

Ozotoceros bezoarticus. By John E. Jackson

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Ozotoceros Ameghino 1891

Ozotoceros Ameghino, 1891:243. Type species *Blastocerus campestris* Gray, 1850:237 (not *Cervus campestris* Cuvier) = *Cervus bezoarticus* Linnaeus, 1758:67.

Ozotoceras Palmer, 1904:492. Lapsus for *Ozotoceros* Ameghino. *Ozelaphus* Knottnerus-Meyer, 1907:98. Type species *Blastocerus campestris* Gray, 1850:237 by designation.

CONTENT AND CONTEXT. Order Artiodactyla, Suborder Ruminantia, Infraorder Cervoidea, Family Cervidae, Subfamily Odocoileinae (Simpson, 1945). The genus *Ozotoceros* has one extant species.

***Ozotoceros bezoarticus* (Linnaeus, 1758)**
Pampas Deer

Cervus bezoarticus Linnaeus, 1758:67. Type locality South America, restricted to Pernambuco, Brazil by Thomas, 1911:151.

Cervus cuguapara Kerr, 1792:303. Renaming of *C. bezoarticus*.

Cervus leucogaster Goldfuss, 1817:1127. Type locality Paraguay; restricted to Asunción by Cabrera 1943:31.

Cervus azarae Weigmann, 1833:954. Type locality Paraguay; *nomen nudum*.

Cervus comosus Wagner, 1844:368. Type locality probably Pernambuco, Brazil.

Cervus pampaeus Bravard, 1857:10. Type locality Paraná, Argentina (a fossil).

Blastocerus sylvestris Gray, 1873:427. Type locality Brazil.

CONTEXT AND CONTENT. Context noted in generic account above. Three subspecies were recognized by Cabrera (1943) on the basis of coat color and length of the mandibular toothrow. The systematic status of Uruguayan specimens is undefined (Cabrera, 1943; Ximenez et al., 1972):

O. b. bezoarticus (Linnaeus, 1758), see above (*cuguapara* Kerr, *comosus* Wagner and probably *sylvestris* Gray are synonyms).

O. b. leucogaster (Goldfuss, 1817), see above (*azarae* Wiegmann is a synonym).

O. b. celer Cabrera, 1943. Type locality Campos del Tuyú, General Lavalle, Buenos Aires Province, Argentina.

The true systematic status of this species is poorly understood and controversial at all levels, and a thorough revision is needed (Bianchini and Delupi, 1979; Cabrera, 1941, 1943; Hershkovitz, 1958a; Ximenez et al., 1972). Some authors regard the pampas deer as a species of *Odocoileus* (Bianchini and Delupi, 1979; Ximenez et al., 1972).

DIAGNOSIS. *Ozotoceros bezoarticus* is distinguished by well-developed hind interdigital glands (Langguth and Jackson, 1980), the exudate of which gives the pungent, persistent, onionlike smell characteristic of the species (Darwin, 1860). Two distinctive hair whorls are present: one toward the base of the neck and one between the shoulders and the middle of the back, with the hair on the withers directed forward (Lydekker, 1898; Whitehead, 1972). The exact position of the whorls differs among individuals.

GENERAL CHARACTERS. *Ozotoceros bezoarticus* is a medium-sized, elegant, lightly built cervid (Fig. 1). No good data for a series of weights or body measurements have been published. Nowak and Paradiso (1983) gave head and body length as 1,100 to 1,300 mm, tail length 100 to 150 mm, shoulder height 700 to 750 mm, and weight 30 to 40 kg. My summary of museum data indicates a body length of 1,100 to 1,400 mm ($n = 13$) and mean cranial dimensions (in mm) for adults of all subspecies combined were: condylobasal length males, 216.5 ($n = 35$) and females, 210.3

($n = 14$); basilar length males, 201.5 ($n = 45$) and females, 196.5 ($n = 14$). Males were slightly larger but there is no marked sexual dimorphism in size, weight, or pelage. Shoulder height was given by Whitehead (1972) as 69 cm. Cabrera (1943) suggested a latitudinal size gradient with northern animals larger.

The color of the short, smooth coat varies geographically according to subspecies, from a pale red-brown (*bezoarticus*) through tawny-brown (*leucogaster*) to bay (*celer*). The face is sometimes darker, as is the crown and tail, but not universally so (Cabrera, 1943; Lydekker, 1898). Coat color is more intense on the back than toward the extremities. Whitish or cream-colored areas occur as tarsal tufts, spots over pedicel sites in females, around each eye, inside the ears, the lips, throat, chest, underparts, front and inner sides of the thighs, inner parts of the buttocks, and underside of the tail. White, or albinistic, specimens have been reported (Whitehead, 1972). No distinct seasonal change in coat color is documented. The muzzle is rather pointed and the tail somewhat bushy.

Only males have antlers, typically consisting of three tines: a lower or front prong of the main fork and the upper or posterior prong divided (Fig. 1). Examples of animals with up to 20 accessory points are known (Goeldi, 1902).

DISTRIBUTION. The pampas deer once lived throughout the natural grasslands of eastern South America situated between latitudes 5° and 40° S (Fig. 2). The natural range of *O. b. bezoarticus* includes eastern and central Brazil south of Amazonia between the plateau of Matto Grosso and the Upper Rio San Francisco, thence southwards to the State of Rio Grande do Sul and Uruguay (Jungius, 1976). Although numbers have declined, the overall distribution pattern has changed only slightly in the north but major reductions in range have occurred elsewhere. Formerly widespread and abundant in Uruguay, the species currently is reduced to about 1,000 head in nine isolated sites (Jackson et al., 1980).

The original range of *O. b. leucogaster* comprised southwestern Brazil (southern Matto Grosso), southeastern Bolivia, Paraguay, and northern Argentina (northern Santiago del Estero, Santa Fé, Formosa, and Corrientes) but not east of the Río Uruguay. Population



FIG. 1. Adult male pampas deer (*Ozotoceros bezoarticus celer*) in central San Luis Province, Argentina.

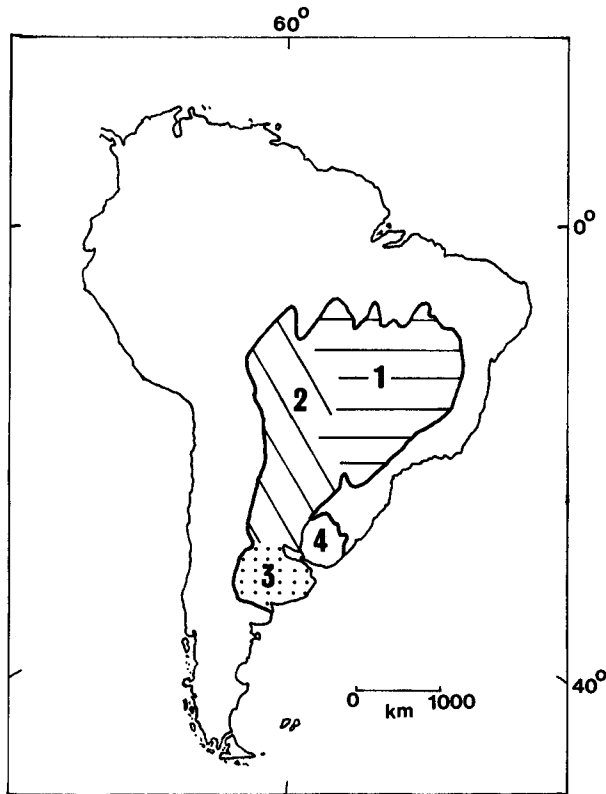


FIG. 2. Geographical distribution of *Ozotoceros bezoarticus*. Subspecies are: 1, *O. b. bezoarticus*; 2, *O. b. leucogaster*; 3, *O. b. celer*; 4, Uruguayan population of undetermined subspecific status (adapted from Jungius, 1976).

densities are low and declining (Jungius, 1976; Thornback and Jenkins, 1982).

The ancestral range of *O. b. celer* embraced the entire Argentinian Pampas from the Atlantic coast almost to the Andean foothills and southward to the Río Negro (Cabrera, 1943). Current distribution is limited to the coastal margin of the Bahía Samborombón, Buenos Aires Province, and 1,000 km westward in central San Luis (Jackson, 1978; Jackson and Langguth, in press). The subspecies is recognized as endangered and is one of the rarest cervids (Holloway, 1975) with total wild stock about 400 head (Jackson and Langguth, in press).

FOSSIL RECORD. Fossils are found frequently in local Quaternary deposits. Bravard (1857) named these *Cervus pampaeus* but Cabrera (1943) considered them synonymous with the modern species. This ungulate occurred in South America since the Pleistocene (Simpson, 1945).

FORM AND FUNCTION. The hair on the flanks is approximately 2.5 cm long, slightly longer on the back, inside the ears, bordering the genitalia, on the thighs, and on the tail. The undercoat is sparse; it is more abundant in southern specimens than those from the north (Cabrera, 1943).

Well-developed preorbital scent glands are present. The forehead may play a role in scent communication. Vestibular nasal glands consist of a pair of flattened oval sacs, underlying a white smudge on either side of the nose, and opening by way of a short duct onto the rim of the nostril (Langguth and Jackson, 1980).

Metatarsal glands may or may not be present. They were not detected by Miller (1930), Langguth and Jackson (1980), or MacDonagh (1940). However, Hershkovitz (1958b) noted a glandular area sometimes defined but tufts were not developed in 19 skins he examined. In 26 *O. b. celer*, 14 had metatarsal glands (Bianchini and Delupi, 1979).

The antler cycle is largely synchronized; old racks are shed in midwinter, and regrowth starts immediately. The new antlers are fully developed and cleaned of velvet by early summer. Captive specimens from Paraguay in the West Berlin Zoo had no fixed rutting season yet demonstrated an annual antler cycle, with antlers

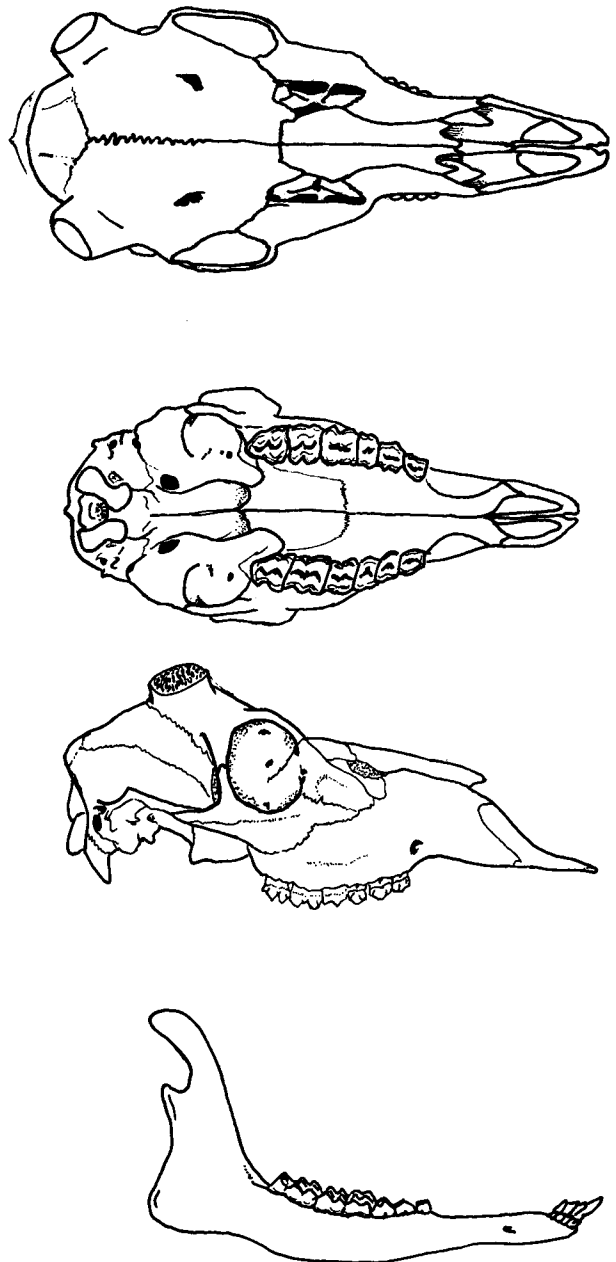


FIG. 3. Dorsal, ventral, and lateral views of cranium, and lateral view of lower jaw of *Ozotoceros bezoarticus celer* (adult male, central San Luis Province, Argentina).

cast in winter (Frädrieh, 1981a). For unidentified populations, Cabrera and Yepes (1960) and Whitehead (1972) stated that antlers were dropped in May (southern autumn) although some males kept their racks a month or two longer. In *O. b. celer*, 85% of adults were in hard antler between January and July; from August to November (southern winter and spring), 70% of bucks were in velvet (Jackson, 1986; Jackson and Langguth, in press). Redford (in press) noted the first *O. b. bezoarticus* in velvet in Las Emas, Brazil, in early July; in 34 males observed in September, 15 were in velvet and 19 in polished rack. Male fawns grow small antlers or "buttons" during their first year (Jackson and Langguth, in press).

Comprehensive anatomical descriptions of whole animals are lacking, however, illustrations of the skull are included herein (Fig. 3).

The dental formula is $i\ 0/3, c\ 0/1, p\ 3/3, m\ 3/3$, total 32. Eruption and wear patterns have not been documented. Permanent upper canines occasionally are present but this is not a general phenomenon. Lydekker (1898) stated that canines usually were present in males; Cabrera (1943) disagreed. Deciduous upper canines

were detected in 78% of young *O. b. celer* (Bianchini and Delupi, 1979). One (6.7%) of 15 adult male skulls that I obtained in San Luis, Argentina, had a permanent canine in both maxillae; the remainder showed neither accessory teeth nor their alveoli.

In 15 transferrin phenogroups found in pampas deer, nine were the same as in *Odocoileus virginianus* (Quinteros et al., 1971).

ONTOGENY AND REPRODUCTION. Wild *Ozotoceros* virtually always bear a single fawn. Redford (in press) reported one female in Las Emas with two similar-sized young at heel but did not rule out possible adoption. Twins are rare in captivity (Frädrieh, 1981a).

According to Lydekker (1898) and Cahalane (1939), coat color in neonates is lighter than in adults but this is not so at least in *O. b. celer*. Pelage of newborn is chestnut with a row of white spots on each side of the back and a second line from the shoulders to the thighs. The spots disappear by about 2 months of age, leaving a russet juvenile coat; fawns of this age have the same markings as adults.

Gestation is slightly more than 7 months. Females are capable of giving birth at 10-month intervals (range 252 to 406 days). Pregnant females can be distinguished visibly about 3 months before parturition and the udder is evident 1 to 2 weeks before birth (Frädrieh, 1981a). Whitehead (1972) reported that most fawns were born from September to November although births have been recorded in almost all months. In *O. b. celer* (Jackson and Langguth, in press), fawns may be dropped all year, but the peak is in the southern spring; 90.5% of births were recorded from August to April. In Uruguay, births are synchronized in spring (Jackson et al., 1980). Darwin (1860) noted that in October many females in Argentina and Uruguay had newly born young. In Las Emas, Brazil, no small fawns were observed from May to August, although two were seen in April (Redford, in press).

In the West Berlin Zoo, first discernible sexual behavior in males occurs when they are about 1 year of age; adult males are capable of mating year-round. Sexual maturity in captive females may occur at 12 months (Frädrieh, 1981a).

ECOLOGY. Pampas deer occupy or formerly occupied a wide variety of open lowland, grassland habitats throughout eastern South America; man has altered or destroyed many of these. Sites where deer still survive range from those temporarily inundated by fresh or estuarine water such as Los Ajos, Uruguay, or the Bahia Samborombón, Argentina, to those with marked winter droughts and no natural, permanent surface water such as central San Luis, Argentina, and Las Emas National Park, Brazil. This deer tolerates a wide range of climatic conditions; daily and seasonal thermal amplitudes may be extreme as for instance in San Luis with absolute winter minima of -15°C and summer shade maxima of 42°C .

The exact diet is unknown. My observations in Argentina and Uruguay indicated pampas deer to select new green growth although shrubs and forbs also are browsed and seed-heads of grasses consumed.

Former larger predators of pampas deer were the puma (*Felis concolor*) and jaguar (*F. onca*). Both are now reduced in number or locally extinct but account for some deer mortality. Feral dogs were common in the Pampas until the late 19th century. Foxes (*Duscyon* sp.), smaller cats (*Felis* sp.), and wild pigs (*Sus scrofa*) reportedly kill newly born, weak, or poorly attended fawns, but the real impact of predation on numbers is unknown (Jackson, 1978; Jackson and Langguth, in press).

Diseases, especially that caused by foot and mouth virus, commonly were blamed for heavy mortality in cervids in the past, but documented scientific evidence is lacking. Bianchini and Perez (1972a) noted that *O. b. celer* recovered from but were weakened by the effects of this virus. Unpublished necropsy reports of this subspecies in semicaptivity indicated deaths from clostridiosis and heavy burdens of intestinal parasites.

The apparently host-specific ked *Lipoptena (Lipoptnella) guimaraesi* was described as a new species from pampas deer in Matto Grosso and Goyaz States, Brazil (Bequaert, 1957), and A. Langguth and I found it on animals in Salto Department, Uruguay.

Competition for food and space with domestic livestock, especially sheep, and with the introduced European hare (*Lepus capensis*), probably exercised an additional negative effect on *Ozotoceros* (Jackson, 1978; Jackson et al., 1980). Bianchini and Perez (1972b) believed that livestock displaced the native deer into sub-

marginal habitats; Jackson (1985) disagreed, and concluded that competition by exclusion probably was not a contributing factor in the decline of this cervid.

Accidents include entanglement in fences and drowning in water tanks and during floods. Periodic droughts cause heavy losses of cattle and sheep, and probably kill deer, too. Despite legal protection, poaching for trophies still takes a considerable toll of remaining populations.

In the past, the pampas deer was hunted commercially for skins for exportation and stomach stones (bezoars) for pseudomedical use. Daguerre (1970) calculated that the Argentinian trade in pelts of this species from 1860 to 1870 exceeded 2 million; official statistics for 1880 indicate that 61,401 skins of pampas deer were shipped from the port of Buenos Aires. Commercial exploitation also occurred in Brazil (Goeldi, 1902). Deer also were hunted locally for food, sport, skins, and stomach stones, and were persecuted as a competitor with livestock (Jackson, 1978; Jackson et al., 1980).

BEHAVIOR. Comfort movements include stretching, shaking, scratching, yawning, grooming with the tongue, sunbathing, urinating, and defecating (Jackson, 1985).

When undisturbed during clement weather, deer lay on open feeding grounds to ruminate and rest. Under adverse conditions, regular sheltered bedding sites are used and vegetation becomes compacted through constant usage to create well-marked beds (Bianchini and Perez, 1972a; Jackson, 1985). Deer often scrape bedding places before lying down; they defecate there on rising (Frädrieh, 1981a; Jackson, 1985).

Reactions to disturbance include staring, peering, standing alert, footstamping and snorting, tilting, and tail raising (Jackson, 1985). Urination and defecation also occur. Deer flee with either a characteristic stiff-legged mechanical run or bound off, with the tail curled over the back to reveal the white underside and anal region. On fleeing, they often give a sharp whistle. To avoid detection, deer also freeze if in cover, lie on the ground, or crawl or slink away (Jackson, 1985).

Aggressive postures include glaring, a head-low threat and chase, striking with the forefoot, biting, barging and flailing, and antler-present threats; submissive acts include looking-away, exposing the neck, commencing self-grooming, mock grazing, or fleeing with the ears back, head lowered, and tail tucked under (Frädrieh, 1981a; Jackson, 1985). Frädrieh (1981a) also noted submissive subadults of both sexes, and adult does, to suddenly lie down, stretch out the neck and head, and repeatedly place the neck on the ground.

During rut, males with polished antlers thrash low branches, grass tussocks, and small shrubs, and rub antler bases, foreheads, and possibly suborbital glands on plants or other objects. More frenzied exhibitions are characterized by scraping the ground with the forefoot, accompanied by urinating and tail curling (Frädrieh, 1981a; Jackson, 1985). Sparring is common between males of different sizes; fighting is frequent between equal males (Jackson, 1985).

Males may approach urinating females, sniff and lick them under the tail, then may lick the wetted earth, too. During courtship, the male follows the estrus female at a slight trot, with his neck slightly lowered and head outstretched, whilst sniffing and tongue flicking. Males demonstrate "fehmen." They may urinate whilst following receptive females, and emit a low, squeaking noise (Frädrieh, 1981a).

No evidence for territorial reproductive behavior, or pair or harem formation was seen in wild *O. b. celer*; several males may harry a receptive female simultaneously (Jackson, 1985).

Pampas deer show a nose-sniffing or touching behavioral sequence often followed by mutual grooming (Jackson, 1985; Langguth and Jackson, 1980).

Play consists of running and chasing in fawns and adults (Frädrieh, 1981a; Jackson, 1985).

Full-term pregnant females, and those with neonates, become secretive, usually separating from other deer. Females physically defend their small young; defensive gestures toward conspecifics, potential predators, and man include foot stamping, snorting, feigning injury, and butting (Bianchini and Perez, 1972b; Frädrieh, 1981a; Jackson, 1985).

Young fawns remain apart from conspecifics. Mothers never approach hidden offspring directly, but always slowly and cautiously (Jackson, 1985). Day-old young may suckle from the reclining mother (Frädrieh, 1981a). Suckling bouts last from 10 to 180 s;

fawns may curl the tail but do not always do so. To stimulate defecation, maternal females muzzle or lick the anal area of the neonate and sometimes also void droppings. Does groom fawns extensively. Mutual grooming is common after fawns lose their spotted natal coat (Frädriich, 1981a; Jackson, 1985).

Fawns first ingest or test plant material and also eat earth when they are about 4 to 6 weeks old. By about 2 months of age, they feed steadily with the mother and other deer, but commonly bed apart until 16 months old (Frädriich, 1981a; Jackson, 1985).

For a small captive herd of *O. b. celer*, Bianchini and Perez (1972a) outlined evidence of territorial formation, home ranges, and social hierarchies. Home size is unknown for wild stock but these deer are largely sedentary. No regular daily or seasonal movements are described. Whitehead (1972) reported that pampas deer are nocturnal whereas Bianchini and Perez (1972b) and Jackson (1985) noted that *O. b. celer* is active throughout the day, particularly in winter.

Even when abundant, pampas deer lived in small herds, rarely exceeding five or six individuals (Cabrera and Yepes, 1960; Darwin, 1860); they continue to do so (Jackson and Langguth, in press; Redford, in press). Wild herds are fluid in size and composition. Individuals, especially males, move freely from one group to another but mother-young bonds appear strong with fawns staying with the maternal female until at least a year old. Males mix with females all year, and no evident habitat repartition exists according to sex or age (Jackson and Langguth, in press). Larger aggregations form on common feeding grounds such as burned areas (Jackson and Langguth, in press). Groups of over 50 animals reported from Las Emas Park, Brazil in the wet season (Redford, in press) may be loose, temporary feeding associations with distinct social subunits.

REMARKS. Local vernacular names for *O. bezoarticus* include venado campeiro, veadó braco, or veadó in Brazil; venado in Argentina, Bolivia, Paraguay, and Uruguay; gama (sometimes used only for the female) in Argentina, Bolivia, and Paraguay; venado del campo in Uruguay; venado o ciervo de las pampas in Argentina; guazú tí (Guaraní) in southern Brazil, Paraguay, and northern Argentina; and guazú in Bolivia.

An International Stud Book is kept for captive specimens (Frädriich, 1981b).

No genetics section is included in this account for lack of information.

Ozotoceros bezoarticus once was one of the most broadly distributed and abundant New World deer, yet is one of the least known.

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