

BEHAVIORAL STUDY OF THE RED LECHWE ANTELOPE (*Kobus leche leche*)
ON DOUBLE D RANCH, BASTROP COUNTY, TEXAS

THESIS

Presented to the Graduate Council of
Southwest Texas State University
in Partial Fulfillment of
the Requirements

For the Degree

Master of Science

By

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San Marcos, Texas
December, 1998

DEDICATION

For Sandra, Natalie, Rishel, and Chris

ACKNOWLEDGMENTS

Every accomplishment is the result of a team effort. Each team member is necessary and valuable, and contributes to the successful completion of the task. It is my greatest honor to recognize and thank the members of my team. I would like to thank the coach, God, for the team assembly, His never-ending care, guidance, and blessings. I appreciate and am awestruck by the beautiful world He created.

I would like to thank the team member of longest standing, Sandra R. Walker, my mother and friend. I would be nothing without your sacrifice and love. You are focused, a great motivator and advisor, and an intelligent and clear thinker. Thank you for your contribution.

I would like to thank my sister and friend, Natalie R. Hepler, the second member to join my team. Your belief and confidence in me is invaluable. I appreciate all the times you listened to me, always on my side. Thank you for your contribution.

I would like to thank Rishel C. Walker, my father and friend, and third member to join my team. You brought stability and reliability, and taught me the importance of a good attitude. Thank you for your contribution.

I would like to thank Christopher A. Kuhl, my husband and friend. You were the fourth member to join my team and made it complete. The time and work you put into this accomplishment was beyond what anyone would believe. You are a great advisor,

listener, and companion. You accept and love me as I am. Thank you for your contribution.

It is my team members that make every effort worthwhile and possible. I will be ever grateful to each of you. This accomplishment belongs to all of us! I love you always.

I would also like to thank the owner, Mr. Duncan, and staff of Double D Ranch. I especially want to thank Gary Rose, the ranch biologist, for all his time, information, and advice. Thank you also, Dr. Baccus, my supervising professor, for your time and effort.

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ABSTRACT

BEHAVIORAL STUDY OF THE RED LECHWE ANTELOPE (*Kobus leche leche*)

ON DOUBLE D RANCH, BASTROP COUNTY, TEXAS

by

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December 1998

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A behavioral study on the red lechwe antelope (*Kobus leche leche*) was conducted at Double D Ranch, Bastrop County, Texas between July 1997 and August 1998. Habitat use, as well as the major behaviors, feeding, resting, and mating, of lechwe introduced in Texas were compared to that described for lechwe in Africa. Open grassland is the preferred habitat type for both African and Texas lechwe, but Texas lechwe, having lost fear and survival precautions of native African lechwe, use forest also. Water, used 18% of the time by lechwe, was an important part of their habitat. Lechwe lived in harmony with other exotic ungulates and, for the most part, Texas wildlife. Lechwe adapt well to alternate diets and breed well on game ranches, though fighting between dominant males can be severe.

CHAPTER I

INTRODUCTION

From the mid 1920s to the early 1940s, nonindigenous wildlife species, or exotics, have become increasingly abundant in the United States, especially on Texas ranches. Exotics are species of plants or animals released into countries where they are not native. Exotic ungulates have become so abundant, living and breeding on Texas rangeland, that the term “Texotics” has been used for them. Some successful Asian introductions include the axis deer (*Axis axis*), blackbuck antelope (*Antilope cervicapra*), nilgai antelope (*Boselaphus tragocamelus*), fallow deer (*Dama dama*), and sika deer (*Cervus nippon*). African introductions include the aoudad sheep (*Ammotragus lervia*), eland (*Taurotragus oryx*), greater kudu (*Tragelaphus strepsiceros*), sitatunga (*Tragelaphus spekei*), impala (*Aepyceros melampus*), lechwe (*Kobus leche*), and other antelope. The success of exotics in Texas can be partly attributed to the ecological similarity of Texas rangeland and the animals’ native habitats and predator control by ranchers (Mungall and Sheffield 1994).

The lechwe antelope (*Kobus leche*) of the Central African floodplains consists of three subspecies. These are the red lechwe (*K. leche leche*) of the upper Zambezi and Kafue Rivers and the Okavango Swamp, the black lechwe (*K. l. smithemani*) of the Bangweulu River floodplain of Zambia, and the Kafue lechwe (*K. l. robertsi*) of the

Kafue Flats floodplain in southern Zambia (Schuster 1980). The greatest remaining concentration of lechwe occurs on the Kafue Flats of Zambia. Aerial surveys of both the north and south banks of the Kafue River intersecting the Flats indicated a population of about 94,000 Kafue lechwe in the 1970s (Sayer and Van Lavieren 1975). The red lechwe population is probably smaller but records for red lechwe in Africa are more limited.

Unfortunately, the lechwe population is declining as a result of habitat loss, uncontrolled hunting by local residents, and the construction of two hydroelectric dams on the Kafue River (Nowak and Paradiso 1983).

The Kafue Flats is an area of about 6,475 km² of floodplain grassland. It is approximately 225 km in length and 16-48 km wide (Robinette and Child 1964). The Flats are flooded annually by the Kafue River, a tributary of the Zambezi River, to a depth varying from a few centimeters to 4 m. The water begins rising in November and December with the onset of seasonal rains and peaks from April to June, a month or two after the end of the rainy season. Because of annual flooding, the Flats support a lush cover of grasses and only a few scattered trees. Grasses on the Flats stay green longer during the dry season than grasses on surrounding non-flooded areas (Robinette and Child 1964). Studies of lechwe on the Flats show that populations move back and forth and forage in relation to the rising and falling water level of these annual floods (Schuster 1980). At one time the carrying capacity of the floodplains was among the highest in the world, an estimated 11,000 kg/ km². However, human industrial development in the area threatens to interfere with food production on the Flats. The Kafue Gorge hydroelectric dam and the Iteshi-teshi hydroelectric dam constructed in the 1970s have disturbed the natural fluctuation of water levels and prevented maximum food production. It is also

thought that the construction of dams may disrupt the lek mating system of lechwe (Schuster 1980).

Lechwe are active mainly in the morning and evening like most antelopes (Nowak and Paradiso 1983). Because lechwe are so specialized for flood plain areas, no extensive migrations take place among these antelope, and they rarely graze far from water (Nowak and Paradiso 1983). They can graze in water up to shoulder height and readily take to water when threatened. Movement in water is facilitated by their elongated hooves and high hindquarters, which are about 10% higher than forequarters. Males (about 100 kg) are larger than females (about 70 kg), and only males have horns which are double curved. Red lechwe have black leg stripes which extend into wide shoulder patches against a reddish brown pelage with a white underside (Schuster 1980).

Primarily, lechwe employ a lek mating system (Schuster 1980). A lek is a circumscribed area ranging from 15 to 200 m in diameter and often the same from year to year, in which a few adult males occupy a cluster of small, adjacent territories used solely for mating. Defense of the territory consists mainly of ritualized displays of threats and chases rather than physical contact. Females enter a lek to mate and choose a male for this purpose. The social status of males on a lek is unequal and usually most or all females can be observed in the prime territory of a single male. Only a small percentage of adult males occupy a few scattered leks and of these, only a small percentage do most of the breeding (Schuster 1976). There is some breeding every month of the year, but leks mainly form on the Kafue Flats from November to January in the rainy season. Males are in peak condition about the time water levels are at their lowest. Most births occur from July to September after a gestation period of about eight months (Nowak and Paradiso

1983). Leking has been observed in larger populations where many adult males simultaneously rut rather than in smaller populations such as the 30 to 40 lechwe observed in this study (Buechner 1961, Schuster 1976, 1980).

One of the more recently added Texotics is the African red lechwe (*Kobus leche leche*). There was a population of about 43 in 1984 on Texas ranches, 137 in 1988 (Mungall and Sheffield 1994), and 270 on 25 ranches in 20 counties in 1994 (Traweek 1995). Since their introduction in Texas, little has been learned about how the red lechwe is adapting to its new Texas environment. The purpose of this study was to learn more about habitat use by red lechwe in Texas. Specifically, I wanted to determine a) where and in which habitat types they spend most of their time, b) if changes in behavior have resulted from living in a new habitat, c) which behaviors occupy most of their time, and d) circadian patterns of behaviors. These behaviors were then compared to those described in the literature for lechwe in Africa. Finally, I address why any changes in red lechwe behavior discovered in this study might have occurred.

CHAPTER II

STUDY AREA

The study site was Double D Ranch near Rosanky, Texas in Bastrop County. Double D Ranch is a privately owned 2,025 ha game ranch surrounded by a 3 m high fence to control ingress and egress of animals. The ranch is stocked with native and exotic game animals which include fallow deer, axis deer, sika deer, blackbuck antelope, elk (*Cervus elaphus*), American bison (*Bison bison*), aoudad sheep, eland, and scimitar-horned oryx (*Oryx dammah*). Three larger lakes and three or more smaller ponds provide water for animals. Supplemental feed is provided in the morning on Monday, Wednesday, and Friday and oats (*Avena sativa*) and ryegrass (*Lolium perenne*) and/or wheat (*Triticum aestivum*) are planted in the fields with a “no till” method in winter. Typical woody vegetation for the area includes blackjack oak (*Quercus marilandica*), eastern red cedar (*Juniperus virginiana*), cedar elm (*Ulmus crassifolia*), loblolly pine (*Pinus taeda*), shortleaf pine (*Pinus echinata*), black hickory (*Carya texana*), hackberry (*Celtis laevigata*), greenbriar (*Smilax Bona-nox*), yaupon (*Ilex vomitoria*), and elbowbush (*Forestiera pubescens*). Herbaceous vegetation includes purpletop (*Tridens flavus*), sand lovegrass (*Eragrostis trichodes*), broomsedge bluestem (*Andropogon virginicus*), little bluestem (*Schizachyrium scoparium*), and bermudagrass (*Cynodon dactylon*).

The climate in Bastrop County is moderate. Winters are mild and summers are hot. In winter, daytime temperatures average 18°C and drop to between 4°C and 9°C at night. In summer, the mean temperature is 32°C , and many days reach 38°C. Mean annual precipitation is 91 cm (Shrout, et. al. 1987).

When this study was initiated the red lechwe herd consisted of about 30 individuals (10 males and 20 females/immature). The red lechwe lived primarily in either of two areas, the “front gate” and the “catfish pond”. These two areas are about 2.4 km from each other. Five fields in this area were numbered (Fig. 1). Areas 1, 2, and 3 are fields surrounding a large pond or lake designated the “catfish pond”. Field 4 is located midway between the catfish pond and the front gate and is intersected by an unpaved ranch road. Field 5 is the front gate area and area 6 is any location other than fields 1 through 5. The front gate and the catfish pond were the boundaries of lechwe activity.



Figure 1. Aerial photograph of red lechwe antelope habitat on Double D Ranch, Bastrop County, Texas. Fields most frequented are numbered 1-5.

CHAPTER III

METHODS AND MATERIALS

Data Collection

Monthly observations of approximately 20 hours per month were made for 14 months (July 1997- August 1998). The following were recorded for each visit: time observations began and ended, weather conditions at time of observation, ambient temperature at time of arrival and departure, for longer duration activities such as feeding and resting, time activity began and ended, number of lechwe in the group being observed, and gender of group members.

Observations were conducted throughout the day from dawn to dusk. No nocturnal observations were made. A 20x spotting scope and 7x35 mm binoculars were used in observations. A mobile blind (car) and several stationary blinds (5 m observation towers) to which the lechwe became accustomed were also used.

Data Analysis

Three types of lechwe habitat on Double D Ranch were recognized; open grassland, forest, and bodies of water. All observations were made while lechwe were in the grassland areas or water only. Field and body of water preferences were determined by recording each time a group of lechwe was observed in each of these sites. The

number of sightings in a field or pond were counted and compared to those at other fields/ponds.

To determine the amount of time other ungulate species spent with the lechwe, sightings were counted and compared.

Major lechwe behaviors were categorized as feeding, resting, and grazing. To determine field preference for each of these activities, counts of lechwe observed grazing, resting, or mating in each field were recorded. At the end of the field study, counts for each field and each activity were tallied and compared. Chi-square analysis was used to determine whether resting and mating activities were biased in time of day, morning or evening (Lehner 1996).

Mating activities were divided into six major categories: (1) male chases male, (2) male chases female, (3) male mounts male, (4) male mounts female, (5) males fight with head, and (6) flehmen. "Male chases male" or "male chases female" is when a male lechwe chases or pursues another male or a female lechwe for a short or long distance with no physical contact. "Male mounts male" or "male mounts female" is when a male lechwe raises the front torso onto the rear and back of another male or a female. "Males fight with head" is when two lechwe males touch foreheads and/or horns and proceed to engage one another for a short or long time. "Flehmen" is "lip curl" exhibited by a male when testing a female's urine for estrogen. Each time an observation was made for a category it was recorded and counted. The counts were tallied and compared to determine the percentage of time each mating category comprised.

The time of day and season of greatest mating activity were determined by averaging the number of mating incidences for mornings and afternoons for each month

(since morning and afternoon data for each month were not equal). A chi-square analysis was performed to determine if there was a significant difference in morning and afternoon mating activity. The hypothesis tested was that there was no difference in morning and afternoon mating activities. Because the chi-square analysis revealed there was a significant difference, with more mating activity occurring in the morning than in the afternoon, I calculated an average ratio of morning to afternoon mating activity using mating data for months with both morning and afternoon data. The ratio is the morning sightings per visit divided by the afternoon sightings per visit. Since the number of morning and afternoon visits each month were not the same, the data was normalized to obtain the total expected mating observations for each month. Thus, visits having only morning or afternoon mating data were supplemented with data by dividing (or multiplying) the existing morning (or afternoon) data by the ratio described above. Data for months were combined into seasons; spring: March, April, and May; summer: June, July, and August; fall: September, October, and November; and winter: December, January, and February. A bar graph of season versus frequency was then constructed.

CHAPTER IV

RESULTS AND DISCUSSION

Comparison of Lechwe Habitat in Texas and Africa

The habitat of the red lechwe in Texas is ecologically similar to their native habitat, the Kafue Flats in Africa. For instance, lechwe in both Africa and Texas live on savannahs, a habitat characterized by an interspersed of grasslands with varying densities of trees and/or bushes. The native and Texan habitat types are similar because their climates are similar. The Kafue Flats has a mean annual precipitation of 84 cm, Double D Ranch has a mean annual precipitation of 91 cm, and both have a mean maximum ambient temperature of 26°C and a mean minimum ambient temperature of 15°C. The Kafue Flats and Double D Ranch also share the same three distinct habitat types; open grassland, forest, and bodies of water. The sizes of each habitat type in Africa and Texas however differ, as well as elevation, and flora and fauna.

The Kafue Flats is made up of three topographical regions. The first and largest region (1,065-1,075 m above mean sea level) is the floodplain grasslands (5,568 km²) (Sayer and Van Lavieren 1975). Common grasses include *Oryza barthii*, *Vossia cuspidata*, *Echinochloa stagnina*, *E. pyramidalis*, *Phragmites mauritianus*, *Cyperus papyrus*, *Typha* sp., and *Setaria sphacelata*. The floodplain grasslands are bordered by a zone of seasonally waterlogged but not flooded bushgroup-grasslands, in which the

bushgroups are associated with termite mounds. This area is 3,271 km² and has an elevation of 1,075-1,085 m above mean sea level. Common grasses are *Sporobolus natalensis*, *Paspalum orbiculare*, and *Panicum coloratum*. The common woody plants are *Acacia seyal*, *A. nilotica*, *A. sieberana*, and *Colophospermum mopane*. The third topographical region (1,100-1,150 m above mean sea level) which borders the bushgroup-grassland and termite mounds, is a mixed woodland in which species of *Acacia* and *Combretum* are common (Sayer and Van Lavieren 1975). Double D Ranch has an elevation of 152 m above mean sea level, about 913 m lower than the Kafue Flats. Double D Ranch grassland (1.62 km²) of which the principal species is bermudagrass, is limited in comparison to the forested areas (12.6 km²) of which the principal species are post oak (*Quercus stellata*), blackjack oak, eastern red cedar, yaupon, and American beautyberry (*Callicarpa americana*). About 1,420 ha of Double D's 2,025 ha of total land area are available to the lechwe. One hundred twenty-one hectares are open field, and another 41 ha are cleared for planting oats, ryegrass and wheat in the winter. The remaining and largest part of the ranch is forest. Three large lakes and a few minor ponds available to the lechwe total approximately 46 ha.

Habitat Use

In winter, spring and fall when temperatures were mild, lechwe spent nearly all day in the grassland areas. Lechwe entered and exited the forest several times for brief periods while grazing. Females usually entered and exited the forest or made changes in position first, and males followed. In summer, grasslands were only used in the morning before

temperatures approached 35°C and in the evenings when temperatures fell below 35°C.

Lechwe spent the hottest part of the day in the forest shade.

Unlike red lechwe on Double D Ranch, lechwe in Africa tend to avoid heavy brush cover. Robinette and Child (1964) observed that lechwe forced to move during a period of rising floodwaters chose an open area a few kilometers further away, rather than a heavy brush area immediately to the south. In Africa, lechwe probably seek open areas in proximity to water as an aid in detecting and escaping predators. Many observers have noted lechwe entering water to escape predators. Lechwe are not particularly fast on land and appear to have a poor sense of smell (Robinette and Child 1964). Both shortcomings would place them at a distinct disadvantage in brush cover or tall grass providing concealment to predators or in open grassland away from water. Although lechwe on Double D Ranch, too, preferred to be in the open grassland nearly all day when temperatures were mild, they entered and exited the forest several times during the day for brief periods and remained in the shade of the forest when temperatures were high. Forests were used by the lechwe as shortcuts to access other fielded areas, for resting, for shelter from sun and rain, and for mating activities. Forest use by captive lechwe populations is not uncommon. In a lechwe-rearing experiment by Max Barnett, a captive population, which had never been subjected to harassment and predation (even from humans) and therefore hadn't developed the fears or survival precautions of wild lechwe, did well without large areas of grassland in proximity to open water (Robinette and Child 1964). Captive lechwe that escaped were seen retiring during the day in heavy vegetation cover bordering a nearby stream. Lechwe on Double D Ranch are also protected from predators and experience limited hunting pressure (only five were shot in the two years of

this study). African lechwe probably forgo the luxury of forest use in exchange for better protection from predators afforded by grasslands. Interestingly, lechwe alarmed while in the forest on Double D Ranch exhibited behavior similar to African lechwe and usually ran out into a field for protection.

When away from the cover of forest, lechwe could be located almost without exception in one or more of five grassland areas within 2.4 km of the “front gate” or the “catfish pond” (Fig. 1). These fields have few trees and are bordered by forest. Females were always observed in these fields and only on occasion were males seen some distance from these fields in bachelor groups formed for short periods. Of these five fields, lechwe spent most of their time in field 2 (30%), a large field to the east of the catfish pond, and field 5 (17%) (Fig. 2). Fields 1 (13%) and 3 (12%) were used about equally, and the least used field was field 4 (8%) (Fig. 2).

Field 2 was most likely preferred by the lechwe for the following reasons. Field 2 is the largest field near the largest pond (catfish pond) toward the back of the ranch where there is minimal human disturbance. Human disturbance is further minimized because, being the largest field, it allows the lechwe increased distance from the few ranch roads in the back of the ranch. Field 2 is also large enough for mating activities that require a lot of space for running and chasing. Field 2 has easy access to the smaller minor fields 1, 3, and 4.

The catfish pond was desirable because it is a large pond with shallow areas along the shoreline. Lechwe water activities most often occurred there. Grimsdell and Bell (1972) documented the use of water up to a depth of about 50 cm by lechwe.

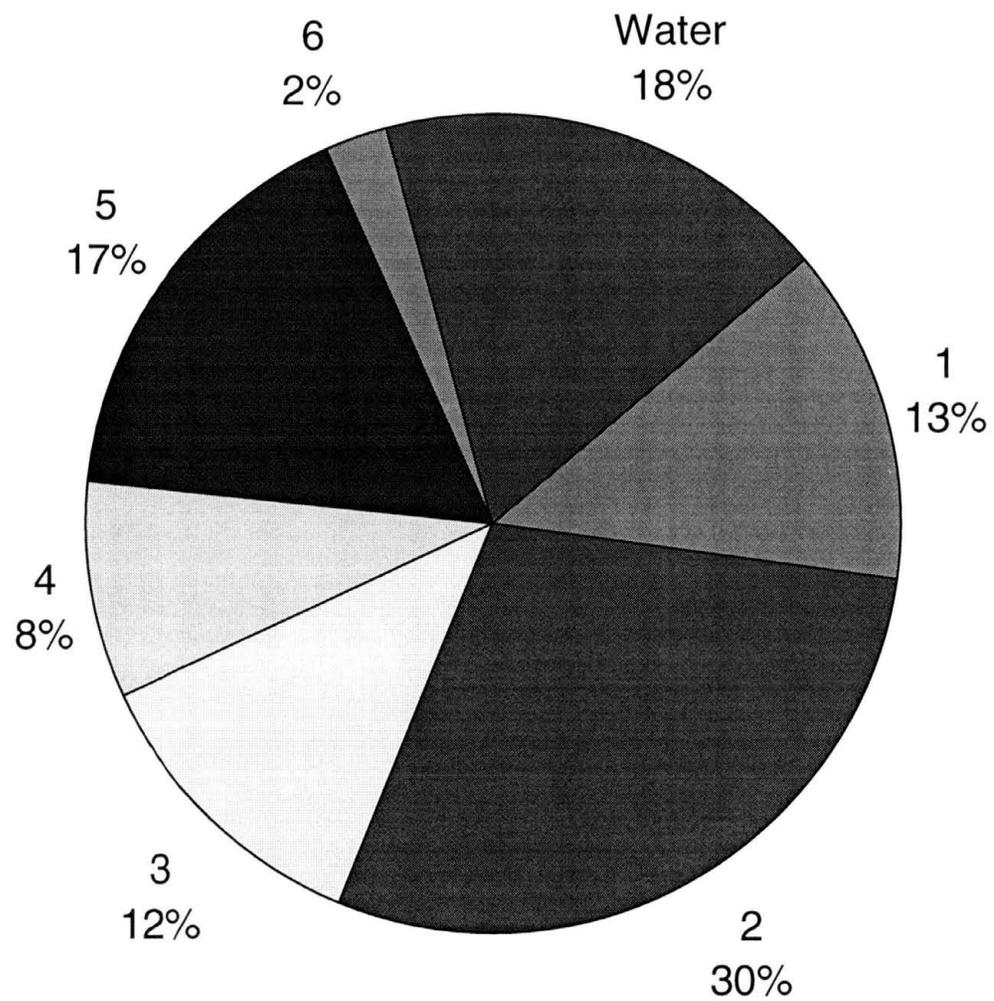


Figure 2. Habitat selection by red lechwe antelope as percent utilization of numbered fields (1 - 6, Fig. 1) and water on Double D Ranch, Bastrop County, Texas.

Lechwe always crossed the catfish pond in single file at the same place near its source stream. They probably had to do the least amount of swimming to cross at this point.

The second most preferred field was field 5. Field 5 was frequented by a maternity group of females and young in late summer and fall and a small “outcast” group of male and female lechwe year around. Male lechwe exhibiting any kind of defect or difference from the other lechwe of the main dominant group (at the catfish pond area) were exiled to field 5 about 2.4 km away from field 2. Some lechwe considered outcasts were a male with “stubby” or blunt-ended horns, a male with crooked horns that were not symmetrical, and a male with a broken horn. Whether females were outcasts and why could not be determined by any visual defects. Field 5 was mostly visited by the dominant group in winter when oats, ryegrass, and/or wheat planted there were easier to access than in the fields near the catfish pond. Field 5 was probably second in preference because it is the least open field with some trees interspersed in it, its ponds were less desirable, it has more fencing, and it is near the front gate and front of the ranch where there is more human disturbance from a dog kennel, storage area, houses, and ranch traffic.

On two occasions only lechwe were observed outside the five fields they frequented. On one occasion a male, who was hurt possibly in a fight with another lechwe male, retreated to another area to recover from his wounds. On another occasion in March 1998, a bachelor group of three to six males was observed several miles away for a few days near the back of the ranch at a point farthest from water. Bachelor groups have been observed in *K. ellipsiprymnus* (Nowak and Paradiso 1983).

A flood plain adapted antelope, lechwe spent much of their time in the ponds and lakes of the ranch (Fig. 2). Activity in the water consisted of much more than just

drinking. Chasing, standing, fighting, nursing, running, swimming, and playing all occurred in the water on some occasion. The catfish pond, surrounded by fields 1, 2, and 3, was used the most. Although lechwe lived successfully without water in Barnett's experiment, lechwe spent 18% of their time in water on Double D Ranch, indicating its importance in lechwe habitat.

Interactions with other animals

Lechwe in both Africa and Texas share their habitat with a variety of other ungulates. On the Kafue Flats, lechwe mainly reside with wildebeest (*Connochaetes taurinus*) and zebra (*Equus burchelli*) but have also been observed with eland, sable antelope (*Hippotragus niger*), roan antelope (*Hippotragus equinus*), puku (*Kobus vardoni*), and cattle (*Bos taurus*). Lechwe on Double D Ranch reside with different species of ungulates. These include axis deer, blackbuck antelope, fallow deer, sika deer, eland, elk, scimitar-horned oryx, aoudad sheep, and bison. Lechwe in both Africa and Texas live in harmony with other ungulates which join them. No territorial behavior towards other species was exhibited by the lechwe or to the lechwe by other species. *K. kob* has been shown to be highly territorial, but this behavior has yet to be firmly documented in *K. leche* (Buechner 1961; Robbel and Child 1975; Nowak and Paradiso 1983). In Africa, *K. leche* do not maintain large, permanent territories probably because of the limited availability and seasonal nature of their habitat (Nowak and Paradiso 1983).

Lechwe were most often observed grazing in close proximity with deer, primarily axis deer, about one-half as often with elk, and least of all with blackbuck antelope (Fig.

3). Lechwe on Double D Ranch were most often observed with axis deer probably because the deer population was one of the largest on the ranch.

Lechwe rarely relied on other ungulates for safety and were mostly indifferent to other ungulates' alarm calls. A yelp from an axis deer might cause them to look up and only in a few cases did the lechwe run if other ungulates were running. Lechwe responded to a perceived danger by running away a short distance and/or making a snorting sound. Males usually became alarmed less quickly than females. Doug Scandrol (personal communication), a professional hunter, reported that lechwe in Africa likewise were not highly alarmable compared to some other ungulate species.

Lechwe on Double D Ranch were observed in direct contact with few native Texas wildlife. Lechwe shared their habitat with various birds like vultures (*Coragyps atratus* and *Cathartes aura*), cattle egrets (*Bubulcus ibis*), crows (*Corvus brachyrhynchos*), and songbirds, but only reacted strongly to the wild turkey (*Meleagris gallopavo*). When a turkey was spotted among the trees by a member of the group it caused immediate alarm and rapid flight. Perhaps there is no ecological equivalent for such a large, confident, ground-walking bird in Africa.

In Africa, lechwe predators include the lion (*Panthera leo*), leopard (*Panthera pardus*), cheetah (*Acinonyx jubatus*), spotted hyaena (*Crocuta crocuta*), wild dog (*Lycan pictus*), and crocodile (*Crocodylus niloticus*) (Grimsdell and Bell 1972). Most hunting is prohibited but poaching by local residents is a problem. Predators such as the coyote (*Canis latrans*) are controlled on Double D Ranch and hunting is limited.

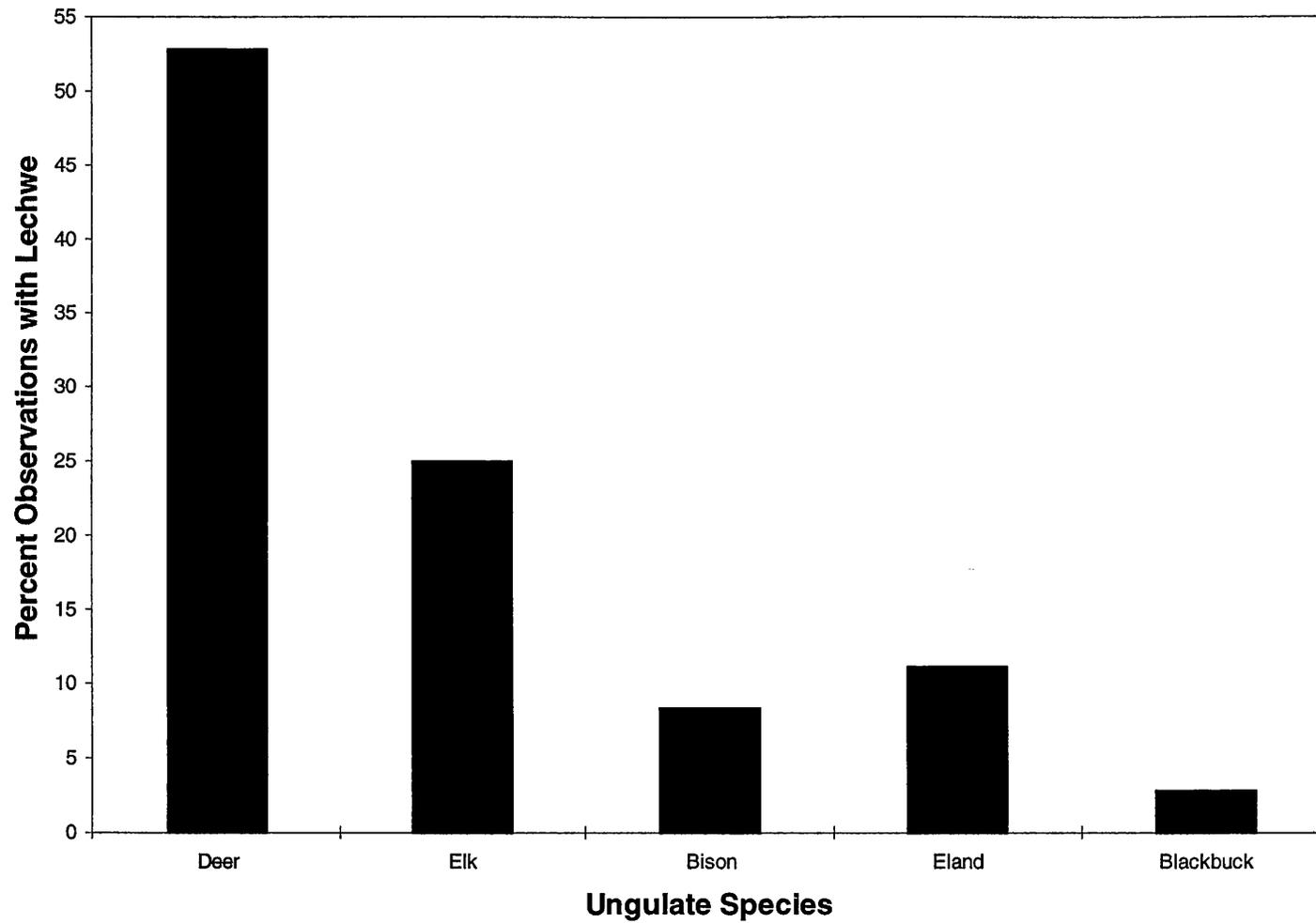


Figure 3. Frequency of observations of other ungulates with red lechwe antelope on Double D Ranch, Bastrop County, Texas.

Feeding

On Double D Ranch lechwe graze primarily in fields with bermudagrass, the predominant grass species. They also receive supplemental feed (18% protein, 3/8 inch diameter pellets) every Monday, Wednesday, and Friday year around. Oats and ryegrass and/or wheat are planted using a no till method in winter.

Lechwe appear to be highly adaptable to variations in diet. The native lechwe diet of *Echinochloa* spp. and other grasses on the Kafue Flats varies considerably from the diet of bermudagrass and supplemental feed on Double D Ranch. Body measurement comparisons between lechwe in Africa and lechwe in Texas showed that Texas lechwe are thriving. Because body measurement records for the red lechwe in Africa are limited, measurements for lechwe in Texas were compared to the more readily available measurements of Kafue lechwe in Africa. The Kafue lechwe is generally considered to be slightly larger than the red lechwe; yet, weights for four red lechwe males shot on Double D Ranch exceeded those of the Kafue lechwe in Africa. The average weight of red lechwe on Double D Ranch was 133 kg; whereas, that reported for the Kafue lechwe was 103 kg (Robinette and Child 1964). Doug Scandrol (personal communication) indicated that Kafue lechwe he had shot were rarely over 91 kg. The horn length averaged 61 cm for red lechwe on Double D Ranch and 71 cm for the Kafue lechwe in Africa. Doug Scandrol (personal communication) reported horn lengths of about 76-84 cm for the Kafue lechwe and 58-66 cm for the black and red lechwe which are about the same size. Average total body length for the red lechwe on Double D Ranch was 229 cm; whereas, total length for Kafue lechwe in Africa was 196 cm (Robinette and Child 1964). Past experiments

showed that red lechwe can adapt to other alternate diets. In Barnett's study, captive lechwe lived successfully on a diet of napier grass (*Pennisetum purpureum*), *Loudetia superba* and *Digitaria* sp. supplemented with cattle concentrates (Robinette and Child 1964).

Feeding behavior was the predominant behavior of lechwe observed in the five preferred fields on the ranch. In winter, spring, and fall, lechwe remained and fed in the fields nearly all day. In the summer, when temperatures reached approximately 35°C or higher, the lechwe retreated to the shade of the woods. They grazed in fields in the morning before temperatures reached about 35°C, and in the evening when temperatures fell below 35°C. Lechwe were observed grazing 45% of the time in field 2, the large field to the east of the catfish pond, and 25% of the time in field 5 near the front gate (Fig. 4). They grazed the least amount of time in field 4.

Because the dominant plant species composition was the same in all five fields they frequented, their affinity for field 2 can be attributed to the lechwe's preference for the habitat elements (mentioned previously in section "Habitat Use", paragraph 4), rather than the forage in field 2. In winter, lechwe were more mobile in their search for food.

Resting

Lechwe rest consisted of lying down in the grass with head up, sometimes chewing their cud with eyes open or closed, and/or lechwe lying down in the grass with head laying on the ground with eyes open or closed. Doug Scandrol (personal communication) also reported seeing lechwe in Africa lying down with their heads on the ground and eyes closed. Such relaxed behavior by a prey species is probably the result of being relatively

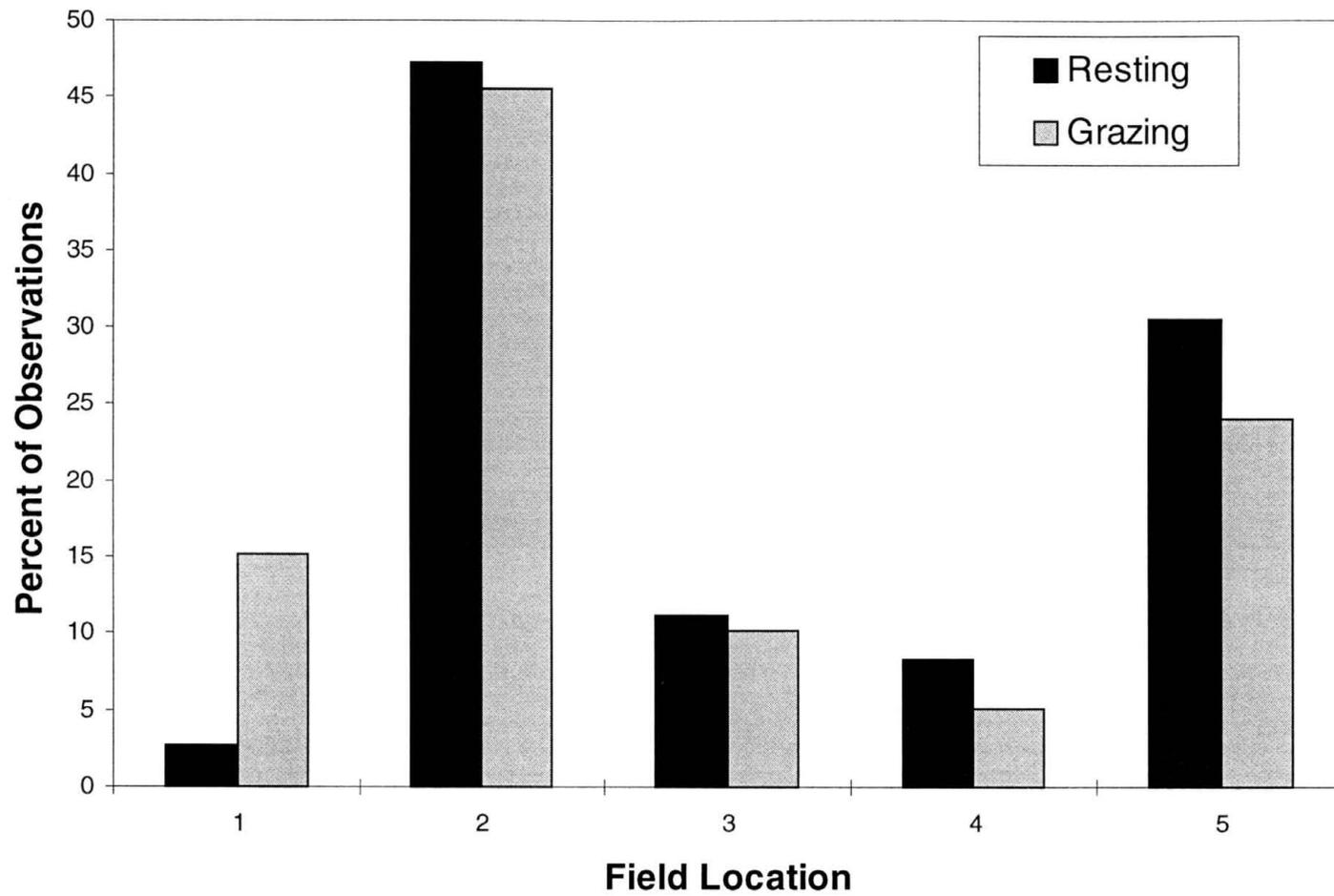


Figure 4. Frequency of red lechwe antelope grazing and resting activities observed in fields on Double D Ranch, Bastrop County, Texas.

undisturbed by predators and humans in both Africa and Texas. Most lechwe populations in Africa have lived on privately owned ranches (now national parks) and have been protected from hunting and predators for decades (Schuster 1980).

Generally, lechwe rested in groups rather than alone. Occasionally a solitary male was seen resting, but this was rare. Usually about half of a group rested, facing the same direction, while the other half grazed, though sometimes the whole group rested. Although lechwe were observed resting in the forest, data reported here have been tabulated for rest occurring in fields only. Lechwe were easily alarmed in the forest and deep forest observations were difficult to obtain. Lechwe rested mostly in field 2, which corresponded with their grazing preference (Fig. 4).

Lechwe were seen resting in the forest, at its edge, several times. Lechwe which are mostly undisturbed, such as those on Double D Ranch and in the Barnett study (mentioned above), may lose their fears and survival precautions and rest under the cover of forest where they are more vulnerable (Robinette and Child 1964).

Lechwe spent a considerable part of their day resting. The number of times per observation period ($\bar{X} = 4$ hours) lechwe were observed resting ranged from zero to three times and the average length of a resting period (when at least one lechwe was at rest) was 1 hour. The average number of times lechwe rested per observation period was one. There was no significant difference between length of resting in the morning versus length of resting in the afternoon ($\chi^2 = .002$, 1 d.f., $p > .05$).

Mating

In addition to feeding and resting, lechwe on Double D Ranch spend a considerable amount of time in mating behavior. A comparison of the number of sightings for each mating category is shown in Fig. 5. Predictably, the majority of lechwe mating behavior is characterized by ritualized displays, not actual copulation (10%). These ritualistic displays were predominantly males chasing males, males mounting other males, and males exhibiting head to head contact. A closer look at only male to male interactions shows that the display most often performed, especially by younger and subordinate males, was the mounting of one male by another male (41%). This mounting between males has been termed a dominance display by Walther (1984). Dominance displays indicate a claim of superiority over the addressee but without fighting intentions. Of further interest is that of the total male to male interactions observed, head to head fighting between males occurred more often (34% of the time) than males chasing other males (25%). In Kafue lechwe of Africa, however, Schuster (1976) observed that during lekking, defense of a territory against neighboring males was highly ritualized and (for all recorded male to male interactions) threats and chases were far more frequent (76%) than physical contact (22%). There was no mention of males mounting males. Also, most of the head to head fights Schuster observed were not serious. The difference in these numbers could stem from the fact that full scale lekking, as described in the literature, did not occur in the lechwe on Double D Ranch. In only one instance was possible lek behavior observed on Double D Ranch. In this instance in June 1998, a large dominant male defended an area around one, possibly two females from six other mature and immature males. When one

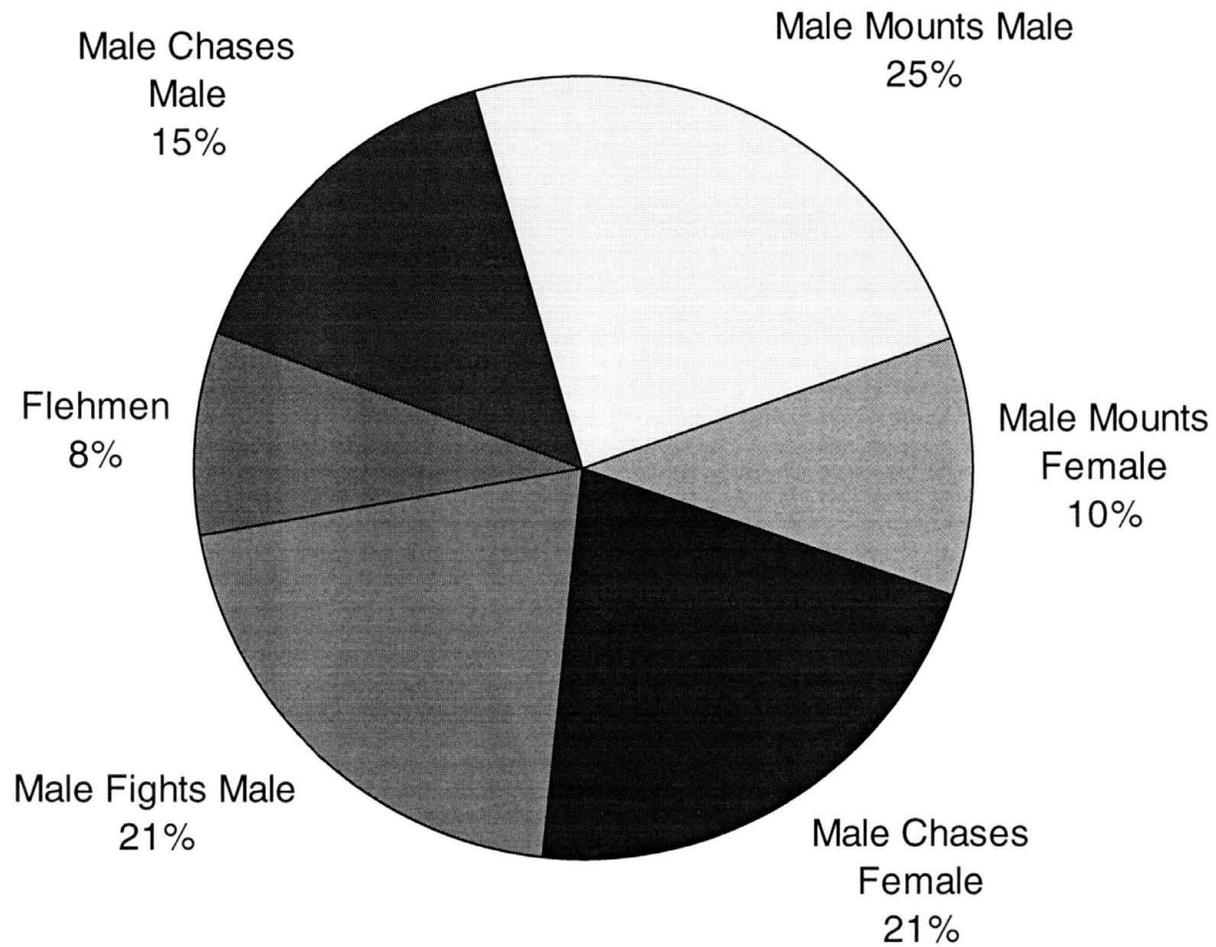


Figure 5. Comparison of percent observations of common mating activities of red lechwe antelope on Double D Ranch, Bastrop County, Texas.

of the six rival males came within about 15 m, the dominant male aggressively chased the challenger away, kicking up dust as they went. This created a frenzy of chasing and head to head fighting between the other six males. When the dominant male chased the rival away he returned to the female and attempted to mount her several times. This behavior lasted for about 1 hour.

Several studies indicate that leks do not form in small populations such as on Double D Ranch (Buechner 1961, Schuster 1976, 1980). This then is consistent with the predictions of ethologists that more intense competition selects for increasingly ritualized forms of interaction, substituting threats for fighting (Schuster 1980). Waterbuck (*K. ellipsiprymnus*) has a continuous distribution from south of the Sahara to southern Africa and fight less than lechwe which are restricted to a few isolated floodplains. Injuries and scars, however, are more common in waterbuck (Schuster 1980). The Uganda Kob (*K. kob*), too, distributed in savannahs from Senegal to western Kenya, often has serious fights in the defense of a permanent territory (Buechner 1961). On Double D Ranch a serious fight occurred January, 1998 in the forest near the front gate and involved a large dominant male and an outcast male with asymmetrical horns. This fight resembled Schuster's (1976) description of serious fights he observed. These fights were notable for their little or no preliminary ritual and for their lengthy periods of continuous contact (about 20 minutes on Double D Ranch). The combatants rushed into combat from some distance apart, the heads lowering immediately and the horns clashing violently. The horns were first tested against each other in vertical position with rapid thrusts. Then the horns were interlocked in horizontal position for extended periods and the fight consisted mostly of pushing and shoving, the combatants twisting and turning until sometimes their

bodies were parallel or one animal was forced to the ground. Such fights consisted of a single encounter, with the loser abruptly breaking contact and running off a long distance and the victor pursuing and then displaying. Although only one serious fight was observed on Double D Ranch, severe injuries observed in several bulls probably indicate a higher occurrence. More serious fighting between males would probably have occurred too, had there not been a ranch management plan limiting the number of dominant males, and therefore, death and loss of money from serious fighting.

Although the serious fight observed on Double D Ranch occurred in the woods surrounding field 5, the larger field 2 was preferred for mating activity (Fig.6). A very low incidence of mating was observed in the other pastures (26%). Running, chasing, fighting, and mounting activities used the full area of field 2 and sometimes even the catfish pond.

Most females especially “nursery herds” with young, formed in early summer, were absent from the area during this time and located to field 5. Perhaps field 5 was used as a refuge from the mating activities of the dominant male group at field 2. Nursery herds have been documented in African lechwe (Schuster 1980) as well.

On Double D Ranch, mating activities were observed throughout the day; however, mating occurrences were more prevalent in the morning ($\chi^2 = 6.65$, 1 d.f., $p \leq .05$). Mating activities and therefore births occur year around. Mating activity was lowest in the spring and summer (about 15% of the total mating activity observed occurred in each), increased in fall (about 30%), and was highest in winter (about 45%) (Fig. 7). Peak mating behavior occurs in December and January, Africa’s summer, for Kafue lechwe on the Flats (Schuster 1976). Although peak mating activity occurs in warmer temperatures in Africa and cooler temperatures in Texas, it occurs in the rainy season of both. The

lechwe gestation period is estimated to be seven or eight months long and young lechwe were observed nursing and playing in late summer and early fall in August and September.

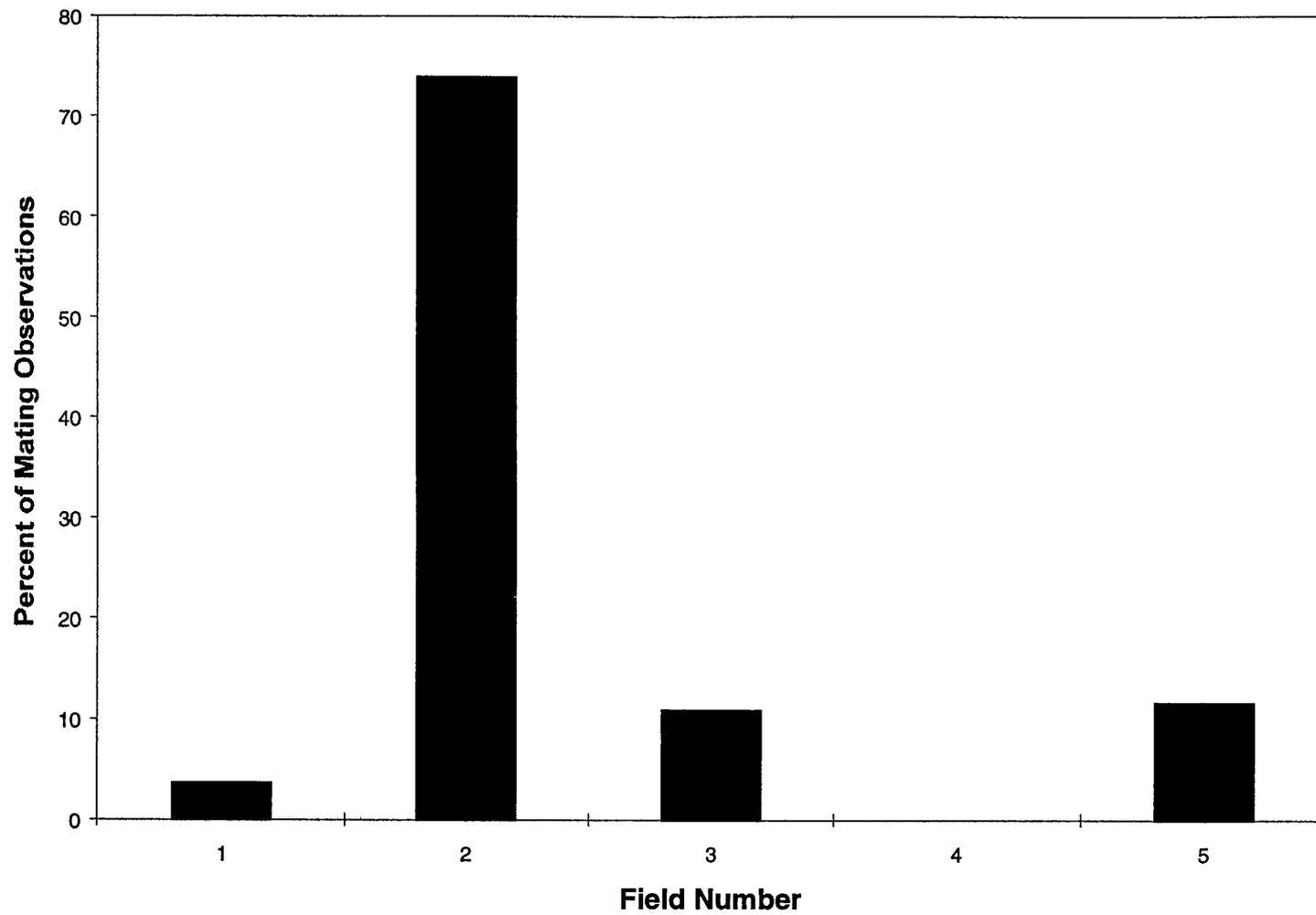


Figure 6. Frequency of mating activity of the red lechwe antelope in fields on Double D Ranch, Bastrop County, Texas.

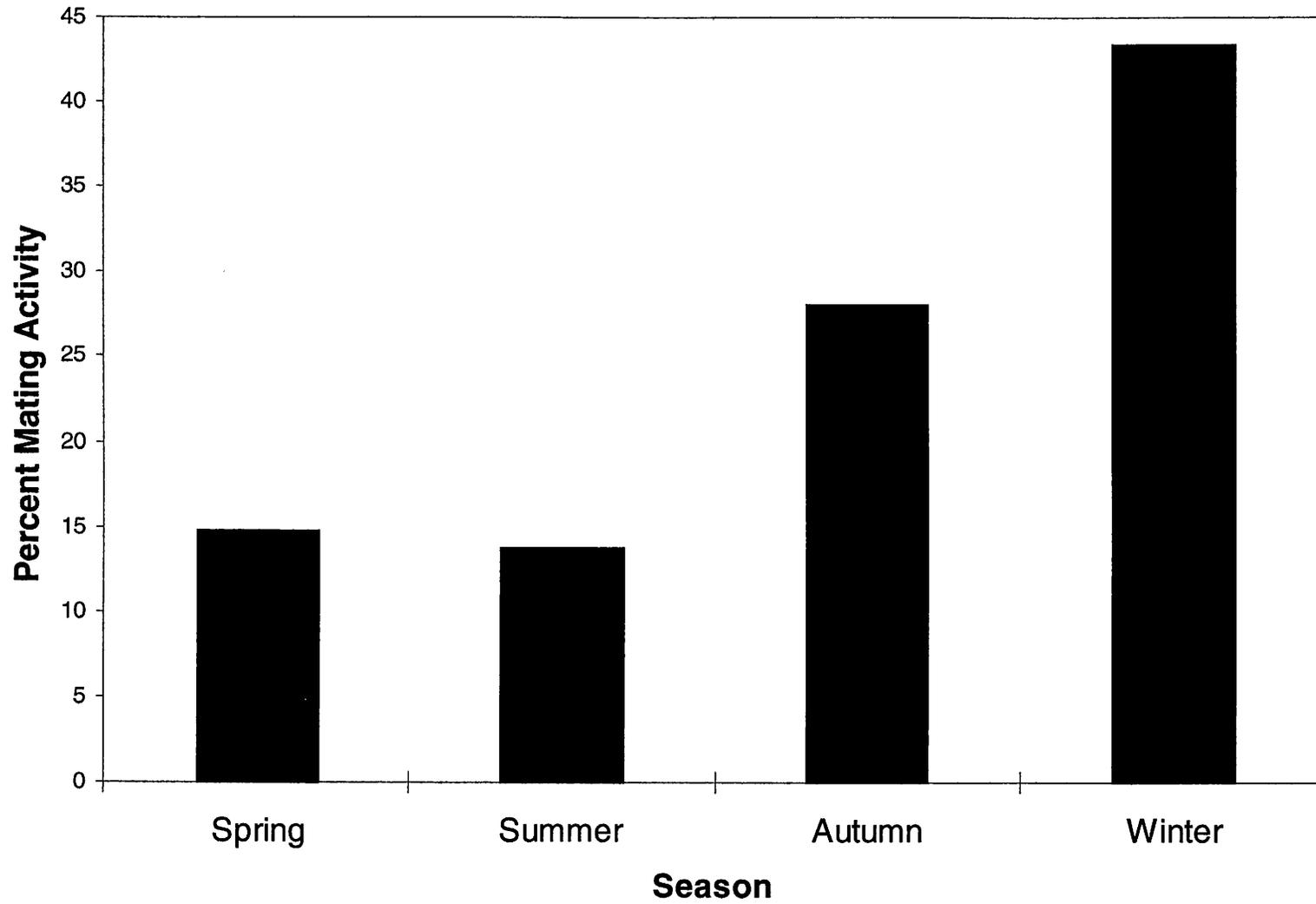


Figure 7. Frequency of red lechwe antelope mating activity per season on Double D Ranch, Bastrop County, Texas.

CHAPTER V

CONCLUSION

The habitat of the red lechwe in Texas is ecologically similar to their native habitat, the Kafue Flats, in Africa. All parts of their Texas habitat (open grassland, forest, and water) are important and used by the lechwe. Open grassland is the preferred habitat type for both African and Texas lechwe, but Texas lechwe, having possibly lost fear and survival precautions of native African lechwe, use the forest also. Of the fields lechwe most often frequented, the largest field (2) beside a large pond was preferred for major activities, feeding, resting, and mating. Field 5, however, was important as a suitable area for the formation of social “outcast” groups and nursery herds.

From a game-ranch management standpoint, lechwe are ideal because they live in harmony with other ungulates and for the most part Texas wildlife. They are content in relatively small areas of grassland in close proximity to water and adapt well to alternate diets. Lechwe breed well in captivity but fighting between dominant males can be severe. Managed correctly, red lechwe can be a successful, interesting, and profitable addition to Texas ranches.

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