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A fossil reduncine antelope from the locality K 2 East of Marāgheh, N. W. Iran

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With 1 textfigure and plates 11 and 12

Abstract

Description of four fossil fragments probably belonging to a single individual and considered to represent a new species of reduncine antelope, found between Kerjābād, or Kirdjava, and Qartāvol, or Gartaul, East of Marāgheh, Iran, by the author's research party in 1973. The stratigraphical age of the find is Turolian.

Résumé

Description d'une nouvelle espèce d'antilope reduncine recueillie en 1973 à l'est de Marāgheh en Iran, entre les villages de Kerjābād (= Kirdjava) et Qartāvol (= Gartaul). L'âge stratigraphique du gîte est le turolien.

Kurzfassung

Beschreibung einer neuen fossilen Antilope von redunciner Verwandtschaft, 1973 gesammelt zwischen Kerjābād (oder Kirdjava) und Qartāvol (oder Gartaul), östlich von Marāgheh, Iran. Stratigraphisch ist das Alter der Ablagerung der Fundstelle das Turolium.

Introduction

Between August and November, 1973, a party consisting of Dr. N. Schmidt-Kittler, then of the Institute for Palaeontology and historical Geology of Munich University, Dr. S.A.P.L. Cloetingh, of the Vening Meinesz Laboratory for geophysical research of Utrecht University, and the author, carried out stratigraphical and palaeontological research at a number of localities East of the town of Marāgheh in N. W. Iran (Bosscha Erdbrink et al., 1976). One of these localities was designated K 2 by us at the time. It is situated not far North of a bridle path between the villages of Kerjābād (or Kirdjava) and Qartāvol (or Gartaul), several hundred metres West of the watershed separating the valleys containing each of the two villages. Comparison with maps

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and data in KAMEI et al. (1977) makes it almost certain that this locality is identical with fossil locality 11 mentioned in that publication (p. 152, fig. 13). It can also be taken as virtually certain that what is called the MMTT 13 quarry by the 1975 and 1976 Irano-American field research parties (with members from the Iranian MMTT and the Universities of California and Colorado, respectively) (see BERNOR, 1978; and CAMPBELL et al., 1980) is the same locality as well, as appeared from personal information given by Dr. R. Bernor when shown some photographs of it, taken by our party in 1973.

The four fragments described here were collected fairly close together by Dr. N. Schmidt-Kittler.

It has been maintained in earlier papers that the age of the K 2 deposit is probably 8.7 ± 0.4 Ma (BOSSCHA ERDBRINK et al., 1976, p. 97), more exactly between 8.4 and 8.7 Ma (BOSSCHA ERDBRINK, 1978, p. 94), when the palaeomagnetic correlation is also considered. KAMEI et al. (op. cit.) favour a younger date, 6.6 Ma, based upon fission-track dating, while CAMPBELL et al. (op. cit.) suggest a date of either 7.8 ± 0.4 Ma, or 7.4 ± 0.3 Ma.

Faunal remains collected at the K 2 site by each of the different research parties indicate, without question, that their stratigraphical position has to be situated in the Turolian.

Systematical part

Order: ARTIODACTYLA
Family: Bovidae
Subfamily: Hippotraginae
Genus: *Reduncа* H. SMITH 1827

Reduncа eremopolitana n. sp.
Fig. 1 & Pl. 11, A–F.

Holotype: Left horncore, No. 1973 XXI 526 (Bayerische Staatssammlung für Paläontologie und historische Geologie, Munich), Fig. 1 & Pl. 11, E.

Paratypes: Right horncore, No. 1973 XXI 527 (ibidem), Fig. 1 & Pl. 11, F. Left mandibular fragment, No. 1973 XXI 193 (ibidem), Pl. 11, A. A left M^3 with the posterior half of M^2, No. 1973 XXI 194 (ibidem), Pl. 11, C.

Stratum typicum: Upper Miocene continental deposits of Turolian age.

Locus typicus: An excavation site near the watershed between Kerjābād and Qartāvol E. of Marāgheh (N. W. Iran) indicated as K 2 in 1976 (= number 11 by KAMEI et al., 1977 = MMTT 13 by Bernor, 1978).

Derivatio nominis: The Latinized Greek translation of the Azeri geographical name Kirjawa (= Kerjābād in Farsi) meaning: Place of emptiness, desert.

Description

The material consists of a fairly complete horncore of the left side with its cranial base (the type specimen), a nearly complete horncore lacking its extreme tip (one of the paratypes) but with a slightly larger part of its cranial base, a small part of a left mandible containing P_3 and P_4 (also a paratype), and a left M^3 together with the posterior half of M^2 of the same individual (also a paratype).

The degree of wear of the teeth points to a rather aged individual. As that degree in the lower and upper dentition is absolutely comparable, while the amount of mineralization, the colouring and the size of the two horncores are also closely related in appearance, it is safe to assume

that all four pieces have belonged together to a single, male individual (only males possess horns in recent Reduncini).

In order to obtain an impression of the size of the horncores, each of these has been perigraphically outlined as close as possible to its base, as well as at a point 45 mm higher up. The four perigrammes (nat. size, figure 1) have to be imagined lying in planes which stand at right angles to the long axes of the horncores. Representing an admissible space (because the original part of the cranium was not recovered) between the left and right horncores, a distance of 45 mm has been selected, this being the stretch measured in a recent skull (RMNH no. 1781–B 85) of *Redunca redunca* in the collections of the Rijksmuseum van Natuurlijke Historie at Leiden, in which comparable horncore dimensions were encountered. That recent specimen is a sawn-off trophy bought on October 14, 1929 from Mr. A. H. C. Schoolwerth, The Hague, and reportedly collected near Caia, S. of the Zambesi river, Mozambique.

The extreme tip of the left horncore appears to have broken off. As is typical for all reduncine antelopes, the horncore is fairly broad and oval at its base, the long axis of the oval having a forward and inward direction, so that left and right axes intersect in the main sagittal plane of the skull somewhere halfway between the orbits. Both horncores then curve gracefully upwards, outwards, and, when roughly half of the entire height is attained, forwards. In this respect the fossil closely resembles the situation encountered in RMNH 1781–B85.

The right horncore is very slightly heavier than the left one while, as has been mentioned, part of the tip has been lost. On the other hand some more of its cranial base is preserved. The minimum distance between the lower edge of this horncore and the edge of the orbit at the right side is some 21 mm. Otherwise the degree of mineralization is identical. All four fossil fragments display the typical mottled whitish to yellowish colour of all fossils collected at site K 2, in which some brown striations and black streaks show up as well.

Table 1 allows a comparison of the measurements of the fossil horncores with those of the already mentioned specimen of *R. redunca* from Caia, and those of another specimen in the Leiden Museum, RMNH Reg. no. 2018, shot on January 10, 1931, at Gebel Kaka, South of Lake

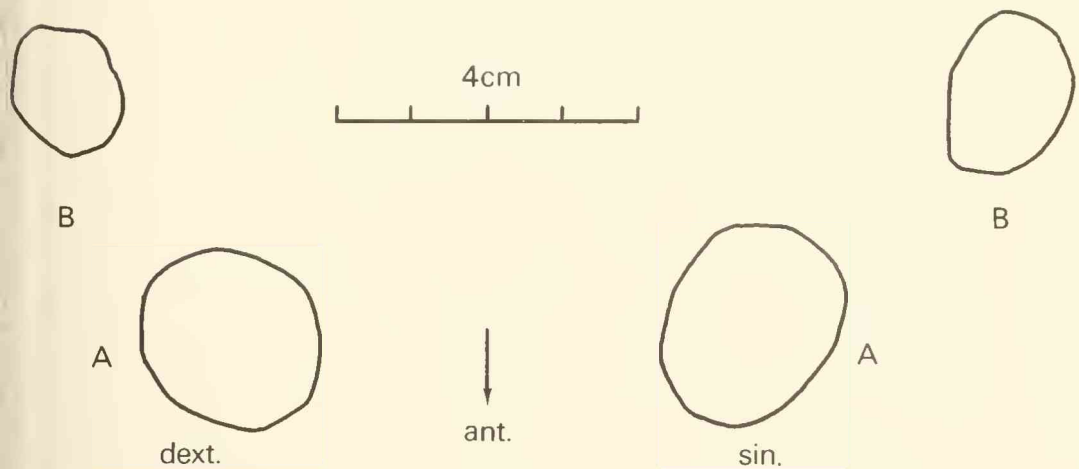

Fig. 1: Horizontal perigrammes (natural size) of the circumferences of the left (1973 XXI 526) and right (1973 XXI 527) horncores of *Redunca eremopolitana* n. sp. in their approximate natural positions and distance from each other (about 4 cm). A: as close to the base (on top of the pedicel) of each core as possible. B: at a point 45 mm higher up.

Awusa or Awasa in Ethiopia and donated to the Museum by Mr. B. Ph. Baron van Harinxma thoe Slooten. The several chords and arcs, and diameters (see for these last also the perigrammes) have been combined in table 1. My sincere thanks are due to Dr. C. Smeenk of the Rijksmuseum van Natuurlijke Historie at Leiden for his aid in placing these two recent specimens at my temporary disposition.

As is demonstrated by Plates 11 and 12, the horncores of the fossil form and those of the recent Bohor resemble each other quite considerably in dimensions. The degree of curvature of the extremities of the cores may be slightly less in the K 2 fossil, while the diameters of the cores indicate a somewhat lesser robusticity.

The few remains of the dentition, presumably belonging to the same individual, provide one with the measurements given in table 2, in which the comparable dimensions in the recent Bohor from Lake Awusa are given too. As a comparison between the fossil and the recent teeth (see plates 11 and 12) shows, the morphological features of the fossil are, again, unmistakably reduncine. This impression is fully supported when SCHLOSSER's treatise (1903) on the odontography of recent antelopes is consulted (op. cit.: "*Cervicapra bohor*", pp. 163–164).

In M^3 and the posterior lobe (or crescent) of M^2 the vestibular styles are less developed in the fossil than in the Lake Awusa specimen; in each, however, the parastyle is relatively strongest (the morphological nomenclature of Artiodactyl teeth as used by PATTON, 1969, is followed). The fossil teeth do not display cement in any appreciable quantity, as the dentition of the recent Bohor should do according to Schlosser; but the recent Lake Awusa Bohor does not display much cement either. Despite the very worn-down state of the molars, the fossil shows no traces of a presence of vertical pillars (endostyles) at the palatinal side between the anterior and posterior inner crescents of either M^3 or M^2. The recent Bohor from Lake Awusa, and the figure and description of the recent form given by Schlosser, concur in this respect that it appears to be the rule that endostyles are present. The anterior and posterior molar fossae in the approximate centres of the occlusal surfaces of the two crescents are very narrow and compressed in the fossil (in the posterior crescent of M^2 the fossa has almost been compressed to a single enamel line; this molar is very worn down), while they possess no vertical enamel plaits (= spurs when seen in section on the occlusal surface). The recent Bohors appear to have molar fossae that are more widely open, while a "spur" can usually be detected at each lingual extremity in all fossae. In general it can be remarked that the teeth of the fossil from K 2 seem to be slightly larger.

In the two lower teeth no evidence of molarization of these premolars can be found. Morphologically they might be characterized as somewhat cervid. Two (in P_4) or three (in P_3) winglike oblique structures can be seen in their occlusal aspect, running from antero-vestibular to postero-lingual. The most anterior of these is formed by the paraconid, which is connected by a graceful curve to the protoconid, the highest cuspid in each of the two teeth. The second wing runs from the protoconid back to the metaconid, while the third connects hypoconid and entoconid. A bridge also connects proto- and hypoconid. Progressive wear has resulted in a single dentine plane incorporating the back of the protoconid, the hypoconid and the entoconid in P_4, with only a kind of (entirely closed) fossa at the entoconid there. In P_4 the two anterior wings border a single oblique valley, open lingually. In P_3 there are two such oblique valleys opening up in a lingual direction: one between the anterior and the central wing and one (which is smaller) between the central and the posterior wing. Here also, however, a minute and entirely closed enamel island can be seen near the entoconid. The vestibular side of the two lower premolars consists of a closed, slightly wavy enamel wall with some wrinkles on it and rather indistinct stylids at para-, proto- and hypoconid. There is an evident concave area in the vestibular wall in front of the hypoconid. The stylid of the paraconid in P_4 has been worn down obliquely almost to its base displaying intensely black dentine. On the lingual side equally indistinct stylids occur at the para-, meta- and entoconids. In the Lake Awusa specimen, and in the description by Schlosser,

the vestibular and lingual stylids are very much more distinctly developed. The valleys opening in a lingual direction are present there too, but they are less obliquely oriented while P_4 possesses two such valleys, not one. The hypoconid-entoconid area appears to be a much more isolated structure in this last premolar of the recent Bohor. The premolars of the K 2 fossil and those of the recent Bohor concur in displaying a compressed lengthwise shape.

That the hypsodontical index of the K 2 fossil (see table 2) is so much lower than that of the recent Bohor from Lake Awusa, while the vestibular length of the two M^3 is practically identical, illustrates the already mentioned contention that the fossil individual must have reached a relatively high age when it died because its teeth are so worn down.

Discussion

The preceding description together with plates 11 and 12 may have made it clear that the fossil form collected at site K 2 is closely allied to the recent Reduncini (if it is preferred to see this group as a Tribus) or Reduncinae (when a Subfamilial arrangement is favoured). Most resemblances exist with the Rietbok (Reedbuck, or Bohor), *Redunca redunca* (PALLAS, 1767), as far as can be made out from the remaining morphological features. Form, size and curvature of the horncores, these being the most typical characters of antelopes, constitute an argument for this. The relative lowness of the pedicels, a feature visible in the two plates but impossible to record as a measurement, conform with it too. So do the few still present dentitional elements, but these are slightly larger while they also display a number of more simple traits.

Taken together as arguments, an attribution of the fossil to the genus *Redunca* appears to be justifiable in my opinion. The existing differences do not permit a complete unification with one of the recent reduncine antelopes, however, so that the form has to be placed in a new species. I do not feel able to express an opinion regarding the possibility that this should be seen as a direct ancestor of one of the recent reduncines (in which case the Bohor is probably the nearest form), nor should connections with other earlier or later fossil reduncines be made. Otherwise one might think, for instance, of PILGRIM's (1939) *Kobikeryx* or *Indoredunca* of Tatrot or Dhok Pathan age from the Siwaliks (see GENTRY, 1970, p. 317), or of the Early Pleistocene ?*Redunca* described by GERAADS (1979) from Melka-Kunture in Ethiopia, without forgetting the perhaps Pliocene *Redunca* sp. from Kaiso Village mentioned by COOKE and CORYNDON (1970, pp. 202–203).

As derivation of the specifical name a geographical indication has to be preferred; in this I invited Professor Schmidt-Kittler's opinion. The fossil locality K 2 (K taken from Kirdjava) lies at hand. The Turkish word kïr, modified to ker or even to kir in eastern Turkish languages or dialects such as Azeri (spoken in Azarbaijan) means: empty, wild, deserted, nothing, uncultivated. Dja or ja has the meaning of: (the) place (where); va or wa is a suffix. Translated, Kir(d)java (transcribed in Farsi into Kerjābād) therefore means: the empty place, the place of nothingness, the deserted village or the desert village. When this is properly translated into Latinized Greek (I sincerely want to thank Professor Dr. R. C. Engelberts of the Institute for Classical Languages and Early History, Utrecht University, for his valued aid), there emerges the name *eremopolis*. An appropriate new specifical name for the fossil form thus becomes *eremopolitana*.

A short characterization of *Redunca eremopolitana* can be given as follows: It is a reduncine antelope of relatively small size, approximately that of a recent Bohor *(Redunca redunca)*, with somewhat more slenderly built and thinner horns, displaying the typical reduncine curvature (first backwards and then, towards the extremity, forwards) but slightly less pronounced than *R. redunca;* and having upper molars without endostyles, while the lower premolars are more cervid-like and more compressed lengthwise in aspect than those of the recent reduncine antelopes. The absolute size of the teeth exceeds that found in the recent *R. redunca*.

If actualistic principles are considered permissible, one may conclude that the surroundings in which *R. eremopolitana* once lived probably represented (LEUTHOLD, 1977, pp. 22, 215, 234–235) exclusive male home ranges or territories, usually containing not more than 3 or 4 animals in all (although there exist observations of perhaps occasional herds containing up to 400 head). These rather small territories contained, as main food sources, fresh (green) grass (wet season) and some dicotyledons (dry season), while the animals were dependent upon water (as implied by their European vernacular name). Their probably rather individualistic way of life and small numbers in any suitable area may account for their uncommon occurrence as a fossil. We collected only this single specimen in an otherwise rather rich fossil material at K 2. Chances at fossilization in savanna- or bush-steppe surroundings are not good and need a large number of individuals for each separate case. Habitual presence near water may, on the other hand, have been a positive factor in this process. The locality K 2 has probably been a shallow depression in the landscape, or an intermittently filled body of water in which sometimes partly scavenged remains of cadavers, lying about, were swept during rains and then covered up immediately by silt and mud, in this case redeposited material of volcanic origin.

Table 1. Some dimensions (in mm) of horncores of two recent Bohor compared with the K 2 form.

		Caia (Mozambique)	Lake Awusa (Ethiopia)	K 2 (fossil)
Posterior arc of horncore	L	177	154	176
	R	164	151	137+
Posterior chord of horncore	L	168	142	173
	R	156	144	135+
Anterior arc of horncore	L	174	143	169
	R	160	146	131+
Anterior chord of horncore	L	172	140	165
	R	158	142	127+
Anteroposterior diameter at	L	33	29	28
base of horncore	R	31	28	26.5
Transversal diameter, ibidem	L	29	29	23
	R	27.5	27.5	23.5

Table 2. Comparison between some teeth measurements of a recent *Redunca* and the K 2 fossil.

	Lake Awusa (Ethiopia)	K 2 (fossil)
Vestibular length of M^3 sin.	16.2	16.9
Transverse width, anterior lobe of M^3 sin.	10.3	14.4
Id., over posterior lobe of M^3 sin.	8.5	14.0
Metacone height of M^3 sin.	7.1	6.4
Hypsodontic index	43.8	37.9
Transverse width over posterior lobe of M^2 sin.	10.2	12.4
Maximum length of P_3 sin.	7.3	11.0
Transverse width (post.) of P_3 sin.	6.1	6.4
Maximum length of P_4 sin.	9.5	13.0
Transverse width of P_4 sin. (post.)	7.3	8.6

Acknowledgements

Although some nine years have now elapsed since our voyage to Iran, results have still not dried up entirely. Once again, I should like to thank the Authorities of the Scientific Affairs Division of the North Atlantic Treaty Organization at Brussels for their financial support (Grant no. 661) of this undertaking. All previously expressed thanks and feelings of gratitude towards the many erstwhile Authorities and Friends who aided and supported the exploration, are once more repeated here without explicit mentioning of names; the only exception being H. E. the late Ambassador of the Netherlands at Tehran, Mr. P. A. E. Renardel de Lavalette, whose friendly and active aid I shall never forget.

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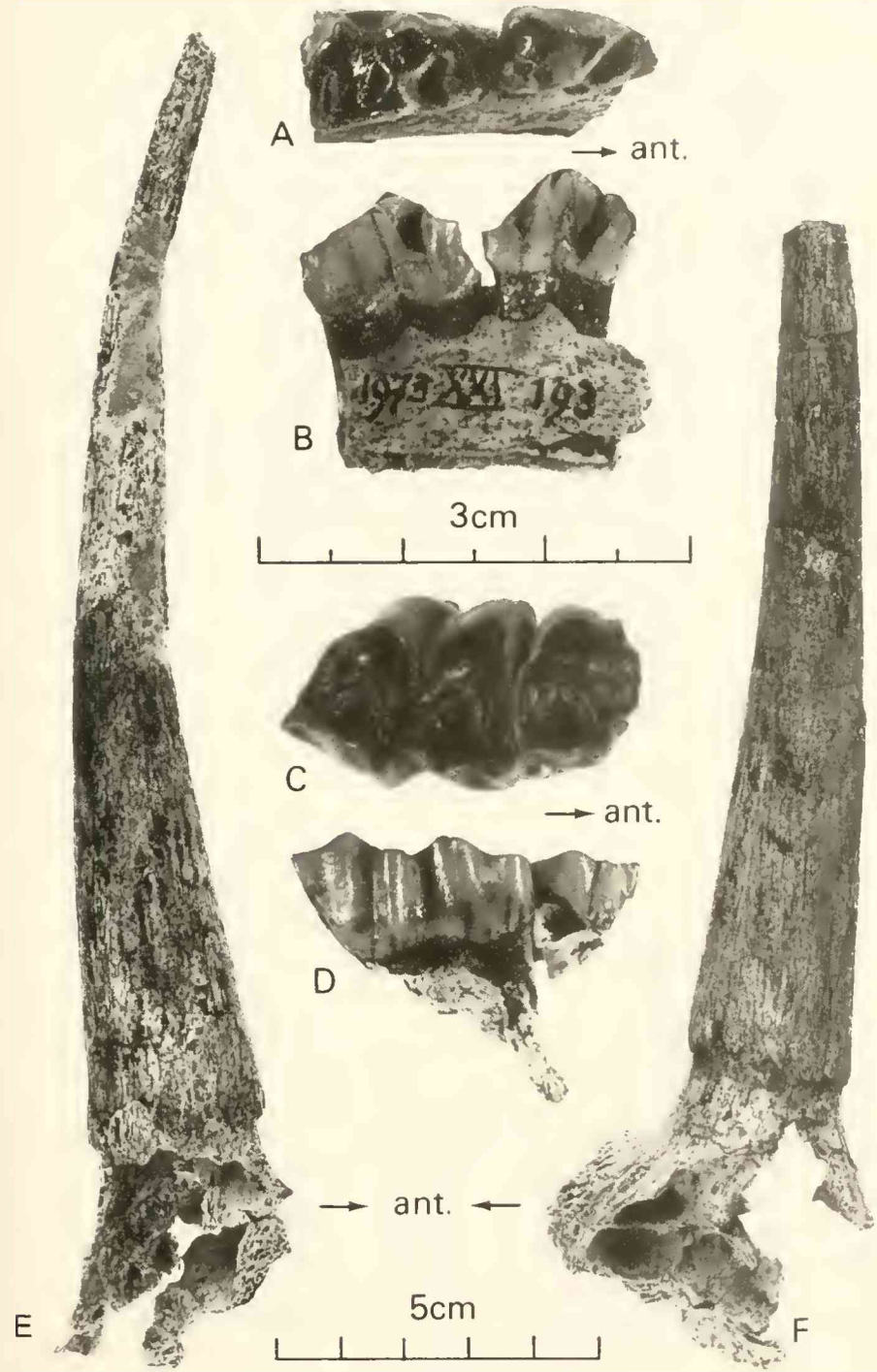
Plate 11

A. occlusal, and B. lingual aspects of P_3 and P_4 sin. in the mandibular fragment 1973 XXI 193, ascribed to *Redunca eremopoltana*.
C. occlusal, and D. vestibular aspects of M^3 and the posterior half of M^2 sin. in the maxillary fragment 1973 XXI 194, ascribed to *Redunca eremopoltana*.
A–D on the same scale (see 3 cm long measurement).
E. left horncore, 1973 XXI 526, and F. right horncore, 1973 XXI 527, each seen in a transverse outward direction from the hypothetical centre above the skull, of *Redunca eremopoltana* n. sp.
E–F on the same scale (see 5 cm long measurement).

Plate 12

A. left horncore, and B. right horncore of *Redunca redunca* from Caia, Mozambique (RMNH Leiden 1781–B 85), seen in the same positions as E and F in Pl. 1, and on the same scale of 5 cm.
C. occlusal view of P_2, P_3 and P_4 sin. (from right to left) of a ♂ *Redunca redunca*, RMNH Reg. no. 2018, from Gebel Kaka in Ethiopia, and
D. occlusal view of M^2 and M^3 sin. (from right to left) of the same animal. C–D on the same (2 cm long) scale as A–D of Pl. 1.



BOSSCHA ERDBRINK, D. P.: A fossil antelope from Iran. Plate 11