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| Lesson 2 **Buffalo Diet Readings:** What do buffaloes eat and is there more of it for them to eat now? |

**READING 1: Forest Buffalo (*Syncerus caffer nanus*) Fact Sheet, 1999**

**Diet**

* Grasses and sedges (plants similar to grasses)form the bulk of buffalo diet, but the leaves and shoots of other plants (e.g., shrubs, trees, and herbs) are also eaten. Diet may be determined solely by availability; however, when a choice exists, plants high in protein and carbohydrates may be selected to maximize nutrient intake.

**Feeding**

* Buffalo are classified as bulk and roughage eaters that are dependent on water.
* Buffalo are less likely to overgraze than than wildebeest and zebra are. Buffalo are also less destructive and more economical than most other grazers in using available food, including old grass.
* During their nomadic foraging routines, they range up to 18 km from their watering places, which they visit at least once (and often twice) a day. Buffalo cannot tolerate water restriction for very long during hot temperatures. Adults need up to 39-55 liters per day. Water consumption may be up to 30-40 liters per day; the rest is obtained via food and metabolism.
* Buffalo are ruminants, meaning mammals that acquire nutrients from their plant-based diet through a complex digestive system that includes fermenting their food with the help of bacteria in one of four stomachs. This complex system allows the ruminant mammal to gain nutrients from complex molecules like cellulose that other mammals cannot break down.
* Daily food intake (dry forage) averages 6.1-17.5 kg.

**READING 2: Dry Season Diets**

It is well known that hoofed herbivores prefer to eat green leaf vegetation. In McNaughton’s (1985) study of diets of several organisms on the Serengeti, during the dry season the abundance of green leaved short grasses in Serengeti grasslands declined dramatically. However, high proportions of green leaves were still found during the the dry season in locations recovering from a fire or heavy grazing.

Much of the green vegetation found during the beginning of the dry season was located close to the surface of the soil making it more difficult for large herbivores to access. Throughout the dry season the plants continued to grow. This increased the height of the remaining green leaves. This growth made the leaves more accessible to the herbivores remaining in the area during the dry season. The easier access also increased the competition among the herbivores during the dry season.

The table below shows the top three species of plant that each of four species of herbivore eat in the dry season: wildebeest, zebra, Thomson’s gazelle, and buffalo. It shows the percentage of the diet that each species of plant makes up for the animal. The numbers do not add up to 100%, because not all the plants eaten by the animal are shown. The plant species names are written in the *Genus species* format.

**Table 2.1**: Dry Season Diets of Herbivores

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | Animal Species | | | |
| Plant Species | Wildebeest | Zebra | Thomson’s gazelle | Buffalo |
| *Themeda triandra* | 63.4% | 20.6% | 35.0% | 35.4% |
| *Sporobolus fibriatus* | 6.3% | ... | 14.8% | ... |
| *S. pyrmaidialis* | 6.1% | ... | ... | ... |
| *Hyparrhenia filipendula* | ... | 20.7% | ... | 26.8% |
| *Digitaria macroblephara* | ... | 13.3% | ... | ... |
| *Pennisetum mezianum* | ... | ... | 14.9% | ... |
| *Laudetia kagarensis* | ... | ... | ... | 12.8% |

**READING 3: Wet Season Diets**

During the start of the wet season, the four major species of herbivores separate into different areas, where they do not compete directly for food, water, or space. The amount of biomass is different for each of the species (Table 2.2).

**Table 2.2:** Amount of Green Leaf Matter (Biomass) in Areas Where Herbivores Inhabit in Wet Season

|  |  |
| --- | --- |
|  | Amount of Green Leaf Matter (g/m2) |
| Wildebeest | 40-80 |
| Zebra | 40-60 |
| Thomson’s Gazelle | 20-40 |
| Buffalo | 80-100 |

During December, the consumption of leaf matter by the herbivores was estimated by placing temporary exclosures on the grasslands to prevent grazing in certain areas, allowing for a comparison to be made with the grazed grasslands. The amount of leaf matter consumed was proportional to the plant productivities (that is, the rate that photosynthesis makes organic compounds like glucose) in the areas occupied by the herbivores. On average, buffalo were concentrated in the most productive grasslands, wildebeest next, then zebra, with gazelle inhabiting the areas with the least productive vegetation.

The table below shows the top three species of plant that each of four species of herbivore eat in the **wet season**: wildebeest, zebra, Thomson’s gazelle, and buffalo. It shows the percentage of the diet that each species of plant makes up for the animal. The numbers do not add up to 100%, because not all the plants eaten by the animal are shown. The plant species names are written in the *Genus species* format.

**Table 2.3:** Wet Season Diets of Herbivores

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | Animal Species | | | |
| Plant Species | Wildebeest | Zebra | Thomson’s gazelle | Buffalo |
| *Sporobolus ioclados + S. Kentrophyllus* | 50.8% | ... | 24.8% | ... |
| *Andropogon greenwayi* | 11.8% | 41.7% | ... | ... |
| *Digitaria macroblephara* | 11.8% | 11.4% | 14.3% | ... |
| *Kyllinga nervosa* | ... | 20.7% | 12.4% | ... |
| *Chloris pycnothrix* | ... | 11.4% | ... | ... |
| *Themada triandra* | ... | ... | ... | 44.8% |
| *Eragrostis exasperata* | ... | ... | ... | 17.0% |
| *Hyparrhenia filipendula* | ... | ... | ... | 11.7% |

**READING 4: Seasonal Diet Shifts**

Diets of the migrating herbivores, or grazers, were different in the wet and dry seasons. The migratory herbivores on the Serengeti are the wildebeest, zebra, and gazelle; the African buffaloes are non-migratory animals. During the wet seasons, the grazers’ diets are primarily based on green leaves, but this shifts to a larger proportion of dry leaves mixed in with the green leaves from the same species of plants during the dry seasons (See table 4.1 below). The green leaves are more abundant when water is available to the plants; the green leaves are more nutrient rich than the dry leaves and stems of the same plants.

**Table 4.1**

Percent Green or Dry Leaves in Dry Season Diets

|  |  |  |  |
| --- | --- | --- | --- |
| Animal | Green Leaves % | Dry Leaves % | Other Parts of Plants |
| Buffalo | 72% | 13% | 15% |
| Gazelle | 42% | 47% | 11% |
| Zebra | 66% | 16% | 18% |
| Wildebeest | 58% | 18% | 24% |

Adapted from McNaughton (1985)

The African buffalo, had a similar diet in the wet and dry seasons, although the proportion of two species of tall grasses, *Hyparrhenia filipendula* and *Loudetia kagerensis,* increased substantially during the dry season. Buffalo continued to consume predominantly green leaves during the dry season (72% of diet), but dry leaves rose from a very small amount to 13% of consumption.

**READING 5: Feeding Selectivity**

Feeding selectivity has to do with how picky (selective) organisms are in what they will eat. A more picky eater has a higher level of feeding selectivity. When food is abundant, organisms may be more selective. When it is more scarce, they may be less selective.

Feeding selectivity of the grazers varied seasonally and there was a significant interaction between season and grazing species (Table 5.1). Zebra and buffalo selectivities were quite similar in the two seasons, but gazelles were more selective in the dry season and wildebeests were more selective in the wet season. Selectivity for food sources is related to nutrient availability, ease of access, and other factors that make that plant a better match for the grazer’s needs. The wildebeest pattern was due to selection for two species of *Sporobolus* in their wet season range and little selectivity at all in their dry season range. The gazelle pattern was due to little selection in the wet season and strong selection for green leaves in the dry season, a very rare forage component in their dry season range. Gazelles occupied more locations than the other grazers during the dry season. In these areas the proportion of green leaves was low, but the gazelles were highly selective and maintained a higher proportion of green leaves in their diet than would be expected from the availability of the green leaf food source.

Table 5.1 below shows how selective the herbivore’s diets were in the dry and wet season. Selectivity is determined by comparing the difference between amount of plant biomass in a given area and the amount of that plant in the diet of the given herbivore. These calculations have outputs of between 0 and 1; where numbers close to zero indicate low diet selectivity and numbers close to 1 indicate high selectivity.

Table 5.1. Selectivity of Herbivore Diets

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | Animal Species | | | |
|  | Wildebeest | Zebra | Thomson’s gazelle | Buffalo |
| Dry season | .144 | .315 | .357 | .232 |
| Wet season | .387 | .352 | .248 | .183 |

**READING 6: Primary Productivity and Precipitation**

Primary productivity refers to the rate that photosynthesis turns CO2 from the atmosphere into organic compounds like glucose.

Many ecologists have studied the relationship between primary productivity and precipitation. Generally, primary productivity is higher when there is more precipitation. This is true on the Serengeti as well, but from place to place, there is a lot of variability in precipitation due to intense but localized rain showers. There can be a lot of food available to grazers in places where these showers occur, but hardly any nearby. Grazers on the Serengeti are effective at finding those sites.

Primary productivity varies by season on the Serengeti. Stands of grasses with substantial green biomasses late in the wet season aged rapidly at the onset of the dry season and only 10% of the stands sustained green biomasses through the dry season. The rapid drying out of vegetation at the onset of the dry season results in a sharp decline of food quality at that time.

**Sources of Readings:**

McNaughton, S. J. (1985). Ecology of a grazing system: the Serengeti. *Ecological Monographs*, *53*, 291–320.

Forest Buffalo (*Syncerus caffer nanus*) Fact Sheet, 1999. c1999-2017. San Diego (CA): San Diego Zoo Global; accessed 2017 Jul 10.