Notes on *Addax nasomaculatus* (De Blainville, 1816)

By James Dolan jr.

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Since the onset of the 1930's, conservation groups and mammalogists alike have expressed deep concern for the future of the desert antelopes native to North Africa. Prior to the Second World War, hunting was carried on primarily with spears and dogs, with the exception of those few European and American sportsmen who penetrated into the great North African expanse. During the war years hunting by sportsmen was almost entirely eliminated, although a secondary factor, derived from military operations was added. The development of motor vehicles for use in desert regions which has had great bearing on conditions as they exist today. The use of mechanized means has enabled hunting parties to reach into areas that were formally impenetrable. Coupled with the enormous distribution of modern firearms, these two factors have played havoc among the remaining herds of desert antelopes. It is only necessary for one to review the situation surrounding the Arabian Oryx, *Oryx leucoryx* (Pallas, 1777) to realize the disastrous effect the use of motor traffic can have on a small population of animals. This mode of hunting has, unfortunately, become the vogue among soldiers, oil workers and Arab nobility, not only in Asia Minor but also in North Africa. The prohibition of such destruction is clearly a matter of education, but the question arises if this can be accomplished in time to save what remains of the wildlife. Certainly, it does not require a period of many years to completely eliminate a threatened remnant when up to one hundred individuals are slaughtered during a hunting expedition. After the great game animals disappeared, where will the attention then be focused? It is not at all unlikely that the great expanse of North African desert inhabited by so many interesting mammalian forms could easily become a lifeless waste should there be no change in the existing trend of thought.

Fig. 1. Adult female *Addax* formerly in the New York Zoological Garden. The animal is in winter pelage (Photo: New York Zoological Society)

Among the North African artiodactyls threatened with extinction is the beautiful Addax antelope (Fig. 1), *Addax nasomaculatus* (De Blainville, 1816), placed by Simpson (1945) along with the genera *Oryx* De Blainville, 1816, and *Hippotragus* Sundevall, 1846, in the tribe Hippotragini. This tribe is composed of antelops of large size, possessing horns in both sexes, which may be either straight, twisted in a corkscrewlike fashion or scimitar in form. They are of almost equal length in

both the males and females. The muzzle ist hairy, the praearbital gland being either absent or poorly developed. Inguinal glands are absent and there are four teats. The tail is relatively long, terminating in a tuft. Pedal glands are present in all four feet, the lateral hoofs well developed. The skull is large with small lachrymal vacuities that may more often than not be lacking. Lachrymal depressions and supraorbital pits are absent. The teeth have tall subquadrangular crowns with a number of accessory columns on the inner side. Formally the members of this tribe ranged from Senegambia east to the Arabian Peninsula and south into the Republic of South Africa.

Addax stands approximately 42 inches at the shoulder, the males being about 1/5 larger and heavier than the females. In build it is reminiscent of a Reindeer, *Rangifer tarandus* (Linné, 1758). The head is comparatively large, with a more or less straight basal profile, the eyes small. Although the praeorbital gland is not discernible externally, it may be present as a flat pad below the large praeorbital tufts, but more conclusive anatomical investigation is lacking. The muzzle is haired except for a thin line between and above the nostrils. The ears of a cylindrical form, medium in length and rounded at their tips. The neck is short and stocky; legs of medium length; body elongated with the back straight though slightly raised at the withers and the rump rounded. The tail is round and thick with a reduced terminal tuft. Unlike the other Hippotragini, the hoofs of Addax are, low, flat, rounded anteriorly and posteriorly and of a half-moon form (Fig. 2). It is not possible to make a distinction between the various parts of the hoof anatomy. The dew claws are large and well developed. Pedal glands are present in both fore and hind feet reperented as a small sack opening from the top of the interungual web. Inguinal glands are absent; four teats are present.

Fig. 2. The hoofs of *Addax* are low, flat, rounded anteriorly and posteriorly as in the genus *Rangifer* (Photo: San Diego Zoological Society)

In the case of *Addax* both sexes carry horns which are twisted in a spiral unlike any of the other Hippotragini. The bulls have longer and heavier horns which generally have 2 1/2 to 3 turns, whereas those of the cows have 1 1/2 to 2 turns. At their base they are separated by a distance of about three inches, rising then at a slight angle and spreading somewhat laterally at their tips. The horns are ringed along their basal one-half or better. Roland Ward (1962) records the record length for a set of horns taken in the Sudan as 43 inches (= 109 cm).

In the summer the pelage is short and somewhat coarse, with a short mane on the ventral surface of the neck, the latter being whitish grey-brown in color. The forelock present in both the summer and winter coat ranges from greyish-brown to black brown; the crown of the head is dark brown. A band of white hairs extends across the bridge of the nose, in front of the forelock and eyes. The lips are white as is a

spot posterior to the eyes which in some cases extends to the base of the ears. The dorsal surface of the ears is ligth greyish-white which may become browner towards the base. On their inner surface the ears are clothed with long white hairs. Shoulders, back und flanks are whitish grey-brown, although occasionally with a reddish suffusion. The fore and hind legs, as well as the breast and stomach are white to greyish-white; upper portions of the fore limbs sometimes with a brownish cast. The dew claws on all four feet are bordered with brown; likewise a brown spot generally is present on the carpal joint. The tail is white or whitish with a brown terminal tuft. Calves are uniformly reddish with only an indication of the facial markings (Fig. 3). As the animals grow older the body colorations become lighter. The hoofs and horns are greyish black. In winter the coat becomes longer and coarser, the mane fuller, extending almost to the withers. At this time of year the head, neck mane, shoulders, back and flanks deepen to greyish-brown.

Fig. 3. Addax calf — New York 4, born June 23, 1953 (Photo: New York Zoological Society)

The Addax of the Eastern Sudan described by CRETSZCHMAR as a distinct subspecies, *Addax n. addax* Cretszchmar, 1826, was retained by LYDEKKER (1913) as a valid form although its distinguishing features were not clearly known. It was said to differ from the more westerly nominate form by the shorter winter coat with a reduction of the white areas bordering the eyes. However, on the basis of preserved specimens in the American Museum of Natural History as well as living animals from the Sudan in the Chicago Zoological Garden, Brookfield, Illinois this does not appear to be the case. The Eastern animals do not differ appreciably, considering individual variation, from the animals of the Western Sahara. Therefore *Addax n. addax* Cretszchmar, 1826, should be considered synonymous with *nasomaculatus* (De Blainville, 1816).

Inhabiting desert and semi-desert regions, the Addax may be found on all types of terrain excepting mountainous. It is particularly fond of large sand dunes and hard desert ground. Unfortunately, it is not a swift runner due to its comparatively short legs and heavy body, the cows and calves being easily brought to bay when pursued on hard terrain. Generally these antelopes occur in family groups ranging from five to fifteen individuals, consisting of a bull, with a number of cows and calves. Single bulls which have been driven out of the herd are said to associate with herds of Addra Gazelles *Gazella dama* (Pallas, 1766) (HALTENORTH, 1963). During the summer rainy periods of July through September, the *Addax* wanders to the southern Sahara and Sudanese savannah, returning to the north with the onset of the winter rains in November through March. They feed on a variety of desert grasses, as well as sprouts of shrubs and trees. *Addax* is strongly migratory following the rains which produce a rapid growth of desert vegetation. Like other desert animals it is capable of sustaining for extended periods without water. During the heat of the day these antelopes can be found lying in the shade of vegetation or cliffs, becoming active in the mornings and evenings when the temperature begins to fall. In cold weather, *Addax* excavates small holes in which it sits as a protection against the wind. Unfortunately, the exact breeding season is not known, although calves are probably produced throughout

Official Register for all *Addax nasomaculatus* Living in Captivity as of January 1, 1965

Studbook Number	Sex	Studbook Name	House Name	Date of Birth	Father	Mother	Location
1	Male	Khartoum 3	Stinky	?	?	?	May 20, 1954: Hannover 1955: Brookfield
2	Female	Khartoum 4	Ma	?	?	?	May 20, 1954: Hannover 1955: Brookfield
3	Male	Vincennes 1		about 1958		40 New York 3	July 20, 1959: Hannover Aug. 16, 1963: Catskill May 19, 1964: Brookfield
4	Female	Brookfield 3	Sissy	about 1958	?	2 Khartoum 4 Ma	About 1958: Brookfield
7	Female	Brookfield 6	Poopsie	Nov. 26, 1962	?	2 Khartoum 4 Ma	Nov. 26, 1962: Brookfield
8	Male	Brookfield 7	Aurens	April 22, 1964	?	2 Khartoum 4 Ma	April 22, 1964: Brookfield
9	Female	Brookfield 8	Farrav	May 15, 1964	?	4 Brookfield 3 Sissy	May 15, 1964: Brookfield
10	Male	Chad C		?			Aug. 16, 1963: Catskill
11	Female	Chad D		?			Aug. 16, 1963: Catskill
12	Female	Chad E		?			Aug. 16, 1963: Catskill
13	Female	Chad F		?			Aug. 16, 1963: Catskill
14	Female	Chad G		?			Aug. 16, 1963: Catskill
15	Female	Chad H		?			Aug. 16, 1963: Catskill
16	Female	Chad I		?			Aug. 16, 1963: Catskill
47	Female	Catskill 4		Nov. 22, 1964	10 Chad C	?	Nov. 22, 1964: Catskill
17	Male	Chad J		?			July 8, 1963: Gelsenkirchen
18	Male	Vincennes 2		April 4, 1961	?	40 New York 3	June 19, 1962: Hannover Nov. 11, 1963: Gelsenkirchen
26	Male	Hannover 2		Jan. 9, 1964	?	?	Jan. 4, 1964: Hannover July 16, 1964: Gelsenkirchen
19	Male	Giza 1		June 26, 1956	Khartoum 1	Khartoum 2	June 27, 1956: Giza
20	Female	Khartoum 5					April 20, 1959: Giza
21	Female	Khartoum 8		?			August 15, 1961: Hannover
22	Female	Hannover 1		Jan. 15, 1962	3 Vincennes 1	21 Khartoum 8	Jan. 15, 1962: Hannover
23	Male	Chad L		?			July 8, 1963: Hannover

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Studbook Number	Sex	Studbook Name	House Name	Date of Birth	Father	Mother	Location
24	Female	Chad M		?			July 8, 1963: Hannover
25	Female	Chad N		?			July 8, 1963: Hannover
27	Male	Hannover 3		Oct. 10, 1964	23 Chad L	?	Oct. 10, 1964: Hannover
28	Male	Khartoum 9		Feb. 24, 1962			Feb. 24, 1962: Khartoum
29	Female	Khartoum 10		Jubly 11, 1962			July 11, 1962: Khartoum
30	Male	Khartoum 11		Sept. 25, 1962			Sept. 25, 1962: Khartoum
31	Male	Khartoum 12		Dec. 29, 1962			Dec. 29, 1962: Khartoum
32	Female	Khartoum 13		Jan. 13, 1963			Jan. 13, 1963: Khartoum
33	Male	Khartoum 14		April 13, 1963			April 13, 1963: Khartoum
34	Male	Khartoum 15		Sept. 23, 1963			Sept. 23. 1963: Khartoum
35	Female	Khartoum 16		Nov. 4, 1964			Nov. 4, 1964: Khartoum
5	Male	Brookfield 4	Mohamad	about Nov. 1960		2 Khartoum 4 Ma	about Nov. 1960: Brookfield May 26, 1962: Oklahoma City
36	Female	Chad O	Tchad	?			Aug. 16, 1963: Oklahoma City
37	Female	Oklahoma 1		May 19, 1964	5 Brookfield 4 Mohamad	36 Chad O Tchad	May 19, 1964: Oklahoma City
38	Male	Chad A		about Aug. 1958			Feb. 9, 1959: Jardin des Plantes, Paris
39	Male	Chad B		about Aug. 1958			Feb. 9, 1959: Vincennes, Paris
40	Female	New York 3		June 29, 1951	Brookfield 1	Brookfield 2	June 29, 1951: New York Dec. 4, 1951: Vincennes, Paris
41	Female	New York 5		Feb. 24, 1955			Feb. 24, 1955: New York Oct. 31, 1955: Philadelphia
42	Male	Chad P	Mao	about 1962			Dec. 1, 1964: San Diego
43	Female	Chad Q	Mondo	about 1962			Dec. 1, 1964: San Diego
6	Male	Brookfield 5	Waldo-Kismet	March 5, 1961		2 Khartoum 4 Ma	March 5, 1961: Brookfield Nov. 1964: Tampa, Florida
44	Male	Catskill 1	Mocha	May 9, 1964	10 Chad C	?	May 9, 1964: Catskill Nov. 30, 1964: Tampa, Florida
45	Male	Catskill 2	Fataan	May 19, 1964	10 Chad C	?	May 19, 1964: Catskill Nov. 30, 1964: Tampa, Florida
46	Female	Catskill 3	Scherazad	May 26, 1964	10 Chad C	?	May 26, 1964: Catskill Nov. 30, 1964: Tampa, Florida

Fig. 4. Addax herd in the Khartoum Zoological Garden (Photo: Khartoum Zoological Garden)

the year, particularly during the rainy seasons. KENNETH and RITCHIE (1953) do not record the gestation period but it probably somewhere between ten to twelve months. A single calf is produced at birth.

Originally, the *Addax* ranged from Senegambia, although this was an assumption on the part of LYDEKKER, Rio de Oro, Algerian Sahara, Southern Tunesia south to approximately 15 degrees north and east to the Sudan and Egypt. Certain authors have also included Palestine and the Arabian Peninsula. I must, however, agree with HARPER (1945), ELLERMAN and MORRISON-SCOTT (1951) and HALTENORTH (1963) in excluding this antelope from the fauna of Asia Minor, as the statements of TRISTRAM (1884) and AHARONI (1930) are inconclusive. There are no recorded specimens of *Addax* from Asia Minor.

It is doubtful that the *Addax* ever occurred in Senegambia, but if it did it is now certainly extinct. Formerly it was to be met with in western Egypt, however, it appears that the last specimen was shot by a Bedawin hunter in the Mariut district, west of Alexandria about 1900 (HARPER, 1945). East of the Nile it is almost non-existent. In 1885, LATASTE recorded the *Addax* as rather widespread in the Algerian Sahara, its horns being frequently sold in Laghonat, Bou-Saade and Biskra. However, HEIM DE BALSAC (1936) stated, "Today it practically exists no more in the Algerian Sahara, unless in the south of the Erg Oriental." Since that time this antelope has been exterminated in Algeria.

LAVANDEN (1924) speaks of the *Addax* as confined to the great sand dunes of the Erg south of Berresof and Bir-Aouine, Tunesia. At the time it was under strict government protection and found in herds not exceeding 15 individuals. As late as 1936 *Addax* was extremely rare, though still to be met within the Grand Erg Oriental, but it has now disappeared from the faunistic list of Tunesia.

In Libya it is close to extinction, being found as a remnant in the extreme south. HONE (1933) remarks that Italian military patrols stationed in Libya had almost exterminated the *Addax* through hunting with machine guns. ANTONIUS (1931) records

two sepcimens formally in the Vienna Zoological Garden, which were transported to Europe from Tarabulus (Tripoli).

Bordered on the west by Dahar Adrar, in the south by the Tagant Adafer and Dhar Tichitt in Mauritania and in Mali in the east by the Azaouad, the *Addax* ranges over the great sandy Hank (El Djouf) which is approximately 500 × 1000 km. in extent. This area lacks water and in uninhabited. Although this antelope is still fairly numerous, hunting parties of three nomadic tribes from the Adrar, the Nemadi of Tichit-Walata and Kel Arawah, do enter the area killing the *Addax* and drying its meat. The extent of the existing population is unknown but it is unlikely that it could sustain any extensive hunting. The famous Austrian animal dealer, WEIDHOLZ, transported a single female in 1927 followed by a bull and two cows in 1930 from Tombouctou (Timbuktu) to Vienna (ANTONIUS, 1931). These animals were captured in the Azaouad District of Mali.

As throughout its entire range, the *Addax* does not occur below 15 degrees north latitude in the Sudan. Apparently the present concentration is to be found in the Northern Kordofan Province and in the region of Dongola, northern Darfur. Although the animal is protected by law there are no existing game reserves in the area. The conventional game reserve would probably prove ineffective as the *Addax* is strongly prone to migration and would, therefore, be difficult to confine within a designated site. A study of the problems involving the protection of this antelope in the Sudan would be most desirable.

Fig. 5. Adult male *Addax* No. 42, Chad P — "Mao" (Photo: San Diego Zoological Society)

Fig. 6. Adult female *Addax* — No. 43, Chad Q — "Mondo" (Photo: San Diego Zoological Society)

At the present time there is a very limited though flourishing trade in living specimens of *Addax nasomaculatus* centered in Fort Lamy, Chad. All of the specimens which have been imported alive into the United States and Germany within the last few years were captured by a European in the desert approximately 70 miles north of Fort Lamy. From what I have been able to gather, there is a heavy loss sustained during capture as the mode in which this is carried out is quite primitive. The animals are pursued by truck until they begin to tire and are then grabbed by the horns from the moving vehicle. It is my own opinion that if the game officials in Chad are to allow for the capture of *Addax*, care should be taken to see that this in done in a humane manner. The animal is too

rare to allow for unscrupulous capture and trade. Throughout the remainder of Chad these antelopes range the desert areas as far north as Tibesti and East to Ennedi.

Presently the population of *Addax* living from Mauritania to the Sudan does not exceed 5000 animals.

Fortunately, the *Addax* is a favorable subject in captivity having bred in a number of European, North American and African zoological gardens. A particularly successful herd can be seen in the Chicago Zoological Garden, Brookfield, Illinois, USA, where *Addax* has been bred and maintained since the mid-1930's. As this antelope is threatened in the wild state and is uncommon in captivity, it has been deemed advisable to establish a stud-book in order that closer observations can be maintained on those animals now living in the various zoological gardens.

I am particularly indebted to Dr. Warren Thomas, Oklahoma City, Oklahoma; Dr. Heinz Heck, Catskill, New York; Mr. Richard Naegeli, Tampa, Florida; Mr. Ronald Blakely, Chicago, Illinois; Miss Grace Devall, New York, New York; Dr. Ermanno Bronzini, Rome, Italy; Dr. Jacques Nouvel, Paris, France; Herr Garlef Müller-Langenbeck, Hannover, Germany; Dr. A. M. Monaiery, Cairo, UAR; and Dr. Mohd. Mubarak Beshira, Khartoum, Sudan, for information pertinent to the establishment of a stud-book for *Addax nasomaculatus* (De Blainville, 1816).

The following stud-book has been established after the form used by Dr. Erna Mohr for *Equus p. przewalskii* Poliakov, 1881. and will be maintained by the San Diego Zoological Society on behalf of the International Union for the Conservation of Nature and Natural Resources and its Survival Service Commission. Each animal will be carried on an individual card, blue for males, pink for females. A complete series of these cards will be kept by the San Diego Zoological Society, the IUCN and a further reference series by Miss Caroline Jarvis, Editor of the International Zoo Year Book. All zoological Gardens exhibiting *Addax nasomaculatus* will receive cards specific to their animals.

Unfortunately, many of the older zoological gardens have kept very incomplete records and in some cases there are no records at all, so that it has been necessary to piece a great deal of the information together. The Brookfield Zoological Garden and the Zoological Garden in Khartoum have been breeding *Addax* since the 1930's, Giza perhaps even longer, but the older records are lacking. Therefore, I named a pair of *Addax* sent to New York in 1946, Brookfield 1 and 2 since are the first Brookfield bred animals of which there is any record. A pair of these antelopes sent to Giza from Khartoum in 1954 have been named Khartoum 1 and 2 and the only recorded Giza bred animal, Giza 1. Without a doubt there have been a number of *Addax* bred in Giza, but they are unrecorded.

All of the captive *Addax* imported from Chad carry the stud name Chad, beginning with A.

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Bibliography

Aharoni, J. (1930): Die Säugetiere Palästinas. Zeitschr. f. Säugetierkunde, vol. 5, Berlin. S. 327—343.

Antonius, Otto (1931): Bemerkungen zu den Tieren des Weidholz-Imports 1930. Der Zool. Garten (NF), 4 Bd., Heft 6/7, S. 204—222, Leipzig.

Ellerman, J. R., and Morrison-Scott, T. C. S. (1951): Checklist of Palaearctic and Indian Mammals. British Museum, (NH), London.

Haltenorth, Th. (1963): Klassifikation der Säugetiere: Artiodactyla. In Handbuch der Zoologie, 8 Bd. 32 Lieferung, Berlin.

Harper, Francis (1945): Extinct and Vanishing Mammals of the Old World. Baltimore.
Heim de Balsac, H (1936): Biogéographie des mammifères et des oiseaux de l'Afrique du Nord. Bull. Biol. France et Belgique, Suppl. 21, p. 1—447.
Hone, Elizabeth (1933): African Game Protection. Spec. Pub. Am. Committee International Wild Life Protection, vol. I, no. 3, p. 1—45, Cambridge Mass.
Lataste, Fernand (1885): Étude de la faune des vertébrés de Barbarie (Algerie, Tunisie et Maroc). Actes Soc. Linnéenne Bordeaux, Vol. 39.
Lavauden, Louis (1924): La chasse et la faune cynégétique en Tunisie (Ed. 2), Tunis.
Lydekker, Richard (1913): Catalogue of the ungulate mammals in the British Museum. London.
Simpson, George G. (1945): The Principles of Classification and a Classification of Mammals. Bull. Amer. Nat. Hist. Mus. **85**, 350 S., New York.
Tristram, H. B. (1884): The fauna and flora of Palestine. London.
Ward, Roland (1962): Records of Big Game. IIth. ed (Africa), London.

Analyse von drei populationsdynamischen Faktoren bei *Apodemus flavicollis* (Melch.)[1]

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In meiner vorigen Arbeit (Pelikán, 1964) veröffentlichte ich eine vergleichend analytische Studie über einige populationsdynamische Faktoren in den südmährischen Populationen von *Apodemus sylvaticus* (L.) und *A. microps* Kr. et Ros. In dem vorliegenden Beitrag möchte ich dieselben Faktoren für die dritte Art, *Apodemus flavicollis* (Melch.), aus demselben Gebiet zusammenfassen. Es handelt sich also wieder um Geschlechtsverhältnis und dessen Schwankungen, um die Wurfgröße und um die Länge und Intensität der Vermehrung im Laufe des Jahres.

Material, welches mir zur Verfügung stand, besteht zusammen aus 2160 Individuen von *A. flavicollis*, und stammt wieder aus der breiteren Umgebung von Hodonín in Südmähren. Dieses Material wurde in den Jahren 1953—1964 erbeutet, und zwar gelegentlich derselben Exkursionen, von welchen auch die Ausbeute von *A. sylvaticus* und *A. microps* stammt. Zum Unterschied von diesen beiden Arten, die nur in den Feldern und Sträuchern erbeutet wurden, stammen alle Fänge des *A. flavicollis* im Gegenteil nur von den Waldbiotopen. Das ganze Material wurde in normalen Klappfallen gefangen und mit den laufenden theriologischen Methoden bearbeitet. Nähere bioklimatische und methodische Angaben sind in meiner vorigen Arbeit (Pelikán, 1964), sowie in der Arbeit über die Ökologie von *A. microps* (Holišová, Pelikán und Zejda 1962) angegeben.

Geschlechtsverhältnis

Im ganzen Material von 2160 Stück überwiegen einigermaßen die Männchen, die 54,6 % der ganzen Ausbeute bilden (Tab. 1, Säule 4). Die Abweichung von dem idealen Verhältnis 1:1 ist statistisch hoch gesichert ($\chi^2 = 18{,}52$; $P < 0{,}01$). Im Laufe des

[1] Frau Dr. h. c. Erna Mohr zum 70. Geburtstag gewidmet.