

A FOSSIL GAZELLE (*GAZELLA SCHREUDERAE* NOV. SPEC.) FROM THE NETHERLANDS

by

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With 1 textfigure

In 1944 Miss Dr. A. Schreuder sent me for identification a fossil horn-core, which according to the accompanying letter came from a well-boring near Grubbenvorst (province of Limburg). It was found in a coarse sandy layer with gravel at a depth of 61.50 m below the surface; the topographic height of the latter is given as 24.53 m + N.A.P. (N.A.P. = sea-level at Amsterdam). Dr. J. F. Steenhuis, geologist to the Government Geological Foundation, informed me that deep borings for the water-supply of Central-Limburg have been made in the years 1918, 1919, and 1922 S. and S.E. of Grubbenvorst. Evidently we have to do with boring no. I of October 1918, which reached a depth of 83 m, the top being at 24.50 m + N.A.P. (Geological Foundation Index no. 695/4). The section is as follows (the denotations of the strata are those used by Tesch (1930)):

Laagterras II 8	from 24.50 m + to 15.50 m + N.A.P.
Middenteras (?) II 6 and Hoogterras II 1	from 15.50 m + to 4.— m + N.A.P.
Zone of the Teglian Clay, "Onderste Fijn" II 0	from 4.— m + to 2.50 m — N.A.P.
More or less coarse, mostly mud-free sand with gravel, alternating with rather fine sand with a variable mud and gravel content	from 2.50 m — to 45.50 m — N.A.P.

Below 45.50 m — N.A.P. very fine micaceous sand containing much mud. The percentage of mud and mica increases with depth. The boring was finished at a depth of 58.50 m — N.A.P.

Our fossil horn-core was found at a depth of 37 m — N.A.P.. Between

33.50 m — and 38.50 m — N.A.P. there was moderately coarse sand with pieces of loam and little gravel. Dr. Steenhuis concludes that probably in the material between 2.50 m — and 45.50 m — N.A.P. we have a representative of the Günz Glacial, thus a terrestrial facies of the marine Icenian II 0 m. The lower portion may belong to the fluvial Pliocene; the fine sand below 45.50 m — N.A.P, according to Steenhuis, doubtless belongs to the latter period.

In the opinion of Zonneveld (in litt.) the "Teglian Clay" in the above section in reality represents the Reuver Clay, of Pliocene age. This would place our fossil definitely in the Pliocene.

The study of the fossil horn-core of Grubbenvorst made it evident to me that it represents a new species of *Gazella*, a genus still unknown for the Netherlands. I dedicate this species to Miss Dr. A. Schreuder, who has already contributed so much to the knowledge of the fossil Mammalian fauna of the Netherlands. The finding of a gazelle in the Grubbenvorst boring proves the occurrence of antelopes in Dutch deposits older than the Teglian Clay, as supposed already by Schreuder (1944, p. 55).

***Gazella schreuderae* nov. spec.**

Diagnosis: Horn-core placed one-third behind the orbit; strongly tilted back (at an angle of 57° with the surface of the frontal in the holotype); comparatively strongly curved backwards; not twisted; and hardly or not divergent. Cross-section at base elliptical and unkeeled, the lateral surface more flattened than the medial.

Holotype: The left horn-core described and figured in the present paper. It is preserved in the collection of the Government Geological Foundation at Haarlem. The Leiden Museum has a plaster-cast.

Age: Pliocene.

Locality: Near Grubbenvorst, province of Limburg, the Netherlands.

Description: The horn-core (fig. 1 a-d) is of the left side, a small part at the postero-external side of the tip is missing, and the anterior and lateral surfaces are superficially damaged at the middle of the height. Part of the upper rim of the orbit, the foramen supraorbitale (f.s. in fig. 1a), and a narrow ledge of the frontal along the posterior and inner side of the core are preserved. Immediately above and behind the orbit, at the outer base of the core, there is a distinct pit, or "fossa postorbitalis" (fig. 1a, f. p.). Two-thirds of the horn-base is situated in advance of the pit, the horn-core thus is placed one-third behind the orbit. The core is regularly and comparatively strongly curved backwards, and is not twisted; in anterior aspect (fig. 1c) it is straight. It measures from the

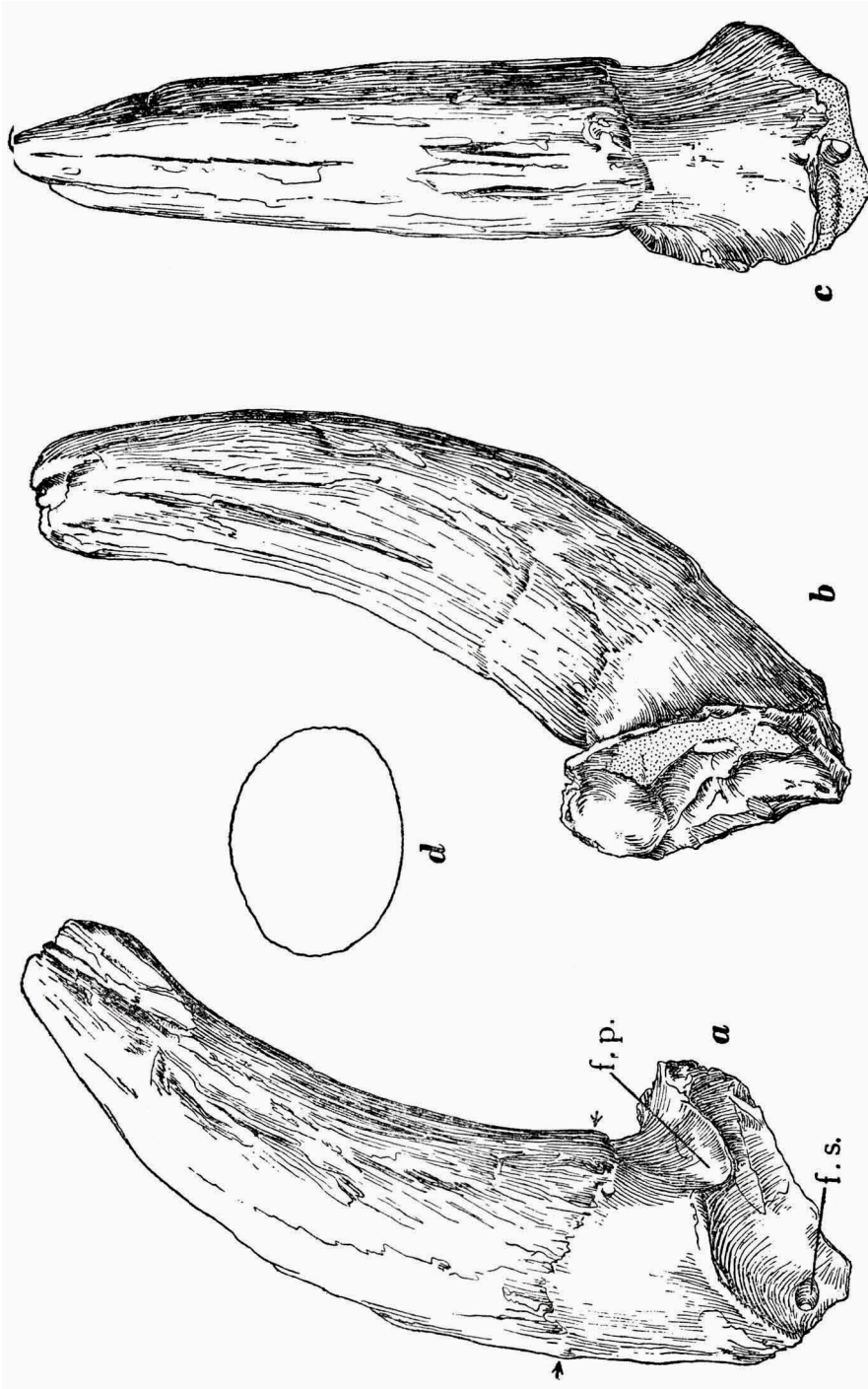


Fig. 1. *Gazella schreuderae* nov. spec., left horn-core. a, lateral view, f. s. foramen supraorbitale, f. p. fossa postorbitalis; b, medial view; c, anterior view; d, cross-section at base, indicated by the small arrows in fig. 1a. Natural size.

supraorbital foramen at its anterior base to the tip in a straight line 110 mm, and 120 mm along the anterior curve.

The neck (or pedicle) is well defined, except at the antero-internal side. Its height is at the least 15 mm above the orbit, and 7 mm above the medial surface of the frontal. The cross-section of the core at the thickest part (fig. 1d) is elliptical and unkeeled, the medial surface is more convex than the lateral. The antero-posterior diameter is 31 mm, the transverse diameter 23 mm.

To the inner side the frontal forms a right angle with the core, thus the horns were hardly or not divergent. As seen in the inner view (fig. 1b) the core is placed very obliquely on the frontal, which is almost straight antero-posteriorly at the base of the core. The latter forms an angle of 57° with the frontal. A small part of the cerebral surface of the frontal is preserved; unfortunately it is too unimportant for comparative studies.

The posterior surface of the core has distinct longitudinal furrows, on the sides they are less distinct, except one on the internal surface. Anteriorly in the lower portion (fig. 1c) there are some vertical furrows, they are interrupted in the middle (due to damage); one commences again in the upper third and reaches almost to the tip of the core.

The characters that can be drawn from this part of the skull point to its belonging to the subfamily Antilopinae, and the closest resemblance in several points to certain gazelles leaves no doubt as to its generic position. Most of the recent and fossil species of *Gazella* differ from our fossil in the horn-cores being less curved, and in many cases they are more erect too. As regards these two points, adult males of *Gazella dama* (Pallas) (Leiden Museum, cat. d and e) and *Gazella soemmerringii* (Cretzschmar) (Leiden Museum, cat. a and c) agree best with *Gazella schreuderæ* nov. spec. The cross-section at the base is not different (see also table on p. 62), but the pit is situated more backwards. The cores in these two recent species are longer, somewhat twisted, and curved outwards at their tips. In *Gazella dorcas* (L.) (Leiden Museum, cat. a and b) the horn-cores are somewhat less tilted back, the cross-section is relatively broader than that in Schreuder's gazelle, and the lateral surface is not more flattened than the medial. In *Gazella bennettii* (Sykes) (Leiden Museum, cat. b and reg. no. 4909), however, the lateral flattening is more stressed than in our fossil, the relative dimensions are not different. As is the case in *G. dorcas* (L.), the cores are less curved and the pit is placed further back. *Gazella leptoceros leptoceros* (Cuvier) (Leiden Museum, cat. a) and *G. leptoceros loderi* Thomas (Leiden Museum, cat. a and f) differ from our species in the straighter and more upright horn-cores, in

the somewhat longer cross-section, which is distinctly flattened laterally, and again in the less forward position of the pit. *Gazella thomsonii* Günther (Leiden Museum, cat. a) has the core inclined backwards almost to the same degree as *Gazella schreuderae* nov. spec., the cross-section is not different. In the recent species, however, the pit is placed more backwards, and the core itself is less curved and longer. These latter characters also hold for *Gazella subgutturosa* (Güldenstädt) (Duerst, 1908, p. 382, pl. 76 figs. 11-13) the average horn-core-index is the same as that in *Gazella schreuderae* nov. spec. (see table).

Fossil gazelles from Algeria have been described and figured under different names by Pomel (1894). According to Joleaud (1917) they belong to recent forms. The cores of *Gazella crassicornis* (Pomel, 1894, p. 19, pl. I fig. 3, pl. XIII fig. 4) agree with our fossil in the curvature. The shape of the cross-section is also alike, but the pit has a less advanced position. They are referred by Joleaud (1917, p. 218) to *Gazella dama* (Pallas), their measurements will be found under that name in the table on p. 62.

Of the fossil European species of *Gazella*, *G. anglica* Newton (1884, p. 284, pl. XIV figs. 1-3; 1891, p. 23, pl. III fig. 6a-c) is founded on a portion of the cranium only slightly greater than that of *Gazella schreuderae* nov. spec. The horn-core of this Norwich Crag form is much more straight than that of Schreuder's gazelle, and the cross-section at the base is relatively longer. It is interesting that also in the British species the pit is situated more forward than in *Gazella dorcas* (L.), *G. subgutturosa* (Güldenstädt), and *G. bennettii* (Sykes), which species seem to display the greatest resemblance to *G. anglica* Newton (Newton, l.c., p. 282/83). Nevertheless in the latter the pit has a still somewhat less advanced position than that in our species.

According to Mayet and Roman (1923, p. 58) *G. anglica* Newton is very probably identical with *G. borbonica* Depéret (1884, p. 251, pl. VIII figs. 1-2) from Perrier. In this case the latter name would have the priority. The Perrier form, however, has a much longer horn-core; the diameter below is hardly greater than that 7 cm above the base, where it has broken off (l.c., p. 252). The antero-posterior and the transverse diameter at the base are given as 50 and 40 mm in the text; this does not agree exactly with the dimensions of the figure (l.c., pl. VIII fig. 1, 28.5 and 17 mm), which is said to be on natural size (l.c., p. 284). The horn-core-index is 80 in the first, against 60 in the second case! The pit is not distinctly shown, but seems to agree in position with that of *G. anglica* Newton. The core is also much more erect than that of *Gazella schreuderae* nov. spec.

A small horn-core, also from the Norwich Crag, was described by Hinton (1906) as *Gazella daviesii*, and figured afterwards (Hinton, 1908, pl. XXIII figs. 4-5). It is, besides smaller, also less curved than that of *Gazella schreuderae* nov. spec., and more rounded in cross-section than that of *G. anglica* Newton. It probably belongs to a female of the latter species. Reynolds (1939, p. 55) does not mention it by name.

With the Pontian species of *Gazella* our species also cannot be identified. In *Gazella capricornis* (Wagner, 1848, p. 368, pl. XII fig. 6) from Pikermi the horn-core is less curved, it tapers more rapidly towards the tip, and is more circular in cross-section.

Gazella pilgrimi Bohlin¹⁾ (Bohlin 1935, p. 103, olim *G. gaudryi* Schlosser, 1904, p. 66, pl. XIII figs. 1, 1a, 1b) from Samos has less curved and also more upright horn-cores, which seem to be longer than that of *G. schreuderae* nov. spec. The cross-section is slightly different, the longitudinal furrows are more numerous and deeper.

The horn-cores of *Gazella lydekkeri* Pilgrim (1937, p. 800, figs. 35-37) from the Dhok Pathan zone of the Siwaliks are much more straight than our fossil; they are tilted back to about the same degree as in our form, which is perhaps the result of crushing. They arise immediately above, instead of partly behind the orbit, the cross-section is more broadly elliptical.

In *Gazella paotehensis* Teilhard et Young (1931, p. 36, pl. VII figs. 2, 2a) from Paote, Shansi, N. China, the cores are longer and less curved; they are more divergent and the cross-section is more nearly circular than in Schreuder's gazelle.

Bohlin (1935, figs. 54 and 62-66) figures six types of horn-cores of gazelles from the Pontian of N. China; the first three are referred to *Gazella gaudryi* (Schlosser, 1903, p. 136). The cross-sections (Bohlin, l.c., fig. 72a-c) agree well with that of *Gazella schreuderae* nov. spec., the lateral surface is more flattened than the medial. Some of the other cross-sections represented in the same figure are rather different. Our specimen is more curved than the horn-cores figured by Bohlin, with the exception of that represented in his fig. 65, which is, however, much slenderer. That of fig. 66 afterwards (Bohlin 1941, p. 113) has been identified as *Gazella*

1) According to Arambourgh and Piveteau (1929, p. 45) this Samos form is identical with *G. schlosseri* Pavlow (1913, p. 19, pl. II figs. 1, 1a and 2) from Grebeneki, Cherson, Ukrain, which is doubted at by Bohlin (1941, p. 115). Indeed the neck of the core of Pavlow's species seems to be longer than that in *G. pilgrimi* Bohlin. The cross-section in the Russian form is somewhat more rounded too. If Arambourgh and Piveteau are right, *G. pilgrimi* Bohlin is a synonym of *G. schlosseri* Pavlow.

dorcadoides Schlosser (1903, p. 129), a species, like the preceding, originally based on teeth alone. It is almost straight and much slenderer than our specimen. In this species the horn-cores are inserted distinctly more obliquely than is the case in *G. schreuderae* nov. spec. (Bohlin, 1941, figs. 36 and 39), and moreover they are somewhat more rounded in cross-section.

The other Pontian gazelles, named or unnamed, are regarded by Pilgrim (1939, p. 33) as probably merely variants of the six mentioned above, though some of them may represent distinct specific types. Andree (1926, pp. 168-169) has figured and described some unnamed horn-cores from Samos to which I should like to call attention because they are inserted very obliquely on the skull, to the same degree as our specimen. The first form is distinguished as "*Gazella* n. sp.?" (Andree l.c., p. 168, pl. XVI figs. 2, 4 5 and 8) and differs from *G. schreuderae* nov. spec. in the lesser curvature of the cores and in the inward turned tips. In the second form (*Gazella*; Andree, l.c., p. 169, fig. 4) the cores also are less curved, and the lateral surface is more convex than the medial. The position of the orbit seems to be the same as that in our species.

In *Gazella mytilini* Pilgrim (1926, p. 464, vide Schlosser, 1904, pl. VIII fig. 7, pl. XIII fig. 5; Andree, 1926, p. 168, pl. XVI figs. 1, 6, 7; Pilgrim and Hopwood, 1928, p. 13, pl. I figs. 3, 3a, 3b) from Samos only the posterior half of the orbit is situated below the horn-base; we find the pit in exactly the same position as in our fossil. The lesser curvature, greater length and more upright position of the cores, and also the relatively somewhat longer cross-section differentiate the Samos form from ours.

Of the post-Pontian species of *Gazella* from China *Gazella sinensis* Teilhard et Piveteau (1930, p. 64, pl. XI figs. 2-4, see also Bohlin, 1938, p. 21, pl. VI figs. 1-3 = *G. sinensis*, cf. Bohlin, 1941, p. 117) resembles our species in the backward tilting of the core, and in the position of the pit; the horn-core is, however, thicker and longer, and also somewhat less curved. *Gazella paragutturosa* Bohlin (1938, p. 12, pl. III figs. 1-2, pl. IV figs. 2-3, textfig. 4b-h) differs from *G. sinensis* Teilhard et Piveteau in the slenderer and much less recurved horn-cores (Bohlin, 1941, p. 117). *Gazella kueitensis* Bohlin (1938, p. 7, pl. I figs. 3, 5, textfig. 2) has horn-cores which are slenderer than those of *G. sinensis* Teilhard et Piveteau but also longer and less curved than that of *Gazella schreuderae* nov. spec..

Though the fossil described in the present paper certainly belongs to a new species of *Gazella*, more material, especially of the dentition, is needed to reveal an eventual closer relationship to one or to a group of species. The horn-core from Grubbenvorst agrees in the backward inclination with

the recent African *Gazella dama* (Pallas) and *G. soemmerringii* (Cretzschmar), somewhat less so with *G. thomsonii* Günther; further with the *Gazella* of Andree from the Samos Pontian, with *Gazella sinensis* Teilhard et Piveteau from China, and probably also with *G. lydekkeri* Pilgrim from the Siwaliks. The same curvature we find in *G. dama* (Pallas), in *G. soemmerringii* (Cretzschmar), and in an unnamed form from the Pontian of N. China (Bohlin, 1935, fig. 65). In *Gazella mytilinii* Pilgrim and the

	cross-section of horn-core at base (mm)		breadth \times 100 length
	length	breadth	
<i>Gazella schreuderae</i> nov. spec.	31	23	74
<i>Gazella dama</i> (Pallas) cat. d.	38	28	73
cat. e	39	29	74
Id. fossil (Pomel, 1894, p. 21).	40	30	75
	35	25	71
<i>Gazella soemmerringii</i> (Cretzschmar) cat. a.	36	28.5	79
cat. c.	43	27.5	64
<i>Gazella dorcas</i> (L.) cat. b	28	24	86
<i>Gazella bennettii</i> (Sykes) cat. b	29	20	69
reg. no. 4909.	29	22	76
<i>Gazella leptoceros leptoceros</i> (Cuvier) cat. a	30	19	63
<i>Gazella leptoceros loderi</i> Thomas cat. a	26	18	69
cat. f	30	20	67
<i>Gazella thomsonii</i> Günther cat. a	33	24	73
<i>Gazella subgutturosa</i> (Güldenstädt) (Duerst, 1908, p. 382)	30	22	73
	30	22	73
	31	21	68
	38	27	71
	34	24	71
	32	24	75
	33	23	70
	34	24	71
	34	25	74
		average	74
<i>Gazella anglica</i> Newton (Hinton, 1906, p. 250)	33.5	21.5	64
	27.8	18.0	65
	29.5	16.5	56
	16.8	12.8	76
<i>Gazella pilgrimi</i> Bohlin (Schlosser, 1904, p. 66)	30	24	80
Id. (Arambourgh and Piveteau, 1929, p. 46)	25	20	80
<i>Gazella schlosseri</i> Pavlow (1913, p. 20)	25	22	88
<i>Gazella paotehensis</i> Teilhard et Young (1931, p. 37)	26	23.5	90
<i>Gazella gaudryi</i> (Schlosser) (Bohlin, 1941, p. 120)	30	22.5	78
Id. small form (Bohlin, l.c.)	21	18	86
	21	17	81
<i>Gazella dorcadoides</i> Schlosser (Bohlin, l.c.)	22	18	82
	20	16	80
<i>Gazella mytilinii</i> Pilgrim (Schlosser, 1904, p. 68)	33	22	67
Id. (Pilgrim and Hopwood, 1928, pl. I fig. 3b)	36	24	67
<i>Gazella sinensis</i> Teilhard et Piveteau (1930, p. 65)	36	28	78
	36	30	83
	43	33	77
	47	36	76
<i>Gazella kueitensis</i> Bohlin (1938, p. 9)	33	24	73

Gazella of Andree from Samos, and in *G. sinensis* Teilhard et Piveteau from China the core has the same position with respect to the orbit. As far as can be concluded for the present, *Gazella schreuderae* nov. spec. seems to find its closest relatives in the Chinese forms. Teeth, however, are of more importance for the classification of the species (Bohlin, 1941, p. 119), and it is to be hoped that future finds will enrich our knowledge of the Dutch gazelle in this respect.

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