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The bushmeat and food security nexus: A global account of the contributions, conundrums and ethical collisions

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ABSTRACT

Wild meat or 'bushmeat' has long served as a principal source of protein and a key contributor to the food security of millions of people across the developing world, most notably in Africa, Latin America and Asia. More recently, however, growing human populations, technological elaborations and the emergence of a booming commercial bushmeat trade have culminated in unprecedented harvest rates and the consequent decline of numerous wildlife populations. Most research efforts aimed at tackling this problem to date have been rooted in the biological disciplines, focused on quantifying the trade and measuring its level of destruction on wildlife and ecosystems. Comparatively little effort, on the other hand, has been expended on illuminating the role of bushmeat in human livelihoods and in providing alternative sources of food and income, as well as the infrastructure to make these feasible. This paper aims to shift the focus to the human dimension, emphasising the true contributions of bushmeat to food security, nutrition and well-being, while balancing this perspective by considering the far-reaching impacts of overexploitation. What emerges from this synthesis is that bushmeat management will ultimately depend on understanding and working with people, with any approaches focused too narrowly on biodiversity preservation running the risk of failure in the long term. If wildlife is to survive and be utilised in the future, there is undoubtedly a need to relax adherence to unswerving biocentric or anthropocentric convictions, to appreciate the necessity for certain trade-offs and to develop integrated and flexible approaches that reconcile the requirements of both the animals and the people.

1. Introduction

Although often poorly recognised, nature's goods and services constitute the ultimate foundation of human life and health. Apart from delivering basic provisioning services such as food, water and medicinal resources, natural ecosystems fulfil other crucial supporting, regulating and cultural functions (Díaz, Fargione, Chapin, & Tilman, 2006). Over the past 50 years, however, mankind has altered ecosystems and the biodiversity they contain more rapidly and extensively than at any other time in history. Transformation of the planet has subsidised considerable net gains in human well-being and economic development, but not all regions have benefitted equally from the process and many people have been harmed (Billé, Lapeyre, & Pirard, 2012). Despite overall progress towards the global hunger reduction target of the Millennium Development Goals,[2] approximately 805 million of the world's people (11.3% of the total population) remain chronically undernourished. Nearly all of them (ca. 98%) reside in low-income areas, with at least one in four people in Sub-Saharan Africa presently lacking sufficient protein and calories for energy (FAO, 2014a). Micronutrient deficiencies, coined as 'hidden hunger', affect about two billion people worldwide, the prevalence of which is similarly highest in developing countries where dietary diversity is low and starchy staple foods predominate (Thompson & Amoroso, 2011). At the other end of the spectrum, over one billion people are overweight and 475 million are obese, with most being in the developed world (FAO, 2013). This nutritional disparity existing between the world's rich and poor is predominantly a result of social and economic factors, including the uneven distribution of global food trade (MEA, 2005).

Many individuals living in poorer countries, especially in rural areas, are often directly dependent on the extraction of wild foods from local ecosystems to bridge the hunger gap created by poverty, environmental stresses and/or civil unrest (MEA, 2005). Wild meat or 'bushmeat' (Box 1), in particular, serves as a key contributor to the food security and livelihoods of millions of individuals throughout the developing world (Brashares, Golden, Weinbaum, Barrett, & Okello, 2011). Bushmeat serves multiple roles and provides many benefits to those that use it. Most notably, this wild resource provides a crucial source of protein in places where domestic alternatives are scarce and expensive (Swamy & Pinedo-Vasquez, 2014). By some estimates, bushmeat

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[2] Millennium Development Goal, Target 1C: "to halve, by 2015, the proportion of people who suffer from hunger".

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Box 1
Bushmeat — concepts and terminology.
Sources: Bennett et al. (2007), Eves & Ruggiero (2002), Nasi et al. (2008), Redmond et al. (2006), and Van Vliet (2011).

Bushmeat is defined in this paper as the meat derived from any wild terrestrial mammal, bird, reptile or amphibian harvested for subsistence or trade, most often illegally. Fish, crustaceans and molluscs are excluded from this definition and while invertebrates are recognised as important dietary items for many communities, focus is placed on the larger vertebrates that constitute the bulk of the terrestrial wild animal biomass consumed by humans.

Although the term 'bushmeat' originated from Africa, it is now widely used to describe the meat taken from wild animals across the tropics, along with other names such as game, wild meat, bushtucker or chop. Here, however, a distinction is drawn for *game meat*, with this term being reserved for the meat that is legally harvested from non-domesticated land mammals and birds, through formalised activities such as ranching, safari hunting and cropping.

In the context of this paper, there is also a need to separate out the illicit and highly-organised trade of other high-value wildlife products (e.g. rhinoceros horns, tiger bones and pangolin scales for medicinal purposes), which, while undeniably a significant threat to many high-value species, will not be dealt with in depth in this paper.

contributes 80–90% of the animal protein consumed in certain rural regions of West and Central Africa (Ntiamoa-Baidu, 1997; Pearce, 2005) and over 20% of that eaten by several indigenous groups in the Amazon (Rushton et al., 2005). Beyond its nutritional contribution, bushmeat also provides an important source of income where few alternatives exist, since it is easily traded, has a high value-to-weight ratio and can be preserved (dried) at low cost (Nasi et al., 2008). Furthermore, bushmeat is often favoured for consumption because it is familiar, traditional or since it confers social prestige (Van Vliet & Mbazza, 2011), while in many (but not all) cases it may be preferred for its taste (Schenck et al., 2006).

Humans have harvested wildlife for food for millennia, using various traditional hunting techniques to capture and kill an array of species whose habitat they shared. While human populations remained relatively small, weapons primitive and where the main goal was simply to secure sufficient food for the family or village, this hunting carried only a localised impact and was mostly sustainable (Nadakavukaren, 2011; Wilkie, Bennett, Peres, & Cunningham, 2011). In more recent times, however, the situation has changed dramatically. As human populations have continued to escalate, pressures on natural ecosystems have become progressively severe. Technological advances, infrastructure development and the loss of traditional hunting controls have facilitated the extensive exploitation of many wildlife species. Increasing urban demand for bushmeat has simultaneously catalysed a booming commercial trade, which, when combined with the latter factors, has led to harvests that are unprecedented and increasing rapidly (Milner-Gulland & Bennett, 2003; Swamy & Pinedo-Vasquez, 2014). Large-scale biodiversity loss is now globally pervasive and widely documented, with numerous case studies revealing a multitude of sites where once vibrant wildlife populations have been hunted to a state of defaunation (Brashares et al., 2011). The 'bushmeat crisis', a term coined to describe the overharvesting of wildlife for food, is now seen as the greatest threat to biodiversity in some regions, but concurrently is of the greatest threats to the livelihoods of those that depend on the resource the most (Redmond, Aldred, Jedamzik, & Westwood, 2006).

Whether and under what circumstances the future use of bushmeat will be sustainable is consequently a contentious issue (Cawthorn & Hoffman, 2014), frequently pitting conservation biologists against humanitarians in a pro-wildlife versus pro-people debate (Miller, Minteer, & Malan, 2011; Redmond et al., 2006). To date, most studies aimed at mitigating the bushmeat crisis have been rooted in the biological disciplines; a biocentric approach focused on measuring the impact of bushmeat harvesting on targeted wildlife populations. This has resulted in efforts being concentrated on the protection of the species and the criminalisation of bushmeat hunting in many countries as part of conservation policies, often in regions that were previously traditional hunting grounds (Swamy & Pinedo-Vasquez, 2014). On the other hand, comparatively little research has focused on the anthropocentric dimensions, in which bushmeat is regarded as a crucial dietary item and where declining wildlife populations are equated with the loss of human resources (Bowen-Jones, Brown, & Robinson, 2002).

The current nature and complexity of socio-ecological systems remains deeply contingent on the past. Indeed, a full appreciation of the existing situation cannot be gained without going back decades, centuries or even millennia (Costanza, Graumlich, & Steffen, 2007). Nevertheless, our priorities on sustainable development must be set in the present, with the realisation that biodiversity conservation and food security are essentially two sides of the same coin (Sunderland, 2011). Conservationists should therefore share a common concern about sustainability with human development advocates when wildlife depletions are seen to exacerbate poverty. While the integration of the social sciences into wildlife management has begun, albeit slowly, there is still a scant understanding of the economic, health and social factors driving human reliance on wildlife and dictating the sustainability of the harvest (Manfredo, 2009). This paper aims to shift the focus to the human dimension, emphasising the true contributions of bushmeat to food security, nutrition and well-being, while balancing this perspective by considering the far-reaching impacts of overexploitation.

2. Methodology

In order to investigate the extent of bushmeat use, the contribution of the resource to human livelihoods, as well as the drivers and implications of overexploitation, a comprehensive review of the literature was conducted between August 2014 and February 2015, the process of which is mapped in Fig. 1. Search terms and Boolean search operators were firstly used to explore published and peer-reviewed literature indexed in the bibliographic databases Science Direct, Google Scholar, SCOPUS, EBSCO Host and Web of Science. A general search ("bushmeat" OR "bush meat" OR "wild meat") was conducted at the outset, with the number of 'hits' in each database being recorded (Fig. 1). Due to the unmanageable number of publications returned using this strategy, more targeted searches were conducted by modifying the search strings to include keywords associated with each of the five major themes addressed in the paper (Fig. 1). The 'grey' literature was also explored using similar search terms in Google, so as to identify relevant theses and dissertations, working papers, project documents and other unpublished materials. The titles and keywords of the captured literature sources were evaluated to ascertain their relevance, where after the abstracts or executive summaries of those passing through this first review stage were further screened. More detailed review allowed refinement to 250 key literature sources, the findings of which are integrated throughout the current paper. It is important to note that, while a global outlook was sought throughout, the focus of the paper did inevitably fall on those regions in which bushmeat harvesting, consumption and trade are the highest, since this is where most research efforts have been placed to date.

3. Bushmeat harvesting and consumption

3.1. The scale of the harvest

Levels of bushmeat off-take vary considerably by continent, country and ecological zone. Nonetheless, hunting efforts tend to be concentrated