
Bushpigs	6	75	2	25
Crocodiles	38	62.3	23	37.7
Elephant	0	0	15	100
Felines	0	0	1	100
Fish	0	0	5	100
Insects	0	0	16	100
Pangolin	3	6.67	42	93.3
Porcupines	4	12.5	28	87.5
Primates	26	36.6	45	63.4
Snakes	0	0	20	100
Turtles	0	0	17	100
Ungulates	39	37.5	65	62.5

* Women (n = 55), Men (n = 90), Total (n = 145).

equivocate this finding.

Within any working environment, women (and men) are subject to adhering to gendered expectations that are predetermined by limited access to opportunities and control due to their gender (Klein and Kress, 1976). This has extended into criminology literature, with women being considered more likely to experience crime victimization; less likely to engage in violent crimes; and less likely to be convicted (e.g., Walker et al., 2021; Marganski, 2019; Fridel and Fox, 2019). These patterns also persist within the wildlife crime sector (e.g., Sollund, 2022; Nurse and Wyatt, 2020). Indeed, some traffickers have noted the sexual vulnerability of women vendors to law enforcement seizures where women will sometimes have to 'pay back' loans with sexual services (Wieland, *personal communication*). Women are also found to benefit, both directly/indirectly, from wildlife crimes (e.g. Nana, 2022; Booth et al., 2021). This benefit scheme was apparent within our study in which women were presumably found to economically benefit from wildlife crimes, thus indicating that UWT intervention strategies emphasize gender-aware alternative livelihoods.

As human populations within urban areas rise, the need for women to independently supply income to themselves and their families also increases. Results may suggest that women are working in some capacity, indicating that UWT may be a means of supplemental income or a primary occupation for these individuals. However, it is also possible for women to begin to adapt and become business operators, which was observed and supported multiple times through source testimonies. These distinct dimensions of gendered power differentials may indicate the varying ability of women to engage with natural resources outside of consumptive practices, and to be doing so out of both necessity and out of economic generation, or other form of self-actualization. This may ultimately reflect a combination of joint capitalist, colonialist, and patriarchal dimensions of wildlife crime, and specifically urban wildmeat trafficking, which warrants further investigation. This investigation illustrates it is necessary to rectify a gendered analysis within wildlife crime analysis due to the power differentials experienced by women and how that affects their participation within the UWT industry.

6. Conclusion

Considering the differences in cultural and societal expectations, evaluations within the livelihood and functioning of wildmeat markets, and the events and activities surrounding the trade, equal evaluation of men and women's roles are necessary for a complete analysis of the UWT industry. Other studies follow a pattern of omitting gender considerations from analyses, which ultimately misrepresents the myriad roles women can and may hold within UWT. This stark difference in representation within sample data indicates a severe deficiency in investigations of gender as a factor within UWT and indicates that current evidence is not positioned to justly evaluate women's role within the industry as a whole. As this analysis shows, a more holistic view of the UWT is easily possible, and that begins with introducing gender-awareness into our analyses. In our investigation, we found that the gender dimension of the UWT existed at the species and geographic level. Because of these findings, we urge others to implement gender-aware analyses when investigating the UWT or the IWT. Ultimately, women within UWT can be subject to degrees of victimization from being engaged in the industry, and potentially at the hands of law enforcement. The heightening of UWT security measures must account for gendered differentiations of species handling, geographic location, and power dynamics which influence the ways that women are able to simultaneously benefit and be harmed by participating in UWT. Indeed, gender-aware analyses are maximally useful for a complete story of who is engaging *with*, and who is being impacted *by*, wildlife trafficking industries. In short, deconstructing the patriarchal expectations within the UWT is important for not only the preservation of wild species affected by the industry, but also the people who are engaging with this industry, and how their experiences are shaped by their gender.

CRedit authorship contribution statement

Aalayna R. Green: Conceptualization, Formal analysis, Writing – original draft, Writing – review & editing. **Christian Plowman:** Data curation, Writing – review & editing. **Robert Mwinyihali:** Writing – review & editing. **Michelle Wieland:** Writing – review & editing. **Meredith L. Gore:** Conceptualization, Formal analysis, Writing – original draft, Writing – review & editing.

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Data availability

The data that has been used is confidential.

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Appendix A. Supplementary data

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