

Pleistocene distribution of the Asiatic wild dog (*Cuon* Hodgson, 1838) (*Carnivora*, Bowdich, 1821 – *Mammalia* Linnaeus, 1758) in Bulgaria – a review

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Short communication

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Abstract. In this article the first summary of data on the past distribution of the dhole in Bulgaria is presented. A total of five Pleistocene localities, with *Cuon* represented by three taxa (*Cuon alpinus europaeus*, *Cuon* cf. *stehlini* and *Cuon* sp.), are known in the country. These localities all represent former human dwellings from 1.8 Mya to 20,000 BP. The altitudinal distribution of the species in Bulgaria ranged from 260 to 430 m a.s.l

Key words: Pleistocene megafauna, Quaternary carnivores of Europe, extinct mammals of the Balkan Peninsula, fossil Canidae, Quaternary extinctions.

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I. INTRODUCTION

It is believed that the Asiatic wild dog (red wolf or dhole (*Cuon* HODGSON, 1838)) has a post-Pleistocene origin (see below), and that its closest modern relative is the jackal (SILLERO-ZUBIRI 2009). The former geographical distribution of the dhole was much larger than it is today. The dhole is known from the Early to Late Pleistocene in Europe (thus it is not ‘post-Pleistocene’), and from the Late Pleistocene to recently in Asia (GROMOV & BARANOV 1981). In the Late Pleistocene, the species distribution included North America (TEDFORD et al. 2009; TARON et al. 2021), stretching southwards to reach Mexico (WANG et al. 2008). In south-western Europe (Iberian Peninsula), *C. alpinus* survived until the initial Holocene (PÉREZ RIPOLL et al. 2010).

At present, the genus *Cuon* is represented by a single species – the Asiatic Wild Dog (dhole, *Cuon alpinus* (PALLAS, 1811)). It is split into three to eleven subspecies, of which the least disputed are: *C. alpinus alpinus* PALLAS, 1811; *C. a. hesperius* AFANAS'EV & ZOLOTAREV, 1935 and *C. a. sumatrensis* HARDWICKE, 1821 (SILLERO-ZUBIRI 2009). In addition, 12 other subspecies have been described, which were subsequently synonymised with the above taxa.

The fossil record of the dhole is also complicated. It includes five subspecies: *C. a. priscus* THENIUS 1954 (Middle Pleistocene, central Europe), *C. a. fossilis* NEHRING 1890 (Middle Pleistocene, central Europe), *C. a. europaeus* BOURGUIGNAT, 1868 (Middle and late Pleistocene and Early Holocene, west and central Europe; Fig. 1); *C. a. caucasicus* BARYSHNIKOV, 1978 (Late Pleistocene, south-east Caucasus), and *C. a. antiquus* COLBERT & HOOIJER, 1953 (Middle Pleistocene, east Asia – China). Thus, the ‘post-Pleistocene origin’ of the dhole (SILLERO-ZUBIRI 2009) cannot be accepted, as the dhole clearly has a Pleistocene origin. Recently, the fossil subspecies *C. a. priscus* was accepted as a full species (*C. priscus*) by VOLMER et al. (2019).

C. alpinus was recently categorised as an ‘endangered’ species according to the IUCN Red List of Threatened Species, with its total population estimated at 4,500–10,500 individuals (KAMLER et al. 2015).

II. MATERIAL AND METHODS

In this study, we attempted to gather all the scattered data on the former distribution of the dhole in the pres-



Fig. 1. *Cuon alpinus europaeus*. Drawing: Zlatozar Z. BOEV.

ent day territory of Bulgaria. For each site (locality), we presented the complete data, as much as possible, on the age, years and leaders of the related excavations, as well as a reference to the original published information (Table I).

The chronostratigraphy (Mya) follows COHEN et al. (2013).

III. RESULTS

So far, three taxa (two species) of *Cuon* have been established in Bulgaria. Their fossils have been recovered at five localities, mostly in North Bulgaria (Fig. 2). The presence of the dhole in Bulgaria was confirmed for the Calabrian, Chibanian and the Upper Pleistocene, i.e. between 1.800-0.0117 Mya:

(1) *Cuon alpinus europaeus* BOURGUIGNAT, 1868 – Upper Pleistocene: Bacho Kiro Cave (NIKOLOV 1983¹; BRUGAL & BOUDADI-MALIGNE 2011; TARON et al. 2021; SMITH et al., 2021). After SMITH et al. (2021) *Cuon alpinus* remains were established in Layer J, dated ca. 46,000 BP.

(2) *Cuon cf. stehlini* (MOULLÉ, 1992) – Calabrian: Kozarnika Cave (FERNANDEZ 2009; GUADELLI et al. 2005). This species is now considered to be a junior synonym of *Xenocyon (Lycaon) lycaonoides*. After FERNANDEZ & CREGUT (2007), the *Cuon cf. stehlini* remains were established in Layer B2-2, dated 1.6-0.9 Ma; but in another study, FERNANDEZ (2009) stated that this taxon was established in two layers – B-2-2 (1.8-1.4 Mya) and B-1 (0.7-0.5 Mya).

Table I

Localities of the fossil bone remains of *Cuon* in Bulgaria

No.	Locality	Province	Altitude, a.s.l.(m)	Age	Date (year) and leaders of excavations	Reference
1.	Kozarnika (Suhı Pech) Cave	Near town of Belogradchik (Vidin P.)	375	Late Pleistocene, MNQ 18-26, 1,800,000-50,000 BP	1993, Z. BOEV; 1994-2005, N. SIRAKOV, J.-L. GUADELLI	SIRAKOV et al. 2010; GUADELLI et al. 2005; FERNANDEZ 2009; FERNANDEZ & CREGUT, 2007
2.	Mishin Kamik Cave	Near Gorna Luka Village (Montana P.)	430	Final Middle Pleistocene, Early MIS 5e, Middle Palaeolithic, 135,000-85,000 BP.	2012-2017, S. IVANOVA	IVANOVA et al. 2014; GUROVA et al. 2015, 2016
3.	Bacho Kiro (Malka Dryanovska) Cave	Near town of Dryanovo (Gabrovo P.)	335	Late Pleistocene, Middle to Late Paleolithic, 70,000-20,000 B P	1938, D. GAROD, R. POPOV; 1971-1975, B. GINTER, J. KOZLOWSKI	NIKOLOV 1983; WISZNIOWSKA 1982; BERON et al. 2006; TARON et al. 2021; SMITH et al. 2021
4.	Magura (Rabishka) Cave	Near Rabisha Village (Vidin P.)	371	Late Pleistocene, over 50,200 BP and 32,750 ± 500 BP	1948, 1960-1961, G. MARKOV; 2011-2012, S. IVANOVA	NIKOLOV 1983; IVANOVA et al. 2013, 2016
5.	Leyarnite Cave	Near Mladezhko Village (Burgas P.)	260	Middle-Late Paleolithic	2010, S. IVANOVA	IVANOVA et al. 2011

¹ Reported as *Cuon cuon*.

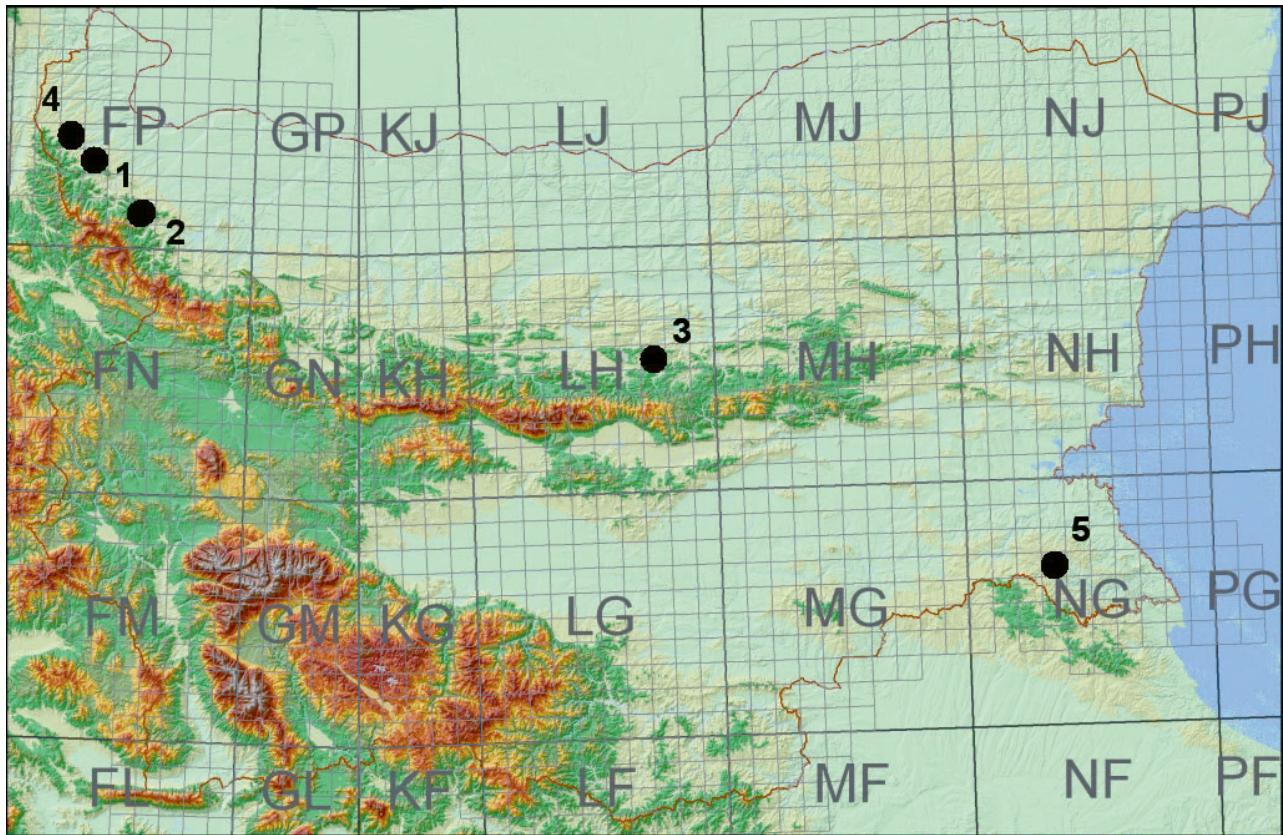


Fig. 2. Former distribution of *Cuon* in Bulgaria. The numbers correspond to the list of the localities of Table I: Kozarnika (Suhi Pech) Cave (1), Mishin Kamik Cave (2), Bacho Kiro (Malka Dryanovska) Cave (3), Magura (Rabishka) Cave (4), Leyarnite Cave (5).

(3) *Cuon* sp. – Chibanian: Magura Cave (IVANOVA et al. 2013, 2016). After IVANOVA et al. (2016), *Cuon* sp. remains were established in Trench III, Layer 9, dated 50 000 BP.

(4) Mishin Kamik Cave (GUROVA et al. 2015, 2016, 2017; IVANOVA et al. 2012, 2013, 2014, 2016). After GUROVA et al. (2017), *Cuon* sp.? remains were established in Layers 4-6.

(5) Leyarnite Caves (IVANOVA et al. 2011, 2012). After IVANOVA et al. (2012), the remains of *Cuon* sp.? were established in Layer 4, dated to the ‘Middle-Late Palaeolithic’.

The Pleistocene geographical distribution of the dhole in Bulgaria included both the northern and the southern parts of the country, although only one locality is registered in southern Bulgaria (in the Leyarnite Caves, No. 5, Fig. 2).

The altitudinal distribution of *C. alpinus*, based on the localities of the findings, ranged from 260 to 430 m a.s.l.

IV. DISCUSSION

It should be kept in mind that the identification of *Cuon* fossils is often complicated by a high morpho-

logical and morphometrical similarity between dholes and other large Pleistocene canids (PETRUCCI et al. 2012; MECOZZI et al. 2020; MARCISZAK et al. 2021; TARON et al. 2021). Therefore, it is possible that a significant part of the finds representing this species have been misidentified and reported as belonging to other species and, vice versa. Thus, it is very probable that *C. alpinus* is underrepresented in the Pleistocene fossil record.

BRUGAL & BOUDADI-MALIGNE (2011) summarised that *Cuon* was widespread in Europe from the beginning of the Middle Pleistocene until as late as the Early Holocene. The Bulgarian record of *Cuon* cf. *stehlini* and *Cuon* 1838 sp. from the Calabrian and Chibanian Age broadened this temporal range significantly.

MALEZ & TURK (1990) reported three subspecies – *C. a. priscus* (Lower Pleistocene in Croatia), *C. a. fossilis* (Middle Pleistocene in Croatia) and *C. a. europaeus* (Upper Pleistocene in Croatia, Bosnia and Herzegovina, and Montenegro). However, the first two subspecies were not found in Bulgaria.

SOMMER & BENECKE (2004) stated that *C. a. europaeus* persisted in Europe between 75,000-9,500 BC. The Bulgarian record of this carnivore proves its distribution on the Balkans between 1,800,000 (Kozar-

nika Cave) and 50,000 BC (Table I). Due to the ancient age of these finds, it is possible that, after a future revision, they may turn out to belong to *Lycaon* (*Xenocyon*) *lycaonoides* (KRETZOI, 1938).

Cuon stehlini was a Pleistocene member of the genus, known so far only from south-east France (MOULLÉ et al. 2006), but this author considers it to be the same as *Xenocyon lycaonoides* KRETZOI, 1938. Earlier, ROOK (1994) referred it in the genus *Canis* - *Canis* (*Xenocyon*) *lycaonoides*.

As can be seen, the dhole was a part of the complex of large predators that coexisted with Palaeolithic hominids in Bulgaria. All the localities of the species originate in Palaeolithic human settlements. The relationship between man and the dhole was likely multifaceted and complex. It may have been a pest, an enemy, a predator or a real threat to humans. Dhole fur, on the other hand, is thick and soft, and it may have been used for clothing in the same way as that of other large predators. There are no proven data from Bulgaria, but it is possible that the meat of killed dholes was used for food, as was the practice for some other predators (lion, badger, etc.).

At the moment, these are only guesses, because we have no data to confirm these hypotheses – for example, co-deposited human artifacts and dhole remains, or traces of their remains with as cutmarks and the like.

Dholes are hypercarnivorous canids (PETRUCCI et al. 2012) that are social and hunt in packs. This is a successful hunting tactic that we know of today in other canids (*Canis lupus*, *Lycaon pictus*), hyaenids (*Crocuta crocuta*), felids (*Panthera leo*), etc. *C. alpinus* inhabits a mountain forest habitat (WISZNIOWSKA 1982), which could reflect the reasons for their distribution and disappearance in the past and present. The Late Pleistocene distribution of forests in many hilly and mountainous regions differed from the present. The disappearance of some prey-species is another reason for the dhole's decline.

V. CONCLUSIONS

The data for the past distribution of the dhole in Bulgaria include five Pleistocene localities and three taxa (*Cuon alpinus europaeus*, *Cuon* cf. *stehlini* (now *Xenocyon lycaonoides*) and *Cuon* sp.). These also represent former human dwellings from 1.8 Mya to 20 000 BP. The altitudinal distribution of the species ranged from 260 to 430 m a.s.l.

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REFERENCES

- AFANAS'EV A.V., ZOLOTAREV N.T. 1935. [Contribution to the systematics and distribution of the red wolf]. *Izvestiya Akademii nauk SSSR, VII seriya. Otdelenie matematicheskikh i estestvennykh nauk*, 3: 425-429. [In Russian, with English summary].
- BARYSHNIKOV G.F. 1978. [The dhole of the Caucasus]. *Trudy Zoologicheskogo Instituta AN SSSR*, 79: 79-84. [In Russian].
- BERON P., DAALIEV T., JALOV A. 2006. Caves and Speleology in Bulgaria. Pensoft Publishers, Sofia, 507 pp.
- BRUGAL J.-P., BOUDADI-MALIGNE M. 2011. Quaternary small to large canids in Europe: Taxonomic status and biochronological contribution. *Quaternary International*, 243: 171-182. <https://doi.org/10.1016/j.quaint.2011.01.046>
- BOURGUIGNAT J.-R. 1868. Sur quelques mammifères nouveaux découverts dans une grotte près de Vence. *Comptes rendus de l'Académie des Sciences*, Paris, 67: 111-113.
- COHEN K.M., FINNEY S.C., GIBBARD P.L., FAN J.-X. 2013: updated 2020. *The ICS International Chronostratigraphic Chart. Episodes*, 36: 199-204.
- COLBERT E.H. & HOOIJER D.A. 1953. Pleistocene mammals from the limestone fissures of Szechwan, China. *Bulletin of the American Museum of Natural History*, 102: 1-134.
- FERNANDEZ P.H. 2009. Mammalian dynamics and palaeoecological analysis during the Pleistocene in Kozarnika Cave (Bulgaria). [In:] GATSOV I., GUADELLI J.-L. (eds). *Saxa Loquuntur. Collected Works Honoring Nikolay Sirakov's 65th anniversary*. Avalon Publ. House, Sofia, pp. 59-73.
- FERNANDEZ P.H., CREGUT E. 2007. Les Caprinae (Rupicapriini, Ovibovini, Ovini et Caprini) de la séquence pléistocène de Kozarnika (Bulgarie du Nord): morphométrie, biochronologie et implications phylogénétiques. *Revue de Paleobiologie, Museum d'Histoire Naturelle de la Ville de Genève*, 26 (2):425-503. <https://halshs.archives-ouvertes.fr/halshs-00284574>
- GROMOV I., BARANOV G. (eds). 1981. Catalogue of the mammals of the USSR (Pliocene – present). Nauka Publ. House, Lenin-grad, 456 pp. [In Russian].
- GUADELLI J.-L., SIRAKOV N., IVANOVA S.T., SIRAKOVA S.V., ANASTASSOVA E., COURTAUD P., DIMITROVA I., DJABARSKA N., FERNANDEZ P.H., FERRIER C., FONTUGNE M., GAMBIER D., GUADELLI A., IORDANOVA D., IORDANOVA N., KOVATCHEVA M., KRUMOV I., LEBLANC J.-CL., MALLYE J.-B., MARINSKA M., MITEVA V., POPOV V., SPASSOV R., TANEVA S.T., TISTERAT-LABORDE N., TSANOVA T.S. 2005. Une séquence du paléolithique inférieur au paléolithique récent dans les Balkans: la grotte Kozarnika à Orechets (Nord-Ouest de la Bulgarie). [In:] MOLINES N., MONCEL M.-H. & MONNIER J.-L. (eds). *British Archaeological Reports*, S 1364: 87-103. <https://halshs.archives-ouvertes.fr/halshs-00136044>
- GUROVA M., IVANOVA S., SPASSOV N., HRISTOVA L., KRUMOV I., VERHEYDEN S., MARINOVA E., DEDOV I. 2016. Excavations at Mishin Kamik Cave: 2015 season. [In:] ALADZHOV A. (ed.) *Archeological Discoveries and Excavations in 2010*. Multiprint, Sofia, pp. 56-59. [In Bulgarian].
- GUROVA G., IVANOVA S., SPASSOV N., HRISTOVA L., POPOV V., MARINOVA E., BOHME M. 2017. Excavations at Mishin Kamik Cave: 2016 Season. [In:] VAGALINSKI L. (ed.). *Archeological Discoveries and Excavations in 2016*. BAS, Archaeological Institute with Museum. Sofia. BulgEd OOD Publishing House, pp. 48-50. [In Bulgarian, with English summary].
- GUROVA M., IVANOVA S., KRUMOV I., SPASSOV N., CHRISTOVA L., DOJAR C. 2015. Study of the Mishin Kamak Cave - Season 2. [In:] KABAOKHIEVA G. (ed.). *Archeological Discoveries and Excavations in 2014*. BAS, Archaeological Institute with Museum. Smolyan. pp. 32-33. [In Bulgarian].

- GUROVA M., IVANOVA S., SPASSOV N., HRISTOVA L., KRUMOV I., VERHEYDEN S., MARINOVA E., DEDOV I. 2016. Excavations at Mishin Kamik Cave: 2015 season. [In:] ALADZHOV A. (ed.). Archaeological Discoveries and Excavations in 2015. BAS, Archaeological Institute with Museum. Multiprint Publishing House. Pp. 48-49. [In Bulgarian, English summary].
- HARDWICKE M.-G.T. 1821. Descriptions of the Wild Dog of Sumatra, a new Species of Viverra, and a new Species of Pheasant. *Transactions of the Linnean Society of London*, **13**(1): 235-238.
- HODGSON B. H. 1838. Classified Catalogue of Mammals of Nepal. *The Annals and magazine of natural history; zoology, botany, and geology*. [ser. 1] vol. 1 p.152.
- IVANOVA S., GUROVA M., SPASSOV N., HRISTOVA L., TZANKOV N., POPOV V., MARINOVA E., MAKEDONSKA J., SMITH V., OTTONIC, LEWIS M. 2016. Magura Cave, Bulgaria: A multidisciplinary study of Late Pleistocene human palaeoenvironment in the Balkans. *Quaternary International*, **415**: 86-108.
- IVANOVA S., GUROVA M., SPASSOV N., POPOV V., MAKEDONSKA J., TZANKOV T., STRAIT D. 2012. Preliminary Findings of the Balkan Paleo Project: Evidence of Human Activity at the "Gateway" of Europe During the Late Pleistocene. *Bulgarian e-Journal of Archaeology*, 2-23. <http://be-ja.org>
- IVANOVA S., GUROVA M., SPASSOV N., POPOV V. 2011. Sound-ing archaeological studies in the Leyarnite cave complex, Mladezhko village, Malko Tarnovo Municipality. [In:] GUROVA M. (ed.). Archaeological discoveries and excavations in 2010. National Archaeological Institute with Museum, BAS, Sofia, pp. 31-34.
- IVANOVA S., GUROVA M., SPASSOV N., HRISTOVA L., GYAUROVA B., MAKEDONSKA Z., ANASTASOVA E., MARINOVA E., HODGKINS J., MILLER C., STRAIT D. 2013. No4. Archaeological excavations in Magura Cave. [In:] GUROVA M. (ed.). Archaeological discoveries and excavations in 2012. Sofia, Kolbis AD Publishing House, pp. 34-37.
- IVANOVA, S., KRUMOV I., SPASSOV N., HRISTOVA L., MAKEDONSKA J., GUROVA M., STRAIT D., 2014. Excavations in the Misin Kamak Cave, Ciprovci. [In:] GUROVA M. (ed.). Archaeological Discoveries and Excavations in 2013. TDG Print, Sofia, Pp. 31-35. [in Bulgarian]
- KAMLER J. F., SONGSASEN N., JENKS K., SRIVATHSA A., SHENG L., KUNKEL K. 2015. *Cuon alpinus*. The IUCN Red List of Threatened Species 2015: e.T5953A72477893. <https://dx.doi.org/10.2305/IUCN.UK.2015-4.RLTS.T5953A72477893.en>
- KRETZOI M. 1938. Die Raubtiere von Gombaszög nebst einer Übersicht der Gesamtfauna (ein Beitrag zur Stratigraphie des Altquartaers). *Annales Historico-Naturales Musei Nationalis Hungarici. Pars Minerale Geologie et Palaeontologica*, **31**: 88-157.
- MALEZ M., TURK I. 1990. *Cuon alpinus europaeus* BOURGUIGNAT (Carnivora, Mammalia) from the Upper Pleistocene in the Cave Apnarjeva jama at Celje. *Geologija*, **33**: 215-232. [In Croatian, with English summary].
- MARCISZAK A., KROPCKY A., LIPECKI G. 2021. The first record of *Cuon alpinus* (PALLAS, 1811) from Poland and the possible impact of other large canids on the evolution of the species. *Journal of Quaternary Science*, **36**(6): 1101-1121. <https://doi.org/10.1002/jqs.3340>
- MECOZZI B., BARTOLINI-LUCENTI S., IURINO D.A. 2020. *Cuon alpinus* (PALLAS, 1811) from the Late Pleistocene site of Ingarrano (Foggia, southern Italy) and insights on the Eurasian Middle to Late Pleistocene record. Alpine and Mediterranean. *Quaternary*, **33**(1): 89-98. <https://doi.org/10.26382/AMQ.2020.08>
- MOULLÉ P.-E. 1992. Les grands mammifères du Pléistocène inférieur de la grotte du Vallonnet (Roquebrune-Cap-Martin, Alpes-Maritimes). Étude paléontologique des Carnivores, Equidé, Suidé et Bovidés. *Ph.D. Dissertation, Museum National d'histoire Naturelle*, Paris. <http://pascal-francis.inist.fr/vibad/index.php?action=getRecordDetail&id=153811>
- MOULLÉ P.-E., ECHASSOUX A., LACOMBAT F. 2006. Taxonomie du grand canidé de la grotte du Vallonnet (Roquebrune-Cap-Martin, Alpes-Maritimes, France). *L'anthropologie*, **110**: 832-836. <https://doi.org/10.1016/j.anthro.2006.10.001>
- NEHRING A. 1890. Über *Cuon alpinus fossilis* nebst Bemerkungen über einige andere fossile Caniden. *Neues Jahrbuch für Mineralogie, Geologie und Paläontologie*, **2**: 34-52.
- NIKOLOV I. 1983. Nyakoi belezhki varhu peshternata fosilan bozayna fauna v Bulgariya. [Some notes on the cave fossil mammalian fauna in Bulgaria]. [In:] DINEV L. (ed.). Fourth European regional conference on speleology, September 1980], Sofia, pp. 215-218. [In Bulgarian].
- PALLAS P. S. 1811. Zoographia Rosso-Asiatica: sistens omnium animalium in extenso Imperio Rossico, et adjacentibus maribus observatorum recensionem, domicilia, mores et descriptiones, anatomen atque icones plurimorum, vol. 1. Petropoli, 600 pp.
- PÉREZ RIPOLL M., MORALES PÉREZ J.V., SANCHIS SERRA A., EMILI AURA TORTOSA J., SARRIÓN MONTANÁ I. 2010. Presence of the genus *Cuon* in upper Pleistocene and initial Holocene sites of the Iberian Peninsula: new remains identified in archaeological contexts of the Mediterranean region. *Journal of Archaeological Science*, **37**: 437-450. <https://doi.org/10.1016/j.jas.2009.10.008>
- PETRUCCI M., ROMITI S., SARDELLA R. 2012. The Middle-Late Pleistocene *Cuon* HODGSON, 1838 (Carnivora, Canidae) from Italy. *Bollettino della Società Paleontologica Italiana*, **51**(2): 137-148. https://www.paleoitalia.it/wp-content/uploads/2022/03/07.Petracci_et_al._2012_BSPI_512_1.pdf
- ROOK L. 1994. The Plio-Pleistocene Old World *Canis (Xenocyon) ex gr. falconeri*. *Bollettino della Società Paleontologica Italiana*, **33**: 71-82.
- SILLERO-ZUBIRI C. 2009. Family Canidae (Dogs). [In:] WILSON D.E. & MITTERMEIER R.A. (eds). *Handbook of the Mammals of the World*. Vol. 1. Carnivores. Lynx Edicions, Barcelona. Pp. 352-447.
- SIRAKOV N., GUADELLI J.-L., IVANOVA S., SIRAKOVA S., BOUDADI MALIGNE M., DIMITROVA I., FERNANDEZ P., FERRIER C., GUADELLI A., IORDANOVA D., IORDANOVA N., KOVATCHEVA M., KRUMOV I., LEBLANC J.-C., MITEVA V., POPOV V., SPASSOV R., TANEVA S., TSANOVA T. 2010. An ancient continuous human presence in the Balkans and the beginnings of human settlement in western Eurasia: A Lower Pleistocene example of the Lower Palaeolithic levels in Kozarnika Cave (Northwestern Bulgaria). *Quaternary International*, **223-224**: 94-106. <https://doi.org/10.1016/j.quaint.2010.02.023>
- SMITH G., SPASOV R., MARTISIUS N., SINET-MATHIOTA V., ALDEIAS V., REZEK Z., RUEBENS K., PEDERZANI S., SHANNON S., MCPHERRON P., SIRAKOVA, S., SIRAKOV N., TSANOVA T.S., HUBLIN J.-J. 2021. Subsistence behavior during the Initial Upper Paleolithic in Europe: Site use, dietary practice, and carnivore exploitation at Bacho Kiro Cave (Bulgaria). *Journal of Human Evolution*, **161**: 103074. <https://doi.org/10.1016/j.jhevol.2021.103074>
- SOMMER R., BENECKE N. 2004. Late-Pleistocene and early Holocene history of the canid fauna of Europe (Canidae). *Mammalian Biology*, **70** (4): 227-241. <https://doi.org/10.1016/j.mambio.2004.12.001>
- TARON U.H., PAIJMANS J.L.A., BARLOW A., PREICK M., IYENGAR A., DRAGUSIN V., VASILE S., MARCISZAK A., ROBLICKOVA M., HOFREITER M. 2021. Ancient DNA from the

- Asiatic Wild Dog (*Cuon alpinus*) from Europe. *Genes*, **22**: 144.
<https://doi.org/10.3390/genes12020144>
- TEDFORD R., XIAOMING W., TAYLOR B. 2009. Phylogenetic systematics of the North American fossil caninae (Carnivora: Canidae). *Bulletin of the American Museum of Natural History*, **325**: 1-218. <http://hdl.handle.net/2246/5999>
- THENIUS E. 1954. On the origins of the dhole. *Österreichische Zoologische Zeitschrift*, **5**: 377-388.
- VOLMER R., VAN DER GEERB A.E., CABRERA P.A., PRASETYO WIBOWO U., KURNIAWANC I. 2019. When did *Cuon* reach Java? – Reinvestigation of canid fossils from *Homo erectus* faunas? – *Geobios*, **55**: 89-102.
<https://doi.org/10.1016/j.geobios.2019.06.004>
- WANG Z., TEDFORD R. H., ANTON M. 2008. Dogs. Their fossil relatives and evolutionary history. Columbia University Press. New York. 209 pp.
- WISZNIOWSKA T. 1982. Carnivora. [In:] KOWALSKI J. (ed.), 1982. Excavation in Bacho Kiro Cave (Bulgaria). Final report. Państwowe Wydawnictwo Naukowe, Warszawa, 52-55.