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NOTE:

## A NEW SUBSPECIES OF GAZELLA GAZELLA FROM THE SOUTHERN NEGEV

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At present, two species of gazelle occur in Israel: *Gazella dorcas* and *Gazella gazella*. The former is the common arid-zone species of the Sahara; the form occurring in Israel is the Sudanese *G. d. isabella* (Mendelssohn, 1974). The larger *G. gazella* is confined to the Middle East, where three subspecies are recognized (Groves and Harrison, 1977; Groves, 1983): *G. g. gazella*, the mountain gazelle, in central and northern Israel and adjacent parts of Lebanon and Syria; *G. g. cora*, the common Arabian gazelle, in the Arabian peninsula; and *G. g. muscatensis*, the Muscat gazelle, restricted to the Gulf Coast of Oman. The second of these, the most widespread of the three, has traditionally been known as *G. g. arabica*, but Groves (1973) has shown that the name *arabica* should only be employed for the distinct gazelle of the Farasan Islands (Saudi Arabia) in the Red Sea (see Thoutless and Al Bassri, 1991).

A population of *G. gazella* living in southern Israel in the Arava depression, the Rift Valley that extends between the southern end of the Dead Sea and the northern end of the Gulf of Aqaba, is different from any described subspecies (Mendelssohn, 1974), especially as far as skull characters are concerned. Considering its extreme rarity, we feel it appropriate to describe it as a new subspecies. In the following, we compare the newly described subspecies to its neighbors, *G. g. gazella* to the north and *G. g. cora* to the southeast.

### *Gazella gazella acaciae* subsp. nov.

#### DIAGNOSIS

A subspecies of *Gazella gazella* differing from other known subspecies by its shorter horns in the male; narrower skull; elongated nasals which are very narrow, especially anteriorly; elongated distal limb segments; long neck; long and broad ears; long bushy

tail; relatively long premaxillae; and dark, earth-brown color, with extremely broad conspicuous black nose-spot and white stripe on inner surface of hind leg reaching beyond hock as far as hoof. It differs additionally from *G. g. gazella* by longer and broader bulge tympanicae; wider-spread horns in the male that taper towards the tips and on which the rings are lacking on the thin, distal part; premaxillae that reach nasals and contact them for 5-12 mm; very slender build with long legs; long and broad ears that are held slanting sideways; darker color, with back and flank stripes especially dark; forehead and dorsum nasi lighter; and more conspicuous facial markings, the dark face-stripe very dark and the light face-stripe almost white. It differs additionally from *G. g. cora* by its larger size; less in-turned horn tips in the male; less elongated hind limbs; browner color; and darker (black) pygal stripe.

#### DISTRIBUTION

Known now only from a 6-km<sup>2</sup> region with dense *Acacia raddiana* and *A. tortilis* stands in the southern Negev near Yotvata, Israel. Presumably it occurs or occurred also on the Jordanian side of the border. It was formerly more widespread in suitable habitats along the Arava depression.

#### HOLOTYPE

Tel Aviv University Zoology Museum no. 6585; skin, skull, and skeleton of an adult male. The animal was caught as a fawn in spring 1966, near Yotvata, southern Israel, and transferred to Tel Aviv University on 4.11.1969 when 3 years old; it died on 4.5.1975.

#### PARATYPES

Two pick-up crania (Tel Aviv University Zoology Museum no. 7304, collected by D. Baharav in 1978, near Yotvata, and no. 4930 near Eilat, damaged and somewhat incomplete, especially 7304; two additional specimens, two 2-year-old males from a captive stock, nos. 7842 and 7751).

#### ADDITIONAL MATERIAL

An adult male skull has recently been added to the collection (no. 8480). Its characters and measurements fall within the range ascribed to the new subspecies.

#### ETIMOLOGY

For the *Acacia* tree, to which the distribution of the new subspecies appears to be closely related.

#### DESCRIPTION

The skin of the holotype is a dark, earth-brown to grey-sandy color, with the typical characters of the species: a very conspicuous pale stripe along the flanks, bordered below by a dark stripe which separates the lighter flanks from the white of the underside; sharply and noticeably paler haunches and limbs; a dark pygal stripe (blackier in this and other specimens than in *G. g. cora*); the white color of the rump reaches higher up on

both sides of the tail than in *G. g. gazella*: characteristic pattern of white and dark zones on face with the white stripes, as is usual in the species, tending to off-white, and the dark stripes below them being broad and blackened rather than thinner and dark brown as in the nominate race. The species *G. gazella* often has a black spot on the dorsal surface of the nose just behind the nostrils (as do some other gazelles); in all members of the new form this nose spot is unusually large, broad, and intensely black. In all *G. gazella* the white of the underside extends into the inner surface of the hind limbs, but generally reaches only to the hock; in the present race the white continues as a line to the hoofs. There is a conspicuous difference between the color of the fur in summer and winter. The short summer fur is glossy and light; the longer winter fur is darker.

The tail is longer than in the nominate race, and appears longer than in *G. g. cora*, though comparative measurements for the latter are lacking; it is also bushier than either of these. The ears are extremely long and broad; again measurements of *G. g. cora* are limited (Table 1), but when the ears on the flat skin of the type are laid forward they reach the nostrils, whereas in skins of other subspecies they reach no more than halfway. In the living animal the ears are carried slanting outwards at 45° or less, as in *G. g. cora*, *G. dorcas*, and some other gazelle species, whereas in the nominate race they are carried upwards, parallel to the horns.

The horns of the male are more bowed outward than in *G. g. gazella*, comparable to *G. g. cora* but, unlike most specimens of the latter, the tips do not turn so markedly inward. They are relatively shorter than in these two races. There are 17 rings on each horn in the type, 14 in nos. 7304 and 4930, 13 in no. 7751, and 17 in no. 7842 (counting up the front surface); these values fall within the upper end of the range for *G. g. gazella*, and the lower end for *G. g. cora*. The horns of the female are similar to those of *G. dorcas* females, straight, longer and stronger than in *G. g. gazella* or *G. g. cora*, unlike those of the two latter subspecies, the horns of the female have 8–10 small but clearly visible rings, resembling those of *G. g. muscatensis* from the Batinah coast of Oman.

The skull is somewhat more like that of *G. g. cora*, but larger; it is also somewhat narrower, and thus entirely unlike that of the nominate race which is characteristically broad. The nasal bones are quite distinctive, being very long, and narrow, especially anteriorly. They contact the premaxillae for 5 mm in the type and for 10 mm in the other specimens. In this respect they are different from *G. g. gazella*, in which there is a difference of several millimeters between nasalia and premaxillae, and similar to *G. dorcas*. The bulla tympanica is larger and broader than that of *G. dorcas* and *G. g. gazella*.

The postcranial skeleton of the holotype is preserved; it can be compared with a large sample of *G. g. gazella*, but only a single specimen of *G. g. cora* is available for comparison. The free segments of the limbs (tibia and metatarsus, radius and metacarpus) are extremely elongated in the new race, compared to other members of the species (Table 1); and here the one skeleton of *G. g. cora* falls within the range of *G. g. gazella*. When the lengths of the bones of the hindleg are summed, however, the total constitutes about the same proportion to the skull length as in *G. g. gazella*: here, the *G. g. cora*

Table 1  
Skull and body measurements of *Gazella gazella acaciae* compared to *G. g. gazella* and *G. g. cora* (adult males only)

Variable*	<i>G. g. gazella</i>		<i>G. g. cora</i>		<i>G. g. acaciae</i>	
	Mean	s.d. n	Mean	s.d. n	6585	7304 4930 7751 7842
Greatest skull length	191.1	4.74 17	184.2	6.01 22	192	183 197 197 200
Biorbital breadth	89.0	2.03 17	81.1	2.28 28	83	79 79 80 81
Nasal length	47.7	2.57 13	46.0	5.57 24	54	50 56 54 58
Horn length	240.9	15.95 16	218.8	17.73 28	208	222 216 261 277
Greatest span of horns	118.7	11.24 16	132.8	13.11 28	135	125 134 123 134
Head and body length (cm)	106.3	4.61 10	104.1	— 1	100	— 110.6 116.2
Ear length (cm)	12.1	.59 10	12.0	— 1	13.5	— 14.1 13.3
Weight (kg)	25.2	1.75 9	—	—	16.0	— 18.6 20.9
Nasal length as % skull length	25.1	1.15 13	24.7	3.02 23	28.1	— 28.4 27.4 29.0
Nasal anterior breadth as % premax length	51.0	3.21 12	45.2	7.50 25	38.9	36.0 33.0 35.2 31.0
Tip-to-tip distance as % horn span	72.6	14.14 16	68.0	9.48 26	83.3	79.2 88.8 82.9 94.8
Tibia length as % femur length	126.1	1.90 21	125.0	— 1	135.7	— — —
Metatarsal length as % femur length	101.1	3.46 22	105.0	— 1	114.9	— — —
Hind leg length** as % skull length	301.9	6.67 22	317.6	— 1	306.8	— — —
Ear length as % head and body length	11.7	.85 15	11.9	.36 3	13.5	— 12.7 11.4
Weight as % head and body length	23.6	1.67 9	—	—	16.0	— 16.8 18.0

\*All length measurements in millimeters unless otherwise indicated.

\*\*Hind leg length = femur length + tibia length + metatarsal length.

skeleton is the one with the marked limb elongation.

Compared to *G. g. gazella*, specimens of this subspecies look much more gracile and delicate; the long legs and long neck are conspicuous, as well as the long, broad ears. According to these data both subspecies are similar in body length; the new subspecies is, on average however, more than 5 kg lighter than *G. g. gazella*, and when the weight (in kg) is expressed as a percentage of the head and body length (in cm), both

*G. g. acaciae* and *G. g. cora* are shown to be relatively much lighter in build (Table 1). As the body length includes the length of the neck, it is possible that if body and neck were measured separately in fresh specimens, it might be found that the new subspecies has a shorter body and a longer neck than *G. g. gazella*. *G. g. cora* is also slenderly built, but seems less so than the new race, which may explain why total hind limb length (i.e., including the femur, which is enclosed by the body wall) is longer.

#### REMARKS

The presence of this distinctive form in the Rift Valley of the southern Negev is unexpected. The differences from *G. g. cora* are quite clear; evidently the Edomite escarpment forms an adequate barrier. At present its range is isolated from that of the nominate race; whether there was such contact in the past is unclear. As the range of the nominate race continues to expand under protection and with the help of irrigated agriculture in the south, it may in the future reach the distribution area of the new subspecies and interbreed with it. A captive male (no. 6585) produced fertile hybrids with a female *G. g. gazella*.

*G. g. acaciae* is sympatric in its small range with *G. dorcas*. The two are readily distinguished in the field: compared to *G. g. acaciae*, the sympatric *G. d. isabella* is smaller in linear dimensions, but less slenderly built, and so reaches about the same weight; the metapodials, but not the tibia and radius, are elongated; the ears are as long but not as broad; the horns of the male are more evenly curved and turn inwards at the tips; those of the female are longer, stronger; the color is redder, with light and dark flank stripes less contrasting, and the white face stripe is well developed and extends as far as above the eye. In *G. d. isabella* a dark nose-spot is often present, but is not so conspicuous in the field. Compared to *G. dorcas*, *G. g. acaciae* is readily recognized by its dark coloration. Features that are similar in both species are the long ears; long, bushy tail; long, straight, ringed horns of the females; and the long nasals.

The mosaic nature of the differences between the three subspecies of *G. gazella* suggests that they diverged at about the same time. Pleistocene rifling seems the most likely isolating factor; a formerly continuous population would have been divided into three segments by the downfaulting of the Arava, effectively cutting off a small population in the intensely arid southern Negev from the widespread Arabian peninsula population, while the consequent hyperaridity of the central Negev districts would, at the same time, isolate it from the population caught in the more mesic hilly country to the north.

#### POPULATION SIZE

This subspecies was formerly found along the Arava depression, but restricted to areas with dense stands of *Acacia (raddiana* and *A. tortilis*). The largest populations existed in the area of Hazeva, a vast plain interspersed with low hills and covered with *Acacia* trees and shrubs (*Ochradanus baccatus*, *Lycium arabicum*, and others), that in some places form thickets. The presence of freshwater makes the area an ideal wildlife habitat. The gazelle population living there before 1956 was estimated at 800–1000

gazelles; about two-thirds of them *G. dorcas* and one-third *G. g. acaciae*. At the time of intense military poaching between 1956 and 1963, which almost exterminated the gazelle populations in the Negev, the *G. dorcas* population at Hazeva was reduced to about 50–80 specimens, whereas *G. g. acaciae* was completely exterminated. They disappeared also from other localities along the Arava depression; several groups survived for some time in the southern Arava depression, and only in a small area near Yotvata have they survived until now. The first gazelle count in the Negev (carried out in 1964) showed a population of about 260 *G. dorcas* and about 35 *G. g. acaciae*. In 1971 the *G. dorcas* population increased to 468, whereas only 32 *G. g. acaciae* were found. Counts carried out in 1987 showed that there were 43 *G. g. acaciae*, including 10 adult males and 17 adult females. In 1988 there were 53 specimens, including 11 adult males and 25 adult females. There were 4 territorial males in this population, with territories measuring 0.5–1.5 km<sup>2</sup> in areas with dense vegetation, where the females also spent most of their time. In October 1993, 21 individuals were found (5 females, 13 males, 1 subadult, and 2 fawns), in December 1994, the number was reduced to 16 (4 males, 9 females, 2 subadults, and 1 fawn), and in November 1996, only 11 remained (1 adult male, 1 subadult male, 6 adult females, 2 subadult females, and a 2-week old fawn). The poor recruitment may be due to predation on fawns by foxes (*Vulpes vulpes arabica*). It is clear that this distinctive subspecies is nearing extinction.

#### BEHAVIOR

*G. g. acaciae* is a browser and heavily dependent on acacias; more than 60% of feeding time is spent browsing from *Acacia* trees and bushes. Thirty percent of the browsing is done while standing on the hind legs. The narrow skull and elongated legs and neck may be connected with this giraffe-like way of feeding. There is little competition with *G. dorcas*, which inhabit the same area but use more open spaces and spend less than 5% of browsing time on their hind legs. As *G. g. acaciae* feed mainly on succulent food, they do not have to drink. A watering place installed in the area in order to help this endangered population is used only by the specimens living near it. If disturbed by humans, these gazelles flee, deer-like, into areas of dense vegetation, as did the gazelles of this subspecies that formerly lived in the Hazeva area. In the Yotvata area they flee, when hard pressed, into the hills (to the west of this small refuge area), like *G. g. gazella*.

#### REPRODUCTION

The female has her first oestrus at the age of 18 months, and bears a single fawn after a gestation of 6 months. Most of the females have a postpartum oestrus, and on average 1.1 fawns are born per female per year. Fawns are born throughout the year with a high peak in spring and a smaller one in autumn. Only 33% of the fawns survive to the age of 6 months as there are many predators in the area: foxes, wolves, striped hyenas, caracals, feral dogs. Apparently, human predation no longer occurs.

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