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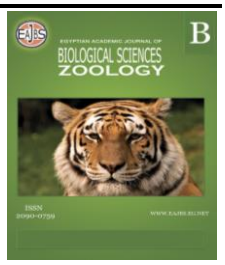

A Survey of Amphibian Fauna in Jazan Region, Saudi Arabia

Aishah Ali Hamdi[1*], and Samah M. Fathy[1&2]
1-Biology department, faculty of science, Jazan University, Jazan, Saudi Arabia.
2- Zoology Department, Faculty of Sciences, Fayoum University, Fayoum, Egypt
E. mail[*]: Aishahhamdi2020@gmail.com

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ABSTRACT

The amphibious animal is defined as a group of vertebrates relying upon water and encompassing areas. Individuals of amphibians are an essential part of environments, but they are threatened by human actions, including climate change. Amphibians can likewise give proof of natural well-being and flexibility. In spite of the fact that Jazan area has distinctive environments and fauna, the investigations of amphibian fauna in Jazan area remain ineffectively contemplated and data about its biology and appropriation is inadequate. This study was carried out to investigate the diversity of amphibians in Jazan region through hand grabbing collection of specimens from Dhamd, Abu-Arish, Samtah, Al-Aradha and Ahad Almasarha. Three types of Amphibia (Anura) belong to the family Bufonidae were recorded to include *Duttaphrynus dhufarensis*, *Sclerophrys arabica* and *Sclerophrys tihamica* among the total of seven amphibian species present in Saudi Arabia. The current study revealed that *Sclerophrys tihamica* is an abundant species while the other two are rare in the study area. Additional field visits and surveys through different seasons and environments (particularly mountains and valleys locations) are recommended.

INTRODUCTION

Since the start of humankind, individuals have been worried about their condition and particularly its capacity to give them sustenance, water, and different assets. As our numbers have developed and our innovation has been created, we have turned out to be progressively worried about the effect we are having on our environment (Hunter, 1996; Masood and Asiry, 2012). Present-day innovation has given people enormously expanded control over nature. This influence has done nothing to decrease human reliance on natural decent variety, which just means the abundance of living things found on earth: Millions of various plants, creatures, and smaller-scale living beings, the qualities they contain and the perplexing biological communities they form. Recently, thoughts about biodiversity got an incredible intrigue (Masood and Asiry, 2012).

The amphibious animal serves as a gathering of vertebrates relying upon water and encompassing areas, especially in the rearing season and larval improvement. Mostly in dry areas, the accessibility of reasonable water bodies is considered the principal constraining factor of amphibian spreading (Modrý *et al.*, 2004). Animals of land and water often look for water, wetlands and wet soils for laying eggs and for insurance against water leaks from their thin skin. Though, it cannot endure the high salt substance of oceans and are consequently the

main vertebrates that have not colonized marine living places (Capula, 1989; Abd Rabou *et al.*, 2007). Three main orders belong to Amphibians are named Gymnophiona, Anura, and Caudata. It has been reported that Anura and Caudata are more relative to each other than either to the Gymnophiona (Stuart *et al.*, 2008). Individuals of amphibians are an essential part of environments, but they are threatened by human actions, including climate change (Blaustein *et al.*, 2010). Amphibian can likewise give proof of natural well-being and flexibility (Salman *et al.*, 2014).

Deterioration or drop of amphibian species can constitute an early cautioning of global change (Gardner, 2001). In this manner, natural administration of delicate terrain ought to be aimed towards checking the assorted variety of amphibians to help in their security or recuperation particularly in wetlands (Storfer, 2003; Salman *et al.*, 2014). Among vertebrates, beings of land and water are right now the most endangered class, with around 41% of more than 7,000 Amphibian species on the planet exposed with eradication (Hoffmann *et al.*, 2010). A further 22.5% are delegated Data Deficient by the IUCN, which possibly adds to an underestimation of the quantity of debilitated amphibian species (Li *et al.*, 2013; Hocking and Babbitt, 2014). Amphibians are experiencing various insults including, infection, living area injury and modification, alongside manure and pesticides (Hayes *et al.*, 2010). Approaching over every single other factor is the danger of eradication because of environmental change (Milanovich *et al.*, 2010; Hocking and Babbitt, 2014).

Amphibian decay is a reason for worry in their own right, however, additionally may be characteristic of a bigger natural issue with possibly foundational suggestions. Land and water animals' disintegration might be an early signal of the looming loss of freshwater aqueous environment assistances all through the world (Collins *et al.*, 2009; Hocking and Babbitt, 2014). The reduction of individuals of amphibians may also cause the loss of more extensive environmental benefits, a worry that has gotten insufficient concern. While it is dangerous to go up against the international amphibious animal emergency, we have to explore what we are losing as far as related environmental duty (Hocking and Babbitt, 2014).

Understanding the assistance of amphibious animals to biological communities can enable, organize and gather to help for protection measures, and foresee the biotic and abiotic changes related to the possible loss of species (Şekercioğlu *et al.*, 2004; Hocking and Babbitt, 2014). The kingdom of Saudi Arabia is a substantial nation with different geology and natural surroundings. Moreover, its topographical area amongst tropical and warm temperature zone makes the nation an interesting one in supporting rich and differentiated fauna (Al-Sadoon, 2010; Al-Sadoon *et al.*, 2016).

Biodiversity is a standout amongst the most fundamental characteristic assets of the Kingdom, if not the most essential in the present period. The main goal is to differentiate and contrast at the level of living creatures from all wellsprings of normal biological communities, including an earthbound, marine and sea-going condition in which they are part (UNEP, 1992; Masood, 2012b). In 2001, the Kingdom of Saudi Arabia turned into a signatory to the Tradition on Natural Assorted variety that tries to guarantee the preservation of species and their territories forever (Abuzinada *et al.*, 2004; Masood, 2012b). Amphibious animal species in the Middle East area were examined by different authors using standard classification, morphology and natural techniques (Disi and Amr, 2010; Salman *et al.*, 2014).

In the Middle East, Turkey includes the most noteworthy number of amphibious animals coming to around 22 species in the Asiatic part (Cox *et al.*, 2006). Balletto *et al.* (1985) gave the chief general examination on the amphibian of Arabian countries. They recorded nine species, six of which are endemic to the Arabian Peninsula. In Syria and Lebanon, 7 types of them have been recorded. Schneider and Sinsch (1999) thought about the calls of Middle Eastern water frogs with those of *Rana ridibunda* in Kazakhstan, Armenia and Greece. They concluded that the Middle Eastern population is known as *R. bedriagae.*

This taxon is the earliest accessible name for water frogs of our locales and was given essential over *R. r. caralitana* and *R. levantina* (Disi and Amr, 2010). Saudi Arabia is possessed by seven types amphibian individuals of land and water, four of which are common in the kingdom (*Duttaphrynus arabicus, D. dhufarensis, Sclerophrys tihamica, Euphlyctus ehrenbergii*) while the other three happen somewhere else in the Palaearctic locale (*Bufotes viridis, Hyla savignyi, Pelophylax ridibundus*) (Balletto *et al.,* 1985; Al-Johany *et al.*, 2014). Few studies have been carried out on the assorted variety of amphibians of Saudi Arabia. Previous researches have portrayed little accumulations of amphibian from various districts including the Western Region (Farag and Banaja, 1980), Central region (Al-Johany *et al.*, 2014), Asir region (Masood and Asiry, 2012), Tabuk region (Aloufi and Amr, 2015) and Bisha area (Hussein and Darwish, 2001; Al-Sadoon *et al.*, 2016).

Albeit all Arabian amphibious animals are recorded as Least Interest (LC) in the International Union for Conservation of Nature (IUCN) Red List 2013 (IUCN, 2013), a looming deterioration of amphibian species numbers for numerous species has been seen because of the aridity, land damage, and contamination (Al-Qahtani, 2011; Al-Johany *et al.*, 2014). Balletto *et al.* (1985) found *D. dhufarensis, D. arabicus,* and *P. ridibundus* at high heights (2,000– 2,800 m) in southwestern Saudi Arabia, likewise exposed these species at a down height somewhere else in Saudi Arabia: *D. dhufarensis* (460 m) close Makkah in western Saudi Arabia, *D. arabicus* (556 m) in Al-Aflaj in middle of Saudi Arabia, and *P. ridibundus* (200 m) in Al-Hassa in eastern Saudi Arabia (Al-Johany *et al.*, 2014).

In spite of the fact that Jazan area has distinctive environments and fauna, the investigations of amphibian fauna in Jazan area remain ineffectively contemplated and data about its biology and appropriation is inadequate (Farag and Banaja, 1980). Jazan area is one of the wealthiest areas of the Kingdom of Saudi Arabia with animal biodiversity, where the area is described by the nearness of a substantial gathering of wild creatures that have a place with various families (Masood, 2012a). Jazan is an area that is located in the southwestern part of Saudi Arabia. It is bounded by the Republic of Yemen in the south, Asir region in the north as well as east, and the Red Sea in the west (Masood, 2012b). The current examination focuses on amphibians in Jazan and is viewed as one of the earliest articles that display a rapid overview of amphibians in this area. This investigation was carried out to give essential data, examination, study, recognizable proof, wealth, natural portrayal, and status of some amphibians in Jazan region.

MATERIALS AND METHODS

The Study Area:

The present work was done in Jazan area. The district of Jazan is in the South-Western portion of Saudi Arabia between longitudes 42° and 43°.80' and scopes 16° and 17°. It is limited from the south and east by the Republic of Yemen, Asir region in the North and the Red Sea in the West (Masood, 2012b). Jazan region is far from the city of Riyadh with a space of 1000 km and the holy city of Mecca with a space of 500 km. The area is famous for its perfect place on the southern Red Sea beach with a coastline of just about 300 km, and its high green mountains in the Eastern area. The area is trailed by a few islands in the Red Sea with the island of Farasan as the most essential and biggest of them (Masood, 2012a). The assessed zone of Jazan district is around 40,000 km^2 and this implies that it involves a space of about 6% of the area in the Kingdom of Saudi Arabia. Jazan Province incorporates around 5,000 towns and urban communities. Its main city, Jazan, is the home to the Port of Jazan, Saudi Arabia's third most imperative port on the Red Sea. Moreover, it encompasses different towns including Sabya, Abu Arish, Farasan, Ad-darb, Samtah and Altuwal (Fig. 1) (Masood, 2012a; Alhababy and Al-Rajab, 2015).

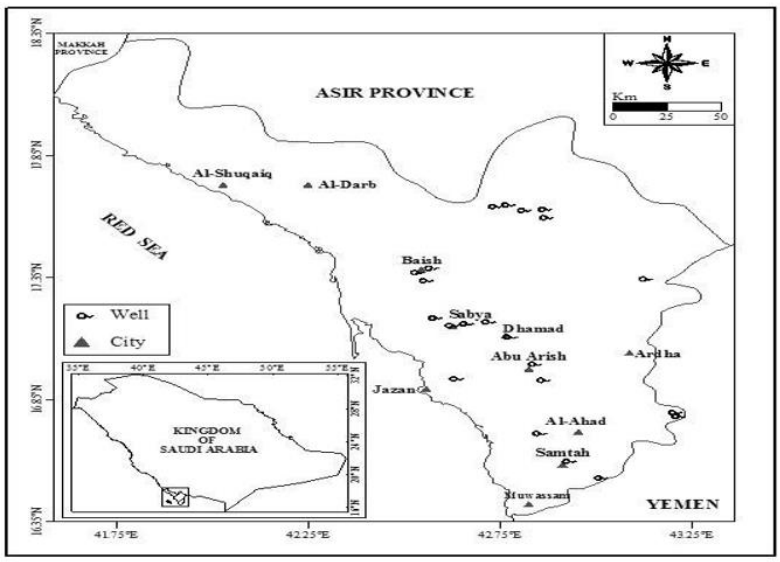

Fig. 1: Map of Jazan region

Climate and Topography of the Study Area:

The normal temperature in January is around 23°C and in August is around 33°C, while the normal relative moisture in January is 74%, 66% in August and 68% over the entire year (Masood, 2012b). The region has ordinarily two stormy seasons, May-July and September-November (Sallam *et al.*, 2013). The precipitation on the shores of Jazan has a rate of in excess of 300 mm^3/y. Concerning the mountain areas in Jazan, the temperature degree is modest in summer, icy in winter and cool air nearly during the time in rocky areas and precipitation everywhere throughout the year. The geology of Jazan is fluctuated and is recognized such as mountains, vales, stony and sandy deserts, semi-desert, besides cultured grounds (Masood, 2012a). Amphibians in Jazan region were surveyed using several locations. These sites have been chosen because they include wetland habitat types. There are villages and towns within study sites, in addition to abandoned agricultural fields (Alshammari and Ibrahim, 2015). Most of the areas were visited during (February–May, 2018) to collect amphibious animals that were mostly observed and collected shortly after sunset. Amphibians were collected by different methods in their suitable habitat like hand grabbing or hand-net (Masood and Asiry, 2012; Al-Sadoon *et al.*, 2016).

RESULTS

In the current study, three species were collected from different areas in Jazan. They all belong to the family Bufonidae.

Class: Amphibia

Order: Anura

Family: Bufonidae

Genus: *Bufo* Laurenti, 1768

Members of the Bufonidae are near-global in occurrence, being absent naturally from Madagascar, New Guinea, Australia and surrounding islands. Species occupy a wide variety of habitats, from very arid conditions to humid tropical rainforests. It is a speciose family and although the vast majority of the species have larval development, there are some direct-developing and live-bearing species.

1-***Duttaphrynus dhufarensis* (Parker, 1931)**

Common name: Dhofar toad

Arabic name: Dhofar toad.

This toad is small in size and varies in appearance as some can be brown, light green and speckled. They have bulged eyes and a large eardrum. It is rarely found in different surveyed parts in Jazan (Fig. 2 & Table 1).

Range: *Duttaphrynus dhufarensis* is constrained to fringe Arabia, running from western Saudi Arabia (Mecca) south to Yemen thereupon east to northern Oman.

Territory and environment: Its characteristic natural surroundings are subtropical or tropical dry bushland, watercourses, discontinuous waterways, freshwater springs, rustic patio nurseries, urban zones, lakes, and inundated land.

Environment: Nocturnal excluding throughout the mating time.

Status and protection need: Fairly normal and across the board. Named Least Concern by IUCN (2005).

Table 1: Distribution, status, and coordinates by GPS of the collected specimens.

No	Location	Scientific name	Status in study area	Coordinates	
				Latitude	Longitude
1	Dhamd	*Sclerophrys tihamica*	Abundance	17.1201	42.7772
2	Ahad Almasarha	*Sclerophrys tihamica* *Duttaphrynus dhufarensis* *Sclerophrys arabica*	Abundance Rare Rare	16.6842 16.7289	43.0237 43.0361
3	Abu-Arish	*Sclerophrys tihamica*	Abundance	16.9695	42.8553
4	Samtah	*Sclerophrys tihamica*	Abundance	16.5757	42.9059
5	Al-Aradha	*Sclerophrys arabica*	Rare	16.9223	43.1291

***2-Sclerophrys tihamica* (Balletto and Cherchi, 1973)**

Common name: Balletto's Toad.

Arabic name: Tohama toad.

It is a small-sized frog with brown color. It has a huge, short and broad head, large eardrum, short and strong limbs as well as thick fingers. In the present survey, *Sclerophrys tihamica* is abundant in all visited locales of Jazan (Fig. 3, Table 1).

Distribution: Saudi Arabia, Yemen.

Natural surroundings and biology: It can be found in dry vegetation (with the exception of riparian vegetation near vale) and wherever there are accessible water sources. It reproduces in immobile or moderate moving water. It is basic in cultivable land near aqueducts.

Status and preservation needs: Fairly typical and across the board. It was named Least Concern by IUCN (2004).

***3-Sclerophrys arabica* (Heyden, 1827)**

Common name: The Arabian Toad.

Arabic name: The Arabian Toad.

The toad's head is round with prominent eyes and has small tympanic membranes. They vary in color that can be gray, tan brown, or green. It is hardly distributed or collected from Jazan (Fig. 4, Table 1).

Distribution: Europe, North Africa, eastward to Mongolia and Tibet.

Natural surroundings and biology: Adevious, mesophilous species, are found in all situations of the promontory where water is accessible. It lives in aqueducts, rock lands, gardens and date copies, and is dynamic both by day and night. The reproducing period of this species takes after the rain. Two reproducing seasons have been recorded in Yemen and Saudi Arabia, one in September-October and the other in June-July.

Status and protection need: Fairly normal and common categorized as Least Concern by IUCN (2005).

Fig. 2: ***Duttaphrynus dhufarensis***

Fig. 3: *Sclerophrys tihamica*

Fig. 4: *Sclerophrys arabica*

DISCUSSION

In this work, we investigated the biodiversity of amphibians that were found in the area. It is noteworthy to know that this study is one of the pioneers which dealt with Amphibia in Jazan. Previous studies were carried out on different species of Amphibia in other regions of Saudi Arabia other than Jazan. Amphibious animal variety has been considered in Southwestern Saudi Arabia, yet no enough examinations had been performed to give fundamental data about the species life, particularly the geological spreading and scatterings (Masood and Asiry, 2012). This examination recorded three types of tailless amphibian (Anura) which include family Bufonidae with *Duttaphrynus dhufarensis*, *Sclerophrys arabica* and *Sclerophrys tihamica* among the total 7 amphibian species present in Saudi Arabia (Balletto *et al.*, 1985). Amphibians possess particular environments inside the distinctive ecozones of this district, which suit their natural prerequisites. The dissemination of these species contrasts as far as plenitude (Al-Sadoon *et al.*, 2016).

Among the recorded species from this area, some were in limited distribution and were gathered from a solitary region (*Duttaphrynus dhufarensis, Sclerophrys arabica*), while *Sclerophrys tihamica* was gathered from various areas of the considered zone (Table 1) (Al-Sadoon *et al.*, 2016). *Sclerophrys tihamica* is the richest species recorded in the present study with many specimens. This species has littoral environments along the Red Sea coastline of the Arabian Peninsula. However, the same species of amphibians were recorded in Asir region (Masood and Asiry, 2012; IUCN, 2013). Both *D. dhufarensis* and *S. arabica* are common in the Arabian Peninsula. They have been recorded in the southwestern Arabian Peninsula along Hejaz, Asir mountains, and Tihamah from south of Makkah down to Yemen, and eastward to southern Oman and eastern the United Arab Emirates (Al-Johany *et al.*, 2014; Soorae *et al.*, 2013). They are considered the least abundant in the study area compared to *Sclerophrys tihamica* where one specimen was recorded for each species. The previous species were recorded in Asir region by Masood and Asiry (2012), in the Central region by Al-Johany *et al.* (2014), the Western region by Farag and Banaja (1980), and in Tabuk region by Aloufi and Amr (2015). The scarcity of some species was associated with reduced precipitation at the time of this study, which declined the suitable habitat for amphibian living and reproducing and consequently, their numbers declined. The amphibians of Jazan are alike those of the other adjacent parts. They commonly possess similar characters to those in southwest Asia, northwest Ethiopian district, Palestine, Jordan and the Arabian Peninsula (Masood and Asiry, 2012). The information introduced in this research is affirmed in reports made by Masood and Asiry (2012), Al-Johany *et al.* (2014), Farag and Banaja (1980), Aloufi and Amr (2015), Hussein and Darwish (2001), Parker (1938), Schmidt (1941), and Hussein (1993) who watched comparable species at different overviews conveyed in various areas of Saudi Arabia.

Hussein (1993) described Arabian area from Northeast Africa to Southwest Asia and portrayed the area by a richness of frogs (family Bufonidae) and other animals. It was shown that the geography or the tallness and state of the land, can have an essential influence in the spreading of the species (Chapman & Reiss, 1995). Indeed, even little changes in geology might be imperative (Masood and Asiry, 2012). Among different vertebrates, they are the most influenced by human infringement on their environments (Capula, 1989). Thus, sea environment demolition, wetland sewerage and contamination are genuine dangers to amphibians (Abd Rabou *et al.*, 2007). The variances in weather conditions and climate can likewise influence the scattering of species (Ford, 1982), and this is because of the complicated communication of components, including the development of regions of low and high weight in the air which impacts mist cover, precipitation and temperature (Masood and Asiry, 2012). An enduring life creature may encounter a notable variety in temperature, dry

season length and airspeed amid its life cycle disturbed by "freak" climate conditions (Masood and Asiry, 2012).

CONCLUSIONS:

The current study was carried out in Jazan region and recorded three types belong to the family Bufonidae with *Duttaphrynus dhufarensis*, *Sclerophrys arabica* and *Sclerophrys tihamica* among the total 7 amphibian species present in Saudi Arabia. *Sclerophrys tihamica* is abundant in the study area while other species are rare. Additional field visits through different seasons are promoted to spotlight the impact of the climatic changes on the diversity of Amphibian species. Additionally, further collection from different environments (particularly mountains and valleys locations), which were poorly described by study exertion in this investigation, is recommended.

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ARABIC SUMMARY

مسح للبرمائيات في منطقة جازان ـ المملكة العربية السعودية

عائشة علي حمدي*، سماح فتحي

1-قسم الأحياء- كلية العلوم -جامعة جازان - المملكة العربية السعودية

2-قسم الحيوان- كلية العلوم – جامعة الفيوم - الفيوم

تعرَف البرمائيات بأنها مجموعة من الفقاريات التي تعتمد على المياه والمناطق المحيطة بها. يعتبر أفراد البرمائيات جزءً أساسيًا من البيئة، لكنهم أصبحوا مهددين بسبب البشر وتصرفاتهم وماينتج عنها بما في ذلك تغير المناخ. يمكن للبرمائيات أيضًا أن تقدم دليلاً على ازدهار الطبيعة وحيويتها. وعلى الرغم من حقيقة أن منطقة جازان بها بيئات وحيوانات مميزة ، إلا أن الأبحاث حول الحيوانات البرمائية في منطقة جازان لا تزال نادرة ، والبيانات المتعلقة بطبيعتها وتنوعها غير كافية.

أجريت هذه الدراسة لاستكشاف تنوع البرمائيات في منطقة جازان من خلال جمع عينات من ضمد، أبوعريش ، أحد المسارحه، صامطة والعارضة. سجلت الدراسة الحالية ثلاثة أنواع من البرمائيات عديمة الذيل (Anura) والتي تنتمي إلى عائلة Bufonidae وتشمل *Duttaphrynus dhufarensis* و *Sclerophrys tihamica* و *Sclerophrys arabica* من بين سبعة أنواع من البرمائيات موجودة في المملكة العربية السعودية. يعتبر *Sclerophrys tihamica* النوع الأكثر شيوعاً وتوفراً في منطقة الدراسة بينما النوعين الأخرين كانا نادرا التواجد. من أهم التوصيات التي تقترحها هذه الدراسة القيام بزيارات ميدانية إضافية وإجراء عمليات مسح في أماكن جديدة خلال مواسم وبيئات مختلفة (الجبال والوديان بشكل خاص).

الكلمات المفتاحية : التنوع، مسح ، البرمائيات، جازان ، المملكة العربية السعودية.