Good news from north-central Africa: largest population of Vulnerable common hippopotamus *Hippopotamus amphibius* is stable

Paul Scholte, Francis Nguimkeng and Emmanuel Iyah

Abstract North-central Africa (i.e. Cameroon, the Central African Republic and Chad) once held important populations of large mammals, including the hippopotamus *Hippopotamus amphibius*. Exports of hippopotamus trophies from Cameroon were suspended in 2012 but the species' status and population trends remain poorly known. Using the same methodology as in 2000 and 2008, we counted hippopotamuses in Faro National Park and bordering hunting zones in 2014. We counted 685 individuals along 97 km of river, compared with 647 and 525 in 2000 and 2008, respectively. The stability of this population contrasts with the declines in populations of large mammals across north-central Africa. We attribute this conservation success to private efforts (i.e. safari hunting) compensating for a decline in state protection. However, the situation remains fragile, as highlighted by an influx of transhumant cattle and gold diggers. We recommend increasing public–private conservation efforts, including incentives for the safari hunting industry, which is also under pressure.

Keywords Hippopotamus, inventory, ivory, poaching, safari hunting

North-central Africa, encompassing the northern Central African Republic, Chad and North Cameroon, was once among the most biodiverse areas in Sahelo–Sudanian Africa, with some of the last remaining populations of large mammals (Brugière & Scholte, 2013). Until 2000, populations of large mammals in protected areas were stable, possibly because anthropogenic pressure was relatively low and rainfall had recovered after the Sahelian droughts of the 1970s and 1980s (Scholte, 2011). A shift in the political–economic climate triggered erosion of state control and insecurity, which has resulted in marked declines in large mammals since 2000 (Scholte, 2011). The common hippopotamus *Hippopotamus amphibius* is under pressure from habitat conversion and hunting for bushmeat and, increasingly, for ivory (Klingel, 2013; Scholte & Iyah, 2016). North-central Africa is home to c. 2,500 hippopotamuses, mostly in Faro and Bénoué National Parks, in northern Cameroon (Tsi et al., 2011; Scholte & Iyah, 2016). Together, these protected areas cover 3.3 million ha, including 27 safari hunting zones, and are the last large remaining wildlife conservation refuge in north-central Africa (Scholte, 2011). The only hippopotamus population in the region that has been surveyed regularly, in Bénoué National Park, declined from 400 to 180 individuals between 1999 and 2011–2013 (Scholte & Iyah, 2016). The uncertainty regarding the status of the hippopotamus population overall in Cameroon prompted the CITES Standing Committee to reconfirm the suspension of exports of hippopotamus trophies (CITES, 2014). In 2014 we conducted a count to assess the trend of the hippopotamus population in Faro National Park, which is under pressure from gold miners and pastoralists, and to contribute to the understanding of the continent-wide decline in large terrestrial mammals (Scholte, 2011).

Faro National Park (330,000 ha) has a Sudano–Guinean climate characterized by a single rainy season, with mean annual rainfall of c. 1,340 mm. The undulating terrain is covered by wooded savannah dominated by trees of the genera *Isoberlinia* and *Terminalia*, and a diversified grass layer with *Andropogon* and *Hyparrhenia* species. The Faro River flows east–west, partly underground during the dry season. During the wet season various intermittent rivers contain water and attract hippopotamuses and other large mammals. The Park is surrounded by sport hunting zones: zone 13 (61,216 ha), Voko-Bantadje (60,000 ha), zone 18 (56,624 ha) and zone 18bis (118,976 ha; Fig. 1).

The count was conducted during 22–25 March, at the end of the dry season, when the Faro River was the only remaining source of water and the area was easily accessible. Searching for hippopotamuses, 2–3 observers walked through the riverbed or along its edges at a speed of 1–4 km h^{-1}, splitting up when the riverbed was too wide to be overseen, and halting for 15–30 minutes each time hippopotamuses were observed. The hippopotamuses were counted until the observers reached a consensus on the number present. No submersion factor was applied as oversight over the schools of hippopotamuses was excellent and water conditions were clear. Two teams, including members that participated in the 2008 count, walked from 07.30 until 17.30, with a 2 hour break at midday. Global positioning system (GPS) coordinates were recorded for each observation of

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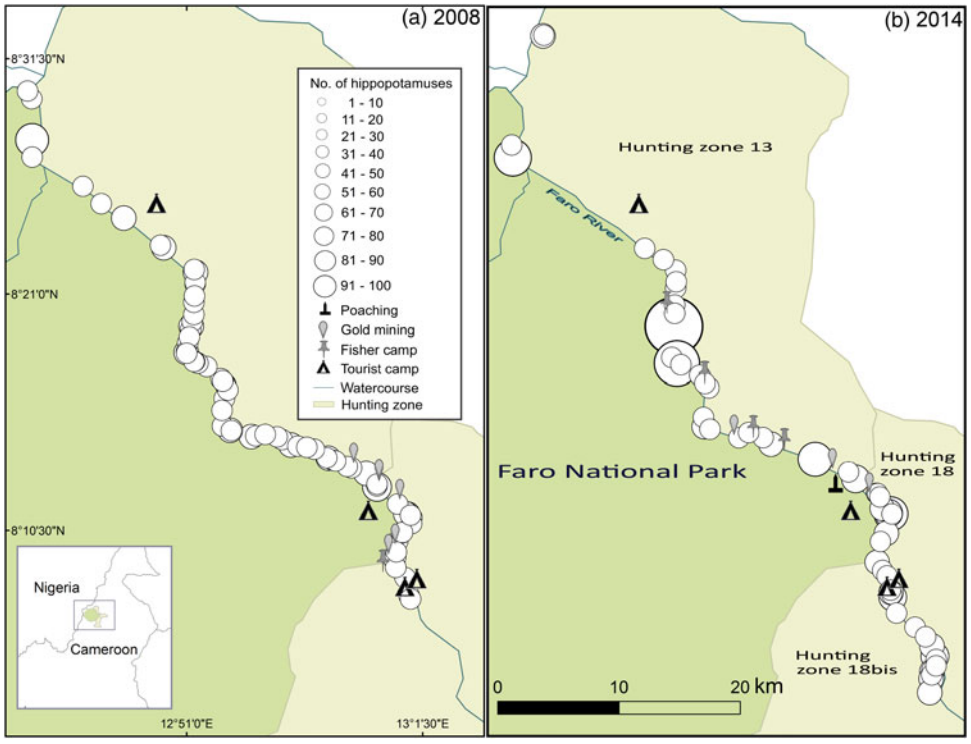

FIG. 1 Hippopotamus *Hippopotamus amphibius* distribution along 97 km of the Faro River in Faro National Park and the surrounding safari hunting zones, in Cameroon, (a) in June 2008 (early rainy season) and (b) March 2014 (end of dry season), with indicators of human presence.

hippopotamuses. We also recorded signs of human presence and tracks of elephants *Loxodonta africana* and large carnivores, which were clearly visible in the sandier parts of the riverbed (for more details see Scholte & Iyah, 2016). We used the number of guards (reported in unpublished annual reports of the regional ministry) as an indicator of the effectiveness of national park management (Bruner et al., 2001).

We observed 685 hippopotamuses along 97 km of river, compared with 647 (97 km) in 2000 and 525 (94 km) in 2008. Numbers varied at certain locations along the river, mainly between the dry season (2014) and early rainy season (2008) counts, probably because of differences in water availability; for example, the water flow downstream of the hunting zone 13 camp is largely below ground during the dry season, with the exception of a single large waterhole (Fig. 1). Only a few traces of human presence (gold digging, fisher camps) were observed (Fig. 1).

We recorded linear density of 6.5 individuals km^{-1}, almost double the 3.7 km^{-1} recorded in Bénoué National Park (Scholte & Iyah, 2016). Given the homogenous vegetation along the Bénoué and Faro Rivers, we attribute the difference in hippopotamus densities to the characteristics of the Faro river bed, which is 2–3 times wider and with up to 10 times higher maximum discharge than the Bénoué River (near park headquarters; Olivry, 1986). For a population of c. 6,000 individuals along 165 km of the Luangwe River (Zambia), Chomba (2013) concluded that food was the main factor regulating population size, whereas the population density distribution was influenced by geomorphologic riverbed features. The linear densities we observed are less than one-third of densities reported from eastern and southern Africa, suggesting that variation in habitat productivity also plays an important role (e.g. Chomba, 2013; Scholte & Iyah, 2016).

Group sizes observed during the 2008 and 2014 counts in Faro were comparable with counts in neighbouring Bénoué National Park ($P > 0.05$, Mann–Whitney *U* test). A relatively high number of larger groups (> 30 individuals) were observed in Faro and, until 2006, in Bénoué (Fig. 2).

We are confident in the longitudinal comparability of the Faro counts because of the participation of the same key observers in 2008 and 2014.

The areas further upstream of the Faro River (hunting zones 16 and 15, with 164,000 and 76,128 ha, respectively) have not yet been surveyed for hippopotamuses. Based on information from professional hunting guides we conservatively estimate the numbers of hippopotamuses in these zones to be 200 and 100, respectively, yielding a total population estimate of c. 1,000 hippopotamuses on the Faro River, thus exceeding the estimated 700 individuals in the 3.1 million ha Arly–Pendjari System in West Africa (Bouché, 2004). If confirmed, this indicates that the Faro population is not only the largest in north-central Africa but in the entire west-central African region (Senegal to Chad).

The number of armed national park guards in Faro has increased since the 1960s, varying from 16 to 29 since 2000; there were 20 guards in 2014. In contrast, in the surrounding hunting zones 13, 18, 18bis and Voko-Bantadje there were 12,

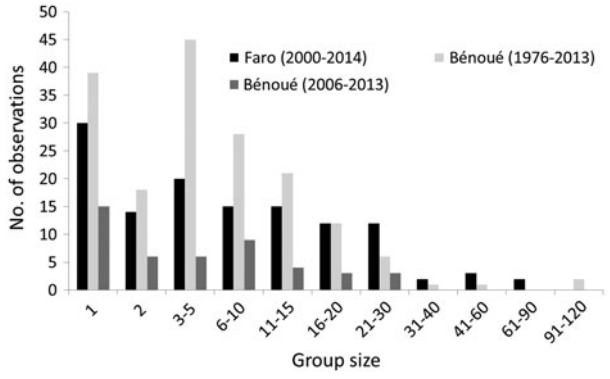

FIG. 2 Hippopotamus group sizes in Faro National Park (Fig. 1) during 2000–2014 compared with Bénoué National Park during 1976–2013 and 2006–2013. Sources: Faro National Park (total of 125 observations; Zibrine, 2000; this study); Bénoué National Park (1976–2013: total of 173 observations, Scholte & Iyah, 2016; 2006–2013: subsample of 46 observations).

13, 17 and 10 guards, respectively, in 2014; i.e. one guard per 16,000 ha in Faro National Park, one per 5,000 ha in hunting zone 13, one per 4,000 ha in zone 18, one per 7,000 ha in zone 18bis and one per 6,000 ha in Voko-Bantadje. The hunting zone guards are not only more numerous but also better equipped, with motorcycles, GPS and field rations, than the Faro National Park guards.

Faro National Park is the only the national park in North Cameroon that has remained almost without road infrastructure. In 2010 c. 350 km of tracks were constructed, of which only 54 km is now functional. This is in contrast with the situation in the hunting zones, where, for example, hunting zone 13 has > 300 km and Voko-Bantadje 230 km of tracks (i.e. a 10–30 times higher road density), facilitating more efficient control.

Hunting zone 13 (Fig. 1) in particular plays an important role in buffering the northern part of Faro against possible incursions. As in neighbouring Bénoué National Park (Scholte & Iyah, 2016), the few observed signs of illegal human presence in Faro (Fig. 1) belie the multiple pressures on the Park. In Bénoué linear densities of hippopotamus have remained constant over the last decade only in the vicinity of the park headquarters and two sport hunting camps (Scholte & Iyah, 2016). We attribute the conservation success in Faro to the private protection afforded by the adjacent safari hunting operations, which compensates for reduced state protection efforts. However, the situation remains fragile, as highlighted by an influx of transhumant cattle and gold miners.

Of a total quota of 114 set by the Ministry of Forests and Wildlife, 44 (39%) hippopotamuses were hunted legally during 2010–2012, the majority along the Faro River (13 of 18 were hunted during 2011–2012). Possibly as a response to critical reports on lion *Panthera leo* and hippopotamus populations by the EU and CITES (2014), the quota was reduced to 10 for 2014–2015, including only one for four hunting zones along the Faro River (13, 18bis, 16 and 15); i.e. c. 1% of the hunting block population. Such a reduced quota compromises the viability of sport hunting enterprises; for an analogous discussion on lion hunting see Lindsey et al. (2012). More could be gained by transparent quota setting as well as controlling illegal hunting and ivory trafficking.

Despite the successful protection of the hippopotamus thus far, we recommend increased efforts to recognize the efficiency of public–private conservation efforts, including incentives for safari hunting. There is further urgency to design an economically viable wildlife-based land use system in North Cameroon, comprising governmentally managed national parks, privately managed hunting zones and community hunting zones, with benefits used to ensure long-term commitment to their conservation by local communities.

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Biographical sketches

Paul Scholte is an ecologist leading organizations in conservation and natural resource management in a development context. Throughout the 1990s he worked in the protected areas of North Cameroon, and after several years in Yemen and Rwanda he returned to Central Africa, where he is building a coalition to respond to the crisis that is compromising the future of the region's protected areas. Francis Nguimkeng studied the hippopotamus population of Faro National Park in 2008, and trains mid-career wildlife professionals from francophone Africa in ornithology. Emmanuel Iyah lectures in zoology and animal ecology and is interested in comparative hippopotamus ecology and behaviour.