Peel A. J., Wood J. L. N., Baker K. S., Breed A. C., de Carvalho A., Fernández-Loras A., Gabrieli H., Gembu G.-C., Kakengi V. A., Kaliba P. M., Kityo R. M., Lembo T., Mba F. E., Ramos D., Rodriguez-Prieto I., Suu-Ire R., Cunningham A. A., Hayman D. T. S. 2017. How does Africa's most hunted bat vary across the continent? Population traits of the straw-coloured fruit bat (*Eidolon helvum*) and its interactions with humans. Acta Chiropterologica, 19(1): 77-92.

SUPPORTING INFORMATION

SUPPLEMENTARY TEXT 1.— Excerpts of observations and hypotheses of straw-coloured fruit bat (*Eidolon helvum*) ecology put forward almost 100 years ago by Herbert Lang and James P Chapin (sourced from Allen J A, Lang H, Chapin J (1917) The American Museum Congo expedition collection of bats).

p481 *"It is of great importance that only a few degrees north of the equator the seasons happen to be the reverse of what they are at that time south of the equator. ...Thus the fruit-bats of these districts, by adjusting their migratory flights, might easily escape the unpleasant and otherwise inevitable conditions of an annual famine. In fact the power of flight could bring them within the fragrance of ripening fruit throughout the year, if they but chose to travel across country between 5° south and 5° north of the equator. Such migrations are wholly within the powers of fruit-bats. Since fruits are not always equally plentiful, they have to shift continually even in the rain-forest."*

p481 *"They have nowhere well established roosts, nor are they present in numbers for a long period in any region except where cultivation of non-autochthonous fruit-trees helps provide an ample food-supply throughout the year, as in many eastern and western coastal districts. Though no positive observations with regard to regular migrations are on record and only "large flights" and "great numbers," without date or locality, are found in the descriptions of various travelers, the occurrence of several species (*Eidolon helvum, Roussettus leachi, Roussettus aegyptiacus, Epomophorus wahlbergi, Epomophorus anurus*) across the eastern and southern portion of the Ethiopian subregion would be a good reason to suggest migration as the only possible solution of their presence throughout the entire territory, where they would have to starve should they remain in one region throughout the year."*

p481-483 *"In* Eidolon helvum*, which has the widest distribution and is also the greatest traveler among African fruit-bats, the third digit is especially long and the fifth rather short, thus forming a long and narrow wing, much better suited for its long flights."*

p484 *"The destruction they cause may be considerable; but by transporting these fruits, sometimes to a distance of several hundred yards, before feeding upon them, they naturally distribute their seeds. ... Since the larger species (*Hypsignathus monstrosus, Eidolon helvum*, and* Epomophorus franqueti*) habitually move fruits as large as figs or guavas in fairly great quantities we can easily imagine what an important role fruit-bats play in the propagation of certain fruit- bearing trees throughout the West African rain-forest. It may even surpass any similar agencies of monkeys and birds that usually receive all the credit in this line.* Eidolon helvum *with its flocks of thousands dropping into a country in search of ripe fruit should certainly be an effective factor for the dissemination of many forms, such as wild figs (Ficus)."*

p499 *"Those who have had an opportunity to see thousands of these bats defile every evening in the same direction high in the air have no doubt as to their performing a migration."*

p500 "*We are not able to coordinate our present observations and the published records from various regions so as to show beyond a doubt that large migrations take place at*

definite seasons. Such movements might be necessary to find new fields of food supply. … It is nevertheless certain that immense numbers of Eidolon helvum *journey about irregularly and then become abundant in regions from which they were previously absent."*

SUPPLEMENTARY TEXT 2.—Roost Descriptions, containing summaries of the characteristics of each *E. helvum* site sampled from or observed during this study, with additional information provided for those roost sites that have not been described in detail previously. Each summary includes a combination of observations and results from data analysis undertaken in this study, and anecdotal reports. GPS details for roost sites are given in Table 1 in the main article.

Sighting records and photographs have been uploaded to the iNaturalist website, http://www.inaturalist.org/taxa/40827-Eidolon-helvum. This community science project includes ongoing addition of unpublished *E helvum* sightings.

2.1. Zambia

Kasanka National Park

Location: The largest known *E. helvum* roosts exists in a 0.4km^2 patch of 'mushitu' evergreen swamp forest in Kasanka National Park in Central Zambia (Figure S2.1).

Roost size and migration: The site is empty for most of the year, is populated rapidly from late-October each year, and persists for 2 ½ months. The arrival and departure dates are remarkably consistent annually, and coincide with peak fruit production in the region (Richter and Cumming 2006). The peak roost size has been estimated at between 1.5 million (Sørensen and Halberg 2001) and 5–10 million (Richter and Cumming 2006) individuals, giving a density of 4–25 bats per m^2 (Figure S2.2). In this study, bats were observed roosting in all three canopy layers of dense vegetation, and often much lower to the ground (5–15 m) than is typically observed in urban roosts. While no further estimations of roost size were performed, the roost was anecdotally reported by park guards to have declined over the last decade.

Reproductive seasonality: Almost all (68/69) females sampled here were pregnant in late November/early December 2008, and the majority were in early to mid gestation (56% and 32% respectively). While no females were observed with attached juveniles from 27/11 – 3/12/2008, 5 females (7%) were in late stage of pregnancy, and one female was observed giving birth in the roost on 3/12/2008. Lack of complete synchrony in female reproductive status meant that a 'phase' was not estimated for this roost.

Roost structure: A female bias (63%) was observed in bats caught by hand, in mist nets and by shooting (by another research team in the park at the time).

Bat-human interactions: The *E. helvum* roost in Kasanka National Park is a tourist attraction, with tourists visiting the periphery of the roost site to watch the bats fly out to feed at dusk and return to the roost at dawn. While close contact is not permitted, the sheer number of bats flying overhead still presents a risk of contact with urine and faeces (Figure S2.3). Park employees, researchers and film crews are permitted to enter the bounds of the roost site, and therefore face an increased risk, however no facemasks or other personal protective equipment are routinely worn. For this, and previous research, bats were caught by hand by park employees, with a high risk of incurring bite wounds. No employees reported any clinical signs believed to be associated with bite wounds.

Shiwa N'Gandu

An anonymous reviewer reported a migratory colony in Shiwa N'Gandu, overlapping in timing with the Kasanka colony.

Figure S2.1 *E. helvum* roosting in Kasanka National Park, Zambia, giving an indication the immense size of this roost

Figure S2.2 *E. helvum* roosting in Kasanka National Park, Zambia, giving an indication of typical roosting densities for this species.

Figure S2.3 *E. helvum* urinating as they alight from a roost in Kasanka National Park, Zambia, giving an indication of the risk to humans of contact with urine. Photograph reproduced with permission from Steven Cunliffe, 2010.

2.2. Malawi

Blantyre

Location: The roost is located centrally within the city of Blantyre, along the north bank of the Mudi River in a stand of very tall (up to 50m) East African mahogany trees (*Khaya anthotheca*).

Roost size and migration: A roost count was performed and the roost size estimated at ~ 8,000–10,000 bats in December 2008. Although some local residents reported that the roost was present year-round, the roost was empty on a repeat visit in July 2009, and had last been observed in May that year. The bats departed the roost in south-easterly direction each evening.

Reproductive seasonality: In December 2008, all adult females were either pregnant (44%), or lactating (56%), with suckling juveniles estimated as less than one month old. However, pregnant females appeared partially asynchronised with lactating females, and were only in early mid gestation, with uterine distension of ~ 1.5–2.5cm diameter.

Roost structure: From a small sample size (n = 18), no significant sex bias was observed (44% male).

Bat-human interactions: Anecdotal reports indicated occasional subsistence hunting of bats, but that they are generally not sold in bushmeat markets.

All known records of *E. helvum* in Malawi have been during the rainy season from October to April (Ansell and Dowsett 1988). However, Happold et al. (1987) note absence from Zomba, Malawi from September 1984 – June 1985. During the above field trip, *E. helvum* were also observed emerging from a roost near the Ruo River on the on Lujeri Tea Estates, Mulange on 15th November 2008. While no bats were sampled, they have been caught in the area previously (Michael Curran and Mirjam Kopp, pers. comm.). A very large roost was also reported ~ 450 km south of Mulanje, near Mt. Namuli in Northern Mozambique. Other roosts previously recorded in Malawi were investigated (Kasungu

National Park and South Viphya Plateau (Ansell and Dowsett 1988)), however no roosts were found, and local residents reported no recent sightings. Another additional roost was reported at Nguludi hospital, Chiradzulu district in December 2009 (Nyson Gawani, pers. comm.).

2.3. Tanzania

Dar es Salaam

Location: *E. helvum* bats are present in small dispersed roosts in the Upanga area of Dar es Salaam, within 1km of the Tanzanian coastline. Bats roost primarily in Indian mast trees (*Polyalthia longifolia* var. *pendula*) that line the roadsides in the area, and also in Indian almond trees (*Terminalia catappa*). The largest roosts (those sampled) are present within private compounds on Lugalo Rd (Figure S2.4). A roost was briefly mentioned in this area in 1974 (Kingdon 1974), however has not been described subsequently.

Roost size and migration: The roost size was estimated at approximately 5,000 bats in August 2009, and residents report the bats being present in the area all-year round, however no indication was given as to whether the roost size fluctuates seasonally.

Reproductive seasonality: Very early or early pregnant females were observed in August 2009. Of five adult female bats caught in April 2013, two were lactating[1].

Roost structure: Male sex biases were observed in August-September 2009 (45/63, 71% males), August 2010 (60/68, 88% male) and in April 2013[1] (23/38, 60.5% male). In August 2009 and 2010, 69% and 79% of bats were adults, respectively, whereas in April 2013[1] many more SI were present (42% adult).

Bat-human interactions: The bats roost over public and residential areas, and the risk of contact with urine and faeces is high for local residents. *E. helvum* bats were occasionally observed being shot from the trees with slingshots by children and guards working in the private compounds. In the latter, this was reportedly to collect live bats to show to passers-by for a fee.

Morogoro

Location: An *E. helvum* roost is located between the railway line and Nuunge Court in the city of Morogoro, ~ 180 km inland from Dar es Salaam

Roost size and migration: The Nuunge court roost size was estimated at 10,000 bats in September 2009, and 8,000 bats in August 2010, however additional smaller roosts present within the local area were not included in the counts. Local residents reported that the roost migrated away completely in September 2010, and returned in November 2010. It is unknown whether this was related to any disturbance. In January 2011, the roost was estimated by a trained staff member of Sokoine University to have increased in size compared with August 2010 (Joseph Malakalinga, pers. comm.). In September 2009, the bats emerged from the roost and flew at a bearing of 200–250 degrees, towards the mountain pass and following a similar path as the road to Kipera.

[1] Data collected as part of the PREDICT project of the United States Agency for International Development (USAID) Emerging Pandemic Threats Program by PREDICT Tanzania team members

Figure S2.4 Photo of an *E. helvum* roosting tree within a private compound on Lugalo Road, Upanga, Dar es Salaam (bats are roosting within the area circled). The photo demonstrates urine collection from plastic sheets underneath the roost (within one residential yard). The tree canopy also overhangs a common walkway and garden area in the property behind.

Reproductive seasonality: Very early to mid pregnant females were observed in September 2009, and early pregnant females in August 2010. In mid-January, 2010, suckling neonates were observed attached to flying females, and some juveniles were observed to be making independent flights (Joseph Malakalinga, pers. comm.). Female bats with nursing young were also present in mid-February 2011[1]. The birthing pulse was therefore estimated to begin sometime in December.

Roost structure: Although a slight male bias (43/73, 59% male) was observed in September 2009, and June 2013[1] (33/55, 60% male), the ratio was equal in August 2010 (30/60, 50% male).). In September 2009 and August 2010, 62% and 42% of bats were adults, respectively, whereas in August 2013[1] many more SI were present (42% adult).

There were highly significant differences between the age and sex structure of Dar es Salaam and Morogoro, with the latter having significantly fewer males and adults ($p<0.01$).

Bat-human interactions: The bats roost over public and residential areas, and the risk of contact with urine and faeces is high for local residents. Children were observed slingshotting at bats, but it appears this is mainly for recreation rather than bushmeat.

Muheza

Location: A roost roosts within the grounds of Teule Mission Hospital, Muheza, 45 km from the northern coast of Tanzania (Ben Amos, pers. comm.).

[1] Data collected as part of the PREDICT project of the United States Agency for International Development (USAID) Emerging Pandemic Threats Program by PREDICT Tanzania team members

Roost size and migration: The roost size has been reported at >15,000[1], but reported to fluctuate during the year. Migration away from the site occurs at the end of the long rainy season and start of the dry season in June-July. Although a small resident roost usually remains during this period, the roost migrated completely in July 2011. The roost returns over a period of several weeks in October and November when fruiting trees become common in the region, though in 2011 this was early September.

Reproductive seasonality: Of 22 adult females caught in June 2013[1] none were detectably pregnant or lactating.

Roost structure: A male bias was observed in June 2013[1] (84/117, 72%).

Bat-human interactions: The bats roost over public areas, including a hospital, and the risk of contact with urine and faeces is high for local residents and potentially immunosuppressed hospital patients. In an attempt to discourage roosting, trees within the hospital grounds are regularly pruned.

Kilombero[1]

Location: A roost site exists in tall trees near homes, a primary court building, and a branch office of NMB bank in Kilombero town at the Illovo Sugar Company (7.66178 S, 36.98741 E), Morogoro region.

Roost size and migration: Unknown, but present in both wet (January, 2013) and dry (September, 2013) seasons. Bats migrated to an unknown destination: animals departed May-July, 2013 and returned late August, 2013. Also, an injured adult *E. helvum* was found below a large fruiting fig tree near the Udzungwa Ecological Monitoring Centre in the Kilombero valley (7.8463 S, 36.8912 E) during the dry season (August, 2009) (Francesco Rovero, pers. comm.).

Reproductive seasonality: Of 11 adult females caught in the wet season (January 2013) four were lactating (though only one caught with a suckling neonate) and one was pregnant.

Roost structure: A male bias was observed in the dry season (20/27, 74% male), compared with a more even representation in the wet season (18/32, 56% male). In the dry season 26/27 (96%) of individuals caught were adults, compared with 27/32 (85%) in the wet season.

Bat-human interactions: : The bats roost over public and residential areas (e.g. casual labourer cottages) and the risk of contact with urine and faeces is high for local residents and individuals visiting the bank or court offices. It is common for primary court clients to wait outside the court building near the bat roost. People may also be exposed to urine and faeces when collecting water from a tap located under the roost trees.

Arusha

Local residents reported that *E. helvum* also roost in palm trees adjacent to the International Criminal Court in Arusha, however none were observed in late-September 2009. Few bats (less than 50) were observed in October, 2013 roosting on tall palm trees adjacent to the Arusha Region Headquarters Office[1].

Ruhudji River[1]

Trees bordering the Ruhudji river, in the Iringa region (9.44600 S, 35.27186 E) and an island in the river is suggested to host a very large *E. helvum* roost on an annual seasonal basis. No bats were present in July 2013, but a local informant reported that the roost

[1] Data collected as part of the PREDICT project of the United States Agency for International Development (USAID) Emerging Pandemic Threats Program by PREDICT Tanzania team members

returned to the roost in October, 2013. The informant observed that the roost migrated to an unknown destination during cold weather (May-August).

Kome islands in Lake Victoria-Mwanza region[1]

A large roost of *E. helvum* fruit bats was observed in November, 2014, roosting in tall trees near the Roman Catholic church (2.380601 S, 32.492924 E). No bats were seen in May, 2015, and villagers reported that the bats migrate seasonally. There is a high risk of exposure to faeces and urine for people walking on the road under roost trees.

2.4. Uganda

Kampala

Location: The *E. helvum* roost from 'Bat valley' in Kampala has been studied by the Zoology Department of Makerere University since 1962 and is reported to have occurred there since at least 1936 (Mutere 1967; 1980). While *E. helvum* bats were observed feeding within the university grounds and in the vicinity of Rubaga hospital in the evenings, no roost could be identified with the help of University staff in October 2009, or in July 2011 (James Wood, pers. comm.). Large populations of Maribou storks (*Leptoptilos crumeniferus*) roost in trees previously inhabited by *E. helvum*.

Roost size and migration: Seasonal presence of this roost is reported from September to May. Historically, this roost contained up to 240,000 individuals in October (Mutere 1980), however it has been in decline in recent years (Perpetra and Kityo 2009). It was unknown whether the inability to detect a roost in October reflects that this roost site no longer sustains large numbers in Kampala, or whether the annual return from migration was simply later than usual. Recent reports (January 2012) indicate that while annual fluctuations in roost size still occur, and very small numbers of individuals can be found in Kampala year-round, seasonal patterns have changed considerably. Roosts appear to stay in Kampala for much shorter time periods (for example, a few weeks in November 2011), perhaps as a result of loss of habitat and increased persecution.

Reproductive seasonality: While mating has been observed in the month immediately preceding the peak wet season (April-June) and annual migration, unimplanted blastocysts have been detected in females remaining in the roost from July to September, and no implantation of embryos into the uterine lining has been observed until October and November (Sodeinde and Soewu 1999; Mickleburgh et al. 2008; 2009; Perpetra and Kityo 2009). With almost 100% of adult females being synchronously pregnant when the roost peaks in size in October, it is assumed that those that had migrated and returned at this time also underwent the same delayed implantation. The peak birthing period occurs from February to March (a true gestation of approximately 4 months), with neonates carried by their mothers until the age of 6 weeks (Mutere 1965; Kingdon 1974; Funmilayo 1979).

Roost structure: Only five individuals were captured during this study (at a night-time feeding site), however all were adult males.

Bat-human interactions: Previous roost sites were investigated, and in all cases, the roost trees had either been cut down, pruned heavily, or residents spoke of active methods employed to deter bats (such as smoking). *E. helvum* bats were observed feeding at night time in Kampala however, in public areas such as in the grounds of Rubaga hospital and Makerere University. Perpetra and Kityo (2009) attribute the reduction in roost size over the last 40 years to these disturbances, and the degradation of habitat that supported large roosts of bats.

[1] Data collected as part of the PREDICT project of the United States Agency for International Development (USAID) Emerging Pandemic Threats Program by PREDICT Tanzania team members

Jinja

Location: *E. helvum* roost high in the canopy of Mvule (*Milicia excelsa*, known also as Iroko) trees lining Bridge Road, Jinja and in *Borassus aethiopium* palm trees in the surrounding area (Figure S2.5 and S2.6). Mvule trees rely on *E. helvum* for seed dispersal (Taylor et al. 2001). The roosting height was estimated to be ~40 m, and it was not possible to get mist nets high enough to capture any *E. helvum* here. This roost is referred to by Mutere (1967) and Perpetra and Kityo (2009).

Roost size and migration: In late-September, 2009, the roost was estimated at ~5,000–10,000 bats. Local residents reported peak abundance usually occurs between December and August. This would be consistent with Perpetra and Kityo (2009), who estimated the roost size at ~46,000 in May 2002, and ~67,000 in July 2002 and ~123,000 in February 2003. Evening dispersal was in a north-westerly direction.

Reproductive seasonality: Unknown

Roost structure: Unknown.

Bat-human interactions: The bats roost over public areas, including a primary school, and the risk of contact with urine and faeces is high for local residents. Local residents mostly ignore the bats. Bushmeat consumption of bats in Uganda was reported anecdotally to be predominantly associated with the Bagisu tribe and the Mount Elgon region near the border with Kenya. Slingshot hunting using clay pellets was observed, however the hunter was not interviewed. Perpetra and Kityo (2009), reported the hunting of ~400 bats for food in one day when the roost was at its peak.

One local resident reported a local belief that bats (in general) are 'poisonous', and sickness can be passed on through biting. Local medical doctors were interviewed and did not report any known associations.

A Maribou stork was observed eating a bat carcass, and local residents reported that storks harass the bats for control of roosting space.

Figure S2.5 Mvule trees (*Milicia excelsa*) on Bridge Rd, Jinja, Uganda. A roost size of 5,000–10,000 bats was observed roosting in Mvule trees here in October, 2009. All of these trees are reported to fill completely with bats during peak times (December to April).

Figure S2.6 *E. helvum* roosting in the upper canopy of Mvule trees (*Milicia excelsa*) on Bridge Rd, Jinja, Uganda, as an example of the height at which this species commonly roosts (bats are roosting within the area circled).

2.5. São Tomé, São Tomé and Príncipe

Multiple locations

Location: Bats were observed roosting throughout the island, though roosts were generally larger and more easily located in the southern half of the island, where the human population density is very low (Figure S2.7). Indeed, the largest roosts observed, at Ponta Basson Gái on the south-western coast of the island, and Ilhéu Jalé nearby, were easy to see, but inaccessible. An impression was gained that roosts in the northern part of the island are highly mobile, particularly in areas with higher human activity and hunting, whereas those in the south, where shotguns and cartridges are not readily available, appeared to be more stable. An exception to this was a small roost of 200–300 bats observed roosting in a coconut grove within the grounds of the Omali Lodge in São Tomé city. Although this roost is in close proximity to humans, in contrast with other roost sites across the island, the bats are protected from hunters since no hunting is permitted within the lodge grounds. It was reported to be a nursing roost and therefore may only be seasonally present (none were present in September/October 2012, Ricardo Lima, pers comm.). A large area of the São Tomé Obô Natural Park in the central and southwest quarter of the island with extremely difficult terrain was not explored during this study. However, this area was subsequently visited in an unrelated study (Table S2.1) and confirmed reports by hunters of large roosts within this area.

Population size and migration: Overall, individual roost sizes were generally quite small, particularly in coconut palms groves (50–200 bats). An estimated 3,300–6,500 bats were observed emerging from the Ponta Basson Gái roost, however this is likely to be a gross underestimate since visibility was impaired. A total population estimate for the whole island is not possible, however it would be expected to be an absolute minimum of 9,000 bats and given the vegetation density and inaccessibility of much of the island, is likely to be many more, perhaps even several orders of magnitude. With the combination of numerous remote roosting locations and breeding sites in the South, with the abundant food in the secondary habitats and plantation in the North, full of fleshy-fruited exotic plants, a total population in the hundreds of thousands is not inconceivable (Ricardo Lima, pers comm). Migration off the island is not expected from previous studies (Juste et al. 2000), and was not reported to occur by any local residents interviewed.

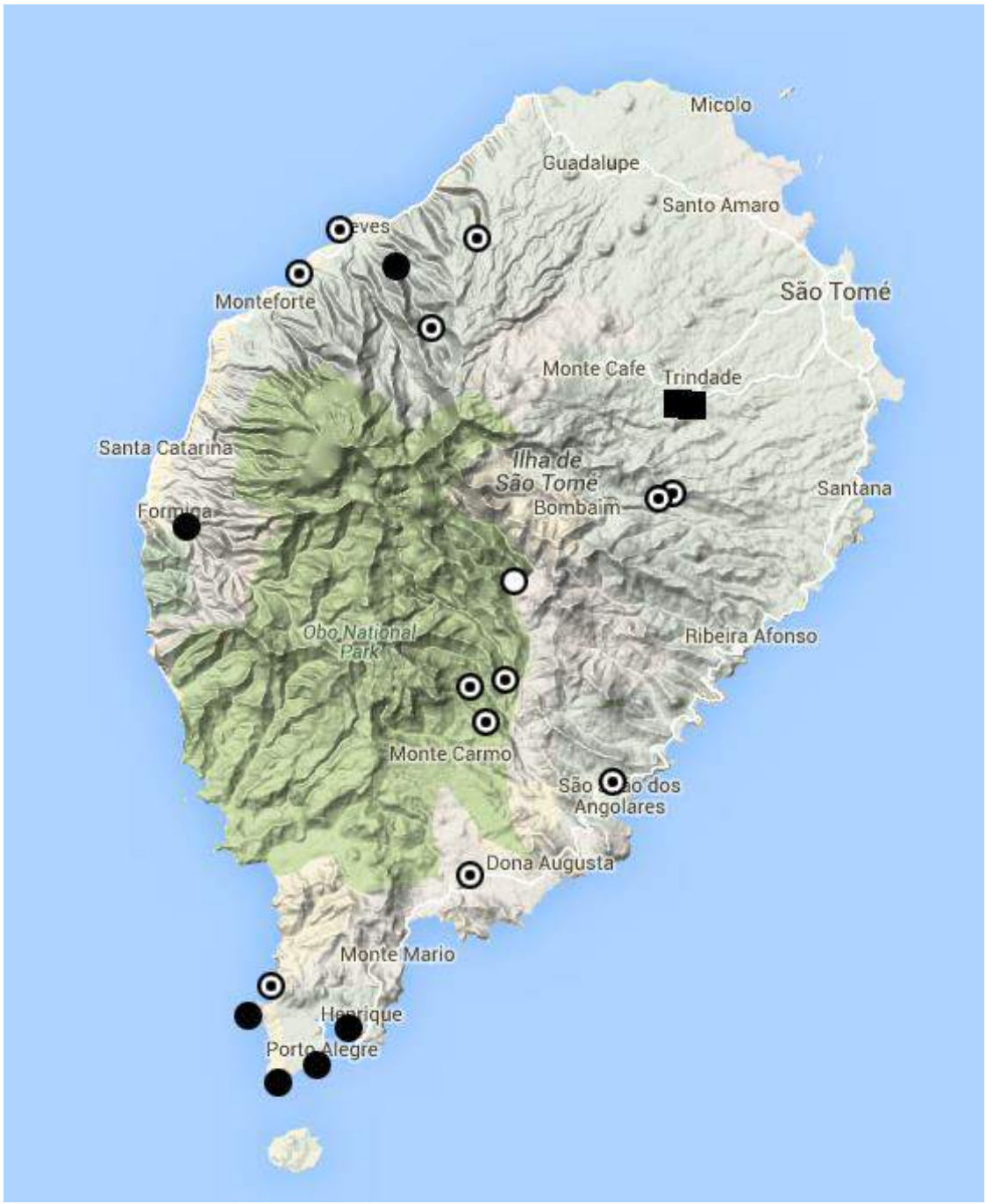


Figure S2.7 Map of São Tomé island indicating *E. helvum* roost and sampling sites from this study (documented table 1 in main manuscript) and another (documented in Table S2.1 below). Key: Circles indicate roost locations (open circle: roosts were reported or used to exist in the past, but no bats were found; partially filled circle: roost observed, but not sampled; filled circle: roost observed and sampled). Filled squares indicate feeding sites where sampling was performed.

Reproductive seasonality: In March and April 2010, adult females were lactating, with attached neonates, and the birthing pulse was estimated to start at the beginning of March. While the peak rainy season is in October-November, this coincides with a smaller peak in rain from March-May. Most birds on the island also breed between September and February, likely also to coincide with peak food availability but not excessive periods of rain (Ricardo Lima, pers comm.)

Table S2.1 Details of observed and sampled *Eidolon helvum* roosts in an unrelated study ('BirdLife International São Tomé Initiative'), as reported by Ricardo Lima (pers comm). Map reference numbers refer to those in Fig. 1 of the main manuscript. Location type: coastal = within 500 m of the coast, peri-coastal = <5km to coast and inland = >5km from the coast. Riparian indicates close proximity to a river or stream. Proximity to humans: Amid = living within 100m of human settlement, near = within 1 km of human settlement, far = living in an isolated area, distant from regular human settlement.

While roost sizes are inestimable, the following footnotes to the table give an indication on relative sizes.

[1] In the tens of thousands. From the coordinates given here, the roost extends North for ~600m, on the East side of the river, and for an undetermined extent to the other side.
[2] Very large, certainly in the tens of thousands.
[3] In the thousands
[4] Large roost, Certainly in the thousands
[5] Hunters report his roost to be 'large' to 'very large' when present. None were present when visited on the date shown.
[6] The roost is very close to a community. People climb trees and kill them with a long stick when they emerge from the roost. It appears to be a key source of the fruit bats being sold in São Tomé town, due to its location and size.
[7] The coordinates correspond to the location of the hunters' camping site. This location is often mentioned by hunters who sell bats in the Cruzeiro/Trindade areas. It is also reported to be seasonal, or that at least the bats leave this location from time to time. Some hunters blame this fluctuation in roost size on excessive hunting pressure.

Location	Map ref	Latitude	Longitude	Roost size	Location type	Habitat	Proximity to humans	Bat-human interaction	Date observed/ sampled	Altitude (m)	Time	Observers
Ana Chaves river	17	0.1794	6.6058	Unknown[1]	Inland, riparian	Natural forest	Far	Not hunted	26/08/13	314	10:39	Hugo Sampaio
Águas Sampaio	17	0.3516	6.5944	Unknown[2]	Peri-coastal, riparian	Natural forest	Near	Hunted frequently[6]	Oct 2012	400	17:00	Ricardo Lima and Fábio Sequeira
João Nunes river	17	0.1765	6.5921	Unknown[3]	Inland, riparian	Natural forest	Far	Not hunted	23/02/14	209	10:51	Hugo Sampaio
Miranda Guedes river	17	0.1625	6.5981	Unknown[4]	Inland, riparian	Natural forest	Far	Not hunted	26/08/13	160	16:00	Ricardo Lima and Ricardo Fonseca, aka Mito
Duas Grotas	17	0.2177	6.6093	Unknown[5]	Inland, riparian	Natural forest	Far	Hunted occasionally[7]	15/09/13	319	11:00	Ricardo Lima and Gabriel Cabinda, aka Yeli

Roost structure: As discussed above, information on the roost structure was obtained as a by-product of working alongside bat hunters, with each shot tending to kill 4–5 bats roosting in a close cluster (though reportedly many more than this when hunting in dense forest roosts). Within the smaller roosts in coconut groves, separation appeared to occur between 'nursing' roosts, which consisted of lactating adult females, neonates and sexually immature bats, and roosts consisting of primarily adult males.

Bat-human interactions:

Bat hunting: Bat hunting with shotguns is very prevalent in the north and central-north of São Tomé, either with bats as the primary target or opportunistically when the hunter might otherwise be targeting monkeys or pigs. The latter are preferred over bats since they are more valuable and a more efficient use of the expensive cartridges. Through informal discussions and a small number of formal questionnaires, it appeared that hunting pressure and the demand for bat bushmeat was increasing, and bat roosts were highly mobile in regions where hunters, guns and cartridges were prevalent. While it was generally agreed that *E. helvum* were more difficult to locate than in the past, opinion was divided among hunters as to whether this was because of frequent rotation through the roost sites, a reduction in the total number of bats, or because hunting pressure was pushing bats into other locations, which were unknown or simply too difficult to reach.

Both subsistence hunting (for the hunter's family or to share with the local community) and commercial hunting occurs. For the latter, larger offtakes are taken to meet specific orders, or to sell in markets or to bat bushmeat bars. Commercial hunters from the north of the island will specifically organise expeditions to kill large numbers of bats in the forest roosts - often to the south, where a shortage of availability of both shotguns and cartridges makes it difficult for local residents in those areas to hunt to the same extent. People must travel to the capital in the north to obtain cartridges. This is also the case at the other 'end of the road', in the central west of the island near Bindá.

Other methods for bat hunting include slingshots (e.g. by children for leisure, Figure S2.8) and the use of wire mesh fruit traps ('kapuélé') with a one-way mesh entrance funnel at feeding sites for consumption in rural communities. Additionally, in Águas Sampaio and other locations with high bat densities, it has been reported that sometimes bats are killed by climbing to a tree and hitting the bats with a long stick as they fly past (Ricardo Lima, pers comm).

Bat consumption: Questionnaire responses indicated that men are much more likely to eat bats than women, however sample sizes from women were too small for statistical analyses. Of 34 men interviewed, 29 responded that they eat bat meat more than once a year (and for over half the respondents, the frequency was at least weekly). Conversely, only 1/5 women interviewed responded that they would ever eat bat. Many respondents considered bat meat to be a 'hot' meat (along with other bushmeat species such as monkey and civet, but not wild pigeon), which should be avoided by pregnant women (due to perceived abortion risk) or people with prior gastrointestinal problems. Several respondents also commented that bat meat should be avoided by people with any open wounds as it was thought to cause delayed healing.

From surveys conducted in 2010, there was generally no perception of any health risks associated with hunting or preparing bats, other than the risk of a wound from a bite. However, this changed significantly after the Ebola epidemic in West Africa in late 2013-2014. A campaign on São Toméan TV informed the potential risk of Ebola spillover from bats and monkeys, and many people reportedly stopped eating these bushmeats (Ricardo Lima, pers comm.). This supports the contention that bats, as most other bushmeat, are not central to the human diet in São Tomé, but instead are a luxury or simply add variety (Ricardo Lima, pers comm.).

Other interactions: Palm wine consumption is ubiquitous among men and women in São Tomé. There are two ways of collecting the sap. One, called "pombou" is controversial and involves cutting a hole in the trunk – it ends up killing the tree and produces low quality wine. The other is the most widely used technique, and involves removing the inflorescence and keeping the wound open to produce abundant sap. Sap is funnelled into containers (mostly 1.5 or 2 L water bottles with a small opening) via a tube inserted into the tree. It requires climbing the tree at least once a day to collect the sap/wine and cut the tree, to keep production going. The sap is filtered through some very coarse netting to remove large debris, and pooled with sap from other trees in larger containers before consumption. Fermentation occurs within ~12 hours and the sap/wine is usually consumed within 24 hours. Palm wine collectors reported observations of bats, monkeys and birds drinking from the funnel, however they do not perceive any health risks from drinking sap (other than as a result of inebriation) and will drink fresh sap in the forest immediately after collection.

Figure S2.8 *E. helvum* bats hunted by slingshot by young boys in São Tomé. The male bat on the left is injured but still alive. Photograph taken by Ricardo Rocha, July 2008.

2.6. Príncipe, São Tomé and Príncipe
Multiple locations, primarily Novo

Location: The entire southern half of Príncipe island is national park, with almost impenetrable terrain, and substantially more rain annually than the north of the island. Local national park rangers reported that *E. helvum* are only found in the north of the island during the rainy season, when they come to feed on the fruiting trees, and roost in coconut palms or coastal cliff-faces closer to smaller human populations (e.g. Abade, Sundy) during the day. While the rainy season was expected to begin in March, no rains had come yet in mid-April 2010, trees were not yet in fruit, and all wet-season roost sites in the north of the island were empty (except for two male adult bats).

In an isolated area of the national park in the south of the island, the large, previously reported 'Novo' roost was located and sampled from (Figure S2.9).

Population size and migration: This roost was previously estimated as having 10,500–14,000 bats (Dallimer et al. 2006), and in this study, was estimated to contain 20,000–24,000 bats, though an incomplete view of the emergence flight path means that this is a

minimum value. Park rangers suggested there might have been another roost of roughly equivalent size on the island. Migration off the island is not expected from previous studies (Juste et al. 2000), and was not reported to occur by any local residents interviewed.

Reproductive seasonality: A previous study observed females with suckling neonates present in late January (Dallimer et al. 2006). Since juveniles suckle for approximately 6–8 weeks, this would indicate that the birthing period begins around the beginning to middle of December. Consistent with this previous observation, no females were detectably pregnant during sampling in April 2010, and juveniles were estimated at approximately 4 months old. However, unusually, one adult female was captured with a suckling neonate that, due to its size, weight (40g) and limited fur covering, was estimated at only a few days old.

Roost structure: Bats caught using a mist net at this location in April 2010, comprised 41/62 (66%) adults, 20/62 (32%) sexually immature bats and one neonate.

Bat-human interactions: Consumption of bats is less common on Príncipe than São Tomé, and while some survey respondents indicated that this was due to lack of supply, hunters reported a lack of demand. This may be seasonal, however, as respondents reported more frequent consumption during the wet season when the bats are more easily found around settlements (November to January). This coincides with the expected birthing period. During the sampling period here (April), bats were roosting in a remote, protected area where hunting is banned. Hunting is performed with shotguns and fruit-traps. Both men and women eat bats (and drink palm wine). As with São Tomé, bat meat is considered 'hot' meat, and not advisable for pregnant and lactating women, but otherwise, consumption is not considered a risk to health.

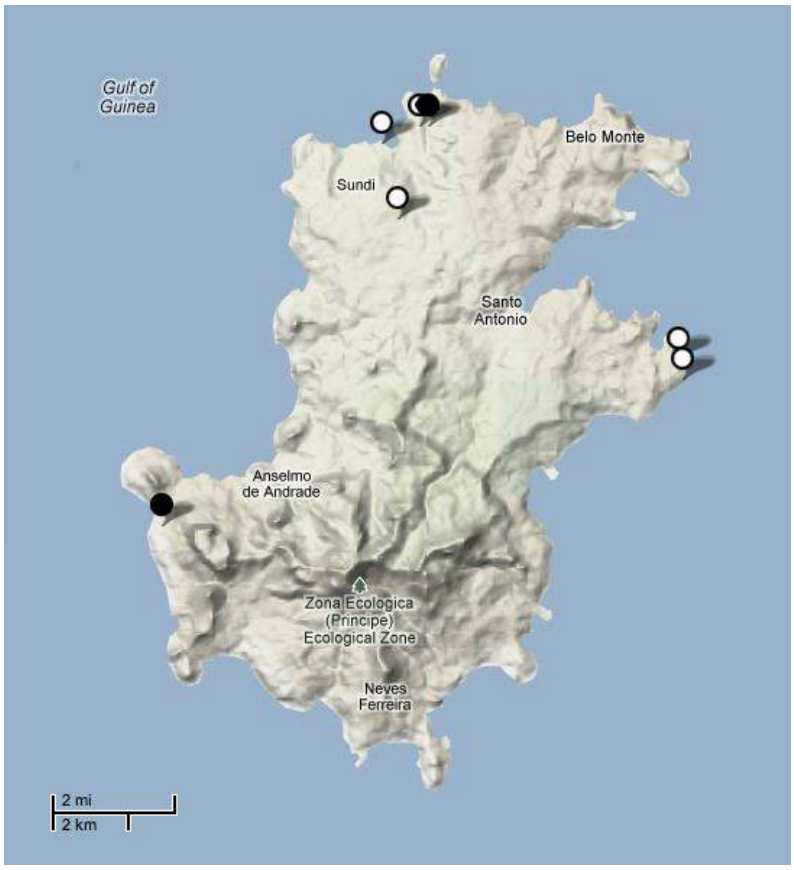


Figure S2.9 Map of Príncipe island indicating *E. helvum* roosts and sampling sites. Key: Circles indicate roost locations (open circle: roosts were reported or used to exist in the past, but no bats were found; filled circle: roost observed and sampled). Only two individuals were sighted in the northern roost, and the major roost is the one shown in the south-west.

2.7. Annobón, Equatorial Guinea

Location: In mid-May 2010 (dry season), two colonies were identified in the south of the island (Figure S2.10), the first, at Adjo (where sampling occurred: 1.58971, 7.3373), north-east of Mábana, and another nearby at Vité, on the path between Mábana and Aual. The terrain precluded accurate roost or nightly emergence counts, however population sizes at Adjo and Vité were estimated at approximately 1000 – 1500 bats and 600 –1500 bats, respectively. A site where bats had previously been seen roosting near San Juan in the north of the island was empty

In late October/early November 2011 (wet season) six roosts were located, all of them of small size (10-80 bats). Two roosts were observed in the northwest of the island: one near Paliá cove (where sampling occurred: 1.4181389 S, 5.6188391 E), and another by a stream 600 m to the south of Paliá. Another small roost was located in the San Juan valley, in the northeast of the island. One small roost was also located in the centre-west of the island, 1.5 km to the north of Aual. The roosts in the south that harboured hundreds of bats in May 2010 (Vité and Adjo) were occupied again but this time only a few dozen bats were present.

In mid-June 2014 (dry season), the roosts in the north of the island were vacated, with only the Vité and Adjo roosts being occupied. The large colony of Vité (1.459736 S, 5.630429 E) was sampled and its population size estimated at 1,000-1,500 bats.

The island is very small but rugged and other small colonies are likely to exist but we think the existence of undetected large colonies is less likely.

Bats can be seen flying over most of the island and they have also been observed feeding on fruiting trees (e.g. breadfruit, mangoes, bananas) in many areas of the island, including the town of Palé. Even at times when the roosts are concentrated in the south of the island some bats are still observed feeding on trees in the northern areas.

Reproductive seasonality: In mid-May 2010, adult females were in very early or early stages of pregnancy and no juveniles were observed in the colony. In mid-June 2014 there were some females in mid stage of pregnancy while others were still in very early to early stages. Based on a gestation period of 4 months, the birthing time was estimated as mid-September. In late October and early November 2011 several females were observed carrying neonates in flight, and one of these pairs was captured in the nets. The proportion of females carrying neonates from the total of flying bats observed appeared to decrease from late October to early November; we made three sampling counts in the north of the island on 25th October (27% of flying bats were females with neonates attached; n = 15), 8th November (5% were females with neonates attached; n = 20), and 10th November (no females carrying neonates were observed; n = 19). While simple sizes are small, this observation likely corresponds with females leaving their juvenile pups at the roost site overnight.

The birthing season seems to occur just before the onset of the wet season. There are two climatological seasons in Annobón; the dry season from March/April to September/October and the wet season from October/November to February/March. The wet season is when most fruits ripen (e.g., mangoes ripen between October and January).

The climatological seasons and/or the reproductive stages also seem to govern the distribution of roosts in the island. Around the beginning of the birth pulse, when females are lactating, (at the start of the wet season) bats are spread in small roosts (less than 100 individuals) dispersed throughout the island (Similar to observations on São Tomé). However, in the dry season, when females are in the early stages of pregnancy, most of the bats seem to be concentrated in just two large colonies in the southern area of the island. The South, with its cloud-catching peaks is the wettest part of the island due to the

southerly nature of the prevailing winds in this oceanic region. It is also the area where the fruiting season of trees extends beyond that of the northern areas (e.g. mangoes season ends in December in the north while one month later many are still ripping in the south).

Roost structure: The proportion of adults vs. sexually immatures among captured individuals was similar for May 2010 and June 2014 in the southern large roosts, with around 60% adults vs. 40 % SI. A higher proportion of adults were captured in the Paliá roost in October/November 2011 (86% adults vs. 14% SI). One neonate bat was also captured attached to its mother in 2011.

The proportion of males vs. females varied from 56% males and 44% females in May 2010 and October/November 2011 to 66% males vs. 34% females in June 2014.

Bat-human interactions: Domestic pigs were observed foraging under a breadfruit tree and banana plantation where *E. helvum* bats were observed feeding during the night. People also regularly collect fruits from and under the same trees where bats feed. Informal investigations revealed that *E. helvum* bats are eaten infrequently in Annobón. Children or teenagers have been observed playfully using stones to harass bats feeding in mango trees in the town (Palé), and they were reported to occasionally kill bats feeding close to urban areas with slingshots for consumption. Adults reported that they would not eat bats, either because of a dislike of the taste and smell, or because of an association with witchcraft.

Isolation and differentiation: Juste et al. (2000) established that the *E. helvum* population on Annobón is significantly smaller in body size than populations on the nearest islands or on continental Africa. This was supported in this study. Additionally, strong genetic differentiation (Juste et al. 2000; Peel et al. 2013) is apparent and it has been proposed that Annobón's geographic isolation has resulted in sufficient genetic differentiation of *E. helvum* on the island for its designation as a separate subspecies, *E. helvum annobonensis* (Juste et al. 2000).

Figure S2.10 Map of Annobón island indicating *E. helvum* roosts and sampling sites. Key: Circles indicate roost locations (partially filled circle: roost observed, but not sampled; filled circle: roost observed and sampled).

2.8. Bioko, Equatorial Guinea

Malabo

Location: *E. helvum* bats roost throughout the city of Malabo in coconut trees and royal palm trees (*Roystonea* spp.) (Figure S2.11). Larger roosts were located in the grounds of the Chinese embassy, the Universidad Nacional de Guinea Ecuatorial (UNGE) and in an empty plot opposite the Spanish embassy. This is a highly urban bat roost and samples were collected using a mist net placed within the construction site (Figure S2.12). There are no known roosts outside of the city.

Figure S2.11 Map of Bioko island (left) and close-up of Malabo (right) indicating *E. helvum* roosts and sampling sites. Key: Circles indicate roost locations (partially filled circle: roost observed, but not sampled; filled circle: roost observed and sampled).

Figure S2.12 Location of mist net for catching *E. helvum* bats in Malabo Bioko, demonstrating that this species appears content to roost in highly urban environments, and the successful and novel use of a construction crane to set mist nets.

Roost size and migration: The sizes of the three large roosts mentioned above are approximately 1,500–2,000, 1,000, and 300 bats respectively. A total roost size for Malabo was crudely estimated at 6,000. Residents report that the roost size fluctuates seasonally, increasing when the rainy season begins in June. It is unclear what proportion of the seasonal population increase in roost size is due to this corresponding to juvenile weaning time versus migration from other roosts on the mainland. Residents also reported that the size of the year-round resident roost has increased over recent years.

Reproductive seasonality: At the end of April, females were seen carrying juveniles, and when catching commenced in late May, many free-flying juveniles were caught. The birth pulse was therefore estimated to begin in mid-April.

Roost structure: From this sampling site at the roost, of a total of 105 bats, just 15 were adults, 2 were sexually immature, and the remainder were juveniles. Logistics meant that sampling was conducted through the night in this location, and in retrospect, this site appeared to be predominantly juveniles who had been left at the roost while their mothers went out to feed.

Small numbers of *Hypsignathus monstrosus* (Hammer-headed fruit bats) were also observed flying through the city at dusk. A sexually immature male and a pregnant adult female were caught and sampled. In Gabon, *H. monstrosus* are reported to give birth around July to August, and the estimated size of the foetus was consistent with this.

Bat-human interactions: While the bats are largely ignored, residents dislike them for their noise and mess, and for destroying the trees in which they roost.

Informal investigations and questionnaires in Bioko revealed that *E. helvum* bats are not eaten by the majority of the population, but they are occasionally eaten by people of the Fang tribe from mainland Equatorial Guinea, or immigrants from other African countries. Bats were reported to occasionally be available at the bushmeat market in Semu. One respondent from the Bubi tribe described perceived associations between bats and witchcraft.

Hunting of bats in mainland Equatorial Guinea is reported to be rare, with the exception of the districts of Mongomo, Ebibeyín and Micomoseng in the north-east of the country (David Gill, pers. comm.). Here, extensive hunting pressure and degradation of forests has resulted in the depletion of other bushmeat species, and in the absence of other available prey, driven people to bat hunting as an alternative. Hunting using a slingshot was also observed in the city of Bata, however the hunter was originally from Cameroon.

2.9. Democratic Republic of the Congo (DRC)

Kisangani

Observations here were made by Guy Crispin Gembu Tungaluna.

Location: Samples were collected during the evening at various forest feeding sites around Kisangani, central DRC. While no major roosts exist within the city of Kisangani, roosts are present year round on the nearby Mbiye island (0.454 N, 25.282 E) and in the Boyoma wildlife sanctuary on Mafi Island (0.399 N, 25.345 E). Specific roost sizes are unknown, however abundance on the islands, and as assessed from captures at feeding sites, is reported to increase between March and September.

Roost size and migration: *E. helvum* is reported to occur year-round in Kisangani with peak abundance between March and September, but roost sizes are unknown.

Reproductive seasonality: Lactating females were caught in March 2005, consistent with reports that fruit bats in the region are generally pregnant either from December to February or from June to August.

Roost structure: From 34 individuals caught late June – late July, 35% were male.

Bat-human interactions: Hunting is reported in roosts on Mafi and Mbiye islands, and in the Yoko forest reserve (32 km from Kisangani). Hunters reported that they used to hunt *E. helvum* with guns, however since carrying weapons was made illegal, they now use slingshots, locally-made nets, or cut down roosting trees during the day and kill bats that fall with a stick. Hunters sell them alive to female vendors to kill, eviscerate, and boil or smoke before selling (Figure S2.13).

Four fruit bat species are regularly sold in the large bushmeat market in Kisangani: *E. helvum*, *Epomops franqueti*, *H. monstrosus* and *Rousettus aegyptiacus*, however *E. helvum* and *E. franqueti* are the more common species. In 2008, an *E. helvum* bat cost 150 FC (0.25 USD) to buy, but in February 2012 cost 800 FC (0.89 USD, approximately 6 – 9 USD per kilo of meat) . *H. monstrosus* bats currently cost 1200 FC (1.33 USD). Although

this is less expensive by weight than other meat, a disproportionate increase in price has been observed over this time period compared to other meats such as beef and pork, which currently cost 10,000 FC (12 USD) and 4500 CF (5 USD) per kilo, respectively. Anecdotally, it appears that the increased price able to be gained from bat meat appears to have increased hunting efforts. Consumption of bats is reported to depend on the food preferences of individuals and their ethnicity.

Figure S2.13 A female vendor near Kisangani who has purchased live *E. helvum* bats from a hunter (tied together, top left), kills the bats and removes the viscera in the Congo river (top right) before boiling or smoking. The bottom photo shows dead *E. helvum* are also for sale as fresh carcasses. Photos taken by Guy Crispin Gembu Tungaluna.

2.10. Ghana

The Ghanaian roosts are described in detail in Hayman et al. (2012), and summarised here. Connectivity between three roosts in the southern half of Ghana included in these analyses has been demonstrated in radio-telemetry studies (Hayman et al. 2012).

37 Military Hospital, Accra

Location: The main study site is a large roost site in the city of Accra, within the 37 Military hospital, Accra Park and Gardens, and along the roadside in the immediate vicinity.

Roost size and migration: This roost fluctuates in size over the year, with a small resident roost of ~4,000 bats from ~ April – October to up to ~ 1,000,000 bats when the majority of

the roost returns from the annual migration in November (Hayman et al. 2012). The exact timing of migration is inconsistent from year to year.

Reproductive seasonality: The annual migration occurs from ~March to November. In November, females are not detectably pregnant. Pregnant females are captured in January, and near-term females are captured frequently in March, however no neonates have been observed within this roost, indicating that females move elsewhere to give birth (Hayman et al. 2012).

Roost structure: A male capture bias has been observed, particularly during the migration period when only a small resident roost remains. Over all sampling periods from 2007 – 2010, males comprised the following proportion of bats caught: 62% (Nov), 71% (Jan), 93% (Mar), 79% (Jul) and 73% overall.

Bat-human interactions: The bats roost over busy public areas and the risk of contact with urine and faeces is high. Bats are commonly hunted from the roadside or within Parks and Gardens for bushmeat consumption. Since the use of shotguns is illegal within the city, bats are killed primarily using slingshots, or collected opportunistically when a bat-laden branch falls to the ground. The bats are resented for the noise and the mess created from urination and defecation and consequently, roosting trees are occasionally pruned heavily to discourage roosting.

Kumasi Zoo, Kumasi

Location: A roost exists within the grounds of Kumasi zoo, which lies centrally in the city of Kumasi, and ~200 km north of the Accra roost.

Roost size and migration: The roost size was estimated at 500,000 in March 2009 (Hayman et al. 2012).

Reproductive seasonality: Females with attached neonates have been observed at this site in March, but not sampled (Hayman et al. 2012).

Roost structure: In March 2009, the roost was heavily male biased and 83% of bats caught were males. Reproductive cycling is assumed to follow a similar pattern to Accra.

Bat-human interactions: As with Accra, the bats roost in a busy public area, and are hunted by slingshot and opportunistically collected from fallen branches.

Tano Sacred Grove, Tanoboase

Location: This recently documented roost is within a sacred forest under protection by the local community, and lies approximately 100km north of Kumasi and 300km north of Accra.

Roost size and migration: The roost size was estimated at over 3 million in March 2008 (Hayman et al. 2012). Bats are reported to roost here all year round, but in greater numbers from April to August and at its maximum in June and July.

Reproductive seasonality: Females with attached neonates have been observed at this site in March, but not sampled.

Roost structure: In March, the sex structure was more balanced than in other locations, with 60% of bats caught being male.

Bat-human interactions: While hunting is prohibited within the sacred reserve, illegal hunting does occur and was recently reported to have increased in intensity. There are also some tourism activities within the reserve.

Other previously unreported locations

A very large roost is reported to visit Biobio Island in Lake Volta very briefly in December and again in March (Alexandra Kamins, pers comm.). It is heavily hunted and stays only a week or two.

In the Afram Plains, hunters reported ~12 small roosts (in the few hundreds or smaller) scattered across the Afram Plains. One Afram hunter reported a large roost near Bonaso village, but this was not verified (Alexandra Kamins, pers comm.).

Recently, Agyei-Ohemeng (2015) reported a roost site in a Wildlife Sanctuary within the grounds of the University of Energy and Natural Resources in Sunyani, Ghana, which had been present since 2008. Roost counts made between January 2013 and July 2014 identified a peak population size of 240,000 bats in December 2013. Lowest counts were observed at the end of the study period (1,500 bats, July 2014).

2.11. Other reported roost locations

The following list contains information regarding other *E. helvum* roost locations gathered during the course of this study, but not investigated in detail.

Yaounde, Cameroon

A large *E. helvum* roost has been observed in the British American Tobacco compound (3.89072 N, 11.50934 E) (Fiona Maisels, pers. comm.).

Libreville, Gabon

Several *E. helvum* roosts were reported in Libreville, including near the Cathedral along the Bord de Mer (0.40342 N, 9.43601 E) and near Trois Quartiers ("we can sometimes hear them being shot at from the office") (Fiona Maisels, pers. comm.); and in the gardens of the French embassy (0.38319 N, 9.44690 E), in Quartier Louis and Haut de Gue-Gue (Oliver Hymas, pers. comm.).

These roosts appear to be present during the wet season from September to June (Kate Abernethy, pers. comm.). *E. helvum* was reported not to be found in the bushmeat markets in Libreville city, however that they are eaten in rural areas (Oliver Hymas, pers. comm.).

Quilemane, Mozambique

A roost was reported in Quilemane (17.88 S, 36.89 E), but no further details are available (Ara Monadjem, pers. comm.).

Brazzaville, Congo

Large bat markets have been reported here in September, with both live and dead bats sold (Trish Reed, pers. comm.). This is consistent with observations in December 1914 and April 1915, reported by Allen et al. (1917). They are also reportedly consumed in great numbers in the Pool region of Congo (Ken Cameron, pers. comm.).

Kigali, Rwanda

E. helvum appear to be seasonally present around the Kiyovu and Nyamirambo areas of central Kigali, predominantly near the National Bank of Rwanda (1.9483 S, 30.0639 E) and the Serena Hotel (1.9565 S, 30.0624 E). Seasonality reports vary, but generally report presence from August to September, followed by an absence, before a return in January–February (Carina Erdmann, Simon Allen and Nick Fraser, pers. comm.)

An *E. helvum* roost has also been observed in palm trees in Gisenyi, outside the Serena hotel along the shoreline of Lake Kivu (1.7047 S, 29.2600 E) in January (Scott Delaney, Carina Erdmann, Sandra Göhl, Aaron Rundus and Anna Colom, pers. comm.)

Ouagadougou, Burkina Faso

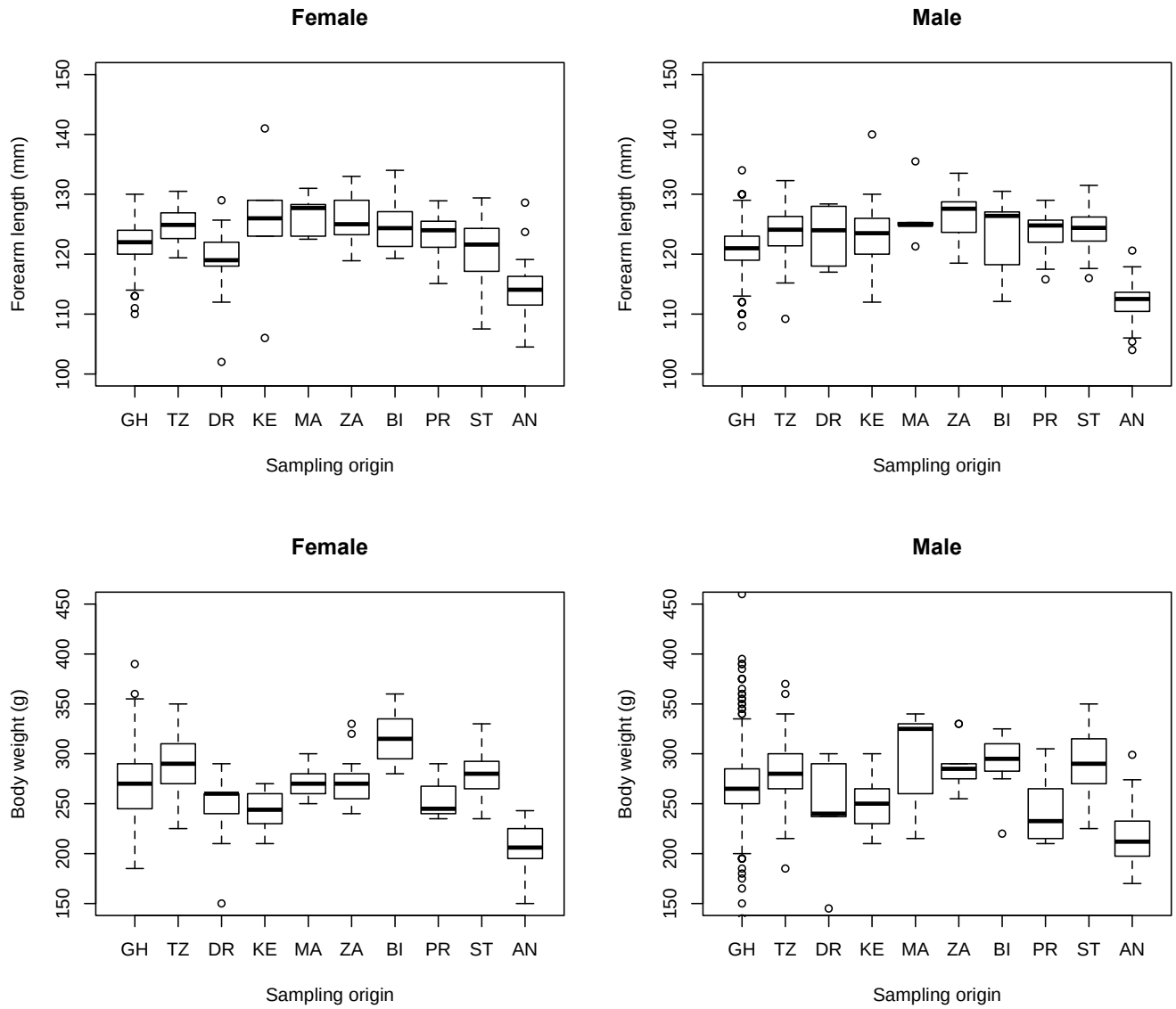
An *E. helvum* roost was observed in the centre of Ouagadougou in November, 2013 (Charles Godfray, pers comm).

Guinea-Bissau

Observations by Ana Rainho and Jorge Palmeirim

Date	Location	Tree type	Coordinates	Colony size
6/03/98	S. Domingos	Unidentified tree	12.36016, -16.0902	500 to 800 ind (both male and female)
16/03/98	Bolama	Mango tree	11.57738, -15.4750	hundreds
28/10/15	Meio	Palm trees	10.973, -15668	hundreds

SUPPLEMENTARY FIGURE 1.— Plots of *E. helvum* adult forearm length (in mm) (top) and body mass (in grams) (bottom) by sex and sampling location (GH (Ghana), TZ (Tanzania), DR (DRC), KE (Kenya), MA (Malawi), BI (Bioko), PR (Príncipe), ST (São Tomé), AN (Annobón)). Box and whisker plots: median (black line), 25th and 75th percentile (box) and 1.5x the interquartile range (dotted line) values. Outliers are shown as individual points.



SUPPLEMENTARY TABLE 1.— *E. helvum* emergence roost counts (observed number of bats emerging from roosts in São Tomé and Príncipe), and parameter estimates from the logistic growth model. AP = Alison Peel, AFL = Andrés Fernandez Loras, NT = Aristides Santana (Nity).

Location	Distance from roost site	Date	Observer	Time first bat counted	Time count finished	Minutes counting	Total no. bats counted	Parameter estimates (95% CI)		
								k	a	t
Novo, Príncipe	600 m	10/04/2010	AP	17:02	17:49	0:47	11,437	21,763 (19,702 - 24,456)	0.11 (0.11 - 0.12)	56.1 (54.5 - 57.8)
		11/04/2010	AP	17:00	17:46	0:46	10,140	NA	NA	NA
Ponta Basson Gai, São Tomé	800 m	20/04/2010	AP	16:50	17:43	0:53	2,564	3,420 (3,200 - 3,693)	0.12 (0.11 - 0.12)	43.5 (42.2 – 45.0)
			NT	16:58	17:44	0:46	4,905	5,275 (5,183 - 5,374)	0.17 (0.17 - 0.18)	38.9 (38.6 - 39.2)
		21/04/2010	AP	16:52	17:43	0:51	3,201	4,216 (4,104 - 4,339)	0.12 (0.12 - 0.12)	43.1 (42.6 - 43.7)
			AFL	16:52	17:42	0:50	2,252	5,313 (4,533 - 6,538)	0.10 (0.09 - 0.10)	54.6 (51.7 - 58.3)

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