Habitat use of *Gerbillus nanus* and *Dipodillus dasyurus* at Azraq Wetland Reserve, north eastern Jordan

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ABSTRACT

The Balochistan Gerbil (*Gerbillus nanus*) and Wagner Gerbil (*Dipodillus dasyurus*) at Azraq Wetland Reserve were captured from different habitat types. *Gerbillus nanus* was more common species than *D. dasyurus*, accounting for 61.9% of the total capture during spring season, its prefer *Tamarix tetragyna* and *Nitraria retusa*, and *Nitraria retusa* vegetation types and avoid clay/soft sand. On the other hand, *D. dasyurus* was the highest captured species among *Tamarix passerionoides* and dry *Phragmites australis* vegetation community, and was absent in *Nitraria retusa*, silt island and *Tamarix passerionoides*, *Tamarix tetragyna, Nitraria retusa,* and *Alhagi maurorum* communities.

INTRODUCTION

In arid regions, rodent communities are considered important components of desert ecology. They play important ecological roles as consumers, producers and mechanical processors (Brown, 1986) and have been used to examine ecosystems quality (Rosenzweig & Winakur, 1969). Rodent's species are significantly considered rapid respondent to any environmental changes. They can be used as representative model in studying effects of environmental deterioration in ecosystems (Tchabovsky et al., 1999).

In Jordan, twenty eight species of rodents representing seven families are distributed in four biogeographic regions (Mediterranean, Irano-Turanian Sudanian Penetration and Saharo Arabian) and inhabiting a wide variety of habitats (Amr, 2012).

In last three decades, the northeastern deserts of Jordan have witnessed several changes to its environment, including effect of climate change and habitat deterioration due to agricultural development and water abstraction. These changes affected the distributions of wildlife within wetlands and arid regions. Azraq Wetland Reserve (AWR) was severely affected by changes in water level due to continuous pumping of water, and resulted in decline of many elements of biodiversity within the reserve (Quatrameez & Nassar, 1997; Abu-Laban, 1999; Abu Yahya *et al.,* 2014).

At AWR, little is known on rodents' communities and habitat preference (Abu-Laban, 1999). Therefore, the present study addressed habitat preference and association with vegetation type for two rodent species known to occur at AWR.

MATERIALS AND METHODS

Description of study area

The AWR is the only natural wetland in the Jordan Badia, it's located in northeastern part of Jordan, which covers around 12,710 km² surrounded by desert environment. The reserve is located in the lowest point of the Azraq basin, with an elevation of 500 m asl (Budieri, 1995). The primary source of water to the basin is the recharge of the basalt aquifers from Jabal al-Arab, and the secondary source of water comes deeply from Tulul al-Ashaqif highlands (Abu-Jaber *et al*., 1998). The reserve is characterized by hot summer average 38.9° C and a moderately cold winter average 7.3° C with a mean rainfall of 69.5 mm per year (Al-Eisawi 1985 and 1995). The landscape is gently undulating eroded plateau at north site to gently undulating plateau to southern direction through salt plains area. The view is open and the soil is shallow and sandy and broken by patches of *Phragmites australis* around water, with occasional patches of *Nitraria retusa, Tamarix passerinoides,* and *Tamarix tetragyna* in northwestern part of the reserve.

Figure (1) shows vegetation communities identified at AWR (Abu Yahya *et al*., 2014). This include either monotypic (e. g. *Nitraria retusa* and *Arthrocnemum macrostachyum*) or mixed communities.

The vegetation communities at AWR are considered anisotropic, based on differences in soil quality, texture, humidity and salinity (Al-Eisawi, 1995). Abu Yahya *et al.* (2014) stated that vegetation structure within AWR in terms of plant species composition differs in association with soil salinity and fresh water percentage, and thus halophytic species are expected to dominate.

Trapping effort

The field work was carried out during April and August, 2015 for five consecutive days. A total of 315 Sherman traps were distributed in nine vegetation communities. In total, 3150 trapping nights during both seasons was performed. Grids were randomly selected using Arc-GIS software program, with a minimum distance of 100 m between every other grid (Figure 1). In each grid, nine traps were placed with 25 m space between each trap. Two sizes of Sherman traps (30X10X8) cm and (23X9X8) cm were used and baited with white oats and peanut butter. Traps were set and baited daily between 15:30 pm and 17:30 pm and checked in the early morning in the following day. Species were identified, marked and released at the same site.

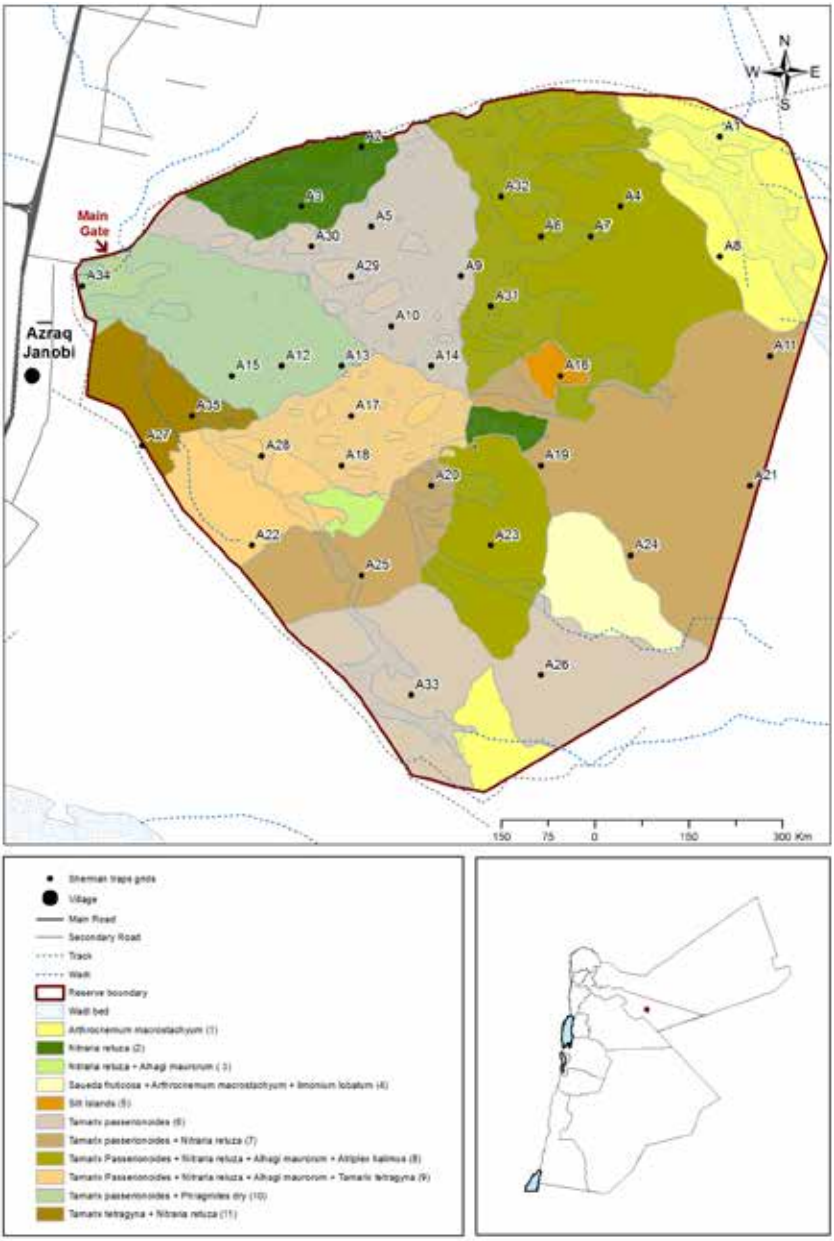


Figure 1: Grids where traps were set at Azraq Wetland Reserve.

RESULTS

Species abundance

The Balochistan Gerbil was more common than Wagner Gerbil, accounting for 61.9% of the total capture. During spring season, number of captured *G. nanus* was about twice as much compared to *D. dasyurus*. However, number of both species was almost similar during summer season (Table 1). In total, 32 *Dipodillus dasyurus* and 52 *Gerbillus nanus* were captured during both seasons. Number of captured *D. dasyurus* during both seasons did not differ significantly (Table 1), while *G. nanus* showed higher number of captures during spring compared to the summer season.

Table 1: Number of captured *Dipodillus dasyurus* and *Gerbillus nanus* during the study period.

	Spring		Summer	
	No. of trap	No. of captured	No. of traps	No. of captured
Dipodillus dasyurus	1575	17	1575	15
Gerbillus nanus	1575	36	1575	16

Association of Rodents with Vegetation communities

Table (2) shows numbers of trapped species in nine vegetation communities at AWR. In spring, the heights number of trapped *D. dasyurus* was among *Tamarix passerionoides* and dry *Phragmites australis* vegetation community. Wagner Gerbil was absent in both summer and spring season in *Nitraria retusa*, silt island void of vegetation and *Tamarix passerionoides*, *Tamarix tetragyna, Nitraria retusa,* and *Alhagi maurorum* communities.

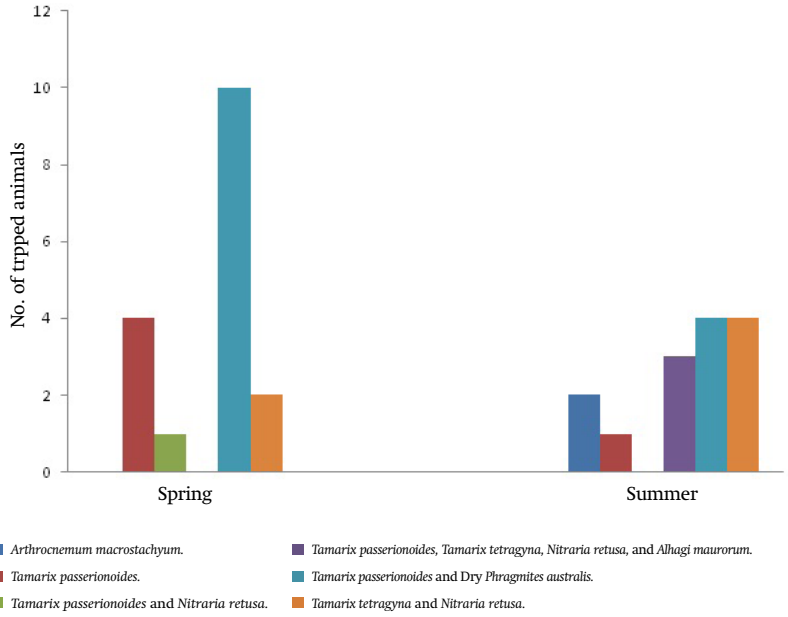
Table 2: shows trappability in the different vegetations types during the study period.

Vegetation type	*Dipodillus dasyurus*		*Gerbillus nanus*	
	Spring	Summer	Spring	Summer
1	0	2	3	3
2	0	0	5	1
3	0	0	1	0
4	4	1	2	1
5	1	0	4	1
6	0	3	3	4
7	0	0	2	4
8	10	4	2	0
9	2	4	12	1

1. *Arthrocnemum macrostachyum.* 2. *Nitraria retusa.* 3. Silt Island. 4. *Tamarix passerionoides.* 5. *Tamarix passerionoides* and *Nitraria retusa.* 6. *Tamarix passerionoides, Nitraria retusa, Alhagi maurorum,* and *Atriplex halimus.* 7. *Tamarix passerionoides, Tamarix tetragyna, Nitraria retusa,* and *Alhagi maurorum.* 8. *Tamarix passerionoides* and Dry *Phragmites australis.* 9. *Tamarix tetragyna* and *Nitraria retusa.*

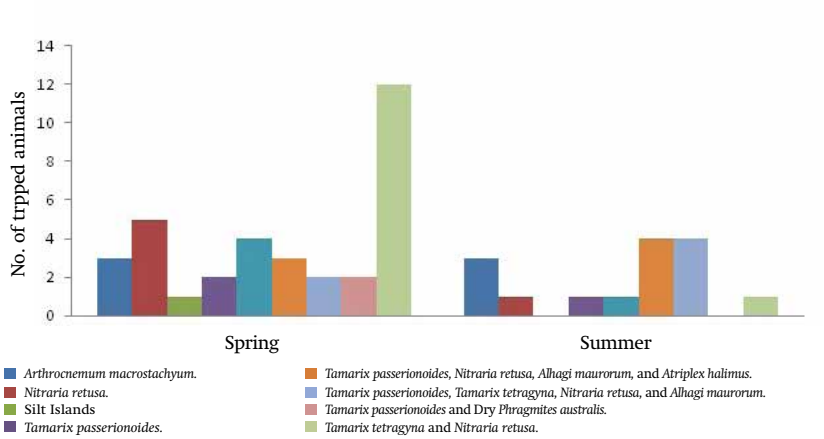
On the other hand, in the summer season, this species was recovered only from *Arthrocnemum macrostachyum* and *Tamarix passerionoides*, *Nitraria retusa, Alhagi maurorum,* and *Atriplex halimus* communities. In the summer season, highest number of *D. dasyurus* was among *Tamarix passerionoides* and dry *Phragmites australis*, and *Tamarix tetragyna* and *Nitraria retusa*.

During this survey, we distinguished nine vegetation communities in the reserve.



Figuer 2. Number of *D. dasyurus* trapped during spring and summer.

As for *G. nanus*, the heights number of trapped animals in the spring season was among *Tamarix tetragyna* and *Nitraria retusa*, and *Nitraria retusa vegetation* types (Figure 3). This species was recovered from all types of vegetation communities during the spring season at various densities. Balochistan Gerbil was absent from silt islands and *Tamarix passerionoides* and dry *Phragmites australis* during the summer season.



Figuer 2. Number of *G. nanus* trapped during spring and summer.

DISCUSSION

Dipodillus dasyurus and *G. nanus* at AWR were found in various habitats types with interaction between vegetation type and soil structure. Krasnov *et al.* (1996) reported that spatial distribution of rodents' communities in Negev Desert, south Palestine, was effected by the gradient of soil hardness from rock to sand, and gradient of vegetation from high vegetated area to hammada. They stated that *G. nanus* is an inhabitants of open gravel plains, while *D. dasyurus* is considered as habitat generalists. Abu-Laban (1999) studied rodent communities at AWR and reported five different species, at the time when pools were dried and sever ecological changes occur at AWR. These changes led to alteration in vegetation communities, thus affecting the overall rodent communities.

Abu Yahya *et al.* (2014) stated that *T. passerionoides* community became more dominant in the southern part of the reserve, while *N. retusa* became more dominant in salt plains areas compared with Al-Esawi (1995). *Dipodillus dasyurus* and *G. nanus* were considered as the most common species found at the reserve. *Dipodillus dasyurus* was trapped near *T. tetragyna* vegetation type and coarse sandy soil with gravels, and avoids clay and soft sandy soil with low vegetation density.

Shenbort *et al.* (1997) observed that *D. dasyurus* avoided sandy habitats and demonstrated selectivity for habitats with high rock and clay contents in Negev desert. Abu-Laban (1999) stated that vegetation cover and soil type are the most important factors that effected on the distribution of rodents at AWR. *Dipodillus dasyurus* was trapped from habitat with high vegetation cover.

In contrast, *Gerbillus nanus*, was found in sandy salty soil with *N. retusa* shrubs, and avoided clay/soft soil. Zahavi and Wahrman (1957), Qumsiyeh (1996), Abu-Laban (1999), and Amr et al., (2004) observed that *G. nanus* was collected from low sandy wadis with considerable salty nature with rich cover of *N. retusa* or *Tamarix* sp. It is common in arid regions especially along wadis, plateaus and hammada. It seems that *G. nanus* is dependent on seeds of *N. retusa*, where most burrows are located. On the other hand, *D. dasyurus* prefers leaves of *Ph. australis*. Wagner Gerbil is more generalist that *G. nanus*, with a wider range of distribution (Amr, 2012). Decline of water precipitation and limited of pools areas at AWR affected directly on vegetation diversity and density, which led to change on distribution and numbers of the rodents' species at the reserve.

Certainly, feeding behaviour and food selectivity are integral part of species diversity within desert habitats. These associations should be examined very closely to better understand the natural history. Interaction of different rodent species at AWR should be studied over an extended period of time to understand the dynamics of these desert adapted species to coexist in such habitat.

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