

## *Gyps bochenskii* sp. n. (Aves: Falconiformes) from the Late Pliocene of Varshets (NW Bulgaria)

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**Abstract:** A new species of griffon vulture (*Gyps bochenskii* sp. n.) is described from the Late Pliocene (Middle Villafranchian) deposits of a locality near Varshets (NW Bulgaria). The site was discovered in 1987 and has the richest Late Pliocene (MN 17) vertebrate fauna in Europe. The more than 71 avian species are indicative of a forest-steppe landscape. Petrophyllous species are widely represented among the fossil material. The finds represent the oldest remains of a griffon vulture, with four skeletal elements: sternum (coracoidal and costal parts), coracoid dex. (humeral and sternal parts), phalanx dist. dig. I pedis sin. and phalanx dist. dig. majoris sin. These remains verify the presence of vultures, and griffon vultures in particular, in Europe (and the Palearctic) before the glacial events of the Pleistocene. The morphology distinguishes (holotype, sternum) the specimens from recent species of *Gyps* by: steeply orientation of linea intermuscularis; relatively thicker incisurae intercostales; relatively longer incisura intercostalis IV; presence of a well developed fossa on the dorsal surface of the sternum above the manubrium; relatively larger (wider) rostrum sterni; cranially less protruding rostrum sterni; relatively wider sternum in dorsal view; narrower distance between the dorsal edges of the sulci articulares, and larger dimensions. Differences from Pleistocene *G. melitensis*: better developed hind limbs (about 1/10 in the measurements of distal pedal phalanges) and the same development of wings (phalanx dist. dig. majoris).

**Key words:** Late Pliocene, Griffon vultures; Bulgaria; Aves; Accipitridae, new species, *Gyps bochenskii* sp. n.

## Recent and Fossil Old World Vultures

The genus *Gyps* (Griffon vultures) is the most specious genus of the recent World's fauna of vultures and includes eight species. Until recently griffon vultures included seven species, three of them (*G. africanus* SALVADORI, 1865, *G. rueppellii* (BREHM, 1852), and *G. coprotheres* (FORSTER, 1798) of African, three (*G. bengalensis* (GMELIN, 1788), *G. indicus* (SCOPOLI, 1786), and *G. himalayensis* HUME, 1869) of Hindustan-Himalayan-Indochinese, and one (*G. fulvus* HABLIZL, 1783) of Afro-Euroasiatic distribution (THIOLLAY 1994). In addition, *G. tenuirostris* (GRAY,

1844) has been split from *G. indicus* (RASMUSSEN, PARRY 2000, 2001) which was firmly confirmed by JOHNSON *et al.* (2006). *G. tenuirostris* is restricted mainly to India, Nepal and Bangladesh. Such distribution suggests a South-Asian (foot of Himalayas) origin of the genus, nevertheless the present-day distribution includes the whole Old World.

The remaining recent vultures belong to eight genera: *Gypohierax* RÜPPELL, 1836, *Gypaetus* STORR, 1784, *Neophron* SAVIGNY, 1809, *Necrosyrtes* GLOGER, 1841, *Aegyptius* SAVIGNY, 1809, *Torgos* KAUP, 1828,

*Trigonoceps* LESSON, 1842, and *Sarcogyps* LESSON, 1842. Four of these are monotypic and are found solely in Africa (THIOLLAY 1994). Serious evidence shows that *Gypohierax* is not a 'true' vulture (STEVEN PARRY, in litt.), LERNER & MINDELL (2005) consider it as a 'transition' from vultures to sea eagles.

After PETERS (1931) the Old World vultures are referred to two subfamilies, (Aegyptiinae (SCLATER, 1924) and Gypaetinae (VIEILLOT, 1816)), accepted by LERNER & MINDELL (2005). As OLSON (1985) writes, '... the Old World vultures ... are of particular interest as they occur in Tertiary and Quaternary deposits of North America' (p. 113). LERNER & MINDELL (2005) place the genus *Gyps* in Aegyptiinae and although Gypaetinae are the earlier diverging group, at present Aegyptiinae are much more varied (especially *Gyps*).

The fossil record of Gypaetinae according to BRODKORB (1964) includes 5 genera and 11 species: *Palaeohierax* MILNE-EDWARDS, 1871 from the Lower Miocene (Aquitania) of France (The type species *Palaeohierax gervaisii* (MILNE-EDWARDS, 1871) according to OLSON (1985) is similar to the recent *Gypohierax angolensis*. CHENEVAL (1996) dates the site from the Early Miocene, MN 2a), *Palaeoborus* COUES, 1884 from the Lower Miocene (Rosebud formation) of South Dakota, Middle Miocene (Sheep Creek formation) of Nebraska and Lower Pliocene (Santa Fe formation) of New Mexico, *Neophrontops* MILLER, 1916 from Middle Miocene (Sheep Creek beds) of Nebraska, Lower Pliocene (Ogallala formation) of South Dakota, Middle Pliocene (Drewsey formation) of Oregon, and Middle Pleistocene (upper part of Palm Spring formation) of California, *Neogyps* MILLER, 1916 from Upper Pleistocene of California and Nevada, and *Gyps* SAVIGNY, 1809 from Middle Pleistocene of Malta. Later RICH (1980) described *Neophrontops ricardoensis* from Middle Miocene (Clarendonian) of California. OLSON (1985) cites the statements of HOWARD (1932, 1966) for the morphological proximity of *Neophrontops* to recent *Neophron* and that of RICH (1980) for the unclear belonging of this genus to Accipitridae.

In the decades three other fossil taxa were described: *Gypaetus osseticus* BURCHAK-ABRAMOVICH,

1971 from Middle/Late Pleistocene (MNQ 24/25) of Georgia (BURCHAK-ABRAMOVICH 1971), *Parvigyps praecox* from Lower Eocene of England (HARRISON & WALKER 1977), and *Aegyptius prepyrenaeus* HERNÁNDEZ-CARRASQUILLA, 2001 from Late Pleistocene of NE Spain, latter redefined as 'nomen dubium' by (SÁNCHEZ MARCO 2007).

Among the fossil Old World vultures, the remains of *Gyps melitensis* LYDEKKER, 1890 are the most abundant (Table 1). This species is known from Middle and Late Pleistocene of a series of sites from the Mediterranean region (BOCHEŃSKI 1997, TYRBERG 1998). TYRBERG (1998) lists six undated sites of Malta, four Middle Pleistocene sites from Austria, Germany and Hungary, and six Late Pleistocene sites of France, Greece, Hungary and Italy. Obviously, some of the mainland sites of C Europe do not contain remains of that species (see below).

The stratigraphic range of the recent *G. fulvus* is Middle Pleistocene – present (TYRBERG 1998).

According to MLÍKOVSKÝ (1996 a) no Tertiary records of *Gyps*, *Neophron* and *Gypaetus* are known from Europe. We consider the formerly published data on findings of *Aegyptius* from Varshets (BOEV 1996) as misidentifications and they are referred (present paper) to *Gyps*. In spite of that, *Aegyptius* existed in the European Tertiary: in Mallorca, Spain from the Late Pliocene, MN 17 (SÁNCHEZ-MARCO 1996) and S Ukraine from Late Miocene, MN 11-13 (MLÍKOVSKÝ, 1996 b). Thus it seems surprisingly to assume that 'first vultures appeared in Europe only in Middle Pleistocene, when all the three genera now inhabiting the western Palearctic were recorded (*Gyps*, *Aegyptius*, *Neophron*) (MLÍKOVSKÝ 1998, p. 23). MLÍKOVSKÝ (2002) lists *A. monachus* in Europe from Late Pleistocene (MQ 2C).

In addition, three taxa, *Vultur fossilis* s. KEFERSTEIN, 1834, *Vultur fossilis* s. GIEBEL, 1847 and *Torgos tracheliotus todei* KLEINSCHMIDT, 1953, have been described from the Central European Pleistocene. The first two were relegated to the Aves incertae sedis, while the last one is a synonym of *Aegyptius monachus* LINNAEUS, 1766 (MLÍKOVSKÝ 1998). On the other hand, *G. fulvus spelaeus* FRIANT, 1950 has been synonymized to *A. mona-*

**Table 1.** Fossil record of *Gyps melitensis*<sup>1</sup>.

N	Skeletal elements	Identification	Age	Site	Country	Source
1.	tarsometatarsus sin. dist., phalanx 1 dig. 3 pedis, phalanx 2 dig. 1 pedis,	<i>Gyps melitensis aegyptioides</i> (synonym of <i>Aegyptius monachus</i> ; MLIKOVSKÝ, 1998)	Middle Pleistocene	Repolust Cave	Austria	JANOSSY (1989a); JANOSSY (1989b) (discarded by MLIKOVSKÝ, 1998)
2.	vertebra cervicalis, humerus sin. prox., radius dex. prox., tarsometatarsus dist., phalanx 1 dig. 1 pedis, phalanx 2 dig. 1 pedis, phalanx 3 dig. 2 pedis, phalanx 1 dig. 3 pedis,	<i>Gyps melitensis</i> (part of material is synonym of <i>Aegyptius monachus</i> , part of <i>Gyps fulvus</i> ; MLIKOVSKÝ, 1998)	Middle Pleistocene	Hundsheim	Austria	JANOSSY (1974); JANOSSY (1989b); (discarded by MLIKOVSKÝ, 1998, 2002)
3.	femur sin. prox.	<i>Gyps melitensis</i>	Mousterian, Wurm II, Late Pleistocene	Grotte de Prince	Italy	BOULE (1919); BRODKORB (1964); MOURER-CHAUVIRÉ (1975); JANOSSY (1989b)
4.	femur prox.	<i>Gyps melitensis</i>	Upper Solutrean – Wurm, Late Pleistocene	Grotte des Harpons à Iespugue	France	MOURER-CHAUVIRÉ (1975); JANOSSY (1989b); MLIKOVSKÝ (2002)
5.	tibiotarsus sin. dist., tarsometatarsus sin.	<i>Gyps melitensis</i>	Late Pleistocene	Soulabé	France	CLOT & MOURER-CHAUVIRÉ (1975, 1986); JANOSSY (1989b); MLIKOVSKÝ (2002)
6.	cranium, mandibula, coracoid, vertebra, humerus, radius, femur, tarsometatarsus, tibiotarsus, synsacrum, phalanx 2 dig. II, phalanx 2 dig. III, phalanx 3 dig. III, phalanx prox. dig. majoris,	<i>Gyps melitensis</i>	15 365 – 14 927 B. C., Late Pleistocene	Castiglione 3	France (Corsica)	LOUCHART (2002)
7.	(unspecified bones and number)	<i>Gyps melitensis</i>	Late Pleistocene	Coscia	France (Corsica)	BONIFAY ET AL. (1998); LOUCHART (2002); MLIKOVSKÝ (2002)

<sup>1</sup> The list includes published data. Other authors' revisions are given in the "Identification" column. Although many records have been discarded by MLIKOVSKÝ (1998, 2002) we list them for the reasons of comprehensiveness.

Table 1. Continued.

N	Skeletal elements	Identification	Age	Site	Country	Source
8.	phalanx 1 dig. 1 pedis	<i>Gyps</i> cf. <i>melitensis</i> (synonym of <i>Gyps fulvus</i> ; MLIKOVSKÝ, 1998)	Middle Pleistocene	Mosbach	Germany	MOURER-CHALUVRÉ (1977); MLIKOVSKÝ (2002) (disputed by MLIKOVSKÝ, 1998)
9.	phalanx 2 dig. 1 pedis, vertebra cervicalis 5, vertebra cervicalis 6,	<i>Gyps melitensis</i>	Late Pleistocene	Liko Cave	Greece (Crete)	WEESE (1987; 1988); JANOSSY (1989b)
10.	phalanx 3 dig. 2 pedis	<i>Gyps melitensis</i>	Late Pleistocene	Simonelli Cave	Greece (Crete)	Weesie (1987, 1988); Janossy (1989b); Mlikovský (2002)
11.	phalanx 2 dig. 2 pedis (erroneously listed by JANOSSY (1977), phalanx 1 dig. 2 pedis (correctly listed by JANOSSY (1990))	<i>Gyps</i> cf. <i>melitensis</i> (synonym of <i>Aegypius monachus</i> ; MLIKOVSKÝ, 1998)	Earliest Middle Pleistocene	Vertesszöllös, Loc. 2	Hungary	JANOSSY (1977; 1990); JANOSSY (1989b); (disputed by MLIKOVSKÝ, 1998; discarded by MLIKOVSKÝ (2002)
12.	phalanx 3 dig. 3 (proximal fragment)	<i>Gyps</i> aff. <i>melitensis</i> (synonym of <i>Aegypius monachus</i> ; MLIKOVSKÝ, 1998)	MNQ 25, Late Pleistocene	Kalman Lambréch Cave	Hungary	JANOSSY (1963; 1986; 1989a); (disputed by MLIKOVSKÝ, 1998; unconfirmed by MLIKOVSKÝ, 2002)
13.	humerus dex., tibiotarsus sin., fibula sin.	<i>Gyps</i> sp. ( <i>G. melitensis</i> after SANCHEZ-MARCO (2007))	Late Pleistocene	Contrada Fusco	Italy (Sicily)	CASSOLI & TAGLIACOZZO (1996); SANCHEZ-MARCO (2007)
14.	ulna prox.	<i>Gyps melitensis</i>		Acquedolci	Italy (Sicily)	PAVIA (2001)
15.	phalanx 3 dig. III pedis	<i>Gyps melitensis</i>	Late Pleistocene 17 000-8 600 B. P.	Rapaci	Italy (Sardinia)	LOUCHART (2002)
16.	mandible, phalanx 2 dig. III pedis	<i>Gyps melitensis</i>	Late Pleistocene 17 000-8 600 B. P.	Coscia Cosabri sud	France (Corsica)	LOUCHART (2002)
17.	synsacrum, phalanx 2 dig. III pedis, phalanx 3 dig. III pedis, sternum, tarsometatarsus, phalanx 2 dig. III pedis, phalanx dist. dig. majoris	<i>Gyps melitensis</i>	Late Pleistocene 17 000-8 600 B. P.	Coscia Cosgrotte	France (Corsica)	LOUCHART (2002)

Table 1. Continued.

N	Skeletal elements	Identification	Age	Site	Country	Source
18.	cranium, vertebra cervicalis 7, 2 tibiotarsi, 3 coracoids, 3 vertebrae, 3 humeri, radius, 2 femora,	<i>Gyps melitensis</i>	Late Pleistocene 17 000-8 600 B. P.	Cast 3	France (Corsica)	LOUCHART (2002)
19.	femur dex. prox., femur dex. dist., tibiotarsus dex. prox., two tibiotarsi dex. dist., two tibiotarsi sin. dist., two tarsometatarsi sin. dist., phalanx 1 dig. 3 pedis, phalanx dist. 2 or 3 dig. 3 pedis, three phalanges 2 or 3 dig. pedis, phalanx 1 dig. 4 pedis, phalanx 2 dig. 4 pedis, two phalanges dist. dig. (?) pedis, vertebra cervicalis VII, two vertebrae cervicales	<i>Gyps melitensis</i>	? Middle Pleistocene	Zebbug Cave (type locality)	Malta	LYDEKKER (1890); LYDEKKER (1891); DESPOTT (1927) LAMBRECHT (1933) BRODKORB (1964); JANOSSY (1989b)
20.		<i>Gyps melitensis</i>	? Pleistocene	Ghar Dalam	Malta	BATE (1916a) LAMBRECHT (1933); BRODKORB (1964); JANOSSY (1989b)
21.		<i>Gyps melitensis</i>	? Pleistocene	Benghisa gap	Malta	LAMBRECHT (1933); UNCONFIRMED BY MLÍKOVSKÝ (2002)
22.		<i>Gyps melitensis</i>	? Pleistocene	Gandia fissure (or Ghagba after MLÍKOVSKÝ (2002))	Malta	LAMBRECHT (1933); UNCONFIRMED BY MLÍKOVSKÝ (2002)
23.		<i>Gyps melitensis</i>	? Pleistocene	“Malta”	Malta	BATE (1916b); LAMBRECHT (1933)
24.		<i>Gyps melitensis</i>	? Pleistocene	Tal Herba Fissure	Malta	LAMBRECHT (1933)
25.				Ta’Kandja	Malta	DESPOTT (1929); LAMBRECHT (1933) after MLÍKOVSKÝ (2002)

*chus* (MLÍKOVSKÝ 2000). *Vultur fossilis* s. MORENO & MERCERAT, 1891 is a synonym of recent *Vultur gryphus* (LINNAEUS), 1758), i. e. it is a ciconiid, but not accipitrid vulture.

As can be seen, only 3 fossil species of vultures (*Palaeohierax gervaisii*, *Gyps melitensis*, *Gypaetus osseticus*) are known from Neogene and Quaternary of Europe. Here we remind the possible identity of *P. gervaisii* and *G. angolensis* (OLSON 1985). As MLÍKOVSKÝ (2002) writes, the distinct status of *G. melitensis* is dubious and it only remains to be shown, whether it is different from the modern vulture species. He lists no other Old World vulture taxa except *P. gervaisii* (Late Oligocene, MP 25 and Early Miocene, MN 2a), *A. monachus* (since Late Pleistocene, MQ 2C), and the Bulgarian record of *Gyps* sp. (Late Pliocene, MN 17, subject of the present paper).

## Description of the site

**General data:** Late Pliocene (Villanyian, MN 17 zone) vertebrate fauna of the site near the town of Varshets (North-Western Bulgaria) is relatively well studied (POPOV 2001, SPASSOV 1997 a, b). The site represents a ponor, which provided a large number of avian fossils. Varshets is the richest paleornithological site in Bulgaria (BOEV 2002). At the present time the list consists in 123 species of birds and mammal. This high paleofaunal diversity makes it the richest Tertiary site with a Villanyian (as well as of Villafranchian) age in Europe. Its exploration started in 1988 and about 1750 bird fossils have been collected so far (BOEV 1999; 2002; unpubl. data). The site is the type locality of a new genus and a new species (*Chauvireria balcanica* BOEV, 1997) of *Perdicinae* as well as a series of other taxa (BOEV 2002, 2007). The paleoenvironment has been determined as a xerophytic forest-steppe (BOEV 1995, 1999).

**Taphonomy:** The accumulation of avian remains may be explained as a feeding location of large owls (Strigiformes) and large carnivore mammals (Carnivora) sharing the cave. The degree of fragmentation of the bird bones is high and the long bones are represented by small articular fragments.

In addition the smallest bones of the avian skeleton, as phalanges for example, are mainly preserved in the collected material. More data on the site taphonomy and biochronology are given by SPASSOV (1997a)

## Associated fauna:

**Micromammalia:** *Erinaceus samsonowiczii* SULIMSKI, 1959, *Desmana* cf. *polonica* PASCHKOV & TOPACHEVSKY, 1990, *Talpa* cf. *csarnotana* KRETZOI, 1959, *Scalopoides* cf. *copernici* (SKCOCZEŃ, 1980), *Quyania polonica* (SCOCZEŃ, 1980), *Sorex minutus* LINNAEUS, 1766, *Sorex* sp. (size of *S. rutonensis* HINTON, 1911), *Petenya hungarica* KORMOS, 1934, *Mafia* cf. *csarnotensis* REUMER, 1984, *Asoriculus* cf. *gibberodon* (PETENYI, 1864), *Beremendia fissidens* PETENYI, 1864), *Rhinolophus* cf. *lissiensis* (MEIN, 1964), *Rh.* cf. *macrorhinus* Topal, 1963, *Myotis* cf. *blythii* (THOMES, 1857), *M.* cf. *schaubi* KORMOS, 1934, *M.* cf. *delicatus* HELLER, 1936, *M.* cf. *exilis* HELLER, 1936, *M. ostromosensis* TOPAL, 1983, *Plecotus* cf. *crassidens* KORMOS, 1930, *Vespertilio* sp., *Hypolagus brachignathus* KORMOS, 1934, *Myomimus* sp., *Myoxus* cf. *sackdillingensis* (HELLER, 1930), *Micromys* cf. *praeminutus* KRETZOI, 1959, *Sylvaemus* cf. *flavicollis* (MELCHIOR, 1834), *Sylvaemus* sp., *Rhagapodemus frequens* KRETZOI, 1959, *Nannospalax* sp., *Estramomys simplex* JANOSSY, 1969, *Allocricetus bursae* SCHAUB, 1930, *Clethrionomys primitivus* POPOV, 2001, *Cseria opsia* RABEDER, 1981, *Borsodia petenyii* (MEHELY, 1914), *Mimomys pliocaenicus* FORSYTH MAJOR, 1902, *Mimomys reidi* HINTON, 1910 and *M. stenokorys* RABEDER, 1981 (POPOV 2001, 2003, 2004).

**Macromammalia:** *Vulpes alopecoides* F. MAJOR, 1877, *Nyctereutes* cf. *tingi* TEDFORD & QIU, 1991, *Ursus minimus* D. DE CHABRIOL & BOUILLET, 1827 – *Ursus etruscus* CUV., 1823, *Pliocrocota perrieri* (CROIZET & JOBERT 1828), *Martes wenzensis* STACH, 1859 – *Martes vetus* KRETZOI, 1942, *Pannonictis ardea* (BRAVARD 1828), *Vormela petenyii* KRETZOI, 1942, *Baranogale balcanica* SPASSOV 2001, *Meles thoralis* VIRET, 1951, *Lynx issiodorensis issiodorensis* (CROIZET & JOBERT, 1828), aff. *Viretailurus schaubi* (Viret, 1954), *Acinonyx pardinensis* CROIZET & JOBERT, 1828, cf. *Cervus renanus* BUBOIS (= C.

*philisi*), *Eucladoceros senezensis* cf. *vireti* HEINTZ, 1970, Cervidae gen. et sp. indet., *Gazellospira* sp., *Megalovis* aff. *latifrons* SCHAUB, 1923, *Equus stenonis vireti* PRAT, 1964 (SPASSOV 2000; 2003) and *Megantereon cultridens* (CUVIER 1824) (BOEV 2008).

The mammal fauna refers the site to the MN 17/MNQ17 (MEIN 1990, GUERIN 1990) and to the St. Vallier Faunal unit of GLIOZZI *et al.* (1997) and includes it in the time span after Roccaneyra and before St. Vallier, thus giving an approximate absolute age of Varshets between 2.4 and 2.1 Ma (SPASSOV 1997, 2000, 2003, POPOV 2001, 2003, 2004).

**Amphibia:** Three species of Anura (BOEV, unpubl. data).

**Reptilia:** Eight species of Squamata (Sauria and Ophidia) and one species of Testudines (*Testudo/Eurotestudo* sp.) (BOEV, unpubl. data), giant land tortoise, Varanidae gen. indet. (N. TSANKOV, NMNHS – pers. comm.), *Pseudopus apodus* (PALLAS 1775) (MADELAINÉ BOHME, Ludwig-Maximilians University, Munich; N. TSANKOV – pers. data).

**Invertebrates:** Gastropoda terrestria: Two species (BOEV, unpubl. data).

## Material and Methods

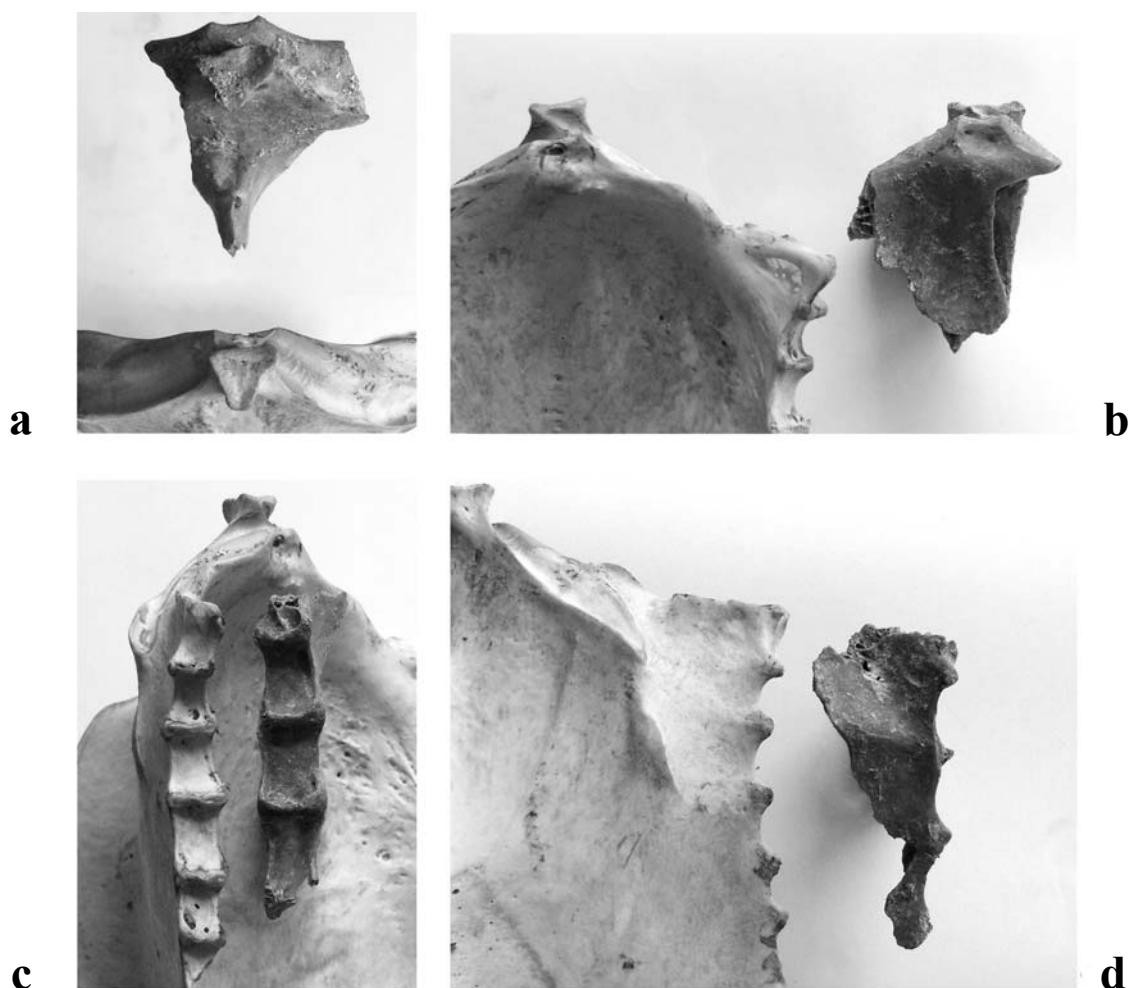
Abbreviations: Anatomical: dex. – dextra; dig. – digitus, digiti; dist. – distalis; f. a. – facies articularis; max. – maximum; min. – minimum; proc. – processus, processi; prox. – proximalis; sin. – sinistra; s. a. – sulcus articularis; Institutional: BMNH – Natural History Museum, formerly British Museum (Natural History), Tring; ISEAK – Institute of Systematics and Evolution of Animals (Polish Academy of Sciences), Krakow; NMNHS – National Museum of Natural History (Bulgarian Academy of Sciences), Sofia; UCBL – University Claude Bernard, Lyon 1.

The material was collected through screening and washing of the sediments between July 1990 and September 1993. It is kept in the NMNHS, and consists of six specimens, representing four skeletal elements of the pectoral girdle, forelimbs and hindlimbs: sternum, pars coracoidalis, NMNHS 248 (rostrum sterni, s. a. coracoideus sin. and medial part of s. a. coracoideus dex., and the inception of crista

sterni are preserved; Fig. 1 a, b); sternum, pars costalis sin., NMNHS 154 (proc. costales II, III, IV and V are preserved; Fig. 1 c, d); coracoid dex., NMNHS 246, pars humeralis (Fig. 2 a, b, c); coracoid dex., NMNHS 247, pars sternalis (Fig. 2 d, e); phalanx dist. dig. majoris sin., NMNHS 160 (Fig. 3 a, b, c); phalanx dist. dig. I pedis sin., NMNHS 159 (Fig. 4 d, e). The findings have been identified through reference to comparative bird collections of the ISEAK, BMNH, NMNHS, and UCBL (see abbreviations in the Introduction section).

Measurements (in mm; Fig. 4): Sternum, pars coracoidalis (A): a – distance between the medial edges of the labrum dorsale, b – width of rostrum sterni, c – thickenes of pila coracoidea in the base of pila carinae, d – height of rostrum sterni; Sternum, pars costalis sin. (B): a – min. thickness of incisura intercostalis I-II, b – thickness in proc. costalis II, c – min. thickness of incisura intercostalis II-III, d – thickness in proc. costalis III, e – min. thickness of incisura intercostalis III-IV, f – thickness in proc. costalis IV, g – min. thickness of incisura intercostalis IV-V, h – thickness in proc. costalis V, i – distance between proc. costalis II and proc. costalis IV, j – distance between proc. costalis IV and proc. costalis V; Coracoid, pars humeralis (C): a – medial width of the acrocoracoideus, b – distance between the dorsal (cranial) edge of fossa pneumatica and the inception of f. a. clavicularis, c – thickness of f. a. clavicularis, d – thicknes of proc. acrocoracoideus; Coracoid, pars sternalis (D): f – max. thickness of f. a. sternalis; Phalanx dist. dig. majoris (E): a – length of the medial edge of f. a. interphalangealis, b – length of the dorsal edge of the f. a. interphalangealis; c – length of the ventral edge of f. a. interphalangealis, d – ventral diagonal thickness of the proximal end of the phalanx; Phalanx dist. dig. I pedis (F): a – total length, b – height of f. a., c – max. length of the basal part, d – min. length of the basal part.

The taxonomy follows THIOLLAY (1994). The osteological terminology is after BAUMEL & WITMER (1993) and, in some respects, KOMAREK (1979). The chronostratigraphy follows MEIN (1990). All measurements have been taken using calipers to 0.05 mm accuracy, but read to the 1st digit after decimal



**Fig. 1.** *Gyps bochenskii* sp. n. (Late Pliocene) Varshets, Bulgaria and *Gyps fulvus* NMNHS 1/1993 (recent) Madzharovo, Bulgaria: sternum, pars coracoidalis NMNHS 248: a – cranial view; b – dorsal view; sternum, pars costalis sin. NMNHS 154: c – left dorso-lateral view; d – ventral view. Scale bare = 1 cm; a – *G. fulvus* below; b, c, d – *G. fulvus* left (Photographs: Assen Ignatov).

point. All generic names of the binominals are given abbreviated in the text and are in full in the tables. ‘Smaller’, ‘much smaller’, ‘larger’ or ‘much larger’ in the ‘Comparison and discussion’ section mean that the fossil specimen differs considerably in size from the specimens of the compared species, and thus their taxonomic identity is excluded.

### Systematic palaeontology

The general morphology of the sternum (pars coracoidalis and pars costalis), coracoid (pars humeralis and pars sternalis), phalanx dist. dig. majoris, and phalanx dist. dig. I pedis indicates that the findings belongs to this largest representatives of Accipitridae.

The very large size of all skeletal elements and the general comparison with genus *Gyps* (*Gyps fulvus*) show considerable morphological similarity and suggests firm affiliation to that genus.

**Order: FALCONIFORMES (SHARPE, 1874)**

**Family: ACCIPITRIDAE (VIEILLOT, 1816)**

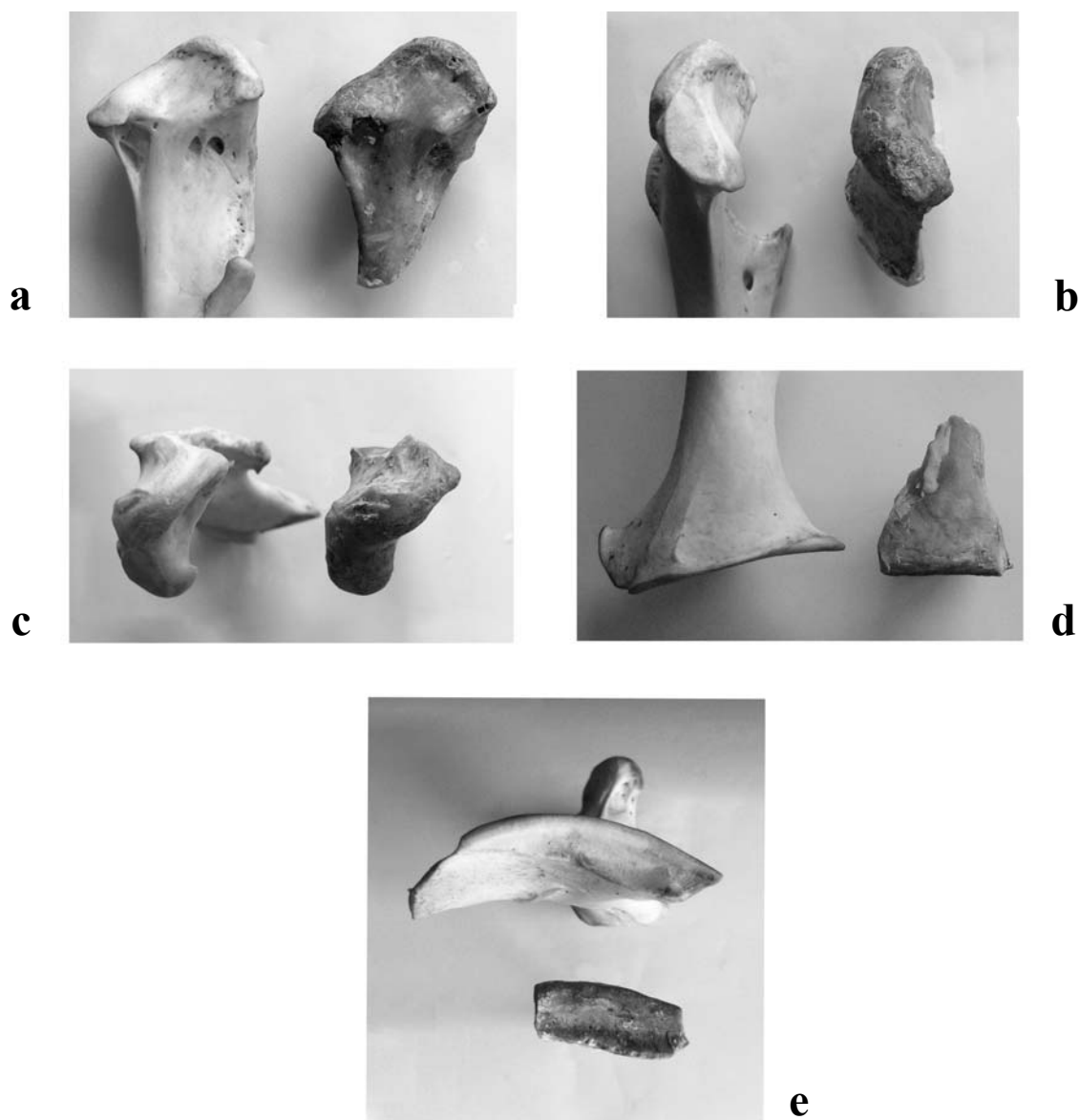
**Subfamily: Aegyptiinae (SCLATER, 1924)**

**Genus *Gyps* SAVIGNY, 1809**

***Gyps bochenskii* nov. sp.**

**Holotype:** sternum, pars coracoidalis, NMNHS 248 (rostrum sterni, s. a. coracoideus sin. and medial part of s. a. coracoideus dex., and the inceptiopl of crista sterni are preserved; Fig. 1 a, b); collections of the Fossil and Recent Birds Department





**Fig. 2.** *Gyps bochenskii* sp. n. (Late Pliocene) Varshets, Bulgaria and *Gyps fulvus* NMNHS 1/1993 (recent) Madzharovo, Bulgaria: coracoid dex. pars humeralis NMNHS 246: a – medial view; b – ventral view; c – omal view; coracoid dex. pars sternalis NMNHS 247: d – ventral view; e – sternal view. Scale bare = 1 cm; a, b, c, d – *G. fulvus* left; e – *G. fulvus* above (Photographs: Assen Ignatov).

of the National Museum of Natural History – Sofia, Bulgarian Academy of Sciences. Collected by Z. BOEV in 1990-1993.

**Paratypes:** coracoid dex., pars humeralis NMNHS 246 (Fig. 2 a, b, c); coracoid dex., pars sternalis NMNHS 247 (Fig. 2 d, e); sternum, pars costalis sin., NMNHS 154 (proc. costales II, III, IV and V are preserved; Fig. 1 c, d); phalanx dist. dig. majoris sin., NMNHS 160 (Fig. 3 a, b, c); phalanx dist. dig. I pedis sin., NMNHS 159 (Fig. 3 d, e).

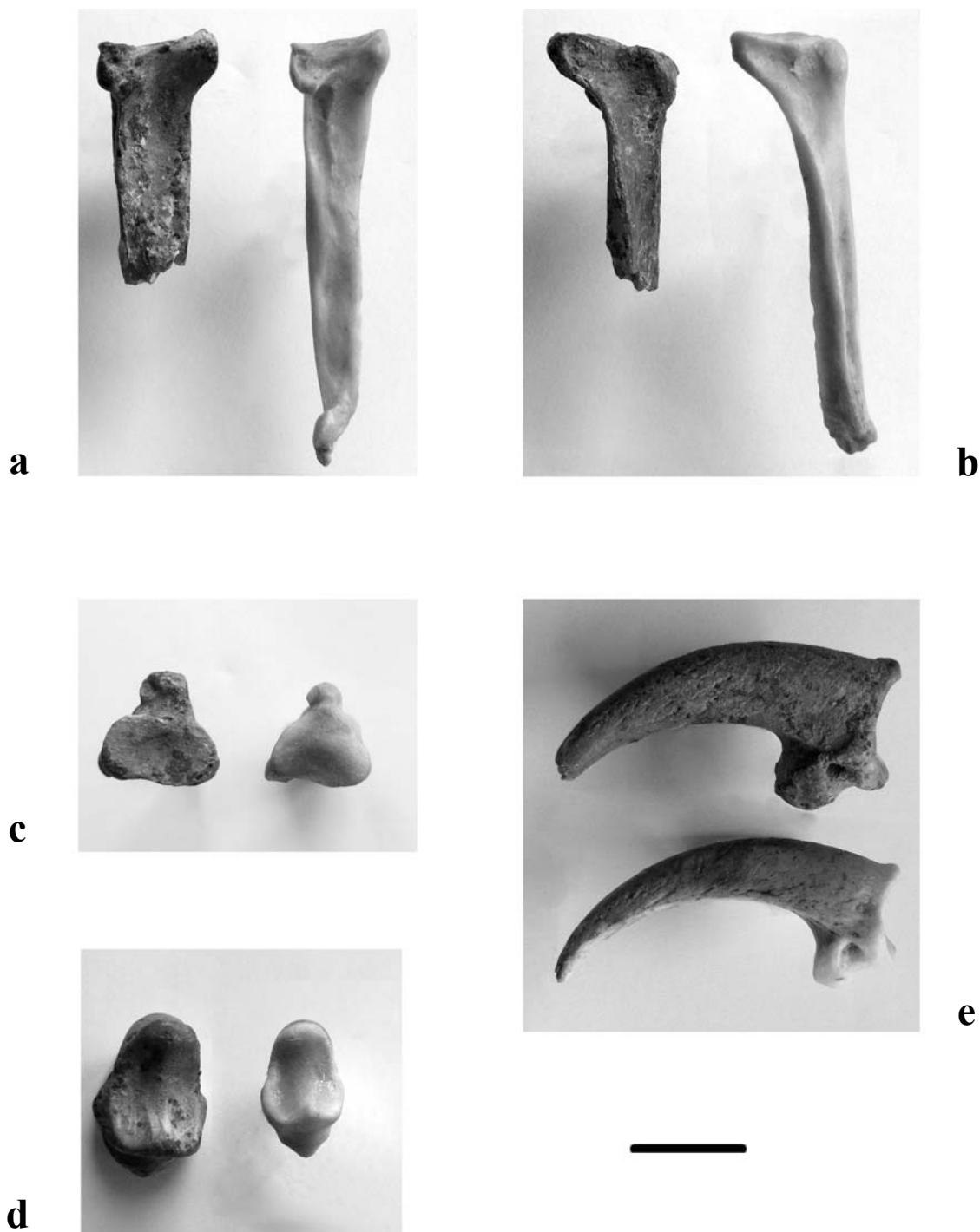
**Comparison:** See Tables 2-6; Fig. 4 and paragraph 5.

**Etymology:** The name ‘*bochenskii*’ is given in honour of the eminent Polish paleornithologist, Prof. D.Sc. ZYGMUNT BOCHEŃSKI (1935-2009), who has contributed greatly to our knowledge of fossil birds.

**Measurements of the holotype:** Tables 2-3.

**Measurements of the paratypes:** Tables 4-6; Fig. 4.

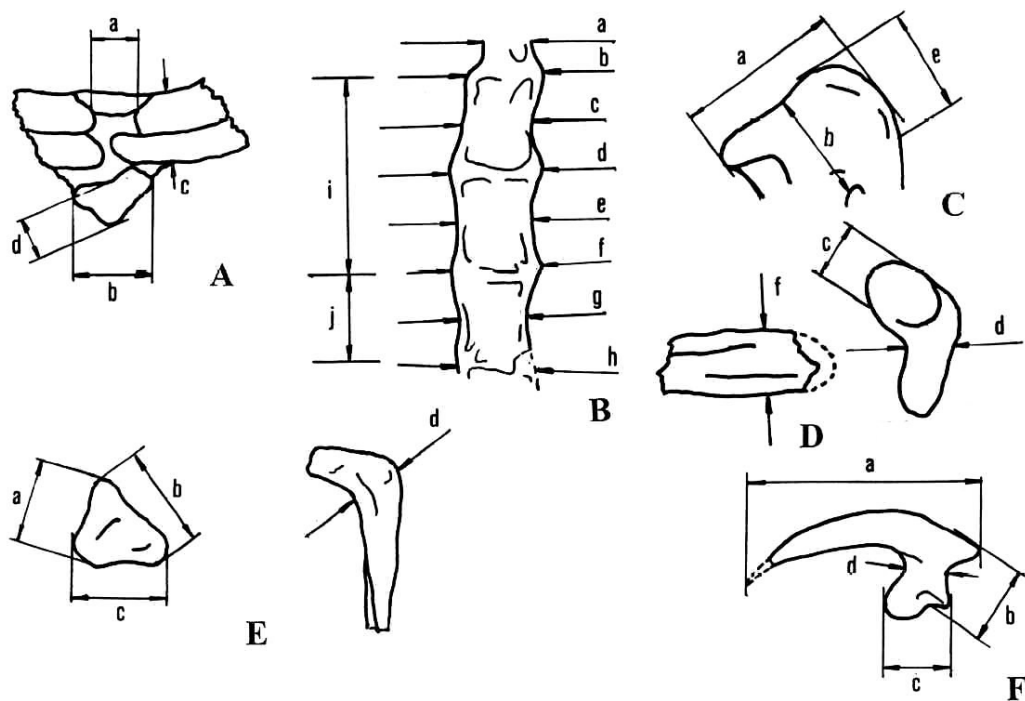
**Diagnosis:** A large fossil species in the genus



**Fig. 3.** *Gyps bochenskii* sp. n. (Late Pliocene) Varshets, Bulgaria and *Gyps fulvus* NMNHS 1/1993 (recent) Madzharovo, Bulgaria: phalanx dist. dig. majoris sin. NMNHS 160: a – caudal view; b – ventral view; c – proximal view; phalanx dist. dig. I pedis sin. NMNHS 159: d – proximal view; e – medial view. Scale bare = 1 cm; a, b, c, d – *G. fulvus* right; e – *G. fulvus* below (Photographs: Assen Ignatov).

*Gyps* differing from the closest *G. fulvus*: (1) sternum, pars coracoidalis – by the presence of a well developed fossa on the dorsal surface of the sternum above the manubrium, the relatively larger (wider) rostrum sterni, i.e. the correlation ‘b : d’, cranially less pro-

truding rostrum sterni; the relatively wider sternum in dorsal view, the narrower distance between the left and right dorsal edges of the s. a. (measurement ‘a’), and the larger general size; (2) sternum, pars costalis – by the larger dimensions, the steeply orientation



**Fig. 4.** Manner of measuring the bones: A – sternum, pars coracoidalis; B – sternum, pars costalis; C – coracoid, pars humeralis; D – coracoid, pars sternalis; E – phalanx dist. dig. majoris sin., F – phalanx dist. dig. I pedis sin. (Drawings: VERA HRISTOVA).

of linea intermuscularis, relatively thicker incisurae intercostales (measurements ‘c’, ‘e’ and ‘g’), and the relatively longer incisura intercostalis IV (correlation between the measurements ‘j’ and ‘i’); (3) coracoid – by its larger proc. acrocoracoideus (measurement ‘c’), and more protuberant, than flattened f. a. clavicularis in ventral view (Fig. 1, 2); (4) phalanx dist. dig. majoris sin. – by the thicker body of phalanx especially before its articular part, deeper fossa on lateral tip of the f.a., and the less concave medial edge of f.a.; (5) phalanx dist. dig. I pedis sin. – by the longer (thicker) base (measurement ‘d’) and the higher f.a. (measurement ‘b’). Differences from Pleistocene *G. melitensis*: better developed hind limbs (about 1/10 in the measurements of distal pedal phalanges) and the same development of wings (phalanx dist. dig. majoris).

**Locality:** A ponor in a rocky hill, 6 km NNE of the town of Varshets (43, 13 N, 23, 17 E). Unconsolidated, unstratified sediments accumulated as a clay terra-rossa. The fossil bones are broken, at times forming a bone breccia.

**Chronology:** Middle Villafranchian. The as-

sociated mammal fauna (SPASSOV 1997 a, b, 2000; POPOV 2001) gives the site an MN 17 zone attribution (MEIN 1990).

## Comparison and Discussion

The specimens show all the features characteristic of the largest accipitrids. However, the sternum clearly differs from *Aquilinae* species by asymmetrical manubrium sterni in cranial view and overlapping of the left over right s. a. coracoideus (*Haliaeetus pelagicus* BMNH 1996.31.1, *Aquila chrysaetos* BMNH 1930.3.24.260, and *Harpia harpyja* BMNH 1862.3.19.14 have been compared). In general the size of eagles is smaller than that of griffon vultures, and f.a. clavicularis in griffon vultures is relatively wider (measurement ‘c’) (Table 4). The bones strongly resemble *Gypaetinae* subfamily both in morphology and dimensions. Detailed comparison entirely excludes all other genera, except *Gyps*. As reported by CRAMP (1980) the sexual dimorphism in size, involves females that are on ‘average larger than males’ (p. 63) in Palearctic vultures. In the clos-

**Table 2.** The measurements of the sternum, pars coracoidalis (ref. to Fig. 4 A) in some large fossil and recent Accipitridae.

Species	a	b	c	d
Fossil – Varshets				
<i>Gyps bochenskii</i> sp. n. NMNHS 248	7.2	13.7	12.7	9.9
Recent				
<i>Sarcogyps calvus</i> BMNH 1858.1.10.1	-	11.8	9.8	9.8
<i>Sarcogyps calvus</i> BMNH [without number]	-	9.0	-	6.8
<i>Torgos tracheliotus</i> BMNH 1870.6.22.11	12.5	12.5	10.4	8.6
<i>Torgos tracheliotus</i> BMNH 1952.3.213	15.5	12.8	9.5	9.8
<i>Torgos tracheliotus</i> BMNH 1954.30.53	-	14.7	-	8.7
<i>Torgos tracheliotus</i> BMNH 1930.3.24.248	14.7	10.8	10.6	10.5
<i>Torgos tracheliotus</i> BMNH 1973.66.56	9.4	12.9	11.4	11.4
<i>Aegyptius monachus</i> BMNH 1952.3.60	12.4	-	12.7	11.5
<i>Aegyptius monachus</i> BMNH 1872.10.25.5	14.1	13.9	12.4	11.2
<i>Aegyptius monachus</i> BMNH 1848.3.8.2	13.4	14.1	12.2	10.0
<i>Aegyptius monachus</i> ISEAK A 3834/81	14.5	14.1	13.8	7.1
<i>Aegyptius monachus</i> ISEAK A 3834/81	14.5	14.1	13.8	7.1
<i>Aegyptius monachus</i> ISEAK A 1926/68	15.0	11.7	13.8	9.4
<i>Aegyptius monachus</i> NMNHS 3/1992	12.0	11.8	11.8	7.5
<i>Aegyptius monachus</i> UCBL 84/1	15.2	12.4	12.2	8.5
<i>Aegyptius monachus</i> BMNH 1995.13.1	12.3	14.0	11.4	10.4
<i>Gyps bengalensis</i> BMNH 1954.30.57	7.4	9.0	8.7	7.2
<i>Gyps bengalensis</i> BMNH 1845.1.12.5	7.0	10.0	8.8	7.6
<i>Gyps africanus</i> ISEAK A 3907/82	10.6	10.2	9.4	8.4
<i>Gyps africanus</i> BMNH S 1954.30.56	7.5	11.8	9.7	9.8
<i>Gyps africanus</i> BMNH S 1978.7.1	7.2	10.2	10.0	8.4
<i>Gyps africanus</i> BMNH S 1983.19.5	8.9	-	9.7	-
<i>Gyps africanus</i> BMNH 1983.19.6	8.1	9.9	9.8	8.5
<i>Gyps africanus</i> BMNH 1983.19.7	3.0	8.7	8.9	8.2
<i>Gyps africanus</i> BMNH S 1983.19.1	6.4	ca. 9.7	9.8	9.4
<i>Gyps rueppellii</i> BMNH 1983.19.2	ca. 7.0	10.8	10.0	7.7
<i>Gyps rueppellii</i> BMNH 1952.1.171	7.4	11.4	10.0	9.6
<i>Gyps rueppellii</i> BMNH 1954.30.55	5.6	12.8	10.7	10.8
<i>Gyps fulvus</i> BMNH 1952.1.183	11.4	13.2	11.5	11.5
<i>Gyps fulvus</i> BMNH 1851.8.25.34	10.0	11.4	12.2	9.8
<i>Gyps fulvus</i> BMNH 1861.3.24.6	9.5	11.2	10.9	9.7
<i>Gyps fulvus</i> BMNH 1899.1.25.2	10.2	11.4	10.6	10.3
<i>Gyps fulvus</i> BMNH 1845.1.12.4	9.6	12.7	10.3	10.3
<i>Gyps fulvus</i> ISEAK A 1854/67	10.1	12.6	11.6	11.0
<i>Gyps fulvus</i> ISEAK A 3369/77	9.1	12.0	10.6	11.4
<i>Gyps fulvus</i> NMNHS 1/1993	9.9	10.5	10.8	9.8
<i>Gyps fulvus</i> NMNHS 6/1989	9.6	11.2	10.8	10.1
<i>Gyps coprotheres</i> BMNH 1983.19.4	8.8	-	11.1	ca. 11.7

**Table 2.** Continued.

Species	a	b	c	d
<i>Gyps coprotheres</i> BMNH 1983.19.3	6.7	12.4	10.5	11.1
<i>Necrosyrtes monachus</i> ISEAK A 2341/70	9.5	6.5	7.8	6.9
<i>Necrosyrtes monachus</i> BMNH 1952.3.209	-	ca. 7.4	-	8.5
<i>Necrosyrtes monachus</i> BMNH 1860.1.16.8	ca. 7.7	5.5	6.8	5.1
<i>Trigonoceps occipitalis</i> BMNH 1864.10.5.11	8.2	8.9	8.1	7.0
<i>Trigonoceps occipitalis</i> BMNH 1954.30.54	11.0	10.0	9.4	8.9
<i>Gypohierax angolensis</i> BMNH 1867.10.5.18	4.0	4.6	6.9	5.0
<i>Gypaetus barbatus</i> ISEAK A 3209/76	24.3	9.7	13.0	6.1
<i>Gypaetus barbatus</i> BMNH 1930.3.24.259	22.3	-	-	-
<i>Gypaetus barbatus</i> BMNH 1850.8.15.11	22.2	12.0	8.6	8.2
<i>Aquila chrysaetos</i> BMNH 1930.3.24.260	7.2	6.9	7.3	8.4
<i>Haliaeetus albicilla</i> BMNH 1869.10.19.2	5.6	5.2	10.3	5.6
<i>Haliaeetus pelagicus</i> BMNH 1996.31.1	4.6	7.3	12.0	10.5
<i>Harpia harpyja</i> BMNH 1862.3.19.14	7.8	7.0	9.7	7.0

est species to the fossils from Varshets, *G. fulvus*, we calculated differences of 0.50 (bill) to 3.60% (wing), based on Cramp's data on the main external features for specimens from different parts of the range (Table 7). The individual variability in the external morphological measurements among the Old World vultures ranges between 0.01 and 4.83%. The mean metrical variability in the vultures as a group varies between 0.69 and 2.38%. Meanwhile, the average percentage differences between sexes for the five examined species range between 0.69 and 2.38% (Table 7). Despite the moderate individual and sexual variability in size, the morphological peculiarities in osteology distinguish Late Pliocene griffon vulture from Varshets from all hitherto known vultures.

LOUCHART (2002) defines the sexual dimorphism in *G. fulvus* as slight, but our data for the ranges (both sexes) of osteometrical features show much higher individual variability (4.9 to 39.3%) in the recent vultures (Table 8). The ranges in fossil vultures are likely to be similar. This leads to the conclusion that small differences in size among vultures may not have taxonomic significance.

*P. gervaisii* is known from a tarsometatarsus, but it is smaller, and similar to *G. angolensis* (OLSON 1985). *Aegypius prepyrenaicus* has been described

from a proximal fragment of an ulna, and its diagnosis defines that the species is 'Larger than any known species of *Aegypius*.' (HERNÁNDEZ-CARRASQUILLA 2001), i.e. the species is incomparable to Bulgarian findings, where the proximal ulna is not present, although at present it is considered 'nomen nudum' (SÁNCHEZ-MARCO 2007).

Formerly *G. melitensis* erroneously has been declared as a mosaic of osteological features belonging to *A. monachus* and *G. fulvus*. TYRBERG (1998) accepted the opinions of JANOSSY (1989 a) and F. HERNÁNDEZ (pers. comm.) that 'The generic assignment of *Gyps melitensis* is uncertain since it shows a mixture of *Gyps* and *Aegypius* features.' (p. 506). Much earlier D. JANOSSY noted that determination of the genus and the species is very difficult (JANOSSY 1974). He writes that the Maltese griffon vulture was a mosaic form, combining the features of *Gyps* and *Aegypius*. WEESIE (1988) found the same with the fossils of *G. melitensis* from Crete. After JANOSSY (1989 a) the subspecies *G. m. aegyptoides* JANOSSY, 1989 appears to have some intermediary morphological features, although this taxon was later considered a synonym of *Aegypius monachus* (MLÍKOVSKÝ 1998). Earlier TUGAIRNOV (1940) described a complete tarsometatarsus from Bessarabia as: 'quite similar to the metatarsus of the

**Table 3.** The measurements of the sternum, pars costalis (ref. to Fig. 4 B) in some large fossil and recent Accipitridae.

Species	a	b	c	d	e	f	g	h	i	j
Fossil – Varshets										
<i>Gyps bochenskii</i> sp. n. NMNHS 154	5.6	10.4	8.0	11.5	9.2	11.5	8.4	ca.10.0	28.8	ca.15.5
Recent										
<i>Sarcogyps calvus</i> BMNH 1858.1.10.1	5.6	7.2	5.8	7.2	6.1	8.5	7.1	7.9	11.2	7.8
<i>Sarcogyps calvus</i> BMNH [without number]	5.3	7.0	-	-	6.2	7.8	-	6.0	25.2	7.5
<i>Trigonoceps occipitalis</i> BMNH 1864.10.5.11	4.0	4.4	3.9	6.3	5.3	7.1	5.4	7.0	24.3	8.7
<i>Trigonoceps occipitalis</i> BMNH 1954.30.54	4.4	6.2	5.4	6.9	5.5	7.3	6.4	7.2	29.0	9.0
<i>Torgos tracheliotus</i> BMNH 1870.6.22.11	5.2	7.7	6.1	9.6	8.6	11.0	8.4	9.4	34.2	13.4
<i>Torgos tracheliotus</i> BMNH 1952.3.213	6.4	8.0	6.4	9.8	7.4	11.6	7.9	9.6	33.7	10.0
<i>Torgos tracheliotus</i> BMNH 1954.30.53	6.3	8.0	5.5	9.8	7.2	9.4	7.6	9.2	34.9	10.3
<i>Torgos tracheliotus</i> BMNH 1930.3.24.248	6.0	8.3	6.5	9.7	8.0	10.7	8.3	9.3	19.6	13.1
<i>Torgos tracheliotus</i> BMNH 1973.66.56	5.3	9.3	6.2	12.1	8.7	11.3	9.9	8.9	31.9	10.9
<i>Torgos tracheliotus</i> UCBL	-	-	-	-	-	9.1	7.4	-	-	14.7
<i>Aegyptius monachus</i> BMNH 1872.10.25.5	6.2	8.3	7.0	11.3	8.1	10.2	8.6	8.9	31.8	9.1
<i>Aegyptius monachus</i> BMNH 1848.3.8.2	5.5	9.2	7.4	10.4	8.3	10.2	7.8	9.0	30.4	10.4
<i>Aegyptius monachus</i> ISEAK A 3834/81	6.0	7.4	5.9	9.7	7.9	10.0	7.9	8.9	-	9.9
<i>Aegyptius monachus</i> BMNH 1952.3.60	6.6	9.6	8.1	11.4	9.0	10.9	8.6	9.5	32.4	10.6
<i>Aegyptius monachus</i> ISEAK A 1926/68	8.4	10.5	7.6	10.6	9.3	12.4	9.3	10.0	-	14.7
<i>Aegyptius monachus</i> UCBL 84/1	6.2	8.2	7.8	10.2	7.6	10.5	-	-	21.0	-
<i>Aegyptius monachus</i> UCBL	-	-	-	-	-	10.2	7.2	9.0	-	13.5
<i>Aegyptius monachus</i> BMNH 1995.13.1	6.0	7.8	6.3	10.0	7.6	10.8	8.7	8.2	16.0	9.9
<i>Aegyptius monachus</i> NMNHS 3/1992	5.1	8.8	6.4	9.9	7.9	9.4	6.7	8.1	22.6	10.1
<i>Gyps bengalensis</i> BMNH 1954.30.57	3.2	6.7	5.2	9.3	7.0	8.0	6.7	6.8	29.3	8.0
<i>Gyps bengalensis</i> BMNH 1845.1.12.5	3.6	6.6	4.3	8.1	5.5	7.8	5.6	10.7	20.5	7.0
<i>Gyps rueppellii</i> BMNH 1952.1.171	3.9	7.2	8.0	11.0	7.9	8.6	6.1	6.4	19.2	7.1
<i>Gyps ruppellii</i> BMNH 1983.19.2.	4.9	9.1	5.5	9.9	6.1	7.0	4.5	7.0	24.0	12.1
<i>Gyps rueppellii</i> BMNH 1954.30.55	5.5	8.5	6.2	11.5	8.2	11.0	7.6	8.8	23.0	11.4
<i>Gyps africanus</i> BMNH S 1954.30.56	4.2	7.0	5.3	9.5	6.9	9.2	6.4	7.7	24.8	11.7
<i>Gyps africanus</i> BMNH S 1978.7.1	5.0	7.5	6.6	9.6	7.5	9.6	7.5	7.4	27.2	8.5
<i>Gyps africanus</i> BMNH S 1983.19.6	4.4	6.2	5.6	9.8	6.4	9.5	6.8	8.1	32.4	11.5
<i>Gyps africanus</i> BMNH S 1983.19.7	3.5	7.8	5.7	9.0	6.7	8.5	6.8	7.5	20.7	9.1
<i>Gyps africanus</i> BMNH S 1983.19.5	4.5	7.2	5.5	10.2	7.2	8.6	6.1	6.5	28.5	8.5
<i>Gyps africanus</i> BMNH S 1983.19.1	4.6	8.7	5.9	9.4	7.2	8.5	6.6	6.5	27.7	7.4
<i>Gyps africanus</i> ISEAK A 3907/82	3.8	7.3	5.4	9.7	6.9	9.2	6.8	7.6	-	12.7
<i>Gyps fulvus</i> ISEAK A 1854/67	4.5	8.2	5.5	9.6	8.1	10.9	8.0	7.9	-	11.7
<i>Gyps fulvus</i> ISEAK A 3369/77	-	-	-	10.7	-	-	8.5	9.3	-	12.9
<i>Gyps fulvus</i> BMNH 1861.3.24.6	5.7	8.9	6.6	12.4	8.5	10.6	7.4	9.3	24.4	11.8
<i>Gyps fulvus</i> BMNH 1952.1.183	5.6	9.2	6.2	11.3	8.2	11.3	8.2	9.2	31.7	11.0
<i>Gyps fulvus</i> BMNH 1845.1.12.4	6.1	10.7	7.0	12.0	9.0	11.6	8.3	10.0	-	9.0
<i>Gyps fulvus</i> BMNH 1851.8.25.34	5.8	9.4	6.4	10.5	7.2	8.9	7.6	8.9	22.1	11.3
<i>Gyps fulvus</i> BMNH 1899.1.25.2	5.9	8.9	6.0	11.1	8.2	10.9	8.0	9.7	-	11.2

**Table 3.** Continued.

Species	a	b	c	d	e	f	g	h	i	j
<i>Gyps fulvus</i> NMNHS 1/1993	5.4	9.5	7.0	10.8	7.3	9.3	6.6	7.7	24.5	10.8
<i>Gyps fulvus</i> NMNHS 6/1989	5.5	7.0	6.4	11.8	8.4	10.7	8.0	8.7	24.3	10.3
<i>Gyps fulvus</i> UCBL	-	-	-	-	-	9.7	7.2	8.4	-	14.3
<i>Gyps coprotheres</i> BMNH 1983.19.3.	5.5	8.0	6.0	11.8	9.1	11.4	8.0	9.6	21.7	13.0
<i>Gyps coprotheres</i> BMNH 1983.19.4.	-	-	6.4	10.9	7.8	9.3	6.7	ca.7.8	-	ca.9.5
<i>Neophron percnopterus</i> BMNH 1860.1.19.8.	3.8	5.0	3.9	5.8	5.9	5.0	-	-	14.9	-
<i>Neophron percnopterus</i> BMNH 1858.5.26.13	4.3	4.7	4.3	5.0	4.4	4.9	3.8	3.7	13.8	6.6
<i>Necrosyrtes monachus</i> BMNH 1952.3.209	-	-	-	6.3	-	-	-	-	22.0	6.6
<i>Necrosyrtes monachus</i> BMNH 1860.1.16.8	-	-	-	-	-	-	-	4.8	25.0	7.4
<i>Gypohierax angolensis</i> BMNH 1867.10.5.18	3.2	3.6	3.5	4.7	4.3	4.9	3.4	3.0	11.9	7.6
<i>Gypaetus barbatus</i> ISEAK A 3209/76	6.7	8.4	6.8	9.9	7.6	8.3	7.3	8.4	-	12.3
<i>Gypaetus barbatus</i> BMNH 1930.3.24.259	6.6	7.4	5.8	8.0	7.0	8.4	6.4	7.1	19.0	12.0
<i>Haliaeetus albicilla</i> BMNH 1869.10.19.2.	4.7	5.8	5.6	7.3	5.7	6.5	5.0	4.6	16.9	9.1
<i>Haliaeetus pelagicus</i> BMNH 1996.31.1	4.6	7.4	6.6	8.4	7.3	9.0	8.5	7.5	19.2	12.8
<i>Aquila chrysaetos</i> UCBL 86/4	-	-	-	7.5	-	-	6.1	7.5	-	12.6
<i>Aquila chrysaetos</i> UCBL 86/5	-	-	-	8.2	-	-	6.0	8.2	-	13.5
<i>Aquila chrysaetos</i> BMNH 1930.3.24.260	4.2	5.5	4.5	5.7	4.7	6.8	5.0	5.8	14.2	9.3
<i>Harpia harpyja</i> BMNH 1862.3.19.14	5.2	6.7	5.5	8.6	6.2	8.0	6.2	7.9	23.6	12.6

modern genus *Aegypius* (*Vultur* auct.)’ (p. 199) and ‘except the general massive nature, no differences from the modern *Aegypius* are observed.’ (p. 200). He stated that the ‘mosaic features’ of *G. melitensis* consist of *Gyps*-like features, seen mainly in pectoral girdle and forelimbs, while *Aegypius*-like features, were better represented in pelvic girdle and hind limbs.

Differences between *Gyps* and *Aegypius* are very clear in the compared skeletal elements and conclusively suggest the genus *Gyps*. WEESIE (1988) also points that ‘both species [*A. monachus* and *G. fulvus*] can be distinguished on the basis of small but distinct osteological differences ...’, even in the cervical vertebrae (p. 15). The statements of TUGARINOV (1940), JANOSSY (1974, 1989 a, b) and F. HERNÁNDEZ (unpubl. data, after TYRBERG 1998) are relevant for our comparison and they completely exclude a taxonomic similarity between *Gyps* (? or *Aegypius*) *melitensis* and the vulture from Late Pliocene of Varshets. In general, we agree with LOUCHART (2002) that it is

improbable that in Pleistocene a vulture would exist combining features of *Gyps* and *Aegypius*. It is incorrect to consider that the extinct *Gyps melitensis* shares features of *Gyps* and *Aegypius*. ‘This is an erroneous statement that dates back to decades ago, was repeatedly written without verification.’ (LOUCHART, in litt.). LOUCHART (2002) checked the morphological characters with the help of very well preserved skeletal elements of *G. melitensis* from Corsica, and found that there is absolutely no such intergeneric mosaic in *G. melitensis*. (A. LOUCHART, in litt.).

In addition three Holocene finds, a humerus dex dist., an ulna dex. prox. and an ulna dex. (medial part of diaphysis) of ‘exceptionally large dimensions: either to the black vulture, *Vultur monachus* L. = *Aegypius monachus* (L.), or to the griffon vulture, *Vultur fulvus* Gmel. = *Gyps fulvus* Salvad.’, collected in 1899, have been reported by BLANC, BLANC 1958 a). This material is dated 6th to 7th century B.C. and originates from Rome (BLANC, BLANC 1958 a, b).

**Table 4.** The measurements of coracoid (ref. to Fig. 4 C, D) in some large fossil and recent Accipitridae.

Species	a	b	c	d	e	f
Fossil – Varshets						
<i>Gyps bochenskii</i> sp. n. NMNHS 246	32.0	18.9	12.8	9.0	21.0	-
<i>Gyps bochenskii</i> sp. n. NMNHS 247	-	-	-	-	-	10.5
Recent						
<i>Sarcogyps calvus</i> BMNH 1858.1.10.1	24.4	16.4	ca. 17.9	ca. 9.4	ca. 15.9	9.0
<i>Sarcogyps calvus</i> BMNH [without number]	ca. 26.0	ca. 19.2	-	ca. 8.8	ca. 18.3	ca. 10.9
<i>Torgos tracheliotus</i> BMNH 1870.6.22.11	32.7	21.8	11.0	8.5	22.0	10.8
<i>Torgos tracheliotus</i> BMNH 1952.3.213	33.6	19.2	13.3	9.6	21.0	11.5
<i>Torgos tracheliotus</i> BMNH 1954.30.53	29.8	18.1	-	8.0	29.2	12.4
<i>Torgos tracheliotus</i> BMNH 1930.3.24.248	33.6	21.0	10.4	10.6	22.4	11.8
<i>Torgos tracheliotus</i> BMNH 1973.66.56	28.9	20.5	10.8	ca. 7.7	20.8	12.0
<i>Gypohierax angolensis</i> BMNH 1867.10.5.18	16.6	8.4	5.4	5.4	11.3	7.4
<i>Gyps africanus</i> BMNH S 1983.19.1	27.4	16.9	9.9	6.3	17.3	9.8
<i>Gyps africanus</i> BMNH S 1978.7.1	28.5	17.2	11.0	6.4	19.0	9.8
<i>Gyps africanus</i> BMNH S 1983.19.5	27.3	18.6	11.4	7.3	ca. 18.5	9.8
<i>Gyps africanus</i> BMNH S 1983.19.6	26.0	17.2	11.2	6.9	16.9	9.3
<i>Gyps africanus</i> ISEAK A 3907/82	27.3	17.0	9.5	8.9	19.3	9.2
<i>Gyps bengalensis</i> BMNH 1954.30.57	28.0	16.9	9.0	8.0	17.6	8.7
<i>Gyps bengalensis</i> BMNH 1845.1.12.5	24.4	14.2	10.2	8.1	15.8	8.9
<i>Gyps africanus</i> BMNH S 1954.30.56	26.2	17.0	11.5	6.7	19.1	10.6
<i>Gyps rueppellii</i> BMNH 2001.42.1	31.2	18.9	11.2	8.4	20.4	10.2
<i>Gyps rueppellii</i> BMNH 1952.1.171	31.0	19.3	9.8	7.3	21.4	10.8
<i>Gyps ruppellii</i> BMNH 1983.19.2	29.5	20.8	10.7	7.3	21.0	10.2
<i>Gyps rueppellii</i> BMNH 1954.30.55	22.8	18.6	13.7	7.7	20.8	10.4
<i>Gyps fulvus</i> ISEAK A 1854/67	30.5	ca.20.0	12.3	9.2	22.3	11.0
<i>Gyps fulvus</i> ISEAK A 3369/77	32.0	21.0	12.2	10.4	23.0	10.7
<i>Gyps fulvus</i> BMNH 1851.8.25.34	-	20.5	-	-	-	11.7
<i>Gyps fulvus</i> BMNH 1952.1.183	31.8	20.0	14.2	8.3	21.0	11.2
<i>Gyps fulvus</i> BMNH 1845.1.12.4	31.0	19.7	11.4	8.3	21.4	10.8
<i>Gyps fulvus</i> BMNH 1899.1.25.2	30.6	22.4	14.6	9.2	21.6	9.7
<i>Gyps fulvus</i> BMNH 1861.3.24.6	32.0	22.3	12.5	8.0	23.4	11.2
<i>Gyps fulvus</i> NMNHS 1/1993	30.5	20.0	11.7	9.4	20.9	10.1
<i>Gyps fulvus</i> NMNHS 6/1989	29.7	19.4	13.6	11.2	21.4	10.7
<i>Gyps coprotheres</i> BMNH 1983.19.3	32.2	19.5	11.6	7.9	20.9	11.3
<i>Gyps coprotheres</i> BMNH 1983.19.4	31.2	20.4	9.8	8.9	19.9	11.3
<i>Gypaetus barbatus</i> BMNH 1930.3.24.259	25.9	14.5	11.0	7.7	17.6	11.9
<i>Gypaetus barbatus</i> ISEAK A 3209/76	27.0	18.5	8.6	10.2	20.7	13.0
<i>Aegypius monachus</i> ISEAK A 3834/81	32.1	19.8	11.9	10.2	22.8	11.6
<i>Aegypius monachus</i> NMNHS 3/1992	33.0	19.7	11.0	9.7	21.7	11.7
<i>Aegypius monachus</i> BMNH 1848.3.8.2	35.8	22.6	11.7	9.0	23.2	12.3
<i>Aegypius monachus</i> BMNH 1872.10.25.5	34.0	19.5	12.4	9.5	21.2	12.0



**Table 4.** Continued.

Species	a	b	c	d	e	f
<i>Aegypius monachus</i> BMNH 1952.3.60	33.3	18.8	11.1	8.2	19.0	12.9
<i>Aegypius monachus</i> BMNH 1995.13.1	34.0	20.4	11.0	10.2	25.2	12.2
<i>Necrosyrtes monachus</i> BMNH 1860.1.16.8	18.0	11.3	8.6	5.2	12.5	-
<i>Necrosyrtes monachus</i> BMNH 1952.3.209	18.2	-	-	5.6	13.9	-
<i>Necrosyrtes monachus</i> BMNH 1860.1.19.8	-	-	-	-	-	6.8
<i>Neophron percnopterus</i> BMNH 1858.5.20.13	17.3	12.4	5.2	5.1	11.9	6.6
<i>Trigonoceps occipitalis</i> BMNH 1954.30.54	26.0	15.8	11.6	8.0	12.3	9.4
<i>Trigonoceps occipitalis</i> BMNH 1864.10.5.11	25.2	16.4	11.2	5.4	18.7	8.0
<i>Haliaeetus albicilla</i> BMNH 1869.10.19.2.	24.0	16.0	7.3	ca. 6.0	17.6	9.8
<i>Haliaeetus pelagicus</i> BMNH 1996.31.1	28.7	12.5	10.6	10.3	13.5	11.6
<i>Aquila chrysaetos</i> BMNH 1930.3.24.260	21.7	13.7	8.3	7.4	13.9	7.8
<i>Harpia harpyja</i> BMNH 1862.3.19.14	24.3	13.1	12.0	10.9	15.5	9.8

The new finds of *G. melitensis* from Spain, Greece (Crete), Malta, France, and Italy have been summarized in Table 1. Obviously, *G. melitensis* is known from at least 25 sites in 4 (5) countries, although it has been reported for 34 sites in 10 countries, all in the European Mediterranean region (Table 1). In fact all sites are dated Late to Middle Pleistocene. TYRBERG (1998) listed 15 sites and latter this author added 10 other sites (TYRBERG 2008), all of them within the stratigraphic range Middle Pleistocene (MNQ 22) – Late Pleistocene (MNQ 26).

Considerable numbers of *G. melitensis* remains known from Europe have been restudied and synonymized with *A. monachus* or *G. fulvus* (MLÍKOVSKÝ 1998). This author concludes that ‘there is no convincing evidence for the existence of *G. melitensis* in the Quaternary of Central Europe, although the species probably did exist in the Mediterranean region during the Middle Pleistocene.’ (p. 27). It seems to have been a Mediterranean species (MLÍKOVSKÝ 2009). MOURER-CHAUVIRÉ (1993) considers this species to be an element of the Mediterranean avifaunas, although the species has also been found in Middle and Upper Pleistocene of European mainland (MOURER-CHAUVIRÉ 1993). MLÍKOVSKÝ (1998) states that *A. monachus* and *G. fulvus* appeared in Europe in Middle Pleistocene, when *G. melitensis*

was found in the Mediterranean region of the continent. The oldest European record of *N. percnopterus* also came from Middle Pleistocene (Greece; MLÍKOVSKÝ 1995).

Recently numerous Late Pleistocene finds of ‘remarkable preservation’ of *G. melitensis* have been found in two localities in northern part of Corsica: Coscia (BONIFAY *et al.* 1998) and Castiglione (SALOTTI *et al.* 2000), examined latter by LOUCHART (2002). It is important to note that *G. melitensis* coexisted with other large vultures – *Gypaetus barbatus* (SALOTTI *et al.* 2000), but in Corsica or Sardinia it didn’t coexisted in the Pleistocene with *G. fulvus* (A. LOUCHART, in litt).

#### Comparison with *Gyps melitensis* LYDEKKER, 1890

The most important for the determination of Bulgarian finds is their comparison to *G. melitensis*. Bone morphology of both coracoidal and costal parts of the sternum, the sternal and humeral parts of the coracoid, the wing and pedal phalanges refer Varshets specimen to the genus *Gyps*. Our examination (in 1999) of the type material of *G. melitensis*, stored at the BMNH showed metrical differences between *G. melitensis* and Bulgarian fossil specimens. As LYDEKKER (1890) writes, Maltese vulture was ‘by

**Table 5.** The measurements of the phalanx dist. dig. majoris sin. (ref. to Fig. 4 E) in some large fossil and recent Accipitridae.

Species	a	b	c	d
Fossil – Varshets				
<i>Gyps bochenskii</i> sp. n. NMNHS 160	11.2	11.6	11.6	7.2
Recent				
<i>Sarcogyps calvus</i> BMNH 1858.1.10.1	8.9	8.0	7.9	7.1
<i>Sarcogyps calvus</i> BMNH [without number]	8.3	7.8	7.3	ca. 8.5
<i>Torgos tracheliotus</i> BMNH 1870.6.22.11	10.5	9.9	10.7	7.6
<i>Torgos tracheliotus</i> BMNH 1930.3.24.248	11.4	9.6	10.0	7.4
<i>Torgos tracheliotus</i> BMNH 1954.30.53	11.0	10.9	10.5	7.7
<i>Aegyptius monachus</i> ISEAK A 3834/81	11.3	11.0	10.5	7.6
<i>Aegyptius monachus</i> BMNH 1848.3.8.2	10.9	10.2	10.7	7.0
<i>Aegyptius monachus</i> ISEAK A 1926/68	12.7	12.2	12.0	8.6
<i>Aegyptius monachus</i> BMNH 1872.10.25.5	10.3	10.0	11.3	7.4
<i>Aegyptius monachus</i> BMNH 1995.13.1	11.6	11.7	11.3	7.8
<i>Aegyptius monachus</i> NMNHS 3/1992	11.3	10.4	10.5	7.7
<i>Gyps bengalensis</i> BMNH 1954.30.57	8.7	8.2	8.8	5.8
<i>Gyps bengalensis</i> BMNH 1845.1.12.5	8.6	8.2	8.3	6.6
<i>Gyps africanus</i> ISEAK A 3907/82	9.0	8.6	7.6	6.0
<i>Gyps africanus</i> BMNH S 1954.30.56	9.0	9.3	9.1	6.7
<i>Gyps africanus</i> BMNH S 1978.7.1	9.6	10.0	10.3	6.2
<i>Gyps africanus</i> BMNH S 1983.19.1	9.2	8.8	8.4	6.0
<i>Gyps africanus</i> BMNH S 1983.19.5	8.2	8.6	8.2	6.7
<i>Gyps africanus</i> BMNH S 1983.19.7	9.3	8.8	8.8	7.2
<i>Gyps rueppellii</i> BMNH 2001.42.1	9.0	7.7	8.5	6.4
<i>Gyps rueppellii</i> BMNH 1983.19.2	9.6	8.9	9.4	5.8
<i>Gyps rueppellii</i> BMNH 1954.30.55	8.7	9.3	10.0	7.1
<i>Gyps rueppellii</i> BMNH 1952.1.171	9.5	10.0	9.1	6.0
<i>Gyps fulvus</i> ISEAK A 3369/77	11.5	10.0	9.6	7.4
<i>Gyps fulvus</i> BMNH 1861.3.24.6	10.4	10.4	10.0	8.3
<i>Gyps fulvus</i> BMNH 1952.1.183	11.4	10.6	10.3	7.5
<i>Gyps fulvus</i> NMNHS 1/1993	10.3	9.9	9.6	6.4
<i>Gyps fulvus</i> NMNHS 6/1989	10.7	10.0	10.2	7.3
<i>Gyps coprotheres</i> BMNH 1983.19.4.	10.9	10.4	9.6	7.2
<i>Gyps coprotheres</i> BMNH 1983.19.3	11.4	9.8	10.5	7.2
<i>Trigonoceps occipitalis</i> BMNH 1954.30.54	9.2	9.0	8.4	7.0
<i>Trigonoceps occipitalis</i> BMNH 1864.10.5.11	7.2	6.4	6.8	4.9
<i>Neophron percnopterus</i> BMNH 1858.5.26.13	6.2	5.6	6.9	4.9
<i>Necrosyrtes monachus</i> BMNH 1952.3.209	6.6	6.8	6.4	5.1
<i>Gypohierax angolensis</i> BMNH 1867.10.5.18	5.9	5.4	5.5	3.9
<i>Gypaetus barbatus</i> ISEAK A 3209/76	10.5	9.6	9.0	6.7
<i>Gypaetus barbatus</i> BMNH 1930.3.24.259	10.4	8.9	10.2	6.7
<i>Aquila chrysaetos</i> BMNH 1930.3.24.260	7.4	7.2	8.6	4.9
<i>Haliaeetus pelagicus</i> BMNH 1996.31.1	8.1	7.8	9.2	5.5
<i>Haliaeetus albicilla</i> BMNH 1869.10.19.2	7.8	7.8	8.8	9.2
<i>Harpia harpyja</i> BMNH 1862.3.19.14	6.8	7.2	8.0	5.3

**Table 6.** The measurements of the phalanx dist. dig. I pedis sin. (ref. to Fig. 4 F) in some large fossil and recent Accipitridae.

Species	a	b	c	d
Fossil – Varshets				
<i>Gyps bochenskii</i> sp. n. NMNHS 159	ca. 40.0	12.6	11.6	9.0
Recent				
<i>Sarcogyps calvus</i> BMNH 1858.1.10.1	ca. 30.5	-	10.0	ca. 6.0
<i>Sarcogyps calvus</i> BMNH [without number]	ca. 30.0	11.3	8.4	ca. 5.8
<i>Torgos tracheliotus</i> BMNH 199669.23	36.6	12.8	11.4	7.9
<i>Torgos tracheliotus</i> BMNH 1952.1.172	37.6	13.4	11.3	8.4
<i>Torgos tracheliotus</i> BMNH 1870.6.22.11	38.5	13.8	12.2	8.2
<i>Torgos tracheliotus</i> BMNH 1930.3.24.248	37.7	12.0	10.2	-
<i>Torgos tracheliotus</i> BMNH 1954.30.53	34.0	13.0	10.8	8.1
<i>Aegyptius monachus</i> ISEAK A 3834/81	ca. 34.0	11.5	10.8	-
<i>Aegyptius monachus</i> ISEAK A 1926/68	ca. 37.5	-	-	-
<i>Aegyptius monachus</i> BMNH S 1995.13.1	37.8	11.9	9.5	-
<i>Aegyptius monachus</i> BMNH 1848.3.8.2	34.0	11.2	11.0	8.2
<i>Aegyptius monachus</i> BMNH 1872.10.25.5	33.2	12.9	10.9	8.9
<i>Aegyptius monachus</i> NMNHS 3/1992	33.7	11.2	10.3	7.8
<i>Gyps fulvus</i> BMNH 1861.3.24.6	ca. 31.0	11.0	8.3	6.4
<i>Gyps fulvus</i> ISEAK A 3369/77	ca. 31.5	10.3	8.4	-
<i>Gyps fulvus</i> BMNH 1952.1.183	ca. 34.5	11.2	8.6	6.7
<i>Gyps fulvus</i> NMNHS 1/1993	34.0	9.9	8.2	6.5
<i>Gyps fulvus</i> NMNHS 6/1989	ca. 35.6	10.5	8.9	7.1
<i>Gyps bengalensis</i> BMNH 1845.1.12.5	21.8	11.5	6.8	-
<i>Gyps bengalensis</i> BMNH 1900.7.7.1	25.2	8.4	8.4	6.2
<i>Gyps africanus</i> ISEAK A 3907/82	24.0	8.4	7.1	-
<i>Gyps africanus</i> BMNH S 1954.30.56	26.2	8.5	7.5	5.4
<i>Gyps africanus</i> BMNH S 1978.7.1	ca. 28.8	8.7	7.2	6.4
<i>Gyps africanus</i> BMNH S 1983.19.1	ca. 30.5	8.8	7.7	6.2
<i>Gyps africanus</i> BMNH S 1983.19.5	22.4	8.5	8.3	6.4
<i>Gyps africanus</i> BMNH S 1983.19.6	26.0	8.3	8.8	5.6
<i>Gyps africanus</i> BMNH S 1983.19.7	28.8	9.1	7.3	-
<i>Gyps rueppellii</i> BMNH 2001.42.1	ca. 31.0	8.9	8.3	6.5
<i>Gyps rueppellii</i> BMNH 1952.1.171	28.4	12.5	7.5	-
<i>Gyps ruppellii</i> BMNH 1983.19.2	30.4	11.9	7.6	-
<i>Gyps rueppellii</i> BMNH 1954.30.55	27.2	9.2	7.8	5.8
<i>Gyps coprotheres</i> BMNH 1983.19.4.	ca. 38.0	9.6	7.7	6.7
<i>Gyps coprotheres</i> BMNH 1983.19.3.	31.7	10.7	9.8	6.7
<i>Gyps tenuirostris</i> BMNH 1885.8.19.36	29.0	8.0	8.0	6.5
<i>Gyps indicus</i> BMNH 1925.12.23.26	28.0	9.1	7.8	6.1
<i>Gyps himalayensis</i> BMNH 1845.1.9.4	27.0	9.4	8.0	6.3
<i>Trigonoceps occipitalis</i> BMNH 1954.30.54	30.4	10.2	9.0	5.9
<i>Trigonoceps occipitalis</i> BMNH 1864.10.5.11	ca. 26.5	8.9	8.3	5.8
<i>Neophron percnopterus</i> BMNH 1858.5.26.13	ca. 22.0	-	7.0	-
<i>Necrosyrtes monachus</i> BMNH 1952.3.209	23.1	6.8	7.8	ca. 6.0
<i>Gypohierax angolensis</i> BMNH 1867.10.5.18	21.8	12.4	6.5	-
<i>Gypaetus barbatus</i> ISEAK A 3209/76	ca. 35.5	10.6	9.0	-
<i>Gypaetus barbatus</i> BMNH 1930.3.24.259	32.4	15.0	9.1	-
<i>Haliaeetus albicilla</i> BMNH 1869.10.19.2	34.4	11.3	9.0	-
<i>Haliaeetus pelagicus</i> BMNH 1996.31.1	ca. 48.5	14.2	ca. 11.6	9.0
<i>Harpia harpyja</i> BMNH 1862.3.19.14	ca. 68.0	21.6	15.5	12.1
<i>Aquila chrysaetos</i> BMNH 1930.3.24.260	36.6	16.9	11.2	8.9

**Table 7.** Percentage of the metrical value of the sexual dimorphism in the standard external morphological features of the Old World vultures (after CRAMP, 1980) (Males superiority above females is indicated underlined).

Species	Wing	Tail	Bill	Tarsus	Middle toe	Sex differences significant	Average percentage
<i>Gypaetus barbatus</i>	0.04	0.60	0.40	0.60	0.01	(yes)	1.09
<i>Neophron percnopterus</i>	0.08	4.32	<u>0.64</u>	<u>0.12</u>	4.83	not, except tail	2.20
<i>Necrosyrtes monachus</i>	2.07	0.46	0.33	3.34	<u>0.60</u>	-	1.36
<i>Gyps fulvus</i>	3.60	1.32	0.50	1.77	2.28	wing	1.89
<i>Aegypius monachus</i>	3.63	4.20	<u>1.31</u>	2.28	2.46	not	2.78
<i>Torgos tracheliotus</i>	1.54	<u>0.57</u>	1.02	<u>4.28</u>	<u>3.78</u>	not	2.23
Mean	2.38	1.91	0.69	2.06	2.32		

**Table 8.** Percentage of the individual variability (max : min) of the value of the osteometrical features of two Old World vultures.

Element/Feature		<i>Gyps fulvus</i>	<i>Aegypius monachus</i>
Sternum, pars coracoidalis	a	9.1	21.0
	b	17.3	17.1
	c	9.4	17.4
	d	11.4	31.8
Sternum, pars costalis	a	26.3	39.3
	b	34.6	29.5
	c	21.5	24.4
	d	22.6	8.5
	e	20.0	8.3
	f	29.1	24.2
	g	22.6	28.9
	h	20.5	8.1
	i	9.8	7.1
	j	37.1	32.7
Coracoid	a	7.2	-
	b	13.4	-
	c	16.2	-
	d	25.9	-
	e	9.2	-
	f	17.1	-
Phalanx dist.dig. majoris	a	10.5	11.1
	b	4.9	14.8
	c	5.9	12.5
	d	22.9	11.7
Phalanx dist. dig. I pedis	a	-	11.5
	b	-	13.2
	c	-	12.8
	d	-	-

about one fifth' larger than *A. monachus* (p. 404) and it was 'considerably larger than any existing species...' (p. 408). Analogous are the conclusions for the femur, tibiotarsus, tarsometatarsus, phalanx 1 dig. 1 pedis, phalanx (2 or 3) dig. 3 pedis, phalanx 1 and 3 dig. pedis, phalanx dist. dig. (?) pedis and the cervical vertebrae (LYDEKKER 1891). WEESIE (1988) also mentioned, that *G. melitensis* 'was about one fifth larger' than *G. fulvus* (p. 15). This author also estimates that some measurements (of distal pedal phalanges) of *G. melitensis* were of 16.9 to 18.3% larger than in *G. fulvus* and 30.3 to 40.0% than in *A. monachus*. The measurements of the distal pedal phalanx of Bulgarian specimen (Table 6) exceed the mean values of the dimensions of that element of *G. fulvus* as follows (nominator – mean, denominator – percentage): a – 33.32/20.04; b – 10.58/19.09; c – 8.48/36.79; d – 6.67/34.93, i. e. distal pedal phalanges of Varshets specimen exceeded these of the recent *G. fulvus* by ~19.1 – ~36.8% (mean 27.7 %). The same comparison of Varshets griffon vulture and *G. fulvus* for phalanx dist. dig. majoris (Table 5) are as follows: a – 10.86/3.13; b – 10.18/13.94; c – 9.94/16.7, d – 7.38/-2.43., i. e. phalanx dist. dig. majoris of Varshets specimen exceeded that of the recent *G. fulvus* by ~ -2.4 – 16.7% (mean 7.8%).

The find of *G. melitensis* from Grottes de Grimaldi (femur prox. sin.) is 'extraordinary robust' (BOULE 1919, p. 307). FRIANT (1951) also reports the very large size of *G. melitensis*, compared to *G. fulvus* (44:35 mm width of distal epiphysis of the femur). The limb bones from Contrada Fusco (Sicily) differ by their larger size from the modern *G. fulvus*

(CASSOLI, TAGLIACOZZO 1996). Obviously, *G. melitensis* might be of a larger size than the compared Late Pliocene specimen from Bulgaria. S. PARRY (pers. comm.) suggests that the age of the type material is Pliocene, because there are no absolute radiometric dates. On the other hand, MLÍKOVSKÝ (2002) defines the chronostratigraphic distribution of that species as Middle to Late Pleistocene. Here we have to remember, that despite the chronostratigraphical proximity (or identity), Varshets specimen is unambiguously referred to genus *Gyps*. It was possibly smaller than *G. melitensis* and showed the closest osteomorphological resemblance to *G. fulvus* and *G. bengalensis* (see below). It is difficult to evaluate individual metrical variability in *G. melitensis*, but the estimations of the data for two (? adult specimens) of MOURER-CHAUVIRÉ (1977) and JANOSSY (1974) suggests that it was 10%. It is likely to be similar to that in the recent *G. fulvus* and (?) *A. monachus*. MOURER-CHAUVIRÉ (1975) established that no significant differences exist for the width of proximal epiphysis of *G. melitensis* and *A. monachus* femur, but they are significant for the diameter of the femur diaphysis, i.e. some of the measurements of a bone element may differ significantly, while others do not.

Almost all Bulgarian finds lie within the metrical range of *G. fulvus*, but we do not list any 'Aegyptius-like' features in the morphology of these skeletal elements. Because of the considerable dimensional and morphological differences between the two main lineages of the Old World vultures, we exclude the group with *Neophron*, *Necrosyrtes* and *Gypohierax* from our comparison. Furthermore, it is suggested that *G. melitensis* 'was ... a geographical subspecies of *G. fulvus* ...' (SÁNCHEZ-MARCO 2007: 1060). Two skeletal elements from Gorham's Cave (Gibraltar), a sternum (cranial part) and a coracoid (both humeral and sternal parts) have been measured by SÁNCHEZ-MARCO (2007; Table 1). These elements are also present in the material from Varshets. The measurement 'depth of cranial part' of the sternum of Gibraltar specimen is 16.2, while in Varshets specimen it is 12.0. The 'width of the glenoid facet' and the 'width of the sternal facet' of the coracoid of Gibraltar specimen are 15.8 and 11.9 respectively,

while in Varshets specimen these measurements are ca. 13.3 and ca. 11.2. SÁNCHEZ-MARCO (2007) refers Gorham's Cave specimen to *G. melitensis*, which once again proves osteometrical differences between Maltese Griffon vulture and Bulgarian specimen.

Important comments of A. LOUCHART (a reviewer of an earlier version of the paper): '...the measurements in LOUCHART (2002), the Corso-Sardinian fossils being the best record for *G. melitensis*, show that the latter is not homogeneously larger than *G. fulvus*. The anterior elements are in the upper half or slightly above *fulvus*, while the posterior elements (leg bones) are generally allometrically larger, i.e. up to 1/5 or 1/4 larger than *G. fulvus*. Individual variation is important, but this allometry is evident, and corresponds obviously to the heavy weight of *G. melitensis*, reflected more in the legs than in the rest of the skeleton (including the wings; perhaps showing slightly reduced flying performances) (LOUCHART 2002). Given this, the measurements of Bulgarian fossils perfectly fit the size expected for *G. melitensis*. ...'. The measurements namely, show that not only the posterior elements (phalanx dist. dig. I pedis; Table 6), but and (some of) the anterior elements of Varshets specimens (phalanx dist. dig. majoris; Table 5) are larger than these of the modern *G. fulvus*. The measurements of the other elements of pectoral girdle (Tables 2-4) lie in the upper dimensional range or also exceed the size of *G. fulvus*. This contradicts to the suggestion of A. LOUCHART of their taxonomical identity with *G. melitensis* made by the comparisons of the measurements of Bulgarian finds and *G. fulvus*: 'They [Bulgarian finds – Z. B.] should be referred to as *Gyps melitensis* or probably better as *Gyps cf. melitensis*'. The suggested 'slightly reduced flying performances' of *G. melitensis* by A. LOUCHART corresponds to our data of the comparison of the measurements of some wing skeletal elements (phalanx dist. dig. majoris), which in Varshets specimen exceeded in the same way that of the recent *G. fulvus* by ca. 8% (mean).

As seen from above, the hind limb elements (distal pedal phalanx) of Varshets specimen exceed these of *G. fulvus* by ~19.1 – ~36.8%. Data so far state that distal pedal phalanxes of *G. melitensis* are

16.9 to 18.3% (mean 17.6%) larger than in *G. fulvus* (WEESIE 1988), but this element of Bulgarian specimens (Table 6) exceeded the mean values of the dimensions of that element of *G. fulvus* by ~19.1 – ~36.8% (mean 27.7%), i. e. having in mind the estimations of WEESIE (1988), they are larger of (mean) 10.1%. That is why we prefer to designate them as a distinct species, instead tentatively to refer to Pleistocene Maltess Griffon, a species differing chronostratigraphically from Bulgarian finds and post-dating them by over 2 ma.

### Comparison with recent large Old World accipitrids

#### Sternum, pars coracoidalis, NMNHS 248

**Measurements:** Table 2, Fig. 4 A.

**Comparison:** We also compared NMNHS 248 with *Haliaeetus albicilla* – one of the largest species in Buteoninae (VIGORS 1824), which approaches the vultures in size. This species also shares the sulci carinae and the asymmetrical rostrum sterni, although the clear differences consist of smaller dimensions and inception of the crista sterni positioned under the rostrum sterni, while in NMNHS 248 a distance of 18 mm is observed between the rostrum sterni and the crista sterni. This is a considerable difference and is large enough for a generic distinction.

The find differs from: *Sarcogyps* by its larger size, the partial overlapping of sulci carinae and the presence of a concavity above rostrum sterni; *Torgos* very clearly by much larger rostrum sterni in cranial view and by the absence of a sagittal protruding between the rostrum sterni and the inception of crista sterni, as well as the partial overlapping of sulci carinae, the asymmetrical rostrum sterni and deeper fossa (NMNHS 248 has similar and even larger dimensions than these of *Torgos*); *Aegypius* clearly by the presence of a medially positioned well developed concavity above the rostrum sterni and the overlapping of s. a.; *Necrosyrtes* by the much larger size and the partial overlapping of sulci carinae. NMNHS 248 differs from *Trigonoceps occipitalis* by overlapping of sulci carinae, asymmetrical manubrium, much deeper fossa, more upright, but not arc-like in ventral view lower edges of sulci carinae.

The find from Varshets resembles *Gyps* as follows: *fulvus* by overlapping of sulci carinae, and by asymmetrical rostrum sterni, but it differs by the presence of a fossa on the dorsal surface of sternum, the relatively larger (wider) rostrum sterni, i.e. correlation 'b : d', larger general size, the relatively wider sternum in dorsal view, and the narrower distance between the dorsal edges of the s. a. (measurement 'a'); *bengalensis* by overlapping of sulci carinae, but it differs from that species by the considerably larger size, the presence of a fossa above the rostrum sterni, and much wider manubrium in correlation to the cranial distance between the medial edges of the labrum dorsale (measurements 'b' : 'a'); *africanus* by overlapping of sulci carinae and asymmetrical cranial view of rostrum sterni, the presence of a fossa above the manubrium sterni (nevertheless that it is very shallow), and differs by the bigger asymmetrical manubrium; *rueppellii* by overlapping of sulci carinae and asymmetrical cranial view of rostrum sterni, but differs by the fossa above the manubrium sterni, and less bow-curved than straight f. articulares sterno-coracoidales in dorsal view; *coprotheres* by the presence of a fossa above the rostrum sterni, overlapping of sulci carinae, asymmetrical cranial view of rostrum sterni, but it differs from that species by the considerably larger dimensions and the shallower incisurae intercostales.

We found that a clear overlapping of sulci carinae and the considerable asymmetry of the rostrum sterni, related to it, occur in all species of genus *Gyps*. In all specimens the s. a. coracoideus sinistra lies above the s. a. coracoideus dextra. Our comparisons shows that among Aegyptiinae taxa this feature is diagnostic for *Gyps*. It is worthy to note that in *Gypohierax* an inconsiderable partial overlapping of sulci carinae is also represented. *G. angolensis* also has a weak asymmetry of its rostrum sterni in cranial view, but this species is much smaller than NMNHS 248.

The mentioned fossa on the dorsal side of the sternum above the rostrum sterni was established in only three specimens of genus *Gyps*: *G. fulvus* BMNH 1845.1.12.4, *G. coprotheres* BMNH 1983.19.2 and 1983.19.3. In these three cases it is smaller and shallower and seems as a pore of underossified tissue, but not as a well developed

fossa with smooth surface. I do not consider it a reliable morphological feature. Rather I believe it is due to individual variability.

The comparison of the correlations between metrical dimensions of one of the most specific structures of the preserved fragment (rostrum sterni) shows a good separation and a metrical distinction of Varshets specimen from all other species of genus *Gyps* and other vultures (except *A. monachus*) (Fig. 5).

#### **Sternum, pars costalis sin., NMNHS 154**

**Measurements:** Table 3, Fig. 4 B.

**Comparison:** The find represents a fragment, preserving proc. costales II to V sin. and differs from: *Sarcogyps* by its enormous size and deep fossa pneumatica; *Torgos* by the larger size and better developed proc. costales (measurements 'b', 'd' and 'f') in comparison of incisurae intercostales; *Trigonoceps* by steeply directed linea intermuscularis in ventral view, and considerably larger size; *Aegyptius* by larger size, but resembles it by the steeply orientation of linea intermuscularis; *Neophron* and *Necrosyrtes* both in morphology, larger size, and higher pneumatization of tabula sterni; *Gypohierax* by orientation of linea intermuscularis to proc. costalis II, but not to incisura intercostalis between the proc. costales III and IV; *Gypaetus* by the larger size and more open arc of the linea intermuscularis (In *G. barbatus* it is directed almost perpendicularly towards the lateral edge of sternum, while in the fossil specimen it forms a sharp angle).

The find from Varshets resembles *Gyps bengalensis* in general morphology, but differs dimensionally by its larger size, and by the lack of a fossa on the lateral surface of the base of the proc. craniolateralis; *rueppellii* in morphology in general but differs by the steeply directed linea intermuscularis towards the incisurae intercostales in ventral view and larger size; *fulvus* metrically (measurements 'i' and 'j', Table 3), but differs by the larger dimensions, the orientation of the linea intermuscularis, the relatively thicker incisurae intercostales (measurements 'c', 'e' and 'b'), and the relatively wider incisura intercostalis IV (correlation between the measurements 'j' and 'i'); *coprotheres*

very much, but dimensionally the fossil specimen is considerably larger (linea intermuscularis in *G. coprotheres* passes between the proc. costales III and IV, while in NMNHS 154 it passes against proc. costalis II). Morphologically NMNHS 154 is similar to *G. africanus*, but it is larger than this species, and has wider incisurae intercostales (measurements 'i' and 'j').

The comparison of the correlations between metrical dimensions of the articular sterno-costal surfaces of sternum also shows a very good separation and a metrical distinction of the fossil specimen from Bulgaria to all other vultures (Fig. 6).

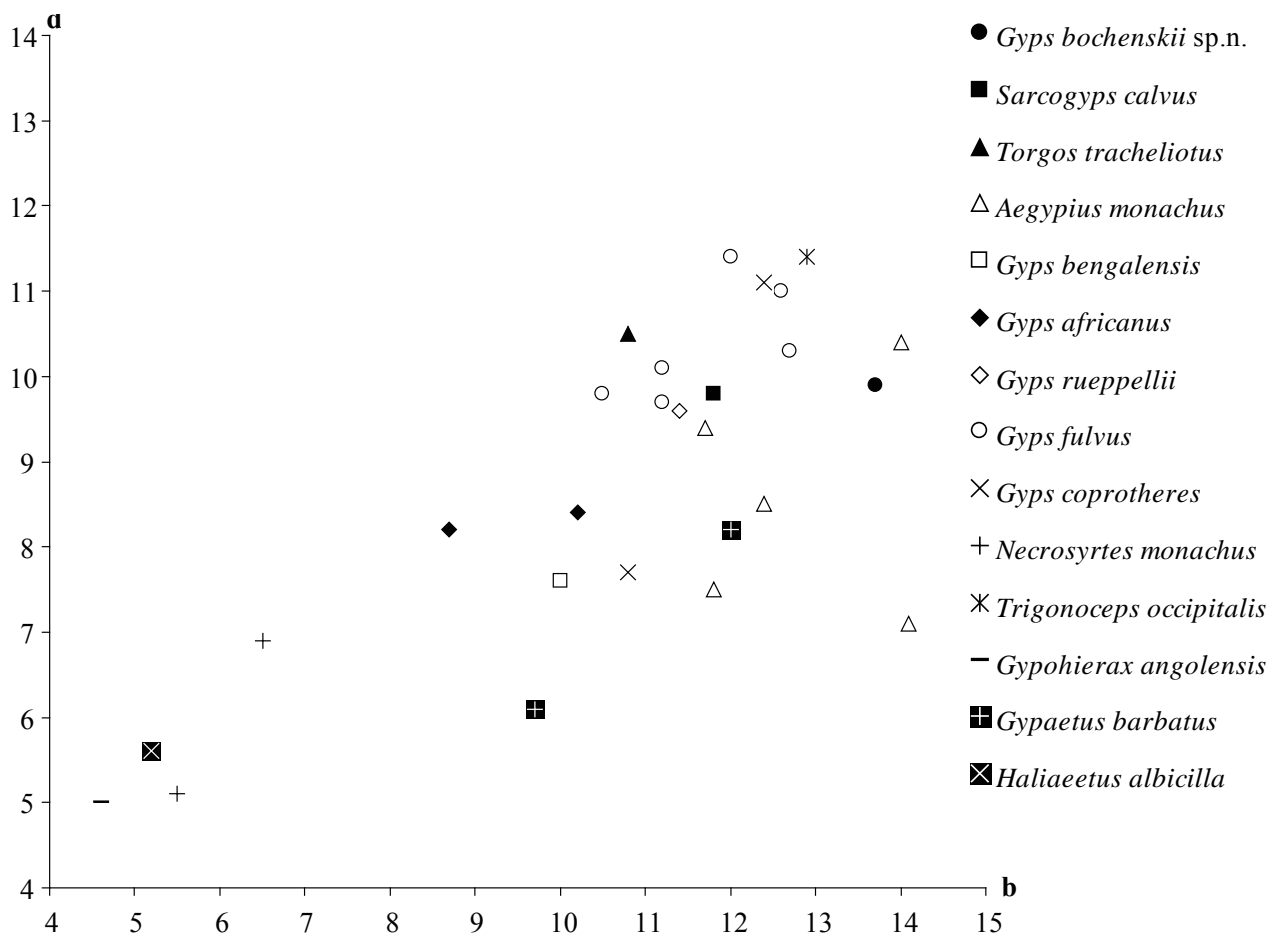
#### **Coracoid dex., pars humeralis NMNHS 246**

**Measurements:** Table 4, Fig. 4 C.

**Comparison:** NMNHS 246 differs from *Aquila chrysaetos*, *Haliaeetus* spp. and other larger species of Aquilinae by its larger size and the relatively wider f. a. clavicularis in dorsal view, and the absence of a ridge on medio-cranial surface between the f. a. clavicularis and the f. a. humeralis.

The find differs from: *Sarcogyps* by larger size and presence of a foramen pneumaticum in the humeral part of the bone; *Aegyptius* by more massive (robust) acrocoracoidal part (larger measurements 'c' and 'd'); *Necrosyrtes* both in morphology (less flattened f. a. clavicularis) and by considerable difference in size; *Gypaetus* by thicker f. a. clavicularis; *Trigonoceps* by wider f. a. clavicularis (measurement 'c') and larger general size; and *Torgos* by much wider f. a. clavicularis (measurement 'c').

The find from Varshets resembles *Gyps bengalensis* in the wider acrocoracoidal part, the presence and location of foramen pneumaticum, but it differs by wider f. a. clavicularis, and the general larger size; *rueppellii* also by the shallower s. musculi supracoracoidei, and more protuberant f. a. clavicularis; *fulvus* in most of the morphological features, but differs by its larger proc. acrocoracoideus (measurement 'c'), and specifically more protuberant, than flatten, f. a. clavicularis in ventral view (Fig. 2 a, b, c), the considerably less concave s. m. supracoracoidei in medial view, the considerably protuberant f. a. clavicularis in



**Fig. 5.** Correlation between the width and height [mm] of rostrum sterni (measurements 'b' and 'd', Table 2) in the Old World vultures.

cranial view; *coprotheres* by the shape of proc. acrocoracoideus, but differs by larger dimensions; *africanus* by general morphology but differs by more protuberant f. a. clavicularis.

#### **Coracoid dex., pars sternalis NMNHS 247**

**Measurements:** Table 4, Fig. 4 D.

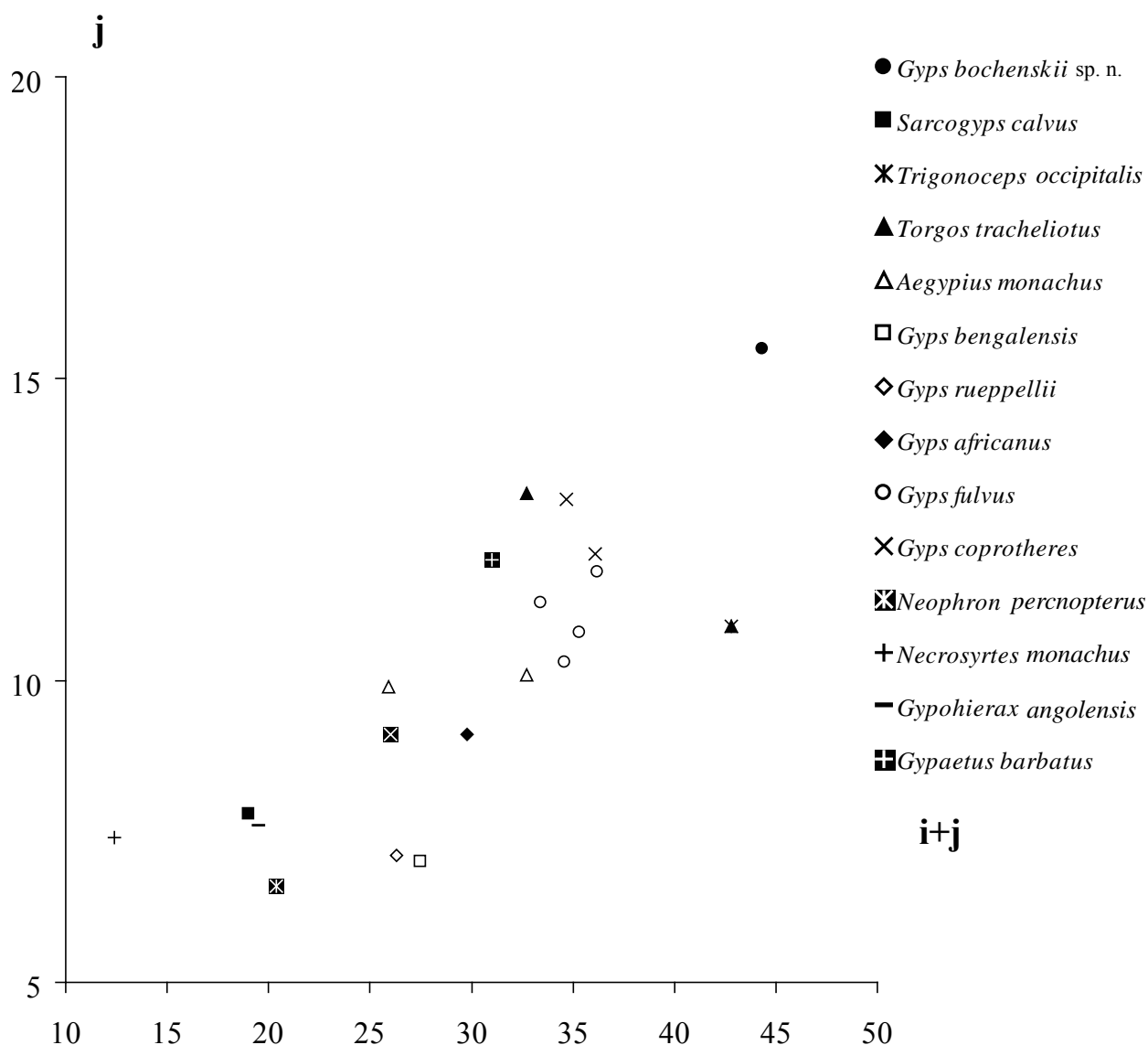
**Comparison:** NMNHS 247 differs from *Aquila chrysaetos*, *Haliaeetus* spp. and other larger species of Aquilinae by larger size. The find differs from: *Sarcogyps* by its lesser concavity of impressio m. sternocoracoidei, and the larger size; *Aegyptius* by the additional thickened part in the sternal part of the bone (suggesting that the griffon vulture from Varshets was more powerful than *A. monachus*, but it could also be due the of individual variability); *Necrosyrtes* both in morphology and by the considerable difference in size; *Gypaetus* by the much narrower f. a. sternalis and the longer f. a. sternalis; *Trionocephs* by the larger

general size; and *Torgos* by the lesser concavity of its impressio m. sternocoracoidei.

The find from Varshets resembles *Gyps*: *bengalensis* in the presence of an additional thickened part in the sternal part, and general larger size; *rueppellii* also by presence of additional thickened part in the sternal part, besides its better development in NMNHS 246; *fulvus* in most of the morphological features; *africanus* by general morphology; and *coprotheres* differs by larger dimensions. The additional thickened part on the cranial surface of the sternal part of diaphysis of the coracoid occurs in all 10 studied specimens of genus *Gyps*, except one – *G. fulvus* BMNH 1845.1.12.4. The arc of f. articular sternalis in ventral view in the specimen of Varshets is considerably more open, indicating it size was larger than in all recent species of *Gyps*.

**Phalanx dist. dig. majoris sin., NMNHS 160**





**Fig. 6.** Correlation between the distance between the proc. costales II and V (measurements ‘i’ + ‘j’) and the distance between the proc. costales IV and V (measurement ‘j’) [mm] (Table 3) in the Old World vultures.

**Measurements:** Table 5, Fig. 4 E.

**Comparison:** The find differs from *Haliaeetus albicilla*, *H. pelagicus*, *Harpia harpyia* and *Aquila chrysaetos* by larger size and rounder, but not angular (triangle) shape of the articular facet. Aquilinae have smaller size and more flattened f. a. Thus all eagles (‘Aquilinae’) must be excluded of our comparison.

NMNHS 160 differs from: *Sarcogyps*: by much larger sizes and more inclined profile of articular part towards the phalanx’ body; *Torgos* by larger size, wider f. a. interphalangealis, deeper fossa on it, and greater general robustness; *Aegyptius* by its greater robustness and massiveness, and deeper fossa on the lateral tip of

the f. a.; *Gypaetus* by round, but not slit-like shape of the fossa and rounder, but not angular edges of the f. a. interphalangealis; *Trigoiceps* by larger size and less concave medial edge of the f. a.; and *Necrosyrtes* by larger size, deeper relief on the f. a. and lack of a longitudinal ridge on the medial surface.

The find from Varshets resembles *Gyps*: *bengalensis* and *africanus* in general shape, but it differs by more flattened f. a. interphalangealis, better developed fossa on it and larger size (*G. africanus* has relatively more elongated phalanx in dorsal view). NMNHS 160 differs from *G. rueppellii* metrically (larger size) and by deeper fossa on the f. a.

interphalangealis. Differences from *G. coprotheres* are shown in the better developed fossa, larger size and the absence of a concave insertion on the medial edge of f. a. interphalangealis. It also differs from *G. fulvus* by thicker body of the phalanx especially before its articular part, deeper fossa on the lateral tip of the f. a., considerably blunter lateral tip of the f. a., and the less concave caudal edge of the f. a.

**Phalanx dist. dig. I pedis sin., NMNHS 159**

**Measurements:** Table 6, Fig. 4 F.

**Comparison:** The find differs from Aquilinae (*Aquila*, *Haliaeetus*, *Harpia*) by relatively shorter and more rounded base of the phalanx and less concave profile of the f. a. interphalangealis.

It differs from: *Necrosyrtes* by much larger size and more protuberant and relatively short base of the phalanx (measurement 'c'); *Sarcogyps* by larger size and more open arc of the lateral profile of the bone; *Torgos* by larger size, less concave contours of the f. a. interphalangealis and more massive and round base of the phalanx; *Trigonoceps* by larger size and less developed collar around the f. a. in lateral view; and *Aegyptius* by sharper shape of dorsal part of the f. a., and less asymmetrical base of the phalanx. JANOSSY (1974) states that the pedal phalanges of *G. melitensis* are 'very close to these of *A. monachus*' (p. 214) – another distinguishing feature from *G. melitensis*; *Gypaetus* by bigger size and shorter and more rounded base of the phalanx. *Gypaetus* has a more elongated and sharper base of f. a. interphalangealis than in NMNHS 159. *G. himalayensis* was only partly compared because of the lack of complete skeletons of that species in the European collections. The only complete specimen in the World (at NMNHW) is mounted (JAMES DEAN, NMNHW, in litt.) and does not allow reliable morphological comparisons. Partial skeletons in BMNH allowed the exclusion on morphological and taxonomical grounds of Varshets specimens as belonging to *G. himalayensis* (see below).

The find from Varshets resembles very much *G. bengalensis*, *G. himalayensis* and *G. africanus* in morphology, but it differs by its larger size, and the relatively bigger base of the phalanx. NMNHS 159 also differs from *G. africanus* by sharper dorsal section of the f. a. interphalangealis. The similarities

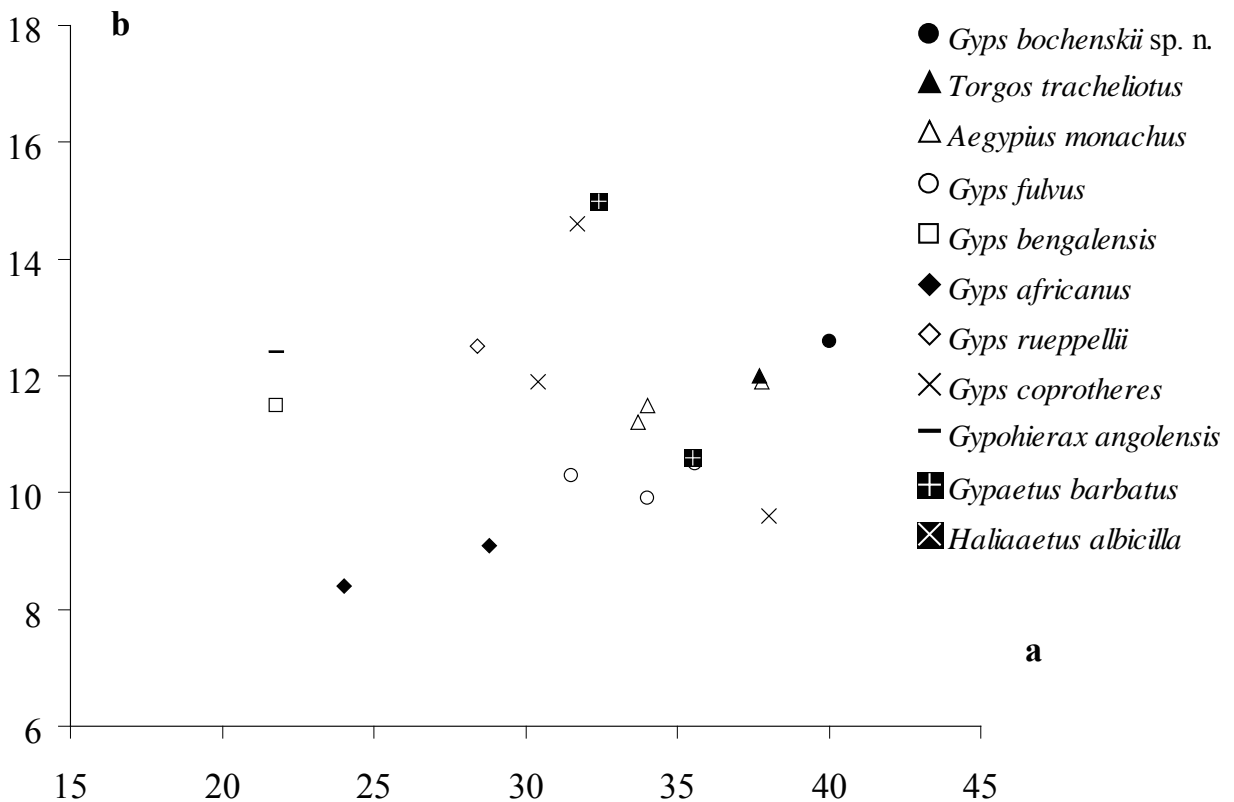
with *G. bengalensis* are considerable and the larger size of NMNHS 159 is the only difference. The find from Varshets differs from *G. coprotheres* not only metrically, but also by more massive base of the phalanx. Differences from *G. himalayensis* are shown in the clearer (deeper) relief of the f. a. It differs from *G. fulvus* by much longer (thicker) base (measurement 'd', Table 6) and higher f. a. (measurement 'b'). NMNHS 159 is considerably larger than *G. indicus*, *G. tenuirostris* and *G. ruppellii* and has a much more developed relief of the phalanx base. As RASMUSSEN & PARRY (2001) mention, the osteological differences between *G. indicus* and *G. tenuirostris* found in the shape of nares, thickness of neck, straightness of claws and length of tarsometatarsus and pedal digits, are more proportional than metrical.

The remaining North-American vultures could be excluded of comparison both because of the considerable chronostratigraphical difference or the geographical isolation and the considerable morphological differences. However, *Neophrontops* was both, morphologically and dimensionally close to the Old World *Neophron* (OLSON, 1985).

The correlations between the metrical dimensions of the distal pedal phalanx of the 1st toe separates the fossil specimen from all other species of genus *Gyps* (Fig. 7).

## Conclusions

The systematic relationships among the griffon vultures are unclear. On both morphological and metrical grounds the fossil griffon vulture from Varshets is closer to recent *G. fulvus* than to Pleistocene *G. melitensis*, which may be a southern-European/Mediterranean form of that species adapted to scavenging on terrestrial megafauna. The phylogenetic analyses with conservative estimates suggest a 'recent and rapid' diversification of *Gyps* taxa, occurring within the past 6 million years (JOHNSON *et al.* 2006), a hypothesis that is consistent with the fossil record. The genus *Gyps* has been determined '... unique among Old World vultures in that they feed exclusively as scavengers...'. This specialization evolved in close association with ungulate popula-



**Fig. 7.** Correlation between the height of the f. a. and the length of the phalanx dist. dig. I pedis [mm] (measurements ‘b’ and ‘a’, Table 6) in the Old World vultures.

tions. The diversification of *Gyps* vultures ‘...coincides with the diversification of Old World ungulates, especially in the family Bovidae and the expansion of the grass-dominated ecosystems (JOHNSON *et al.* 2006). SEIBOLD, HELBIG (1995) state that four species of *Gyps* probably speciated even within the Pleistocene.

All the associated avifauna and the mammalian megafauna of the Villanyian of Varshets completely confirm the former existence of the open savannah-like grassland with scattered trees. The presence of the large griffon vultures among the other forested-savanna components (*Pachycrocuta perrieri*, *Vormela petenyii*, *Meles thoralis*, *Lynx issiodorensis*, *Acinonyx pardinensis*, *Viretailurus schaubi*, *Croizetoceros ramosus medius*, *Eucladoceros senezensis*, *Gazellospira* sp., *Megalovis latifrons*, *Equus stenonis*, etc., among the mammals, and *Otis khosatzkii*, *Circaetus* sp., *Hieraetus* cf. *fasciatus*, *Aquila* sp. ex. gr. *clanga*, *Melanocorypha* sp., *Alauda* sp. among the birds, as well as giant land tortoises) at Varshets resembles the associations

from other Pliocene sites of the Old World. It is the first site of this kind in the Balkans and completes our knowledge of Late Pliocene environment of this gateway to Europe.

Metrical and especially morphological and proportional differences in all skeletal elements firmly exclude a taxonomic affinity with *G. melitensis* or *G. fulvus*.

Varshets is the first known and the earliest Pliocene (and Tertiary) site in the Palearctic region with the genus *Gyps*. In spite of the southern origins of the genus, it is clear that at the very end of the Tertiary its representatives were found in the SE European area (Balkans). As has been shown from the observations on recent griffon vultures (Gir Forest, India; GRUBTH 1978) strong dietary competition exists among coexisting species (*G. bengalensis*, *G. indicus* (incl. *G. tenuirostris* – Z. B./)) and *G. fulvus*). The last species clearly dominated, in spite of its ca. 10 times lower numbers. This supports the suggestion on morphological and ecological adaptations of *G. fulvus* lineage of griffons. Although of other

large diurnal raptors (*Aquila* sp. n. close to *A. fasciata* (VIEILLOT 1822), *Aquila* sp. n. (ex. gr. *clanga*) and *Circaetus* cf. *gallicus* were present; (Boev, in prep.) at the site, *G. bochenskii* sp. n. apparently occupied the top of food chain of Varshets zoocenosis.

It is more probable that *G. bochenskii* sp. n. was an element of the megafaunal open woodlands (forest-steppe/mosaic biotopes or open forests; SPASSOV 2003) complex, which included numerous fossil taxa. These included the land tortoises, felids, viverids, canids, bovids, equids, rhinoceroses, etc., generally similar in composition to the present day African open/forested savannah.

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## APPENDIX 1

### Examined specimens belonging to recent species in the Accipitridae

Eurasian Black Vulture *Aegypius monachus* BMNH 1848.3.8.2, BMNH 1872.10.25.5, BMNH 1952.3.60, BMNH 1995.13.1, ISEAK A 1926/68, ISEAK A 3834/81, NMNHS 3/1992, NMNHS 3/1992, UCBL 84/1, UCBL (unnumbered), Golden Eagle *Aquila chrysaetos* BMNH 1930.3.24.260, UCBL 86/4, UCBL 86/5, Bearded Vulture *Gypaetus barbatus* BMNH 1850.8.15.11, BMNH 1930.3.24.259, ISEAK A 3209/76, Palm-nut Vulture *Gypohierax angolensis* BMNH 1867.10.5.18, White-backed Vulture *Gyps africanus* BMNH 1983.19.6, BMNH 1983.19.7, BMNH S 1954.30.56, BMNH S 1978.7.1, BMNH 1983.19.1, BMNH S 1983.19.5, BMNH S 1983.19.6, BMNH S 1983.19.7, ISEAK A 3907/82, Indian White-rumped Vulture *Gyps bengalensis* BMNH 1845.1.12.5, BMNH 1900.7.7.1, BMNH 1954.30.57, Cape Griffon Vulture *Gyps coprotheres* BMNH 1983.19.3, BMNH 1983.19.4, Eurasian Griffon Vulture *Gyps fulvus* BMNH 1845.1.12.4, BMNH 1851.8.25.34, BMNH 1861.3.24.6, BMNH 1899.1.25.2, BMNH 1952.1.183, ISEAK A 1854/67, ISEAK A 3369/77, NMNHS 1/1993, NMNHS 6/1989, UCBL (unnumbered), Himalayan Griffon Vulture *Gyps himalayensis* BMNH 1845.1.9.4, Indian Vulture *Gyps indicus* BMNH 1925.12.23.26, Rüppell's Vulture *Gyps rueppellii* BMNH 1952.1.171, BMNH 1954.30.55, BMNH 1983.19.2, BMNH 2001.42.1, BMNH 1983.19.2, Slender-billed Vulture *Gyps tenuirostris* BMNH 1885.8.19.36, Steller's Sea Eagle *Haliaeetus pelagicus* BMNH 1996.31.1, White-tailed Eagle *Haliaeetus albicilla* BMNH 1869.10.19.2, American Harpy Eagle *Harpia harpyja* BMNH 1862.3.19.14, Hooded Vulture *Necrosyrtes monachus* BMNH 1860.1.16.8, BMNH 1860.1.19.8, BMNH 1952.3.209, ISEAK A 2341/70, Egyptian Vulture *Neophron percnopterus* BMNH 1858.5.20.13, BMNH 1860.1.19.8, Red-headed Vulture *Sarcogyps calvus* BMNH 1858.1.10.1, BMNH [1] (unnumbered), BMNH [2] (unnumbered), Lappet-faced Vulture *Torgos tracheliotus* BMNH 1870.6.22.11, BMNH 1930.3.24.248, BMNH 1952.1.172, BMNH 1952.3.213, BMNH 1954.30.53, BMNH 1954.30.53, BMNH 1973.66.56, BMNH 199669.23, UCBL (unnumbered), White-headed Vulture *Trionoceph occipitalis* BMNH 1864.10.5.11, BMNH 1954.30.54.

## ***Gyps bochenskii* sp. n. (Aves: Falconiformes) от късния плиоцен от Вършец (Северозападна България)**

Зл. Боев

### **(Резюме)**

Описан е *Gyps bochenskii* sp. n. от късно-плиоценските (среден вилафранк) отложения в находище край гр. Вършец (Северозападна България). Находището е известно от 1987 г. и разкрива най-богатата късно-плиоценска (MN 17) авифауна в Европа. Установените над 71 вида птици характеризират наличието на горско-степен ландшафт. Петрофилните видове са широко представени сред фосилния материал. Находките са най-древните останки от лешояди от рода *Gyps*, представени от четири скелетни елемента: sternum (коракоидна и костална части), coracoid dex. (хумерална и стернална части), phalanx dist. dig. I pedis sin. и phalanx dist. dig. majoris sin. Тези находки доказват разпространението на лешоядите и специално – на лешоядите от рода *Gyps* в Европа (и в Палеарктика въобще) още далеч преди глациалните явления през плейстоцена. Морфологията разграничава находките от съвременните видове в рода *Gyps* чрез: стръмното ориентиране на linea intermuscularis; сравнително дебелите incisurae intercostales (размери „с“, „е“ и „b“); сравнително по-дългата incisura intercostalis IV (съотношението между размери „j“ and „i“); наличието на добре развита ямка на дорзалната повърхност на стернума над manubrium му; сравнително голям (по-широк) rostrum sterni, т. е. съотношението „b : d“; по-слабо изпъкващ краниално rostrum sterni; сравнително по-широк sternum в дорзален изглед, по-тясно разстояние между дорзалните ръбове на sulci articulares (размер „a“), и по-големи размери. От плейстоценския малтийски лешояд (*Gyps melitensis*) се различава по по-силно развитите си задни крайници (с около 1/10 по-големи размери при дисталните фаланги на пръстите на краката) и същото развитие на крилата (phalanx dist. dig. majoris).