Dry season counts (1976 – 2016) in the Faro - Bénoué protected area complex (North Cameroon) highlight the continued importance of West – Central Africa's largest population of common hippopotamus

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Abstract

We reviewed the surveys on the status of hippopotamus, hereafter hippo, in the c. 1.3 million ha protected area complex of Faro – Bénoué, North Cameroon. Initiated in 1976, counts were conducted in the second part of the dry season, when the Bénoué and Faro rivers were the parks' only remaining source of water and observers followed for several days the dry river bed, counting each individual hippo. Bénoué National Park (NP) has been surveyed between 1976 and 2013, showing a reduction of hippo numbers from 400 to 180, negatively correlated with the presence of gold diggers. However in the vicinity of the hunting camps and park headquarters, with an all-year round protection presence, numbers have remained with 3.7 individuals km^{-1} relatively constant. Contrastingly, numbers of hippo along 97 km of the Faro River have remained stable with 647, 525 and 685 between 2000 – 2014 showing the efficiency of the private sector (i.e. safari hunting) compensating a decline in state protection efforts. Results of the most comprehensive survey to date, implemented in Faro NP in March and Bénoué NP in May 2016, showed only 136 individuals along the Bénoué River, with 92 individuals found in nearby tributary Mayo Oldiri. Numbers along the 2000-2014 Faro River trajectory showed a continued stable number of 665. An additional 206 hippo were observed further upstream in hunting zones 16 and 15. The observed total of 1093 individuals in the Faro-Bénoué ecosystem in 2016 largely surpasses estimates from other populations in the wider region. This signifies that the Faro-Bénoué hippo population is not only the largest in North-Central Africa but of the entire West-Central Africa region from Senegal in the West to Chad in the East, and given their possible genetic specificity the population is of global conservation concern.

Introduction

North Cameroon used to be among the richest biodiversity areas in Sahelo-Sudanian Africa with some of the last remaining populations of large mammals (Brugière & Scholte 2013). Until 2000, large mammal populations in protected areas were stable, possibly due to relatively low human population pressure and a recovery in rainfall after the 1970-80s Sahelian droughts (Scholte 2011). A shift in the political-economic climate triggered erosion of state control and insecurity resulting in marked declines in large mammal populations over the last decade (Scholte, Nguimkeng & Iyah 2016). The Vulnerable common hippopotamus (*Hippopotamus amphibius* L.), hereafter hippo (Photo 1), is under pressure due to habitat conversion and hunting for bushmeat and increasingly ivory (Klingel 2013). Threats from influxes of transhumant cattle and gold diggers are rapidly increasing in North Cameroon, where the protected areas are confronted with declined governmental protection (Scholte & Iyah, 2015; Scholte, Nguimkeng & Iyah 2016).

Photo 1. Hippopotamus (Faro River, January 2015)

Genetic analyses have supported the presence of hippo subspecies, or unique genetic groupings (Okello et al 2005) across Eastern, Southeastern and Southern African countries. Although West-Central Africa samples were not included in this analysis, the finding of subspecies across Eastern and Southern African countries suggests that hippos in West Africa may also contribute unique genetic material and, as such, represent an important target for conservation and management activity. However the status of hippos in North Cameroon has till recently remained poorly known, as illustrated by the lack of inclusion in the latest continent-wide references (Klingel 2013). The lack of clarity on trends of the hippo populations has led CITES and the European Union to suspend trade in hippo trophies from Cameroon since 2012. We, a team under the umbrella of the Garoua Wildlife College based in North Cameroon, initiated in 2013 subsequent surveys to clarify the status of hippopotamus and identify threats to their populations.

Here we review the surveys on the status of hippo populations in the protected area complex of North Cameroon over the last 40 years. In addition results of the most comprehensive survey to date, implemented in 2016, will be presented. This paper builds heavily on earlier analysis, most notably of Bénoué National Park (Ngog Nje 1988; Scholte & Iyah 2016) and Faro National Park (Scholte, Nguimkeng & Iyah 2016) to which the reader is referred for more details on hippo population structure and how its distribution correlates with the distribution of other species, human disturbance as well as management issues.

Study area

The protected area complex in the North Region of Cameroon (Fig.1) has a Guinea-Sudanian climate characterized by a single rainy season from April till October with average rainfall of c.1200 mm in the north up to c.1500 mm in the south. Towards the end of the dry season, temperatures soar well above 40°C. The mostly undulating area, with few isolated mountains, is covered by wooded savanna dominated by the trees genera Isoberlinia and Terminalia and a diversified grass layer with Andropogon and Hyparrhenia species.

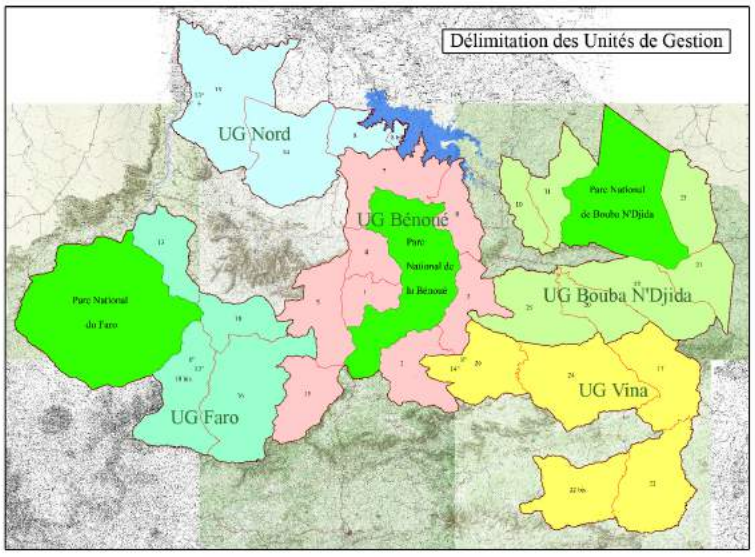

Fig. 1. Map of the North Region, Cameroon, with Faro – Bénoué - Bouba Ndjida national parks and hunting zones

The five management units are depicted in five colours, including various hunting zones with their respective identity numbers (Source Regional Delegation of Forestry and Wildlife, Garoua, Cameroon)

Bénoué National Park (NP) main geographical feature, the Bénoué River, forms its Eastern border over 100 km flowing between the tributary of Mayo Alim in the South and the Grand Capitaine tourist camp in the North (Fig. 1). The Faro River flows East – West. During the dry season, the rivers flow over large stretches underground. Intermittent rivers, so-called mayos, contain water during the wet season and attract hippo and other large mammals.

Bénoué NP (180,000 ha) is surrounded by sport hunting zones, zone 9 (50,072 ha) in the North-East, zone 3 (55,328 ha) in the East and zone 2 (75,648 ha) in the South-East. Zone 9 has been abandoned by professional hunters since 2012, while zones 2 and 3 are marginally operational (Fig. 1). Faro NP (330 000 ha) is surrounded by sport hunting zones, clockwise: zone 13 (61 216 ha), Voko-Bantadje (60 000 ha), zone 18 (56 624 ha) and zone 18bis (118 976 ha). Further East and upstream the Faro River are situated hunting zones 16 (164 000 ha) and 15 (80 000 ha), (Fig. 1).

Previous hippopotamus surveys in North Cameroon

Bénoué National Park (1976-2013)

In 1976 Ngog Nje (1988) initiated hippo counts with what has become a standard methodology for total hippo counts along seasonal rivers in Central Africa. Counts were generally conducted in the second part of the dry season, when the Bénoué River is the park's only remaining source of water and the area is easily accessible. Notable exceptions are the July 2011 and May 2016 counts that were carried out during the early rainy season. Looking out for hippo, observers walked through the riverbed or along its edges, splitting up when the riverbed was too wide to be overseen. Walking speed varied between 1 to 4 km hr^{-1}, but in case of observations a halt of 15-30 minutes was taken. With each observation, the number of hippo was counted several times, till consensus on the number could be reached (Photo 2).

Photo 2. Counting Hippopotamus (Faro River, hunting zone 15, March 2016)

Total counts were repeated with the same methodology in 1987 (Ngog Nje 1988) and in 1999 (Zibrine & Gomse 1999). After another decade, in 2011 and 2013, a team of observers, with two permanent members, walked from 7:30 till 17:30 with a 1-2 hour break at midday (Maha 2015, Scholte & Iyah 2016). Nine and six days respectively were spent for the 2011 rainy season and 2013 dry season counts. Contrary to earlier surveys, GPS coordinates were taken for each hippo observation and major landmarks, allowing their subsequent mapping of individual hippo groups (even spaced) or assemblages (if concentrated in the same waterhole). In 2013, observations on other wildlife, i.e. antelopes and primates, as well as signs of human presence were also recorded.

Photo 3. Gold diggers in Bénoué River bed, cause of local extinction of hippopotamus.

Counts in the 100 km stretch of the Bénoué River in the park showed a reduction from 400 to 188 individuals from 1976 to 2013 (Scholte & Iyah 2016). Hippo distribution was negatively associated with the presence of the camps of gold diggers, which occupied the northern half of the Park (Photo 3). Supervised by the same staff, teams of 2-3 students at the Garoua Wildlife College conducted comparable partial hippo count every two years from 1976 till 2010. Counts concentrated on a stretch of 15 to 32 km of the Bénoué River centered on the Buffle Noir park headquarters, not extending beyond the hunting zone camps (Fig. 4). Counts were carried out in the dry season, during a single day generally between 9 and 12 AM (Ngog Nje 1988). Results of 2011 and 2013 total counts were reinterpreted to linear densities over the same area (Scholte & Iyah 2016). Linear densities in the 15-32 km stretch centered on the park headquarter and sport hunting camps had, with 3.7 individuals km^{-1}, remained remarkably constant between 1976 and 2013 (Scholte & Iyah 2016). These results showed the importance of year-round conservation presence.

Faro National Park (2000 – 2014)

Based on the methodology developed by Ngog Nje (1988), Zibrine (2000) was the first counting hippo along the wildlife-rich Faro River, followed in 2008 as reported by Tsi et al. (2013). In 2014, Scholte, Nguimkeng & Iyah (2016) counted hippo in neighboring Faro National Park and hunting zones. Using the same methodology as in 2000 and 2008, 685 individuals were counted over 97 km of river, compared to 647 and 525 in 2000 and 2008 respectively. The observed stability of hippo population contrasted the dramatic declines in large mammal populations across North-Central Africa, including the hippo population in Bénoué NP. This conservation success was attributed to private (safari hunting) protection compensating declined state protection (Scholte, Nguimkeng & Iyah 2016). Despite the results of these surveys to date, there are stretches of the Faro River and its tributaries which have never been surveyed. This holds especially for the c. 60 km river stretch further upstream, traversing the hunting zones 16 and 15 (Fig. 3). Information from trophy hunting enterprises suggested that this area harbors an important number of hippos that, if confirmed, would further highlight the area's importance for their conservation.

Disregarded survey results

Stark (1986) used in 1974-1975, without stratifying the Bénoué River, terrestrial transect counts and estimated a hippo population size of 235 individuals in Bénoué NP with high 95 % confidence limits of ± 212. Total aerial surveys covering the entire North Cameroon protected area system (including hunting zones) targeted elephants and did not stratify the Bénoué and Faro Rivers neither. Omondi et al. (2008) suggested unrealistically low hippo numbers, i.e. 17 in Bénoué NP, two in Faro NP and 31 hippos for all hunting zones combined in 2008. Also in 2015 an aerial survey provided unrealistically low estimates: 20 hippo in Bénoué NP and none in the surrounding hunting zone blocks, with 100 individuals at the edge of Faro National Park and hunting zone 13,

and another 34 hippo in the southeastern hunting blocks of the Faro ecosystem (Elkan et al. 2016).

Methodology comprehensive survey Faro - Bénoué (2016)

We here report the findings of a survey in 2016 that aimed to cover the entire Faro River. In addition we also conducted a count along the Bénoué River, allowing an assessment of changes in hippo numbers and distribution since 2013. The proximity of both rivers, at one point c. 20 km as the crow flies, with tributaries even closer to each other, suggests that we can consider the hippos present in Bénoué – Faro as one single population.

Following the same methodology as applied during previous surveys (Scholte & Iyah 2016; Scholte, Nguimkeng & Iyah 2016), we conducted, with two parallel teams, a five day survey in March 2016 at the end of the dry season to cover the entire Faro River system (c. 200 km). In 2016, we also conducted a count along the Bénoué River, following the same methodology (Scholte & Iyah 2016) during six days with a single team. Because of logistical constraints, an anti-poaching operation had just taken place, rendering the area temporarily less safe for the counts, the Bénoué count has taken place after the onset of the rains in early May 2016 when water levels in the Bénoué River had already risen with risk of dispersion of hippos.

Results and discussion

Results comprehensive survey Faro - Bénoué (2016)

Along the Faro River, we counted a total of 865 individuals, of which 415 downstream of the confluence (conservation camp) till the Mayo Deo, 19 further downstream (close to the village Djalingo 5 km downstream of the Faro-Deo confluence), 250 upstream of the conservation camp till Mayo Bigoué (hunting zones 18 and 18bis), 113 in hunting zone 16, and 93 in hunting zone 15 (Figs. 2, 3). The number of hippo observed along the Bénoué River totaled 136, a further decline from 180 (2011) and 188 (2013). Note that this includes a group of 9 hippo in Mayo Oldiri, expected to have been present in the Bénoué River a few weeks earlier (Fig. 4).

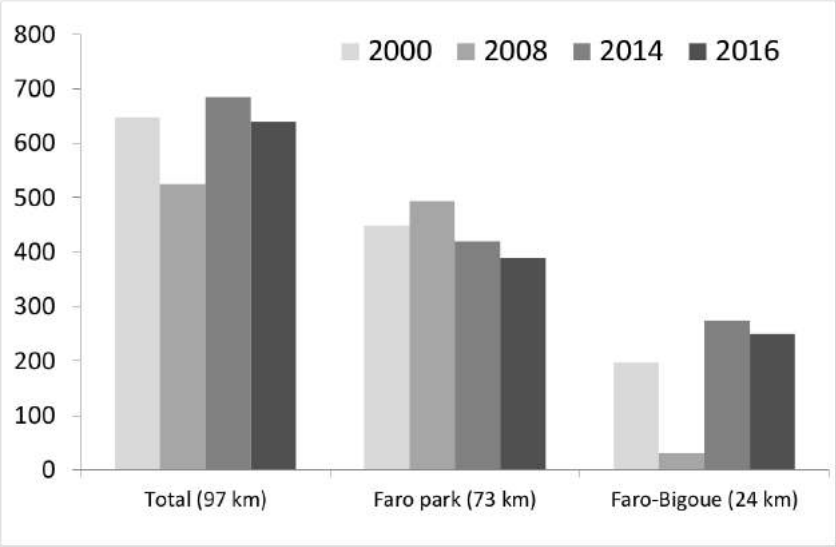

Fig. 2. Numbers of hippopotamus along Faro River (97 km stretch, 2000-2016).

We earlier concluded that linear densities in a 15-32 km stretch centered on the park headquarter and sport hunting camps with 3.7 individuals km-1, remained remarkably constant between 1976 and 2013 (Scholte, Ngumkeng & Iyah 2016). In 2016 linear density was with 2.7 individuals km1 in the lower range, hinting at increased pressure, also within the proximity of the camps. The total population of hippos counted on the Faro River stands at 865, with 136 individuals along the

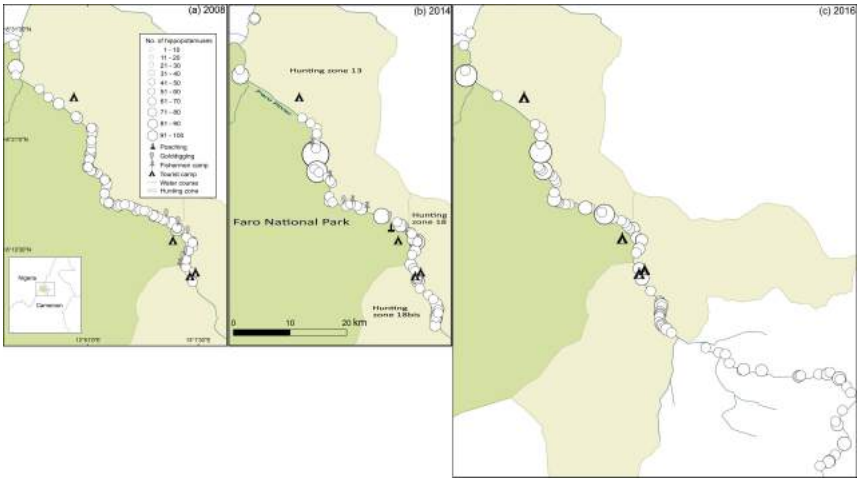

Fig. 3. Distribution of hippopotamus along Faro River (2008, '14, '16).

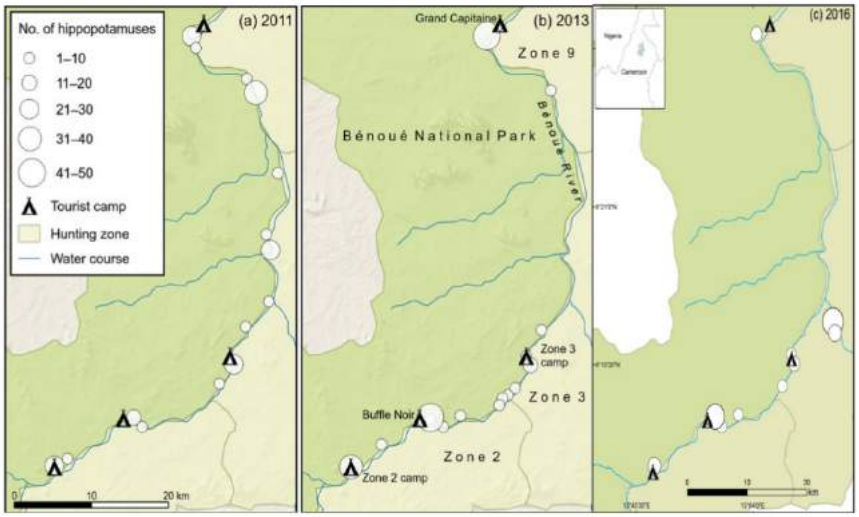

Fig. 4. Distribution of hippopotamus along Bénoué River (2010, '13, '16).

Bénoué River, in addition to 92 individuals along Mayo Oldiri a total of 1093 individuals in an area of national parks and hunting zones of c. 1.3 millions ha, with high reliability (A cf. Thouless et al. 2016).

Other hippo (sub-) populations in Cameroon

No systematic surveys of hippo in other areas in North Cameroon have been reported. Our own incidental observations suggest another 50 hippo downstream of Bénoué NP, mainly in Lagdo reservoir (observations of 36 individuals), as well as a guess-estimated 50 hippo in the hunting zones further east. This would bring the total hippo population in North Cameroon at 1120 observed + 64 guess-estimated with low reliability (E cf Thouless et al. 2016) = c.1184 individuals. The Far North Region is guess-estimated to encompass at least 200 individuals (Lake Maga 50, Fianga 50, Lower Chari and Lake Chad 100), the Adamaoua Region at least 100 (Nchanji & Fotso 2007) observed 79 in 2001),and guess estimates for the central and South West region each at 50 individuals. This would result into a country-wide number of 1120 observed (A) + 470 guess-estimated (E cf Thouless et al. 2016), i.e. c. 1600 hippos.

Comparison with other populations in West – Central Africa

The 2008 Red List assessment described hippo as not common in West Africa and the population is split into a number of small groups totaling about 7,000 spread over 19 countries (Lewisson and Oliver 2016). North Cameroon being largely neglected in assessments (see above), three other populations stand out: the one in Comoé National Park (Ivory Coast), in the Pendajari-Arli protected area complex (North Benin and Burkina Faso) in West Africa and of the northern Central African Republic (CAR) in Central Africa. According to the latest assessments, albeit non-targeted aerial surveys shown to be inaccurate (see above), hippo has become virtually extinct in the CAR (Bouché et al. 2012). In 2015 estimates from the 3.1 million ha of the Arly-Pendjari System in West Africa (Benin, Burkina Faso) provided 346 individuals (Kougnati & Narakoua), although in 2007 the hippo population was estimated at 1010 individuals (Tehou 2007), with

estimates of 696 in 2003 (Bouché 2004; Bouché et al. 2004) and 520 in 1981 (cited by Tehou 2007). Comoé NP harbored in the period 1977-1981 over a thousand hippo, reduced to c. 600 and 400 in 1988 and 1989, when the last pre-crisis systematic large mammal counts have taken place. During the 2016 aerial survey, specifically targeted hippo by flying over the entire river bed, only 129 hippo were counted (Bouché et al. 2016).

The observed 1093 individuals in the Faro- Bénoué ecosystem of c. 1.3 million ha largely surpass estimates from these other populations. This signifies that the Faro-Bénoué hippo population is not only the largest in North-Central Africa but of the entire West-Central Africa region that goes from Senegal in the West to Chad in the East and given their possible genetic specificity, of global conservation importance.

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