A New Discovery of Carnivores Mammalian Skeleton Fossils of Late Miocene-Early Pliocene age from Chamchamal area/Kurdistan Region/NE-Iraq.

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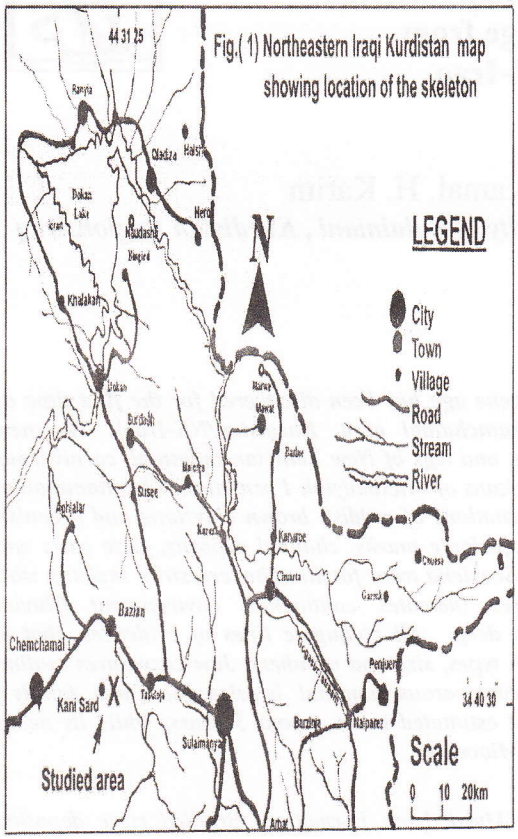
Abstract

A new vertebrate skeleton of Late Miocene-Early Pliocene age has been discovered for the first time as concerning in Kurdistan, nearby Kanisard village (Chamchamal area, Kurdistan/NE-Iraq). The new vertebrate remains comprised of the skull, teeth, backbone, and legs of New Tethyian mammal, carnivorous type, recognized and collected within pebbly sandstone horizons of Mukdadyiah Formation. The mammalian skeleton bearing sequence is comprised of rhythmic alternations of reddish brown claystone and greenish grey pebbly sandstone, which is also characterized by megaripple marks, channel deposits, flute casts and clay balls, associated with the dominance of Skolithos and Scoyiena trace fossils. The terrestrial skeleton with bioturbation and the associated sedimentary structures indicates continental environment (fluvial depositional environments) mostly less than three meters deep. All conjugate lines of evidences, that is morphological criteria of skull, leg length and width, teeth types, size and numbers, Jaw curvatures outline and the overall vertebrate size and shape, specify that the carnivorous mammal is related to Canis family (dog-like carnivorous). Its age when the individual is died estimated to be about 5 years, while its death possibly occurs before 8- 9 Million years ago. (That is Late Miocene).

Keywords: *Carnivores Vertebrates, Mammalians fossil Mukddadyiah Formation. Braided river deposits, terresterial, Kurdistan,geology*

Introduction

The mammalian vertebrates remains are discovered about (500) meter southeast of Kanisard village, which is located 10 km /NE of Chamchamal Town .The mammalian samples are collected from the site of the intersections of latitude (34° 40‾ 30″ N) and longitude (44° 31‾ 25″ E) .Fig: (1) ,Fig.(2). From tectonic point of view the studied area represent the northern extremities of the Iraqi Low Folded Zone, just at the boundary with the High folded zone (Chamchamal-Erbil subzone) [1]. Mostly representing the southwestern periphery of Zagros Belt (part of Neotethyain basin). However the studied stratigraphic sequence is located at the southern limb of Takyia- Sangaw syncline, which is trending almost (320°-330° azimuth) [2].. Stratigraphically Fig.(2), the tertiary rocks are exposed on the surface. The oldest rocks are belong to Eocene age and related to the Pilaspi Formation at the core of the adjacent Hanjera anticline. The Oligocene deposits are totally absent and this gap represent by what is known as Basal Fars Conglomerate, which is about (1-3) meters thick. Laterally (from Qshlag to Hanjera Mountains) shows a diagnostic variation into hardground surface).The rhythmic clastic strata of Injana Formation (Middle-Late Miocene) overlies the Fatha Formation[3], with conformable graditional contact. Similar conformable boundary with



claystone and siltstone. Depending on the [4],these silisicalstic sequences are deposited during major sea level drowning, combined by exposures.

The organic rich mudstone and claystone beds are representing transgressive system tract, and formed during maximum flooding time [5]. However, The high system tract of this unit represent by dominance of siltstone and claystone alternated with coarsing up wards sandstone pebbly sandstone, cross bedded with mega ripple marks in addition to several shallow habitats trace fossils, such as *Skolithos*; Scoyiena, and *Arenocolite* [6] Several clay balls and mottled clay material are also not uncommon. The silisiclastics strata of Bai Hassan Formation Represent diagnostic fresh water deposits. Mukdadyiah Formation provides evidence that a major river system once flowed through an area that is now arid garmian district. The river was made up of numerous small channels, probably no more than few meters deep, but the entire river system was a braided network tens to hundreds of meters wide. This river has been part of a larger system, the remains of which includes the modern Tigris and Euphrates rivers. A permanent flow of water existed in which freshwater mussels, catfish, turtles and crocodiles, and hippopotami lived. The fauna feeding from the plants living around the river system, a grassy-woodland environment-comprised rodents, including a new species of gerbil, species of antelopes, giraffes, primitive elephants and carnivores, such as hyena and a lion-sized sabre toothed cat and dogs. [7]

Some horizons of Mukhdadiyah Formation is the mammalian bearing zone(they are common in the middle to upper part of Mukdadyiah Formation), their biostratigraphic and depositional systems are the main aims of this study, which is considered as the first discovered of mammalian carnivore's vertebrates in Iraq and Kurdistan region..Fig.(3), it's also important to mention that the first recorded mammalian vertebrates in Iraq, recognized by [8], from the northeastern slope of Tauk and Kormore anticlines. He is able to list the following general vertebrates forms (logirostris, gazelle, Hippurian, Mastodon and gracile. From Qaratapa region (East of Jebel Hamrin), Hippurian vertebrates were recorded by [9], within Injana formation. The first published research deals with Iraqi vertebrates are related to Kassab et al in [10] from Injana Formation; about 140 km north of Baghdad. Also [10] classify the vertebrate's remains as Hippurian bones and

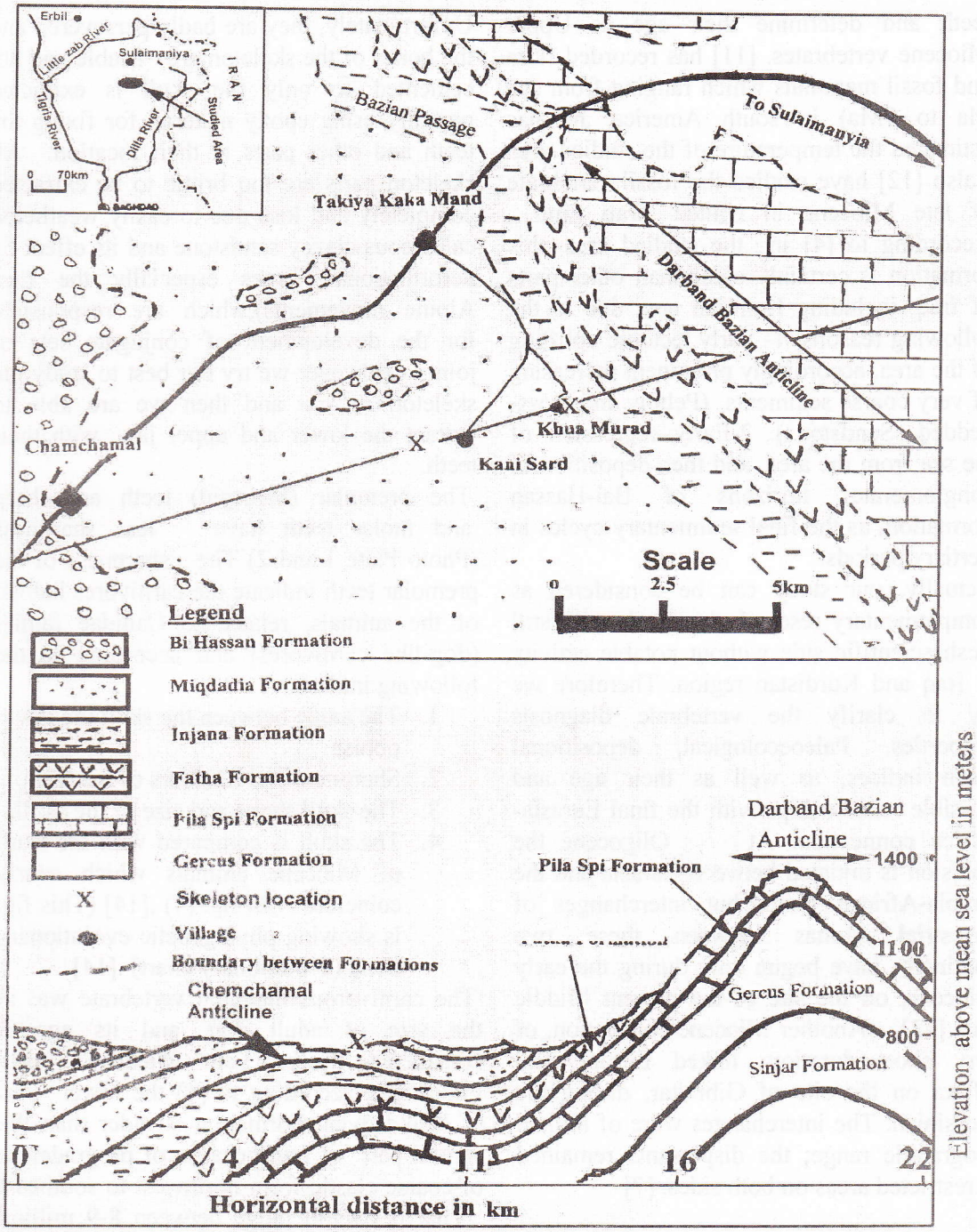


Fig. (2) Geological map and cross section of the studied area.(Karim, *et al.* 2003 in press) slightly modified.

teeth and determine their age as Upper Miocene vertebrates. [11] has recorded flora and fossil mammals which ranging from (18 Ma to 9Ma) in south America ,he has estimated the temperature of the studied area . also [12] have studied the fossil vertebrate of late Miocene in United Arab Emir . According to [4] in the studied area, this formation is certainly older than other parts of Iraq, including Hemrian area due to the following reasons: 1- Early tectonic uplifting of the area, accordingly prominent increasing of very coarse sediments (Pebbly and cross-bedded, Sandstone). 2-Early regression of the sea from the area, and then deposition of conglomerates horizons of Bai-Hassan Formation, as the final sedimentary cycles in Tertiary periods.

Actually, our study can be considered as complementary research that deals with still fresh scientific side without notable activity in Iraq and Kurdistan region. Therefore we try to clarify the vertebrate diagnosis properties, Paleoecological, depositional basin indices, as well as their age and possible relationships with the final Eurasia-Africa connection. At Oligocene the collision is initiated between Eurasia and the Arabia-African Plate, but interchanges of terrestrial faunas between these two continents have begun only during the early Miocene, on the site of the present Middle East [13]. Another Miocene connection, of very short duration, linked Europe and Africa on the site of Gibraltar, during the Messinian. The interchanges were of limited geographic range; the dispersants remained in restricted areas on both sides. [7]

Skeleton diagnosis

The whole skeleton is speeded over 3 meters in surface area and up to 1-meter depth, within sandstone beds.Fig.(3). Unfortunately, they are badly persevered and the bones of the skeleton are friable and not cemented so only the skull is extracted partially using epoxy material for fixing the teeth and other parts in their location. All skeleton parts are too brittle to be extracted completely and lose due to easily weathered calcareous clayey sandstone and its effect by deformational forces especially the Last Alpine movements),which are responsible for the development of conjugate sets of joints. However we try our best to study the skeleton *in situ* and then we are able to extract the lower and upper jaw, with their teeth.

The premolar (bicuspid) teeth are sharp and molar teeth have less sharpness (Photo Plate 1.and 2) The sharpness of the premolar teeth indicate the carnivores habitat of the animals, related to Canidae family (dog-like carnivores) and according to the following indices:

1. The angle between the skull the jaw obtuse.
2. Sharpness and numbers of the teeth
3. The skull shape and size of the skull.
4. The skull is compared with the skull of Miocene animals which nearly coincides with fig. (4) ,[14] (This fig. is showing phylogenetic evolutionary trend (evolutionary chart) .[14]

The carnivorous mammal vertebrate was at the size of adult dog, and its age is considered to be Late Miocene –early Pliocene?), according to [4] the lower part of Mukdadyiah Formation is older than the central part of Iraq because of progradation of coarse clastic from northwest to southeast . That is overall range between 8-9 million years, The dislodged legs about 70 cm in length and of diameter range between 3.5cm at thinner part parts and about 7 cm at the joint. According to [15] large bone

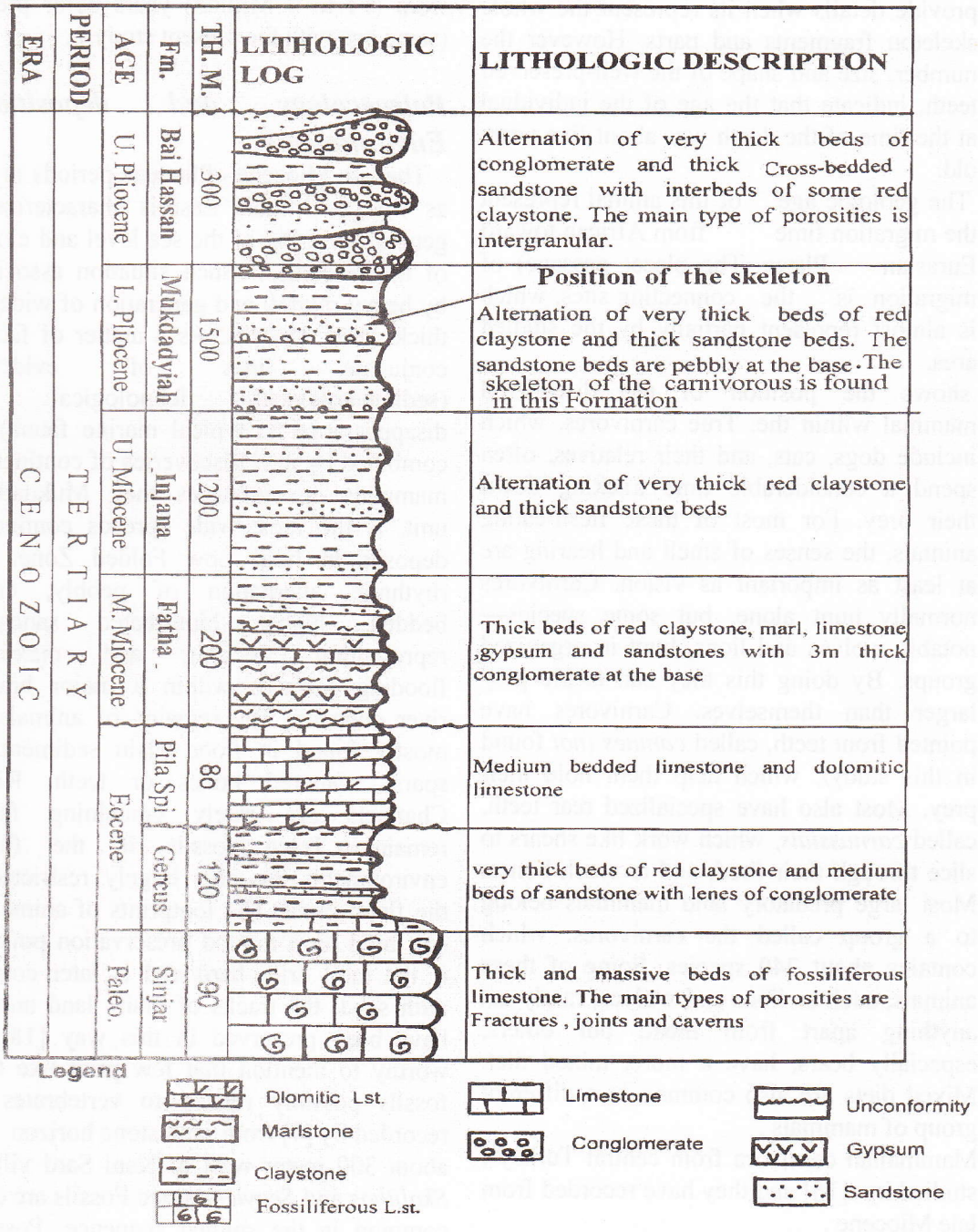


Fig.(3) Stratigraphic column of the Low Folded Zone showing stratigraphic of the sandstone inwhich the skeleton is found.

weathering out from soft sediments and can provide details when its represent the whole skeleton fragments and parts. However the number, size and shape of the well-preserved teeth, indicate that the age of the individual at the time of the death was about five years old.

The geologic age of this animal represent the migration time from African toward Eurasian Plates .The place(passage) of migration is the connecting sites, which is almost represent partially by the studied area.

shows the position of the discovered mammal within the. True carnivores, which include dogs, cats, and their relatives, often spend a considerable time tracking down their prey. For most of these flesh-eating animals, the senses of smell and hearing are at least as important as vision. Carnivores normally hunt alone, but some species—notably wolves and lions, hunt in organized groups. By doing this they can tackle prey larger than themselves. Carnivores have pointed front teeth, called *canines (not* found in this study*),* which help them hold their prey. Most also have specialized rear teeth, called *carnassials,* which work like shears to slice through their food, and to crush bones. Most large predatory land mammals belong to a group called the carnivores, which contains about 240 species. Some of these animals, such as lions and wolves, rarely eat anything apart from meat, but others, especially bears, have a more, mixed diet. Mixed diets are also common in a different group of mammals .

Mammalian carnivora from central Turkey , studied by [16] and they have recorded from late Miocene .

[17] have published paper on late tertiary mammalian fauna in U.S.A. , then the recording fossils included carinal ,dental and postcarinal elements , the age determined from (14 to 7 Million) years befor present (same age with the present study) .

Paleoecology and depositional Environments

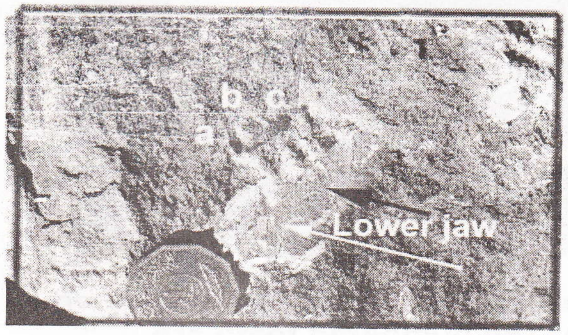
The late Miocene –Pliocene periods in Iraq as well as Middle East is characterize by general lowering of the sea level and closing of the Neotethys. Such situation associated by heavy rainfall and generation of wide and thick, river deposits. As a matter of fact all conjugate lines of evidences (sedimentological, Ichnological and disappearance of typical marine fauna), all combined by new discoveries of continentals mammals are indicates that: Mukdadyiah unit, is the most wide spreads continental deposits in Iraqi Low Folded Zone. The rhythmic alternation of pebbly, cross-bedded, highly bioturbated sandstone representing flooding and maximum flooding surfaces within a major braided river deposits. The remains of animals are mostly found in flood plain sediments as spars, scattered bones or teeth. Rivers Channels are rarely containing faunal remains. Trace fossils in the fluvial environments are also largely restricted to the flood plain. The footprints of animals in soft mud have a good preservation potential if the mud dries hard and is later covered with sand; the tracks of many land animals have been preserved in this way [18]. Its worthy to mention that few print like trace fossils possibly related to vertebrates are recorded by [4] from sand stone horizon] about 300 meter west of Kani Sard village. *Skolithos* and *Scoyiena* trace Fossils are quite common in the studied sequence. Possibly formed by Crustaceans or annelids[6] .The scoured base channel of pebbly sandstone, Changes vertically into Channel fill

Photo plate 1

(1.1) Location of the area, at which the skeleton is found. At the background Hanjera anticline can be seen

((1.2) The sandstone bed in which the skeleton is found.The bed is dipping toward northeastern at 20 degrees along southeastern limb of Takyia - Sangaw syncline

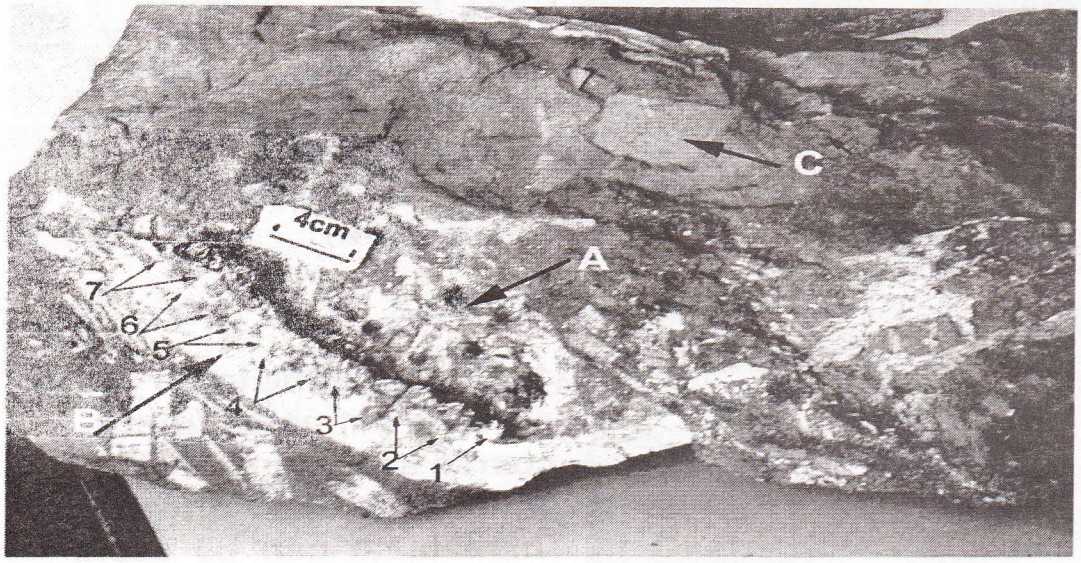
(1.3) A part of skeleton (disloged leg) exposed by erosion. At the lower left corner, one can seen two exposed teeth of the lower jaw (indicate by white arrow)



(1.4)A part of the lower jaw partiarly extracted from coarse sandstone of The Mukdadiyah Formation. Three teeth can be seen, which indicated by a,b and c.

Photo plate 2

(2.1) The extracted left upper (B) and lower jaw (A) , ten teeth can be seen in the lower one. The bar is 4cm long.



(2.2) The extracted upper and lower jaw (B and A),with a piece of the skull at upper part of photo (C). The numbered teeth are numbered for comparison with with the fig. (4).

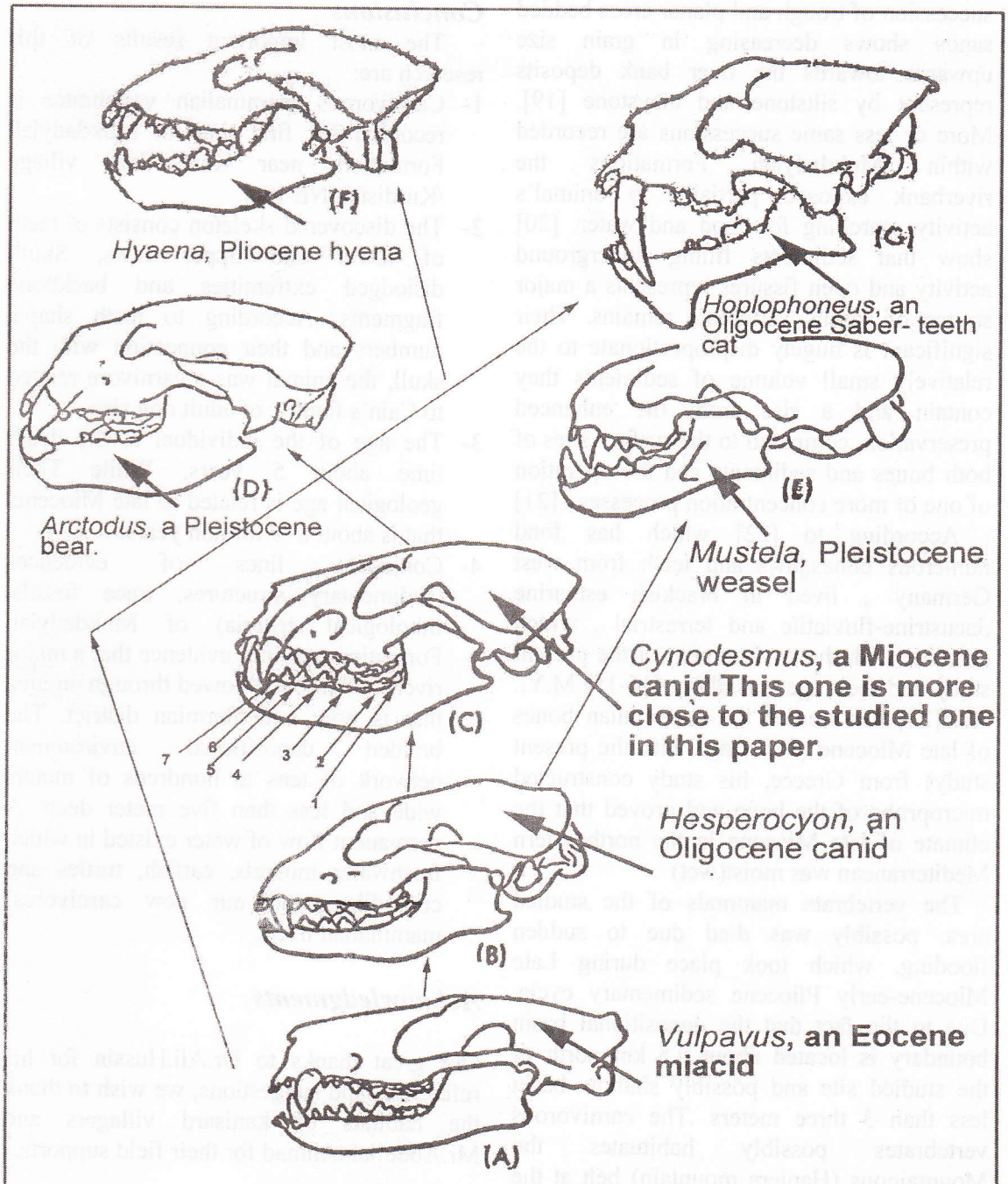


Fig.(4) The postion of the studied mammal skull among of the evolulionary trend of (14) chart. The numbered teeth is for comparison with the photo plate (2.2)

succession of trough and planar cross bedded sands shows decreasing in grain size upwards towards the over bank deposits represent by siltstone and claystone [19]. More or less same successions are recorded within Mukdadyiah Formations the riverbank exposed partially to animal's activity searching for food and water. [20] show that sediments filling underground activity and open fissures represents a major source of fossils vertebrate remains. Their significant is hugely disproportionate to the relatively small volume of sediments they contain and a rise from the enhanced preservation, compared to the surface sites of both bones and sediments and the operation of one or more concentration processes. [21] . According to [22] which has fond numerous bones,jaws and teeth from west Germany , lived in brackish estuarine ,lacustrine-fluviatile and terrestrial , which coincide with the environment of the present study and their age was about (16-15) M.Y.. Also[23] has studied the mammalian bones of late Miocene (Same age with the present study) from Greece, his study constructed microprobe of the bone and proved that the climate of late Miocene in the northeastern Mediterranean was moist(wet) .

The vertebrate mammals of the studied area, possibly was died due to sudden flooding, which took place during Late Miocene-early Pliocene sedimentary cycle. Due to the fact that the depositional basin boundary is located about 0.5 km north of the studied site and possibly shallow basin less than 3 three meters .The carnivorous vertebrates possibly habituates the Mountainous (Hanjera mountain) belt at the basin boundary.

Conclusions

The most important results of this research are:

1- Carnivorous mammalian vertebrates is recorded for first time in Mukdadyiah Formation, near Kani Sard village /Kurdistan/NE-Iraq.
2- The discovered skeleton consists of teeth of lower and upper Jaws, Skull, dislodged extremities and backbone fragments. According to teeth shape, numbers and their connection with the skull, the animal was a carnivore related to Cain's family, of adult dog size.
3- The age of the individual at the death time about 5 years, While Their geological age is related to late Miocene, that is about 8- 9 million years.
4- Conjugate lines of evidences (sedimentary structures, trace fossils, lithological criteria) of Mukdadyiah Formation provides evidence that a major river system once flowed through an area that is now arid Garmian district. The braided depositional environment network of tens to hundreds of meters wide and less than five meter deep. A permanent flow of water existed in which freshwater mussels, catfish, turtles and crocodiles, and our new carnivores' mammalian lived.

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