Canid Biology & Conservation

Field Report

Frugivory in African wild dogs in northern Botswana

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Abstract

African wild dogs are found throughout sub-Saharan Africa. They have been observed to be exclusively carnivorous, preying mostly on small to medium sized antelopes. Direct observations over a period of 27 days of a single pack in the Okavango Delta in northern Botswana reported wild dogs opportunistically consuming fruit from the jackalberry tree *Diospyros mespiliformis*. This is the first record of wild dogs foraging for and consuming fruit.

Introduction

Frugivory is a widespread feeding strategy observed in many mammals (Fleming and Kress 2011), including primates e.g., bonobos *Pan paniscus* (Serckx et al. 2015), flying foxes *Pteropus* spp. (Banack 1998), ungulates and elephants, e.g., Asian elephants *Elephas maximus* (Sekar and Sukumar 2015). Functionally, fruits are rich in sugars and are easily digested and frugivory likely plays a crucial role in seed dispersal for many plant species (see Levey, Silva and Galetti 2002). Indeed, some seeds show improved germination after ingestion (Fleming & Sosa 1994), suggesting generalised mutualism (Estrada & Fleming 1986, Eriksson 2014). Amongst the Carnivora, the presence of molars has enabled dietary plasticity (Asahara 2013) and strict carnivory is rare. Consequently, frugivory among carnivores may have implications for seed dispersal (Draper et al. 2022). More typically, however, is that such resources provide seasonal access to quick energy that may play an important factor in carnivore ecology (see Nielsen et al. 2016). Many canids described as generalists and omnivorous are known to supplement their diet with fruit; including black backed jackals *Lupulella mesomelas* (Favaretto et al. 2024), maned wolves *Chrysocyon brachyurus* (Motta Junior & Martins 2000), red foxes *Vulpes vulpes* (Padial et al. 2002) and Japanese raccoon dogs *Nyctereutes procyonoides viverrinus* (Sasaki & Kawabata 1994).

African wild dogs (*Lycaon pictus*) are known to be pack-hunting, obligate carnivores that primarily prey on small to medium-sized ungulates (Hayward et al. 2006, Woodroffe & Sillero-Zubiri 2020). Studies across their extant range have observed predation of a variety of prey species, ranging in size from juvenile buffalo *Syncerus caffer* and eland *Taurotragus oryx* to hares *Lepus* spp. (Creel & Creel 2002), with their preferred prey usually one of Thomson's gazelle *Eudorcas thomsonii*, greater kudu *Tragelaphus strepsiceros*, impala *Aepyceros melampus* and bushbuck *Tragelaphus scriptus* (Hayward et al. 2006). Geographic variation in preferred prey has been attributed to the most abundant small-medium sized prey species in an area (Woodroffe et al. 2004, Hayward et al. 2006). Numerous studies have documented African wild dog feeding behaviour, but none have described consumption of fruit (e.g. Estes & Goddard 1967, Woodroffe et al. 2004, Mbizah et al. 2012, Vogel et al. 2018, Crossey et al. 2021, Tshimologo et al. 2021).

Here we report on the first records of African wild dogs, traditionally thought of as "hyper carnivorous" due to their specialised dentition (Van Valkenburgh & Koepfli 1993, Chavez et al. 2019), consuming the fruit from the jackalberry tree *Diospyros mespiliformis*, also known as African ebony. The jackalberry, so named because jackals (*Lupulella* spp.) are known to be fond of the fruits, is a large deciduous evergreen tree found in African savannahs across the continent. The trees flower seasonally at the end of the rainy season (April and May), and the females bear fruit during the dry season months (June to August; Ramadwa & Meddows-Taylor 2023). Many species of animals have been known to consume this dry season resource, with small carnivores being known to commonly feed on the jackalberry fruits, including African wild cats *Felis lybica*, and side-striped jackals *Lupulella adusta* (Skinner & Chimimba 2005).

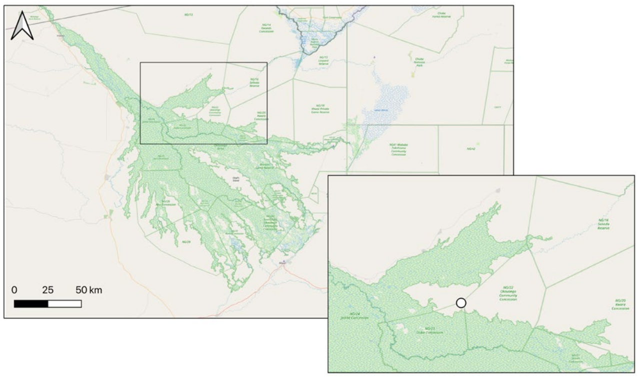

Figure 1. Map of the study area situated in the northern Okavango Delta, Botswana. The white point demarks the approximate location of the den where pack movements were centred around for the duration of the study. Source: OpenStreetMap.

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Results

During a period of 27 days from 29th July to 24th August 2022, a single denning pack of wild dogs consisting of 11 adults (five of which were yearlings) were observed feeding on jackalberry berries in the northern Okavango Delta, in northern Botswana centred around -18.94538, 22.68789 (Fig. 1).

The Okavango Delta is a 14,000km^2, highly productive freshwater alluvial fan with a swamp interior and seasonal floodplains at the distal ends, that supports very high densities of large mammals (Ramberg et al. 2006). The study area contains abundant herbivore species typical of the wild dog diet, including impala, common warthog *Phacochoerus africanus*, greater kudu, and southern lechwe *Kobus leche*.

The habitat in the study area comprised of primarily open floodplains with jackalberry trees interspersed throughout, and mixed woodland treelines comprised of mainly *Acacia nigrescens*, *Croton megolobotrys* and *Philenoptera violacea* tree species. To the south, the area is a permanent swamp, and to the north, the area consists of Kalahari Bushveld *(Philenoptera nelsii, Terminalia* spp., *Combretum* spp., and *Acacia* spp.).

Wild dogs were seen to forage under jackalberry trees, scooping up berries with their incisors and ingesting the berry whole with minimal chewing (Fig. 2a-c). Wild dogs were directly observed to feed on berries on 20 of the 27 observation days, with varying numbers of dogs feeding on different days (range = 3–11 individuals; Fig. 3; Fig. 4). All pack members were observed ingesting berries at least once throughout the observation period and 80% of feeding observations occurred directly after a pre-departure rally prior to the pack moving off to hunt. In addition, several individuals were observed eating berries at various times on nine days. Older subdominant individuals were observed to feed on jackalberry fruits more often than other pack members, although this could not be statistically quantified. Jackalberry seeds were found in some (Fig. 5a, b), but not all, wild dog scats deposited at wild dog latrines (see Claase et al. 2022) in the area.

A neighbouring pack was observed eating berries in a similar manner the year prior to this study (Duncan Rowles, pers. comm.), and as early as 2013 a pack was observed exhibiting this behaviour in the area approximately 23km to the east (Mike Fitt, pers. comm.)

Discussion

Jackalberry trees are widespread throughout the Okavango Delta, and their seasonal fruit provides nutrition for a wide range of animals during the dry season months in this region. It is not unusual for canid species to ingest a variety of fruit (Woodroffe et al. 2004), and indeed this tree species is named due to the tendency of jackals to ingest the berries. Here we present evidence that African wild dogs also ingest the fruit of the jackalberry tree in the northern Okavango Delta.

Interestingly, this behaviour has never been recorded in the study area of Botswana Predator Conservation (BPC) over the 30+ years that the programme has been running, despite the presence of jackal berry trees in certain areas of the study area. The BPC study area lies approximately 80km to the southwest and is separated from this focal study area by deep water channels of the Okavango Delta, although these habitats do not preclude dispersal between the areas (Cozzi et al. 2020). Despite the high level of connectivity within the Okavango Delta (Hofmann et al. 2021), this feeding behaviour appears to be isolated to three contiguous packs in the northern part of the delta system. A study in the same area between 2010–2011 did not report this feeding behaviour (Tshimologo et al. 2021), implying that this may be a recent phenomenon.

The occurrence of jackalberry trees fruiting concurrent to the denning of wild dogs in this region (typically falling between June–August (McNutt & Silk 2008, McNutt et al. 2019) may coincidentally provide wild dogs with additional nutrition during this period when all individuals help to provision pups at the den (Creel & Creel 2002). Given that individuals regurgitate for pups, young individuals may also ingest berries, perhaps teaching these individuals about this novel food source. This potentially learned behaviour may help to explain the limited geographical area of its recorded occurrence. It is possible that ingestion of jackalberry fruits may provide wild dogs with medicinal benefits, as various component parts of this tree, including the fruit, have long been used in traditional medicine and are pharmacologically active (Ramadwa & Meddows-Taylor 2023). The observation that older, subdominant individuals appear to ingest fruit more often than other pack members may be linked to limited access to food at a kill site where younger and more dominant individuals are provided priority access (Jordan et al. 2022).

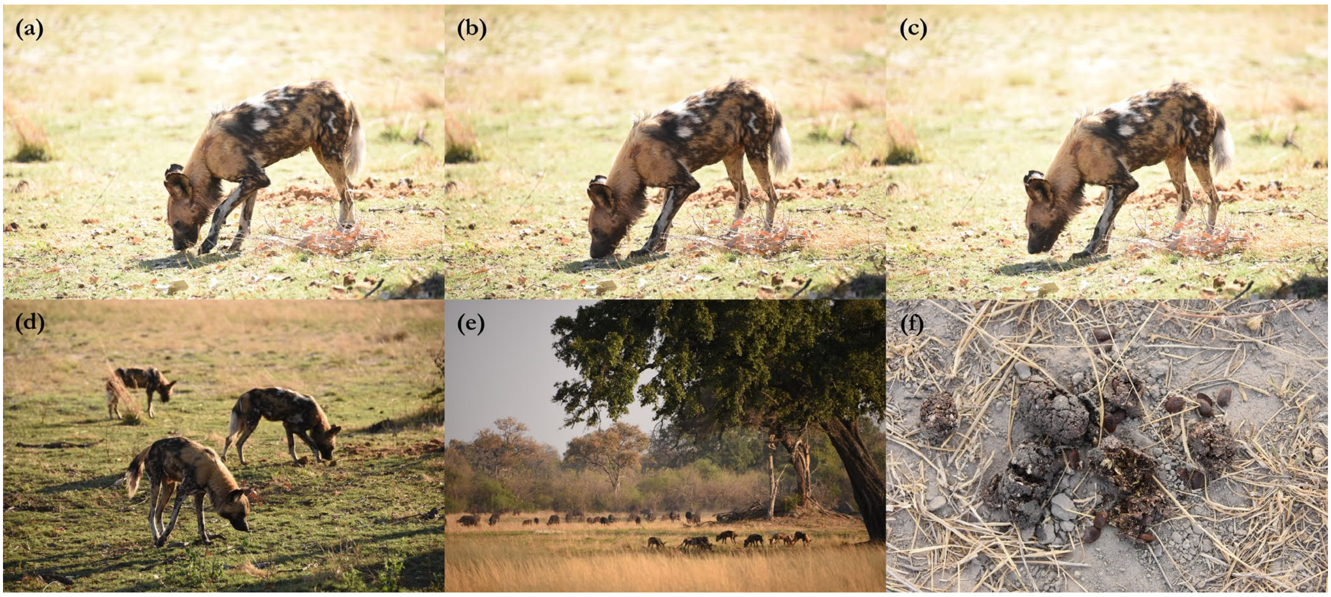

Figure 2. (a-c) An individual is observed approaching a jackal berry with its head to the ground, taking the berry into its mouth, chewing it briefly and swallowing before moving on to find another berry. (d) Members of the pack foraging for jackal berries with their heads directed towards the ground. (e) Most (nine) of the 11 adults in the pack forage and ingest jackal berries prior to attempting to hunt the herd of buffalo in the background. (f) Wild dog scat found to contain numerous jackal berry seeds. Scats were confirmed to be wild dog either through direct observation or from latrines where individuals were observed to scent mark. All photos © Megan Claase.

This field report serves as the first documented evidence of frugivory in African wild dogs, a characteristic not uncommon in many "omnivorous" canid species e.g., coyotes *Canis latrans* (Montiel & Montaña 2000) and golden jackals *C. aureus* (Lange et al. 2021). This report also serves to demonstrate that studies on taxa should be conducted in a wide variety of habitats and ecosystems as unexpected behavioural plasticity and behaviours potentially relevant to dietary shifts related to resource availability or climate change may otherwise go undocumented.

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Biographical sketch

Megan Claase is a wildlife biologist with over a decade of experience conducting and leading research and conservation efforts across Africa, in particular with regard to large carnivores.

J.W. "Tico" McNutt is founder and director of Wild Entrust Africa and has worked in Botswana's Okavango Delta since 1989 leading integrated research, conservation, and community programmes for large carnivores.