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A Review of Southern Iraq Herpetofauna

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Abstract: The present review discussed the species diversity of herpetofauna in southern Iraq due to their scientific and national interests. The review includes a historical record for the herpetofaunal studies in Iraq since the earlier investigations of the 1920s and 1950s along with the more recent taxonomic trials in the following years. It appeared that, little is known about Iraqi herpetofauna, and no comprehensive checklist has been done for these species. So far, 96 species of reptiles and amphibians have been recorded from Iraq, but only a relatively small proportion of them occur in the southern marshes. The marshes act as key habitat for globally endangered species and as a potential for as yet unexplored amphibian and reptile diversity. Despite the lack of precise localities, the tree frog *Hyla savignyi*, the marsh frog *Pelophylax ridibunda* and the green toad *Bufo viridis* are found in the marshes. Common reptiles in the marshes include the Caspian terrapin (*Clemmys caspia*), the soft-shell turtle (*Trionyx euphraticus*), the Euphrates softshell turtle (*Rafetus euphraticus*), geckos of the genus *Hemidactylus*, two species of skinks (*Trachylepis aurata* and *Mabuya vittata*) and a variety of snakes of the genus *Coluber*, the spotted sand boa (*Eryx jaculus*), tessellated water snake (*Natrix tessellata*) and Gray's desert racer (*Coluber ventromaculatus*). More recently, a new record for the keeled gecko, *Cyrtopodion scabrum* and the saw-scaled viper (*Echis carinatus sochureki*) was reported. The IUCN Red List includes six terrestrial and six aquatic amphibian species. It includes also 23 terrestrial and one aquatic reptile species. The list of herpetofauna of southern Iraq of the present review consists of six amphibian species belonging to one order (Anura) which includes three families as well as 32 reptilian species belonging to two orders (Squmata and Testudines) which include 15 families.

Keywords: Herpetofauna, Southern Iraq, Biodiversity.

Introduction

Iraq, encompassing both terrestrial and aquatic ecosystems, is geographically, climatically and ecologically diverse. In southern Iraq, a vast wetland is found and used to cover more than 15000 km^2. These are the most ancient Mesopotamian marshes with their southwards water network of Shatt Al-Arab river (Figure 1). Unfortunately, these vital wetlands with their rich biodiversity have been destroyed for military and industrial purposes over the last four decades. The damage was so huge that all recent efforts to restore these wetlands did not cover more than 30% of the original area (Richardson & Hussain, 2006) or may be less due to water shortage.

Little is known about Iraqi amphibian and reptile species, and no comprehensive checklist has been done for these species (Mohammed et al., 2015a, b; Rhadi et al., 2015a, b; Afrasiab et al., 2018). The study of Iraq's amphibians and reptiles has important scientific and national interests, which started during fifties, sixties and seventies of the last century with taxonomic lists of amphibians and reptiles. More recently, field collection researches from Basrah area

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have been initiated by some researchers such as Yousif (1995), Hussain et al. (2002) and Yousif (2016).

Regardless of this interest, there remains a lack of coordination between the application of scientific research and the implementation of conservation action. By compiling important information such as the distribution and conservation status of Iraq's amphibians and reptiles, it will be possible to delineate units for conservation prioritization, direct research effort and effectively designate cooperation.

Herpetological biodiversity is often not prominent in discussions of sustainable management of natural resources (Rastigar-Pouyani et al., 2015). However, both reptiles and amphibians (herpetofaunas) fulfill a vital link in the food chain and the stability of both freshwater and terrestrial ecosystems (Duellman & Trueb, 1994). Herpetofaunas are also important in the culture of many societies, where in the global society frogs and salamanders have become major icons for environmental health and protection (Mobaraki et al., 2014). Unfortunately, many species of herpetofauna are highly threatened and populations are generally declining (Collins, 2010).

Materials and Methods

The present review depends upon critical revision of 55 articles dealing with herpetofauna of the studied area and the neighbouring sites. Some of these articles are of ecological concerns while others dealt with the taxonomic subject. Checklists and occurrence records of amphibians and reptiles of the present review have been reported from actual survey especially recent studies. Others relied upon previously recorded species in the area. The Global Biodiversity Information Facility, GBIF (2018) was adopted for preparing the list of herpetofauna of the present review.

The Study Area: Mesopotamian Marshes and Shatt Al-Arab River

The southern marshes of Iraq contain immense of temporary or permanent shallow water bodies at the lower reaches of Tigris and Euphrates. They comprise 4.5% of Iraqi area or 20000 km^2. The most important ones are those situated to the East of Tigris (Huawiza & Shuwaija marshes, 3000 km^2), those laying between Tigris and Euphrates such as Damlag & Sanyah marshes and those on both sides of Euphrates such as Al-Hammar marshes (5000 km^2). The marshes are divided into three major units: (i) Hammar marshes, (ii) Central (Qurnah) marshes and (iii) Huawiza marshes (Figure 1).

Al-Hammar marshes are situated almost entirely south of the Euphrates, extending from near Dhi Qar (also spelled as Dhi-Qar, Thi Qar and Thi-Qar) in the west to the outskirts of Al-Basrah on the Shatt Al-Arab river in the east. The surface area was estimated to range from 2,800 km^2 of contiguous permanent marsh and lake, to a total area of over 4,500 km^2 during periods of seasonal and temporary inundation. The 120 km-long Al-Hammar marshes were formerly the largest water body in the lower Euphrates. The Central marshes are bordered by the Tigris river to the east and the Euphrates river in the south receiving water influxes from both rivers. The Central marshes covered an area of about 3,000 km^2 extending to well over 4,000 km^2 during flood periods. Al-Zikri and Umm Al-Binni are some of the notable permanent lakes located around the center of the marshes. The Huawiza marshes lie to the east of the Tigris river, straddling the Iran-Iraq border. In the west, they are largely fed by three main distributaries departing from the Tigris river near Al-Amarah. Historically, the Huawiza covered an approximate area of at least 3,000 km^2, expanding to over 5,000 km^2 during the floods. The northern and central parts of the marshes were permanent but the lower southern sections were mostly seasonal. Large permanent lakes (Umm Al-Ni'aj), up to six meters deep, are still found in the northern part of the marshes. The Huawiza marshes

represent the most intact part of the original Mesopotamian wetland complex and are of major importance as a biodiversity site (FAO, 2010).

Shatt Al-Arab river (Figure 1) is the sole waterway connecting Iraqi fresh waters with the Arabian Gulf. It is up to 500-700 m wide, and is 8-15 m deep below (Coad, 2010). It is under some tidal influence up to 110-140 km from the Arabian Gulf. Salinity varies with distance from the sea but the freshwater input from the Karun river of Iran can make even its lower reaches fairly fresh, around 5‰. It is an important source of nutrients for the Arabian Gulf. There are appreciable diurnal and seasonal fluctuations in physico-chemical conditions. The Shatt Al-Arab river has temperatures of 32°C in August and 10°C in January but there is little or no vertical stratification. Tidal waters probably penetrated far inland through the Holocene as evidenced by faunal remains in boreholes of the Al-Hammar formation (Coad, 2010).

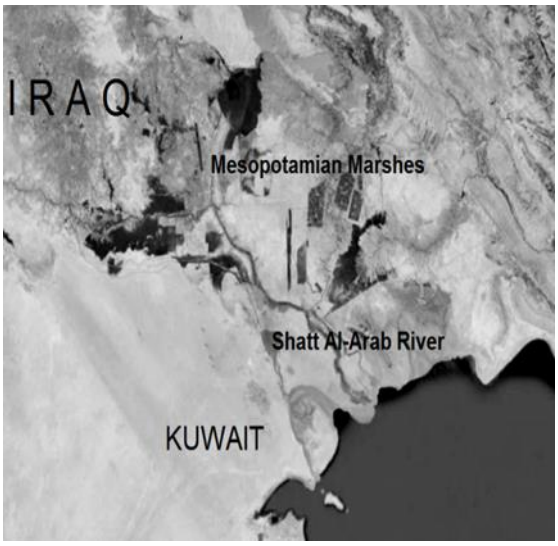

Figure (1): The southern marshes of Iraq and Shatt Al-Arab river.

Historical Review of Herpetofaunal Studies in Iraq

Iraq's herpetofauna was studied extensively during the 1920s when British troops were in Iraq. Earlier studies were summarized by Allouse (1955) and Mahdi & Georg (1969). They included studies of Boulenger (1918, 1919, 1920a, b), Corkill (1932), Angel (1936) and Schmidt (1939). The few scattered studied that were published in the mid-20th Century (Haas, 1952; Reed & Marx, 1959; Haas & Werner, 1969) added little to the understanding of the herpetofauna of Iraq. For example, many lists included the agamid *Phrynocephalus maculatus longicaudatus* within the herpetofauna of Iraq, but without giving exact localities. Other problems include the identity of the snakes *Coluber rogersi* and *Coluber ventromaculatus*.

Maxwell (1957) commented on the extreme abundance of frogs, but did not indicate species. He concluded that there were several species in the marshes. Haas & Werner (1969) reported six species of reptiles from areas in the vicinity of the marshes (*Ophisops elegans*, *Agama* cf. *persicus*, *Mabuya aurata septemtaeniata*, *Trachylepis vittatus*, *Eryx jaculus* and *Platyceps ventromaculatus*). A significant series of articles on Iraqi herpetofauna were published in the late 1950s and early 1960s by Khalaf (1959, 1960, 1961). They include a general account, without mentioning localities. Two more works on southern part of Iraq include the first record and range extension of saw scaled viper, *Echis carinatus sochureki* from Basrah, southern Iraq (Rhadi et al., 2015a). The second research focused on the hunting

impact on the spiny-tailed lizards in Iraq, with notes on their conservation status (Afrasiab, 1987). Six species of Amphibia were reported for Iraq by Mahdi & Georg (1969) as the smallest group among other vertebrates in Iraq. The same authors reported 91 species of reptiles from the whole country of Iraq. The sea snakes reported for the Arabian Gulf were also incorporated. Furthermore, Nader & Jawdat (1976) published a taxonomic study of the geckos of Iraq.

A review of the literature for Iraq was released by Nature Iraq in 2008, which provided a list of 10 amphibian species or species groups and 97 reptile species found throughout all habitats of Iraq (Amr, 2009). Many are conservation concern species and several of these may be endemic or near-endemics such as the vulnerable mountain newt (*Neurergus crocatus*), the endangered Kurdistan newt (*Neurergus microspilotus*) and the endangered Euphrates softshell turtle (*Rafetus euphraticus*). The World Wildlife Fund maintains a species list for all ecoregions, but to date, little work has been done to evaluate these species categories and develop habitat ranges within their related ecoregion based on species-habitat relationships. Surveys conducted by Nature Iraq (Amr, 2009) have collected only anecdotal information on these species to date though it is likely that more information exists in Iraq. Two of these (*Hemidactylus flaviviridis* and *H. persicus*) were also found by Al-Barwari & Saeed (2007) in the same region.

An investigation on the occurrence of geckos in some provinces in central and southern Iraq was carried out by Mohammed et al. (2015a) for the period from September 2013 to October 2014. A total of 111 adults and sub adult specimens were collected and identified. The collected specimens represented six species (*Hemidactylus turcicus*, *Hemidactylus persicus*, *Hemidactylus flaviviridis*, *Cyrtopodion scabrum*, *Stenodactylus affini*s and *Stenodactylus doriae*). This study was carried out in five provinces throughout central and southern Iraq (Al-Najaf, Babil, Dhi Qar, Al-Muthana and Basrah). A detailed bibliography of reptiles and amphibians of Iraq was included in the comprehensive treatise on the reptiles of the Middle East by Leviton et al. (1992).

The most recent list has been released by Mohammed et al. (2015b) in an investigation on the status of lizards in Al-Najaf province. A total of 116 specimens were collected and identified. The collected specimens represented six families, eight genera, and 11 species and subspecies, including Agamidae (*Phrynocephalus maculatus maculatus* and *Trapelus ruderatus ruderatus*), Gekkonidae (*Cyrtopodion scabrum*, *Hemidactylus flaviviridis*, *Hemidactylus turcicus* and *Hemidactylus persicus*), Lacertidae (*Ophisops elegans elegans*), Scinicidae (*Trachylepis aurata septemtaeniata* and *Trachylepis vittata*), Uromasticydae (*Uromastyx aegyptius*) and Varanidae (*Varanus griseus griseus*). Furthermore, Mohammed et al. (2017) studied the lizard fauna of central and southern Iraq with special reference on the agamid *Trapelus ruderatus*.

Quite recently, Afrasiab et al. (2018) published an annotated checklist of reptilian fauna of Basrah, south of Iraq which included 49 reptile species including snakes, sea and fresh water turtles, and lizards. The authors provided plates, brief notes and descriptions for the rare and important species. The list recorded from the city of Basrah and orchards zone includes lizards and snakes. The lizards included family Gekkonidae with two species (*Hemidactylus flaviviridis* and *Cyrtopodion scabrum*), family Lacertidae with two species (*Acanthodactylus opheodurus* and *Mesalina brevirostris*) and family Scincidae with *Mabuya aurata*. The snakes included family Typhlopidae with *Ramphotyphlops braminus*, family Leptotyphlopidae with *Leptotyphlops macrorhynchus*, family Boidae with *Eryx jaculus jaculus* and family Colubridae with *Platyceps ventromaculatus*. Those recorded from the desert areas of southern Iraq also include lizards and snakes. Lizards include family Gekkonidae with *Stenodactylus slevini*, *S. doriae* and *Bunopus tuberculatus*, family Agamidae with *Trapelus persicus fieldi*, *T. pallidus haasi*, *Phrynocephalus arabicus* and *Uromastyx aegyptius microlepis*, family

Lacertidae with *Acanthodactylus schmidti* and *A. scutellatus hardyi*, family Scincidae with *Scincus scincus* and family Trogonophidae with *Diplometopon zarudnyi*. The snakes included family Boidae with *Eryx* (*Pseudogongylophis*) *jayakari*, family Colubridae with *Malpolon moilensis*, *Lytorhynchus diadema gaddi* and *Psammophis schokari* and family Viperidae with *Cerastes cerastes gasperettii*.

Herpetofauna of Shatt Al-Arab River and Southern Marshes

Little information are available about the herpetofauna of the Mesopotamian marshes. Garstecki & Amr (2011) suggested the following key points in their screening study on potential world heritage nomination of biodiversity and ecosystem management in the Iraqi marshlands and through studying the contribution of the herpetofauna to the biodiversity values of the marshes:

1. Key habitat for globally endangered species. The globally endangered Euphrates softshell turtle *Rafetus euphraticus* may have one of its key strongholds in the marshes.
2. Potential for as yet unexplored amphibian diversity. The almost complete lack of information about the amphibians of the marshes leaves open the general possibility of the occurrence of additional species in the marshes. They may include endemic or semi-endemic species which are endangered, threatened, or vulnerable to extinction. The IUCN Red List of Endangered Species provides conservation status on many species that are facing declines and potentially extinction.

A toad (*Bufo viridis*), a tree frog (*Hyla arborea*) and two frogs (*Rana ridibunda* and *R. esculenta*) are listed for Iraq by Mahdi & Georg (1969). Despite the lack of precise localities, the tree frog *Hyla savignyi*, the marsh frog *Pelophylax ridibunda* and the green toad *Bufo viridis* are found in the marshes (Leviton et al., 1992). Since data about the amphibians of the marshes are extremely scarce, further field studies may yield additional species. However, the few recent molecular studies on herpetofauna in the Tigris-Euphrates basin outside the marshes yielded exclusively species already known from other areas, rather than new species (Stöeck et al., 2006, 2008).

Common reptiles in the marshes include the Caspian terrapin (*Clemmys caspia* synonym to *Mauremys caspia*), a soft-shell turtle (*Trionyx euphraticus* synonym to *Rafetus euphraticus*), the Euphrates softshell turtle (*Rafetus euphraticus*), geckos of the genus *Hemidactylus*, two species of skinks (*Trachylepis aurata* and *Mabuya vittata*) and a variety of snakes of the genus *Coluber*, the spotted sand boa (*Eryx jaculus*), tessellated water snake (*Natrix tessellata*) and Gray's desert racer (*Coluber ventromaculatus*). The desert monitor (*Varanus griseus*) was formerly common in desert areas adjacent to the marshes, but this species has been heavily persecuted and is now rare (Scott, 1995). The spiny-tailed lizard *Uromastyx aegyptia* probably occurs in or near the marshes, but there are no definite records. Amphibians list of the southern marshes of Iraq as recorded by Haas & Werner (1969) consists of three amphibian families including three species and eight reptile families which included 17 species.

More recently, a record for the keeled gecko, *Cyrtopodion scabrum* was reported to be widely distributed in many places in Basrah such as Al-Jubaila and Al-Salhia near Shatt Al-Arab river (Mohammed et al., 2015a). These geckos are ecosympatric, primarily inhabiting crevices in arid badland mudflats, overgrown with sparse grasses, which support a variety of insect preys. A single specimen was collected by Rhadi et al. (2015a) in a scrublands close to the river Shatt Al-Arab as Saghir, on the outskirts of the Shatt Al-Arab river as a first record and range extension of this snake (*Echis carinatus*) in southern Iraq. The specimen identification based on morphometrics, color pattern and pholidotic characters. In a further investigation, Rhadi et al. (2015b), studied two populations of the saw-scaled viper (*Echis carinatus sochureki*) in southern Iraq at Basrah and Dhi Qar provinces. Basrah locality is

about 150 km away from the village of Said Dakheel (Dhi Qar province), the nearest previously published record for this subspecies.

Field observations recorded by Hussain (2014) and his ecological team during 2003 after refillings of marshes pointed out the presence of frogs of the genus *Rana* and a single observation of the tree frog only, despite previous record of three species in the late seventies namely, *Pelophylax rihbundus* (*Rana ridibunda*), *Bufo viridis* and *Hyla arborea* (*H. savignyi*) as recorded by Mahdi & Georg (1969). Furthermore, Amr (2009) added the aquatic amphibian *R. esculenta* and *R. comerani-macrocnemis.* The same team has recorded the presence of the aquatic turtle with the hard carapace which is called Eastern Caspian turtle *Mauremys caspica* (*Clemmys caspica*) in large numbers at Huawaiza marshes (Hussain, 2014). From the same genus, Amr (2009) added another subspecies (*Mauremys caspica siebenrocki*). The team had also reported the presence of the soft shell turtle (Euphrates turtle) *Rafetus euphraticus* which was previously called *Trionyx euphraticus* in eastern and western Al-Hammar marshes in lesser numbers (Hussain, 2014). The temporal occurrence, feeding and reproductive ecology of both turtle species has been studied by Yousif (2016) at eastern Al-Hammar marsh near Garmat Ali, Basrah. The same author has calculated some ecological indices for the two turtle species, which were low in values as Shannon index (0.48) and Richness index (0.3), while the equivalent index was modest (0.7).

Aquatic snakes were frequently seen in east Al-Hammar and Huawaiza marshes during the ecological survey of 2003. They were observed, by the team, eating fishes during early spring and summer of that year. They are thought to belong to the genus *Natrix.* According to Hussain (2014), they might be *Natrix tessellate* which was previously reported in the marshes before desiccation.

The most recent annotated list of reptiles in southern Iraq has been published by Afrasiab et al. (2018) including 49 species with some from Basrah city. The following species were recorded from the marshes and wetlands, which comprise an ecosystem with a specific reptilian diversity. The lizards including three families, mainly family Gekkonidae (*Stenodactylus affinis*), family Lacertidae (*Acanthodactylus boskianus* and *A. grandis*) and family Scincidae (*Ablepharus pannonicus* and *Mabuya aurata septemtaeniata*). For snakes, three families were reported, family Colubridae (*Natrix tessellata tessellata*, *Dolichophis jugularis*, *Spalerosophis diadema cliffordii* and *Malpolon monspessulana*). The second family was Elapidae (*Walterinnesia morgani*) and the third family Viperidae (*Echis carinatus sochureki*). As for the turtles, two families were reported, family Trionychidae (*Rafetus euphraticus*) and family Emydidae (*Mauremys caspica caspica*).

According to Afrasiab et al. (2018), there are few records of sea turtles and sea snakes from Shatt Al-Arab river and the sea shore zone, but there is a collection of only two sea snakes, *Enhydrina schistosa* and *Hydrophis cyanocinctus* from Basrah province. The following turtles and sea snakes species were recorded from Shatt Al-Arab river and sea shore areas. Three turtle species belonging to family Cheloniidae were reported (*Ertmochelys imbricata*, *Dermochelys coriacea* and *Rafetus euphraticus*). For sea snakes, one family was reported (Hydrophiidae) comprising two species: *Hydrophis cyanocinctus* and *H. ornatus* (Hussain et al., 2002).

List of Amphibians and Reptiles of Southern Iraq

Table (1) shows the list of amphibians and reptiles that have been recorded in the present reviewe of literature as amphibians and reptiles of southern Iraq. The list consists of one order (Anura) of the class Amphibia containing three families with six species in addition to 32 reptilian species belonging to two orders (Squmata and Testudines) and 15 families.

Table (1): List of amphibians and reptiles of southern Iraq.

Phylum Chordata
- Class Amphibia
  - Order Anura
    - Family Bufonidae
      - *Pseudepidalea viridis* (Laurenti, 1768)
    - Family Ranidae
      - *Pelophylax lessonae* (Camerano, 1882)
      - *Pelophylax ridibundus* (Pallas, 1771)
      - *Rana macrocnemis* Boulenger, 1885
    - Family Hylidae
      - *Hyla arborea* (Linnaeus, 1758)
      - *Hyla savignyi* Audouin, 1827
- Class Reptilia
  - Order Squamata
    - Family Lacertidae
      - *Acanthodactylus boskianus* (Daudin, 1802)
      - *Acanthodactylus grandis* Boulenger, 1909
      - *Ophisops elegans* Ménétriès, 1832
    - Family Scincidae
      - *Ablepharus pannonicus* (Fitzinger, 1824)
      - *Trachylepis aurata* (Linnaeus, 1758)
      - *Trachylepis septemtaeniata* (Reuss, 1834)
      - *Trachylepis vittata* (Olivier, 1804)
    - Family Gekkonidae
      - *Cyrtopodion scabrum* (Heyden, 1827)
      - *Hemidactylus flaviviridis* Rüppell, 1835
      - *Hemidactylus persicus* Anderson, 1872
      - *Stenodactylus affinis* (Murray, 1884)
    - Family Agamidae
      - *Trapelus ruderatus ruderatus* Leviton et al., 1992
      - *Uromastyx aegyptia microlepis* Arnold, 1980
    - Family Viperidae
      - *Echis carinatus* (Schneider, 1801)
      - *Pseudocerastes fieldi* Schmidt, 1930
    - Family Boidae
      - *Eryx jaculus familiaris* Eichwald, 1831
    - Family Lamprophiidae
      - *Psamophis schkari* (Forskål, 1775)
      - *Rhagerhis moilensis* (Reuss, 1834)
    - Family Colubridae
      - *Dolichophis jugularis* (Linnaeus, 1758)
      - *Malpolon monspessulana* (Hermann, 1804)
      - *Natrix tessellata* (Laurenti, 1768)
      - *Platyceps ventrimaculatus* (Gray, 1834)
      - *Spalerosophis diadema cliffordii* (Schlegel, 183)
    - Family Leptotyphlopidae
      - *Myriopholis macrorhyncha* (Jan, 1860)
    - Family Hydrophidae
      - *Enhydrina schistosa* Daudin, 1803
      - *Hydrophis cyanocinctus* Daudin, 1803
      - *Hydrophis ornatus* (Gray, 1842)
    - Family Elapidae
      - *Walterinnesia morgana* (Mocquard, 1905)

Order Testudines
Family Geomydidae
Mauremys caspia (Gmelin, 1774)
Family Trionychidae
Rafetus euphraticus (Daudin, 1802)
Family Cheloniidae
Eretmochelys imbricata (Linnaeus, 1766)
Family Dermochelyidae
Dermochelys coriacea (Vandelli, 1761)

Feeding Ecology of Amphibians and Reptiles

Information about the feeding ecology of amphibians is scars. They are considered as omnivores as they feed mainly on insects, algae and other plant materials. They play a vital role in the eco-system balance in the shallow marshes habitats as they feed on insects on aquatic plants. On the negative side, they feed also on the larvae of fishes and other aquatic animals. They became, in turn, favorite preys for other large size animals which inhabit the marshes such as birds, snakes and mammals (Hussain, 2014).

The eastern Caspian turtle (*Mauremys c. caspica)* is an omnivore feeding mainly on plant materials such as large algae and submerged aquatic plants (21%), insect larvae (19%), crabs (14%) and on snails and fishes as miner components. Euphrates turtles (*R. euphraticus*) feed on fishes, shrimp and crabs as main food items and they become scavengers on some occasions (Yousif, 2016). The matrix aquatic snake is a predator which can attack fishes and frogs. It has been seen attacking fishes in Huwaiza and East Hammar marshes.

Threats to Herpetofauna Biodiversity

In general, the threats to biodiversity of herpetofauna in southern part of Iraq might be a direct result of the effects of climatic changes and effects of other environmental changes such as reduction in freshwater discharge and salinization in recent years. Anthropogenic influence also plays a major role in altering herpetofaunal assemblages in this region. The IUCN Red List provides a list of terrestrial and aquatic herpetofaunal species that have been assessed on the basis of their conservation status. Numbers of assessed terrestrial and aquatic amphibian are six species each, while those of reptilian reached 23 and one, respectively. IUCN Red List of critically endangered, endangered, vulnerable, near-threatened and extinct freshwater species of Iraq includes six species of amphibians, two of them are of conservation concern species (IUCN, 2010). The list also provides conservation status on many species (both migratory and endemic) that are facing declines and potentially extinction.

Concluding Remarks

As seen from the above review, little is known about the biodiversity of amphibians and reptiles of the southern part of Iraq. There is a considerable need for basic research on herpetofauna of the southern marshes of Iraq. However, for the endangered species known to occur, there should be a matter of priority during nomination and management planning. In addition to research priority, there are further knowledge gaps regarding the distribution and environmental impacts on this group which should be filled, to improve the management of any possible World Heritage site in the marshes (Garstecki & Amr, 2011). Priority research regarding the herpetofauna of the marshes as suggested by Garstecki & Amr (2011) are summarized as follows:

1- The status, trends and distribution of the globally endangered Euphrates soft-shelled turtle *Rafetus euphraticus* within the marshes as well as pressures and threats. This could be part

of a basin-wide IUCN Red List assessment of freshwater fauna, to represent the species in the global IUCN Red List and in national Red Lists of individual states within the basin.

2- The herpetofauna, particularly the amphibians, are among the least known groups of the marshes. Most records are old and lack specific localities. Herpetofauna have not been included systematically in recent biodiversity surveys. Baseline surveys and collaborations with molecular biologists are required to establish an updated list of the reptiles and amphibians in this area.

3- Pressures and threats affecting the herpetofauna of the aquatic habitats of southern Iraq such as salinization, nitrification, hydrocarbons and pesticide contamination, as well as alien and invasive species, need to be assessed as a basis for conservation management planning.

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