Hunting, Fishing, and Ecosystem Functions and Services in the Congo Basin

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Abstract

Hunting and fishing have long been central to the traditions, culture, and livelihoods of rural communities in the Congo Basin, supporting both rural and urban populations. Wildmeat and freshwater fish are key protein and nutrient sources, central to both rural and urban diets, and support informal economies, employment, and traditional medicine. Culturally, they are embedded in ceremonies, prestige, and social cohesion. These activities are governed by a mix of customary and statutory laws, though traditional regulations have weakened over time and national laws, especially for inland fisheries, are often incomplete or outdated. Enforcement is uneven and weakening. Currently, wildmeat harvests, estimated at 1.6–11.8 million tons annually, are dominated by ungulates, rodents, and primates, while fish production, notably in the DRC, reaches about 230,000 t yearly, with high post-harvest losses. Both sectors feed a significant illegal international trade in bushmeat, fish, and exotic pets. Wildlife populations show marked decline from habitat disturbance and overexploitation: large mammals are scarce in hunted areas, replaced by small, resilient species; top predators and key herbivores are reduced; and inland fisheries face shrinking catches, smaller fish

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sizes, and market-driven pressures. Overhunting disrupts seed dispersal and ecosystem dynamics, while overfishing degrades aquatic biodiversity and habitats, with long-term catch declines of 65–80% threatening food webs and resilience. These losses endanger rural and Indigenous livelihoods, heighten nutritional insecurity, and expose communities to zoonotic disease risks through unsafe wildlife handling. Given the importance of these sectors in the Congo Basin, there is a need for integrated governance and management models that align human needs with ecological sustainability (see chapter 26).

Keywords

Hunting · Wildmeat · Fishing · Inland fisheries · Livelihoods · Cultural identity · Customary law · Statutory law

Introduction

In the Congo Basin, hunting and fishing have been an integral component of the traditions and cultural identity of rural communities for millennia (Abernethy et al. 2013; Dounias 2016; Fa and Shunk, 2024; Kandza et al. 2023; Walters et al. 2014; Wilkie et al. 2016).

Hunting and fishing activities are locally regulated through customary laws, which have largely eroded over time due to various factors that shape the way in which hunters and fishers comply with customary law (Mavah et al. 2022). At the national level, hunting and fishing practices are regulated by laws and regulations, most of which are incomplete or outdated, especially the inland fisheries sector that is often poorly regulated.

Clearly, hunting and fishing continue to play a major role in the food security, traditions, and livelihoods of rural and urban populations in Central Africa, despite a poor recognition of those sectors at national and regional levels and in food systems in general (Coad et al. 2019). In the meantime, hunting and fishing practices are increasingly leading to resource depletion with major impacts on ecosystems services, biodiversity, and local livelihoods (Abernethy et al. 2016; Ickowitz et al. 2024).

In this chapter, we first synthesize the most recent literature on the role of hunting and fishing in providing key ecosystem services. Then, we describe the legal and customary frameworks that regulate their practice. Subsequently, we synthesize available knowledge on the levels of offtake and the current status of terrestrial and freshwater wildlife populations. Finally, we discuss the ecological and livelihood impacts related to overexploitation.

Ecosystem Services Provided by Freshwater and Terrestrial Wildlife Throughout the Congo Basin

There are numerous ecosystem services provided by hunting and fishing in the Congo Basin, including as sources of food, income, medicine, and cultural significance (Coad et al. 2019; Ingram et al. 2021; Trefon 2023).

Food

In rural areas of the Congo Basin, wildmeat is often the primary source of animal protein, though fish also plays a major role in local diets (Abernethy et al. 2016; van Vliet et al. 2015, 2019, 2021). Wildmeat contributes significantly to nutritional security and dietary diversity, supplying proteins, fats, and minerals essential for both rural and urban populations (Coad et al. 2019; Ingram et al. 2021). For Twa hunter-gatherers in the Democratic Republic of Congo (DRC), wildmeat and honey are the most important forest resources (Cuni-Sanchez et al. 2019). In the DRC, where poverty levels are high, wildmeat remains the most affordable and widely consumed meat (Batumike et al. 2021; Van Vliet et al. 2012). Similarly, in Nigeria's Cross River region, over 90% of respondents had eaten wildmeat in the previous month, reflecting its status as the most preferred and frequently consumed meat (Friant et al. 2020). Among the Baaka people in Cameroon, hunting provides an estimated 7.5 t of meat annually per village, nearly half of which is consumed directly by hunters and their families (Martin et al. 2020).

Wildmeat is valued not only for its nutritional benefits (Rickenbach et al. 2017; van Vliet et al. 2022) but also for its taste and cultural significance (Fa et al. 2015; Fargeot et al. 2017; Semeki et al. 2014). In urban areas such as Bertoua and Ebolowa (Cameroon), wildmeat is perceived as tastier, healthier, and more prestigious than domestic meat (Nguyen et al. 2021). While urban consumption is often driven by preference rather than necessity, towns closely connected to hunting grounds with limited access to imported meat still rely on it as a staple. Some urban dwellers also attribute "wild power" to wildmeat, a quality not found in domestic animals (Ichikawa and Hattori 2016).

In Pointe Noire (Republic of Congo), wildmeat retains its popularity despite high prices, seen as a natural, healthy delicacy and status symbol (Chausson et al. 2019). In Port Gentil (Gabon), 24% of households reported wildmeat as their main source of meat, especially consumed on weekends (Bachand et al. 2015). Conversely, in cities like Kindu, Kisangani, and Bangui, smoked wildmeat is regarded as an affordable, readily available staple rather than a luxury, particularly where access to alternative proteins is limited (Batumike et al. 2021; Fargeot et al. 2017; Van Vliet et al. 2012). Patterns of preference and consumption in urban settings also vary according to gender, age, and wealth, reflecting broader socio-demographic influences (Chausson et al. 2019; van Vliet et al. 2021).

Alongside wildmeat, river fish are an equally critical protein source across the Congo Basin, providing essential nutrients such as omega-3 fatty acids, vitamins, and minerals that underpin health and well-being (Inogwabini 2014). Fish can account for over 50% of total protein intake in rural households, significantly contributing to diets, particularly for vulnerable groups (Béné et al. 2010). Small fish harvested from the large lakes of Central Africa are especially important due to their ease of preservation and transport: they are typically sun-dried whole, unlike larger fish that require gutting, salting, or smoking (Kolding et al. 2019).

Fishing also plays a critical role in livelihoods. In rural DRC, poorer households rely heavily on fishing, with women often contributing substantially to catches (Béné 2008). In northeastern DRC, species such as *Clarias*, *Labeo*, *Protopterus*,

Stolothrissa tanganyicae, *Limnothrissa miodon*, and *Distichodus* are among the most commonly consumed, ranking second only to wildmeat in importance (Van Vliet et al. 2019). During times of civil unrest or economic crisis, particularly in central DRC, fish became a fallback food source when forest mammals were overhunted or scarce (Kimura et al. 2012). Among the Bakwele of Cameroon, fishing remains an essential subsistence activity throughout the year, especially in the dry season when fish are easier to catch in shallow waters (Oishi 2010, 2016).

Income

Wildmeat is a crucial income source for rural and urban households across the Congo Basin, generating millions of dollars annually (Coad et al. 2019; Fa et al. 2022). Operating largely within the informal economy, the trade involves hunters, brokers, and traders (Van Vliet et al. 2019). In Cameroon alone, it is valued at around US$112 million per year (Lescuyer and Nasi 2016). Commercial hunters typically sell 35–89% of their catch, depending on market access and urban demand (Coad et al. 2019). Earnings vary widely by context. In the Yangambi landscape (DRC), hunters earn an average of $40 per month—twice the official minimum wage in 2017 (Van Vliet et al. 2019). Where wildlife remains abundant, hunting yields high profits with little material investment, attracting young men seeking stability. However, as populations decline and urbanization expands, reliance on hunting decreases. In Tchibanga (Gabon), hunters are turning to alternative livelihoods (Van Gils et al. 2019). Around Korup National Park (Cameroon), over 66% of hunters sell primarily to Nigerian markets (Ervis et al. 2024), while near Douala Edea National Park, hunting supports 13% of households (Fonkwo 2023). Wildmeat sales sustain rural economies by funding essentials such as school fees, healthcare, and food in places like Befale and Boende (DRC) (Ngolela et al. 2023). Demand peaks during the agricultural lean season, school year openings, and festivities. In urban areas with few job options, women increasingly engage in wildmeat trade, which, despite bribes and preservation costs, is considered less risky than farming. Kinship and ethnic networks underpin the trade, shaping ties with hunters, peers, and enforcement officers. In Cameroon, the trade has offered women greater economic independence and financial security (Randolph et al. 2022).

Fish is equally vital as a commercial resource. Freshwater fisheries underpin local economies across the Congo Basin, offering both income and stability (Brummet 2005). In the DRC, the inland fishing sector employs about 600,000 people, making it the country's largest job provider. It contributes an estimated USD 63.4–166.3 million annually to national GDP (FAO 2023). Small-scale freshwater fishers can be grouped into "full-time fishermen," who rely on specialized gear such as long lines and seines, and "farmer fishermen," who integrate fishing into broader livelihood strategies (Béné 2009). While the former are more productive, they are also more vulnerable to stock fluctuations, whereas the latter maintain more resilient but less efficient economies. Fish also plays a vital role in food security. Small fish, often sold in affordable portions, are eaten whole, including bones and viscera, providing

concentrated nutrients (Longley et al. 2014). Fishing households typically earn more than nonfishing households, highlighting its importance in poverty alleviation (Béné 2008). In Kinshasa markets, surveys recorded 20 fish species from 7 orders and 14 families, with imported oceanic species such as *Trachurus capensis* and *Sardina madarensis* more frequently sold than local catches (Tchomba et al. 2020).

Medicine

In the Congo Basin, wild animal products serve not only as a key food source, but also as a key component in traditional medicinal practices. Various animal parts are utilized in traditional, with each species or part believed to possess specific healing properties. Examples include hard parts like bones, shells, and teeth, internal organs, and other elements like fur, blood, and bile (Friant et al. 2022). This knowledge underpins the health and healing practices in these communities (Mpoyi et al. 2024; Swiacká et al. 2022). Different animal parts are employed to treat a wide range of ailments, from joint pain and digestive issues to more complex conditions like convulsions, anemia, asthma, and infertility (Van Vliet et al. 2017a). Central African species, such as the pangolins, are also highly sought after in the international Asian market, with a volume currently estimated at 0.4–2.7 million pangolins hunted annually for medicinal purposes over the past four decades (Ingram et al. 2018). Additionally, wildmeat plays a role in ritualistic and cultural practices with medicinal uses. In Ouesso, in the Republic of Congo, for instance, pangolins are used in various ways, including for spiritual and physical healing (Swiacká et al. 2022). Zootherapies involve using live animals, raw or processed animal parts, or by-products through various methods like cooking or soaking in liquor (Friant et al. 2022). Gender also influences the use of animals in traditional medicine, with women generally displaying greater knowledge and attachment to these practices, particularly for maternal and childcare (Mutombo et al. 2022; Shephard et al. 2023).

Cultural Identity

Wildmeat carries deep cultural significance in the Congo Basin, shaping nutrition, identity, rituals, and social structures. Its value extends beyond food, reinforcing traditions and symbolic practices. For many, wildmeat evokes prestige, nostalgia, and childhood memories, making it a "biocultural food" central to community identity (Dounias and Ichikawa 2017; van Vliet and Mbazza 2011). It is often viewed as natural, tasty, healthy, and a rare luxury, symbolizing social status, particularly in urban areas (Brashares et al. 2011; Wilkie et al. 2016).

Cultural taboos also govern consumption. Pregnant women, newly circumcised boys, or entire communities may be restricted from eating specific animals, including leopards, buffalo, elephants, monkeys, bats, snakes, pangolins, or snails (Kyale Koy et al. 2024). Such prohibitions reflect beliefs about disease, misfortune, or

spiritual danger. Wildmeat also features in ceremonial contexts: for example, the Benga of Gabon use sea turtle meat during baptisms, marriages, and funerals, embedding animal consumption into major life events.

Similarly, river fish play a vital cultural role. Fishing is not only a subsistence activity but also a collective practice that strengthens community ties (Jang and Boyette 2021; Ngole 1986). Successful fishing trips and the sharing of catches foster social cohesion, while rare or large fish can signal higher social standing. Beyond nutrition, fish consumption and preparation symbolize hospitality, unity, and continuity, often marking festivals or rites of passage (Davis and Harasti 2020). Among the Punu of Congo-Brazzaville, the dance *ikoku* represents fishing activities and links them to fertility and the water spirit world (Plancke 2011).

Overview of the Legal and Customary Framework Regulating Hunting and Fishing in the Congo Basin

In the Congo Basin, hunting and fishing are traditional activities that follow customary practices, regulated by statutory legal frameworks since colonial times. National regulations on hunting and fishing are critical for the sustainable management of wildlife resources. Effective regulation can balance ecological health, biodiversity conservation, and local livelihoods, ensuring that hunting and fishing practices do not lead to the depletion of wildlife populations. In this section, we compile information on the legal hunting and fishing frameworks in the Congo Basin, based on the consolidated legal analysis tools developed by the Sustainable Wildlife Management Programme and the available scientific literature. At the time of writing, the analysis was only available for Gabon, Congo, Cameroon, and DRC.

Legal Framework Regulating Hunting

The hunting regulations of Gabon, Cameroon, the Republic of Congo, and the Democratic Republic of Congo (DRC) share common features but differ in their treatment of customary rights, licensing systems, species protection, and hunting methods. All require permits for most hunting activities, but they vary in how traditional use is recognized and how conservation measures are enforced.

Gabon regulates hunting under the Forest Code, which requires permits or licenses from the Water and Forestry Administration. Exceptions are made for customary use rights, allowing subsistence hunting by communities bordering harvesting areas. Permits are issued depending on residency and nationality, covering small and large game, scientific capture, and commercial use. Hunting is permitted year-round, though certain species are restricted through quotas for non-resident hunters. Wildlife is divided into three categories: fully protected, partially protected, and unprotected species. Pangolins and bats are now banned from hunting, capture, and consumption as a health precaution. Harmful techniques—such as fire, poisoned bait, explosives, or fixed rifles—are prohibited. However, the 2023

Forest Code revision introduced exceptions for customary rights, authorizing the use of snares, nets, and pits for community subsistence.

Cameroon regulates wildlife under Law 94-01 of 1994 and Decree 95-466 PM of 1995. Commercial hunting requires licenses and payment of taxes, while subsistence hunting is restricted geographically and must be consumed locally. Game is classified into three categories: Class A (rare/endangered, fully protected), Class B (huntable with commercial licenses under management), and Class C (all other species). Hunting zones include sport hunting areas (ZIC), community-managed areas (ZICGC), and co-managed zones (COZIC). In ZICs, most trophy revenues go to the state, with a smaller share to the Ministry of Forests and Wildlife. In ZICGCs, fees are shared equally with communities, while in COZICs, revenues go mainly to the ministry with additional community benefits. Prohibited practices include hunting with explosives, poisons, firearms, electric currents, or diving gear, as well as the transportation of game without a license.

The Republic of Congo requires permits for hunting, except under customary rights or contractual rights in certain protected zones. Law No. 37-2008 mandates hunter associations for village hunting and requires a weapons permit. Species are divided into fully protected (Class A), partially protected (Class B), and unprotected (Class C). Fully protected species may not be hunted or marketed except for scientific purposes, while Class B species may be hunted and marketed under controlled conditions. Class C species may be hunted permanently as part of traditional practices. Although a 1972 law established hunting seasons, these mainly cover sport hunting, leaving traditional and subsistence practices less clearly regulated. Decree No. 6075 of 2011 further regulates hunting by prohibiting night hunting and methods that cause undue suffering or environmental harm.

The Democratic Republic of Congo (DRC) regulates hunting through Law No. 82/002. All forms of hunting—traditional, sport, tourism, and commercial—require a license. Obtaining one requires legal ownership of weapons and passing a skills test, though the latter has never been fully implemented. Wildlife is classified as fully protected, partially protected, or unprotected. Hunting in protected areas is generally forbidden, but exemptions may be granted by the Congolese Institute for Nature Conservation (ICCN) for food security or public interest. Harmful hunting methods are banned, but unlike neighboring countries, the DRC lacks fully defined seasonal regulations, as no official hunting calendar has been adopted.

Legal Framework Regulating Fishing

Fishing regulations in Gabon, the Republic of Congo, and the Democratic Republic of Congo (DRC) share some similarities but also highlight different approaches to managing aquatic resources and recognizing customary rights. Gabon and the Republic of Congo have relatively modern frameworks emphasizing licensing, conservation, and restrictions on destructive practices, while the DRC maintains traditional fishing rights but relies on outdated regulations that allow largely open access.

Gabon regulates fishing under Law No. 15/2005, the Fisheries and Aquaculture Code. All activities beyond subsistence fishing require licenses specifying permitted quantities. Categories include commercial, artisanal, sport, scientific, and aquarium fishing. Licenses are issued by the fisheries minister after consultation with the Technical Commission. Fishing is permitted year-round but can be restricted to protect species. Destructive or nonselective methods—such as explosives, toxic substances, gas-powered harpoons, monofilament nets, and obstructive seines—are banned. The framework prioritizes conservation while distinguishing between small-scale subsistence and commercial exploitation.

Cameroon governs fishing under Law 94-01 of 1994. Industrial fishing requires licenses subject to exploitation taxes, while small-scale and traditional fishing are exempt. Three license types cover fish, shrimp/crustaceans, and tuna/high-seas fishing, complemented by four permit categories: semi-industrial (A), sport (B), small-scale profit-making (C), and research (D). Prohibited practices include trawling within three nautical miles, obstructive gear that reduces net selectivity, diving suits with breathing devices, and the use of explosives, poisons, firearms, or electricity. Construction of dams or discharge of toxic substances without prior approval is also banned, reflecting strong environmental safeguards.

The Republic of Congo regulates inland fishing and aquaculture under Law No. 03-2010. The law covers capture, processing, and marketing, while also recognizing traditional fishing for self-consumption. Professional fishing requires registration cards and boat registration. Although quotas are not fixed, temporary restrictions may be applied to protect rare species, and fees are required for exploitation. Fishing zones must be classified, with potential conservation measures for nurseries, spawning areas, and migration routes, though implementation remains unclear. The law defines permissible and prohibited techniques but lacks size limits for aquatic species. It also regulates processing facilities and oversees fishery imports and exports, signaling a more complete but uneven system.

The Democratic Republic of Congo (DRC) relies on older laws, primarily from 1932 and 1937, with partial updates in the 1980s. The framework recognizes traditional fishing rights for communities but provides limited structure for broader management. Fishing is generally free and does not require authorization under the 1937 decree, though concessions can be granted. Prohibited practices include the use of explosives, toxins, and electric devices, except for research. While there are no formal categories of fishermen, three types of annual permits—industrial, artisanal, and individual—exist in Lake Tanganyika, expiring each year on December 31. Overall, the DRC maintains open access to fisheries but lacks comprehensive regulations for conservation or industry oversight.

Customary Rules Regulating Hunting and Fishing

Customary rules on hunting and fishing in Central Africa are deeply rooted in local traditions, ecological knowledge, and cultural practices. While varying among ethnic groups and regions, these rules generally regulate resource use and maintain social cohesion through seasonal and spatial restrictions, species-specific taboos, and

protection of totemic animals. Some scholars interpret these norms as expressions of an ethic toward nature, whereas others argue that economic incentives often override conservation logic (Duda 2017). Nevertheless, there is growing consensus that understanding and integrating customary practices into wildlife and fisheries policies are critical for sustainable resource management (Bérard et al. 2005; Roussel 2005).

Over millennia, rural communities have developed norms governing hunting and fishing, including periodic bans and food taboos targeting specific groups. Pregnant women, newly circumcised young men, and sometimes entire communities are prohibited from consuming species such as leopards, buffalo, elephants, monkeys, snakes, snails, and pangolins (Ichikawa 1987; Kyale Koy et al. 2024). In the Yangambi landscape (DRC), the Turumbo tribe values 43 animal species for political, zootherapeutic, and social purposes, with 27 species restricted from commercial hunting to protect sacred customs (Mpoyi et al. 2024).

Communities also safeguard sacred spaces that host initiation rites and are considered seats of ancestral spirits and totems. These areas are traditionally free from hunting, fishing, and agriculture, serving both cultural and ecological functions as refuges and breeding grounds (Butare 2001; Soumbane et al. 2017). Historically, compliance with these rules was enforced through sanctions or believed spiritual repercussions, including illness or death for violators (Bigombe and Toukéa 2023). However, adherence has declined, particularly among younger generations, reducing the effectiveness of customary norms in conserving wildlife and fish populations today.

Wildmeat and Fish Offtake Levels and Consumption Patterns

Species and Quantities Traded

Estimates of wildmeat harvest in the Congo Basin vary widely, ranging from 1.6 to 11.8 million tons annually (Coad et al. 2019). Consumption is substantial, with 60,000 t per year in the Republic of Congo and 691,000 t in the DRC (Valimahamed et al. 2017). Per capita consumption generally decreases with urbanization: smaller towns tend to have higher reliance on wildmeat than large cities. For example, in Ouesso (Republic of Congo), 273 t were traded in 2008 for a population of about 80,000 (Hennessey and Rogers 2008), while the Yangambi landscape (114,000 people) saw 103–145 t annually (Van Vliet et al. 2019). By contrast, Kisangani (1.6 million people) recorded only 293 t in 2016 (Van Vliet et al. 2017a). Near Lomami National Park, more than 40,000 carcasses are sold annually in Kindu, valued at USD 725,000 (Batumike et al. 2021). Across sub-Saharan Africa, at least 318 species are hunted, 72% of them mammals (Ingram et al. 2018). In Central African forests, ungulates, rodents, and primates dominate consumption (Abernethy et al. 2013; Coad et al. 2019; Fa et al. 2006). Frugivores contribute more than 60% of harvested biomass, with hunters often targeting larger animals for their higher yields (Abernethy et al. 2013). Species composition varies geographically. In Angola, roadside surveys documented duikers, monkeys, snakes, and

pangolins (Gonçalves et al. 2019). In Kindu, rodents (*Atherurus africanus*), duikers, bushpigs, and red-tailed monkeys are most traded (Batumike et al. 2020). In Basankusu, red-tailed monkeys and red river hogs dominate sales (Dupain et al. 2012). Kisangani and Brazzaville markets feature blue and bay duikers alongside brush-tailed porcupines (Mbete et al. 2011; Van Vliet et al. 2012), while porcupines are also common in Nigeria and Cameroon (Macdonald et al. 2012). Due to poor transport and storage facilities, most carcasses are smoked before reaching markets (Batumike et al. 2020; Van Vliet et al. 2012).

Fish are another major food source in the Basin. In 2018, the DRC produced 230,000 t of freshwater fish, with annual per capita consumption averaging 5 kg (FAO 2023). By comparison, per capita intake is far higher in Gabon (30.9 kg), Angola (20.2 kg), and Cameroon (18.1 kg). In Kinshasa, popular smoked species include *Parachanna* spp. (27.6%), *Protopterus doloï* (26.3%), *Clarias* spp. (19.4%), and *Channalabes apus* (19.1%) (Tchomba et al. 2020). In Uvira, Latidae and Clupeidae dominate commercial sales (Christian et al. 2020). Artisanal fishers mainly use smoking, salting-drying, and sun-drying techniques, though spoilage remains high, with up to 45% lost along the value chain (FAO 2023).

Urban and Rural Wildmeat Consumption Levels

The average consumption of wildmeat in rural regions of the Congo Basin varies considerably by location. For instance, studies in the Republic of Congo have shown an average consumption of around 2.7 kg per person per month (Linder 2013), while in the Democratic Republic of the Congo (DRC), some rural communities report higher rates of up to 4 kg per person per month (Fa et al. 2015). Wildmeat can account for 30–50% of the total meat intake in rural households (Nasi et al. 2008; Wilkie et al. 2016). In urban areas, wildmeat consumption depends on various factors that differ by region, with consumers having access to a broader range of meat options (Wilkie et al. 2016; Fa et al. 2019; Van Vliet et al. 2017b). Annual per capita wildmeat consumption is estimated at 7.2 kg in Libreville (Gabon) (Wilkie et al. 2005), 14.6 kg in Bangui (Central African Republic) (Fargeot and Dieval 2000), and 2 kg in Mbanjock (Cameroon). Even though urban per capita consumption of wildmeat is relatively low, total consumption in cities exceeds that of rural areas due to higher population densities (Nguyen et al. 2021).

The Illegal International Trade in Wildmeat, Fish, and Pets

The scale of international wildmeat trafficking is increasingly recognized. Seizures at Brussels Airport suggest 3.9 t of wildmeat are smuggled monthly from West and Central Africa, including at least ten CITES-listed species (Chaber et al. 2010; Chaber et al. 2023). At Paris Roissy-Charles de Gaulle Airport, weekly seizures average 5 t, indicating trade for profit rather than personal consumption. Prices in Europe remain high, reinforcing wildmeat's status as a luxury item (Chaber et al.

2010). In Switzerland, annual inflows are estimated at 8.6 t (Falk et al. 2013). Despite illegality, wildmeat is openly sold in African grocery stores in Brussels, Paris, and London, supported by regular shipments (Gombeer et al. 2021). Cultural ties help sustain demand among African expatriates, with wildmeat valued for its traditional and familial significance (Bair-Brake et al. 2014; Walz et al. 2017). This evidence underscores the need for stronger enforcement, clearer regulations, and targeted awareness campaigns in consumer countries (Chaber et al. 2023).

Illegal fish exports are even less documented, but one Paris-based study estimated 57.95 t of fish smuggled weekly from West and Central Africa (Chaber et al. 2010). Exotic pets also drive wildlife trade. Globally, thousands of species and millions of individuals are sold annually (Harfoot et al. 2018; Scheffers et al. 2019). With online platforms replacing physical markets, tracking volumes has become more difficult (Fukushima et al. 2020). The Congo Basin is known to contribute to this trade, though data are limited. Grey parrots (*Psittacus erithacus*), listed as Endangered by CITES, are among the most trafficked birds worldwide and continue to decline in Central and West Africa due to the pet trade (Bush et al. 2014). Reptiles, including venomous species, are also exported illegally (Jensen et al. 2019; La Laina et al. 2021).

Status of Terrestrial and Aquatic Wildlife

Status of Terrestrial Mammals

The population status and distribution of medium and large mammals in the Congo Basin are strongly influenced by the distribution of suitable, undisturbed habitats and the level of access available to hunters (Gallego-Zamorano et al. 2020). For example, many mammal species (e.g., forest elephants) tend to be more abundant as distance from roads increases (Blake et al. 2008), with the exception of Gabon (Laguardia et al. 2021). In hunted forests, larger animals are typically found at lower densities, since they usually have lower reproductive rates, whereas small sized species (especially small duikers and rodents) tend to become prominent, as they usually reproduce faster. In Cameroon, around the Dja Fauna reserve, Bruce et al. (2018) demonstrated that the hunted areas showed high abundance of some disturbance-tolerant species and low abundance of larger-bodied species. Yasuoka et al. (2015) showed that the proportion between red duikers and blue duikers decreases as the hunting pressure increases in the remote forest. Fonteyn et al. (2024) found in Gabon that degraded sites are dominated by rodents (up to 76%), while, in well-managed protected areas, the medium- and larger-sized mammals dominate. In the Yangambi landscape (DRC), the terrestrial mammal community is largely degraded and dominated by two species of rodents: Emin's pouched rat (*Cricetomys emini*) and the African brush-tailed porcupine (*Atherurus africanus*), which are known to be highly resilient, while large ungulates and medium-sized carnivores have particularly low abundances (Van Vliet et al. 2023). In the Yangambi landscape, the mammal community globally exhibits lower occupancy (<10%) and species richness is

lower compared to other conservation areas in the Congo Basin (Van Vliet et al. 2023). In Luki Biosphere Reserve and Phalanga village territory, two degraded landscapes in the DRC, rodents were the most important species detected by camera trap studies (Djami et al. 2023). Similar results were observed in the Yangambi Biosphere Reserve, which is characterized by a degraded species composition profile (Van Vliet et al. 2017a). Top predators also tend to decrease in highly hunted areas. For example, in Gabon, Henschel et al. (2011) showed that leopards exploited smaller prey where competition with hunters was strong, resulting in reduced leopard densities at highly hunted sites.

Status of Inland Fish Stocks

Freshwater fish in the Congo Basin are generally in decline, as attested by perceived changes in fisheries resources by fishers, declines in catch-rates, reduced size of fish, and increased prices on the markets (De Keyzer et al. 2020). Fish stocks are less abundant where terrestrial wildlife has been depleted, given the complementarity and interchangeable nature of fishing and hunting (Inogwabini 2014). The main fish stocks are present along the Congo River and the major large lakes. Along the Congo River Basin, which includes the Congo River and its tributaries such as the Uganga, Lualava, Lulonga, and Tshuapa, about 800 fish species have been identified, among which Zambezi cichlids (*Oreochromis macrochir* and *Haplochromis mellandi*) and Nile species (*Protopterus aethiopicus* and *Polypterus senegalus*) are the most prevalent. In the middle course (between Kisangani and Kinshasa), approximately 50 species from 20 families dominate catches. Notable fish families include Protopteridae, Clariidae, Cichlidae, Mormyridae, Characidae, Bagridae, Cyprinidae, and Mochokidae. The middle Congo River is highly productive due to nutrient enrichment from major tributaries, especially between Makanza and Irebu. The ichthyological fauna in this region includes forest species from Mormyridae, Alestidae, Bagridae, Cyprinidae, and Mochokidae families. Other notable species include Protopteridae (*Protopterus dolloi*), Polypteridae (*Polypterus* spp.), and various other families. *Heterotis niloticus*, introduced from West Africa, has adapted well and spread throughout Central Africa, particularly in this river complex. The various large lakes in the Congo Basin also form major fish stocks. Lake Tumba and tributaries (765 km^2) host about 30 fish species, with *Auchenoglanis occidentalis*, *Clarotes laticeps*, *Clarias buthopogon*, and others being prevalent. In the Equateur Province, popular species include "mongusu" (*Parachanna obscura*), *ngolo* (*Clarias gariepinus*), and nzombo (*Protopterus dolloi*). In Lake Maï-Ndombe (2300 km^2), principal catches include species from Channidae, Cichlidae, Mormyridae, Claroteidae, Cyprinidae, and Alestidae families. Lake Tanganyika (32,900 km^2) serves as a major water reservoir for the Congo River and supports pelagic fish species like *Stolothrissa tanganicae* and *Limnothrissa miodon*, as well as endemic Latidae species like *Lates stappersii*. Lake Albert (5270 km^2) hosts diverse fish species, with commercial catches primarily, including *Alestes baremoze*, *Hydrocynus forskahlii*, and *Lates niloticus albertinus*. Lake Edward (2300 km^2)

hosts mostly *Tilapia* species, *Bagrus docmak*, *Protopterus aethiopicus*, and others. Lake Kivu (2370 km^2) is the least diverse ichthyologically, with the introduced *Limnothrissa miodon* now constituting about 90% of the catch. Katanga Lakes are also crucial for commercial fish production with *Oreochromis macrochir, Clarias* spp., *Synodonti*s spp., and various *Tilapia* species being the most common.

Impacts of Hunting and Fishing

Ecological Impacts of Overhunting and Overfishing

The demand for wildmeat in Central Africa, driven by local consumption and international markets, has resulted in unsustainable hunting practices and rising pressure on wildlife (Ingram et al., 2021). Hunters now operate across most forest lands, including protected areas (Abernethy et al. 2013). In the Congo Basin, 39% of forests are under high hunting pressure from villages (Ziegler et al. 2016). Road construction amplifies these impacts by opening new hunting areas, fragmenting habitats, and altering mammal communities (Blake et al. 2008; Fa et al. 2005). Hunting often targets large mammals, particularly keystone species such as apex predators, large herbivores, and frugivores, whose ecological roles are vital (Ripple et al. 2014, 2015). Elephants, gorillas, and chimpanzees are among the most affected (Maisels et al. 2013; Plumptre et al. 2016; Strindberg et al. 2018). Declines in frugivores compromise seed dispersal and forest regeneration (Abernethy et al. 2013; Wright et al. 2007). Hunting pressure directly influences population densities: duikers, for example, range from 0.2 ind/km^2 in heavily hunted sites to 20.6 ind/km^2 in protected areas (O'Brien et al. 2020). In some cases, smaller and medium-sized species exhibit stability or growth under high hunting pressure, a pattern known as density compensation (Fa and Brown 2009). Species' resilience also depends on reproductive rates, home-range, dispersal capacity, and behavioral flexibility, such as shifting activity patterns to avoid hunters (Mockrin 2010; Van Vliet et al. 2023). However, hunting yields are short-lived without regulation. Wilkie et al. (2019) found that although hunted areas initially provide high biomass, unsustainable offtake leads to rapid declines. Recovery requires reduced hunting for 3–13 years, a challenge without alternative food or income sources.

Similarly, river fish populations face growing threats from overfishing, habitat degradation, and climate change. These species are central to aquatic food webs, supporting larger predators and nutrient cycling. Overfishing disrupts these roles, reducing predator populations and altering species interactions with cascading ecological effects (Levêque et al. 2008). Many fish in the Congo Basin are highly specialized; overharvesting can cause severe reductions or even local extinctions, undermining biodiversity and ecosystem resilience (Allan et al. 2005). The ecological consequences extend further: overfishing hampers detritus processing, nutrient redistribution, and habitat quality, leading to algal overgrowth, siltation, and reduced spawning grounds (Cohen et al. 2014; Dugan et al. 2010). According to the (FAO 2023) Priority Plan for the Revival of Fishing in the DRC, fish habitats are severely

degraded, a problem often overlooked by fishermen. Historical accounts show that fish catches in the Congo Basin have dropped by 65–80% over the past 50 years. The loss of once-dominant species has led to more homogeneous catches, decreasing the diversity of exploited fish (Castello et al. 2023). Illegal, unreported, and unregulated fishing, along with destructive gear use, worsens overexploitation and habitat decline. These practices not only erode aquatic ecosystems but also undermine the food security and livelihoods of riverine communities.

Livelihoods Impacts of Overhunting and Overfishing

The economic repercussions of overhunting are potentially significant, particularly for communities that depend on hunting and the sale of wildmeat for their livelihoods. To illustrate this statement, Nasi et al. (2011) proposed the concept of "Empty forests, empty stomachs." In a global comparative study, Nielsen et al. (2017) argue that bushmeat is most important to rural households as a source of protein and micronutrients unavailable through domestic animal and staple crop production. Various studies conducted worldwide have shown that wildmeat consumption improved food security and dietary diversity among the most vulnerable groups (Friant et al. 2020; Golden et al. 2011; Sarti et al. 2015; Van Vliet et al. 2017a). However, this topic remains understudied in Central Africa (Ingram et al. 2021). Most literature in the Congo Basin focuses on understanding wildmeat consumption frequencies and volumes (Nasi et al. 2011) but the importance of bushmeat in people's diets cannot be merely assessed by volume consumed (Fa et al. 2015). Across the Congo Basin, Fa et al. (2015) showed that child stunting was lower in areas where wildlife is still abundant and increased in defaunated regions, particularly around urban areas. A recent study by Booth et al. (2021) showed that the Republic of Congo and Central African Republic could be at especially high risk of protein deficiencies if access to wildmeat was to be lost without immediate replacement. The COVID-19 pandemic, with its related temporary market shutdowns, also drew some lessons learnt about what the implications would be of losing access to wildmeat for stakeholders involved in the trade (Enns et al. 2023). In Cameroon, vendors generally agreed that the pandemic had a negative impact on their activities and the number of clients (Gaubert et al. 2024). In Brazzaville, some traders lost their jobs, while others shifted to different types of food trade. These disruptions also heightened stress among traders and their families, impacting their food and nutritional security, as well as their immune system resilience against diseases (Mialoundama et al. 2020).

Similarly, overfishing reduces the number of fish available for harvest, leading to lower yields, decreased income for local fishers, and the need to exert more effort. In Salonga National Park and Lac Tumba regions (DRC), Inogwabini (2014) showed that overfishing was mostly due to specialized fishermen coming from nearby urban areas, who can invest time and resources in efficient fishing gear (such as nylon nets), therefore impacting on the food security of rural families, who can only afford to fish with traditional fishing gear (hooks and lines). Overfishing, as observed in the

Tshopo Province (Busanga et al. 2023) and Lake Tumba (Zanga et al. 2019), threatens food security by reducing the availability of this crucial resource. As fish resources become scarcer, conflicts can arise among local fishers and between communities and external commercial interests (Namwira et al. 2024).

Unregulated Wildlife Trade and Associated Risks to Human Health

Globally, the consumption of wildmeats represents a major vector for the transmission of zoonotic pathogens (Loh et al. 2015; van Vliet et al. 2022; Wolfe et al. 2004). Public health crises related to zoonoses have led to political calls for the closure of wildlife markets (van Vliet et al. 2022). The absence of food safety standards in informal trade chains—covering the harvesting, transportation, butchering, and preservation of meat—further exposes hunters, butchers, vendors, and consumers to the risks of zoonotic and foodborne diseases (FAO et al. 2020). Various pathogens present in wildmeat, including viruses, bacteria, protozoa, and parasites, are transmissible to humans. In the Congo Basin, for example, there are 25 types of parasites (such as *Trichuris* sp., *Ancylostoma* sp., *Ascaris* sp., *Toxoplasma gondii*, and *Strongyloides fulleborni*), 9 major viruses (including SIV, HTLV, Marburg virus, Lassa virus, Ebola virus, Nipah virus, and herpes virus), and 8 types of bacteria (such as *Escherichia coli*, *Salmonella* spp., and *Campylobacter* spp.) found in wildmeat (Van Vliet et al. 2017a). However, these pathogens are not exclusively transmitted through the consumption of wildmeat. Most zoonoses spread through exposure to bodily fluids and feces during the handling and butchering of meat before cooking. To the best of our knowledge, there is no evidence to suggest that individuals who have contact with wildmeat have a higher parasite load than the general population. In general, wildmeat traders, hunters, and consumers believe that zoonotic disease risks are low despite high exposure to wildlife (Saylors et al. 2021). In Yangambi and Kisangani (DRC), only a small percentage of hunters are concerned about health and food safety risks, but most traders and consumers express concerns about food safety and foodborne diseases (van Vliet et al. 2022).

Neglected Positive Impacts of Hunting for Ecosystems and People

Across the globe, hunting and fishing are known to provide several services to both ecosystems and people, through mechanisms such as population control, prevention of invasive species, maintenance of biodiversity balance, disease or pest control, and reduction of human–wildlife conflict (Garshelis et al. 2020). In the Congo Basin, very little research has been directed toward better understanding and managing the benefits of hunting and fishing to nature and people. Nevertheless, hunting is known to be practiced as a way to reduce agricultural pests and as a way to mitigate human wildlife conflicts (Nasi et al. 2008). One further neglected benefit of hunting and fishing in Central Africa is that these activities, if they remain sustainable, do not result in the alteration of natural habitats (the forest itself), which is a key positive

aspect when compared to many other income-generating human activities such as agriculture and industrial logging.

Through these services, hunting may play a role in both supporting ecosystems and benefiting human populations, a concept known as people's services to nature, but more efforts need to be placed in understanding the complex and interlinked processes between hunters/fishers and ecosystems.

Conclusions

This chapter examines the ecosystem services provided by hunting and fishing in the Congo Basin, the governance frameworks shaping these activities, current offtake levels, wildlife and fish stock status, and the consequences of overexploitation.

Freshwater and terrestrial wildlife underpin food security, livelihoods, health, and cultural identity for millions across the Basin. Wildmeat and river fish are primary sources of protein and essential nutrients, supporting both rural and urban populations. Their consumption is driven by necessity, taste preferences, and cultural values. These resources also sustain rural economies through informal hunting, fishing, and trade, offering employment and safety nets, particularly for women and marginalized groups. Beyond food, wildlife contributes to traditional medicine and spiritual practices, while fish and wildmeat feature prominently in ceremonies, hospitality, and social identity. Fishing practices, often collective, reinforce community cohesion. Together, these services demonstrate the ecological, economic, and cultural significance of wildlife to regional resilience.

Hunting and fishing are governed by statutory laws and customary norms that vary widely across Gabon, Cameroon, the Republic of Congo, and the Democratic Republic of Congo (DRC). All require permits or licenses, classify species for protection, and prohibit destructive methods, though recognition of customary rights differs. Gabon provides broad subsistence rights and allows traditional techniques; Cameroon limits hunting without licenses and manages sport hunting zones with revenue-sharing; Congo requires hunter associations and permits year-round hunting of unprotected species; while the DRC retains a bureaucratic, outdated framework with minimal seasonal regulation. Fishing laws in Gabon and Congo are relatively conservation-oriented, whereas DRC regulations remain antiquated and poorly enforced. Alongside statutory rules, customary norms—such as species taboos, seasonal bans, and sacred site protection—have historically fostered sustainability but are weakening under modernization and generational shifts. Integrating customary and statutory systems remains a critical governance challenge.

Wildmeat and fish offtake are substantial. Annual wildmeat harvests are estimated between 1.6 and 11.8 million tons, dominated by mammals, with frugivores contributing over 60% of biomass. Rural households obtain 30–50% of their meat from wild sources, averaging 2.7–4 kg per person monthly, while urban volumes are higher overall due to dense populations. Freshwater fish are equally vital: the DRC alone produces 230,000 t annually, though post-harvest losses can reach 45%. Preservation relies heavily on smoking, salting, and drying. International trade

adds pressure, with tons of wildmeat—including CITES-listed species—smuggled weekly to Europe to meet diaspora demand. The region also supplies the global exotic pet trade, including endangered parrots and reptiles.

Wildlife and fish populations show widespread decline. Large mammals such as elephants and ungulates are severely reduced, leaving rodents and small duikers dominant in disturbed areas. Predator declines further disrupt prey dynamics. Fish stocks are shrinking, reflected in reduced catch sizes and rising market prices, compounded by overfishing and reliance on aquatic resources when terrestrial fauna decline. Though the Congo River and major lakes remain biodiversity hotspots, mounting pressures threaten both species composition and local livelihoods.

Unsustainable exploitation carries severe ecological, economic, and health costs. Overhunting erodes biodiversity, seed dispersal, and ecosystem dynamics, while road expansion exacerbates pressures. Overfishing reduces aquatic diversity and has driven catch declines of 65–80% over the past half-century. These trends undermine food security, livelihoods, and nutrition for rural and Indigenous peoples, leaving them vulnerable to shocks such as COVID-19 market closures. The unregulated trade also heightens zoonotic risks, with pathogens such as Ebola and Salmonella linked to wildmeat. Nonetheless, sustainable use can yield ecological benefits, such as pest control, conflict reduction, and forest cover maintenance, underscoring the need for balanced management approaches (see chapter 26).

Competing Interest Declaration The author(s) has no competing interests to declare that are relevant to the content of this manuscript.

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