

THE SMALL EQUIDS OF BINAGADY (AZERBAIDJAN) AND QAZVIN (IRAN): *E. HEMIONUS BINAGADENSIS* NOV. SUBSP. AND *E. HYDRUNTINUS*

VÉRA EISENMANN & MARJAN MASHKOUR

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ABSTRACT - Most of the remains of the small pleistocene equid of Binagady usually considered as an *E. hydruntinus* may be referred to a new subspecies, *E. hemionus binagadensis*. A few teeth and bones really resemble *E. hydruntinus*. In the holocene of the plain of Qazvin, beside numerous remains of an average Hemione, there are several first phalanges similar to those of *E. hemionus binagadensis*, and several teeth similar to those of *E. hydruntinus*. We decided to consider them as representative of separate taxa. If, however, they are just variations of *E. hemionus*, our insight of *E. hydruntinus* has to be modified in one of two ways: either *E. hydruntinus* is a Hemione (not an Ass, nor a kind of *E. stenonis* or Zebra), or the "specific" characters of *E. hydruntinus* result of a parallel evolution.

KEYWORDS: HEMIONES, *E. HYDRUNTINUS*, PLEISTOCENE, HOLOCENE, AZERBAIDJAN, IRAN.

RÉSUMÉ - Les Equidés du Pléistocène moyen-supérieur de Binagady, jusqu'à présent rapportés à *E. hydruntinus* peuvent être en majorité attribués à un petit Hémione comme le montrent des restes crâniens et squelettiques. Nous proposons de le dénommer *E. hemionus binagadensis* nov. subsp. Quelques dents jugales supérieures à très petits protocônes et quelques métapodes pourraient appartenir à un vrai *E. hydruntinus*. Dans l'Holocène de Qazvin, à côté de nombreux restes d'un Hémione de taille et de proportions habituelles, on retrouve des dents jugales supérieures à très petits protocônes et quelques premières phalanges semblables à celles d'*E. hemionus binagadensis*. S'il s'agit de variations anormalement grandes à l'intérieur de l'Hémione de Binagady d'une part, et à l'intérieur de l'Hémione de Qazvin, d'autre part, on se trouve devant une alternative. Ou bien *E. hydruntinus* ne doit plus être considéré comme un descendant d'*E. stenonis*, mais comme une sous-espèce d'*E. hemionus*, ou bien les caractères "spécifiques" d'*E. hydruntinus* sont apparus à plusieurs reprises à des endroits différents. Nous avons pris le parti de considérer que ces restes représentent des taxons réels et non de simples variations d'*E. hemionus*.

MOTS-CLÉS - HEMIONES, *E. HYDRUNTINUS*, PLÉISTOCÈNE, HOLOCÈNE, AZERBAIDJAN, IRAN.

EQUIDS OF BINAGADY

In Azerbaijan, 8 kilometers North of Baku, the asphalt deposits of Binagady have yielded a very rich and well preserved fossil material belonging to small Equids, partly described Gadjiev (1953) and referred by him to *E. cf. hydruntinus*. The Rodents were extensively studied by Gromov (1952) and more recently discussed by Baryshnikov and Baranova (1983). The latter report: *Hystrix vinaogradovi*, *Dryomys nitedula* (one specimen according to Gromov 1952), *Allactaga jaculus*, *A. elater*, *A. williamsi*, *Mus musculus*, *Apodemus sylvaticus*, *Cricetulus argyropuloi*, *C. migratorius*, *Mesocricetus raddei planicola*, *Meriones erythrorus*, *Microtus ex gr. arvalis-socialis*; *Ellobius* aff. *lutescens* and *Pitymys apscheronicus* indicate a somewhat older age than the rest of the Rodents, and the whole fauna is believed to belong in the Riss-

Wurm, or even in the final Riss. Among the large Mammals, beside *E. cf. hydruntinus*, there are numerous remains of *Equus caballus*, *Rhinoceros mercki*, and *Cervus elaphus binagadensis* (Gadjiev 1953; Baryshnikov & Baranova 1983). There are moreover fossils of *Bos namadicus* and *Sus apscheronicus*, resembling the chinese *Sus vittatus*, and various other Mammals, Birds, Insects, and Vegetals (Gadjiev 1953). According to Gromov (1952), part of the fossils belong to animals trapped in the asphalt, while some belong to fluvial deltaic deposits; although they are separated by a layer of oxidated petrol, some mixing may have occurred.

We were unable to see the collections preserved in Azerbaijan, but the material stored in the PIN collections of Moscow and in Tbilissi, apparently not studied by Gadjiev (1953), warrants a description and some discussion. A close observation of

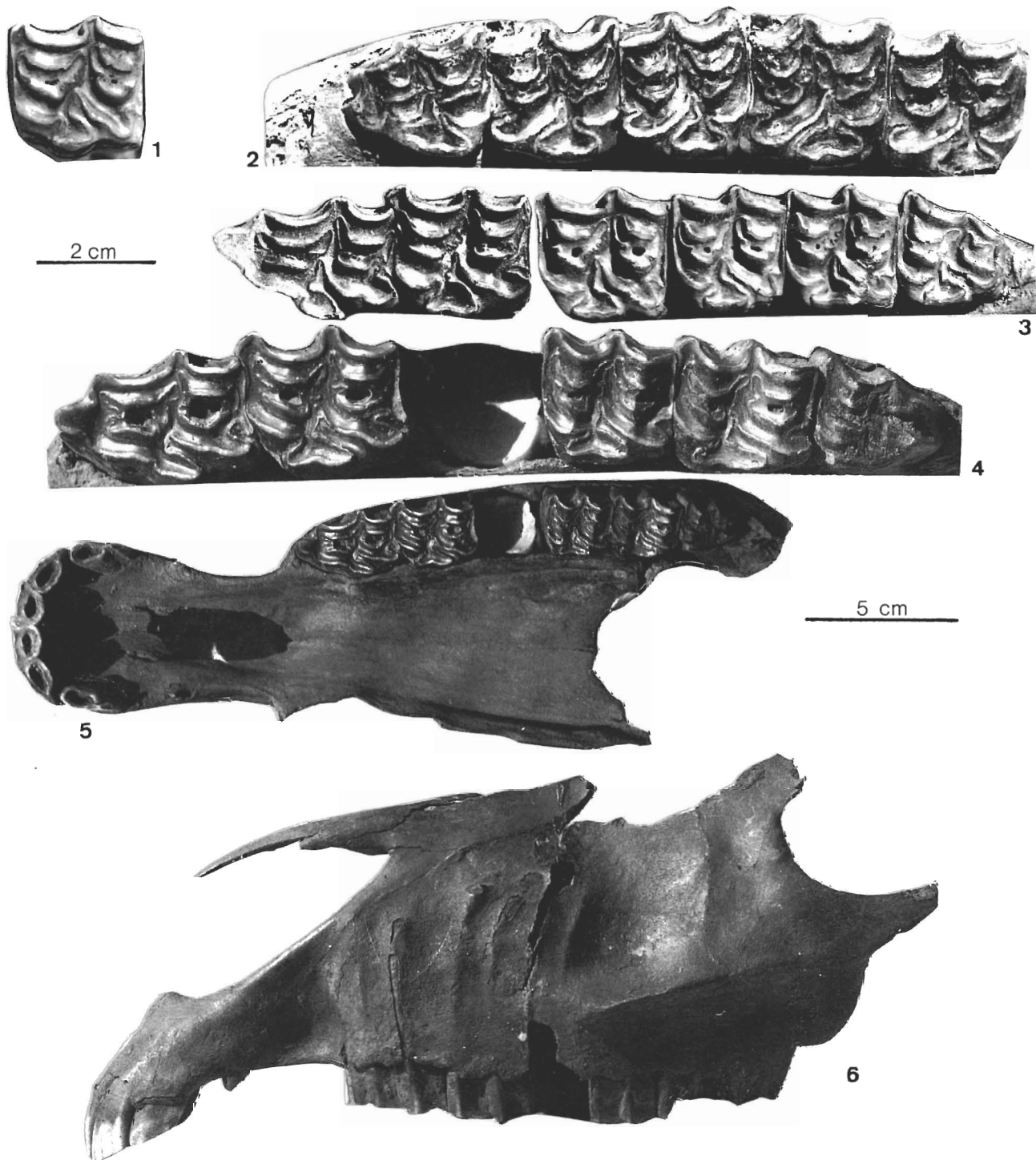


FIGURE 1 - 1. *E. cf. hydruntinus*, TB 222, upper P3 or P4, occlusal view. 2-6. *E. hemionus binagadensis* nov. subsp. 2. TB 222, upper P3-M3, occlusal view. 3. *E. hemionus binagadensis*, TB 222', upper P3-M3, occlusal view. 4, 5, 6. skull, type, MS 395-453+448. 4, upper P2-P3 and M1-M3, occlusal view. 5, skull, ventral view. 6, skull, profile. TB = Institute of Paleobiology and Museum, Tbilissi. MS = PIN (Paleontological Institute), Moscow. 1. *E. cf. hydruntinus* TB 222, P3 ou P4 supérieure, vue occlusale. 2-6. *E. hemionus binagadensis* nov. subsp. 2. TB 222'. P3-M3 supérieures, vue occlusale. 3. MS 395-454-2, P2-M3 supérieures, vue occlusale. 4, 5, 6. Crâne, type, MS 395-453+448. 4, rangée dentaire, vue occlusale. 5, crâne, vue ventrale. 6, crâne, vue de profil. TB = Institut de paléobiologie et Muséum, Tbilissi. MS = PIN (Institut de paléontologie), Moscou.



FIGURE 2 - *E. hemionus binagadensis* nov. subsp. 1,3,4,5. MS 395-446, skull. 1, occipital view. 3, profile. 4, ventral view. 5, dorsal view. 2. MS 395-447, skull, occipital view. 1,3,4,5. MS 395-446, crâne. 1, vue occipitale. 3, vue de profil. 4, vue ventrale. 5, vue dorsale. 2. MS 395-447, crâne, vue occipitale.

the material convinced us that there may be two small Equids at Binagady: most of the material, including several skull fragments, belongs to a small *E. hemionus*, for which we propose a new sub-specific name. A few teeth and metapodials may indeed be referred to an *E. cf. hydruntinus*.

E. hydruntinus is a rather enigmatic species, showing features found in Hemionones (slenderness and cursorial proportions) and in Zebras (deep ectoflexids on lower molars), associated with a primitive character, usually found in *E. stenonis* (very short protocônes on the upper cheek teeth).

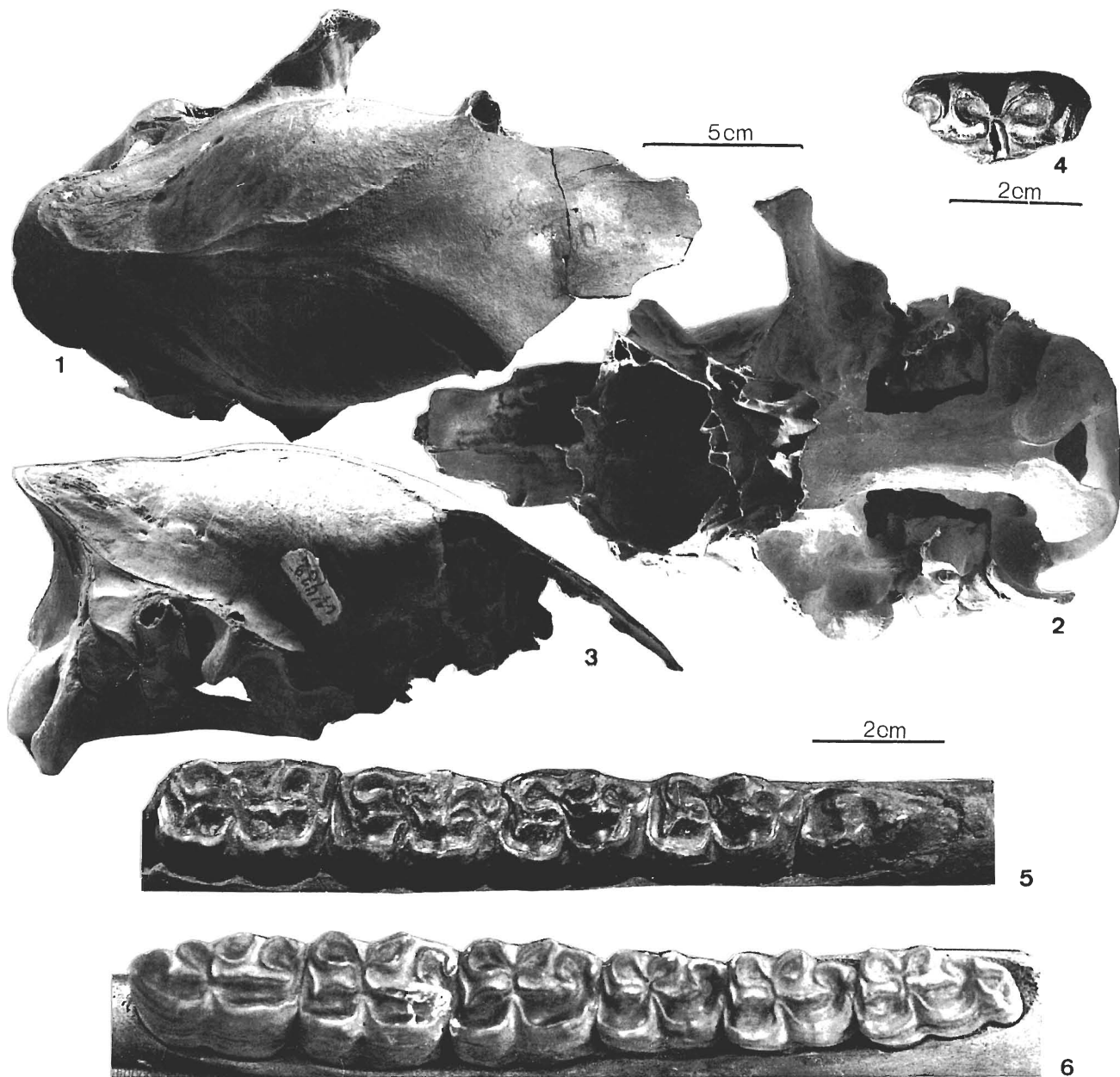


FIGURE 3 - 1,2,3. *E. hemionus binagadensis*, MS 395-447, skull. 1, dorsal view. 2, ventral view. 3, profile. 4. *E. cf. hydruntinus*, MS 399-126, lower M1 or M2, occlusal view. 5. *E. hemionus binagadensis*, TB no number, lower P4-M3, occlusal view. 6. *E. hemionus binagadensis*, MS 395-458, lower P2-M3, occlusal view. 1,2,3. *E. hemionus binagadensis*, MS 395-447, crâne. 1, vue dorsale. 2, vue ventrale. 3, vue de profil. 4. *E. cf. hydruntinus*, MS 399-126, M1 ou M2 inférieure, vue occlusale. 5,6. *E. hemionus binagadensis*. 5, TB sans numéro, P4-M3 inférieures, vue occlusale. 6, MS 395-458, P2-M3 inférieures, vue occlusale.

Accordingly, *E. hydruntinus* is considered by some authors as a Zebra (Davis 1980), or as a Stenonine horse (Forsten 1995), but is commonly referred in the Russian literature as the “European Ass” and put in the genus *Asinus* together with the African Asses and the Hemiones (Gromova 1949).

Although Gadjiev referred the small Equid of Binagady to *E. cf. hydruntinus*, he believed it to belong to a distinct form, and even to a different

species (Gadjiev 1953, p. 7). His comparisons with Hemiones led him to conclude that the Binagady Equid was much too small to belong in that group, but he did not consider the smallest of the modern Hemiones, the Syrian *E. hemionus hemippus*.

If the possible existence of small Hemiones (like the Hemippe of Syria) is taken in consideration, it can be seen that most of the fossils of the small Equid of Binagady fit better with Hemiones than

with *E. hydruntinus*: the protocônes are too long for the latter and the shallowness of the ectoflexids in molars is in contradiction with the pattern usual for *E. hydruntinus*. The skull proportions are also consistent with what is known of Hemiones in general, and with *E. hemionus hemippus* in particular. There are, however, differences between the Syrian Hemippe and the Binagady small Equid. In the latter, the overall size is bigger (including the teeth), the muzzle seems shorter and wider, the diaphyses of the metapodials are wider and deeper. These points added to the fact that the two forms are separated by more than 1000km and more than 100.000 years, leads us to propose a new subspecific name for the Binagady small Equid:

Genus *Equus* LINNAEUS, 1758Subgenus *Hemionus* STEHLIN & GRAZIOSI, 1935Species *Equus hemionus* PALLAS, 1775*Equus hemionus binagadensis* nov. subsp.**Type-locality** - Binagady, Azerbaidjan (8 km north of Baku).**Type specimen** - Partial skull of an adult female composed of two associated fragments preserved in the PIN collections (Moscow, Russia) under the numbers 395-448 and 395-453 (Fig. 1.4,5,6).**Paratype** - Fragmentary mandible of an adult female, PIN 395-458 (Fig. 3.6).**Derivatio nominis** - From the type locality.**Referred material** - Most of the teeth and limb bones as discussed below.**Age** - Middle-Upper Pleistocene of Azerbaidjan, and possibly Holocene of Iran (see below).

	<i>E. h. onager</i> n=30	<i>Equus hemionus hemippus</i>					<i>E. hem. binagadensis</i>			<i>E. h. minor</i> Lunel Viel
		HS 1	HS 2	HS 3	HS 4	HS 5	MS 395 453 + 448	MS 395 446	MS 395 447	
16	56,4	46,5	44,0	49,0		49,0		50,0	54,0	
23	347,0	295,0	295,0	285,0	300,0	320,0	300,0			
3	115,6	97,0	93,0	82,0	98,0	101,0				85,5
4	102,2	80,0	91,0	93,0	91,0	93,0		112,0		
2 - 5	116,2	90,0	87,0	102,0	96,0	104,0	104,0			99,0
5	103,7	85,0	84,0	84,0	88,0	85,0	84,0			87,0
17	55,0	48,0	44,0	46,5	44,0	50,0	51,0			50,0
17bis	40,5	38,0	35,5	34,0	37,5	39,0	38,0			36,5
13	196,0	168,0	164,0	157,0	156,0	176,0		175,0		180,0
10	47,4	40,0	36,0	37,0	40,5	43,0	43,0			41,5
25	101,7	88,0	96,0	92,0	83,0	92,0	88,0			
28	90,1	78,0	75,0	79,0		85,0		80,0	91,0	84,0
9	63,0	48,0	50,0	54,0	57,0	58,0				56,0
20	14,4	11,5	9,7	11,0	10,0	12,0		10,2	12,0	
31	142,9		118,0	124,0	122,0	133,0	125,5			101,0
32	160,0		133,0	130,0	137,0	142,0	134,0			
7	87,0	79,0	78,0	78,0	80,0	83,0	81,0			79,8
7bis	70,5	64,0	71,0	63,0	52,0	65,0	69,0			62,8
8	156,9	145,0	147,0	141,0	141,0	147,0	148,0			143,0

TABLE 1 - Skull measurements in millimeters of Hemiones, modern (Onagers and Hemippes) and fossil (*E. hemionus binagadensis* nov. subsp.), and of *E. hydruntinus minor*: For Onagers, the data are average of 30 skulls. For Hemippes, data are given separately for each specimen: HS 1 = British Museum 1867.12.3.1, London; HS 2 = Anatomie Comparée 1863.20, Paris; HS 3 = Osteology 1637, Yale; HS 4 = Mammalogie 1977.83, Paris; HS 5 = MCZ 6345, Harvard. MS = PIN (Paleontological Institute), Moscow. Measurements as in Eisenmann, 1986: 16 = breadth of the supra-occipital crest; 23 = anterior ocular line; 3 = distance from palate to hornion; 4 = distance from hornion to basion; 2-5 = palatal length (without the muzzle); 5 = muzzle length; 17 = muzzle breadth at the posterior border of the I3; 17 bis = least muzzle breadth between the interalveolar borders; 13 = frontal breadth; 10 = greatest choanal breadth; 25 = facial height in front of P2; 28 = cranial height behind the orbits; 9 = choanal length; 20 = height of the external auditory meatus; 31 = length of the naso-incisival notch (from prosthion to the back of the nasal opening); 32 = cheek length (from the back of the nasal opening to the most anterior point of the orbit; 7 = length of P2-P4; 7 bis = length of M1-M3; 8 = length of P2-M3. *Mesures crâniennes en millimètres d'Hémiones actuels (Onagres et Hémippes) et fossiles (E. hemionus binagadensis nov. subsp.) et de E. hydruntinus minor. Pour les Onagres les mesures correspondent à la moyenne de 30 crânes. Pour les Hémippes, elles sont données séparément pour chaque individu: HS 1 = British Museum 1867.12.3.1, Londres; HS 2 = Anatomie Comparée 1863.20, Paris; HS 3 = Osteology 1637, Yale; HS 4 = Mammalogie 1977.83, Paris; HS 5 = MCZ 6345, Harvard. MS = PIN (Institut de paléontologie), Moscou. Pour les mesures voir Eisenmann 1986: 16 = largeur maximale de la protubérance occipitale externe; 23 = longueur de la ligne oculaire antérieure; 3 = distance du palais à l'hormion; 4 = distance de l'hormion au basion; 2-5 = longueur du palais (sans le museau); 5 = longueur du museau; 17 = largeur du prémaxillaire derrière les I3; 17bis = largeur minimale du museau entre les deux bords interalvéolaire; 13 = largeur frontale; 10 = largeur maximale des choanes; 25 = hauteur de la face en avant de la P2; 28 = hauteur de la crâne en arrière des orbites; 9 = longueur des choanes; 20 = hauteur du méat auditif externe; 31 = longueur de l'échancrure naso-incisive; 32 = longueur de la joue; 7 = longueur de la série prémolaire; 7bis = longueur de série molaire; 8 = longueur de la série jugale.*

FIGURE 4 - Ratio diagrams of skull measurements of *E. hemionus hemippus* and *E. hemionus binagadensis*. Measurements as in Table 1. *Diagramme de rapport des mesures crâniennes de E. hemionus hemippus et E. hemionus binagadensis. Pour les codes de mesures voir Tableau 1.*

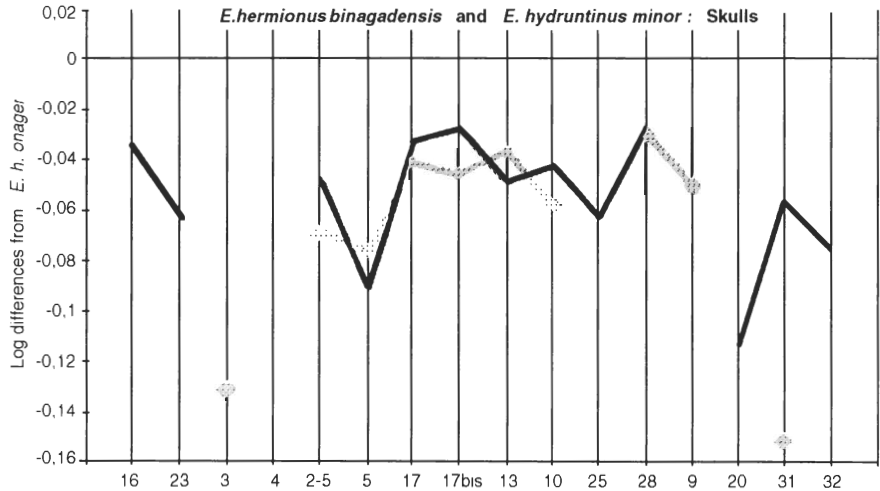
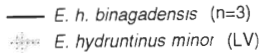
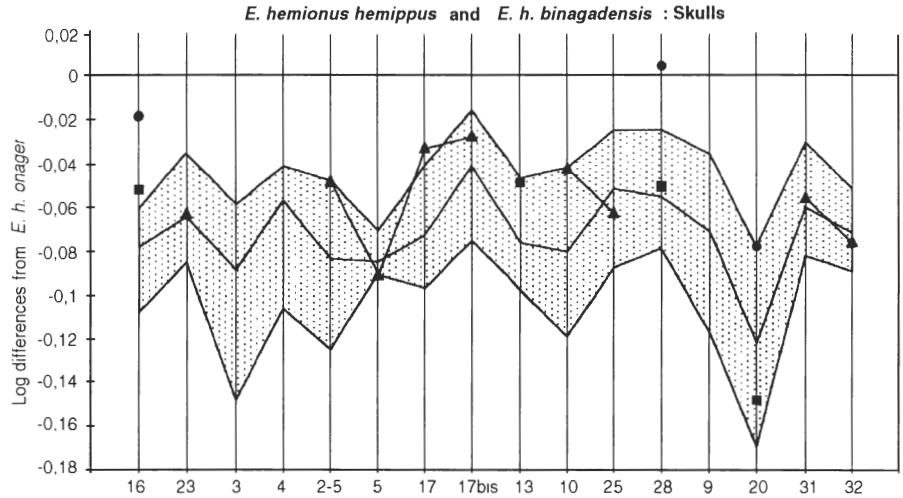
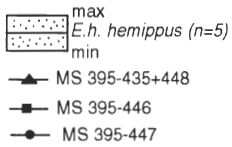


FIGURE 5 - Ratio diagrams of skull measurements of *E. hemionus binagadensis* and *E. hydruntinus minor* (Lunel Viel, France). n = number of specimens. *Diagramme de rapport des mesures du crâne de E. hemionus binagadensis et E. hydruntinus minor (Lunel Viel, France). n = nombre d'individus.*

Skull - Gadjiev described a juvenile skull (less than one year old) and two adult cranial fragments. There are moreover in the PIN collections two associated facial fragments of a skull (Fig. 1.5,6: 395-448 and 395-453) belonging to a young adult female, and two adult cranial fragments (Fig. 2; Fig. 3.1-3: 395-446 and 395-447). One of them may be associated with the facial fragments but there is no evident connection.

Most of measurements (Table 1) fall into the range of variation of the extinct *E. hemionus hemippus* of Syria (our sample comprises only 5 specimens). The muzzle is relatively shorter and wider but the skull belongs to a young adult which may account for this character. The width of the supra-occipital crest and the height of the cranium are somewhat larger in the specimen 395-447 (Fig. 4). We have no data on the relative development of the Vomer in the adults. According to Gadjiev (1953), the distan-

ce between the posterior border of the Vomer and the posterior border of the Palate in the juvenile skull is 90mm; its ratio to the anterior ocular line of the same skull (272mm) is close to what is found in Hemionus in general, and in *E. hemionus hemippus* in particular (Table 1).

Of *E. hydruntinus*, only three fragmentary skulls have been described; they come from the Middle Pleistocene of Lunel-Viel, France and have been referred to a new sub-species, *E. hydruntinus minor* (BONIFAY, 1991). The distance between Palate and Vomer and the depth of the narial opening seem shorter in the Lunel-Viel equid but the material is not perfectly preserved. The other dimensions are very similar in the Binagady and Lunel Viel skulls (Fig. 5; Table 1).

Upper cheek teeth - We have studied five more or less complete series and five isolated teeth

TABLE 2. Upper cheek teeth of Binagady: measurements in millimeters. MS = PIN (Paleontological Institute), Moscow; TB = Institute of Paleobiology and Museum, Tbilissi. OL = occlusal length; PL = protocone length; OW = occlusal width; PI = protocone index (PI = 100PL/OL). For M3, measurements were taken at mid-crown height. *Dents jugales supérieures de Binagady: mesures en millimètres. MS = PIN (Institut de paléontologie), Moscou; TB = Institut de paléobiologie et Museum, Tbilissi. OL = longueur occlusale, PL = longueur du protocone, OW = largeur occlusale; PI = indice protoconique (PI = 100PL/OL); no number = sans numéro. Sur la M3 les mesures ont été prises à mi-hauteur.*

		MS	MS	MS	MS	TB	TB
		395-454-2	395-7	395-311	395-448	222'	no number
P2	OL	30,0		30,5	33,0		
	PL	7,0		7,0	8,0		
	OW	21,0		21,0	22,0		
	PI	23,3		23,0	24,2		
P3	OL	22,7		24,0	26,0	26,0	
	PL	8,8		10,0	11,8	11,7	
	OW	22,0		22,0	24,5	24,5	
	PI	38,8		41,7	45,4	45,0	
P4	OL	22,0	23,0	24,3		24,0	
	PL	8,0	7,0	10,5		11,7	
	OW	23,0	24,0	21,0		24,5	
	PI	36,4	30,4	43,2		48,8	
M1	OL	19,0	19,0		22,0	21,5	
	PL	7,5	7,0		10,3	9,5	
	OW	20,0	22,0		21,5	23,0	
	PI	39,5	36,8		46,8	44,2	
M2	OL	20,0	19,1		22,2	21,5	
	PL	7,9	7,8		12,4	10,0	
	OW	20,0	21,5		22,0	22,0	
	PI	39,5	40,8		55,9	46,5	
M3	L	19,0	20,5		20,5	23,5	21,8
	PL	7,5	8,5		11,5	12,0	8,0
	W	18,0	19,0		20,2	18,7	19,0
	PI	39,5	41,5		56,1	51,1	36,7
P3 P4		TB 222					
	OL	22,0					
	PL	7,0					
	OW	21,5					
		PI		31,8			
M1 M2		TB 222		TB 222		TB no number	
	OL	20,0		21,5		21,0	
	PL	8,0		9,5		9,0	
	OW	20,0		21,2		21,1	
		PI		40,0		44,2	
				42,9			

FIGURE 6 - Upper cheek teeth of *E. hemionus hemippus*, *E. hemionus binagadensis*, and *E. cf. hydruntinus* of Binagady. PtL = protocone length; L = occlusal length; mm = millimeters. *Dents jugales supérieures de E. hemionus hemippus, E. hemionus binagadensis et E. cf. hydruntinus de Binagady. PtL = longueur du protocone; L = longueur occlusale. mm = millimètres.*

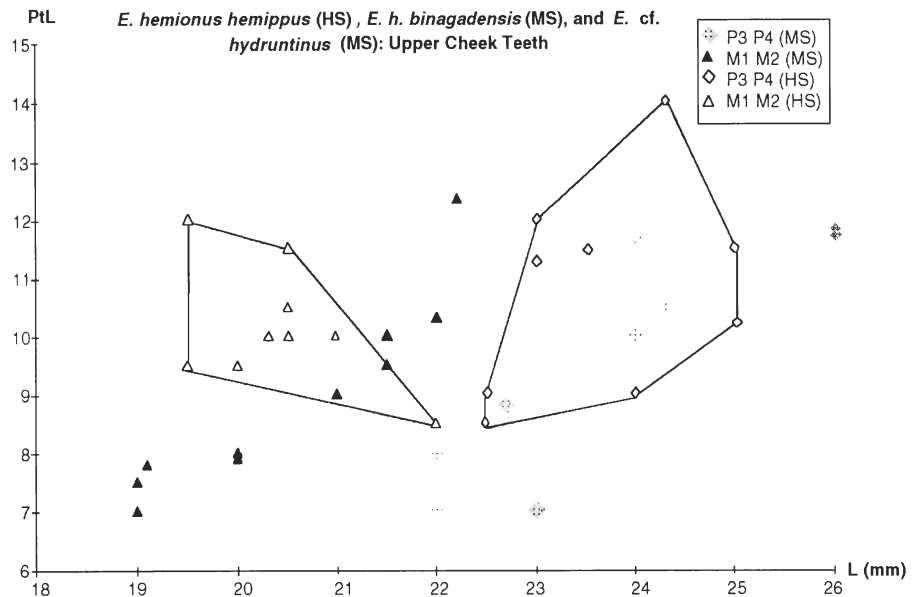


FIGURE 7 - Upper cheek teeth of *E. hydruntinus minor* of Lunel-Viel and *E. cf. hydruntinus* of Binagady. PtL = protocone length; L = occlusal length; mm = millimeters. - *Dents jugales supérieures de E. hydruntinus minor de Lunel Viel et E. cf. hydruntinus de Binagady. PtL = longueur du protocône; L = longueur occlusale. mm = millimètres.*

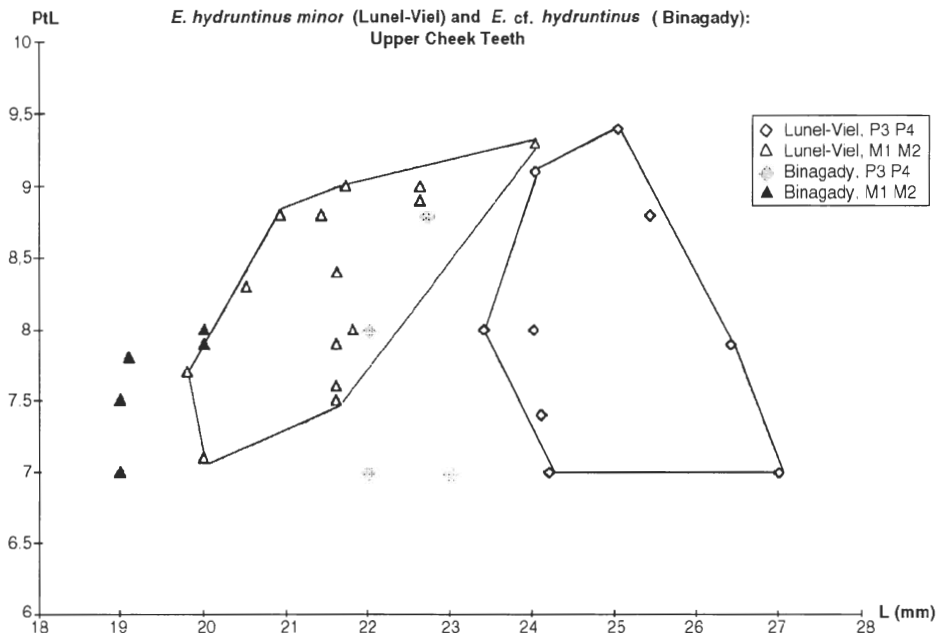
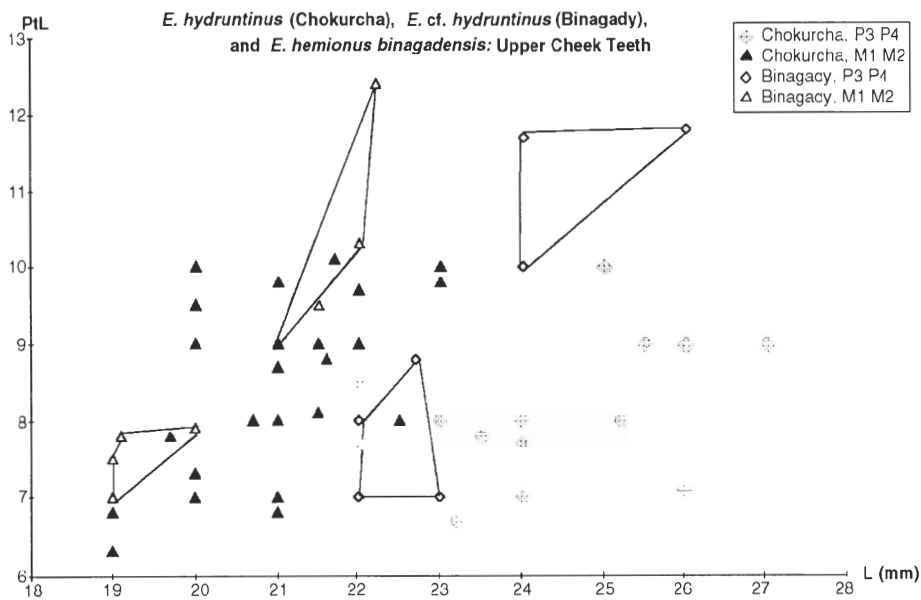


FIGURE 8 - Upper cheek teeth of *E. hydruntinus* (CHOKURCHA), *E. cf. hydruntinus* of Binagady, and *E. hemionus binagadensis*. PtL = protocone length; L = occlusal length; mm = millimeters. - *Dents jugales supérieures de E. hydruntinus (CHOKURCHA), E. cf. hydruntinus de Binagady et E. hemionus binagadensis. PtL = longueur du protocône; L = longueur occlusale. mm = millimètres.*



(Table 2). The plis caballin are usually lacking, and the post-protoconal groove is very deep. As can be seen on the diagram of dispersion of protocone length versus length of the P3P4 and M1M2 (Fig. 6), the teeth of Binagady do not fit well with our sample of *E. hemionus hemippus*: several teeth (in particular the teeth belonging to the skull 395-453, Fig. 1.4) are somewhat larger. On the other hand, several other have smaller protocônes. We have thus at Binagady some teeth that can be nearly (but not altogether) referred to *E. hemionus hemippus*, while some other cannot be referred to any Hemione at all. It may be argued that the differ-

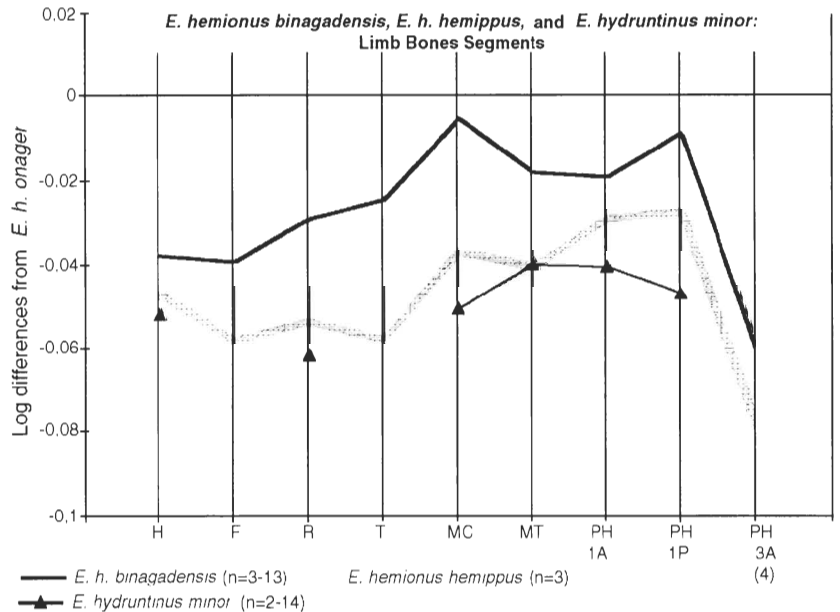
ences are due to different degrees of wear, but while, admittedly, the teeth of the skull are not very worn, the series 222' has long protocônes though it is not particularly young (Fig. 1.2). On the other side, the premolar 222 (Fig. 1.1) has a very short protocone though it is not very worn.

Although the material is very poor, we have decided to tentatively distinguish two groups and to refer the teeth with small protocônes to *E. cf. hydruntinus*. Compared to *E. hydruntinus minor*, these teeth have similar protocone lengths (Fig. 7) but they are smaller. The same observation can be

	<i>Equus hemionus hemippus</i>					<i>E. hemionus binagadensis</i>			<i>E. hy. minor</i>
	HS 1	HS 2	HS 3	HS 4	HS 5	MS 395-458	TB no number	Gadjiev 318-320	Bonifay
Maximal L (1)	315,0	320,0	320,0	325,0	355,0				
Mand. angle	99,0	86,0	89,0		99,0		105,0		
diastema	51,0	55,5		60,0	58,0	61,0		59-64	66,0
Premolar L (3)	72,0	75,0	75,0	73,0	78,0	73,0			74,2-79,0
Molar L (4)	70,0	70,0	66,0	68,0	69,0	66,0	71,0		66,2-71,2
P2-M3 L (5)	142,0	145,0	140,0	140,0	146,0	138,0		129-155	138,7-151,0
Symphysis L (13)	55,0	59,0	61,0	61,0		52,0		57-60	68,0
W at I3 (7)	40,0	38,0	43,5	40,0	43,0	48,0		48-50	48,9
H Asc.Ramus (9)	170,0	156,0	154,0	140,0	190,0				
H front of P2 (12)		35,5	44,0	34,0	41,0	51,0			
H at P4-M1 (11)		57,0	56,0	49,0	58,0	65,0	65,0		
H behind M3 (10)		84,5	62,0	72,0	94,0	83,0	93,0		
Muzzle L (2)	75,0	87,0	75,0	84,0	80,0	80,0			
Min. Muzzle W (14)	29,0		30,0	27,0		33,0			19,5

TABLE 3 - Mandible measurements in millimeters of Hemiones, modern (Hemippes) and fossil (*E. hemionus binagadensis* nov. subsp.), and of *E. hydruntinus minor*. Same abbreviations as in Tables 1 and 2. The data for *E. hydruntinus minor* were published by Bonifay 1991. Some data for *E. hemionus binagadensis* come from Gadjiev 1953. L = length; Mand. = mandibular; W = width; H = height; Asc. = ascending; Min. = minimum. In the left column, the numbers between brackets refer to Eisenmann et al. 1988. *Mesures mandibulaires en millimètres d'Hémionés actuels (Hémippes) et fossiles (E. hemionus binagadensis nov. subsp.), et de E. hydruntinus minor. Les données pour E. hydruntinus minor sont de Bonifay (1991). Quelques données pour E. hemionus binagadensis sont de Gadjiev (1953). L = longueur; Mand. = mandibule; W = Largeur; H = hauteur; Asc. = ascendant; Min. = minimum. Dans la colonne de gauche les codes entre parenthèses renvoient à Eisenmann et al 1988.*

FIGURE 9 - Ratio diagram of limb bones lengths of *E. hemionus binagadensis*, *E. hemionus hemippus*, and *E. hydruntinus minor*. H = humerus; F = femur; R = radius; T = tibia; MC = third metacarpal; MT = third metatarsal; Ph I A = anterior first phalanx; Ph I P = posterior first phalanx; Ph III A = anterior third phalanx (4 = maximal width). n = number of specimens. *Diagramme de rapport de la longueur des os des membres de E. hemionus binagadensis, E. hemionus hemippus et E. hydruntinus minor. H = humérus; F = fémur; R = radius; T = tibia; MC = troisième métacarpien; MT = troisième métatarsien; Ph I A = première phalange antérieure; Ph I P = première phalange postérieure; Ph III A = troisième phalange antérieure (4 = largeur maximale). n = nombre d'individus*



made when they are compared with the samples of Prolom 2 (Lower Würm of Crimea; Eisenmann & Baryshnikov 1995) and of the Mousterian of Chokurcha, Crimea (Fig. 8), referred to *E. hydruntinus* (VERESCHAGIN & BARYSHNIKOV, 1980). The teeth that are the more similar to this sub-sample of Binagady come from the Mousterian of Shkul, Tabun B, and Kebara (Eisenmann 1992b).

Most of the other teeth of Binagady (including those belonging to the skull 395-453) fall outside the range of *E. hydruntinus* of Crimea and Israel.

Mandible - Belonging to the PIN collections, one mandible of an adult female (MS 395-458) lacks only the ascending ramus. Gadjiev (1953) gives some measurements for 3 adult specimens (Table 3). Dimensions and proportions are similar to those of the extinct *E. hemionus hemippus*, but the heights in front of P2 and at the level of P4-M1 seem bigger at Binagady. According to the data published by Bonifay (1991), *E. hydruntinus minor* has a longer and much narrower symphysis, but the given width measurement (19.5mm) is

FIGURE 10 - Ratio diagram of third metacarpal measurements of *E. hemionus binagadensis* and *E. hemionus hemippus*. 1 = maximal length; 3 = breadth at mid-diaphysis; 4 = antero-posterior diameter (APD) at mid-diaphysis; 5 = proximal breadth; 6 = proximal APD; 10 = distal breadth at the supra-articular tuberosities; 11 = distal articular breadth; 12 = maximal APD of the keel; 13 = minimal APD of the medial condyle; 14 = maximal APD of the medial condyle; 7 = diameter of the articular facet for the magnum; 8 = diameter of the anterior articular facet for the unciform. n = number of specimens. *Diagramme de rapport des mesures du troisième métacarpien de E. hemionus binagadensis et E. hemionus hemippus*. 1 = longueur maximale; 3 = largeur au milieu de la diaphyse 4 = diamètre antéro-postérieur (DAP) au milieu de la diaphyse; 5 = largeur proximale; 6 = DAP proximale; 10 = largeur distale au niveau des tubérosités supra-articulaires; 11 = largeur distale articulaire; 12 = DAP maximal de la quille; 13 = DAP minimal du condyle interne; 14 = DAP maximal du condyle interne; 7 = diamètre de la facette articulaire du magnum; 8 = diamètre de la facette articulaire antérieure de l'unciforme. n = nombre d'individus

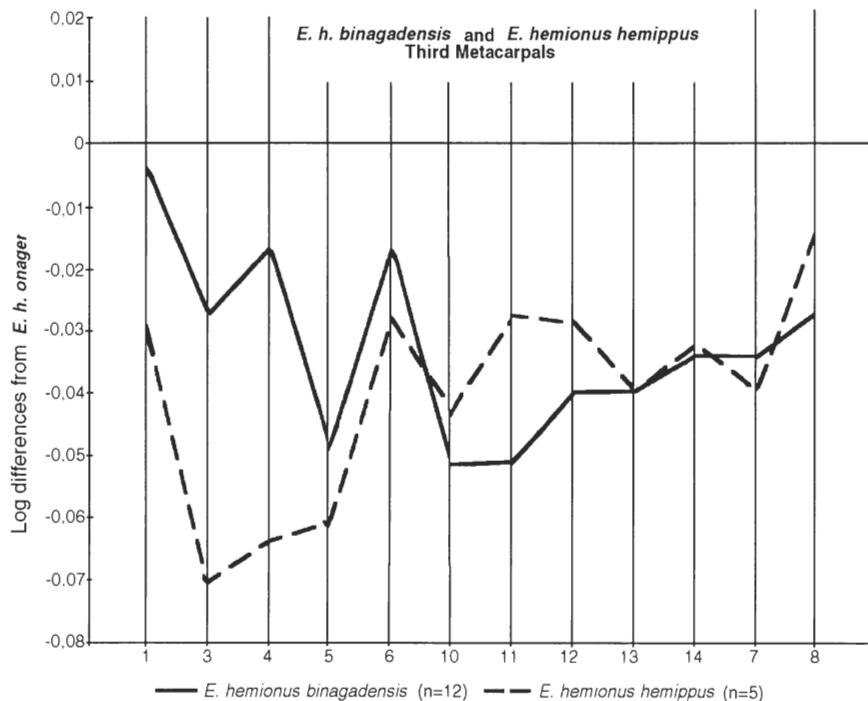


TABLE 4 - Limb bones lengths in millimeters of Hemiones, modern (Onagers and Hemippes) and fossil (*E. hemionus binagadensis* nov. subsp.), and of *E. hydruntinus minor*. n = number of specimens; x = mean. Other abbreviations as in *Longueur des os des membres d'Hémiones actuels (Onagers et Hémippes) et fossiles (E. hemionus binagadensis nov. subsp.), et de E. hydruntinus minor en millimètres*. n = nombre d'individus. x = moyenne. Autres abréviations comme dans la Figure 9.

	<i>E. h. onager</i>		<i>E. h. hemippus</i>		<i>E. h. binag.</i>		<i>E. hydr. minor</i>	
	n	x	n	x	n	x	n	x
H	10	241,3	3	216,3	7	221,1	1	214
F	10	329,7	3	288,3	6	301,0		
R	10	293,5	3	259,3	7	274,4	2	254,5
T	10	313,0	3	273,8	6	295,7		
MC	10	214,1	3	196,5	12	209,8	8	190,5
MT	10	250,8	3	228,3	10	240,5	14	228,7
Ph I A	10	76,3	3	71,3	3	73,0	2	69,5
Ph I P	10	71,2	3	66,8	7	69,8	7	63,9
Ph III A 4	8	54,0	3	45,8	3	47,0		

probably not the equivalent of our minimal width of the symphysis.

The cups are normally developed on all the incisors of MS 395-458. Gadjiev (1953) has noted the occurrence of imperfect cups (I2 and I3), and even the lack of cup on one I3.

Lower cheek teeth - The material is very poor: in Tbilissi collections, one rather young series P3 to M3 without number (the M3 is not worn) and one isolated right premolar (without number); in PIN collections, a moderately worn complete series measuring 138mm (395-458), and a fragmentary right molar (399-126). In the young series, the lingual groove is very shallow, thus resembling some Hemiones in the little worn series (Fig. 3.5), stenonine in the rest of the material (Fig. 3.6). The vestibular groove is short in all of the molars but one

(399-126: Fig. 3.4). According to Gadjiev (1953, p. 32), the vestibular groove is usually short on the molars, but may be occasionally deep.

One of the points supposed to characterize *E. hydruntinus*, and to distinguish it from Hemiones and Asses, is the depth of the vestibular groove. There are, however, even in classical *E. hydruntinus* samples (for example Roterberg), some molars in which the vestibular groove is shallow (4 out of 24 M1 or M2). It remains yet that according to that character, most of Binagady teeth are close to Hemiones, not to *E. hydruntinus*.

Limb bones segments - As usually in fossil samples, metapodials are more numerous than other limb bones. There are, however, at Binagady some other entire proximal and distal bones so that we were able to compare their relative

TABLE 5 - Third metacarpal measurements in millimeters. n = number of specimens; x = mean; min = minimum; max = maximum; s = standard deviation; v = coefficient of variation ($v = 100s/x$). Same codes as in Figure 10. *Mesures de troisièmes métacarpes en millimètres. n = nombre d'individus; x = moyenne; min = minimum; max = maximum; s = écart type; v = coefficient de variation ($v = 100s/x$). Pour les codes des mesures, voir Figure 10.*

		<i>E. hemionus binagadensis</i>						<i>Equus cf. hydruntinus</i>			
		n	x	min	max	s	v	TB 222	TB 222-5	MS 173	TB 222-11
1	12	209,8	197,0	224,0	8,56	4,08	213,5	211,0	205,0	230,0	
3	12	24,3	23,0	26,5	1,27	5,24	28,0	26,0	26,5	27,0	
4	12	20,5	18,0	22,0	1,25	6,09	23,0	22,0	21,0	23,0	
5	12	38,6	36,0	41,0	1,61	4,17	41,0	42,0	40,0	42,0	
6	12	26,1	24,0	27,0	0,92	3,53	28,0	26,0	26,0	27,5	
10	12	34,4	32,0	37,0	1,42	4,13	36,6	38,1	35,0	36,7	
11	12	34,2	32,6	35,5	0,93	2,73	37,8	36,7	36,5	37,5	
12	12	26,8	24,9	28,5	0,91	3,38	28,0	26,6	28,5	28,5	
13	12	22,0	20,1	23,5	0,86	3,90	23,0	22,0	23,0	24,0	
14	12	24,0	22,0	25,5	0,97	4,05	26,0	24,7	24,5	26,2	
7	12	31,7	30,0	34,0	1,50	4,73	33,5	33,0	32,0	33,0	
8	12	11,6	10,0	13,0	0,86	7,45	12,2	14,0	11,0	12,0	
		<i>E. hydruntinus minor</i>						<i>E. hemionus hemippus</i>			
		n	x	min	max	s	v		HS 2	HS 3	HS 5
1	8	190,5	187,0	193,5	2,35	1,23	1	195,0	193,4	205,0	
3	8	24,8	23,0	26,0	0,84	3,40	3	21,7	21,0	23,5	
4	8	21,0	19,5	22,5	1,00	4,76	4	18,0	17,0	19,5	
5	8	35,3	33,5	38,0	1,28	3,62	5	35,9	38,0	38,5	
6	8	23,4	22,5	25,0	0,89	3,81	6	23,9	24,1	26,0	
10	8	32,5	31,0	34,5	1,17	3,61	10	35,5	34,7	35,0	
11	10	33,6	33,0	35,0	0,80	2,37	11	35,3	35,6	36,5	
12	10	25,4	23,0	26,5	1,02	4,00	12	26,5	27,7	28,0	
13	9	21,3	20,2	21,7	0,48	2,27	13	21,3	20,5	23,5	
14	9	22,8	21,5	23,5	0,67	2,93	14	23,6	23,1	25,0	
7	8	29,3	27,0	31,0	1,31	4,48	7	29,8	31,2	33,0	
8	9	10,3	8,5	12,0	0,94	9,14	8	12,7	12,5	12,0	

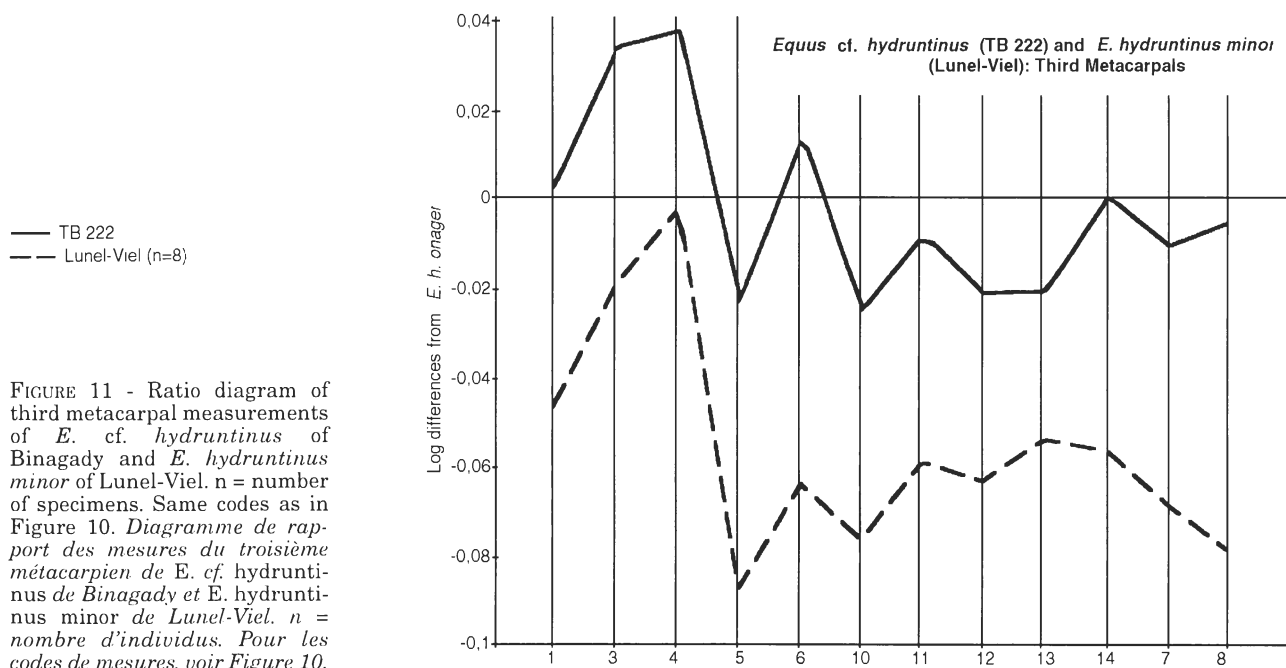


FIGURE 11 - Ratio diagram of third metacarpal measurements of *E. cf. hydruntinus* of Binagady and *E. hydruntinus minor* of Lunel-Viel. n = number of specimens. Same codes as in Figure 10. *Diagramme de rapport des mesures du troisième métacarpien de E. cf. hydruntinus de Binagady et E. hydruntinus minor de Lunel-Viel. n = nombre d'individus. Pour les codes de mesures, voir Figure 10.*

lengths (Table 4) to those of *E. hemionus hemippus* and *E. hydruntinus minor* (Fig. 9). No detailed discussion is possible on so small samples. It appears only that the Binagady Hemione is the largest, and that *E. hydruntinus minor*, close in size to *E. hemionus hemippus*, seems to differ both

from the Binagady form and from the Hemippe, at least by the relative lengths of the third metacarpals and metatarsals.

Third metacarpals (MC III) - We have measured 16 specimens in Moscow and Tbilissi. Twelve of them may belong to a small *E. hemionus*, yet

TABLE 6 - Third metatarsal measurements in millimeters. Same codes and abbreviations as in Table 5 and Figure 10, but 7 = diameter of the articular facet for the large cuneiform; 8 = diameter of the articular facet for the cuboid. *Mesures du troisième métatarsien en millimètres. Pour les abréviations et codes, voir Tableau 5 et Figure 10, sauf 7 = diamètre de la facette articulaire pour le grand cunéiforme; 8 = diamètre de la facette articulaire pour le cuboïde.*

<i>E. hemionus binagadensis</i>							<i>E. cf. hydr. E.h.hemip.</i>		
	n	x	min	max	s	v	TB n	n'	HS 2
1	10	240,5	221,0	251,0	10,01	4,16	238,0		224
3	10	24,0	22,0	25,5	1,29	5,36	27,0		22
4	10	24,7	23,0	26,0	0,96	3,90	27,3		20
5	10	37,0	35,0	39,0	1,26	3,41	40,5		33,5
6	10	31,6	30,0	33,0	1,22	3,87	35,0		31
10	10	33,7	31,0	36,0	1,78	5,28	38,0		33,5
11	10	34,4	32,0	37,2	1,70	4,94	38,5		32,5
12	10	27,6	26,0	30,0	1,23	4,46	29,0		27,5
13	10	21,9	20,0	22,8	0,83	3,78	23,6		20,7
14	10	24,4	22,4	26,0	1,00	4,09	26,0		23,1
7	10	33,9	31,0	35,0	1,23	3,62	37,5		30,5
8	10	8,5	7,0	10,0	0,96	11,31	12,0		8,1

<i>E. hydruntinus minor</i>							<i>E. hemionus hemippus</i>	
	n	x	min	max	s	v	HS 3	HS 5
1	14	228,7	225,0	234,0	2,95	1,29	225,0	236,0
3	13	24,8	23,0	26,9	1,00	4,02	21,0	23,0
4	14	24,8	22,5	26,0	1,00	4,04	20,0	22,8
5	13	36,9	34,0	40,0	1,62	4,39	35,5	36,0
6	13	29,7	28,0	31,0	0,88	2,95	30,0	30,0
10	14	33,2	32,0	34,2	0,83	2,52	34,0	35,0
11	15	33,6	33,0	34,5	0,59	1,74	35,2	35,0
12	14	26,1	25,0	27,0	0,56	2,15	28,0	29,0
13	14	20,7	20,0	21,0	0,38	1,83	20,4	22,5
14	15	23,0	22,1	24,0	0,47	2,02	23,0	24,0
7	11	32,1	30,5	34,5	1,25	3,88	35,0	33,0
8	10	7,6	7,0	8,5	0,60	7,84	8,0	9,0

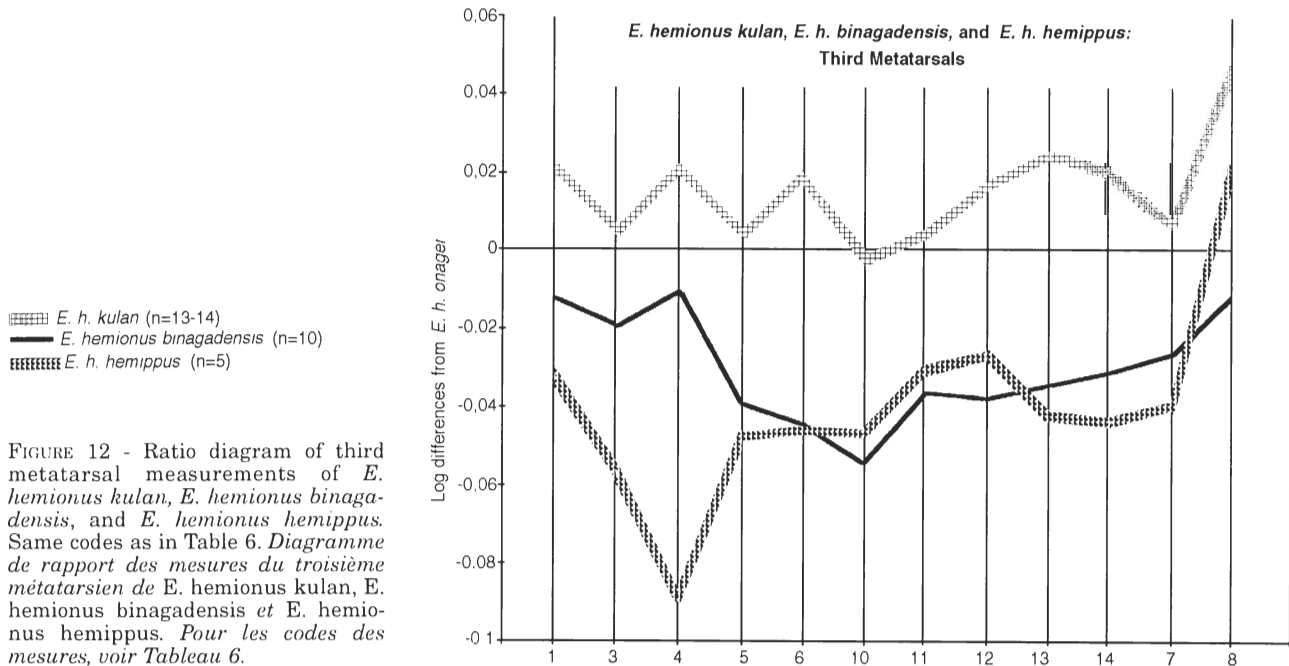


FIGURE 12 - Ratio diagram of third metatarsal measurements of *E. hemionus kulan*, *E. hemionus binagadensis*, and *E. hemionus hemippus*. Same codes as in Table 6. *Diagramme de rapport des mesures du troisième métatarsien de E. hemionus kulan, E. hemionus binagadensis et E. hemionus hemippus. Pour les codes des mesures, voir Tableau 6.*

larger than *E. hemionus hemippus* by the total length and the diaphysis dimensions (Fig. 10). Table 5 gives their statistical description. One MC III (TB 222) has a wider and deeper diaphysis (Fig. 11). We refer the last one to *E. cf. hydruntinus*. Possibly three other MC III belong also to an

E. hydruntinus. All four specimens are listed separately in Table 5.

Third metatarsals (MT III) - Eleven specimens were measured (Table 6). Ten of them may belong to the same form of Hemione. The maximal leng-

FIGURE 13 - Ratio diagram of third metatarsal measurements of *E. cf. hydruntinus* of Binagady and *E. hydruntinus minor* of Lunel-Viel. n = number of specimens. Same codes as in Table 6. *Diagramme de rapport des mesures du troisième métatarsien de E. cf. hydruntinus de Binagady et E. hydruntinus minor de Lunel-Viel. n = nombre d'individus. Pour les codes de mesures, voir Tableau 6.*

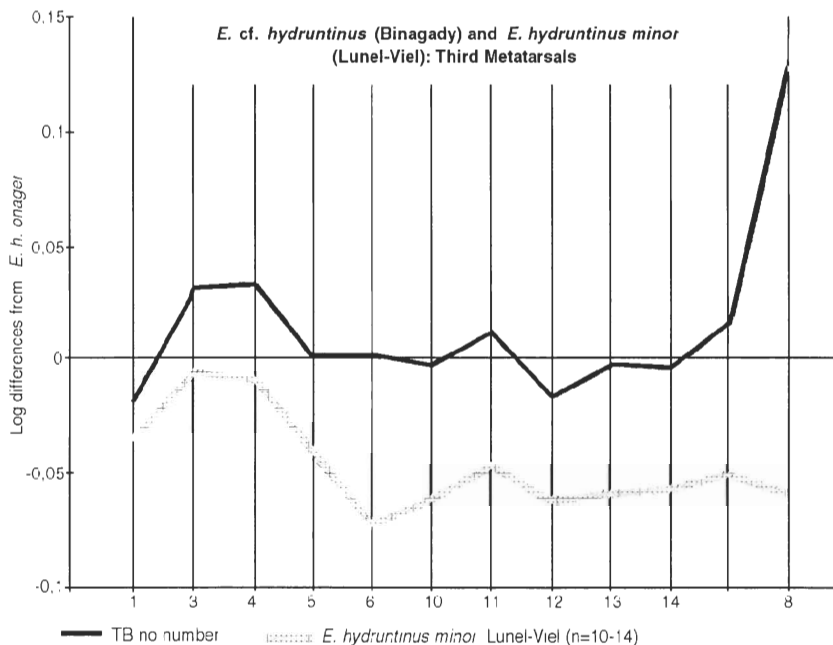
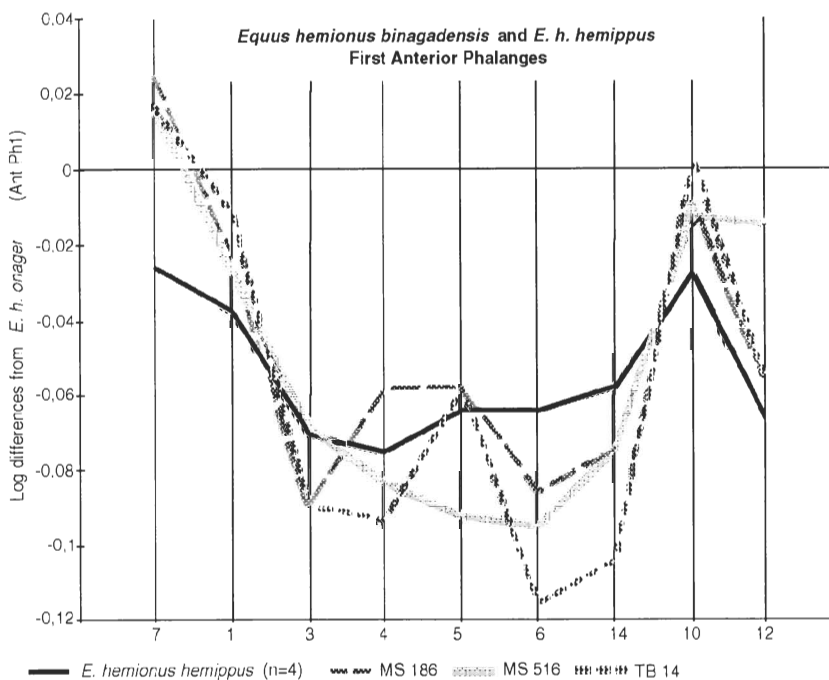


FIGURE 14 - Ratio diagram of first anterior phalanges measurements of *E. hemionus binagadensis* and *E. hemionus hemippus*. 1 = maximal length; 3 = breadth at mid-diaphysis; 4 = proximal breadth; 5 = proximal antero-posterior diameter; 6 = distal breadth at the supra-articular tuberosities; 7 = greatest length of trigonum phalangis; 10 = medial supratuberosital length; 12 = medial infratuberosital length; 14 = distal articular breadth. n = number of specimens. *Diagramme de rapport des mesures des premières phalanges antérieures de E. hemionus binagadensis et E. hemionus hemippus. 1 = longueur maximale; 3 = largeur au milieu de la diaphyse 4 = largeur proximale; 5 = diamètre antéro-postérieur proximal; 6 = largeur distale supra-articulaire; 7 = longueur maximale du trigonum phalangis; 10 = longueur supra-tubérositaire médiale; 12 = longueur infra-tubérositaire médiale; 14 = largeur distale articulaire. n = nombre d'individus.*



th and the dimensions of the diaphysis are bigger than in *E. hemionus hemippus* (Fig. 12), smaller than in *E. hemionus kulan*, and *E. hemionus onager*. As for the MC III, the epiphyses are about the same size as in the Hemippe, or smaller. One MT III (Tbilissi, without number) has a wider and deeper diaphysis; it is larger than *E. hydruntinus minor*, but has similar proportions (Fig. 13); we refer it tentatively to *E. cf. hydruntinus*.

First phalanges - Three anterior first phalanges are longer and slenderer than those of *E. hemionus hemippus* (Fig. 14). Specimen TB14 is especially slender because it belonged to a subadult animal. The three anterior phalanges are also longer and slenderer than the first phalanges of *E. hydruntinus minor* (Table 7). The seven posterior first phalanges show the same characters (Fig. 15; Table 8, 9).

TABLE 7 - First anterior phalanx measurements in millimeters. Same codes as in Figure 14. U 35.73 = specimen collected at Ras al Bassit, Syria, Late Bronze (Gagnier 1986); LV = Lunel-Viel, France; SCM = Qabrestan, Qazvin, Iran, III-IV millennium BC. *Mesures des premières phalanges antérieures en millimètres. Pour les codes des mesures, voir Figure 14. U 35.73 = spécimen récolté à Ras al Bassit, Syrie, Bronze final (Gagnier 1986); LV = Lunel Viel, France; SCM = Qabrestan, Qazvin, Iran, III-IV millénaires BC.*

		<i>E. hemionus hemippus</i>				<i>E. hydruntinus minor</i>	
ANT.		HS 2	HS 3	HS 5	U 35.73	LV 1645	LV 13630
1		70,8	70,0	73,0	67,0	69,0	70,0
3		21,3	20,8	21,5	20,0	21,0	23,0
4		34,4	35,0	36,0	33,0	36,0	36,7
5		26,5	27,0	28,0	25,0	28,0	28,0
6		31,5	33,0	32,5	29,5	31,0	32,0
7		44,5		49,0	42,5	46,0	49,0
10		54,0		56,0	52,0	53,0	55,0
12		9,0		9,0	8,5	8,5	8,3
14		30,0	31,6	32,0	31,0	30,0	30,0
		<i>E. h. binagadensis</i>			<i>E. cf. hem.binagadensis</i>		
ANT.		MS 395-186	MS 395-516	TB 14	SCM 37	SCM 50	SCM 95
1		72,5	72,0	74,5	79	77,5	79,6
3		20,0	21,0	20,0	24	23,9	22,5
4		36,0	34,0	33,2	37,1	37,2	38,4
5		27,0	25,0	27,0	27	26,9	27,7
6		30,1	29,5	28,1	33,2	31,6	31,4
7		51,0	50,0	50,0		52,6	54
10		57,5	57,0	59,0		59,7	56,7
12		9,0	10,0	9,0		10,4	11
14		30,0	30,0	28,0		35,7	33,6

E. hemionus kulan, *E. h. binagadensis*, and *E. h. hemippus*:
First Posterior Phalanges

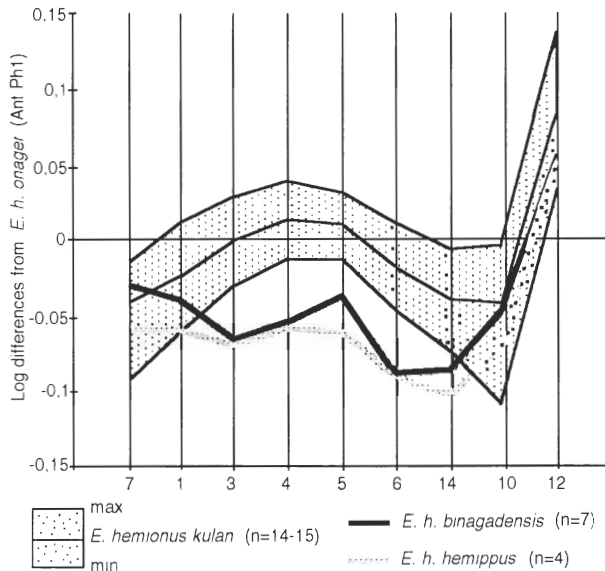


FIGURE 15 - Ratio diagram of first posterior phalanges measurements of *E. hemionus kulan*, *E. hemionus binagadensis*, and *E. hemionus hemippus*. max = maximum; min = minimum; n = number of specimens. Same codes as in Figure 14. *Diagramme de rapport des mesures des premières phalanges postérieures de E. hemionus kulan, E. hemionus binagadensis et E. hemionus hemippus. n = nombre d'individus; max = maximum; min = minimum. Pour les codes de mesures voir Figure 14.*

EQUIDS OF QAZVIN

One of us (MM) is currently writing a PhD thesis on the faunas of several Holocene sites situated in the plain of Qazvin, West of Tehran (Iran) (Mashkour et al., in press). Most of *Equus* upper cheek teeth may be referred without difficulty to *E. caballus* and *E.*

hemionus onager, but several specimens (Fig. 16) are remarkable by their very short protocones (Table 10). Compared to the fossils of Lunel Viel and Chokurcha (Fig. 17), the teeth of Qazvin are larger but have similar protocone lengths. We tentatively refer them to *E. cf. hydruntinus*.

Among the first phalanges of *Equus*, three specimens (Table 7) are a little larger but look otherwise similar to the first anterior phalanges of Binagady. Two other specimens (Table 8) look very much alike the first posterior phalanges of Binagady, although they are also a bit larger (Fig. 18). We refer them to *E. hemionus cf. binagadensis*.

DISCUSSION AND CONCLUSIONS

Thus, during the Holocene of Iran, as well as during the Middle-Upper Pleistocene of Azerbaidjan, a small number of teeth (and possibly limb bones) are similar to specimens elsewhere referred to *E. hydruntinus*. To refer them to an Hemione, would amount to stretching the variation far beyond the range known in all present subspecies of *E. hemionus* (Hemippe included). We refer them to *E. cf. hydruntinus*.

At the same times and in the same places there is moreover evidence of a small Equid, larger than the Hemippe of Syria, but smaller and slenderer than either *E. hemionus onager* or *E. hemionus kulan*. There is no anatomical reason to assign this small Equid to any other species than *E. hemionus*. To assign it to *E. hydruntinus* would be in contradiction with the very definition of *E. hydruntinus*' dental characters (Stehlin & Graziosi, 1935). We refer to it under the name of *E. hemionus binagadensis* or *E. cf. hemionus binagadensis*.

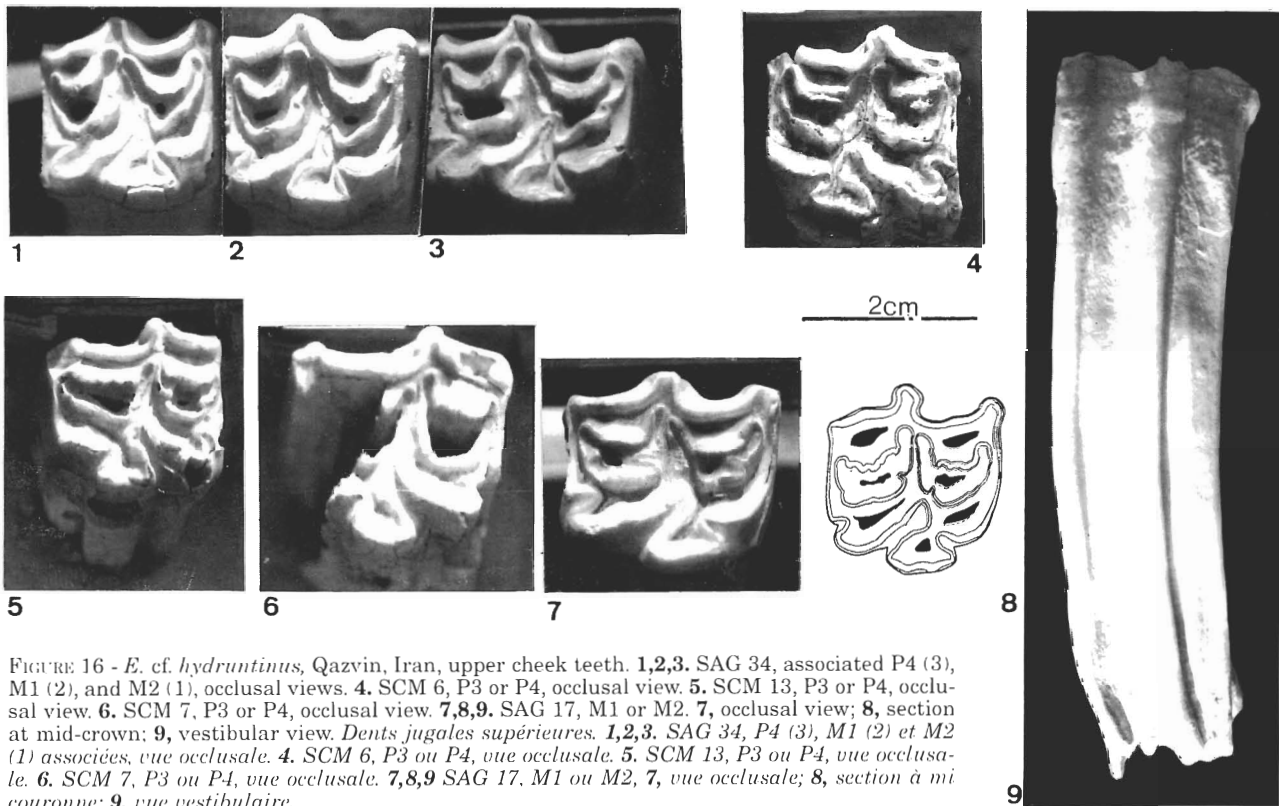


FIGURE 16 - *E. cf. hydruntinus*, Qazvin, Iran, upper cheek teeth. 1,2,3. SAG 34, associated P4 (3), M1 (2), and M2 (1), occlusal views. 4. SCM 6, P3 or P4, occlusal view. 5. SCM 13, P3 or P4, occlusal view. 6. SCM 7, P3 or P4, occlusal view. 7,8,9. SAG 17, M1 or M2. 7, occlusal view; 8, section at mid-crown; 9, vestibular view. *Dents jugales supérieures*. 1,2,3. SAG 34, P4 (3), M1 (2) et M2 (1) associées, vue occlusale. 4. SCM 6, P3 ou P4, vue occlusale. 5. SCM 13, P3 ou P4, vue occlusale. 6. SCM 7, P3 ou P4, vue occlusale. 7,8,9 SAG 17, M1 ou M2, 7, vue occlusale; 8, section à mi couronne; 9, vue vestibulaire.

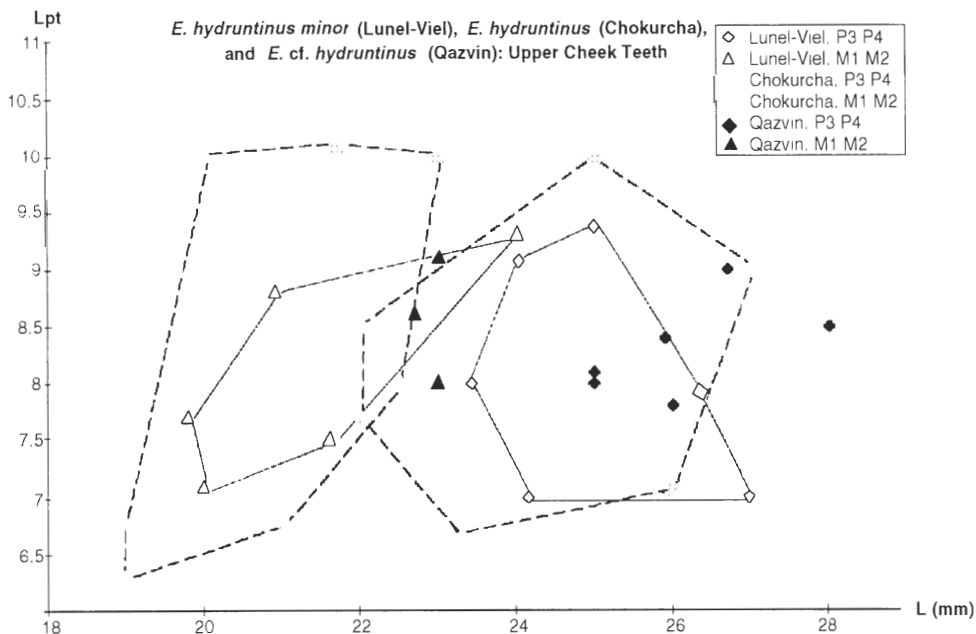


FIGURE 17 - Upper cheek teeth of *E. hydruntinus minor* (Lunel-Viel), *E. hydruntinus* (Chokurcha), and *E. cf. hydruntinus* (Qazvin). Lpt = protocone length; L = occlusal length; mm = millimeters. *Dents supérieures* de *E. hydruntinus minor* de Lunel-Viel, *E. hydruntinus* (Chokurcha) et *E. cf. hydruntinus* (Qazvin). Lpt = longueur du protocône; L = longueur occlusale. mm = millimètres.

It seems that species of *Equus* quite similar to modern species may be morphologically recognized with confidence as early as the Middle Pleistocene (Eisenmann 1992a). At least this is certainly the case for the Plains Zebras (*E. mauritanicus*) and the true Horses (*E. mosbachensis*). It is probably

also the case for *E. hydruntinus*: although Azzaroli (1990) does not include the late middle Pleistocene equid of Lunel-Viel in *E. hydruntinus*, most of its features agree with an attribution to a subspecies of this form (Bonifay 1991; Caloi 1997; Forsten & Ziegler 1995). In the Middle Pleistocene of Greece,

TABLE 8 - First posterior phalanx measurements in millimeters. Same codes as in Figure 14. SAG = Sagzabad, Qazvin, Iran, I-II millennium BC. *Mesures de premières phalanges postérieures en millimètres. SAG = Sagzabad, Qazvin, Iran, I-II millénaires BC. Pour les codes de mesures voir Figure 14.*

POST.	<i>E. h. hemippus</i>			<i>E. hemionus binagadensis</i>		
	HS 2	HS 3	HS 5	MS 395-189	MS 395-521	MS 395-518
1	66,7	65,2	68,5	67,7	74,0	67,0
3	21,1	20,3	21,5	20,0	23,0	20,0
4	35,1	36,3	36,5	36,0	39,0	35,0
5	26,5	26,9	27,0	27,0	30,0	27,0
6	29,1	30,2	30,0	30,0	32,2	29,5
7	40,5		44,0	43,5	48,5	44,0
10	49,0		51,0	51,0	56,0	51,0
12	11,0		12,0	11,0	11,5	11,0
14	27,0	29,0	28,5	29,0	32,2	28,0

POST.	<i>E. hemionus binagadensis</i>			<i>E. cf. hemion. binagadensis</i>		
	MS 395-516	MS 395-520	TB no n°	TB 5	SAG 87	SAG 112
1	71,5	70,0	71,1	67,0	74,1	73,4
3	21,5	22,0	22,0	19,0	21,3	21,6
4	37,0	37,0	36,8	33,2	39,6	39,3
5	29,0	27,7	30,1	27,0	31,2	30,6
6	30,0	29,0	31,0	27,1	32,3	32,0
7	48,0	44,0	46,0	40,0		45,8
10	53,0	53,0	52,0	50,0		54,8
12	12,0	12,0	11,8	11,0		11,6
14	28,0	29,1	30,5	26,9	30,8	31,5

POST.	<i>E. hemionus binagadensis</i>					
	n	x	min	max	s	v
1	7	69,8	67,0	74,0	2,66	3,81
3	7	21,1	19,0	23,0	1,43	6,77
4	7	36,3	33,2	39,0	1,82	5,02
5	7	28,3	27,0	30,1	1,42	5,01
6	7	29,8	27,1	32,2	1,60	5,35
7	7	44,9	40,0	48,5	2,93	6,52
10	7	52,3	50,0	56,0	1,98	3,78
12	7	11,5	11,0	12,0	0,47	4,11
14	7	29,1	26,9	32,2	1,77	6,09

POST.	<i>E. hydruntinus minor</i>					
	n	x	min	max	s	v
1	7	63,9	61,0	66,0	1,92	3,01
3	7	21,4	21,0	22,0	0,53	2,49
4	7	36,9	36,0	38,0	0,92	2,48
5	7	27,7	26,8	29,0	0,82	2,95
6	7	30,8	30,0	32,0	0,82	2,66
7	6	39,1	37,0	40,0	1,43	3,66
10	7	46,2	43,0	49,0	2,00	4,32
12	7	12,2	11,0	13,5	0,81	6,62
14	6	28,8	28,0	29,7	0,74	2,56

TABLE 9 - First posterior phalanx measurements in millimeters. Same codes as in Figure 14 and Table 6. *Mesures de premières phalanges postérieures en millimètres. Pour les codes de mesures voir Figure 14 et Tableau 6.*

E. petraloniensis, is closely related to *E. hydruntinus* (TSOUKALA, 1991). It is probable that *E. hemionus* existed also by that time. Therefore, from the biochronological point of view, it is not surprising to find a quite differentiated Hemione together with an *E. hydruntinus* in the early late Pleistocene of Binagady. The question is, however, if there can be ecological room for two species which are both assumed to be adapted to the same kind of biotope. Judging by what happens in Africa with Bovids, and even with two species of Equids (Grevy's

Zebras and African Wild Ass), such coexistence is possible, although unusual for Equids in Europe.

In Azerbaidjan, these small Equids (*E. cf. hydruntinus* and *E. hemionus binagadensis*) coexisted with a middle-sized Horse (not a large one as is usual in Europe; Forsten and Ziegler, 1995). In Iran, a middle-sized Horse was also present, but there are, moreover, numerous fossils referable to a middle-sized Hemione. If our assignment of the Qazvin small form to *E. hemionus* is correct, it appears that two subspecies of *E. hemionus* were more or less sympatric in Iran during the Holocene. Since the Qazvin material is the result of hunting, one may suppose that maybe they were not hunted on exactly the same territories, but the territories must still have been quite close. *E. cf. hydruntinus* would be a third form to share apparently the same biotope. It is still more unusual.

We are perfectly aware that our attributions may look like an over-splitting of poor data. Possibly the actual variation of *E. hemionus binagadensis* did include teeth and bones presenting characters of *E. hydruntinus*. It is also possible that during the Holocene, the range of variation of the middle-sized Hemione found at Qazvin included very slender specimens (resembling *E. hemionus binagadensis*), and teeth with very short protocônes (resembling *E. hydruntinus*). If so, we must either accept that *E. hydruntinus* was basically a variation of Hemione, not a Zebra nor an *E. stenorhinus*. Or that the morphologies considered as specific for *E. hydruntinus*, developed several times in different places, and inside different phylogenetic lines. This hypothesis is tempting because, after all, *E. hydruntinus* is "characterized" by the association

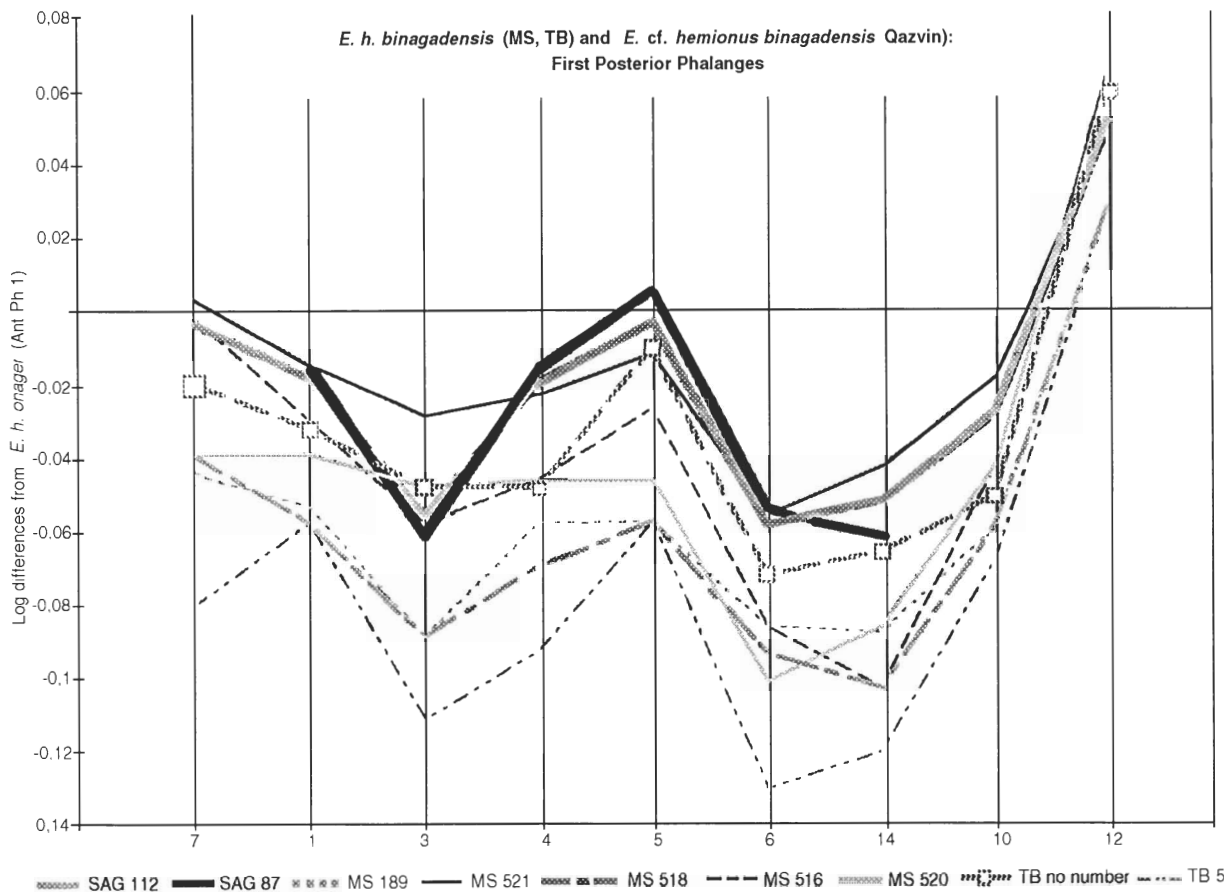


FIGURE 18 - Ratio diagram of first posterior phalanges of *E. hemionus binagadensis* (MS) and *E. cf. hemionus binagadensis* (SAG) of Sagzabad, Qazvin, Iran. Same codes as in Figure 14. *Diagramme de rapport des mesures des premières phalanges postérieures de E. hemionus binagadensis (MS) et E. cf. hemionus binagadensis (SAG) de Sagzabad, Qazvin, Iran. Pour les codes de mesures voir Figure 14.*

TABLE 10 - Upper cheek teeth of Qazvin, Iran: measurements in millimeters. SAG = Sagzabad, Qazvin, Iran, I-II millennium BC. SCM = Qabrestan, Qazvin, Iran, III-IV millennium BC. OL = occlusal length; PL protocone length; OW = occlusal width; H = height; PI = protocone index (PI = 100PL/OL). For M3, measurements were taken at mid-crown height. *Mesures en millimètres des dents jugales supérieures de Qazvin, Iran. SAG = Sagzabad, Qazvin, Iran, I-II millénaires BC. SCM = Qabrestan, Qazvin, Iran, III-IV millénaires BC. Mêmes abréviations et remarques que dans le Tableau 2. H = hauteur.*

		SAG 13	SAG 34	SCM 6	SCM 7	SCM 82	SCM 89
P3, P4	OL	25,0	26,0	25,0	28,0	25,9	26,7
	PL	8,0	7,8	8,1	8,5	8,9	9,0
	OW	25,0	24,5	25,0	28,0	26,8	26,0
	H	49,0	63,0	54,0	44,0		
	PI	32,0	30,0	32,4	30,4	34,4	33,7
M1, M2		SAG 17	SAG 34	SAG 34			SAG 34
	OL	23,0	23,0	22,7		L mid-height	23,0
	PL	9,1	8,0	8,6		PLmid-height	9,0
	OW	25,0	23,0	23,0		W mid-height	21,0
	H	45,0	65,0	70,0		Height	65,0
	PI	39,6	34,8	37,9		PI	39,1

of small size, primitive patterns of upper cheek teeth (small protocones) and lower cheek teeth (stenonine double knot, deep vestibular groove in molars), with “evolved” (adapted to a dry environment) characters of the skeleton (gracility, cursorial proportions) and teeth (hypsodonty). Not one of these characters is specific. One may imagine other forms associating several if not all of these charac-

ters, as it is indeed the case of the South African *E. lylei*, which by size and teeth morphology seems quite close to *E. hydruntinus*, but differs by more robust limb bones (Brink 1994a, 1994b).

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V. EISENMANN

Muséum national d'Histoire naturelle
URA 12 and 1415
Laboratoire de Paléontologie
8 rue Buffon
F-75005, Paris

M. MASHKOUR

URA 1415
Laboratoire d'Anatomie Comparée
55 rue Buffon
F-75005, Paris