

Feeding patterns of sitatunga (*Tragelaphus Speki*) in the Rushebeya-Kanyabaha wetland, south western Uganda

Mnason Tweheyo^{1*}, Bruce Kacebonaho Amanya¹ and Nelson Turyahabwe²

¹Department of Forest Biology and Ecosystems Management, Faculty of Forestry and Nature Conservation and ²Department of Community Forestry, Faculty of Forestry and Nature Conservation, Makerere University, P.O. Box 7062 Kampala, Uganda

Abstract

Feeding patterns and habits of sitatunga were assessed in Rushebeya-Kanyabaha wetland between June 2006 and July 2007. Sixty transects were cut at intervals of 250 m along which sitatunga dung piles, habitats used and diet were identified from feeding signs or plant damage. Household interviews were also conducted in villages adjacent to the wetland to understand plants and crops known to be fed on by sitatunga, type of damage, frequency of sitatunga farm visits and their methods to control crop raiding. Sitatunga mostly fed on leaves (60%) and in the wetland edge (WE) habitat (49%). Forty plant species were recorded to be eaten with herbs as majority (33%) and of crops sweet potatoes were most raided. Sitatungas are basically solitary species with 73% of the sightings being of a single individual. They had mornings and late evenings as their movement peaks and preferred to feed on broad leaved plants. There were significant relationships between both habitat use and food preferences with seasons. We predict that because of seasonal food variations, crop raiding would increase and may result into more negative attitudes by farmers to sitatunga. More research on farmers' sensitization, population census, behaviours and ecotourism are necessary for this species conservation.

Résumé

On a évalué les schémas et les habitudes alimentaires des sitatungas dans la zone humide de Rushebeya-Kanyabaha entre juin 2006 et juillet 2007. On a tracé six transects de 250 m le long desquels on a identifié les tas de crottes de sitatungas, les habitats fréquentés et le régime alimentaire à partir des signes laissés et des dégâts causés aux plantes.

*Correspondence: E-mail: tweheyo@forest.mak.ac.ug

Il y eut aussi des interviews dans les foyers des villages voisins de la zone humide pour connaître les plantes et les cultures dont se nourrissent les sitatungas, le type de dégâts causés, la fréquence de leurs visites dans les exploitations, et les moyens utilisés pour contrôler les invasions dans les cultures. Les sitatungas se nourrissent principalement de feuilles (60%), et surtout dans l'habitat à la limite de la zone humide. Quarante espèces végétales ont été relevées dans leur régime alimentaire, dont la majorité sont des herbes (33%) et, dans les cultures, surtout des patates douces. Les sitatungas sont une espèce solitaire et 73% des observations concernaient des individus isolés. Les pics de leurs activités ont lieu le matin et en fin de soirée, et ils préfèrent se nourrir de plantes à larges feuilles. Il existe une relation significative entre la fréquentation d'un habitat et la présence de nourriture selon les saisons. Nous prévoyons que, en raison des variations saisonnières des plantes dont ils se nourrissent, les invasions dans les cultures vont s'intensifier et pourraient aboutir à des attitudes plus hostiles des exploitants envers les sitatungas. Il est nécessaire de faire davantage de recherche sur la sensibilisation des exploitants, des recensements de population, des études sur le comportement et l'écotourisme pour la conservation de cette espèce.

Key words: feeding patterns, *Tragelaphus speki*, Wetlands

Introduction

The sitatunga, one of the globally remaining few water antelopes and the only one remaining in the wetlands of Uganda, is an endangered species (IUCN (International Union for Conservation of Nature and Natural Resources), 2004; CITES, 2005). According to Williamson (1986), this species is sought after for its both meat and skin; and hunters capture this semi-aquatic antelope by setting snares along their well-travelled paths or by driving them

into open water (OW) where they are easily trapped. Sitatunga is dependant on both thick and dense vegetation and water availability. Consequently, habitat destruction because of swamp drainage is its greatest threat (Starin, 2000).

Even with problem of both habitat shredding and human threat for meat and skin, little research has been carried out to understand the ecology of the sitatunga (Magliocca, Querouil & Gautier-Hion, 2002). This study understands that it is very difficult to assess the impact of habitat destruction and hunting activities on sitatunga populations when there is little information available on its abundance and feeding ecology. In addition, there is no recording or published information about sitatunga numbers and threats in Uganda. Therefore, this study was undertaken to help in addressing the problem facing sitatunga in Uganda's wetlands and contribute in filling the information gap. The specific objective was to understand the species habitats and feeding ecology in the newly gazetted Rushebeya-Kanyabaha wetland reserve. This article will help in understanding the feeding ecology and habitats of sitatunga. In addition, this study will also serve as a backbone to subsequent studies on sitatunga in this area where it has been reported to be a leading cause of human-wildlife conflict through raiding farmers' crops. This threatened species will act as a flagship and benefit other species in this wetland especially water birds, butterflies and otters (*Lutra Canadensis*) because this wetland has other important biodiversity of plants and animals like the crested cranes (*Balearica regulorum*) and otters which are endangered. This wetland is also a major source of water, fish, and craft materials for the local people. Thus, this work will also act as an education tool to the proximal communities on the need to protect the swamp and the wetland ecosystem as a whole.

Materials and methods

Study site

Rushebeya-Kanyabaha wetland is located in Kabale District, South Western Uganda, and lies between latitudes 1° and 1°30' South, and longitudes 29°18' and 30°9' East. It covers an area of about 5 km² of intact wetland and it is part of the former Kigezi wetland of which 95% has been reclaimed (NEMA, 2005). It is one of the only remaining wetlands at such an altitude (higher than 1700 m.a.s.l.) in East Africa inhabited by sitatunga and is the largest wet-

land at this altitude in Uganda. It is fed by Lake Kanyabaha, a fresh water lake that lies on the northern end. The area has a daily temperatures range between 28°C and 5°C, and also experiences two marked dry and wet seasons with June–August and December–February as the dry seasons while March–May and September–November form the wet seasons. The December–February dry season is less marked much as the present trends indicate that it is becoming a typical dry season. The average annual rainfall is about 1000 mm and varies from 760 to 1200 mm per annum. The wetland was gazetted in 2004. As District in partnership with the National Wetland Inspection Division (NEMA, 2005).

Field design for data collection

A descriptive design was used to record feeding signs and collect data on sitatunga habitats between June 2006 and July 2007. This involved direct observations and an interview guide for hunters and local leaders. The variables included habitat characteristics, species distribution, social behaviour, type of diet, feeding habits, food plant species, season, weather conditions, and distance from WE, and name of the proximal village. People interviewed included the management of the wetland, guides, hunters and local council leaders of proximal villages. During data collection, the following equipment was used: binoculars, cassette recorders, tape measure and pangas. We collected specimens for identification at the Makerere University Herbarium. Specimens were tagged with labels indicating local names and where no single name was known, they were tagged as unknown.

Setting of transects and sitatunga habitat selection

Sixty transects were cut running across the wetland at an interval of 250 m to cover the entire 15-km stretch of the wetland along which dung piles were enumerated. The assumption here was that where more dung piles were found, these were habitats of preference for sitatunga. Though research on elephants (Dearden, Pegau & Hansen, 1975) shows that defecation is always independent of vegetation types; for animals with a small home ranges like sitatunga and limited to a 15-km stretch of wetland, dung piles may be an indicator of habitat use. For each dung pile encountered, the corresponding vegetation type or habitat was recorded. We also identified habitat used and diet from feeding signs or plant damage along transects. We

assumed that signs of plants preyed upon by sitatunga have unique appearances because different ungulates have different feeding styles. Because sitatunga are the only wild ungulates recorded in the area and the feeding signs of domestic ungulates are well known to farmers, local assistants were useful in helping locate signs of sitatunga damage both on the wetland plants and crops.

Recording of food and habitats

In this study, habitat types were recorded as: Tall and closed papyrus, lightly open papyrus, tall and closed sedges, lightly open sedges (LOS), open grassland (OG), WE, marshy/boggy habitat, OW and burnt area (BA). In the process of dung collection, all types of plants with feeding signs of sitatunga were recorded. Unique codes were given to each plant group and recorded as:

Herb (HB), climber (CL), sedge (SED), water weed, tree (T), shrub (S), grass (G), papyrus (P), and those unknown were recorded as Unkl, Unk2 and so on. Food types were recorded as: Flowers (FW), buds (B), leaves (L) and no observation (NO). Seasons were recorded as: early dry season (June/December); peak dry season (January/July); Late dry season (February/August); early wet season (March/September); peak wet season (April/October) and LWS, late wet season (May/November). Other activities were entered in the check sheet as: P, playing; Fe, feeding; R, resting; Ru, running; NO. Distance moved by sitatunga was measured from each habitat type to the longest distance travelled in the private land. This is was to help in comparing distance moved with habitats and food sources. The wetland ecosystem data were recorded on the check sheet.

Social survey

Data were collected between June 2006 and July 2007 using open-ended questionnaire interviews with households distributed among the six villages: Kakirari, Kabirizi, Rushebeya, Kabimbiri, Rwempisi and Rwengongo. Secondary data were obtained from wildlife conflict data books maintained by sub-county chiefs, Wetland Inspection Division and Nature Uganda. Data on availability of sitatunga foods were gathered through an ecological survey of wetland food. A total of 80 interviews were accomplished; 48 men and 32 women. To minimize biases from farmers' perceptions, we disclosed the reason for our presence to the local leaders and later cross-checked

information given by direct observation through interviewing different people and reviewing literature. Farmers believed that they were able to differentiate between damage caused by sitatunga and that of other animals. Information obtained was mainly about animals raiding crops, time(s) of crop raiding, crops raided and frequency of animal raids.

Data analysis

Qualitative data were subjected to content analysis to extract meaningful information from verbal communication. Data were entered into SPSS 10.0 for windows. Data were coded to generate frequencies of species, food status and types, feeding time, grouping, fires, crops raided, activities, distances of feeding, habitat use and seasons.

Cross tabulations were made between feeding and/or habitat use and seasons. Feeding preferences were tested by comparing different foods in different habitats and various seasons. To test the significance of the relationships between feeding and habitat use with seasons, chi-square tests were performed. All statistics were analysed at 5% c.I.

Results

Feeding time and sitatunga activity budget

The distribution in sighting feeding time of sitatunga using both binoculars and visual observations through a day was bimodal with both morning and evening time showing high peaks in terms of visibility frequencies. Thirty-seven observations were identified during the study period between June 2006 and July 2007. The sightings were made either when cereals were fresh in farmers' garden or when there was fresh grass from fire burning in the wetland. When tested, there was a significant relationship ($l = 70$, d.f. = 50, $P = 0.05$) between feeding time and season of the year (chi-square test). They were observed to be solitary because most observations were of a single animal. In other instances, sitatunga was very shy and hard to see physically. Being shy animals, it was mainly in early mornings between 05 30 and 09 00 and after 1800 h that one could sight them. Between 10 00 and 17 00 h it was very hard to see the animal and we assumed that they were hiding themselves from the sun, playing or resting. This character of sitatunga i.e. to hide during day time is not limited to the Rushebeya-Kanyabaha only but

has also been expressed by the Botswana sitatunga (Games, 1983). In this area, the time of viewing sitatunga i.e. early mornings (05 30 and 09 00) and late evenings (after 18 00 h) corresponded with the time when farmers had either not come into the farms or were already out. On average, farmers in this region entered the farms at around 09 00 h and left the farms at 17 30 h. Thus, a sitatunga day activity is characterized by resting, playing, hiding, feeding and running. Feeding was influenced by presence or absence of fresh grass, mainly after fires, or a season after the dry period and setting of the first rains. Seasons and activities, i.e. resting, playing, hiding, feeding and running, had a strong and significant relationship ($X^2 = 201$, d.f. = 30, $P = 0.001$; chi-square test). The highest sitatunga observations were made during August 2006 (43%) while there was no single observation in March 2007 (Fig. 1). Most of the observations were made during the end of dry season and beginning of wet season. Because the new food flash was at this period, we noted that the high observations were influenced by the fresh grass.

Habitat use, food types, food status and plant species eaten

A total of 454 observations of feeding and habitat use were made of which 49% were on the WE. Twenty sightings of feeding were made on the WE; in this case, we classified it as the most preferred habitat followed by LOS and papyrus at 12% and 11%, respectively. The least preferred habitats

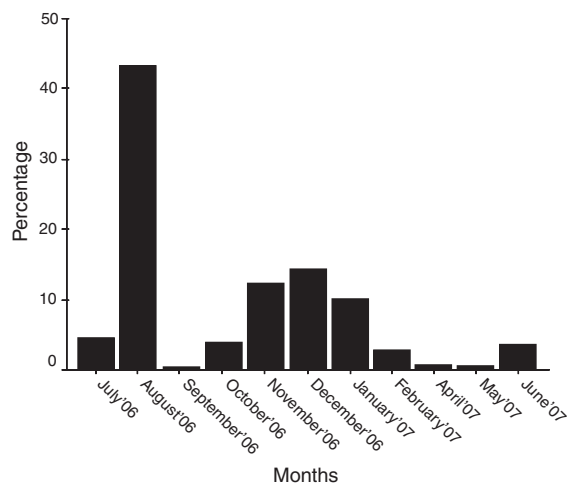


Fig 1 Time of the year and frequency of sitatunga observations between June 2006 and June 2007 in the Rushebeya-Kanyabaha wetland, S.W. Uganda

were OW and OG. We did not record sitatunga in the marshy and BAs of the wetland. The WE habitat that was most preferred was also the one that bordered with farmers fields. When habitat use was tested against seasons, we found a significant relationship; ($l = 173$, d.f. = 80, $P = 0.001$; chi-square test). In these habitats, sitatunga mostly fed on leaves (60%), followed by buds (33%) and FW (17%). Food types and habitats for sitatunga varied significantly; ($l = 226$, d.f. = 56, $P = 0.001$; chi-square test).

The commonest foods eaten by sitatunga are presented in Table 1. *Cyperus latifolia* was the most preferred species with 15%, followed by *Cyperus papyrus* (14%). Within plant species eaten, there was a significant relationship with sitatunga food selection ($X^2 = 1009$, d.f. = 320, $P = 0.001$; chi-square test). *Cyperus latifolia*, *Cyprus papyrus* and *Hydrocotyle species* dominated sitatunga food in the dry season and *Commelina species*, *Rubus pinnatus*, *Cyperus latifolia* and *Polygonum* species mostly located in WE habitat dominated wet season. In general, sitatungas were also found to feed more on herbs (36%) and sedges (24%) during the study period (Fig. 2). *Ipomoea batatas* were the fifth most eaten species thus most raided crop (Table 2). Because of raiding, farmers adopted growing of crops unpalatable to sitatunga along the WE and these crops include sugarcane, pumpkins and Artemisia.

Feeding distance from the wetland edge and in village farms

The WE was considered as an area boarding wetland to private land while the wetland habitat was an area between the WE and the high papyrus habitat. The wetland habitat ranged between 35 and 100 m from either side of the wetland boarder and covered the whole 15-km stretch of the wetland area. Sitatungas occasionally moved beyond the WE while feeding. During our observations, 89% of sitatunga movements were made between 0 and 100 m from the edge of which 53% were between 0 and 25 m (Fig. 3). Feeding distance varied with season as sitatunga moved long from the WE during the rainy season. Feeding distances had a significant relationship with seasons; ($X^2 = 123$, d.f. = 60, $P = 0.001$; chi-square test). In general, sitatungas were located in the whole wetland area (Table 3), given that we could see the species or its signs from within each of the villages bordering the wetland. The highest concentrations were adjacent to Hamuhonga (16%), Rushebeya (14%), Kitanga and Kakirari with 10% each.

Table 1 A record of plant species eaten by sitatunga in and around Rushebeya- Kanyabaha wetland, Kabale S.W.Uganda. Figures indicate the percentage of both our actual observation of sitatunga feeding and also sitatunga feeding signs on same species in the area. Feeding signs are those marks that were not directly seen but were indicators of sitatunga feeding on the plant species

Local name	Scientific name	Family	Species status	Percentage of actual and feeding signs observed
Ekikangaga	<i>Cyperus latifolia</i>	Cyperaceae	Sedge	14
Ebitooogo	<i>Cyperus papyrus</i>	Cyperaceae	Papyrus	10
Emikamba	<i>Ipomoea batatas</i>	Convolvulaceae	Herb	7
Encerere	<i>Rubus pinnatus (R. rigidus)</i>	Rosaceae	Climber	7
Omubyanjobe	<i>Polygonum lapathifolium</i>	Polygonaceae	Herb	6
Omubimbiri	<i>Typha capensis</i>	Typhaceae	Sedge	5
Orumbugu	<i>Digitaria scalarum</i>	Poaceae	Grass	5
Amarebe	<i>Nymphaea caerulea</i>	Nym phaeacea e	Water weed	5
Enchemba	<i>Cladium mariscus</i>	Cyperaceae	Sedge	4
Omugyeyye	<i>Myrica kandtiana</i>	Myricaceae	Shrub	4
Unknown	<i>Polygonum salicifolium</i>	Polygonaceae	Herb	4
Eteija	<i>Commelina benghalensis</i>	Commelinace ae	Herb	3
Emondi	<i>Solanum tuberosum</i>	Solanaceae	Herb	3
Ebicori	<i>Zea mays</i>	Poaceae	Herb	3
Kagwe	<i>Malanthera scandens</i>	Compositae	Herb	2
Ekyoganyanja	<i>Erlangea tomentosa</i>	Estraceae	Herb	2
Omushungura	<i>Miscanthus violaceus</i>	Graminae	Grass	2
Ekivuvu	<i>Myrianthus arboreus</i>	Urticaceae	Herb	
Kabegi	<i>Brassica oleracea</i>	Brassicaceae	Herb	1
Ekibingo	<i>Pennisetum purpureum</i>	Poaceae	Grass	1
Omuchwamba	<i>Pennisetum clandestinum</i>	Poaceae	Grass	
Ekisiru	<i>Thelypteris conjluens</i>	Thelypteridac eae	Herb	1
Omurindabagat Sl	<i>Ipomoea tenuirostris</i>	Convolvulaceae	Climber	0.9
Esununu	<i>Crassocephalum vitellinum</i>	Compositae	Herb	0.9
Ebihimba	<i>Phaseolus vulgaris</i>	Fabaceae	Herb	0.9
Omuhurura	<i>Achyranthes aspera</i>	Amaranthaceae	Herb	0.7
Ekifuramimbi	<i>Crassocephalum montuosum</i>	Compositae	Herb	0.7
Efugwe	<i>Urtica massaica</i>	Urticaceae	Herb	0.5
Omunaba	<i>Triumfetta</i>	Tiliaceae	Herb	0.5
Eucaryptus	<i>Eucalyptus grandis</i>	Myrtaceae	Tree	0.5
Omugusha	<i>Sorghum bicolor</i>	Poaceae	Grass	0.5
Omujuma	<i>Vernonia lasiopis</i>	Compositae	Herb	0.4
Ebikwijo	<i>Saccharum arundinaceum</i>	Poaceae	Grass	0.4
Omufumbwa	<i>Rumex abyssinicus</i>	Polygonaceae	Herb	0.4
Ekishokonkora	<i>Cyanthula uncinulata</i>	Amaranthaceae	Herb	0.4
Amategyenyere	<i>Dovyalis macrocalyx</i>	Fracourtiaceae	Shrub	0.2
Omumbya	<i>Laportea ovalifolia</i>	Urticaceae	Herb	0.2
Ekisindokwa	<i>Pycnostachys coerulea</i>	Lamiaceae	Shrub	0.2

Discussion

Crop raiding and distance sitatunga moved

In Rushebeya-Kanyabaha wetland, sitatunga preferred young freshy plants as is reported for other herbivorous raiding species, e.g. Naughton-Treves (1998); and

Tweheyo, Lye & Weladji (2003), Tweheyo, Hill & Obua (2005) when they found a correlation between stage of crop growth and crop raiding. In addition, similar authors found that the level of crop raiding and distance of the crops from the edge of protected area were strongly correlated a result that has been confirmed true to the Rushebeya-Kanyabaha sitatunga. Crop raiding was

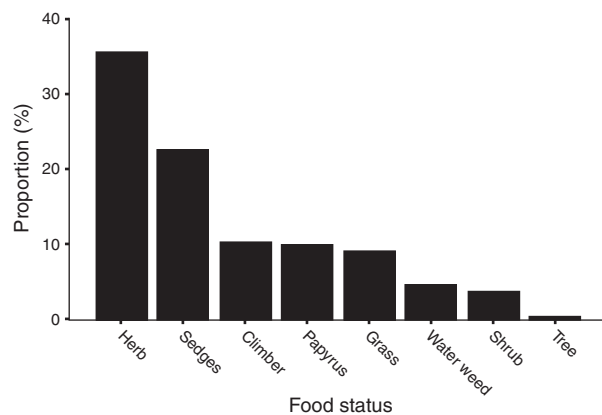


Fig 2 Status of plant species fed on by sitatunga in Rushebeya-Kanyabaha wetland, S.W. Uganda

blamed on over utilization and degradation of the wetland in the process of extracting raw materials for crafts and building materials and this was in agreement with Hill, Osborn & Plumptre (2002) who found out that proximity of farmers' gardens affected the quality of forest in Budongo Forest Reserve, Uganda. Sitatunga is on pressure to raids because of food scarcity and moved in early mornings and late evenings to avoid farmers as also indicated by Begon, Harper & Townsend (1996) for other animals under similar food stress. Our findings on sitatunga raiding and food timing were similar those of Williamson (1986) and Starin (2000). From our findings, we would like to add another reason to why sitatunga move in early mornings and at night. Authors e.g. Williamson (1986) have indicated the reason for late and early hours movement to being shy; but in Rushebeya, this may be also because of fear of hunters that makes the sitatunga hid under closed vegetation when humans are active. This in part may explain the reason why we had only 37 direct sitatunga sightings during the study period.

Local Name	Common Name	Scientific Name	Percentage of farmers response to preferred crops in terms of raiding
Emikamba	Sweet potatoes	<i>Ipomoea batatas</i>	45
Emondi	Irish potatoes	<i>Solanum tuberosum</i>	18
Ebicori	Maize	<i>Zea mays</i>	17
Kabegi	Cabbage	<i>Brassica oleracea</i>	8
Ebihimba	Beans	<i>Phaseolus vulgaris</i>	6
Omugusha	Sorghum	<i>Sorghum bicolor</i>	3
Ebikwijo	Sugarcane	<i>Saccharum arundinaceum</i>	2

Sitatunga activities, habitat use and food preferences

Similar to Games (1983) in Botswana, sitatunga was rarely seen in the wetland and only come out at feeding times. Also, in Kenya, sitatunga is reported to have morning and late afternoon peaks in activity (Owen, 1970) but with exception of Uganda and Botswana where sitatunga retreat during the day (Williamson, 1986; personal observations), respectively. According to farmers (personal observations) and Starin (2000) in Gambia, sitatungas are sensitive to hot weather and hide in water leaving only their nostrils above the water surface. We found sitatunga movement in water helps them trace surrounding areas with food. As supported by Starin (2000), we found that during the afternoon, sitatunga move out of water quickly feed and go back probably in fear of predators.

Our findings revealed that the longer the distance from the WE, the smaller the number of observations of sitatunga feeding signs as supported by Yolf (1992). Because almost 90% of sitatunga observations outside the wetland were made within 100 m from the edge, we predicted that much of their crop feeding takes place just close to the WE. This could as well be attributed to water logging as most of the wetland is flooded all year around. The vegetation deep inside the swamp is usually overgrown and undisturbed, and our findings indicated that sitatunga preferred young plants implying that they come out to feed on fresh vegetation on the edge. Still similar to Starin (2000), in Gambia, sitatunga in the Rushebeya-Kanyabaha fed mainly on leaves. This was further in agreement with Yolf (1992) who found sitatunga to be both grazers and browsers. The predominant vegetation in the wetland being the sedges common in other highland swamps (Okedi, 1987), sitatunga was better off feeding on leaves because they are readily available.

Our findings show that sitatunga fed mostly on herbs and sedges as this was the most dominant vegetation.

Table 2 Crops raided by sitatunga in and around Rushebeya-Kanyabaha wetland, Kabale S. W. Uganda. The figures indicate farmers' percentage response to crop raiding and the most affected species. Compared to Table 1 which is based on our direct observations, Table 2 is based on farmers' response

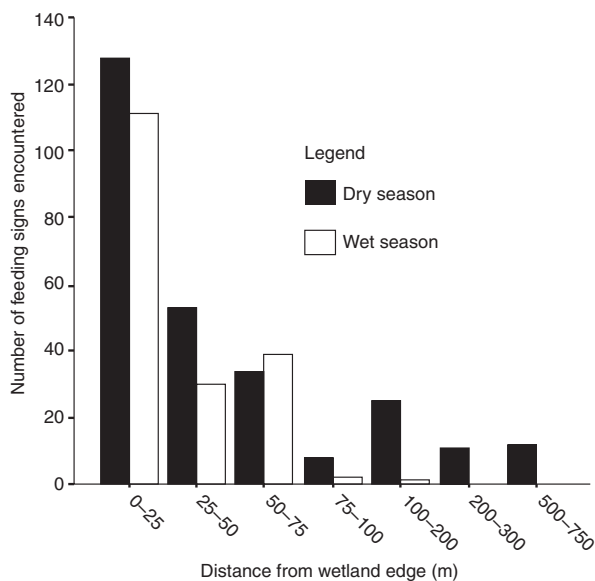


Fig 3 Distance in meters as indicated by sitatunga feeding signs in different seasons from gazetted wetland edge into to private farms in Rushebeya-Kanyabaha wetland, S.W.Uganda

Magliocca, Querouil & Gautier-Hion (2002) indicated that sitatunga is both grazers and browsers and are sedges fit for both grazing and browsing species. Herbs existed in highly degraded habitats especially WE and farmers' crops, showing a perfect correlation between habitat type and dominance of food statuses. In a way, intermediate wetland disturbances seemed to provide sitatunga food. Only forty plant species were found eaten by sitatunga indicating the lower diversity of wetland ecosystems. *Cyperus latifolia* was the most eaten by sitatunga probably because sedges dominated the wetland. There was a likelihood of increased crop raiding because most of the crop species planted were eaten by sitatunga. Generally, plants with broad leaves were preferred to wetland grasses and this was in agreement with Yolf (1992) that sitatunga feeding preference is for freshly sprouted reed tips, but will also take aquatic grasses such as *Eragrotis inamoena*.

Food distribution over the wetland areas and seasonal use of habitats

Most observations were made on the western side of the wetland in the villages of Kakirari, Kitanga, Kanshana, Kabirizi and Hamuhonga which could be attributed to awareness of the people on that side that may have scared

Table 3 Areas where we located sitatunga occurrence around Rushebeya-Kanyabaha wetland, Kabale S. W.Uganda. Areas indicate geographical villages which directly boarder with the wetland and occurrence means that either we saw sitatunga physically there or identified its signs in the area mentioned. Figures in columns are for both observation from feeding signs and our actual observations in the village areas

Village	Percentage of feeding observed	Actual sitatunga sightings
Hamuhonga	16	12
Rushebeya	14	16
Kakirari	10	3
Kitanga	10	4
Kabirizi	8	0
Kanshana	6	0
Rwengongo	6	0
Kabimbiri	4	2
Nyamugasi	3	0
Rwempisi	3	0
Bihondo	3	0
Rubirizi	3	0
Kanyabaha	3	0
Nyamabare	2	0
Kabira	2	0
Kitwe- Bihondo	1	0
Bugarama	1	0
Rweza	1	0
Nyaruhanga	1	0
Hamunyinya	1	0
Nyakacera	1	0
Kitojo	1	0

away hunters. The local people indicated that the eastern side is not monitored and most of the nets for capturing the sitatunga are usually set within that part. This could in part explain why we could not easily see sitatunga in that area; and out of 37 direct observations, only five were from the eastern side. We propose that any conservation measure to be effected should first focus on the eastern side. The local administration at the subcounties of Bukinda and Rwamucucu seemed to have neglected wetland conservation making hunters become so confident that at one time we got them dragging the dead animals near the headquarters. Hunters in this region do much harm to sitatunga mainly in August (dry season) when the animal is more vulnerable because of food shortage in the wetland. During the dry season, sitatunga move long distance from WE in search of food. Because this study mainly concentrated on the wetland, such feeding signs outside could not be ascertained. Seasons of the year affect the feeding habits

and habitat use; and because of such variations, there are high chances of crop raiding which will in turn lead to human–wildlife conflicts. The challenge remains with the capacity of local governments to implement conservation measures because of negative attitudes from neighbouring communities and lack of ecological data on sitatunga in this wetland. Because sitatunga is endangered, all measures should be thought of e.g. educating people and further behavioural and ecological research done to save this species and its habitat.

Acknowledgements

We thank IFS for funding the research. We also thank George Kacebonaho family, D. Kamugyeregyere, chairperson Kitanga wetlands and village chairpersons who guided us during data collection.

References

BEGON, M., HARPER, J.L. & TOWNSEND, C.R. (1996) *Ecology: Individuals, Populations, and Communities*, 3rd edn. Blackwell Science Ltd, Cambridge, MA.

CITES (2005) <http://www.cites.org> (accessed 25 March 2005).

DEARDEN, B. L., PEGAU, R.E. & HANSEN, R.M. (1975) Precision of microhistological estimates of ruminant food habits. *J. Wildl. Manage.* **39**, 402–407.

GAMES, I. (1983) Observations on the Sitatunga *Tragelaphus spekei selousi* in the Okavango Delta of Botswana, South Africa. *Biol. Conserv.* **27**(2), 157–170.

HILL, C.M., OSBORN, F. & PLUMPTRE, A.J. (2002) Human–wildlife conflict: identifying the problems and possible solutions.

Albertine rift technical report series Vol. 1: Wildlife Conservation Society.

IUCN (INTERNATIONAL UNION FOR CONSERVATION OF NATURE AND NATURAL RESOURCES) (2004) *2004 IUCN Red List of Threatened Species*. Available online at <http://www.redlist.org/>

MAGLIOCCA, F., QUEROUIL, S. & GAUTIER-HION, A. (2002) Grouping patterns, reproduction, and dispersal in a population of Sitatunga (*Tragelaphus spekei gratus*). *Can. J. Zool.* **80**(2), 245–250.

NAUGHTON-TREVES, L. (1998) Predicting patterns of crop damage by wildlife around Kibale National Park, Uganda. *Conserv. Biol.* **12**, 156–168.

NEMA (2005) *District state of the Environment Report, Kabale 2004*. NEMA, Kampala.

OKEDI, Y.O.J. (1987) *Swamp Ecosystems in Uganda*. Ministry of planning and economic development, Kampala.

OWEN, R.E.A. (1970) Some observations on the Sitatunga in Kenya. *E. Afr. Wild. J.* **8**, 181–195.

STARIN, E.D. (2000) Notes on Sitatunga in the Gambia. *Afr. J. Ecol.* **38**(4), 339–342.

TWEHEYO, M., HILL, C.M. & OBUA, J. (2005) Patterns of crop raiding by primates around the Budongo Forest Reserve, Uganda. *Wildl Biol Pract* **11**, 237–247.

TWEHEYO, M., LYE, K.A. & WELADJI, B. R. (2003) Chimpanzee diet and habitat selection In Budongo Forest Reserve, Uganda. *For. Ecol. Manage.* **188**, 267–278.

WILLIAMSON, D.T. (1986) Notes on Sitatunga in the Linyanti Swamp, Botswana. *Afr. J. Ecol.* **24**, 293–297.

YOLF, J. (1992) Sitatunga and its breeding at Prague Zoo. *Ziva* **40**(4), 187–189.

(Manuscript accepted 8 February 2010)

doi: 10.1111/j.1365-2028.2010.01210.x