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Survey for cave animals of Iraqi Kurdistan

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Abstract

Many caves were developed in Iraqi Kurdistan such as Shera Swar Cave within carbonate rocks (Upper Campanian- Maastrichtian) on the south west flank of Safeen Anticline; Shanider Cave within carbonate rocks (Late Early Cretaceous) on the south west flank of Bradost Anticline; Beeston Cave within carbonate rocks (Late Early Cretaceous) on the north east flank of Bradost Anticline; Sarkerdayate Caves within carbonate rocks (Upper Paleocene) near Chimy Razan Valley; Hawraman Caves: within carbonate rocks (Upper Triassic); Hamashowana Cave; Ashcawte (Cave) Gawaran and Hazar Merd Cave: within carbonate rock bed units (Upper Paleocene). A survey was conducted to animals live in these caves reveals presence of 46 species belonging to 8 classes, 15 orders, 26 families, and 39 genera. The following a systematic list of animals of caves recorded in this study in Iraqi Kurdistan. Results show no true troglofauna, except for one bat species; or stygofauna were recorded in the studied caves. Present animal collection of cave animals encounters a beetle, two soft ticks, a woodlouse, two scorpions, a centipede, a land snail, 9 reptiles including 5 lizards and 4 snakes, 21 birds and 8 mammals. Cave animals were divided into 3 categories: animals of cave entrance, animals of inside cave and animals of deep inside cave most of animals fall in the first category followed by second one while the third category represented by one species only. A tentative conservation status assessment for each species was provided.

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Introduction

Cave is a natural hall in the mountains and on ground surface, caused by geologic and hydrologic processes. They offer unique environments for many vertebrate as well as invertebrates species. Iraqi Kurdistan caves were utilized by ancient hominids may be *Homo erectus* and certainly Neaderthal (in Shanidar Cave). Some tools and artifacts were found in some caves north Iraq, such as Hazar Merd, Zarai and Zawi Chami which related to Paleolithic, Mesolithic and Newlithic periods (Solecki, 1952; Braidwood and Hawi, 1972). On the other hand, animals that live in caves include troglofauna which are small cave-dwelling animals that have adapted to their dark surroundings and associated with caves and spaces above the water table; and stygofauna that are associated with water. According to literature, there was no work carried out in Iraqi Kurdistan that dealt with a survey of cave dwelling animals except for some papers published on bats including Harrison (1964), Al-Robaae (1976), Nader and Kock (1983), and recently Al-Sheikhly *et al.* (2015), but they did not discuss the other groups of animal dwellers of the caves in Iraq The aim of the present study is to investigate about the animal diversity utilize the caves of Iraqi Kurdistan and to provide preliminary conservation assessment for each species recorded.

Materials and methods

Geologic Settings

Structural features of Iraq are subdivided into two main units, stable and unstable shelf. Unstable shelf subdivided into three zones: low folded, high folded and imbricate zone. Studied caves located within high folded zone. Rock bed units of studied area mainly aged from Cretaceous to Late Tertiary. 1- The oldest one from the Late Early Cretaceous includes: Balambo, Sarmord, and Qamchuqa Formations, which comprises of limestone and dolomitic limestone. 2- Late Cretaceous rock bed units consist of Carbonate of Kometan, Dokan, Bekhme, Aqra and Shiranish Formations in addition to clastic rocks of Tangero Formation. 3- Paleogene rock bed units, consists of carbonate such as, Sinjar, Khurmala and Pilaspi Formations, in addition to clastic rocks of Gercus Formation. 4- Middle and Late Miocene rock bed units, that include, Fatha Formaton (anhydrite, gypsum and marlstone), and Injana Formation (sandstone and mudstone).

Stratigraphy

The most important rock bed units related to involved caves are:

Avroman, Qamchuqa, Aqra-Bekhme, and Sinjar Formations.

Avroman Formation (Upper Triassic):

Consists of 680 meters, light colored, thick bedded limestone and marly limestone (Bolten, 1958; in Buday, 1980; Alaadin, 2008). Structurally, it is located within the Thrust Zone, therefore the rock bed units are deformed and highly fractured (Talabani, 2013).

Qamchuqa Formation (Albian, Late Early Cretaceous):

It comprises massive, argillaceous, fossiliferous limestone interbedded with crystalline dolomites.

Aqra-Bekhme Formation (Upper Campanian-Maastrichtian).

Aqra-Bekhma name used by Buday (1980), its thickness about 300- 500 meters at the type area, and up to 1050 meters at other sections.

Bekhme Formation comprises three parts: Bituminous secondary dolomite (upper part), reefal limestone (middle part) and conglomeratic breccias (lower part). It is form the core of many anticlines of high folded zone. Aqra Formation comprises reefal and detrital limestone that locally dolomitized and impregnated with bitumen (Bellen *et al.*, 1959; Buday, 1980; Jassim & Goff, 2006).

Sinjar Formation (Upper Paleocene):

Consists of reefal limestone which is usually recrystallized (Bellen *et al.*, 1959; Buday, 1980).

Data collection on animals

Recording of animal species and conservation status assessment process in this study depend on collecting specimens, searching for animal parts or remains, footprints, and interviews with locals living nearby the studied caves. A variety of equipments and chemicals were used to collect and to preserve the animals including mist nets, iron rodent traps, insect nets, fish nets, digital camera (Sony), ethanol alcohol, methanol alcohol etc. Identification of specimens was done with the aid of available keys in pertinent literature, comparing with museum specimens of the collections of the Iraq Natural History Museum, University of Baghdad and consulting taxonomists through personal communications.

Results and discussion

The studied caves are chosen among many caves visited at the beginning of this work in Kurdistan of Iraq for them at different altitudes so that they will comprise different climatic conditions, relatively easily accessible and cover large area falls within two provinces of Iraqi Kurdistan, Erbil and Sulaimaniya.

Table 1. Distribution and conservation status of animal species among the eight caves of the study.

Species/cave	Beeston	Shanidar	SheraSwar	Sarkerdayate	Hawraman Caves	Hamashowa na Cave	Ashcawte (Cave) Gawaran	HazarMerd Cave	Conservation status	Place category
Scarites sp	+	-	-	-	-	-	-	-	DD	NK
Vespa orientalis	-	-	+	-	+	-	-	-	DD	EC,IC
Ornithodoros lahorensis	-	+	-	-	-	-	-	-	DD	IC
Argas reflexus	-	-	+	-	-	-	-	-	DD	IC
Hemilepistus prob. *crenulatus*	-	+	+	-	-	-	-	-	DD	EC
Buthacus leptochelys	-	+	+	-	+	-	-	+	DD	EC,IC
Scorpio maurus	-	-	+	-	-	+	-	-	DD	EC,IC
Scolopendra prob. *mirabilis*	-	+	+	+	+	-	+	-	DD	EC,IC
Sphincterochila boissieri	-	-	+	+	-	+	-	-	DD	EC
Assacus griseonatus	+	+	+	+	+	+	+	+	LC	IC
Assacus saffinae	-	-	+	-	-	-	-	-	LC	IC
Laudakia nupta	-	+	+	+	-	+	-	+	DD	EC
Eumeces schneideri	-	+	+	+	+	-	-	+	DD	EC
Apathya cappadocica	-	+	+	+	-	-	-	+	DD	EC
Eryx jaculus	-	-	+	-	-	-	-	-	DD	EC
Platyceps rhodorhachis	+	-	-	-	+	-	-	-	DD	IC
Malpolon monspessulana	-	-	+	-	+	-	-	-	DD	EC
Eirines persicus	-	-	+	-	-	-	-	-	DD	EC
Falco tinnunculus	-	-	+	-	-	+	-	-	LC	EC
Falco columabarius	-	-	-	-	+	-	-	-	DD	EC
Aegypius monachus	-	-	-	-	+	-	-	-	DD	EC
Gypaetus barbatus	-	-	+	-	-	-	-	-	VU	EC
Aquila heliaca	+	-	-	-	+	-	-	-	LC	EC
Accipiter nisus	-	-	-	+	-	-	-	-	DD	EC
Columba livia	-	+	+	+	-	+	-	-	LC	EC
Apus melba	+	-	-	-	+	-	-	-	DD	IC
Apus apus	-	-	-	+	-	-	-	+	DD	IC
Bubo bubo	-	-	-	+	-	-	+	-	DD	EC
Athene noctua	-	-	+	+	-	+	-	+	DD	EC
Hirundo daurica	+	-	-	-	+	-	+	+	DD	IC
Oenanthe oenanthe	-	-	+	-	+	+	-	-	DD	EC
Corvus corax	-	-	+	-	-	-	-	-	DD	EC
Garrulus glandarius	+	+	-	-	+	-	-	+	DD	EC
Pyrrhocorax pyrrhocorax	+	-	-	-	+	-	-	-	DD	EC
Sitta europaea	+	+	-	-	+	-	+	-	DD	IC
Sitta neumayer	-	-	-	-	-	-	-	+	DD	IC
Sitta tephronata	+	-	-	-	+	-	-	-	DD	IC
Passer domesticus	-	+	+	+	+	+	-	-	LC	EC
Rhinolophus ferrumequinum	+	+	-	-	-	-	+	-	LC	DC

Hystrix indica	-	+	-	-	+	-	-	-	DD	EC,IC
Canis lupus	-	+	-	-	-	-	-	-	VU	EC
Canis aureus	-	-	+	+	-	-	+	+	LC	EC
Vulpes vulpes	+	+	+	+	-	+	-	-	LC	EC
Hyaena hyaena	-	-	+	-	-	-	-	-	VU	EC
Lynx lynx	-	-	+	-	+	-	-	-	VU	EC
Meriones persicus	-	+	-	-	-	-	-	-	DD	EC,IC

DD Data Deficient, LC Least Concern, VU Vulnerable, NK situation not known, EC entrance of cave, IC inside cave, DC deep inside cave.

Most of the studied caves, Shera Swar, Shanidar, Beeston, Sarkerdayate, Hawraman caves, Hamashwana cave, Ashkawte (cave) Gawaran, and Hazar Merd caves are formed within carbonate rocks of Avroman, Qamchuqa, Aqra-Bekhme, Sinjar Formation. Caves and caverns have been developed when solutions penetrated through joins, fractures and bedding planes and widening them. Cave forming processes at studied area happened during Paleocene, Oligocene and Miocene (Stevanovic *et al.*, 2009).

Fig. 1. Shera Swar cave, outside view.

Shera Swar Caves

many caves and caverns occurred on both sides of main valley dissected the south-west limp of Safeen anticline, within carbonate rocks of Aqra-Bekhme Formation according to natural survey by authors (from April- December (2015) and Sissakian (1997). The coordination of the main cave is: 36° 23′ 87″ N, 44° 17′ 24″ E, and its dimensions about 9x5.5 meters.

The roof covered by black bituminous materials that penetrated via joints and fractures. On June 2015 temperature was 42 ℃ outside the cave, 38 ℃ at the entrance, and 36 ℃ inside of the cave. There are no water pools inside the cave. (Figs. 1-2):

Fig. 2. Shera Swar cave, inside view.

Shanider cave

It is located on the south-west limp of Bradost anticline, within carbonate rocks of Qamchuqa Formation. The coordination of the cave is: 36° 50' 05" N, 44° 13' 09" E. On June 2015 temperature was 40 ℃ outside the cave, 36 ℃ at the entrance, and 29 ℃ inside of the cave. There are no water pools inside the cave. Shanidar cave is well-known worldwide for Neanderthal skeletons (c. 60,000 years ago) found here as in the late 1950s, archeologist Ralph Solecki and his team unveiled four cultural layers within this cave (Stevanovic *et al.*, 1999) (Figs. 3-4).

Fig. 3. Shanidar cave, outside view.

Fig. 4. Shanidar cave, inside view.

Beeston cave

It is visited by anthropologist Henry Field for the 1st time on 1934, and 2nd time with archaeologist Fuad Safar on 1950. They discovered some pottery artifact belong to Palaeolithic. It is located on the north-east limp of Bradost anticline, within massive carbonate rocks of Qamchuqa Formation. The total length of the hall <450 meters with <25meters. The speliothemes features and its size put it in the most attractive one.

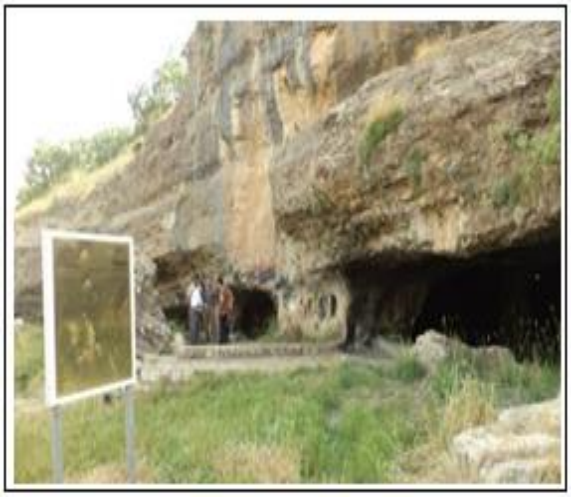

Fig. 5. Beeston cave, outside view.

The altitude of the cave entrance about 1200 meters a.s.l. (Stevanovic *et al.*, 2009) available water within rock bed units over lined Beeston Cave has been dropping from the roof and form many speliotheme structures of different colors, such as: stalactites, stalagmites and flowstones (figs.7-9).On June 2015 temperature was 39° C outside the cave, 29 ℃ at the entrance, and 21 ℃ at the deep inside the cave. The ground of the cave is wet and very slimy. Temperature of water pools which is located about 100-200m inside the cave was 11 ℃. The depth of the pools ranges 10-15 centimeters. The water pools are formed from the dripped water beneath the rocks forming the roof of the cave. The low temperature of water may inhibit presence of some animal life. (Figs. 5- 6).

Fig. 6. Beeston cave, inside view.

Sarkerdayate caves

Sarkerdayate in Kurdish means the main or large cave. They are located on the west side of Chemi Razan valley within massive carbonate rocks of Sinjar Formation. Its coordination's are: 36° 23' 693" N, and 44° 17' 127" E, and the altitude about 888 meters a.s.l..

Fig. 7. a stalagmite in Beeston cave.

They include three doubled halls caves vary in its size that classified into large, medium and small. Each of them has two halls perpendicular to each other, one of them toward NW-SE and the other toward NE-SW which coincided with joint system and other fractures in studied area.

Fig. 8. Another stalagmite in Beeston cave.

Fig. 9. a stalactite in Beeston cave.

The dimensions of the large one are: width of 1st hall entrance is about 12-15 meters, the width of 2nd hall entrance is about 25 meters, and interior width is about 6-9 meters, and the high is about 2-10 meters.

On June 2015 temperature was 38 ℃ outside the cave, 30 ℃ at the entrance, and 21 ℃ and relative humidity 36% inside of the cave. There are no water pools inside the cave. (Figs. 10-11).

Fig. 10. Sarkerdayate cave, outside view.

Hawraman caves

It is located in Hawraman Mountain within carbonate rocks of Avroman Limestone Formation (Upper Triassic). The most important caves are Hamashowana and Ashkawte caves, for example:

Hamashowana: it is also called sanctuary of Bawanawes, and it is very important cave because its includes Stone Age paints belong to Archaic-*Homo sapiens*, more than 30,000 years B. P., according to S. R. Afrasiab who excavate it (Afrasiab *et al*., 2013).

Fig. 11. Sarkerdayate cave, a view inside a small branch of the cave.

Ashcawte Gawaran: (fig. 12): it is a mysterious cave and there is an old stair way about 50 meters high from the 1st step to its entrance. Its history is still debate and doubtful, but somebody believed that it is a place of prayer and contains place of Zardashte old religions (Afrasiab *et al*., 2013).

Fig. 12. The Ashcawte (Cave) Gawaran.

Hazar merd cave

It is located on the top of Qaradag Mountain within carbonate rock bed units of Sinjar Formation (Fig. 13)

about 12 kilometers south west Sulaimaniyah City and the coordinations are: 35° 29' 38.66" N and 45° 18' 38.96" E. It is group of caves but the largest one named Hazar Merd, Which has 30X20X10 meters, length, width and high respectively and it is related to Paleolithic period.

Fig. 13. Hazar Merd cave entrance.

Results show that animals encountered in this study are 46 species belonging to 8 classes, 15 orders, 26 families, and 39 genera. The following a systematic list of animals of caves recorded in this study in Iraqi Kurdistan:

Kingdom Animalia
Phylum Arthropoda
Class Insecta
Order Coleoptera
Family Carabidae
Scarites sp., beetle
Order Hymenoptera
Family Vespidae
*Vespa orientalis*Linnaeus, 1771, Oriental hornet
Class Crustacea
Order Isopoda
Family Trachelipodidae
Hemilepistus prob. *Crenulatus* (Pallas, 1771), Woodlice
Class Arachnida
Order Scorpiones
Family Buthidae
Buthacus leptochelys(Ehrenberg, 1829)
Family Scorpionidae
Scorpio maurus Linnaeus, 1758
Order Acari
Family Argasidae
Argas reflexus (Fabricius, 1794), Pigeon tick
Ornithodoros lahorensis Neumann, 1908, Middle East sheep tampan
Class Chilopoda
Order Scolopendromorpha
Family Scolopendridae
Scolopendra prob. *mirabilis*(Porat, 1876) centipede
Phylum Mollusca
Class Gastropoda
Superfamily Helicoidea
Family Sphincterochilidae
Sphincterochila boissieri(Charpentier, 1847)
Phylum Chordata
Class Reptilia
Order Squamata
Family Gekkonidae
*Assacus griseonatus*Dixon & Anderson, 1973
Assacus saffinae Afrasiab & Mohamad,
Family Agamidae
Laudakia nupta (De Filippi, 1843)
Family Scincidae
Eumeces schneideri (Daudin, 1802)
Family Lacertidae
Apathya cappadocic aurmiana (Lantz & Suchow, 1934)
Family Boidae
Eryxjaculus
Family Colubridae
Platyceps rhodorhachis (Jan, 1863)
Malpolon monspessulana (Hermann, 1804)
Eirines persicus (Anderson, 1872)
Class Aves
Order Falconiformes
Family Falconidae
Falco tinnunculus Kestrel
Falco columabarius
Order Accipiteriformes
Family Accipitridae
Aegypius monachus Black vulture
Gypaetus barbatus Lammergeier
Aquila heliaca Golden eagle
Accipiter nisus Sparrow hawk
Order Columbiformes

Family Columbidae
Columba livia Gmelin, 1789, rock dove
Order Apodiformes
Family Apodidae
Apusapus
Apus melba (Linnaeus, 1758) Alpine swift
Order Strigiformes
Family Strigidae
Bubo bubo Eagle owl
Athene noctua Little owl
Order Passeriformes
Family Hirundinidae
Hirundo daurica (Laxmann, 1769) red rumped swallow,

Ptyonoprogne fuligula African rock martin
Family Muscicapidae

Oenanthe oenanthe (Linnaeus, 1758) common wheatear,
Family Corvidae
Corvus corax Linnaeus, 1758 Common raven
Garrulus glandarius (Linnaeus, 1758) Eurasian jay
Pyrrhocorax pyrrhocorax(Linnaeus, 1758) Chough
Family Sittidae
Sitta europaea L., 1758, European nuthatch
Sitta neumayer Michaelles, 1830
Sitta tephronata
Family Ploceidae
Passer domesticus (Linnaeus, 1758), House sparrow
Class Mammalia
Order Chiroptera
Family Rhinolophidae
Rhinolophus ferrumequinum (Schreber, 1774), Greater horseshoe bat
Order Carnivora
Family Canidae
Canis lupus
Canis aureus
Vulpes vulpes
Family Hyeanidae
Hyaena hyaena
Family Felidae
Lynx lynx
Order Rodentia
Family Hystricidae
Hystrix indica Kerr, 1792, Indian crested porcupine
Family Muridae
Meriones persicus (Blanford, 1875) Persian jird

Our results show that all excavated caves in this study have no true troglofauna which associated with caves and spaces above the water table except for the Greater horseshoe bat *Rhinolophus ferrumequinum* which is considered as a trogloxene; an animal that uses caves for shelter but does not complete its life cycle in them, neither true stygofauna which associated with water although many water pools of a good quantity are present in Beeston cave. Results show that the animals diversity in SheraSwar cave, in regard to species number and individual number, is more diverse compared with other studied caves (Table 1). This is because, perhaps, the cave is with lower latitude and situated only few meters above the valley basin which leads to warmer conditions and consequently more attractive habitat for the animals.
On the other hand, animals collected may be categorized according to their existence in relation to the place of cave they present at into three groups: 1- at the entrance of the cave including the direct area in front of the cave door (EC, at the entrance of the cave), 2- at inside the cave where light is dramatically decrease but still animals could see the surroundings with difficulty, in the studied caves this distance may reach up to 20 meters (IC, inside the cave), and 3- deep inside the cave for a distance < 50 meters and may reach 300-500 meters as in Beeston cave, it is totally darkness and animals must use another ways route instead of eyes to get their route (DC, deep inside the cave). In view of the previous categorization the present collection of animal species includes, 1(2.2%) situation unknown, 25 (54.3%) entrance of cave, 11 (23.9%) inside of cave, 1 (2.2%) deep inside of cave, and 6 (13%) present in both entrance and inside the cave. The present results show that all investigated caves in this study have no true troglofauna which associated with caves and spaces above the water table neither true stygofauna

which associated with water although many water pools of a good quantity are present in Beeston cave. The only species adapted animals for life deep inside the cave is the bat *R. ferrumeqinum* which represents only 3.3% of the total sample, while those living inside the cave include 2 species of soft tick *A. reflexus* and *O. lahorensis*, one gecko *Assacusgriseonatus*, and 6 birds *A. melba, H. daurica, S. kurdistanica, S. europea, S. neumayer,* and *S. dresseri.* All these are only partly adapted to life in caves. Presence of the Carabid beetle *Scarites* sp. (Insecta) in Bestoon cave is rather surprising and most likely is accidental as Cividanes and Santos-Cividanes (2008) stated that beetles belong to this genus preferred crop areas.

Fig. 14. The oriental hornet at the entrance of a cave.

The oriental hornet *Vespa orientalis* (fig. 14) enters the cave entrance to build their hive on the walls or within crevices. Only two specimens of spiders were collected from inside studied caves (Beeston and Shera Swar), but unfortunately they were damaged and nearly destroyed and became useless for taxonomic study. Schmalefuss & Wolf-Schwenninger (2002) in their world catalogue of the isopods recorded woodlice *Hemilepistus* probably *crenulatus* from Iraq without mentioning collection site and also from Turkestan, Kazakhstan, Uzbekistan, and Tadzhikistan which are all of mountainous nature. It is occasionally seen in Shanidar cave. Recording of this terrestrial crustacean in Shanidar cave only may be correlated directly to the fact that shepherd frequently visit this cave as a shelter for their sheep and goat, meanwhile they feed the herd with available fresh plant leaves which the woodlice feeds on. This case is not present, apparently, in the other caves. The soft tick, the Middle East sheep tampan *Ornithododrs lahorensis* was collected from cervices beneath rocks in Shanidar cave only. This could be attributed to presence of sheep and goats inside the cave which the tick parasitizes on them. Stevanovic *et al.* (2009) observed that many of the caves are used as human and animal settlements in Iraqi Kurdistan. Until recently shepherds use this cave as shelter and resting place for them as well as their animals. Now local authorities put iron barrier and set guards to prevent them from entering inside the cave. Its incidence on hosts is controlled by species behavioral patterns (Mohammad, 1999). This argasid tick stays on its host only for a short time and for feeding by sucking the blood and then return back to their shelter in rocks. Anastos (1957) studied the habitats of this species and found that all stages of development were found in cracks and crevices of wooden and stone structures used as shelter for domestic animals. Another species of soft tick the pigeon tick *Argas reflexus* was collected in Shera Swar cave.

Fig. 15. *Buthacus leptochelys,* dorsal view.

It could be assumed that this finding correlated with presence of the rock doves which use the cave as roosting place and this association between them lead to record both of them from the same cave. However, rock pigeon was reported to present in another two caves in the present study (Shanidar and Sarkerdayate) without collecting this tick. This may be because that the roosting places for pigeons in latter caves are much higher and could not be accessible for us to collect tick specimens.

Fig. 16. *Scorpio maurus,* dorsal view.

Two scorpion species (figs: 15-16) were reported in this study collected from Shera Swar and Shanidar caves only. No specimens were collected Beeston cave perhaps because of the wet and slimy substrate of the cave ground, while Sarkerdayate cave yields no

specimens also because of the intense visits of tourists from inside and outside Iraqi Kurdistan for several month as "tourism season" may extend for 7-8 months or even more leading to killing and disappearing the scorpions. *Buthacus leptochelys* (fig. 9) was recorded in Tel Afar and Makhmoor in the north of Iraq (Bringle, 1960; Khalaf, 1962; Khalaf, 1963). *Scorpio maurus* (fig. 10) was frequently reported from the north of Iraq, Bringle (1960), Khalaf (1962), and Khalaf (1963) recorded it in Duhok-Aqra region, Diana-Rwandoz region, Tel Afar, and Serseng in the north of Iraq. It was also reported from Rutba in the west of Baghdad and Abou-Saida in the middle (Khalaf, 1962).

Fig. 17. The chilopod *Scolopendra mirabilis*.

Lewis (2001) reported 4 species belong to genus *Scolopendra* from the mountainous area in Iraqi Kurdistan namely: *Scolopendra cingulata, S. canidens*, *S. mirabilis* and *S. valida*. He reported the present species *Scolopendra mirabilis* (fig. 17) from Penjwin, Sulaimaniya, Zakho and Gali Alibek in Erbil.

Fig. 18. Land snail *Sphincterochila boissieri*, dorsal view.

It looks of a wide distribution throughout Iraq since he recorded it also from Amara and Nasiriya in the south and from Habbaniya in the middle of the country. He pointed out that this species is common in the Middle East. Lewis (2010) recorded it in Egypt, Sudan, Somalia, Eritrea, Ethiopia, Tanzania (including Zanzibar), Israel, Palestine, Syria, Jordan, Saudi Arabia, Kuwait, UAE, Oman, Yemen, Iraq, Iran, Turkmenistan, Tajikistan, Uzbekistan, Afghanistan, India, and Vietnam in the far east.

Fig. 19. Land snail *Sphincterochila boissieri,* ventral view.

The white desert snail *Sphincterochila boissieri* (figs. 18-19) was collected from Shera Swar and Sarkerdayate caves at the direct entrance of the cave beneath and sometimes above rocks. Evenari *et al.* (1971) found it in the rocky slopes habitat. Most of the specimens collected except for few were partly empty shells. Some empty shells, however, were partly destroyed indicating that this snail might be attacked and eaten by unknown predators at the cave entrance.

The number of reptilian species recorded in this study are 9 including 5 lizards and 4 snakes.

Apathya cappadocica urmiana (fig. 20) was recorded by Afrasiab *et al.* (2013) from Shanidar cave in addition to Aqrah west of Erbil, Peramagroon Sulaimaniya Province, stating that the dorsum of the Peramagroon specimen was green with two longitudinal stripes, whereas the Shanidar specimen was bluish with two dorsal stripes and two red blotches on the sides of the neck.

They concluded that *A. c. urmiana*is present at altitudes of more than 1000 m a.s.l. Ilgaz *et al.* (2010) examined *urmiana* subspecies at molecular level and found it has own special electrophorenograms. This result put in mind some possible adaptation of this subspecies to life in cave. This beautiful lacertid lizard found in most caves north of Erbil.

Fig. 20. *Apathya cappadocica urmiana near* Shera Swar cave entrance.

Eumeces schneiderii is a large lizard observed near the entrance of Shanidar cave.

Assacus griseonatus (fig. 21) was recorded in northeast Iraq (Afrasiab & Mohamad, 2009; Parash *et al.*, 2009). It was recorded in this study from all caves. It was very common in Sarkerdayate cave.

Fig. 21. *Assacus griseonatus* in Sarkerdayate cave

Assacus saffinae differs from other species of *Assacus* by separation of postmental shields. It was found in Shera Swar and Shanidar caves.

Laudakia nupta (fig. 22) was identified in the field by its large size, and the tail ends with black. It was observed in Shanidar and Sarkerdayate caves.

Eryx jaculus (fig.23) is a non poisonous Boidae snake found in Beeston cave, north of Erbil. It is probably searching for the bird nests and for bats.

Fig. 22. *Laudakia nupta* at Sarkerdayate cave.

The snake *Malpolon monspessulana insignitus* is recognized by its uniform grass green dorsals. It enters caves at the time of bat migration. It was found at Hawraman caves.

Fig. 23. *Eryx jaculus* snake from Beeston cave.

Platyceps rhodorhachis ladacensis: it is widespread throughout Iraq (Afrasiab & Mohammad, 2011; Schatti *et al.*, 2014). It prefers dry rocky crevices and stony habitats (Amr & Disi, 2011). It is known to feed on skinks, *Eumeces schneiderii*, small mammals and birds (Schleich *et al.*, 1996; Amr & Disi, 2011). Recording both *P. rhodorhachis* and *E. schneiderii* from Shera Swar could be understood in view of this association. This snake was found at the roof of

Hawraman caves may be searching for bats and geckoes.

The snake *Eirines persicus* (fig. 24) is nocturnal and hides in crevices during daytime and feeding on insects, spiders and occasionally lizards (Mahlow *et al.*, 2013).

The avian species in this study comprises 21 species and thus represents the most diverse group belonging to 6 orders, 10 families, and 17 genera.

Fig. 24. *Eirines persicus* snake.

In regard to nuthatches *Sitta* spp. observed in this study, Salim *et al.* (2006) recognized three species of nuthatches namely, European nuthatch *Sitta europea* (fig. 25), Eastern rock nuthatch *S. tephronata*, and Western rock nuthatch *S. neumayer*, but Lahony (2011) gave a detailed systematic account on the species known to Iraq and referred to 5 species of them adding *S. kurdistanica* and *S. dresseri* to the previously recorded. Al-Zubaidi *et al.* (2014) observed that some birds choose Shera Swar cave in Safeen mountain for building their nests including Nuthatch, *Sitta europaea*, common wheatear *Oenanthe oenanthe* (fig. 26) and Rock Dove, *Columba livia*. House sparrows were frequently observed visiting cave's entrances. A male house sparrow was observed, in an unusual behavior, sitting in the nest of another bird (fig.27). Nests of red rumped swallow *Hirundo daurica* (fig. 28) were observed in the studied caves.

Fig. 25. *Sitta europea* at the entrance of SheraSwar cave.

The birds recorded from caves in this study include a good deal of birds of prey comprising 6 species. Order Passeriformes constitute the most diverse group of birds in this study with 10 species.

Fig. 26. nest of the common wheatear O. oenanthe

Mammalian species recorded here is 8. It is the least diverse vertebrate group. The most interesting species of this group is the Greater horseshoe bat *Rhinolophus ferrumequinum* (Schreber, 1774) which enters deep inside the caves and spend relatively long periods in it. Al-Sheikhly *et al.* (2015) mentioned the habitat of the bat *R. ferrumequinum* as limestone caverns and suitable retreats of northern and central Iraq. Earlier (Harrison, 1964) and Al-Robaae (1976) reported it from Duhok and Mosul respectively. Also, Niazi (1976) reported it from a cave located in the western desert about 130 km west of Ramadi city. The

same author talking about his finding on *Rhinolophus eurayle*, wrote that it is highly probable that these bats spend the winter in the southern caves to avoid the freezing cold weather of the north. This assumption may be true also for our bat as they belong to the same genus. Another survey will definitely reveal more species of bats in Iraqi Kurdistan caves.

Fig. 27. a male sparrow sitting in the nest of another bird.

Kadhim (1997) and the records of the Iraq Natural History Museum indicate wide distribution of the Indian crested porcupine *Hystrix indica* all over Iraq. However, its recording from Shanidar cave depends on the quills found in the cave substrate. The quill is with dark brown bands alternating with white ones. Field (1955) reported its presence on Jabal Baradust, a much higher elevation than is elsewhere recorded. Hatt (1959) mentioned that it probably occurs throughout Iraq except for the alpine zone, the marshes, and extreme deserts.

The archaeological excavations found the bones of the Persian jird *Meriones persicus* in Shanidar cave (Sommer, 1999). This rodent seems widely distributed in Iraqi Kurdistan area (Hatt, 1959; Harrison, 1956).

Incidence of animals within the studied caves seems to be not different from that of open surrounding areas. This is a reflection of the fact that there is no true troglofauna found in these caves except only for one bat species.

In general, conservation status assessment of invertebrates could not be done due to lack of adequate and reliable data on their abundance, habitats, behavior and ecology in previous relevant literature. Present data which retrieved from the sites for the record of their presence or absence and interviews with locals, did not allow us to make proper assessments for a wide range of recorded animals in this study. However it could be pointed out that these creatures are under severe pressure in the caves because of the intense visiting by people during most of year.

On the other hand, studied caves witness intense turnout of tourists, except for Beeston cave, that disturb their fauna and put threat pressures and may lead to poorer animal life. These pressures seem severe in Sarkerdayate cave and for a lesser extent for the other caves.

Fig. 28. Nest of the red rumped swallow *Hirundo daurica*.

In view of our investigations on conservation status of the animals recorded in this study, it is clear most invertebrate should be categorized as data deficient (DD) since no reliable information was available on the basis of a long term monitoring program. This is true also for birds, except for house sparrow and rock dove, and reptiles until more information are available. The geckoes and bats in this study proposed to be least concern (LC) from the conservation point

of view since no direct threat was recorded affecting them that may cause serious decline in their individual number. This assessment should be approached with caution since relatively large number of caves is distributed throughout Iraqi Kurdistan and therefore all assessments must considered tentative. Most vertebrates could not be evaluated properly since they are present outside the caves also.

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