



Lizards biodiversity of arid regions in Iraq

Zohair I.F. Rahemo* and Sarbaz I. Mohamad

Kurdistan Natural History Museum, College of Science, University of Salahaddin, Erbil, Kurdistan, Iraq

*Corresponding authors: zohair_rahemo@yahoo.com , sarbaziraq@yahoo.com

ABSTRACT

Arid region in Iraq are extensive, as such lizards have been adapted to different substrates. Certain Iraqi lizards are adopted for life in or on eolian sand dunes, or at least on sandy soils and more or less restricted to such zones. Among the abundant species are species of *Acanthodactylus*, *Scincus*, *Phrynocephalus*. Members of genus *Scincus* and to lesser extent species of *Phrynocephalus*, are adapted both for burrowing in soft sand and for sand running. Furthermore, the species of *Laudakia*, such as *L. nupta* appear to be restricted to areas such as limestone outcrops and rocky cliff faces where both basking surfaces and deep crevices even in mountains of Kurdistan for retreat are provided. Species of *Trapelus*, such as *T. agilis*, *T. persicus*, *T. ruderatus* occur on plains, valleys, and alluvial fans, on sandy, loam, clay, and gravel soils. These lizards are usually found in the vicinity of small rock piles, such as those erected by local inhabitants to mark the boundaries of grain fields in a dried region of Mosul city (near Syrian boundaries). They retreat into these piles for shelter. Species of *Phrynocephalus* show distinct preference for particular soil types some species prefer open clay and gravel plains, while others usually found on sandy plains and steppes. Species which are rock-inhabiting able to negotiate the rough vertical surfaces of rock outcrops and mountain habitats. These include species of *Laudakia* and several species of *Lacerta*. These lizards utilize the many angles and shadows of this environment for temperature regulation by asking and make use of the many crevices for retreat from predators and temperature extremes. The gecko, *Cyrtopodion* usually are found on rocky slopes and cliff faces, in crevices and caverns, and in about human habitation particularly *C. scrubum*. Moreover, *Asaccus elisae* is found in caverns in gypsum deposits and limestone. Species of *Uromastix* are confined in their local distribution to well-drained alluvial soils wherein they are able to excavate their burrows, for instance *U. lorcatu*s prefers silty-clay soils. As regards, *Varanus* spp. inhabiting the most continuously distributed substrate. From above biodiversity of lizard habitat. It can be conclude that the evolution of lizards may be correlated with this specific affinity for substrate type.

Keywords: Lizards, Lacerta, Substrate, Distribution, Iraq

Introduction

Iraq is a rich geographic area for many animals, and more especially for lizards, due to its wide range of deserts and diversified habitat, as desert plateau comprises the largest part of Iraq (57% of the total land area) as estimated by a directory of wetlands in the Middle East (Iraq), 1994 Reptiles of Iraq have been a subject of investigation long time ago starting from Werner (1895), then Khalaf, (1959) who wrote a book on his researches and other observations, without giving any locality of the species recorded. In his additional research on lizards and snakes (1960) he was able to identify 22 species of lizards giving their locations and dates of collection. Mahdi and George (1969) gave a comprehensive list of vertebrates of Iraq including lizards, they listed a total of 48 species of lizards without giving any locality in Iraq or any unique character in specimens collected. Later on Dixon and Anderson (1973) described a new genus and

species of Gecko collected from Iran and Iraq. Afrasiab and Mohamad (2009) described a new species of geckos from Saffin mountain, Kurdistan, Iraq. Recently, Afrasiab *et al.* (2013) published a valid review of the lacertini of Iraq recording five species. Anyhow, lizards information still incomplete due to the difficulty in catching, and their classification which need an expert and valid references, noteworthy in Asia work is continuous and a new species still described even in recent years, for instance in India (Giri, 2008). As concern ecological information about lizards in Iraq, Ctyroky (1972) described the ecological and geographical habitats of northern Iraq, and stated that mountains ranges mostly built by limestone of different age, the intra mountainous valleys originated in softer clay or sandy strata, the slopes of ranges are covered mainly by low xerothermous one-year vegetation, oak bushes-about 5 different species-rarely by junipers and pines. In valleys along

streams the vegetation is livelier with low grown oak woods, popular woods and single willow trees. Greater or smaller streams are running in most of valleys and few wells on mountainous slopes. Climatically this area has a dry and warm summer from June to September, winter is cold with regular snow fall from November to February. Rainfall periods are mainly in November and from March to April.

The present investigation aimed to collect ecological information about distribution of lizards in different regions of Iraq especially mountainous and arid regions as very little information is available to such field.

Materials and Methods

Collection, Examination and Classification:

Specimens were collected using hand net or directly by hand using sticks or steel bars. Specimens after catching were brought to the laboratory of Kurdistan Natural history museum to record some

of the external features such as color, and then preserved in 4% formalin in order to be examined under microscope for fixing its details of morphology. From other parts of Iraq especially arid regions scattered information were collected and analyzed and compared with personal information, or from museum records, or personal consultation.

Classification based on available literature such as those published in Iraq (Khalaf, 1959; 1960), Afarsiab and Mohamad (2009), Afarsiab *et al.* (2013), or the comprehensive book on lizards of our neighbor, Iran (Anderson, 1999) and Sindaco (2006).

Results and Discussion

After carrying out several collection trips in mountainous region and other regions a total of 13 species of lizards were able to identify, belonging order Squamata including 5 families, including four species Gekkonidae, 2 Scinidae, 2 Lacertidae, 3 Agamidae and 2 Anguidae as in the Table (1).

Table (1): Lizard species collected from mountainous region

Species name	Ecozones	Habitat
<i>Asaccus elisae</i>	Mesopotamian plain, reported from Baghdad, Mosul, Ana and Arbil	Caves and old houses, Ruins of Ninivah,
<i>Asaccus griseonotus</i>	Palegawra cave, mosel, Sulaimaniyah, Hammadjuna-ngarrawa (altitude) near Dokan dam	Caves
<i>Asaccus saffinae</i>	Saffain munntains, Erbil, Kurdistan	Caves
<i>Cyrtopodion scabrum</i>	Baghdad, Hindiya , Mousaiab, Ana, Rawa, Arbil and Basrah and Mosul	Houses of Mosul, Arbil, found everywhere
<i>Mabya aurata</i>	Shaklawa, Baghdad, Mosul, and Hindiya	mountainous areas or foothills of Kurdistan
<i>Mabuya vittata</i>	Mosul, Arbil and sulaimaniya	In arid region of Mosul,
<i>Lacerta media media</i>	Piran mountin, Arbil, Dhok	Hills on the rocks
<i>Ophisops elegans persicus</i>	Mesopotamian plain, Zagaros foothills Sadi, Arbil, Haj Umran, Sakran and Makhmoor.	Dry terrains overgrown with grasses and shrubs sticks to stone and rocks
<i>Laudakia nupta</i>	Kurdistan mountains, near Rawandoz	Rock cervices
<i>Trapelus ruderatus</i>	Piran mountain, Arbil	Dry steppe and relatively densely vegetated and stony pastures
<i>Agama caucasic</i>	Sedakan, situated in northeast Iraq	Mountains and valleys
<i>Ophisaurus apodus</i>	Sulaimanya	Valleys

(1) *Asaccus saffinae* (Afrasiab and Mohamad, 2009), Figure 1.

(2) *Asaccus elisae* (Werner, 1895), Figure 2.

Phyllodactylus elisae (Werner, 1895): Leaf-toed gecko

(3) *Asaccus griseonotus* (Dixon and Anderson, 1973), Figure 3.

Gray-spotted leaf-toad gecko,

(4) *Cyrtopodion scabrum* (Heyden, 1827), Figure 4.

(5) *Mabya aurata* (Linnaeus, 1758): golden grass skink

(6) *Mabuya vittata* (Olivier, 1804): Bridled skink

(7) *Lacerta media media* (Lantz and Cyren, 1920), Figure 5

(8) *Ophisops elegans* (Menetries, 1832).

- (9) *Laudakia nupta* (De Filippi, 1843), Figure 6.
Large scaled rocks Agama
- (10) *Trapelus ruderatus* (Olivier, 1807), Figure 7.
Agama rudiratus
Horny scaled agama, Olivers agama
- (11) *Agama caucasic* (Eichwald, 1831), Figure 8.
Caucasian agama, northern rock agama
- (12) *Ophisaurus apodus* (Pallas, 1775), Figure 9.
Glass lizard it's common in foothills of the Zagros mountain in Iraq. (Leviton *et al.*, 1992).
Noteworthy, to record some of other species listed by Khalaf (1960) and giving indication of their geographical distribution as in the following:
- (13) *Hemidactylus persicus* (Anderson, 1872): Baghdad; Mousaiab
- (14) *Hemidactylus flaviviridis* (Ruppell, 1835): Baghdad country wide distribution.
- (15) *Ptyodactylus hasselquist* (Donndorff, 1798): Haditha.
- (16) *Agama stellio* (Linnaeus, 1758): Sheikhan region, Hamrain mountain.
- (17) *Uromastix microlepis* (Blanford, 1874): Tharthar (*U. aegyptius*, Figure 10.)
- (18) *Varanus griseus* (Daudin, 1803): Bagdad, Kurdistan and South of Iraq
- (19) *Diplometopon zarudnyi* (Nikolsky, 1907): Hindia: south west desert (Afrasiab and Ali, 1989)
- (20) *Acanthodactylus boskianus asper* (Daudin, 1802): Ana, Rawa
- (21) *Ophisops elegans* (Menetries, 1832). Wide distribution.
- (22) *Ablepharus kitaibelli* (Bibron and Bory, 1933): Bagdad, and *A. pannonicus* (Fuhn, 1969)
- (23) *Eumeces chneiderii princeps* (Eichwald, 1839): Arbil, Kurdistan of Iraq.
- (24) *Scincus scincus* (Blanford, 1881): Hindiya, Najaf. Karbala (Tar caves) southwest desert.
- (25) *Diplometopons hueaibi* (Niazi, 1979): Karbala city. Karbala (Tar cave).
- (26) *Diplometopon zarudnyi* (Nikolsky, 1907). South west desert. (Afrasiab and Ali, 1989).

In Iraq a distinguished study on ecological habitat of a lizard was carried out by Niazi (1979), along with describing a new species from Iraq, *Diplometopon shueaibi*. The study included new ecological observation on the type of habitat, factors affecting their distribution such as humidity, temperature and type of food. Ethological observations, concerning the mode of locomotion, tunnel construction, reaction to light, effect of temperature on depth occupied, seasonal and diurnal vertical shifts. Specimens were collected from Karballa city, and later expanded westward in open the specimens were collected from Karballa of desert. Most of the specimens were collected from Karballa country,

south and southwest of Lake Rhazaza and few from Anbar city Southeast of Lake Habbanya.

In the valid and extensive book, Anderson (1999) devoted a chapter on (Ecological and Behavioral Influences on Lizard Distribution) of Iran, which seem also logic to include lizards in Iraq in the same sequence, as in the following items:

Eolian sand dunes: certain lizards species are adapted for life in or on eolian sand dunes, or at least on soft sandy soils, with little vegetation and humidity and are more or less restricted to such zones, among these species of *Acanthodactylus*, *Scincus* and species of *Diplometopon* is also a sand dweller. Noteworthy, imprints of different species of lizards were noticed on the sandy dunes of the town Senyiaa, northern of Tikrit city (personal communication with some natives).

Surface of the sand: Some lizards live beneath the surface of the sand, and their limbs have been greatly reduced, one of the drastic example, *Diplometopon* and adaptation facilitating the types of subsurface locomotion which these animals employ, while some of the species have the digits equipped with com-like fringes of scales, and adaptation which has arisen independently in many groups in various sandy deserts, e.g. *Acanthodactylus schmidt* (Haas, 1957) as stated by Anderson (1999).

In Najaf and Hindia deserts *Scincuss cinlcus* (Khalaf, 1960) are adapted *Ptyodactylus puseuxi*, *P. hasselquistii* were collected from lime stone of caves of Rawa in Anbar province (Afrasiab and Mohamad, 2009).

Limestone Outcrops: *Laudakia* (Agama) is restricted to areas such as limestone outcrops and rocky cliff faces where both surfaces and deep crevices for retreat are provided. Species in this group include possibly *L. nupta* on Iraqi soils and rocks

Theses lizards are usually found in the vicinity of small rocks piles, such as those erected by local inhabitants to mark the boundries of grain fields or mark the boundries of fruits or olive farms. Such rock piles provided vantage points and basking areas upon which the lizards are able to orient them to sunlight for temperature control. They retreat into these piles for the shelter. As also stated by Anderson(1999), some prefer open clay and gravel plains, while others usually found on sandy plains and steppes, other prefer mountain slopes, other is found on both sandy and clay surfaces of flatlands. However, species of lizards also are subject to similar environmental conditions for instance *L. nupta* were collected from the sandy area mixed with limestone rocks in little village known as ain Al-

Bakra (=eye of Cow) southern of Mosul city (Rahemo, unpublished data, 1972). Furthermore, *Ophisops elegans* were also collected from olive farms near Baashiqā town east of Mosul city (ZIFR).

Crevices: Local distribution of many lacertid species may be determined by availability of cracks and holes in clay and gravel soils, or burrows in plant-stabilized sandy soil. These crevices provide a retreat from predators and from temperature extremes. *Uromastix* sp. observed in crevices and burrows between sandstone rocks at sides of Khozar river (little tributary of Tigris river) passing through Mosul city is a typical example of such habitat.

Rock-inhabiting: A number of species are rock-inhabiting, able to negotiate the rough vertical surfaces of rock outcrops and mountain habitates. These include the species of *Laudakia*. These lizards utilize the many angles and shadows of this environment for temperature regulation by basking and make use of many crevices for retreat from predators and temperature extremes.

Among the geckos, sand-dwelling species have been recorded. The various species of *Stenodactylus* occur on sandy desert, but to what extent they occupy other substrates is not known, and *Cyrtopodium* usually are found on rocky slopes ,caves and cliff faces, in crevices and caverns and in about places of human habitation particularly true of *Cyrtopodium scabrum*. This lizard is abundant in Mosul Houses as many specimens were collected by the first author (ZIFR), 2012.

Asaccus elisae is found in caverns in gypsum deposits and limestone and occasionally as a house gecko. *Hemidactylus* is similarly adapted to life on walls and roof of the old house. May be that these large geckos are dependent upon the cavernous areas in the gypsum where water persists throughout the year and a high relative humidity may be maintained. Afrosaib and Mohammad (2009) came to similar results when describing a new cave-dwelling geckos from Saffine mountain (Iraq), it is a nocturnal species found inside the SheraSwar cave, between oak trees and after sunset.

Furthermore *Asaccus griseonotus* was also collected from different caves, Palegawra cave, Hazarmerd cave; SargatDaray Mar caves (Afrasiab and Mohamad, 2009).

Cyrtopodium heterocercum collected from Sheraswar cave, Saffine mountain (Afrasiab and Mohamad, 2009).

Cyrtopodium scabrum as it is common house gecko but also found in Sadam cave, south of

Mosul, in the same cave with *A. elisae* (Afrasiab and Mohamad, 2009). It is important to note that *C. scabrum* population was also observed in Nakot cave in Makloop mountain near St Matta monastery(ZIFR).

Mud-brick habit: Structures usually built of mud-brick provide additional habit not only for the geckos mentioned above, but for rock-dwelling species of *Laudakia* as well. These lizards are often quite numerous on walls, houses, and monuments. There is usually an abundance of insects prey in such situations, attracted by the human inhabitants and their domestic animals and cultivated plants. Geckos were observed in houses built by mud-bricks in village of Jirin southern of Mosul (ZIFR).

Alluvial Soil: The Iraqi species of *Uromastix* are confined in their local distribution to well-drained alluvial soils wherein they are able to excavate their burrows. Many *Uromastix* sp. were observed in burrows at sides Al-Khossar river passing through left-bank of Mosul city. Furthermore, *Uromastix* were some time smashed by cars when passing roads in Hamama-Alil southern of Mosul city as specimens brought to the laboratory of Zoology at college of Agriculture and Forestry (Rahemo, 1975, unpublished observations).

Species occupying the greatest range of substrates, such as *Trapelus spp.*, *Mabuyasp* or those inhabiting the most continuously distributed substrates. General conclusion as reached by Anderson (1999), came to a point that (Evolution of the various lizard groups in Southwest Asia (including Iraq and Iran) may be significantly correlated with this specific affinity for substrate type and the discontinuous distribution of these substrates). Noteworthy, as mentioned before, that specimens of *Mabuyae vittata* have been reported from a sandy areas near north-east of Mosul city examined for their parasites (Rahemo *et al.*, 2002).

Vegetation and lizards Distribution: Vegetation attract insect which is a food for most lizards. Many Lizards hide under shrubs to avoid sun slight. Certain types of shrubs, for instance, stabilize dune sands and provide suitable sites for burrow excavation among their roots. These burrows may be constructed by rodents, or even large arthropods, and thus the lizards are also dependent upon presence of these animals as well as on plants e.g. *Uromastix* which live in alluvial excavation between roots of sos(licorice) as those seen at bank of Khosser and Tigris river in Mosul city. *Uromastix aegyptius* also reported near vegetation (Kevork and Ul-Uthman 1972). *U. aegyptius* is phytophagus in habitat inhibiting

Karbala desert area, its presence near vegetation of *Peganum harmala*, *Alhagi morurum* and *Tamarix* spp. and shrubs *Astragalus*, *Fagonia*, and they gave a list of 37 species of plants present in its stomach, namely, *Artisia plumose*, *Cornulaca leucacantha*, *Peganum harmala*, *Scrophularia hypericifolia*, *Zygophyllum coccineum*, *Stipa capensis* and others.

In the arid areas of sparse vegetation, many lizards may depend for sustenance upon the insect species attracted to the vegetation and consequently their local distribution depends upon the frequently narrowly restricted occurrence of certain plants. Some species such as *Trapelus* climb into the branches of low steppe vegetation - to orient themselves relative to the sun's rays and to escape the hot soil surface for temperature control. Some prefer heavy vegetation such as *Lacerta*, skinks such as *Mabuya* these species are riparian habitats.

Effect of Temperature on Lizards Distribution:

The animal's body temperature at any given time is a product of its relation to ambient temperature, and reflected radiation from substrata. In Iraq Niazi (1979) concluded an important clue as he found that the Arabian worm lizard *Diplometopon shueabi* descent deep in soil with little humidity when temperature is above 50 C° and similarly when temperature drop to 20 C°, it may descent to a meter in depth.

Temperature may be most critical to developmental stages, as lizard must be able to place its eggs where they will be protected from lethal extremes as well as exposed to temperatures sufficiently high for development to proceed.

Oviparous species must be developmentally labile to extent that they are able to endure the inevitable fluctuations and inconsistencies in temperature and moisture characteristic of arid regions.

Sand Surface: By moving onto the sand surface, or near the surface, during the warm hours, they

come quickly to activity temperature, while both high and low extremes are readily avoided by burrowing a few centimeters below the surface. The small lacertids are able to extend their activity periods into the hottest hours of the day by utilizing the small areas of shade provided by rock or bush, making brief forays into the sunlight to catch insects. The agamids position themselves relative to the incident sunlight so that the maximum surface is exposed during basking the minimum during the hottest period.

Nocturnal Species: One of the striking aspects of the lizard fauna of this desert region is the diversity of gecko species. These animals are able to circumvent the problem of Light time temperatures through exploitation of nocturnal activity. During the hottest season, when diurnal lizards are restricted to brief activity periods, nocturnal air temperatures remain high, due to the re-radiation from the heated ground surface. The activity of many aspects and other arthropods is also largely confined to the night hours during this period. A few geckos apparently have become secondarily diurnal, or partially so. Such behavior is indicated for *Cyrtopodium* all of which have darkly pigmented peritoneum. *Asaccus saffinae* is a nocturnal species collected from caves in Kurdistan region, its main food is the swarm of mosquitoes flying at sunset (Afrasiab and Mohammad 2009).

Mountains and Plateau: with general increase of continental temperatures and increased aridity, some plateau species may find refuge in the higher elevations of the mountain masses, while in response to climatic cooling and increased precipitation, species isolated in such mountain areas may descend to the plateau to become more widely distributed. In Iraq many species were collected from mountainous regions of Kurdistan such as *Asaccus saffinae*, *Cyrtopodium heterocercum* collected from Sheraswar cave, Saffine mountain and *Cyrtopodium scabrum* (Afrasiab and Mohamad, 2009).



Figure (1): *Asaccus saffinae* (Saffin mountain/ collector Saman R. Afrasiab)



Figure (4): *Cyrtopodion scabrum* (Arbil and Mosul city/ collector Sarbaz Ibrahim and Zohair I.F.Rahemo)



Figure (2): *Asaccus elisae* (Arbil/collector Bashar, Randy and Shayma)



Figure (5): *Lacerta media media* (Arbil- Piran mountain/ collector Sarbaz Ibrahim)



Figure (3): *Asaccus griseonotus* (Sulaimanya- Jami Rezan / collector Sarbaz Ibrahim)



Figure (6): *Laudakia nupta* (Arbil- Merga sur/ collector Nabaz sherwani)



Figure (7): *Trapelus ruderatus* (Arbil- Piran mountain/ collector Sarbast sherwani)



Figure(9): *Ophisaurus apodus* (Sulaimanyazaryin/ collector Marywan nasradin)



Figure(8): *Agama caucasic* (Arbil, Sedakan, collector Hyda Qader) History Museum.



Figure(10): *Uromatyx aegyptius* : deposited in the Kurdistan Natural

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