

along rivers and after the first showers, particularly from October–December. As soon as it starts flowering it is not preferred to the same extent, but still extensively grazed on and continues to be one of the main components of the reedbuck's diet until January. Together with *Hyparrhenia dissoluta* it is considered to be the nutritive basis. During the dry season it is grazed on as well, but not to any great extent and then only those parts which are still green, the dry parts being avoided.

15. *Hyparrhenia dissoluta*: (P), 120–360 cm. This grass can be regarded as the visually dominant element of this plant community, although it is the second most abundant one. As regards grazing and cover it is the most important element of the reedbuck's habitat. Reedbuck feed on it in the young stage as well as in the old, until it dries up. It is extensively grazed on almost to the exclusion of other species on burnt veld during winter, and during the early rains when it starts growing along all hill-sides. It often happened that this plant made up 90–95 % of the forage eaten during one grazing period of 1–2 hours. Only during July–September is it hardly used, apart from burnt areas. But as soon as the first rains start, the grass sprouts and again makes up the bulk of the reedbuck's diet. Reedbuck use the young, short leaves of the tussocks and bite off the tips 15–25 cm above the ground. Closed flowers are used as well. Later, when the culms are mature, the animals take the leaves which are growing laterally on the stems.

16. *Hyparrhenia filipendula*: (P), 120–150 cm. Grows on open grassland, less common than *H. dissoluta* and of lesser importance. Now and then reedbuck graze on leaves and lateral shoots. During the dry season this was only observed once in August.

17. *Loudetia simplex*: (P), 20–90 cm, locally important constituent of the grassveld. Very often it occurs on poor and eroded soils. Spreads on over-grazed pasture. It is frequently grazed on when freshly sprouted on "burns" and after the first rains from October–December. Leaves and closed flowers are taken. During the dry season it is ignored; only occasionally some blades are taken.

18. *Panicum maximum*: (P), 60–200 cm. Widely distributed and common in shady places. Occurs most frequently in the open tree savanna where it grows under trees and bushes. It is to be found as well along the borders of gallery bush and along the *Phragmites* belt of small rivers. It produces large quantities of high-quality food and maintains its nutritive value throughout the winter, even when dried up.

After burns it is usually the only grass that has not been destroyed by virtue of its high moisture content and because it grows in the protection of trees and shrubs. Due to this it is the only cover for the reedbuck and a very important fodder plant until the young grass sprouts.

Leaves and stems are used in any season. Unlike other grasses it is also eaten when absolutely dry due to its palatability and high nutritive value. As soon as it sprouts green, early in the rainy season, it covers wide areas along river banks which are then utilized systematically by the

reedbuck. It also composes one of the main items of the diet when dry, but it is not grazed on as heavily as *H. dissoluta*.

19. *Perotis patens*: (A), 20–60 cm, grows on poor soils (as pioneer plant or weed). It is relatively common around Pretoriuskop, but not important for grazing. It was only seen to be taken once, in January.

20. *Pogonarthria squarrosa*: (P), or biennial (B). 30–90 cm. Often grows on granitic soils in disturbed areas; common around Pretoriuskop. Only young grass is utilized now and then after the first rains from September/October to January.

21. *Rhynchelytrum setifolium*: (P), 30–60 cm, uncommon. Not important for grazing. Only some young leaves were seen to be taken in October and January, before the plant started flowering.

22. *Schizachyrium semiberbe*: (P), 40–120 cm. Common (5th in order of abundance) and therefore a typical element of the vegetation. This is particularly obvious in autumn when the plants are coloured purple-red. It was consumed in large quantities after the first rains (September) until February. The animals utilize the sprouts and leaves which are bitten off 8 cm above ground level. During the dry season it is only eaten in the green stage, but never to any great extent.

23. *Setaria flabellata*: (P), 30–60 cm. Frequent on poor soils; scattered distribution. Of no importance as a fodder plant. It was not grazed on during the dry season. In the young state leaves are taken occasionally.

24. *Setaria perennis*: (P), stoloniferous. Occasionally grows in open grassveld on sandy soils. Was grazed on once, when young, in November.

25. *Setaria sphacelata*: (P), 60–180 cm. More frequent than *S. flabellata*. Good fodder grass, cultivated as pasture and hay grass. In places where present it was grazed on in large quantities from October to June. The reedbuck take leaves which are bitten off 28 cm above the ground.

26. *Sporobolus fimbriatus*: (P), 60–90 cm. On dry soils, "sweet" grass, grows in bushveld. Although considered palatable it was only utilized once in February. Some leaves were bitten off 10 cm above the ground.

27. *Sporobolus schlechteri*: (P), 30–90 cm. More common than *S. fimbriatus*. In the young stage consumed in high quantities particularly from October to December, i.e. before the flowering stage.

28. *Themeda triandra*: (P), 30–90 cm. It is one of the most important grasses in South Africa. Before the arrival of the Europeans this grass was dominant over wide parts of the country between the Cape and Transvaal. It formed dense swarths in which other grasses had only local importance, e.g. *Hyparrhenia* sp, *Panicum* sp, *Andropogon* sp, *Digitaria* sp, *Trachypogon* sp, etc. By reason of wrong management (over-grazing, injudicious burning) this climax community has been destroyed by man and was replaced by a secondary grassland.

The former distribution of *T. triandra* in the lowveld is not known. Today it is nowhere of importance, being only of insular distribution. The utilization of this veld type by the reedbuck could not be observed all year round. In one block it was frequently grazed until June. Green

and dry leaves were taken. After this block was burnt no further observations were possible. During the rains young grass is eaten in large quantities everywhere. Because of its local distribution it does not represent an important fodder plant.

29. *Trachypogon spicatus*: (P), 120 cm. A typical constituent of "sour" veld. Very common. Besides *Panicum maximum* this is the only grass which is utilized throughout the year. It is of particular importance during the dry season. When most of the other species have dried, *T. spicatus* still has some green leaves in its dry tussocks. This fresh herbage is used by the reedbuck which pick out the single green leaves. As in *Urelytrum squarrosom*, it was observed that reedbuck graze from one tussock to the next, only utilizing the fresh leaves and ignoring the others. Even when it starts sprouting, early during the rains (November) it continues to be one of the main fodder plants. When the grass starts flowering (January) reedbuck feed only on the younger specimens; mature plants are ignored.

30. *Tricholeana monachne*: (P), 40–120 cm. Prefers dry soils, and thus grows frequently on the upper parts of the hillside, but not on the crests. Only young plants are grazed on immediately after the rains.

31. *Urelytrum squarrosom*: (P), 60–160 cm. Grows on some stony hill-sides; not common. Despite the bitter taste ("quininegrass") of its leaves and stems it is grazed heavily during the dry season whenever found. Even in August some green leaves are still concealed in its dry tufts which are picked out by the reedbuck. In places where this grass is common it was observed that reedbuck grazed systematically from one plant to the next.

32. *Urochloa mosambicensis*: (P), stoloniferous, 120 cm, "sweet" grass. Occasionally grows near the rivers; very palatable. Even when dried an important fodder plant. Due to its scarcity there are only two observations of its being utilized (July and February). In each case all available plants were heavily grazed and leaves as well as stems were eaten. It can be supposed that this grass is also used throughout the year, but due to its scarcity it is of no importance.

Summary and conclusion

The most important grasses, i.e. those which compose most of the reedbuck's diet throughout the year (apart from a few months during the dry season) are: *Hyparrhenia dissoluta*, *Trachypogon spicatus*, *Panicum maximum* and *Heteropogon contortus*. During the winter months heavy use is made particularly of *Trachypogon spicatus*, *Panicum maximum*, species of the river area (grasses, grass-like plants, herbs; see below) and some plants of the hillside which were ignored under normal conditions.

Even though *Elyonurus argenteus* represents the dominant grass of the region, reedbuck were not observed grazing it. Therefore I regard it as fairly well proved that this grass is ignored when mature, because it would definitely have been observed if the reedbuck consumed it in proportion to its abundance. However, it can be possible that it is eaten when young

but even then the quantity consumed must be fairly low. It was observed that other ungulates feed on it occasionally, e.g. wildebeest, zebra, impala and sable.

Apart from this species, which is one of the poorest grasses, it is noticeable that predominantly those species (besides *Panicum maximum*) which are usually considered less palatable or even useless pasture-grass seem to constitute the most important fodder grasses. Like the waterbuck in East Africa, which make relatively more use of unpalatable grasses like *Heteropogon* sp and *Aristida* sp than other herbivores (Kiley, 1966), the reedbuck seem to be an antelope which subsists on "poor" pasture if enough water is available. This is of importance for cultivated areas, because it can be assumed that the reedbuck is one of those ungulates which are highly suitable for game ranching purposes.

Unlike livestock reedbuck feed on less palatable grasses and retire into vleis and other suitable places when concentrations of other game occur on their favoured grazing sites. In these areas they utilize grasses and herbaceous plants which are normally ignored by livestock and thus lie fallow. In relation to the feeding habits of other game (apart from wildebeest, zebra and impala) reedbuck are very unpretentious and survive better than many other herbivorous ungulates (for instance sable) in poor grassland (see below).

(b) *Grass-like plants and herbaceous vegetation of the hillsides* (Table 1)

1. *Anthericum* sp: A monocotyledonous plant with white flowers. Leaves and flowers are consumed from September to November.

2. *Cyanotis nodiflora*: Common along rivers and on slopes; occasionally grazed in December.

3. *Cyperus margaritatus*: 20 cm, on slopes; leaves were utilized now and again in winter. During November whole plants with flowers were taken.

4. *Fimbristylis* sp: Sedge-like, 10–20 cm, in tufts on sandy soils. Once, in October, leaves and stems were consumed in large quantities.

5. *Graphalium undulatum*: Herbaceous, 30 cm, tips of young plants were eaten in September.

6. *Hypoxis rooperi*: Monocotyledonous. Grows near rivers and on lower slopes. In June three dry but still "succulent" leaves were eaten; young leaves were taken in October.

7. *Kyllingia alba*: Sedge-like, 10–20 cm, on dry hillsides. Leaves were occasionally taken in October but flowers were ignored.

8. *Lotononis florifera*: Herb; tips of young plants were consumed in October.

9. *Mariscus capensis*: Herb, on hillsides. Flowers were taken once in October.

10. *Murdannia sinicum*: Herbaceous Commelinaceae. Once, in March, a whole plant was eaten.

Summary and Conclusion

All grass-like plants and herbaceous plants were mainly utilized during winter, but only if green and "succulent". They are of less importance as staple food, but are possibly significant because of their water and mineral content and the presence of trace elements.

(c) Grasses of the river-zone (Table 2)

1. *Hemarthria altissima*: (P), 30–100 cm. Grows in all wet places; typical constituent of riverine and vlei vegetation, sometimes occurs even in waterlogged areas. It is a palatable, valuable fodder grass which is of particular importance at the end of the dry season, when the vegetation along the hillsides has dried out. During winter, when reedbuck frequent the river areas, it is heavily grazed because it stays soft and fresh for a long time. Reedbuck prefer the lateral sprouts and the tips of the leaves. In summer it is utilized only occasionally, because the reedbuck do not frequent this area as much as in winter, but if they come across it, large amounts are consumed.

2. *Imperata cylindrica*: (P), 10–30 cm. Grows in moist places, frequently on river-banks or along the *Phragmites* zone. It is considered to be hard and unpalatable, but despite this it is grazed by reedbuck in large quantities from May–October. Leaves are bitten off 10 cm above the ground. During the dry season it constitutes one of the reedbuck's favourite herbage when they grazed in dry river beds. Although being hard, it contains much moisture and dries out late. Sometimes it was grazed for 50–150 m and made up 80 % of the total food consumption.

3. *Leersia hexandra*: (P), with creeping rhizomes, up to 100 cm. Grows in or near water. It is hydrophytic and one of the few grasses that have become adapted to growth in water. It stays green long into the dry season, particularly if growing in the shade of reeds. It is very palatable and one of the main diet items of the reedbuck in this vegetation zone during winter. If the reedbuck visits this area during summer, large amounts are grazed as well.

4. *Phragmites communis*: (P), 60–300 cm, aquatic or semi-aquatic. Dominant in all rivers, along river banks and other wet places. It cannot stand overgrazing and trampling and is absent in places which are regularly visited for drinking. *Phragmites* is an important fodder plant for the reedbuck from July to September (Herbert, 1970, observed the same in the waterbuck). From April to June tips of the leaves are utilized occasionally. As the dry season progresses, it is grazed more and more. The young shoots which appear after fires are particularly favoured. The reedbuck do not bite them off, but pull them out of their sheaths.

5. *Sorghastrum rigidifolium*: (P), 90–150 cm. Not common; grows only in damp soils, sometimes even in water; when young it was grazed in large quantities in May.

6. *Sorghastrum friesii*: (P), 70–120 cm. In wet places and on poor soils. When sprouting after the first rains, it is consumed in large quantities.

Ignored after flowering.

7. *Sorghum verticilliflorum*: (A), or (P), 80–250 cm. Only in wet places; rare; in May leaves of one plant were eaten.

Summary and Conclusion

Most grasses of the riverine area are grazed during the dry season, except *Leersia hexandra* and *Hemarthria altissima*. During this time hillsides are avoided, due to the absence of cover and competition from other herbivores.

The most important grasses are *Leersia hexandra* and *Phragmites communis*. When feeding in rivers the reedbuck sometimes wade into the water or mud to a depth of 20 cm. This is of interest, because it usually avoids entering water while drinking.

(d) *Grass-like plants and herbs of the river-zone* (Table 2)

1. *Cyperus* sp: Grass or sedge-like plants that normally grow in wet places, together with *Phragmites communis*. Only young plants are consumed. They are bitten off a few cm above the ground. Most *Cyperus* sp are green and “succulent” during the dry season. They are grazed to some extent but never as much as grasses. They constitute a part of the winter diet and are also utilized by buffalo and waterbuck during the dry season.

The following species have been identified:

C. fastigatus: Utilized from May–August, single leaves and flowers.

C. immensus: One of the tallest *Cyperus* species, common. Eaten particularly from July–September, but never in large amounts, always only a few leaves (maximum 20).

C. teniospica: September, leaves.

C. difformis (?): November, large amounts of young leaves.

C. sp: August–September, large amounts of young leaves and sprouts.

2. *Commelina africana*: Herbaceous plant, grows in river beds, very “succulent”. From May–June it is grazed in large quantities together with different *Cyperus* sp and other plants of this region. In June it begins drying up and is ignored.

3. Compositae: Numerous species grow close to the ground, either in the *Phragmites* zone or at its outer parts. Out of four species only one could be identified, i.e. *Niderella auriculata*. The “succulent” leaves and stems of these plants are bitten off at their base. They are utilized from July–September, together with other herbage.

4. *Equisetum ramosissimum*: sprouts after the rains and is common in most rivers until August. Was grazed twice in June and August; each time two green shoots were taken. It is possibly of importance as a source of trace elements. The outer membranes of the stems and epidermis are particularly rich in silicic acid.

5. *Fuirena pubescens*: Common in rivers; leaves of young plants are utilized from September–November, but never in large amounts. Once

it was also eaten in June.

6. *Kyllingia erecta*: Sedge-like, common in rivers; from June–September large quantities of leaves and flowers are consumed.

7. *Kyllingia melanosperma* (?): like *K. erecta*.

8. *Polygonum pulchrum*: Herbaceous, covers large areas of dry river beds. From June–October it is grazed in large amounts, particularly when it begins growing again after fires.

9. *Polygonum saltifolium*: Herbaceous, in river beds. Grazed in July but not as much as *P. pulchrum*.

10. *Pycurus polystachus*: Herbaceous, grows in water and wet places near water. Common in some rivers. Young plants are frequently grazed, leaves and flowers alike.

11. *Scirpus* sp *corymbosus* (?): Sedge, common in river beds and around water holes. It is occasionally utilized from August–October. Only once, when it was flowering, were large amounts consumed.

12. *Typha capensis*: “Bull-rush”, is aquatic or semi-aquatic. It colonizes river beds and water holes. The leaves are rich in intercellulares and stay fresh and “succulent” during winter. Like *Cyperus immensus*, tips of leaves are taken now and then, but never more than 10 at a time. In September young sprouts are preferred. The plant is utilized from July–September.

Summary and Conclusion

The *Phragmites* zone with hydrophytic grasses and herbs is only intensively utilized from June–October when other fodder is scarce. After the first rains, when fresh herbage sprouts on hillsides and along river banks, this zone is ignored. This is especially noticeable on burnt blocks, where reedbuck linger on the fresh grasses along water courses and on river banks (1a) until February but avoid the vegetation of the *Phragmites* zone. The following indicate the outstanding importance of this zone during winter:

1. Reedbuck can spend the whole day along rivers due to the presence of adequate cover. They need not leave the area to graze on the open hillsides.

2. They occupy a distinct ecological niche and can graze without severe competition from other herbivorous ungulates.

3. The vegetation consists of many different species. Despite the dry season, these plants are fairly fresh, “succulent” and of sufficient nutritive value. On account of this the reedbuck survive in good condition. Favourable plants are: *Cyperus* spp particularly *C. fastigatus*, *Polygonum* sp, *Kyllingia* sp.

(e) *Woody plants*

1. *Dichrostachys cinerea* ssp *nyassana*: “Sickle-bush” is the most abundant woody plant around Pretoriuskop and has become a serious problem in many areas. In places where the grass cover has been weakened by overgrazing and other means of wrong veld management, sickle-bush has

encroached on large areas (Codd, 1951). The leaves of this bush are browsed in the young stage (observations in August and October). In August one reedbuck was observed browsing a few leaves and in October three animals occasionally browsed a few leaves during their grazing period at intervals of 20–30 minutes. All leaves were young and still partly folded. One animal even browsed for 8 minutes. This was never observed again. It is of interest to note that occasional browsing on this shrub has also been recorded for wildebeest, zebra, sable and roan (Van Wyk, *pers. comm.*; own observations).

2. Browsing on other shrubs or trees was not observed around Pretoriuskop but only in the north, where grazing conditions were much poorer (see below).

2. *Shawu vlei* (Table 3)

(a) Grasses consumed by the reedbuck

1. *Aristida adscensionis* ssp *guineensis*: (A), 60 cm, in the Mopane veld; some stems were grazed in December.

2. *Cenchrus ciliaris*: (P), 10–120 cm, typical of dry and poor soils, but a characteristic constituent of the Mopane veld, as well as many bushveld and savanna communities. It is very resistant to drought and is valued as a palatable pasture grass even when dry. This species is grazed (leaves and stems) in large quantities from August to December even when dry. After some rains in December young sprouts were preferred.

3. *Chloris gayana*: (P), 40–60 cm, common in the vlei, absent from the Mopane veld. Was grazed extensively in all three months. Very often it is preferred because green and fresh leaves occurred in the dry matter of its tussocks, which are picked out by the reedbuck. In December stems were grazed as well.

4. *Digitaria pentzii*: (P), stoloniferous. Typical in “sweet” veld; good pasture grass. Was only grazed in December in the Mopane veld.

5. *Dinebra reflexa*: (A), 80 cm. Common in the vlei, particularly in depressions and wet soil of the erosion channel. In December green leaves were eaten in large amounts.

6. *Enneapogon cenchrroides*: (A), 100 cm, common on poor soils of the bush veld. It was grazed in large quantities during September, even though it was nearly 100% dry.

7. *Eriochloa borumensis*: (P), grows in wet areas of the vlei (in depressions), and along the erosion channel. Leaves and stems were grazed in December.

8. *Heteropogon contortus*: (A), 20–70 cm, constitutes one of the outstanding fodder species as in the “sour” veld (see above). In the Mopane veld it is fifth in abundance (third in Pretoriuskop), and is known to be a good pasture grass. It is utilized in the young stage (December) but also when semi-dry (August and September), particularly the thick, “succulent” bases of the leaves. When dry it was hardly eaten.

9. *Ischaemum brachyatherum*: (P), 80–120 cm. Common only in the vlei.

Thrives in damp soils and forms lawn-like formations. Dominates in some parts of the vlei. Green and dry leaves and stems were grazed in all three months. The stems are still fairly "succulent" during the dry season. This grass constitutes an important fodder plant.

10. *Panicum coloratum*: (P), 200 cm. Typical "sweet" grass. Predominant in the Mopane veld. Good pasture grass. Was consumed in the three months when observations were made.

11. *Sporobolus robustus*: (P), 100–230 cm. Predominates in all the northern vleis. It is as important as *Hyparrhenia dissoluta* in the Pretoriuskop area and provides cover for the reedbuck, but unlike the tall grass at Pretoriuskop it is not a preferred fodder plant. It was only grazed in September. Reedbuck feed on the leaves of young plants which sprout at long stolons.

12. *Urochloa mosambicensis*: (P), 120, important "sweet" grass. grows in depressions and along the erosion channel of the vlei. It was grazed in the green and dry state during September and December.

13. *Setaria x oodii*: grazed in February

14. *Echinochloa pyramidalis*: grazed in June

15. *Themeda triandra*: grazed in November

} recorded by Van Wyk
(pers. comm.).

Summary

On the basis of these few observations it is difficult to deduce the order of preference of certain species. It seems that *Ischaemum brachyatherum* and *Chloris gayana* are the most important fodder plants in the vlei. In the Mopane veld it seems to be *Cenchrus ciliaris* and *Panicum coloratum*.

(b) Utilization of other vegetation

1. *Cyperus sexangularis*: 160 cm. Predominates (besides *Phragmites communis*) in depressions and along the erosion channel. In September it was eaten once.

Woody plants (Table 3)

2. *Acacia* sp (*nilotica*?): Identification was difficult because fruits or flowers were not available. It is a small tree, which is very common in the vlei. In August I observed a ♂ feeding on the tips of the branches (6 cm long), the thorns of which were still soft.

3. *Albizzia harveyi*: Deciduous shrub, common and widespread in the north. Grows on the outskirts of the vlei and in the Mopane veld. Browsing occurred during three months. Young and old leaves were taken in large quantities.

4. *Hibiscus micranthus*: Dwarf shrub, leaves and tips of young branches were browsed once in August.

5. *Maerua legati*: Dwarf shrub, 30–50 cm tall. In August and September reedbuck occasionally browsed leaves and the tips of branches.

6. *Maytenus senegalensis*: Shrub, 4 m, hard leaves. In August two reedbuck browsed some young leaves.

7. *Ruellia patella*: Dwarf shrub. In August leaves and tips of the branches were consumed once.

8. *Securinea virosa*: Dwarf shrub, 40 cm. In August leaves and tips of branches were browsed.

Summary and conclusion

Browsing never occurred exclusively; but always occurred at intervals during the grazing period. Reedbuck kept to their main diet of grass. At the Shawu vlei it was rather conspicuous that the reedbuck did not feed on herbs but browsed a lot during winter, unlike Pretoriuskop where browsing practically never occurred. In the north the vegetation was considerably drier and the number of species is lower (Van der Schijff, 1957). Herbs are nearly totally absent or at least very rare. To compensate for the absence of sufficient green and fresh herbage, reedbuck browsed on young and old leaves or whole tips of young branches. At Pretoriuskop browsing did not occur because a large amount of fresh plants were at the disposal of the reedbuck in the riverine area.

The way the reedbuck adapts to moderate browsing under difficult nutritive circumstances shows that this species is also able to adjust itself in the north to other food resources without coming into competition with other species (like at Pretoriuskop, see above), because browsers like eland, kudu, or impala are rare in this area.

III. Competition for food

The observations on the feeding habits of other species in the KNP were only partly made by the author. I am indebted to Mr. van Wyk who offered me the use of his records; other statements are drawn from Van der Schijff (1959) and Brynard and Pienaar (1960). But as only single observations were recorded in all cases, it is not possible to make any statements on the year-round utilization of certain plant species or the frequency of their consumption.

Tables 1-3 show that grasses which are of importance for the reedbuck on hillsides, in vleis and in the Mopane veld appear as well in the diet of other grazing ungulates. Those grasses are: *Andropogon amplexans*, *Heteropogon contortus*, *Hyparrhenia dissoluta*, *Panicum maximum*, *Cenchrus ciliaris*, *Panicum coloratum*, *Sporobolus robustus* and *Enneapogon* sp. Therefore, it must be concluded that several kinds of antelope compete with the reedbuck for its main forage. During summer this is only of small significance because plenty of good and young herbage is available. But in the dry season this competitive interaction can be the cause of severe problems, when many herbivores graze the same pasture along rivers or around waterholes. Game concentrations around permanent water supplies are a common sight at this time. Depending on the ability of the different antelope species to go without water for long or short periods of time, they either graze in the vicinity of, or further away from, the water supply. The

reedbuck belongs to those species which have to drink once a day and thus stay very close to water (0–1,5 km), Jungius (1970). As a result of this, reedbuck live in that zone where very heavy grazing and competition takes place during the dry season. According to Van der Schijff (1959) this main grazing pressure lies within a radius of about 4,5 km from watering places.

If various species with the same food requirements utilize the same area and the same pasture this can only be accomplished under certain conditions. Some of these are:

1. Different ecological niches of the habitat are occupied.
2. One species (usually the lower ranking one) retires into marginal areas and uses another forage which is ignored by its competitors. Thus the inferior one takes over a new nutritive resource.
3. The same habitat is utilized at different times. The reedbuck ranks as an inferior species in interspecific competition for space and food. It avoids larger animals or those which congregate in large herds like wildebeest, zebra, tsessebe and impala. This aspect certainly played an important part during its evolutionary process. The reedbuck has "selected" the habitat of the tall grass veld because this was avoided by the majority of other ungulates. He is well adapted to the conditions of this habitat and utilizes it almost exclusively as long as the tall grass provides cover and impedes orientation for other species. Vesey-Fitzgerald (1960) records the same for the bohor reedbuck *Redunca redunca wardi*, which occupies the tall grassland of *Echinochloa pyramidalis* on the floodplains of the Rukwa Valley without any severe competition from other ungulates for at least five months of the year.

During winter, when the tall grassveld near watering places and on burnt areas is invaded and destroyed by herds of zebra, wildebeest and impala, the reedbuck retires again into another ecological niche that is avoided by his competitors, i.e. the riverine area (Fig. 1). Being cut off from his normal food-supply on the hillsides he has adjusted himself to this particular plant community. Waterbuck and buffalo are his only competitors. However, buffalo normally prefer different habitats such as rivers fringed by dense bush and gallery forest. In typical reedbuck habitats they are rare and thus do not represent severe competitors for food in this defined zone along rivers, spruits and vleis.

Apart from this, different activity patterns are another possibility for separating species which utilize the same pasture. The degree to which this is employed in this case is not known, because no exact investigations have been made of the diurnal and nocturnal activities of other herbivores in the same habitat or from similar areas. The reedbuck is mostly active during the night and characterised by low daily activity from the end of the rains until October. Only later does he become active during the whole day, as has been observed for impala, zebra and others during the early winter. Particularly on burnt veld reedbuck were encountered

resting, while other species were grazing nearly continuously from the morning until the evening. This difference in activity was very significant and in combination with other facts this seems to reduce competition between these species to a minimum, and if the habitat is not overpopulated it can also be utilized by the lower ranking species without any problem. Lamprey (1963) records similar observations from East Africa. The same grazing sites are utilized by Grant's gazelle and wildebeest, impala and zebra, at different times. Child and Von Richter (1969) state identical conditions from Botswana for puku, lechwe and waterbuck in regions where these species overlap in their habitats.

Summary

Reedbuck feed mainly on grass. Only during the dry season are grass-like plants, herbs and leaves of shrubs utilized as well. When grazing, reedbuck normally stay in confined areas and do not cover large distances. Grazing is always interrupted by periods of watching. These periods are more pronounced in ♀♀ than in ♂♂.

After grazing, reedbuck lie down for resting and ruminating in cover or in the shade of trees. Daily periods of rumination total 2-3 hours. Rumination as well as the number of times the cud is chewed seem to be specific behaviour patterns.

The utilization of the different fodder plants is evaluated and compared with other ungulates. It is of interest that the food of reedbuck consists mainly of "unpalatable" grasses which are avoided by other antelope species.

The tall grass veld of Pretoriuskop is occupied and utilized by reedbuck during most of the year without any competition from other species. Only during the dry season when the cover of tall grass is destroyed and other game concentrate on the hillsides, attracted by green herbage after fires or by permanent water, was it noticed that reedbuck retire from these places and move into the riverine areas. Here they feed on grass-like plants and herbaceous vegetation which are ignored by other species; they thus occupy an "empty" ecological niche.

On the hillsides reedbuck seem to avoid competition with other herbivores by different activity patterns. Their nocturnal behaviour pattern seems to be an essential part of this.

Based on all these facts, reedbuck can be considered as unpretentious grazers which still thrive on "unpalatable" and seasonally densely populated grassland, if sufficient cover is available (rivers, vleis) for shelter and retreat from other species. Under these conditions reedbuck seem not to be competitors for delicate game species or for cattle on farmland. If subjected to sound management techniques reedbuck may represent a valuable element for game ranching purposes, particularly in marginal areas of tall grass veld, vleis and open riverine stretches.

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REFERENCES

- ACOCKS, J. P. H. 1953. Veld Types of South Africa. *Bot. Surv. S.Afr. Mem.* 28. Annual reports of the warden of the Kruger National Park (1903–1913), unpublished.
- BRYNARD, A. M. and U. DE V. PIENAAR. 1960. Annual report of the biologist 1958/59. *Koedoe* 3: 1–205.
- BRYNARD, A. M. 1965. The influence of veld-burning on the vegetation and game in the Kruger National Park. In: D. H. S. Davis (ed.) *Ecological studies in Southern Africa*. The Hague: Junk.
- BOTHA, J. P. 1945. Veld management in the eastern Transvaal. In: *Farming in South Africa*: 537–541.
- CHILD, G. and W. VON RICHTER. 1969. Observations on ecology and behaviour of Lechwe, Puku and Waterbuck along the Chobe River, Botswana. *Z. Säugetierk.* 34: 275–295.
- CODD, L. E. W. 1951. Trees and shrubs of the Kruger National Park. *Bot. Surv. S.Afr. Mem.* 26.
- DASMANN, R. F. 1964. *African game ranching*. Oxford, London, Paris, Frankfurt: Pergamon Press.
- HERBERT, J. H. *in press*. The population dynamics of the waterbuck *Kobus ellipsiprymnus* (Ogilby 1833) in the Sabi Sand Wildtuin. *Mammalia depicta*. Hamburg: Paul Parey.
- JUNGIUS, H. *in press*. The biology of the Reedbuck (*Redunca arundinum*, Boddaert 1785). *Mammalia depicta*. Hamburg: Paul Parey.
- KILEY, M. 1966. A preliminary investigation into the feeding habits of the Waterbuck by faecal analysis. *E.Afr. Wildl. J.* 4: 153–157.
- LAMPREY, H. F. 1963. Ecological separation of the large mammal species in the Tarangire Game Reserve, Tanganyika. *E.Afr. Wildl. J.* 1: 63–92.
- ODUM, E. P. 1966. *Fundamentals of ecology*. W. B. Saunders Co. Philadelphia and London.
- PIENAAR, U. DE V. 1963. The large mammals of the Kruger National Park – their distribution and present day status. *Koedoe* 6: 1–38.
- VAN DER SCHIJFF, H. P. 1957. Ekologiese studie van die flora van die Nasionale Krugerwildtuin. D.Sc. Thesis, Potchefstroom University for C.N.E. (unpublished).
- VAN DER SCHIJFF, H. P. 1959. Weidingsmoontlikhede en weidingsprobleme in die Nasionale Krugerwildtuin. *Koedoe* 2: 96–127.

- SCOTT, I. D. 1955. *In*: D. Meredith (*ed*). The grasses and pastures of South Africa. Johannesburg: Central News Agency.
- VESEY-FITZGERALD, D. F. 1960. Grazing succession among East African game animals. *J. Mammal.* 41: 161–172.
- WALTHER, F. 1968. *Verhalten der Gazellen*. Neue Brehm-Bucherei 373.

Table 1

Food plants on the hillsides around Pretoriuskop

	% of occurrence	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Competition
Grasses														
<i>Indropogon amplexans</i> ..	8,18	+	+	-	-	-	-	-	-	+	+	+	+	B, Z, S, W
<i>L. schirensis</i> ..	0,25									/	/	/		S
<i>Moris gayana</i> ..	0,25													G, J, Z
<i>Podon dactylon</i> ..	4,35	-	-											G, B, Z, S, W
<i>Piptaria erecta</i> ..	0,25													
<i>P. eriantha</i> ..	1,53	(+)	(+)											J, Z
<i>P. pentzii</i> var <i>stolonifera</i>	0,25				(+)					/				**
<i>P. monodactyla</i> ..	0,25									/	/	/		G, J
<i>Brachystachya capensis</i> ..	1,02									+	+	+		Z
<i>B. curvula</i> ..	1,02									+	+	+		
<i>B. galpinii</i> ..	1,02						(+)	(+)	(+)	(+)				G, B, S
<i>B. superba</i> ..	1,02													
<i>Eriochloa borumensis</i> ..	0,25				/	/								G, B, Z, S, W
<i>Heteropogon contortus</i> ..	8,18	/	/	/	/	/	/	-	-	-	+	+	+	G, B, Z, S, W
<i>Hyparrhenia dissoluta</i> ..	13,55	+	+	+	+	/	/				/	/	/	G, S
<i>H. filipendula</i> ..	2,30	/	/								/	/	/	G, Z, S
<i>Loudetia simplex</i> ..	2,07	/	/								+	+	+	G, B, J, S, W, K
<i>Panicum maximum</i> ..	4,86	+	+	+	+	+	/	/	/	/	+	+	+	J
<i>Perotis balens</i> ..	3,32	-	-											Z, S
<i>Pogonarthria squarrosa</i> ..	6,39	/	/							/	/	/	/	
<i>Rhynchelytrum setifolium</i> ..	0,25	-	-							/	+	+	+	G, B, Z
<i>Schizachyrium semiberbe</i> ..	7,42	/	/	/	/					/	+	+	+	
<i>Setaria flabellata</i> ..	0,51	-	-								-	-	-	S
<i>S. perennis</i> ..	0,25													S
<i>S. spicelata</i> ..	0,77	/	/	-	-	-	-				/	+	+	G
<i>Sporobolus fimbriatus</i> ..	0,25	/	/											G, J, S
<i>S. schlechteri</i> ..	0,25									/	(+)	(+)	(+)	G, B, J, Z
<i>Themeda triandra</i> ..	0,25	(+)	(+)	(+)	(+)	(+)	(+)	(+)			(+)	(+)	(+)	S
<i>Trachypogon spicatus</i> ?	1,79?	/	/	/	/	/	/	/	/	/	+	+	+	G, Z
<i>Tricholeana monachne</i> ..	0,25													G?
<i>Urelytrum squarrosus</i> ..	0,25		(+)					(+)	(+)					W, Z, J, G, B
<i>Urochloa mosambicensis</i> ..	0,25		(+)					(+)						
Grass-like plants and herbs														
All Dicotyledons ..	1,79													
<i>Anthericum</i> sp ..	?									/	/	/	/	
<i>Cyanotis nodiflora</i> ..	?													/
<i>Cyperus margaritatus</i> ..	?									/	/	/	/	
<i>Fimbristylis</i> sp ..	?										+			
<i>Graphalium undulatum</i> ..	?									/				
<i>Hypoxis rooperi</i> ..	?													
<i>Kyllingia alba</i> ..	0,51													
<i>Lotononis florifera</i> ..	?													
<i>Mariscus capensis</i> ..	?													
<i>Murdannia sinicum</i> ..	?													
Shrub														
<i>Dichrostachys cinerea</i> ssp														
<i>nyassana</i> ..										-	-			G, Z, S, W, J, K

+ frequently grazed
 / moderately grazed
 - slightly grazed
 () only locally important
 * Grass sp. not known
 C = Common
 F = Fairly common
 R = Rarc

G = Wildebeest
 S = Sable
 B = Buffalo
 Z = Zebra
 W = Waterbuck
 J = Impala
 K = Kudu

Table 2

Food plants along rivers around Pretoriuskop

	Occurrence	Month												Competition
		Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	
Grasses:														
<i>Hemarthria altissima</i> ..	C	/	/	/	/	/	+	+	+	+	+	/	/	
<i>Imperata cylindrica</i> ..	C				/	+	+	+	+	+	+	/	/	W
<i>Leersia hexandra</i> ..	C	/	/	/	/	/	+	+	+	+	+	+	/	W
<i>Phragmites communis</i> ..	C				—	—	/	+	+	+				B, J, S, W
<i>Sorghastrum rigidifolium</i>	R					(+)								B
<i>S. friesii</i> ..	F									+	+	+		
<i>Sorghum verticilliflorum</i> ..	R			—										
Grass-like plants and herbs														
<i>Cyperus</i> sp ..	C					—	/	+	+	+	/	/		W, B
<i>C. difformis</i> ? ..												+		
<i>C. fastigiatu</i> s ..						/	+	+	+					
<i>C. immensus</i> ..								—	—	—				
<i>C. tenuispica</i> ..										—				
<i>Commelina africana</i> ..	C					/	/							
Compositae ..	F						/	/	/					
<i>Equisetum ramosissimum</i>	F						—							
<i>Fuirena pubescens</i> ..	C						/			/	/	/		
<i>Kyllingia erecta</i> ..	C						/	/	+	+				W
<i>K. melassopama</i> ? ..	C						/	/	+	+				
<i>Polygonum pulchrum</i> ..	C							+	+	+	+			W
<i>P. salitifolium</i> ..	F							+						
<i>Pycreus polystachyus</i> ..	F									+	+			
<i>Scriptus</i> sp. <i>corymbosus</i> ? ..	F								/	/	/			
<i>Typha capensis</i> ..	F							—	—	—				B

+ frequently grazed
 / moderately grazed
 — slightly grazed
 () only locally important
 * Grass sp. not known
 C = Common
 F = Fairly common
 R = Rare

G = Wildebeest
 S = Sable
 B = Buffalo
 Z = Zebra
 W = Waterbuck
 J = Impala
 K = Kudu

Table 3

Food plants in the Shawu-vlei

	% of occurrence	Aug.	Sept.	Dec.	Competition
Grasses					
<i>Aristida adscensionis</i> (M) ...	under 0.30			—	
<i>Cenchrus ciliaris</i> (M) ...	2.97	+	+	+	R, B, Z, T, E
<i>Chloris gayana</i> (V) ...	C	+	+	+	*****
<i>Digitaria stolonifera</i> (M) ...	under 0.30			/	R, G, B, Z, T
<i>Dinebra reflexa</i> (V) ...	F			+	
<i>Enneapogon cenchroides</i> (M) ...	3.63	—	—	+	G, B, Z, E
<i>Eriochloa borumensis</i> (V) ...	F			/	E
<i>Heteropogon contortus</i> (M) ...	6.27	—	—	/	Z, T
<i>Ischaemum brachyatherum</i> (V) ...	C	+	+	+	
<i>Panicum coloratum</i> (M) ...	23.10	+	+	+	R, B, Z, T
<i>P. maximum</i> (M) ...	under 0.30			/	G, B, E, Z, T, K
<i>Sporobolus robustus</i> (V) ...	C		/		R, B, E, G
<i>Urochloa mosambicensis</i> (V) ...	F		/	/	Z, G, B
Woody plants:					
<i>Acacia</i> sp. <i>nolotica</i> ? ...		/			E
<i>Albizia harveyi</i> ...		+	+	+	E, K
<i>Hibiscus micranthus</i> ...		—			
<i>Maerua legati</i> ...		/	/		E, K
<i>Maytenus senegalensis</i> ...		—			
<i>Ruellia patella</i> ...		—			
<i>Securinega virosa</i> ...		—			
Cyperus species					
<i>Cyperus sexangularis</i> ...			/		

(M) Mopane veld

(V) Vlei

C = common

F = fairly common

+ frequently grazed

/ moderately grazed

— slightly grazed

R = Roan antelope

B = Buffalo

Z = Zebra

G = Wildebeest (Gnu)

T = Tsessebe

K = Kudu

E = Elephant

* = other *Digitaria* sp.
grazed