

Addax nasomaculatus.

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Addax Laurillard, 1841

Adace Frisch, 1775:128. Nomen nudum (Palmer 1904:78, footnote).

Addax Rafinesque, 1815:74. Nomen nudum; evidently based on “the *Addax* of the ancients” vide Palmer (1904:78).

Cerophorus de Blainville, 1816:74. Part, type not given.

Antilope Otto, 1825:521. Type species *Antilope suturosa*. Part, not *Antilope* Pallas, 1766:1.

Addax Laurillard, 1841:619. Type species *Antilope suturosa* (= *Cerophorus nasomaculata* de Blainville, 1816) by subsequent designation (Sclater and Thomas 1899).

CONTEXT AND CONTENT. Order Artiodactyla, suborder Pecora, family Bovidae, subfamily Hippotraginae, genus *Addax*. *Addax* is monotypic.

Addax nasomaculatus (de Blainville, 1816)

Addax

Cerophorus (Gazella) nasomaculata de Blainville, 1816:74. Type locality “Probably Senegambia,” vide Allen (1939:531).

Antilope suturosa Otto, 1825:521. Type locality not given; “brought by travelers from Alexandria to Venice” according to Allen (1939:531).

Antilope addax Cretzschmar, 1826:19. Type locality “Desert south of Ambukol to the Haraza Oasis, Dongola” vide Allen (1939:532).

Antilope mytilopes Hamilton-Smith, 1827:204. Type locality “Guinea or . . . West Africa” vide Allen (1939:532).

Oryx addax: Hamilton-Smith, 1827:188. Name combination.

Antilope gibbosa Savi, 1828:163–164. Type locality not given.

Oryx nasomaculatus: Gray, 1843:117–119. Name combination.

Addax nasomaculatus: Gray, 1846:232. First use of current name combination.

CONTEXT AND CONTENT. Content as for genus. *Addax nasomaculatus* is monotypic.

DIAGNOSIS. Face of addax (Fig. 1) can be distinguished from face of partially sympatric scimitar-horned oryx (*Oryx dammah*) by spiral twisting of ringed horns and facial markings of addax. Horns of adult addax have from 1.5 to 3 flattish spirals directed upward and outward (Fig. 2; Walker et al. 1964); in contrast, horns of scimitar-horned oryx are up to 127 cm long, with parallel, backward curvature (Dorst and Dandelot 1970). Forehead of addax has a dark brown tuft of hair from base of horns to between eyes. Below this tuft of hair, addax has a white patch that extends outward to middle of cheek. In contrast, scimitar-horned oryx has a white head with a brown blaze on forehead and a brown lateral stripe across eyes (Dorst and Dandelot 1970).

GENERAL CHARACTERS. During summer, *A. nasomaculatus* is white to off-white with white underparts (Fisher et al. 1969). During winter, addax has a gray coat and develops a heavy mass of long brown hair on neck, shoulders, and forehead (Harper 1945; Renshaw 1902). External measurements (in cm) are: total length, 120–130, length of tail, 25–35; height at shoulder, 105–115 in males and 95–110 in females (Haltenorth and Diller 1980). Secondary sexual dimorphism is present, with males weighing 100–125 kg and females 60–90 kg (Haltenorth and Diller 1980). Length (in cm) of horns in males is 70–85, with a maximum recorded length of 109.2 (Hanák and Mazák 1979). Length (in cm) of horns

in females is 55–80 (Haltenorth and Diller 1980). From 30 to 35 rings are present on lower 66–75% of horns. Hooves are low and half-moon shaped in outline, with flat sole face. Foot glands are present on fore and hind feet (Haltenorth and Diller 1980). Tail is cylindrical with black tuft of hair at end (Dorst and Dandelot 1970).

DISTRIBUTION. Former distribution of *A. nasomaculatus* included the entire Sahara and Libyan deserts from Rio de Oro and southern Morocco to Egypt and Sudan, from northern edge of sand in Algeria, Tunisia, and Libya to ca. 14°N in the south (Haltenorth and Diller 1980). Addax has been extinct in Jordan since ca. 1900 (Aharoni 1930) and became extinct in Egypt (Manlius 2000) and Morocco (Loggers et al. 1992) by the mid-20th century. Addax was exterminated in Algeria (Groombridge 1993), Libya, and Tunisia (Fisher et al. 1969).

FOSSIL RECORD. Four sites in Egypt produced fossils of *A. nasomaculatus*: Great Sandsee (7,000 BCE—Berke 2001), Djara (5,000–6,000 BCE—Berke 2001), Abu Ballas Stufenland (4,000–7,000 BCE—Berke 2001), and Gilf Kebir (5,000 BCE—Berke 2001; middle Holocene—Peters 1987). Fossil addax were recovered from Mittleres Wadi Howar, Sudan (6,300 BCE—Berke 2001). The Pleistocene Grotte Néandertaliens, Jebel Irhoud, Morocco (Thomas 1981) and Parc d’Hydra, Algeria (Balout 1942) also contained addax.

FORM AND FUNCTION. Dental formula is $i\ 0/3, c\ 0/1, p\ 3/3, m\ 3/3$, total 32 (Simpson 1984; Spingale 1986). Molars are hypsodont (Flower and Lydekker 1978). Lacrimal canal has 1 orifice, usually inside rim of orbit. Lacrimal bone almost meets nasal bone. Postorbital bar is present, and basiocranial axis is bent. Cork-screw-shaped horns are present in both sexes (Flower and Lydekker 1978) and composed of a bony core covered by keratin. Horns are unbranched and nondeciduous. Lateral toes are vestigial or absent. Cannon bone is present. Ulna is reduced distally and fused to radius. Fibula is reduced, with only distal nodule present. Front and hind feet are subequal in length (Simpson 1984). Hooves are large and splayed, an adaptation for walking on sandy substrates (Dorst and Dandelot 1970). Stomach is 4-chambered (Simpson 1984).

Pale color of addax reflects radiant heat. Pelage length and density assist thermoregulation, and barrel-shaped body reduces surface area to volume ratio (J. Newby, in litt). During the day, *A. nasomaculatus* huddles in shade of shrubs and thorn bushes and, on cool nights, lies in hollows in sand to aid in dissipation of body



FIG. 1. An adult *Addax nasomaculatus*. Used with permission from the Mammal Slide Library of the American Society of Mammalogists. Photograph by B. E. Joseph.

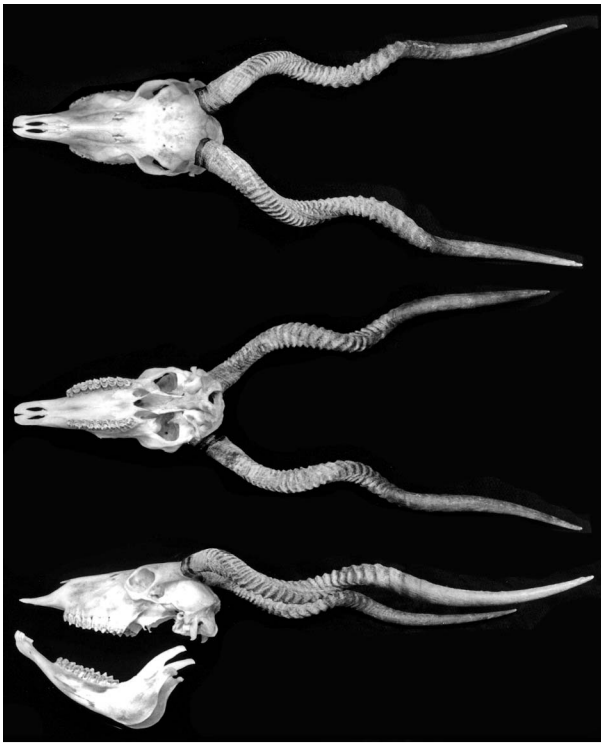


FIG. 2. Dorsal, ventral, and lateral views of cranium and lateral view of mandible of an adult male *Addax nasomaculatus* (Field Museum of Natural History, Chicago, Illinois; FMNH 101988). Occipitonasal length is 308 mm. Used with permission of the photographer, Y. Petryszyn.

heat; both strategies help to minimize amount of water lost by evaporative cooling (Spinage 1986).

ONTOGENY AND REPRODUCTION. *Addax nasomaculatus* gives birth throughout the year with peaks in winter and spring (Asa et al. 1996). Main calving seasons in northern Sahara are at the end of winter and beginning of spring; in southern Sahara, calving peaks occur from September to October and from January to mid-April (Densmore and Kraemer 1986; Dittrich 1972). Estrus lasts 24–48 h (Manski 1991). Gestation is 257–270 days (Dittrich 1972). Females alternate between lying and standing during labor (Manski 1991). Females give birth to 1 calf per season (Walker et al. 1964) and a postpartum estrus occurs at 2–3 days (Haltenorth and Diller 1980). Calves weigh ca. 5 kg at birth (Densmore and Kraemer 1986; Dittrich 1972) and are weaned at 23–29 weeks (Manski 1991).

ECOLOGY. *Addax* survives in deserts with little vegetation (Eltringham 1979). Its nomadic lifestyle (Walker et al. 1964) allows it to forage for sparsely distributed vegetation and to take advantage of vegetation growth in response to localized rains (Dorst and Dandelot 1970). *A. nasomaculatus* rarely drinks free water and instead derives moisture from grasses, forbs, and leaves of small bushes (Haltenorth and Diller 1980).

Small populations of addax remain in Chad, Mali, Mauritania, and Niger (Fig. 3; East 1998). In Sudan, *A. nasomaculatus* was common in northwestern Sudan in the early 1900s (Happold 1966); today, any remaining individuals are part of a population that moves between Sudan and Chad (Hillman and Fryxell 1988). Fewer than 50 addax populate the Mreyye area along the border of Mauritania and Mali (Heringa 1991; Sayer 1977; Soumia and Verschuren 1990). Fewer than 200 remain in Termit Massif and Air-Ténéré Nature Reserve, Niger (Grettenberger and Newby 1990). Similar numbers occur in remote desert areas between 15°N and 17°N in Chad (Thomassey and Newby 1990).

Addax nasomaculatus travels in herds of 5–20 individuals and makes long-distance migrations under the leadership of older females (Lamarque 1980). In the southern Sahara, migrations in response to rainfall are generally north to south and vice versa (Haltenorth and Diller 1980).

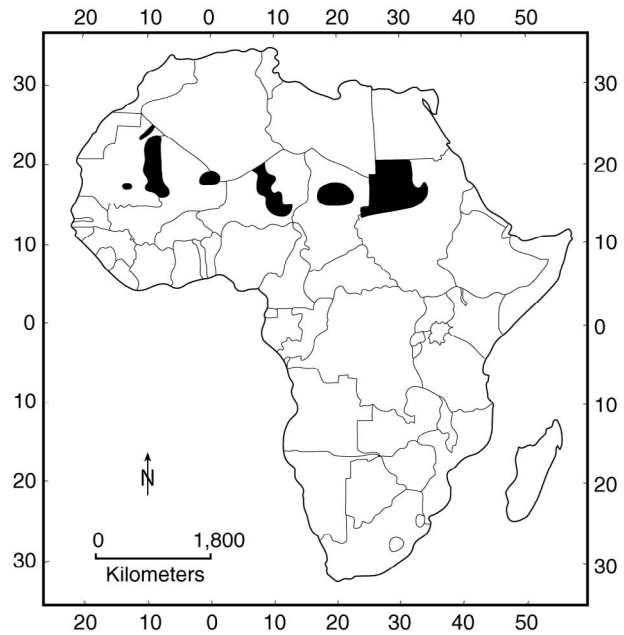


FIG. 3. Current distribution of *Addax nasomaculatus*. Map redrawn from East (1988, 1990).

Addax nasomaculatus is heavy bodied and moves slowly relative to other species of antelope, providing easy prey for local people who value its meat and have traditionally used its skin for soles of shoes and sandals (Walker et al. 1964). Local people also use the horns of *A. nasomaculatus* for digging salt from the ground (Wilson 1980). Other predators include African hunting dogs (*Lycacoon pictus*), African lions (*Panthera leo*), cheetahs (*Acinonyx jubatus*), and leopards (*P. pardus*). Caracals (*Caracal caracal*), hyenas (*Crocuta crocuta*), and servals (*Leptailurus serval*) prey on calves (Haltenorth and Diller 1980).

Captive animals live up to 25 years, 8 months (Jones 1993). One addax on an exotic ranch in Texas had the nematodes *Haemonchus contortus* and *Longistrongylus curvispiculum* (Craig 1993). Necropsied specimens of addax were infected by *Clostridium glycolicum* (Gulland and Parsons 1987) and *Mycobacterium avium paratuberculosis* (Burton et al. 2001).

BEHAVIOR. Addax is not naturally aggressive (Delany and Happold 1979), although individuals may charge if provoked (Duplaix and Simon 1976). Captive males kept in dense populations show evidence of territoriality and mate guarding (Spevak et al. 1993; Walther 1978). Captive females establish dominance hierarchies, with oldest females holding highest rank (Reason and Laird 1988).

GENETICS. Diploid number of chromosomes is 58 (Wurster and Benirschke 1968). The 1st pair of autosomes are submetacentric; all other chromosomes are acrocentric. Of the acrocentric chromosomes, the X chromosome is largest, and the Y chromosome is medium sized. Banding patterns of p and q arms of addax chromosomes resemble goat (*Capra*) and cattle (*Bos*) chromosomes 27 and 1, respectively. Chromosomes 9 and 14 of *A. nasomaculatus* are of caprine type (Claro et al. 1996).

CONSERVATION STATUS. *Addax nasomaculatus* was classified as “vulnerable” by the International Union for Conservation of Nature and Natural Resources (IUCN) in 1972 (Goodwin and Holloway 1972). In 1986, the IUCN changed the status of addax to “endangered” (International Union for Conservation of Nature and Natural Resources Conservation Monitoring Centre 1986). Addax was listed as “critically endangered” in the 2004 International Union for the Conservation of Nature *Red Data List* (International Union for Conservation of Nature and Natural Resources 2004). Decline of *A. nasomaculatus* is due to overhunting, poaching, chronic drought, and encroachment of human settlements that force addax to use areas with fewer and poorer resources (Dixon et al. 1991). In Tripolitania, Italian military personnel gunned down

herds of addax, contributing to its decline in the area (Fisher et al. 1969). In 1993, 200–500 addax were left in the wild (Spevak et al. 1993) and >1,700 remained in captivity (Correll 1991). Some addax are kept on exotic game ranches in New Mexico and Texas (Harmel 1980; Lever 1985) and in captive breeding programs in zoos (East 1988, 1990).

In 1969, the Chad government created a large refuge, the Ouadi Rimé-Ouadi Achim Faunal Reserve to protect remaining addax, but few addax are in the reserve (Anonymous 1970; Monfort et al. 2004). Since October 1972, the government of Chad has protected *A. nasomaculatus* throughout its range (Anonymous 1973). Similar protective measures have been taken in Niger, where the government has created a national nature reserve in Air-Ténéré, an area that may support a population of addax (Newby 2000). In Tin Toumma, eastern Niger, ca. 90–100 addax remain (Wacher et al. 2004).

REMARKS. Etymology of specific epithet stems from prefix *naso* (Latin for nose) and *macula* (Latin for spot or spotted), referring to the spotted facial patterns of *A. nasomaculatus* (Borror 1971). An alternative common name used by Bedouins is the Arabic term bakr (usually “bagr”) al wahsh (literally, the cow of the wild), which also may apply to other species of ungulates in the area (Qumsiyeh et al. 1996).

J. A. Bissonette provided translations of some foreign publications and B. D. Jansen located obscure references.

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