

THE IMPORTANCE OF GEODIVERSITY ON THE ANIMAL  
DIVERSITY IN HUWAIZA MARSH AND THE ADJACENT AREAS,  
SOUTHEASTERN IRAQ

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ABSTRACT

Geodiversity is the variety within abiotic natural elements that include: rocks, minerals, landforms, soil types, and water resources. Recently ecologists and naturalists recognized that there is close relationship between geodiversity and ecosystems. Huwaiza marsh is located south eastern Iraq within Lower Mesopotamian plain. The main rock bed units which crop out north east of the studied area comprises many types of rocks: conglomerate, sandstone, mudstone, siltstone and claystone belong to Bai Hassan, Mukdadiya and Injana Formations. The general elevation of the area ranges around 5 meters (a. s. l.) near the marsh and increase northeast to more than 100 meters (a. s. l.) and the Land forms are: cuesta, oxbow lakes, flood plain, water lake, shallow marshes, mud flats, and sand dunes. Soil (sediments) usually derived from north east rock bed units and from rivers, which are composed of gravel, sand, silt and silty clay. Huwaiza Marsh is provided by water resources from Musharah and Kahlaa distributaries in addition to Al- Teeb and Duwaireeg rivers which enter Al- Sanaf seasonal marsh, then after to Huwaiza Marsh. The later has 1377 km<sup>2</sup> during rainy season and 650 km<sup>2</sup> during dry season. Geodiversity created diverse ecosystems such as: desert (including sand dune), salt flat (sabkha), mud flats and aqueous ecosystem that provided good flora and fauna diversity of which wide range of plant and animal species use the area. Such geodiversity formed the foundation in creation three main terrestrial ecoregions in this area of Iraq. Huwaiza marsh and adjacent area can be used for scientific researches, education, traditional agricultural, ecotourism and for other sustainable developments. Vertebrate biodiversity comprises 27 mammals, 81 birds, 6 reptiles, 3 amphibians, and 9 freshwater fishes. The characteristic vertebrates of each habitat of Huwaiza marsh were indicated. Of interest among them is the presence of African Darter *Anhinga rufa* in Deep-water marsh habitat; Basra Reed Warbler *Acrocephalus griseldis*, Goliath heron *Ardea goliath*, and smooth coated otter *Lutrogale perspicillata maxwelli* in shallow water marsh habitat.

**Key words:** Biodiversity, Geodiversity, Huwaiza marsh, Iraq, Mesopotamia.

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### INTRODUCTION

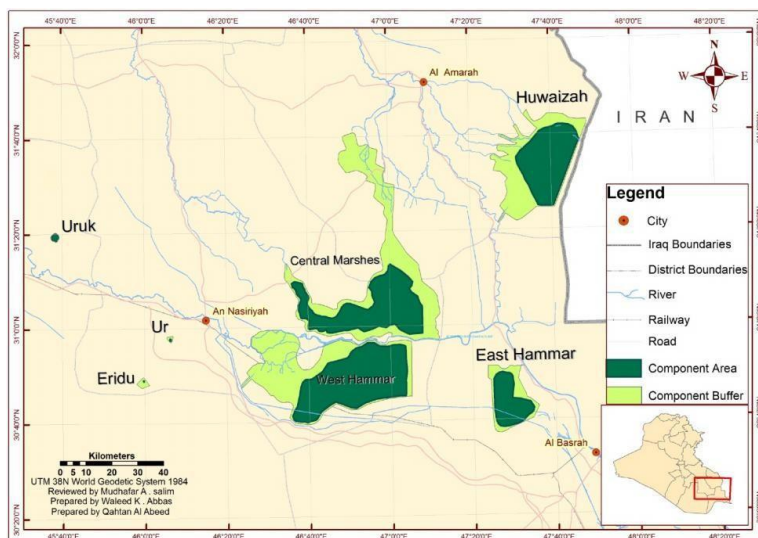
This study depends on two important world conventions: Ramsar Convention (1971) which is focused on the wetland and Convention on Biodiversity (CBD) (1992). Today many conferences held overall the world to explain the wise use and management of water. Water flows are controlled by topography which is considered part of geodiversity. The later describes the variety within abiotic nature which includes: rocks and minerals, land forms, soil type and water resources (Gray, 2004), provides the framework for life on earth (Stanley, 2002) and is considered the foundation of the ecosystem. Geodiversity and other abiotic resources are sustaining ecosystem and biotic resources (Santucci, 2005). Recent ecologist and naturalist recognized the importance of geodiversity on the biodiversity and ecosystem (Jackova and Romport, 2008; Hart, 2012; Petrisor and Sabro, 2010; Gray *et al.*, 2013; Mohammad and Al- Zubaidi, 2014; Al- Zubaidi *et al.*, 2014). The biodiversity of the Huwaiza marsh in comparison with other southern marshes is rather rich both in the number of species and the number of individuals of each species.

The aim of this study is to investigate the correlation aspects of geodiversity factors: rock and minerals, land form and surface processes, type of soils and water resources; and their importance on vertebrate biodiversity components in Huwaiza marsh and adjacent areas.

### MATERIALS AND METHODS

Geodiversity and biodiversity data of this study depend on the field surveys to the Huwaiza Marsh and adjacent areas. Geodiversity surveys were undertaken during the period from 2007-2008 to identify the abiotic factors. Data on biotic material of this study came from the collection or sighting of animal and plant samples, remains of animals, footprints, previous records of the Iraq Natural History Museum staff, and the relevant on this area like Salim *et al.* (2006), Al-Sheikhly and Haba (2014), and Nature Iraq (2017). Identification of biotic elements was done depending on available literature and keys in the library of the Iraq Natural History Museum, University of Baghdad, Baghdad, Iraq.

**Location:** Huwaiza marsh located south east Amara City, south east Iraq, between Tigris River on the west and Iraq- Iran border on the east, between latitude: 31° 00' N and 31° 54' N (Map 1). Its area reaches to 1377 km<sup>2</sup> during rainy seasons and about 650 km<sup>2</sup> during dry seasons.



**Map (1):** location of Huwaiza Marsh and other Iraqi Southern Marshes. After Al-Lami *et al.* (2014)

**Climate:** according to the world climatic classification, the study area is categorized into dry arid climate as showed in Table (1) (IMO, 2006).

**Table (1):** Climatic conditions near Huwaiza Marsh (IOM, 2006)

Station	Max. temp. °C	Min. temp. °C	Annual ppt. ml./year	Highest Evap. ml./ year	Lowest Evap. ml./ year	Highest Humidity %	lowest Humidity %
Amara	36.9	13.5	116.84	1455	155.7	54	18.1
Basra	34.6	14.1	81.28	1251.2	187.7	69.2	36.2

## RESULTS AND DISCUSION

Field survey to the Huwaiza Marsh and adjacent areas shows clear intrinsic relationship between geodiversity, habitat and biodiversity.

### Geodiversity

Geodiversity of Huwaiza Marsh and adjacent areas comprises different rock bed units with Quaternary sediments, natural processes, topography (land forms), soil type, and water resources.

**Rock bed units with Quaternary sediments:** Many ecologists and naturalists consider the rock bed units as a foundation of the ecosystem which composed of abiotic and biotic factors. Rock beds units of Huwaiza Marsh and adjacent areas belong to Injana (L. Miocene), Mukdadiyah (E. Pliocene), Bai Hassan (L. Pliocene) which comprises some type of rocks

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cropping out north east of Huwaiza Marsh such as: mudstone, clayey mudstone, sandstone, claystone, silty sandstone, pebbly sandstone and conglomerate in addition to Glacial deposits and Quaternary sediments (Bellen *et al.*, 1959; Buday, 1980; Jassim and Goff, 2006; Jassim, 2009) (Tab.2).

**Table (2):** Rock bed units of Huwaiza Marsh and adjutant areas.

Formation	Age	Thickness	Description
Quaternary	Holocene	-	Aeolian, depression fill, flood plain and sheet run off deposits.
Glacial deposits	Pleistocene	-	Clastic sediments of alluvial fan deposits and sheet run off deposits.
Bai Hassan	Late Pliocene	-	Sandstone, claystone, siltstone, conglomerate
Mukdadiyah	Early Pliocene	20-75 m. near Badra	Sandstone, claystone, siltstone, conglomerate
Injana	Late Miocene	620 m. type section	Mudstone, claystone, sandstone.

**Land forms:** Landforms of studied area includes: marsh, mud flat, rivers, alluvial fan and sand flat.

**Marsh:** Contains water canal about 2 meters depth, 25-30 meters width and flows from north to south; open water lake, locally known as “Bargah”; large open water known as “Tahla”; wet soil and seasonal marsh, shallow water and dry areas (Abdulhasan, 2009).

**Mud flats:** It is transitional zone between marsh water and dry land which is fluctuated between aqueous and subaqueous area.

**Rivers:** There are many rivers in the studied area such as: Tigris River and its distributaries, Mushrah and Kahlaa which are on the west side; in addition to Teeb and Dwaireej ephemeral streams on the north east.

**Alluvial fan:** There are two alluvial fans: Teeb and Dwaireej which were formed during rainy periods of Pleistocene, but these fans are not active now due to climatic changes and lack of precipitation. Sediments of these fans are composed of sand 26.30, 5.05% , silt 49.60, 65.05% and clay 24.10, 29.90% in Teeb and Dwaireej respectively.

**Sand flats:** It is present at the north part of studied area, which includes sand dunes as a barchans and sand cover. Sand sediments may be derived from parent rocks as well as from fluvial and alluvial fan sediments.

**Type of soil:** The soil of studied area eroded, transported and deposited from many streams flowing either from northwest from Iraqi side via Tigris distributaries such as: Kahlah and Musharah, or from north east from Iran side such as Karkha, Teeb and Dwereege streams (Buring, 1960; Kukal and Saadallah, 1971). Later rivers derived high percent ratio of sediments from parent rock bed units of Injana (Late Miocene), Mukdadiya (Early Pliocene), Bai Hassan (Late Pliocene), and from Glacial deposits (Pleistocene) and Quaternary (Holocene). The above mentioned rivers are classified as an old age rivers which are characterized by low energy, low discharge and always transports fine suspended sediments particularly at the Marsh. Soil comprises silty clay, silt, clay and very low amount of fine to very fine sand rich in calcium (Kata', 2006). Grain size analysis of ten soil samples show the

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range of sand from 0.80- 10.10 %, silt from 31.00- 60.90 % and clay from 29.00- 66.00. According to Fuchtbouer (1974), the soil samples of Huwaiza Marsh can be classified into clayey silt and silty clay. High ratio of the soil may be derived from parent rocks bed units of Injana (L. Miocene), Mukdadiyah (E. Pliocene) and Bai Hassan (L. Pliocene) Formations in addition to the others may be recycles and deposits from Tigris River tributaries.

X-Ray diffraction (XRD) analysis shows that the soils composed of calcite, quartz, halite, dolomite and clay minerals. The later includes smectite- chlorite, palygorskite- illite and kaolinite (Rasheed, 2008).

**Water resources:** Huwaiza Marsh is fed mainly from Kahla and Musharah Rivers, distributed from Tigris River. Kahlah River is subdivided into Ummu Zubair, Altous, and Husaiji, which flow to Huwaiza Marsh. It is also fed from north east from Teeb and Dwaireej ephemeral streams via Sannaf Seasonal Marsh. The main outlet of Huwaiza Marsh is the Kassara drainage which reconnects with the Tigris River near Kassara Village. Another outlet is the Swayb which flows into Shatt Al- Arab, south of Qurnah City.

#### **Habitats**

Habitats of Huwaiza Marsh could be classified into the following categories according to the availability and location of water around the year.

**Deep-water marsh habitat:** Situated at the center of marsh and characterized by the permanent water throughout the year like Um Elniaaj area. Flora: mainly floating and submerged plants. Fauna: *Mesopotamichthyes sharpeyi* (Günther, 1874), *Arabibarbus grypus* (Heckel, 1843), *Luciobarbus xanthopterus* Heckel, 1843, *Porphyrio poliocephalus* (Latham, 1801), *Anhinga rufa* (Daudin, 1802), *Larus* spp., *Sterna* spp., *Pelicanus oncorotalus* Linnaeus, 1758, *Fulica atra* Linnaeus, 1758, *Tachybaptus ruficollis* (Pallas, 1764), *Anas* spp., *Anser* spp., *Cygnus* sp., *Natrix tessellate* (Laurenti, 1768).

**Shallow-water marsh habitat:** Encircled the center of the marsh, the water is shallower and its area fluctuate from a year to another according to amount of water income. Flora: mainly reed and typha beds. Sometimes an isolated accumulation of reeds surrounded by open water areas represents an ideal site for nesting of the endangered *Acrocephalus griseldis* (Hartlaub, 1891). Fauna: *Mesopotamichthyes sharpeyi*, *Arabibarbus grypus*, *Luciobarbus xanthopterus*, exotic *Coptodon zillii* (Gervais, 1848), *Bufo viridis* (Laurenti, 1768), *Pelophylax ridibundus* (Pallas, 1771), *Natrix tessellata*, *Mauremys caspica* (Gmelin, 1774), threatened *Rafetus euphraticus* Daudin, 1802, *Ceryle rudis* (Linnaeus, 1758), *Egretta* spp., nesting sites for *Marmaronetta angustirostris* (Menetries, 1832) and *Aythya nyroca* (Güldenstädt, 1770), rare *Ardea goliath* Cretzschmar, 1827, Endangered *A. griseldis*, endemic subspecies of *Tacypaptus ruficollis iraquensis*, *Lucinia svecica* (Linnaeus, 1758), the rare resident breeders *Threskiornis aethiopicus* (Latham, 1790), *Plegadis falcinellus* Linnaeus, 1766 and *Platella leucorodia* Linnaeus, 1758, endangered *Lutrogale perspicillata maxwelli* Hayman, 1957, *Lutra lutra* (Linnaeus, 1758). Another outstanding example of fauna in this area is the snail *Gyraulus Huwaizaensis* Glöer & Naser, 2007 (Molluska) which was originally described from this area (Gloer and Naser, 2007) and probably endemic to Iraq though a small part of the marshes also stretch out into Iran living on submerged aquatic vegetation *Ceratophyllum demersum* L. together with the snails *Bithynia* spp., *Radix* spp. and *Physella acuta* (Draparnaud, 1805) (Damme, 2014). This type of habitat constitutes the typical environment for this invertebrate.

**Inland river habitat:** This habitat is represented by Al-Teeb and Duwireej rivers from the north side which come from Iran and Al-Kahlaa and Al-Msharah rivers from the west side coming from Tigris. This habitat is characterized by absence of macroflora. Fauna:

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*Mesopotamichthyes sharpeyi*, *Arabibarbus grypus*, *Luciobarbus xanthopterus*, *Silurus triostegus* Heckel, 1843, exotic *Coptodon zillii*, *Bufo viridis*, *Pelophylax ridibundus*, *Natrix tessellata*, *Mauremys caspica*, and *Rafetus euphraticus*.

**River banks habitat:** With riparian vegetation which is represented by bank areas of Al-Kahlaa and Al-Msharah rivers; this habitat is characterized by presence of sparse shrubs with relatively dense grasses due to highly fertile soil and continuous availability of freshwater. Fauna: *Canis aureus* Linnaeus, 1758, *Sus scrofa* Linnaeus, 1758, *Gerbillus mesopotamicus* Harrison, 1956, *Tatera indica* (Hardwicke, 1807), *Herpestes javanicus* (É. Geoffroy Saint-Hilaire, 1818), *Felis chaus furax* de Winton, 1898, *Nycticorax nycticorax* (Linnaeus, 1758), *Egretta garzetta* (Linnaeus, 1766), *Circus aeruginosus* (Linnaeus, 1758), *Falco tinnunculus* Linnaeus, 1758, *Porzana porzana* (Linnaeus, 1766), *Streptopelia turtur* (Linnaeus, 1758), *Ceryle rudis*, *Pycnonotus leucogenys* (Gray, JE, 1835), *Hypocolius ampelinus* Bonaparte, 1850, *Erithacus rubecola* (Linnaeus, 1758), *Prinia gracilis* Lichtenstein, 1823, *Cisticola juncidis* (Rafinesque, 1810), *Passer domesticus* (Linnaeus, 1758), *Stenodactylus affinis* (Murray, 1884), *Natrix tessellata*, *Mauremys caspica*, *Rafetus euphraticus*, *Bufo viridis* and *Pelophylax ridibundus*.

**Mud flats:** It is with shallow water and relatively poor vegetation. Fauna includes *Sus scrofa*, *Pipistrellus kuhlii* (Kuhl, 1817), *Himantopus himantopus* (Linnaeus, 1758), *Charadrius dubius* Scopoli, 1786, *Charadrius alexandrinus* Linnaeus, 1758, *Mauremys caspica*, *Rafetus euphraticus*.

**Marsh banks:** It is characterized with the presence of the crustacean species *Sphaeroma annadaiei* Stebbing, 1911 (Pl. 1) which burrows in the muddy banks of the marsh for sheltering and feeding (Mohammad, 2014). Ali *et al.* (2007) could not find it in Huwaiza marsh. *Mauremys caspica* and *Rafetus euphraticus* use these banks for their reproduction and then lay and bury their eggs beneath the banks.

**Sand sediment plain:** It is characterized with rather poor biodiversity components. Insects and spiders were the main groups found in the area. Reptiles include *Trapelus persica fieldi* (Haas & Werner, 1969), *Mesalina* sp., *Acanthodactylus* sp., and some snakes like *Eryx jaculus* (Linnaeus, 1758) and *Pseudocerastes persicus fieldi* K.P. Schmidt, 1930. Birds include *Burhinus oecidnemus saharae* (Reichenow), *Chlamydotis macqueenii* (J.E. Gray, 1832), *Pterocles* spp., *Columba* spp., *Streptopelia* spp., *Upupa epops* Linnaeus, 1758, *Galerida cristata* (Linnaeus, 1758), *Calandrella* sp., *Tyto alba* (Scopoli, 1769), *Falco* spp., and *Aquila* spp. Mammals include the *Gazella subgutturosa* (Güldenstädt, 1780), *Lepus capensis* Linnaeus, 1758, *Vulpes vulpes* (Linnaeus, 1758), *Canis lupus* Linnaeus, 1758, *Hyaena hyaena* (Linnaeus, 1758) and *Nesokia* sp.

**Rocky hills of adjacent area:** It is characterized with probable existence of the toad *Bufootes surdus* (Boulenger, 1891) which has a very limited distribution in the east of Iraq (Afrasiab and Ali, 1988). Other animals include reptiles such as *Mesalina* sp., *Acanthodactylus* sp., and *Pseudocerastes persica* (A.M.C. Duméril, Bibron & A.H.A. Duméril, 1854). Birds include passerine birds, doves, shrikes, owls, and falcons. Mammals will include *Gazella subgutturosa*, *Canis lupus*, *Hyaena hyaena*, *Mellivora capensis* (Schreber, 1776), *Hystrix indica* Kerr, 1792 and *Meriones* sp. The iconic animal of the marshes in Iraq is the water buffalo *Bubalus bubalis* (Linnaeus, 1758) (Pl. 2). It represents the most economically important animal for the Arab marshes and it has accompanied them since Sumerian time several thousand years ago. It utilizes mainly shallow-water marsh habitat to graze on the soft parts of reed *Phragmites australis* (Cav.) Trin. ex Steud.

### **Biodiversity**

In comparison with other marshes of southern Iraq, the biodiversity of the Huwaiza Marsh is rather richer both in the number of species and the number of individuals of each species. This is due to, at least partly, to the continuous existence of water around the year and relatively good quality of the water in regard to salt content. Vertebrate biodiversity comprises 27 mammals, 81 birds, 6 reptiles, 3 amphibians, and 9 freshwater fishes (List1). Many species of invertebrates were recorded from the Huwaiza Marsh including insects, crustaceans, ticks, scorpions, centipedes, mollusks.

**List (1):** Vertebrate diversity recorded in Huwaiza marsh during the course of the study.

#### **Mammals:**

- 1- Long-eared hedgehog, *Hemiechinus auritus* (S. G. Gmelin, 1770).
- 2- Etruscan shrew, *Suncus etruscus* (Savi, 1822).
- 3- Naked-rumped tomb bat, *Taphozous nudiventris* (Cretzschmar, 1830).
- 4- Kuhl's pipestrel, *Pipestrellus kuhlii* (Kuhl, 1817).
- 5- Asiatic jackal, *Canis aureus* (Linnaeus, 1758) (Pl. 3).
- 6- Gray wolf, *Canis lupus* (Linnaeus, 1758).
- 7- Red fox, *Vulpes vulpes* (Linnaeus, 1758).
- 8- Honey badger, *Mellivora capensis* (Scriber, 1776) (Pl. 4).
- 9- Eurasian otter, *Lutra lutra* (Linnaeus, 1758).
- 10- Smooth coated otter, *Lutrogale perspicillata maxwelli* (I. Geoffroy Saint-Hilaire. 1826).
- 11- Small Asian mongoose, *Herpestes javanicus pallipes* (I. Geoffroy Saint-Hilaire. 1818).
- 12- Striped hyaena, *Hyaena hyaena* (Linnaeus, 1758).
- 13- Wild cat, *Felis silvestris* (Schreber, 1777).
- 14- Jungle cat, *Felis chaus* (Schreber, 1777).
- 15- Goitered gazelle, *Gazella subgutturosa* (Guldenstaedt, 1780).
- 16- Wild boar, *Sus scrofa* (Linnaeus, 1758) .
- 17- European hare, *Lepus europeas* (Pallas, 1778).
- 18- Indian crested porcupine, *Hystrix indica* (Kerr, 1792).
- 19- Euphrates jerboa, *Allactaga euphratica* (Thomas, 1881).
- 20- Lesser Egyptian jerboa, *Jaculus jaculus* (Linnaeus, 1758).
- 21- House mouse, *Mus musculus* (Linnaeus, 1758).
- 22- Black rat, *Rattus rattus* (Linnaeus, 1758).
- 23- Brown rat, *Rattus norvegicus* (Berkonhaut, 1769).
- 24- Short tailed nesokia, *Nesokia indica* (Gray, 1830).
- 25- Baluchistan's gerbil, *Gerbillus nanus* (Blanford, 1875).
- 26- Libyan jird, *Meriones libycus* (Lichtenstein, 1823).
- 27- Indian gerbil, *Tatera indica* (Hardwicke, 1807).

#### **Birds:**

- 1- Little grebe, *Tachypabtus ruficollis* (Pallas, 1764) (Pl. 5).
- 2- Great crested grebe, *Podiceps cristatus* (Linnaeus, 1758).
- 3- Black-necked grebe, *Podiceps nigricollis Brehm*, 1831.
- 4- Cormorant, *Phalacrocorax carbo* (Linnaeus, 1758) (Pl.6).
- 5- Pygmy cormorant, *Microcarbo pygmaeus* (Pallas, 1773).
- 6- Darter, *Anhinga rufa* (Daudin, 1802).
- 7- White pelican, *Pelecanus oncorotalus* Linnaeus, 1758.
- 8- Bittern, *Botaurus stellaris* (Linnaeus, 1758).
- 9- Little bittern, *Ixobrychus minutes* (Linnaeus, 1766).
- 10- Night heron, *Nycicorax nycticorax* (Linnaeus, 1758).

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- 11- Squacco heron, *Ardeola ralloides* (Scopoli, 1769).
- 12- Cattle egret, *Bubulcus ibis* (Linnaeus, 1758) (Pl. 7).
- 13- Little egret, *Egretta garzetta* (Linnaeus, 1766).
- 14- Great white egret, *Egretta alba* Linnaeus, 1758.
- 15- Grey heron, *Ardea cinerea* Linnaeus, 1758.
- 16- Purple heron, *Ardea purpurea* (Linnaeus, 1766).
- 17- Glossy ibis, *Plegadis falcinellus* Linnaeus, 1766.
- 18- Spoonbill, *Platalea leucorodia* Linnaeus, 1758.
- 19- Greater flamingo, *Phoenicopterus ruber* Linnaeus, 1758.
- 20- Graylag goose, *Anser anser* (Linnaeus, 1758).
- 21- Shelduck, *Tadorna tadorna* (Linnaeus, 1758).
- 22- Gadwall, *Anas strepera* Linnaeus, 1758.
- 23- Common teal, *Anas crecca* Linnaeus, 1758.
- 24- Mallard, *Anas platyrhynchos* Linnaeus, 1758.
- 25- Pintail, *Anas acuta* Linnaeus, 1758.
- 26- Garganey, *Anas querquedula* Linnaeus, 1758.
- 27- Shoveller, *Anas clypeata* Linnaeus, 1758 (Pl. 8).
- 28- Marbled teal, *Marmaronetta angustirostris* (Menetries, 1832).
- 29- Common pochard, *Aythya ferina* (Linnaeus, 1758).
- 30- Black kite, *Milvus migrans* (Boddaert, 1783).
- 31- Marsh harrier, *Circus aeruginosus* (Linnaeus, 1758).
- 32- Long-legged buzzrd, *Buteo rufinus* (Cretzschmar, 1829).
- 33- Kestrel, *Falco tinnunculus* Linnaeus, 1758.
- 34- Black francolin, *Francolinus francolinus* (Linnaeus, 1766).
- 35- Water rail, *Rallus aquaticus* Linnaeus, 1758.
- 36- Spotted crane, *Porzana porzana* (Linnaeus, 1766).
- 37- Moorhen, *Gallinula chloropus* (Linnaeus, 1758) (Pl. 9).
- 38- Coot, *Fulica atra* Linnaeus, 1758.
- 39- Purple gallinule, *Porphyrio poliocephalus* (Latham, 1801).
- 40- Houbara bustard, *Chlamydotis macqueenii* (J.E. Gray, 1832).
- 41- Black-winged stilt, *Himantopus himantopus* (Linnaeus, 1766).
- 42- Avocet, *Recurvirostra avoceta* Linnaeus, 1758.
- 43- Collared pratincole, *Glareola pratincola* Linnaeus, 1766.
- 44- Little ringed plover, *Charadrius dubius* Scopoli, 1786 .
- 45- Kentish plover, *Charadrius alexandrinus* Linnaeus, 1758 (Pl. 10).
- 46- Spur-winged plover, *Hoplopterus spinosus* (Linnaeus, 1766).
- 47- Red-wattled Lapwing, *Hoplopterus indicus* (Boddaert, 1783).
- 48- White-tailed Lapwing, *Vanellus leucurus* (Lichtenstein, 1823) (Pl. 11).
- 49- Lapwing, *Vanellus vanellus* (Linnaeus, 1758).
- 50- Little stint, *Calidris minuta* (Leisler, 1812).
- 51- Temminck's stint, *Calidris temminckii* (Leisler, 1812).
- 52- Common snipe, *Gallinago gallinago* (Linnaeus, 1758).
- 53- Redshank, *Tringa tetanus* (Linnaeus, 1758).
- 54- Slender-billed gull, *Larus genei* (Breme, 1839).
- 55- Common gull, *Larus canus* Linnaeus, 1758.
- 56- Common tern, *Sterna hirundo* Linnaeus, 1758.
- 57- White-winged black tern, *Chlidonia leucopterus* (Temminck, 1815).
- 58- Pin-tailed sandgrouse, *Pterocles alchata* (Linnaeus, 1766).
- 59- Rock dove, *Columba livia* Gmelin, 1789.
- 60- Wood pigeon, *Columba palumbus* Linnaeus, 1758.
- 61- Collared dove, *Streptopelia decaocto* (Fridvaldszky, 1838).



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- 62- Turtle dove, *Streptopelia turtur* (Linnaeus, 1758).
- 63- Barn owl, *Tyto alba* (Scopoli, 1769).
- 64- Egyptian nightjar, *Caprimulgus aegyptius* Lichtenstein, 1823.
- 65- White-breasted kingfisher, *Halcyon smyrnensis* Linnaeus, 1758.
- 66- Common kingfisher, *Alcedo atthis* (Linnaeus, 1758).
- 67- Pied kingfisher, *Ceryle rudis* (Linnaeus, 1758) .
- 68- Blue-cheeked bee-eater, *Merops superciliosus* Linnaeus, 1766.
- 69- Indian roller, *Coracias benghalensis* (Linnaeus, 1758).
- 70- Crested lark, *Galerids cristata* (Linnaeus, 1758).
- 71- Barn swallow, *Hirundo rustica* (Linnaeus, 1758).
- 72- White wagtail, *Motacilla alba* Linnaeus, 1758(Pl. 12).
- 73- White-cheeked bulbul, *Pycnonotus leucogenys* (Gray, JE, 1835) (Pl. 13).
- 74- Grey hypocolius, *Hypocolius ampelinus* Bonaparte, 1850.
- 75- Graceful prinia, *Prinia gracilis* Lichtenstein, 1823.
- 76- Basra reed warbler, *Acrocephalus griseldis* (Hartlaub, 1891).
- 77- Iraq babbler, *Turdoides altirostris* (Hartert, 1909).
- 78- Rook, *Corvus frugilegus* Linnaeus, 1758.
- 79- Mesopotamian crow, *Corvus cornix capellanus* (P.L. Sclater, 1877).
- 80- Starling, *Sturnus vulgaris* Linnaeus, 1758 (Pl. 14).
- 81- House sparrow, *Passer domesticus* (Linnaeus, 1758).

**Reptiles:**

- 1- Euphrates shell turtle, *Rafetus euphraticus* Daudin, 1802.
- 2- Caspian turtle, *Mauremys caspica* (Gmelin, 1774).
- 3- marsh gecko, *Stenodactylus affinis* (Murray, 1844).
- 4- dice snake, *Natrix tessellata* (Laurenti, 1768).
- 5- *Acanthodactylus* sp.
- 6- *Mesalina* sp.

**Amphibians:**

- 1- Iranian earless toad, *Bufoles surdus* (Boulenger, 1891).
- 2- Green toad, *Bufo viridis* (Laurenti, 1768).
- 3- Marsh frog, *Pelophylax ridibundus* (Pallas, 1771).

**Fishes:**

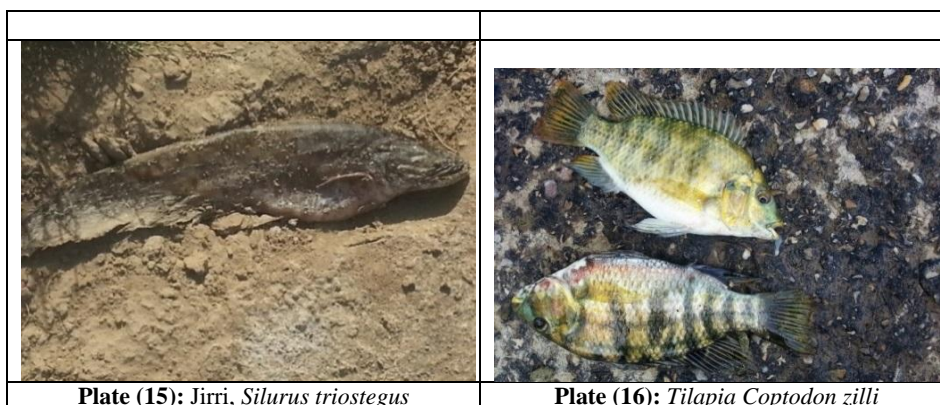
- 1- Binni, *Mesopotamichthyes sharpeyi* (Günther, 1874).
- 2- Shabboot, *Arabibarbus grypus* (Heckel, 1843).
- 3- Mesopotamian himri, *Carasobarbus luteus* (Heckel, 1843).
- 4- Qattan, *Luciobarbus xanthopterus* Heckel, 1843.
- 5- Khishni, *Liza abu* (Heckel, 1843).
- 6- Common carp, *Cyprinus carpio* Linnaeus, 1758.
- 7- Shiliq, *Leuciscus vorax* (Heckel, 1843).
- 8- Jirri, *Silurus triostegus* Heckel, 1843 (Pl. 15).
- 9- Tilapia *Coptodon zillii* (Gervais, 1848) (exotic) (Pl. 16).

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<b>Plate (1):</b> Burrows of <i>Sphaeroma annandalei</i> in the muddy banks of Huwaiza Marsh.	<b>Plate (2):</b> Water Buffaloes, <i>Bubalus bubalis</i>
	
<b>Plate (3):</b> Road killed, <i>Canis aureus</i>	<b>Plate (4):</b> Honey badger, <i>Mellivora capensis</i>
	
<b>Plate (5):</b> Little grebe, <i>Tachypabtus ruficollis</i>	<b>Plate (6):</b> Cormorant, <i>Phalacrocorax carbo</i>

	
<p><b>Plate (7):</b> Cattle egret <i>Bubulcus ibis</i></p>	<p><b>Plate (8):</b> Shoveller, <i>Anas clypeata</i></p>
	
<p><b>Plate (9):</b> Moorhen, <i>Gallinula chloropus</i></p>	<p><b>Plate (10):</b> Kentish plover, <i>Charadrius alexandrinus</i></p>
	
<p><b>Plate (11):</b> White-tailed Lapwing, <i>Vanellus leucurus</i></p>	<p><b>Plate (12):</b> White wagtail, <i>Motacilla alba</i></p>
	
<p><b>Plate (13):</b> White-cheeked bulbul, <i>Pycnonotus leucogenys</i></p>	<p><b>Plate (14):</b> Starling, <i>Sturnus vulgaris</i></p>

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#### LITERATURE CITED

- Abdulhasan, N. 2009. Habitat mapping project of the proposed Iraqi Marshlands National Park area. *BioRisk*, 3: 55-68.
- Afrasiab, S.R. and Ali, H.A. 1988. A new record of toad *Bufo surdus* Boulenger (Amphibia, Bufonidae) from Iraq, with preliminary key for Iraqi Amphibia. *Bulletin of the Iraq Natural History Museum*, 8 (1): 115-123.
- Ali, A. H., Aziz, N.M. and Hamza, H.A. 2007 Abundance, occurrence, seasonal changes and species composition of Macroinvertebrates in the restored Iraqi southern marshes. *Marsh Bulletin*, 2 (1): 80-95.
- Al-Lami, A. A., Salim, M.A., Mohammed, M.K., Al-Zubaidi, A.A., Kareem, S.O., Al-Zaidawi, A.H., Al-Taweel, D.A., Salman, K.A., Khudair, H.A., Khaled, W.A., Abulhawa, T., Al-Mughrabi, L., Garstecki, T. and Hoffman, F. 2014. Ahwar of Southern Iraq: Refuge of Biodiversity and the Relict Landscape of the Mesopotamian Cities. Nomination Dossier for Inscription of the Property on the World Heritage List. The Republic of Iraq, 266 pp.
- Al-Sheikly, O.F. and Haba, M.K. 2014. The field guide to the wild mammals of Iraq. College of Science for Women, Baghdad, 89 pp.
- Al-Zubaidi, A.A., Jane, S.K. and Hadi, A.M. 2014. Geological diversity and its importance on biodiversity SW Safeen Mountain- Erbil, Kurdistan, North Iraq. *Advances in BioResearch*, 5 (2): 53-60.
- Bellen, R.C. van, Dunnington, H.V., Wetzel, R. and Morton, D.M. 1959. *Lexique Stratigraphique International*, 03 10 Asie (Iraq), 333 pp.
- Buday, T. 1980. The Regional Geology of Iraq, Stratigraphy and Paleogeography. GEOSURV, Baghdad, Iraq, 445pp.
- Buring, P. 1960. Soils and Soil Conditions in Iraq. Ministry of Agriculture, Iraq. 322 pp.

Aqeel Abbas Al- Zubaidi *et al.*

- Damme, D. van 2014. *Gyraulus Huwaizaensis*. The IUCN Red List of Threatened Species 2014: e.T49023155A49023289. <http://dx.doi.org/10.2305/IUCN.UK.2014-3.RLTS.T49023155A49023289.en>.
- Fuchtbauer, H. 1974. *Sediments and Sedimentary Rocks*. E. Schweizerbartsche Verlagsbuchhandlung (Nagele u. Obermiller), Stuttgart, 464 pp.
- Glöer, P. and Naser, M.D. 2007. *Gyraulus Huwaizaensis* n. sp. a new species from Mesopotamia, Iraq (Mollusca: Gastropoda: Planorbidae). *Mollusca*, 25(2) : 147-152.
- Gray, M. 2004. *Geodiversity: Valuing and Conserving Abiotic Nature*. John Wiley & Sons Ltd, Chichester, 508pp.
- Gray, M., Gordon, J. E. and Brown, E. J. 2013. Geodiversity and the ecosystem approach: the contribution of geoscience in delivering integrated environmental management. *Proceedings of the Geologists' Association*, 124: 659–673.
- Hart, M. B. 2012. Geodiversity, palaeodiversity or biodiversity: where is the place of palaeobiology and an understanding of taphonomy . *Proceedings of the Geologists' Association*, 123: 551-555.
- IMO, 2006. Iraq Meteorological Organization. In Book 1- Water Resources. The Italian Ministry for the Environment and Territory & Iraq Foundation. "Overview of present conditions and current use of the water in the marshlands area".
- Jackova, K. and Romportl, D. 2008. The relationship between geodiversity and habitat richness in šumava national park and křivoklátsko pla (Czech republic): quantitative analysis approach. *Journal of Landscape Ecology*, 1(1): 23-38.
- Jassim, S.Z. and Goff, J.C. (Eds.) 2006. *Geology of Iraq*. Dolin, Prague and Moravian Museum, Brno, 341 pp.
- Jassim. H.K. 2009. Petrography and Sedimentology of Al-Mukdadiya Formation in Badra Area, Eastern- Iraq. Unpub. M. Sc. Thesis, Department of Geology, College of Science, University of Baghdad. 155 pp.
- Kukal, Z.D. and Saadallah, A. 1973. Aeolian admixture in the sediments of the northern Persian Gulf. In Pursur, B. H. (Ed.). *The Persian Gulf*, Springer- Verlag, Berlin, 115- 121 pp.
- Mohammad, M.K. 2014 Existence and Ecology of the Burrowing Isopod *Sphaeroma annandalei* Stebbing, 1911 (Crustacea; Isopoda; Sphaeromatidae) in Lake Razzaza, Kerbala Province, Central Iraq. *Advances in Bioresearch*, 5(1): 178-184.
- Mohammad, M.K. and Al-Zubaidi, A.A. 2014. Potentials of geodiversity for biodiversity at ga'ara depression, Iraqi western desert. *Advances in Bioresearch*, 5 (1): 169-177.
- Nature Iraq. 2017 (Hawizeh (HZ) (IBA 032 & 036) . Retrieved on 29 May 2017 from [www.natureiraq.org/uploads/9/2/7/.../hawizeh\\_hz\\_21\\_mar-anna.pdf](http://www.natureiraq.org/uploads/9/2/7/.../hawizeh_hz_21_mar-anna.pdf)

The importance of geodiversity on the animal diversity in Huwaiza marsh

- Petrisor, A.I. and Sabro, C.N. 2010. Dynamics of geodiversity and eco-diversity in territorial systems. *Journal of Urban and Regional Analysis*, 2(1): 61-70.
- Ramsar Convention Secretariat, 2013. The Ramsar Convention Manual: a guide to the Convention on Wetlands (Ramsar, Iran, 1971), 6th ed. Ramsar Convention.
- Rasheed, M.J. 2008. Geomorphological and Sedimentological Investigation of Hur Al-Huwaiza and Adjacent Areas. Unpub. Ph.D. Thesis. College of Science, University of Baghdad. 192 pp.
- Salim, M.A., Porter, R.F., Christensen, S., Schiermacker-Hansen, P. and Al-Jbour, S. 2006. Field guide to the birds of Iraq. Amman: Nature Iraq & Bird Life International. (In Arabic).
- Santucci V.L. 2005. Historical Perspectives on Biodiversity and Geodiversity. *Geodiversity and Geoconservation*, 22 (3): 29-34.
- Stanley, M. 2002. Geodiversity-linking people, landscapes and their culture. Abstract for natural and cultural landscapes conference. Royal Irish Academy, Dublin, 14pp.
- U. N. 1992. Convention on Biological Diversity. [www.cbd.int/convention/](http://www.cbd.int/convention/).

## اهمية التنوع الجيولوجي على التنوع الحيواني في هور الحويزة والمناطق المجاورة، جنوب شرق العراق

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### الخلاصة

التنوع الجيولوجي هو تنوع العناصر الطبيعية اللاحية التي تضم الصخور والمعادن، والاشكال الارضية، وانواع التربة، والموارد المائية. ويؤكد علماء البيئة والطبيعة الى وجود علاقة وثيقة بين التنوع الجيولوجي والانظمة البيئية الطبيعية. يقع هور الحويزة جنوب شرقي العراق ضمن سهل ما بين النهرين. والوحدات الصخرية المنكشفة شمال شرق منطقة الدراسة مكونة من صخور المدملكات، والصخور الرملية، والوحلية، والغرينية، والطينية؛ التي تعود الى تكوين باي حسن، والمقدادية، وانجانة. ويتراوح الارتفاع العام للمنطقة بين ٥ متر قرب ضفاف الهور، و اكثر من ١٠٠ متر فوق مستوى سطح البحر في الشمال الشرقي. واهم الاشكال الارضية هي: كويستا، بحيرات هلالية، وسهل فيضي، واهوار ضحلة، ومسطحات طينية، وكثبان رملية. والتربة (الرسوبيات الحديثة) مشتقة في الغالب من الوحدات الصخرية الواقعة الى شمال شرق هور الحويزة؛ وكذلك من رواسب الانهار المكونة من الحصى، والرمل، والغرين، والطين الغريني. ويتغذى هور الحويزة من مياه فروع نهر دجلة، المشرح والكحلاء، وكذلك من نهري الطيب ودويريج اللذين يصبان في هور السناف الموسمي وبعد ذلك الى هور الحويزة الذي تبلغ مساحته ١٣٧٧ كم<sup>٢</sup> في الفصول المطيرة، و ٦٥٠ كم<sup>٢</sup> في الفصول الجافة. ساهم التنوع الجيولوجي، المكون من العناصر المذكورة اعلاه، في تشكيل الانظمة البيئية الاتية: مياه الهور العميقة، ومياه الهور الضحلة، انهار خارج الاهوار، ضفاف الانهار، المسطحات الطينية، ضفاف الاهوار، الرسوبيات الرملية، التلال الصخرية؛ التي ساهمت في نشوء تنوع بيولوجي جيد يضم: ٢٧ من اللبائن، و ٨١ من الطيور، و ٦ من الزواحف، و ٣ من البرمائيات، و ٩ من الاسماك. وبذلك يمكن الاستفادة من هور الحويزة والمناطق المجاورة له لاغراض البحوث العلمية، والتعليمية، والزراعة التقليدية، والسياحة البيئية، واستعمالات اخرى تلبى شروط التنمية المستدامة. ان التنوع الاحيائي في هور الحويزة عند مقارنته مع اهوار العراق الجنوبية الاخرى يعتبر غنيا من حيث عدد الانواع وكذلك عدد الافراد من كل نوع. يشتمل التنوع الاحيائي للفقرات على ٢٧ لبونا و ٨١ طيرا و ٦ زواحف و ٣ برمائيات. وقد اشترت انواع الفقرات المميزة لكل بيئة من بيئات هور الحويزة. من الانواع المثير للاهتمام تواجد الوردية (الزقة) في بيئة المياه العميقة وتواجد هازجة قصب البصرة ومالك الحزين الجبار والقضاعة ناعمة الفرو في بيئة المياه الضحلة.