

Review

Regional variation of the manifestation, prevalence, and severity of giraffe skin disease: A review of an emerging disease in wild and captive giraffe populations



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ABSTRACT

Large mammals have drastically declined in the past few decades yet we know little about their ecology. Giraffe numbers for instance, have dropped by more than 40% in the last 15 years and recently, a skin disease, has been observed in numerous giraffe populations across Africa. The disease(s), commonly referred to as giraffe skin disease (GSD), manifests as lesions, wrinkled skin, and encrustations that can affect the limbs, shoulder or neck of giraffes. Here, we review GSD cases from literature reports and surveying efforts of individuals working with giraffes in the wild and in captivity. The aim of this review was to describe spatial variation in the anatomical location of lesions, prevalence, and severity of GSD. In total, we retrieved 16 published sources that referenced GSD and we received 63 respondents to our survey. We found that GSD has been observed in 13 protected areas across 7 countries in Africa and in 11 out of 48 zoos distributed across 6 countries. The prevalence of GSD in wild populations ranged from 2% to 80% of observed giraffes. Although little research to date has focused on GSD, our review reveals that the disease is more prevalent than initially thought and more severe in some areas than previously assumed. With vast areas of Sub-Saharan Africa still without information on GSD, researching the prevalence and conservation impacts of this disease should be a priority. We propose broader and longer-term studies to further describe and comprehend the effects of GSD on giraffe vital rates among populations in the wild and in captivity.

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1. Introduction

Large mammal populations have plummeted in recent times (Ceballos et al., 2005). Between 1970 and 2005, there was a 59% decrease in the population abundance of large African mammals (Craigie et al., 2010).

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This decline in large mammal populations has been attributed to both biotic and abiotic factors (Cardillo et al., 2005). For example, infectious diseases can pose a substantial risk to populations of threatened species (Karimuribo et al., 2011): rinderpest has caused massive mortality events for numerous species of African ungulates including Cape buffalo (*Syncerus caffer*), eland (*Taurotragus oryx*), and kudu (*Tragelaphus* spp.; Normile, 2008). Ethiopian wolves (*Canis simensis*) are threatened by rabies (Randall et al., 2006) and canine distemper, which has a fatality rate that is second only to that of the aforementioned disease, has been reported in all families of terrestrial carnivores (Deem et al., 2000; Mach et al., 2008). Great apes such as the western lowland gorilla (*Gorilla gorilla*) and chimpanzee (*Pan troglodytes*) have suffered drastic population declines associated with Ebola virus strains (Huijibregts et al., 2003; Leroy et al., 2004). In the past 15 years, giraffe (*Giraffa camelopardalis*) populations across Africa have declined by more than 40% (Giraffe Conservation Foundation, 2013 [GCF]). The extent to which diseases have contributed to the decline of giraffe populations is currently unknown.

Currently, there are 9 recognized subspecies of giraffe distributed across Sub-Saharan Africa (Fig. 1), though ongoing DNA analysis seeks to clarify the subspecies and species divisions (Bock et al., 2014; Giraffe Conservation Foundation, 2013; Fennessy et al., 2013). The International Union for the Conservation of Nature's (IUCN) conservation statuses of these 9 giraffe subspecies vary, though most are considered to be declining (Dagg, 2014; Giraffe Conservation Foundation, 2013). The West African giraffe (*Giraffa camelopardalis peralta*) and Rothschild's giraffe

(*Giraffa camelopardalis rothschildi*), for instance, are both listed as *Endangered* on the IUCN Red List (Fennessy and Brenneman, 2010; Fennessy and Brown, 2010, Giraffe Conservation Foundation, 2010). The remaining subspecies, and consequently giraffe at the species-level, will be recommended to be listed as *Threatened* on the IUCN Red List in 2016 (J. Fennessy pers. com.). Although giraffe is a common captive animal in zoos across the world, there is very little information describing the population dynamics, ecology, and behavior of wild-living giraffe populations (Dagg, 2014). Despite this dearth of information, it is well understood that illegal hunting, habitat fragmentation, and human encroachment are causally linked to the fragmentation and decline of giraffe populations across Africa (Dagg, 2014; Giraffe Conservation Foundation, 2013). However, the effect of disease on the population trajectories of these different giraffe subspecies while potentially significant is poorly documented.

Giraffe experience a variety of skin disorders. For example, giraffe ear disease causes wounds and lesions on the outer ear (Karimuribo et al., 2011). Yellow-billed (*Buphagus africanus*) and red-billed (*Buphagus erythrorhynchus*) oxpeckers are thought to be involved in the pathology of giraffe ear disease (Karimuribo et al., 2011). Lumpy skin disease is a viral disorder from the family Poxviridae which affects a variety of ungulates (Hunter and Wallace, 2001). Much is known about lumpy skin disease because it is a common disease among livestock (Davies, 1991; Woods, 1988; Young, 1970). Within the past 25 years however, another skin disease has emerged in giraffe populations throughout Sub-Saharan Africa. This disease, which has been

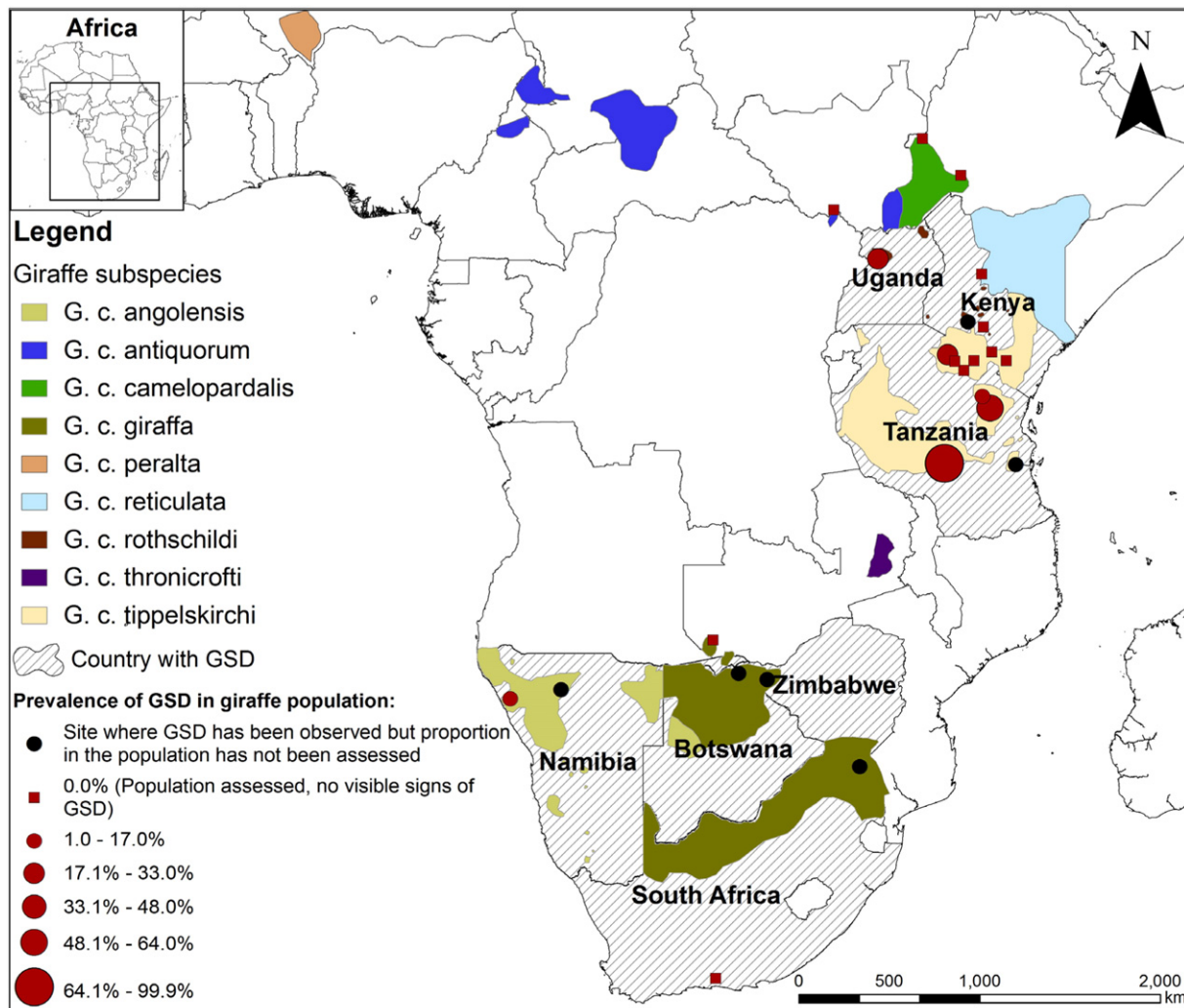


Fig. 1. Distribution of giraffe (*Giraffa camelopardalis*) subspecies and giraffe skin disease in Sub-Saharan Africa.

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