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Research Article

A preliminary study of the lizard fauna and their habitats in Bafq Protected Area and Darreh-Anjir Wildlife Refuge, Yazd Province, Central Iran

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Abstract

Kuh-e Bafq Protected Area and Darreh-Anjir Wildlife Refuge are located in Yazd Province, Central Iran. Although reptiles are relatively diverse in this area, little is known regarding their diversity, distribution, and habitat preferences. The present study was carried out from March 2012 to late June 2013. A total of 55 specimens were collected (or observed) and identified, belonging to six families, 14 genera, and 16 species.

Keywords: Bafq Protected Area, Central Iranian Plateau, Darreh-Anjir Wildlife Refuge, Faunistic study, Reptiles

Introduction

Although Yazd Province (76,469 km^2) encompasses about 4% of the total area of Iran (1,873,959 km^2), few faunistic studies have been carried out so far on reptiles of this province (Anderson, 1999). Only two brief studies were conducted in this field by Rajabizadeh et al. (2009) and Ebrahimipour et al. (2016). Anderson (1999), divided the whole of Iran to 13 physiographic regions relative to lizard distribution, including the Central Plateau (~32.8%), The Urmiyeh Basin (~3.5%), The Sistan Basin (~2.2%), The Caspian Region (~1%), The Khuzestan Plain and the Persian Gulf Coast (~9.9%), Iranian Baluchistan and the Makran Coast (~13%), The Turkmen steppe (~0.6%), The Moghan steppe (~1.6%), The Zagros Mountains (~7%), The Western Foothills of the Zagros Mountains

(~2%), The Alborz Mountains (~7%), The Kopet-Dagh (~7%), and Islands of the Persian Gulf (~2.5%) (Fig. 1). The herpetofauna of the Central Iranian Plateau have been surveyed by some foreign (e.g., Anderson, 1966, 1999; Tuck, 1971, 1974; Leviton et al., 1992; Šmíd et al., 2014) and Iranian (e.g., Latifi, 1984, 1991; Balouch & Kami, 1995; Firouz, 2000; Rajabizadeh, 2009; Kamali, 2013; Safaei Mahroo et al., 2015) herpetologists. Based on our observations during this study and the next few years after that (until 2015), it seems that frequent droughts, high evaporation, mining activities, vegetation loss, overgrazing, and other environmental pressures lead to low abundances and random distributions of lizards (NDWMC, 2014; Akbari, 2015; Ashraf Vaghefi et al., 2019; Emadodin et al., 2019, Akbary & Sayad, 2021). The purpose of this research was to determine the lizard fauna within two important protected areas in Central Iran. We hypothesized that Darreh-Anjir Wildlife Refuge and Kuh-e Bafq Protected Area have high richness and diversity in lizard fauna related to other protected areas in Central Iran (e.g., 13 species from northwestern Yazd Province (Ebrahimipour et al., 2016); 23 species from the entire Qom Province (Kazemi et al., 2015); five species from Nazmabad, Markazi Province (Sabaghzadeh & Mashayekhi, 2015); seven species from Sefid Kouh No-Hunting Area, Semnan Province (Soleiman-Fallah et al., 2018); 15 species from Maranjab Desert, Isfahan Province (Gharzi et al., 2020); 17 species from Damghan County, Semnan Province (Hojati et al., 2006).

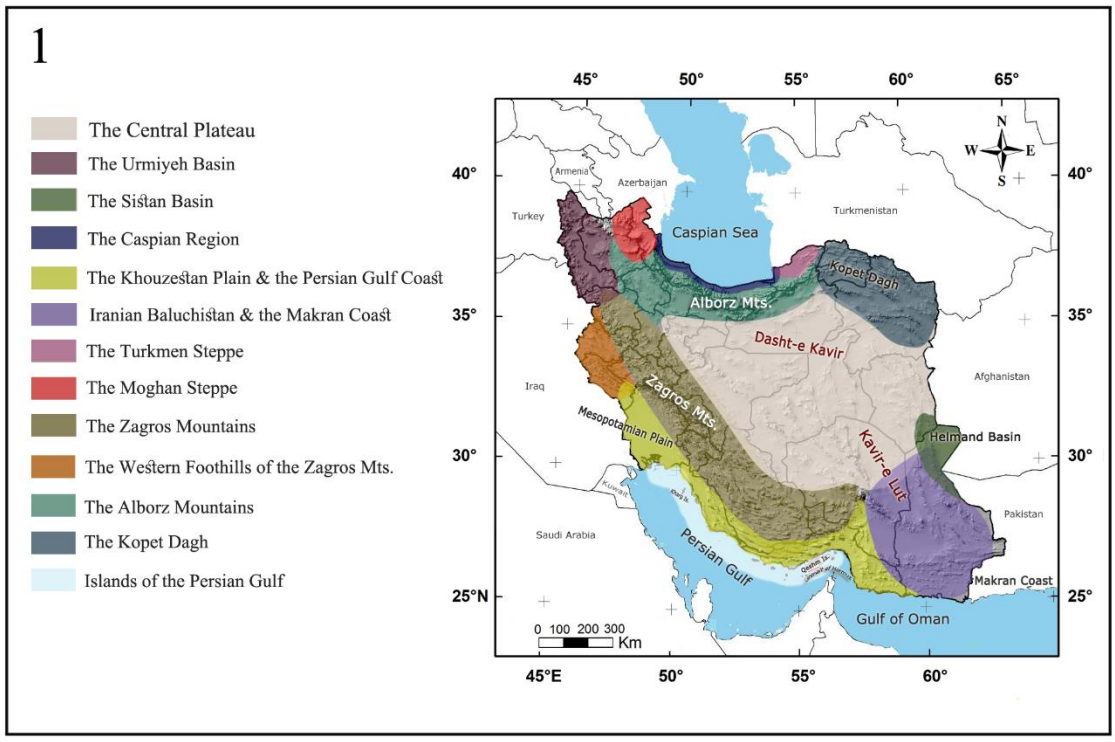

Figure 1. 13 physiographic regions of Iranian lizard fauna according to Anderson (1999).

Material and methods

The fieldwork was carried out in the spring, summer, and autumn of 2012 and 2013, during the activity months of reptiles based on temperature. In order to find both diurnal and nocturnal species, surveys were conducted during the daytime and at night. mostly after sunrise from 9 A.M. until 12 P.M. for diurnal species, and then, from 5 P.M. until 11 P.M. for both diurnal and nocturnal species) in two distinct protected areas. The temperature is a key factor for wildlife activity in Central Iran especially among the reptiles because the harsh temperature during summer and winter role as a limitation, which leads some species to aestivation during the hot days of summer and hibernation in the winter season. The optimum temperature range for the activity of lizards in the study areas is between 22°C to 34°C. Various habitats were selected in each study area for investigation, including steppes, hills, mountains, rangelands, sand dunes, and rocky deserts. Both study areas were located in the eastern half of Yazd Province. Kuh-e Bafq Protected Area is located between 31.306111° and 31.757222° N, 55.473611° and 55.924444° E, has a total area of 88,528 ha, with an elevation between 1,060 to 2,860 m above sea level (a.s.l.), mean annual precipitation of 70 mm, the average annual temperature of 16°C, and an arid and hyper-arid climate (Pourchitsaz, 2009). This protected area is among the best habitats for the Persian leopard (*Panthera pardus saxicolor*) in Iran which is hosting a considerable population. Darreh-Anjir Wildlife Refuge, is located between 32.180556° and 32.616111° N, 54.814167° and 55.546944° E, is 175,302 ha in area, with an elevation range of 200 to 850 m a.s.l., mean annual precipitation of 74 mm, the average temperature of 15.5°C, and a temperature hyper-arid climate (Fig. 2). This protected area was among the best habitats of the Asiatic cheetah (*Acinonyx jubatus venaticus*) in Iran, which, unfortunately, that population is now on the edge of extinction. Vegetation types of these two areas are varied in different habitats, ranging from scattered vegetation in both areas to dense rangelands and wild Cypress trees in the highlands in Kuh-e Bafq P. A. The predominant vegetation in Bafq is *Artemisia-Zygophyllum* on the steppes and plains and *Amygdalus-Pistacia-Juniperus* in the highlands; compared to Kuh-e Bafq P. A., Darreh-Anjir does not have a rich phytodiversity; the dominant vegetation of that is *Artemisia-Zygophyllum* (Mozafarian, 2000; Pourchitsaz, 2009; Entekhabi, 2010; Irannejad Parizi, 2012). The survey was carried out from March 2012 to June 2013, during the activity months of reptiles in Yazd Province (April to July and September to October). Most specimens were captured by pinning the neck with 30 cm forceps or by hand. Identifications were made according to the well-known publication of Anderson (1999) and the recent publication of Nasrabadi et al. (2017), based on an examination of meristic and morphometric characters. Biometric characters such as Snout-vent length (SVL) were measured by a caliper accurate to 0.02 mm.

Subsequently, each specimen was photographed (all by the senior author, except Figures 5B and 15B which were taken by Mr. Amir Ali Afshar-Jam and Mr. Rambod Rabiei, respectively) and then released at the collecting point. The permission for this study was issued by the Department of Environment of Yazd Province from spring 2012 to autumn 2013 (Permission Number: 13910117, March 2012). Locality data and habitat features were recorded for all specimens. The vegetation of the region in relation to the lizard fauna was determined by direct observation. In order to better understand and investigate the literature related to the study area, we reviewed other similar studies, especially those related to neighboring provinces (Latifi, 1984; Shcherbak & Golubev, 1996; Ahmadzadeh et al., 2008; Sindaco & Jeremčencko, 2008; Fathinia et al., 2009, 2010; Ramezani et al., 2011; Gholamifard et al., 2012); to predict what species could be present at both localities, and also, owing to time constraints, we preferred to follow the classic method, ordinarily used in faunistic studies, similar to Fathinia et al. (2009). We used Šmíd et al. (2014), Mozaffari et al. (2016), and some other studies as references for distribution records and global distributions. The taxonomic status of each species is in accordance with the Reptile Database (Uetz et al., 2022). All the maps were created by ArcGIS (Ver. 9.3), and the topology profile (Fig. 18) is a simulation according to the natural environment drawn by Photoshop CS5.

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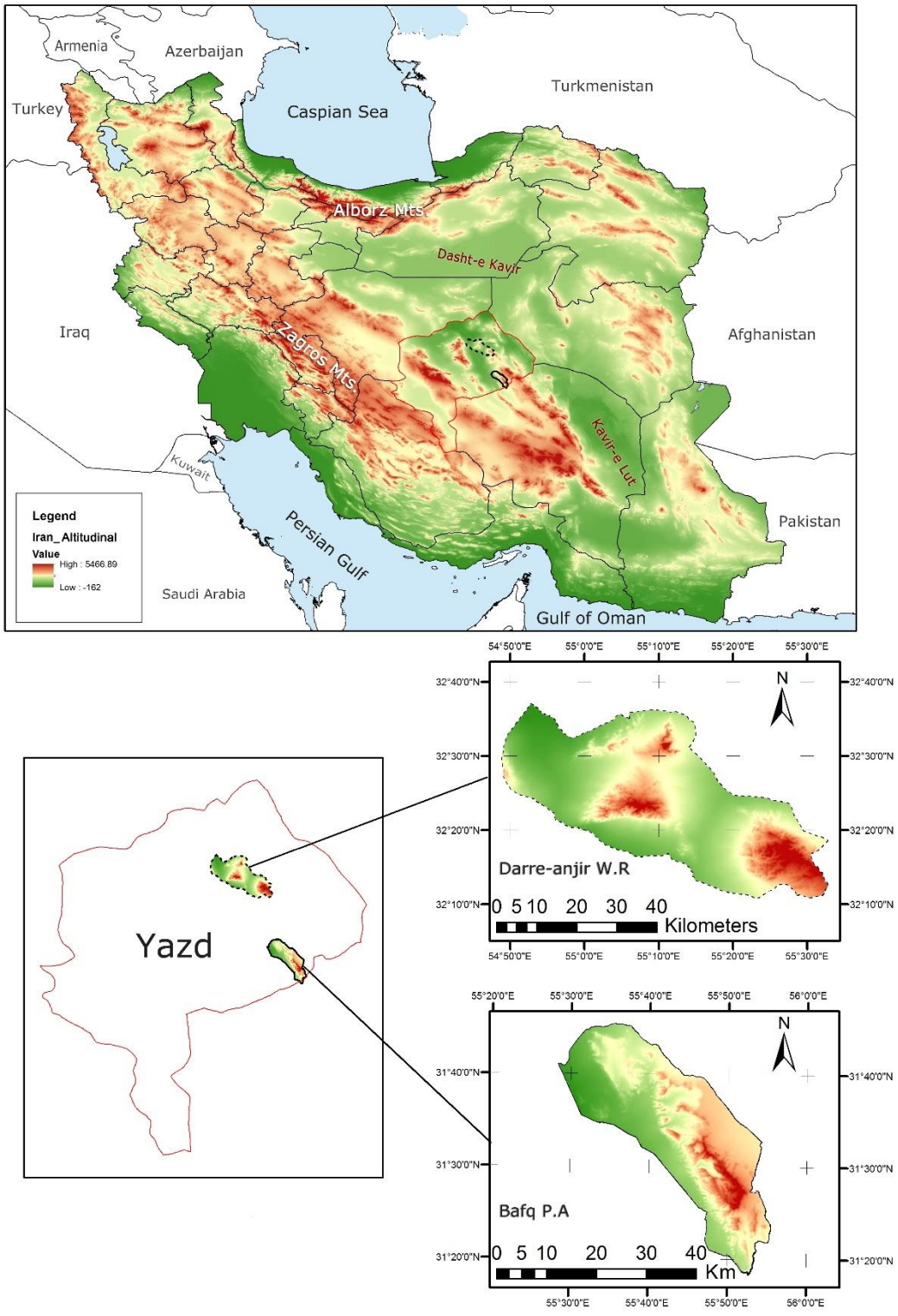

Figure 2. Yazd Province (down left), and position of study areas: Darreh-Anjir Wildlife Refuge (up right, dotted line border), and Kuh-e Bafq Protected Area (down right).

Results

A total number of 55 specimens were examined from Kuhe-Bafq Protected Area, Darreh-Anjir Wildlife Refuge, and the neighboring areas from March 2012 to June 2013, belonging to 16 species, 14 genera, and six families. The Snout-Vent Lengths given here are for the largest recorded specimen of each species.

List of Species

Order Squamata Oppel, 1811

Suborder Sauria Mccarthney, 1822

Family Agamidae Spix, 1825

Genus *Laudakia* **Gray, 1845**

Laudakia nupta (De Filippi, 1843): (Fig. 2A, 2B)

A large-sized lizard with heterogeneous dorsal scales in diagonal longitudinal series in the middle and highly enlarged in 16-22 rows; a prominent transverse fold across the nape; each tail segment consists of more than two whorls and the tail is about 2x SVL, bright yellow to pale grey with few crossbars proximally and brown to black distally (Anderson, 1999).

Two males and one female individual were observed at elevations < 1,400 to 2,100 m a.s.l. SVL 124.4 mm for female. The habitats of this species vary from rocky areas and boulders with crevices to ruined structures and near human dwellings in both areas. The vegetation, mainly consisted of *Artemisia* sp., *Zygophyllum* sp., *Amygdalus scoparia*, *Astragalus* spp. and *Acanthophyllum* sp. in the locations where specimens were observed. It appears that the type of substrate is more important for this species than the vegetation type, because during our surveys all of the specimens were found on rocks or stony substrates with diverse plant species.

Global distribution: “E Iraq, S and C Iran, Afghanistan and Pakistan.” (Kamali, 2013).

Distribution in Iran: “Along the Zagros eastwards continuously to the Pakistan border; very common particularly in the western Zagros foothills. Isolated records from Semnan and Khorasan Razavi Provinces.” (Kamali, 2013).

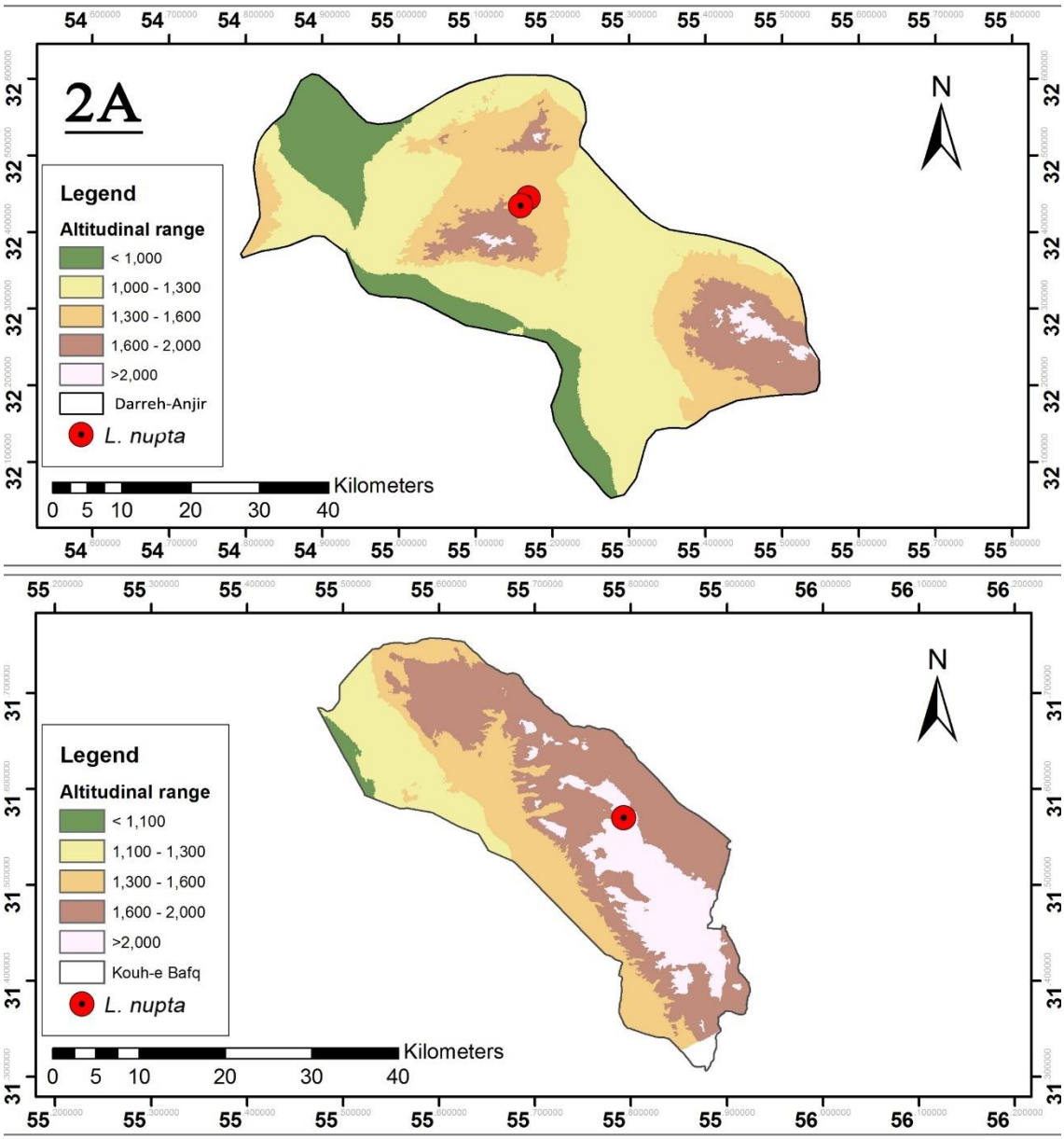

Figure 2A. Presence points of *Laudakia nupta*.

Figure 2B. *L. nupta* in Bafq P. A.

Genus *Phrynocephalus* **Kaup, 1825**

Phrynocephalus maculatus Anderson, 1872: (Fig. 3A, 3B)

An average-sized agama with round and toad-like head; usually four or five lateral rows of scales above supralabials at the anterior edge of eye; less than 1/3 of the tail at the tip is black or not; dorsal coloration is creamy to pale yellow. Mainly found on sandy substrates.

Three males and three females were observed at elevations < 900 to < 1,100 m a.s.l. SVL 67.1 mm for male, and 66.4 mm for female. Two specimens were found outside the borders of Darreh-Anjir W. R. This species prefers sandy habitats and sometimes found on sandy-gravel areas. The vegetation at the localities consisted of *Calligonum* sp., *Hammada salicornica*, *Seidlitzia rosmarinus* and *Haloxylon persicum*.

Global distribution: Iran (Ebrahimipour, 2021)

Distribution in Iran: “Most of the central plateau to elevations up to 3,000 m a.s.l.”

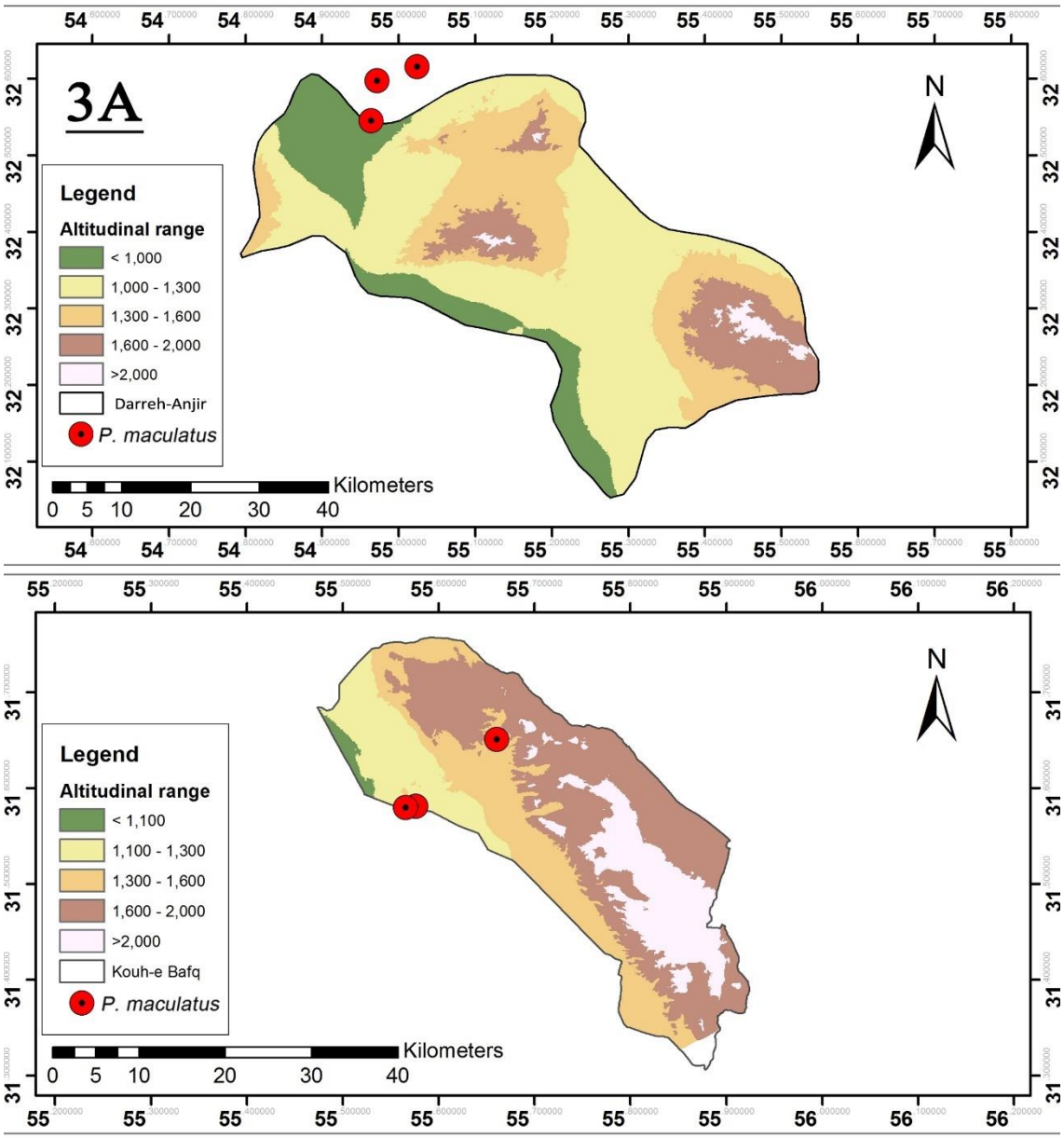

Figure 3A. Presence points of *Phrynocephalus maculatus*.

Figure 3B. *P. maculatus* in Darreh-Anjir W. R.

Phrynocephalus scutellatus (Olivier, 1807): (Fig. 4A, 4B)

A small-sized lizard with a rounded toad-like head, dorsal coloration is a mixture of grey and pale orange. Ventral coloration is white and the tail has intense black crossbars, crossbars always present ventrally. This species exhibits perfect camouflage with the substrate, which is mainly colorful gravel.

One male and two females were collected at elevations > 1,400 to 1,800 m a.s.l. SVL 45.2 mm for an adult male and 48.6 mm for one adult female. The habitats of this species are open steppes, desert watercourses, and deserts with colorful gravel substrate. It seems that the type of soil and substrate is more important than the vegetation type for this species because of the camouflage and coloration pattern. Generally, the vegetation consisted of *Artemisia sieberi*, *Zygophyllum eurypterum*, *Alhagi* sp. and sometimes psammophyte species such as *Pteropyrum* sp. and *Atrophaxis* sp.

Global distribution: “Iran, Afghanistan and Pakistan up to the Makran and Sulaiman Mountain ranges.”

Distribution in Iran: “Widely distributed all over the central Iranian Plateau but not crossing the Zagros in the west and the Alborz in the north.”

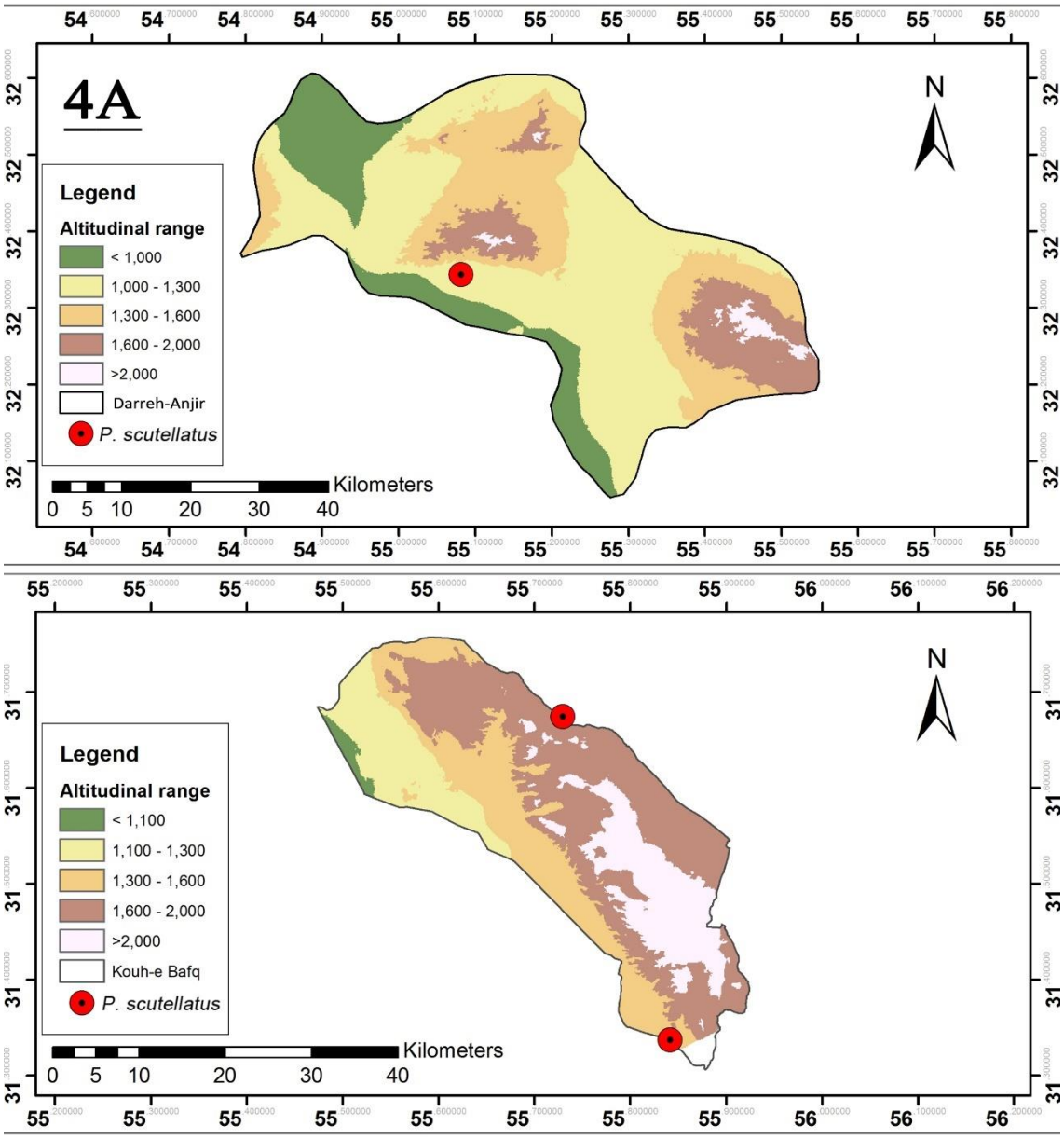

Figure 4A. Presence points of *Phrynocephalus scutellatus*.

Figure 4B. *P. scutellatus* in Darreh-Anjir W. R.

Genus *Saara* Gray, 1845

Saara asmussi (Strauch, 1863): (Fig. 5A, 5B)

A large and broad lizard with spiny grey tail; 7-10 scales in a transverse row on the dorsal surface of the tail base; dorsal coloration is typically orange to grey. Generally found near its burrow, which is about one meter deep.

Two female specimens were observed, both in Darreh-Anjir at elevation > 1,400 m a.s.l. SVL 216 mm for one female carcass which was found near Moghestan road. The typic habitat was well-vegetated soft substrates with gravel. The predominant vegetation consisted of halophyte plants.

Global distribution: “Iran, Afghanistan, Pakistan.”

Distribution in Iran: “From central Iran S of Tehran eastwards and southwards through the deserts to South Khorasan and Sistan and Baluchistan Provinces.”

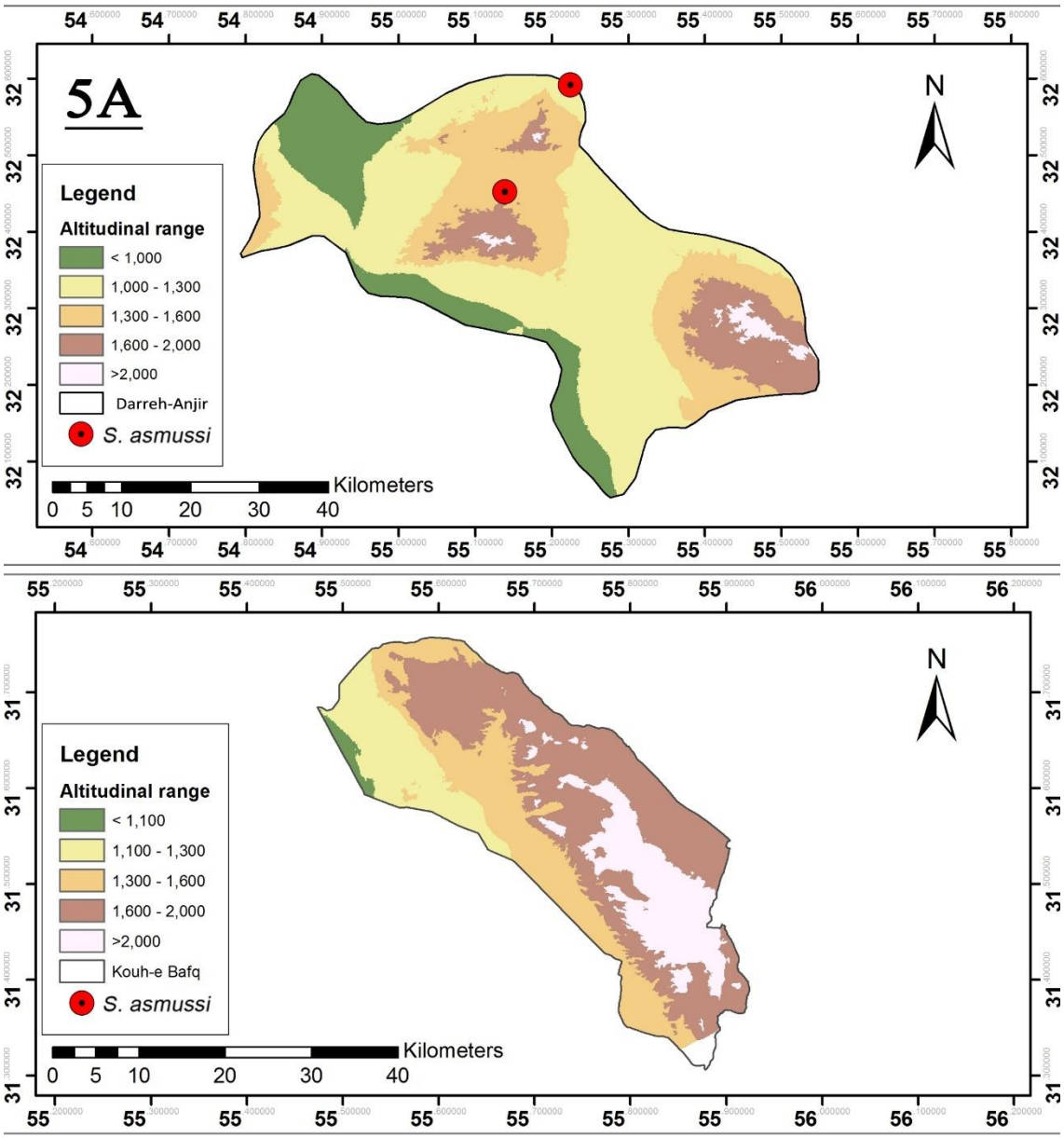

Figure 5A. Presence points of *Saara asmussi*.

Figure 5B. *S. asmussi* in Darreh-Anjir W. R.

Genus *Trapelus* **Cuvier, 1816**

Trapelus agilis (Olivier, 1807): (Fig. 6A, 6B)

An average-sized agama with homogeneous dorsal scales, large dorsal scales grading into progressively smaller flank scales with no larger scales among them; caudal scales arranged diagonally; males blue and females orange in background color at high temperatures and therefore the color is related to temperature (Kamali, 2013).

Three males and one female specimen were observed at elevations 1,700 to 2,000 m a.s.l. SVL 93.7 mm for the largest adult male. The habitats were open steppes, vegetated and rocky deserts. The main vegetation type consisted of *Artemisia* spp., *Zygophyllum eurypterum*, *Peteropyrum* sp. and *Acanthophyllum* sp. One female was observed hiding under a bush of *Artemisia* sp., between two hills on the soft soil.

Global distribution: “Iraq, Iran, Turkmenistan, Afghanistan, Pakistan and NW India.

Distribution in Iran: “Across all Iran except the NW part of the Zagros.”

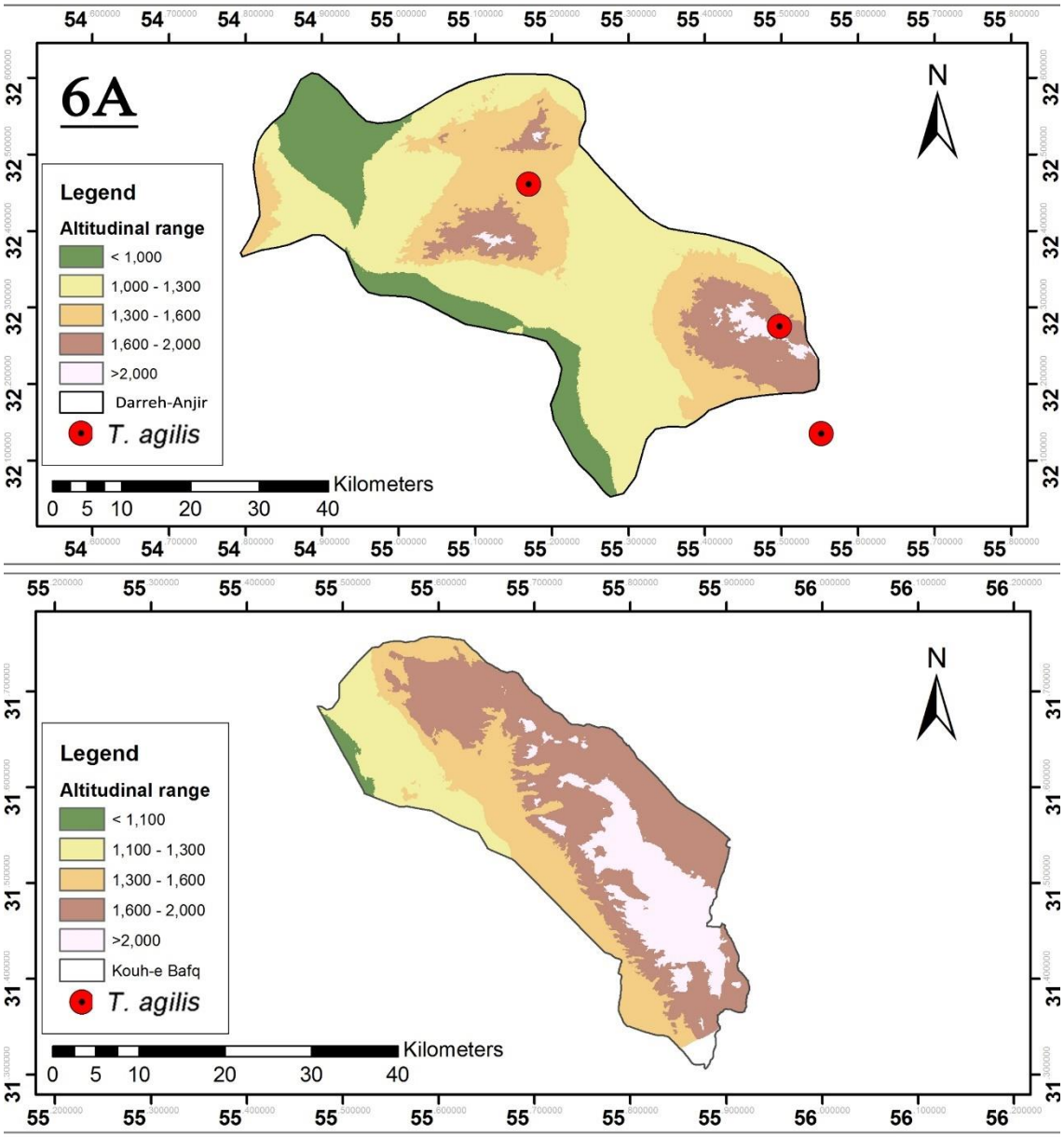

Figure 6A. Presence points of *Trapelus agilis*.

Figure 6B. *T. agilis* in Darreh-Anjir W. R.

Family Gekkonidae Gray, 1825

Genus *Agamura* **Blanford, 1874**

Agamura persica (Duméril, 1856): (Fig. 7A, 7B)

A mid-sized gecko with distinctive tuberculate dorsum; tail slender, cylindrical, almost uniform diameter from base to tip, subcaudal scales smooth and convex, with no mucronate tubercles or annuli; light greyish tan above with five distinct darker brown dorsal crossbars, first on the nape, fifth on the sacrum, 9-10 on the tail. Mainly found on rocks beside watercourses or alluvium plains.

Four male and four female specimens were observed at elevations 1,350 to < 1,900 m a.s.l. All the males were found at night and all females were observed during daylight in both areas. SVL 58.8 mm for one adult male and 70.0 mm for female. Their habitats include steppes, rocky deserts, rocky foothills, or even rocky valleys and dry waterways. The vegetation of the habitats of this species in Darreh-Anjir consisted of *Atraphaxis* sp., *Artemisia sieberi*., *Zygophyllum fabago*, *Amygdalus scoparia*, and in Bafq were mainly *Dorema ammoniacum*, *Ferula assa-foetida*, *Artemisia aucheri*, *Zygophyllum eurypterum, Teucrium pollium* and *Astragalus* spp.

Global distribution: Iran (Yousefkhani et al., 2017; 2018; 2019)

Distribution in Iran: “Throughout most of the Iranian Plateau W of the Zagros and S of the Alborz

and Kopet Dagh; absent from the central desert system."

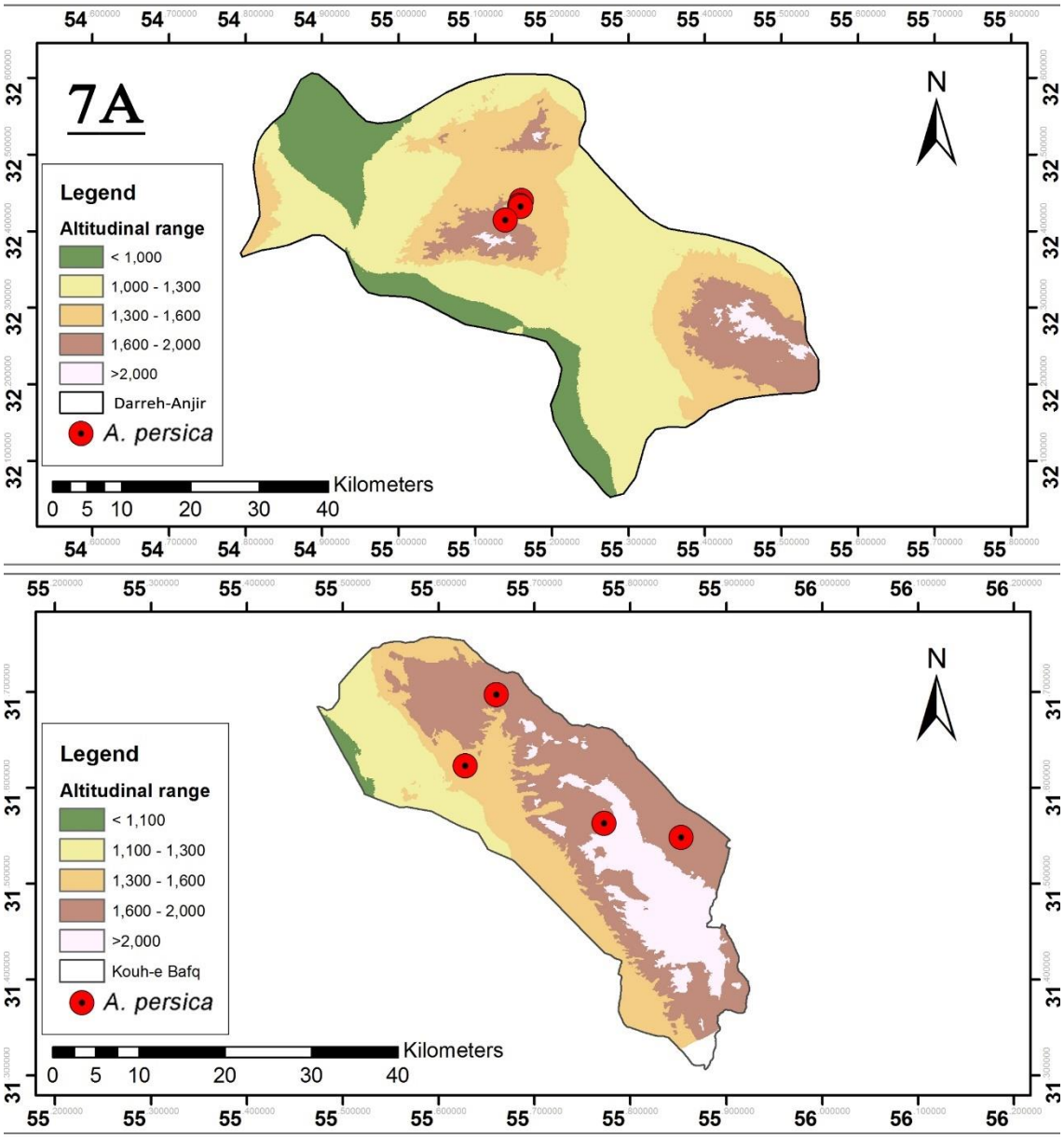

Figure 7A. Presence points of *Agamura persica*.

Figure 7B. *A. persica* in Darreh-Anjir W. R.

Genus *Bunopus* **Blanford, 1874**

Bunopus crassicauda Nikolsky, 1907: (Fig. 8A, 8B)

A small-sized gecko with tuberculate dorsum, lateral caudal tubercles in each tail segment are in contact along the entire lateral edge; a pair of postmentals in contact behind the pentagonal mental; ventrals smooth; distal three-fourths of the tail with enlarged subcaudal plates. The distinctive difference between this species and *B. tuberculatus* is the presence of postmental scales, which are absent in *B. tuberculatus*.

Three males and one female were found in both areas at elevations < 1,400 to < 1,800 m a.s.l. Three specimens were observed in Darreh-Anjir W. R. and only one in Bafq P. A. We observed one individual on the road and another near the environmental guard station during the night. SVL 42.2 mm for an adult female and 44.0 mm for an adult male, which was observed during the day in a sheepfold at Bafq P. A. In Darreh-Anjir W. R., they were mainly observed near hard calcareous-clay hills with vegetation dominated by *Artemisia sieberi* (Kamali & Mozaffari, 2013). Also, we found *B. tuberculatus* in Kalmand-Bahadoran W. R. which is located outside our study areas, about 220 km West of the Bafq P. A.

Global distribution: “Endemic to Iran.”

Distribution in Iran: “Central Iranian Plateau in the area around Tehran, Qom, Isfahan, Yazd and

Kerman; also, S of the Kopet Dagh."

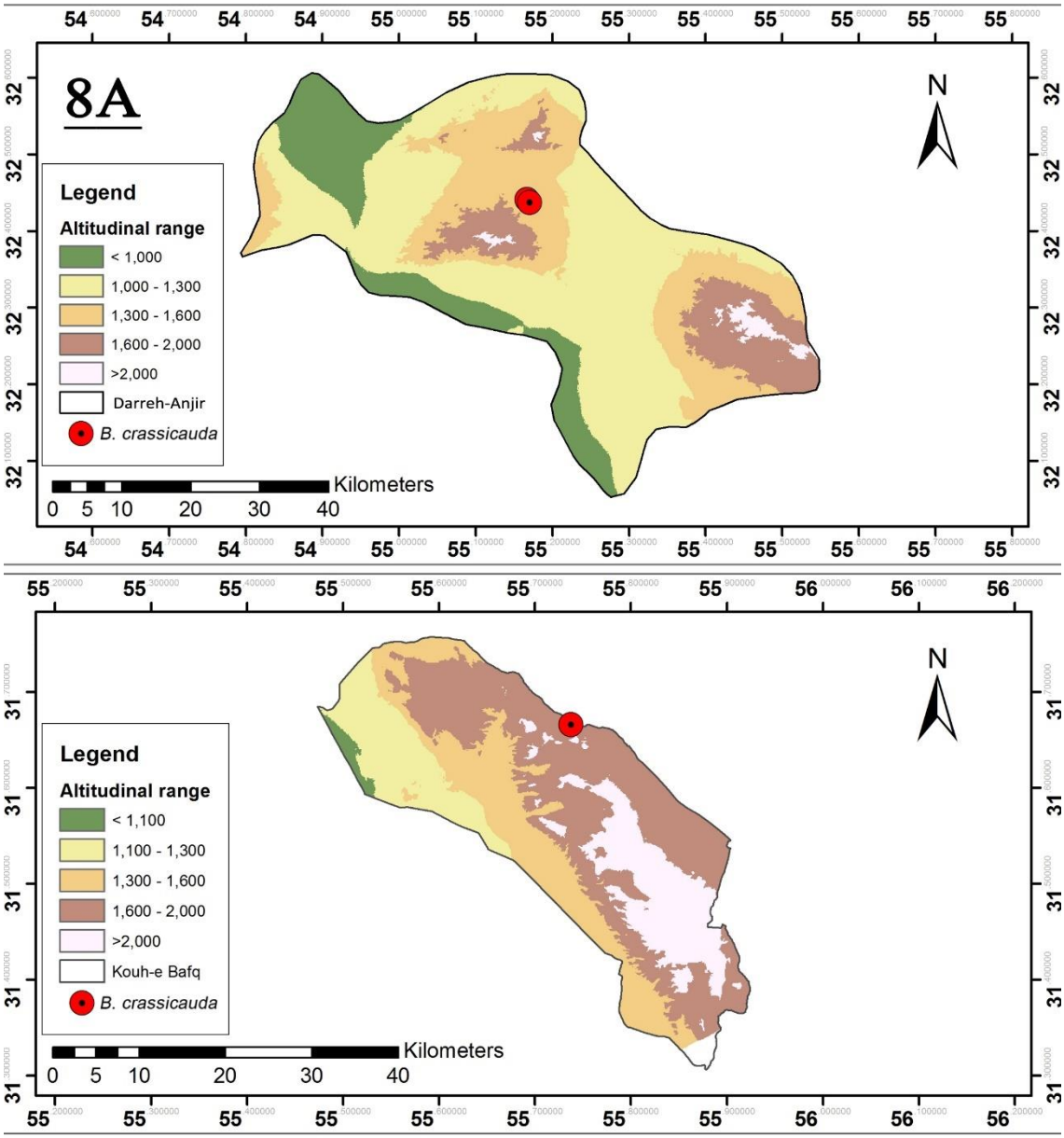

Figure 8A. Presence points of *Bunopus crassicauda*.

Figure 8B. *B. crassicauda* in Darreh-Anjir W. R.

Genus *Cyrtopodion* **Fitzinger, 1843**

Cyrtopodion scabrum (Heyden, 1827): (Fig. 9A, 9B)

A mid-sized gecko; caudal tubercles or enlarged keeled scales forming a terminal ring on each tail segment; a row of narrow subcaudal plates; 12-16 dorsal tubercles in longest transverse series across back; width of dorsal tubercles distinctly smaller than the greatest diameter of ear-opening; 10-14 supralabials; dorsum sand-colored, with brown spots arranged in regular longitudinal series; limbs and tail with narrow dark transverse bars; venter white.

One male and one female were observed at elevation < 1,200 m a.s.l. SVL 40.5 mm for an adult female, on an abandoned building near Patkestan in Bafq and 44.0 mm for an adult male near Darreh-Anjir at the Chadormaloo mining facilities. We did not find any specimens outside of human habitations in this study. The vegetation in their habitats was mainly *Alhagi* sp. and *Peganum harmala*.

Global distribution: “West from Egypt along the Red Sea and the Gulf of Aden, Arabian Peninsula, Iraq, Syria, S Turkey, Iran, Afghanistan, Pakistan, NW India.”

Distribution in Iran: “Most of Iran including the Mesopotamian Plain in the west through the Zagros and central Plateau continuously to Afghanistan and Pakistan in the east.”

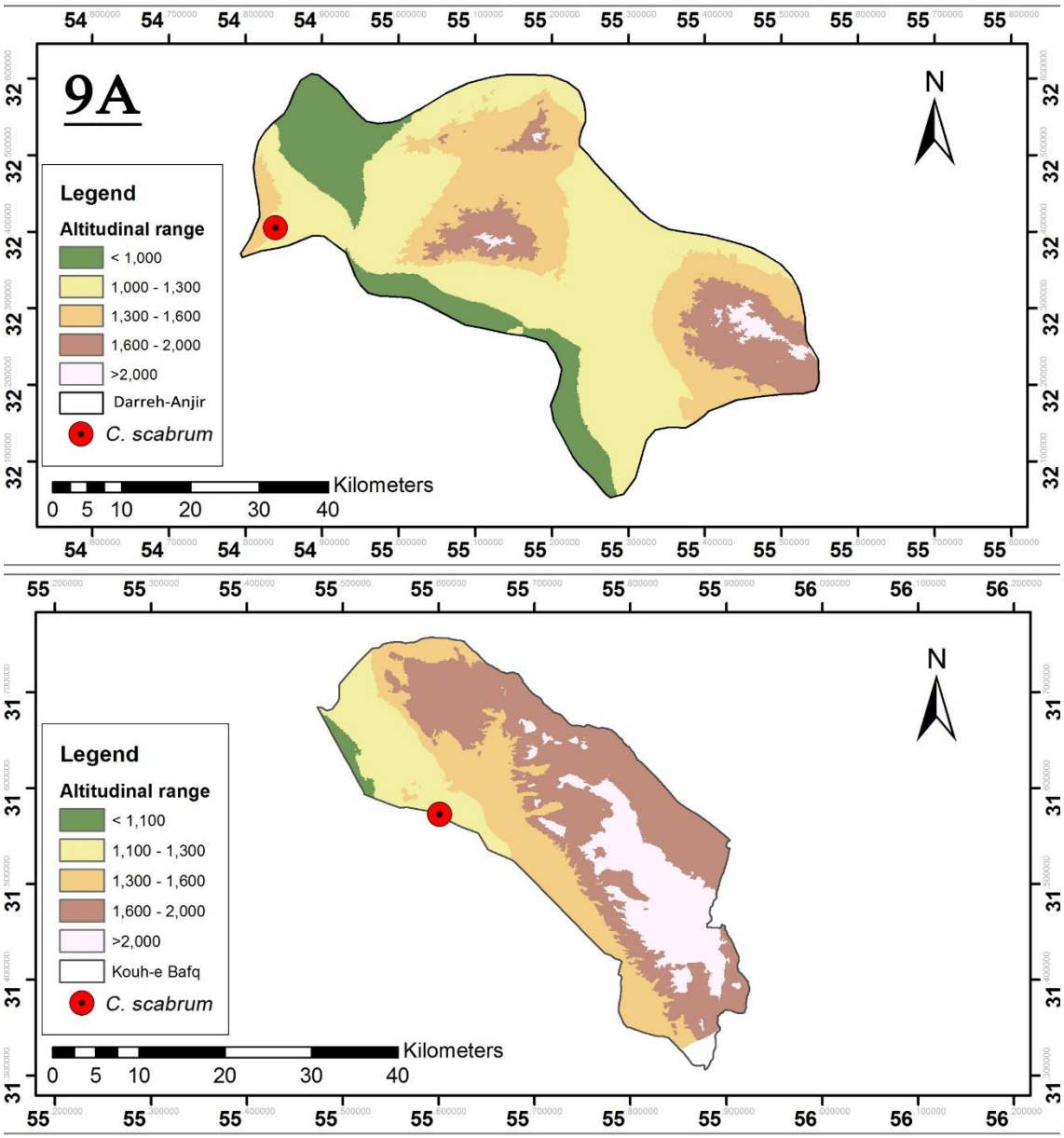

Figure 9A. Presence points of *Cyrtopodion scabrum*.

Figure 9B. *C. scabrum* from Bafq P. A.

Family Lacertidae Bonaparte, 1831

Genus *Eremias* **Fitzinger, 1834**

Eremias fasciata Blanford, 1874: (Fig. 10A, 10B)

A mid-sized lizard, ventral scales are diagonally in longitudinal series; frontal and supraocular scales separated by a complete row of granules; nasal contacts two or three supralabials; dorsum with alternating light and dark lines; 5-8 narrow dark dorsal stripes; dorsal background color is pale yellow and head uniform brown.

Three males and one female specimen were observed at elevations < 900 m a.s.l. It seems Darreh-Anjir W. R. has a more suitable habitat for this species. SVL 59.3 mm for one adult male. All specimens were found at the base of *Hammada salicornica*, *Colligonum* sp., *Atraphaxis* sp. and *Seidlitzia rosmarinus* on a sandy substrate.

Global distribution: “E Iran, Afghanistan, Pakistan.”

Distribution in Iran: “All provinces of the 55° meridian and south of the Kopet Dagh. The record by Mozaffari & Parham (2007) from Isfahan Province.”

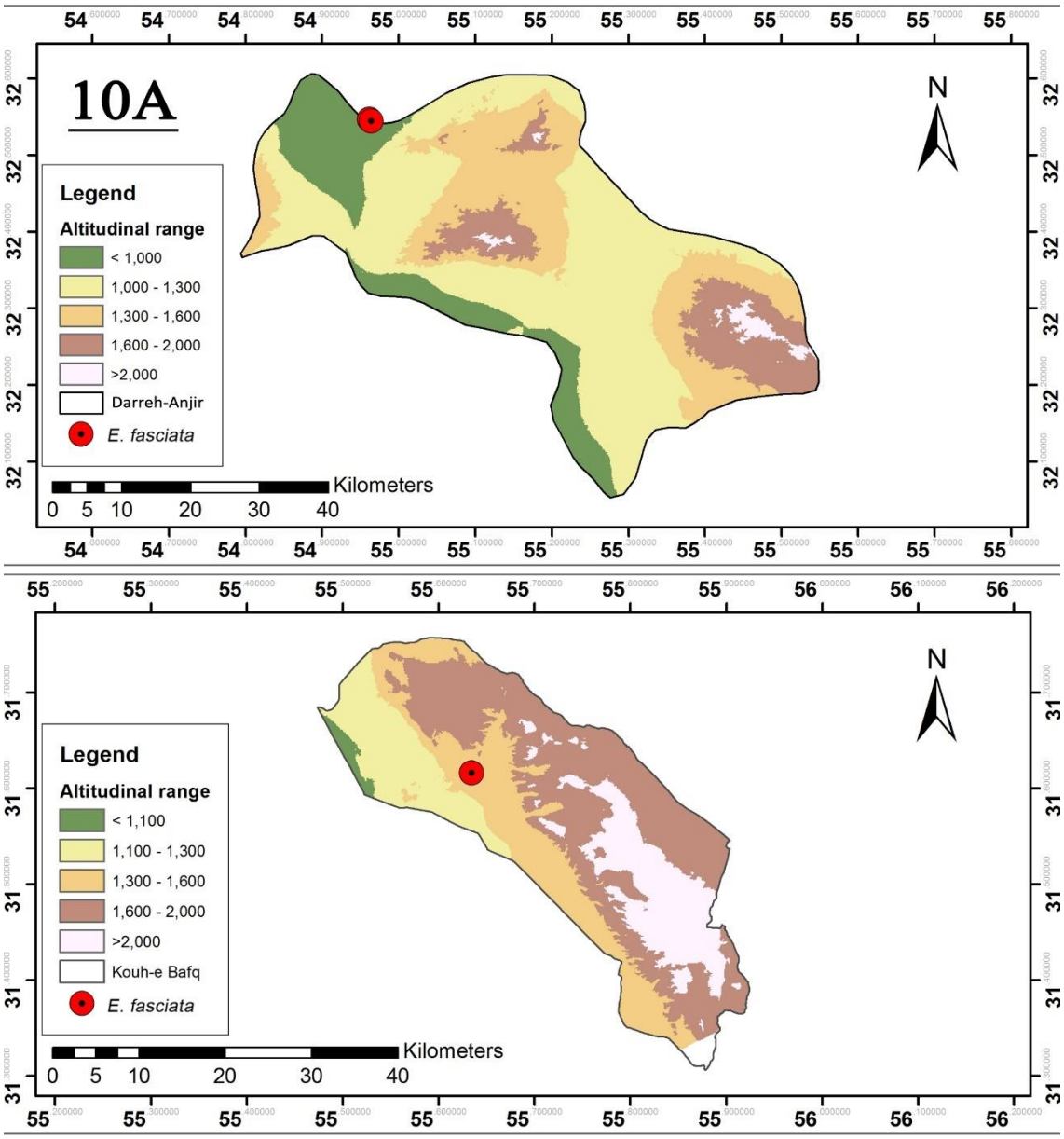

Figure 10A. Presence points of *Eremias fasciata*.

Figure 10B. *E. fasciata* in Darreh-Anjir W. R.

Eremias persica Blanford, 1875: (Fig. 11A, 11B)

Ventral plates in oblique longitudinal series; adults with four more or less distinct rows of dark spots on dorsum between dorsolateral dark stripes, the latter usually with a row of white spots within each stripe.

Three specimens were observed at elevations < 1,700 to < 1,900 m a.s.l., all in Kuh-e Bafq P. A. We were not able to capture any specimens to record the morphometric characteristics but according to Kamali (2013) SVL is 98 mm. The specimens were observed at Lard-e Shytour rangeland with soft soil substrate and vegetation of *Zygophyllum-Artemisia*.

Global Distribution: “S Azerbaijan, Central and Eastern Iran, S Turkmenistan, Afghanistan, and W Pakistan.”

Distribution in Iran: “The whole central plateau south of the Alborz Mts. and including the Zagros. There are no records from the central desert system the Dasht-e Lut and the Dasht-e Kavir which are apparently avoided by this species.”

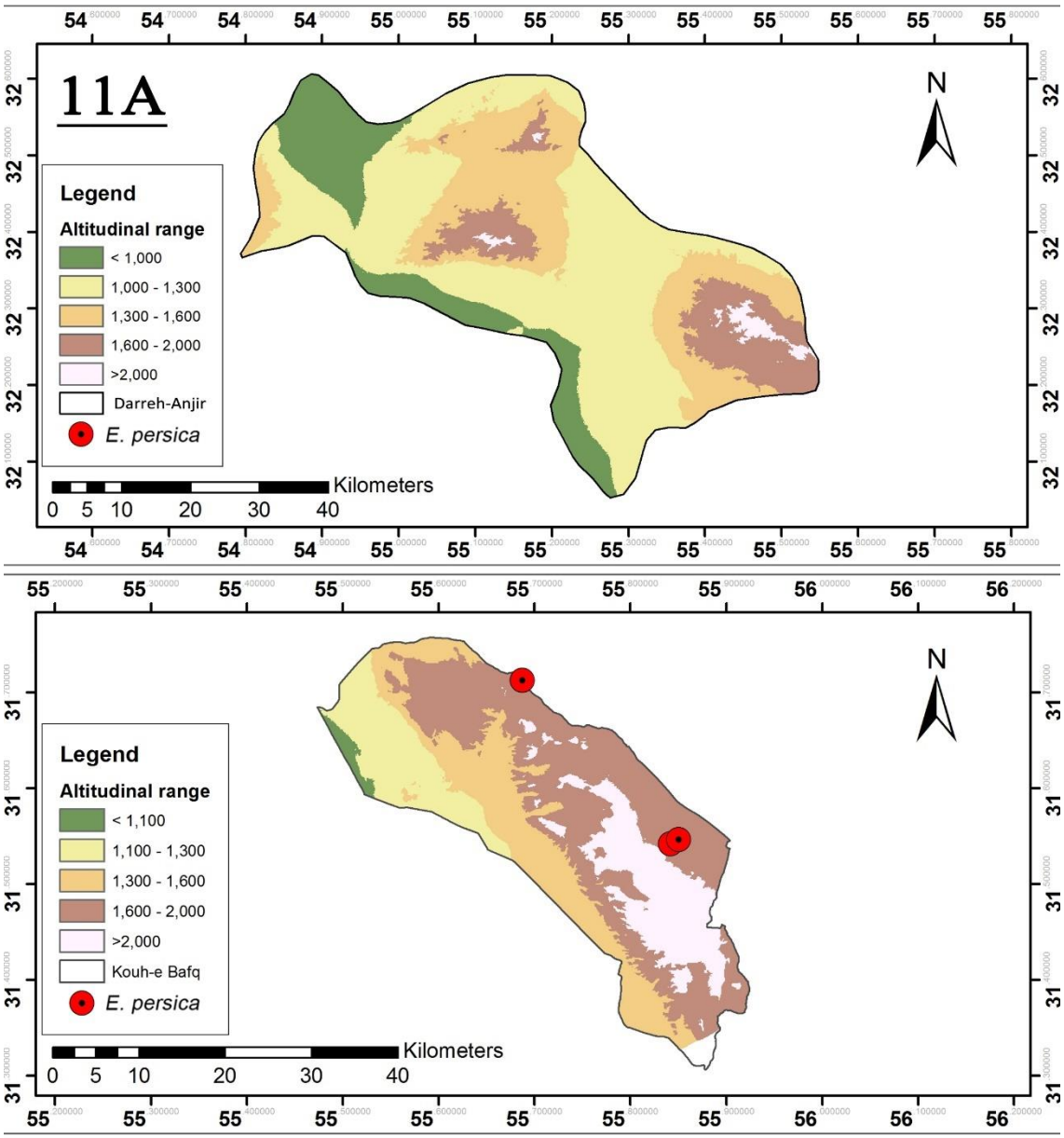

Figure 11A. Presence points of *Eremias persica*.

Figure 11B. *E. persica* in Bafq P. A.

Genus *Mesalina* **Gray, 1838**

Mesalina watsonana (Stoliczka, 1872): (Fig. 12A, 12B)

A mid-sized lizard; ventral plates in 10 straight longitudinal series; three nasals, lower end in contact with rostral and first supralabial; grey or olivaceous above; dorsum with longitudinal series of small white spots, edged or accompanied by black spots, small white spots edged with black on flanks; often light dorsolateral stripe running to the eye.

Three male specimens were found at elevations 1,450 to < 1,940 m a. s. l. SVL 47.0 mm for an adult male. Habitats vary from the rocky deserts with low cover to the steppes with soft and clay-loam soil. The vegetation type mainly consisted of *Artemisia* spp. and *Atraphaxis* sp.; it seems habitat quality is not very important for this species and it could be considered as a generalist lizard. It is noteworthy that this species shares the habitat with *Ophisops elegans*.

Global distribution: “Iran, S Turkmenistan, Afghanistan, Pakistan, NW India.”

Distribution in Iran: “The Mesopotamian Plain west of the Zagros, all of the Iranian plateau S of the Alborz and Kopet Dagh. It avoids the Dasht-e Lut and Dasht-e Kavir deserts.”

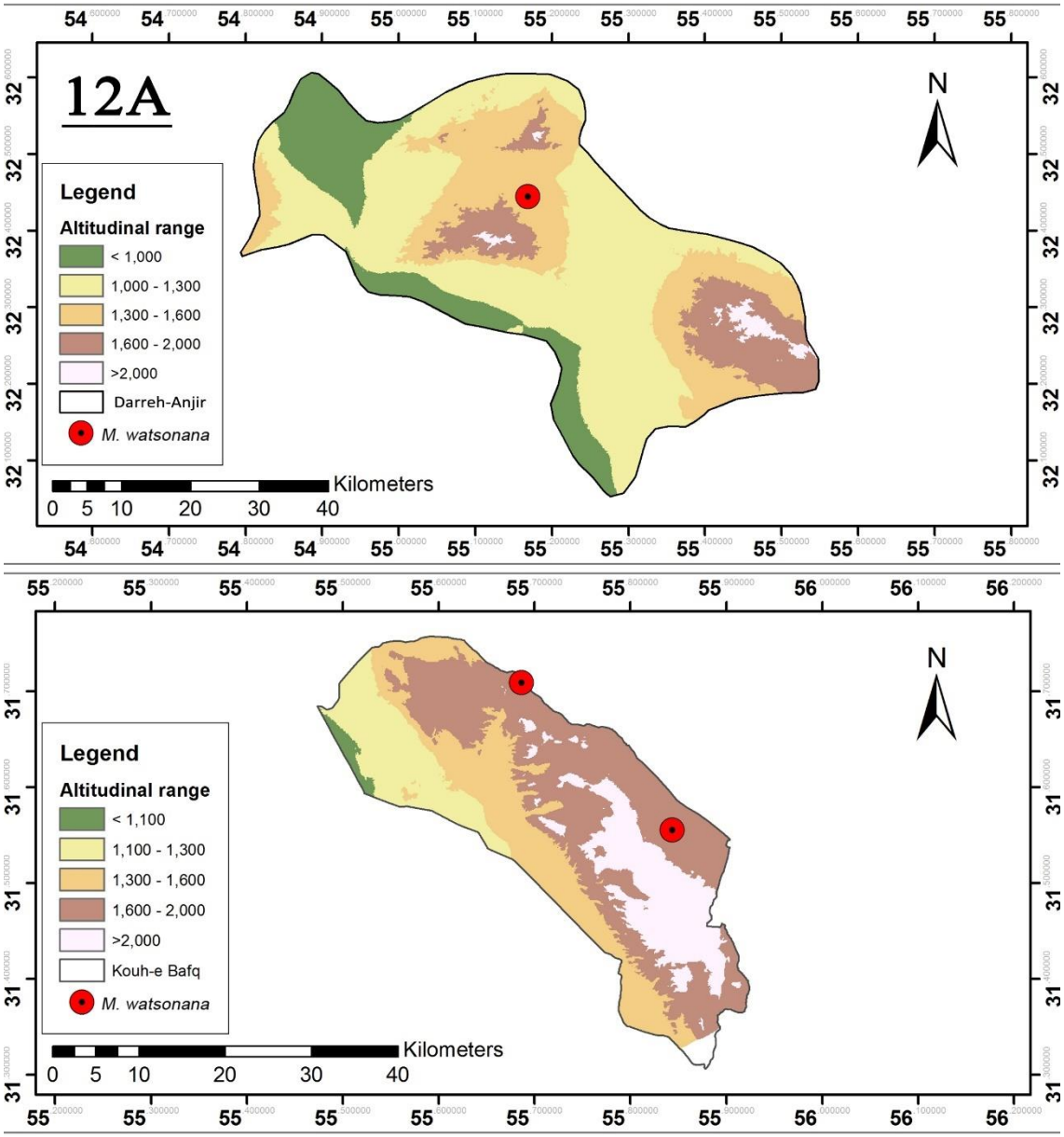

Figure 12A. Presence points of *Mesalina watsonana*.

Figure 12B. *M. watsonana* in Darreh-Anjir W. R.

Genus *Ophisops* **Ménétriés, 1832**

Ophisops elegans Ménétries, 1832: (Fig. 13A, 13B)

A mid-sized lizard with immovable eyelids; collar weakly developed or absent; olive-green or brown above, with two light dorsolateral stripes, upper running from supraciliary margin to tail; lower running from below eye through the ear, along the flank to hind limb; upper margin of dorsolateral stripe spotted with black.

Two females were collected from Bafq at elevations 1,900 to 2,000 m a.s.l. SVL of the larger specimen was 52.7 mm. Habitats were steppes with hard substrate. The vegetation consisted of *Artemisia* spp., *Echinops* sp., *Acantholimon* sp., and *Astragalus* spp. It seems that this species prefers higher elevation with high humidity and cool temperatures.

Global distribution: “SE Balkans, Turkey, Levant, Transcaucasia, Iraq, Iran. An isolated population occurs in N Algeria.”

Distribution in Iran: “Throughout the western and southwestern part of the country along and around the Zagros range, southern Alborz, Mesopotamian Plain, and on the southern Iranian plateau up to the border with Pakistan.”

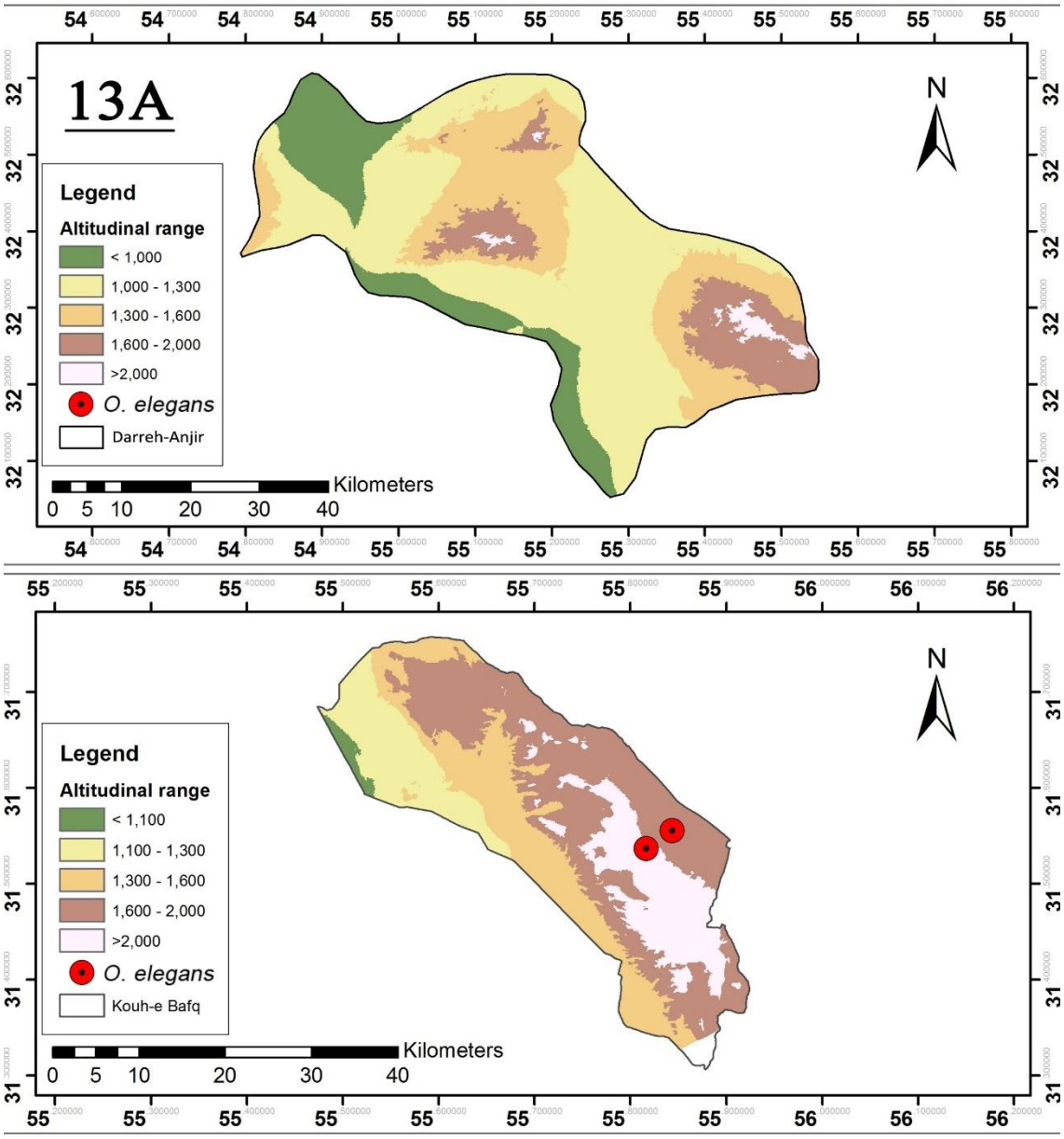

Figure 13A. Presence points of *Ophisops elegans*.

Figure 13B. *O. elegans* in Bafq P. A.

Family Scincidae Oppel, 1811

Genus *Ablepharus* **Fitzinger, 1823**

Ablepharus pannonicus Lichtenstein, 1823: (Fig. 14A, 14B)

A small-sized skink with immovable eyelids, slender body, and separated prefrontals; usually a single frontoparietal; limbs well developed; four longitudinal rows of scales on dorsum; olive or brownish above in preservative, with metallic gloss; dark brown dorsolateral stripe with a whitish edge above; flanks with less distinct dark longitudinal lines.

A large number of specimens were observed in the yard of the Environment Office of Bafq County at an elevation of 1,000 m a.s.l. SVL 31 mm for the largest male specimen. It seems that splits in the trunk and roots of palm trees provide a suitable hiding spot for this species. Actually, we did not find any specimen in the Kuh-e Bafq P. A.; however, because of the similarity of the habitats in western parts of the Kuh-e Bafq P. A. to the yard of the Environment Office, and the short geographical distance of these two locations (about 20 km), we suppose that this species lives in these areas.

Global Distribution: “A discontinuous distribution; beside the main range covering the Mesopotamian Plain, Azerbaijan, Iran, Central Asian Republics, Afghanistan, NW Pakistan, and India there are isolated populations in SW Saudi Arabia, N Yemen, and N Oman.”

Distribution in Iran: “All provinces W of the Zagros, areas along with southern Zagros, Alborz, and Kopet Dagh ranges and SE Iranian provinces (South Khorasan, Kerman, Sistan and Baluchistan). Apparently absent in the central Iranian desert systems.”

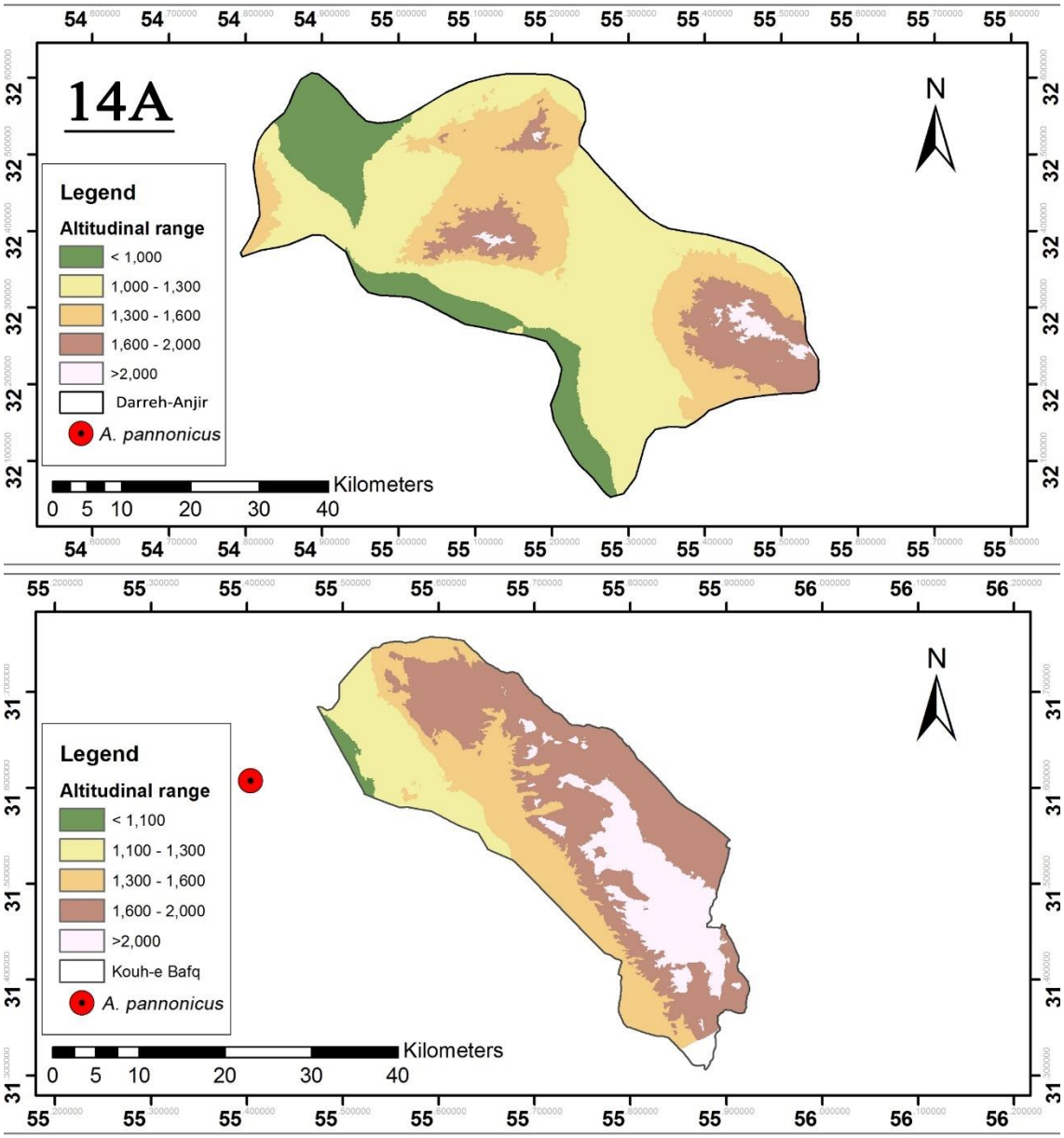

Figure 14A. Presence point of *Ablepharus pannonicus*.

Figure 14B. *A. pannonicus* in the yard of the environment office of Bafq County.

Genus *Eumeces* **Wiegmann, 1834**

Eumeces schneideri princeps (Eichwald, 1839): (Fig. 15A, 15B)

A large-sized skink with two median rows of dorsal scales broader than those on flanks, postnasal shield absent; dorsum with or without orange or red flecks; ear with 3-4 acute lobules; dorsum nearly uniform brownish-grey to lavender, some scattered grey flecks; indistinct, narrow lateral cream line from posterior labials through the ear, along the sides to groin; below this line, color greyish, becoming lighter below; tail lighter above than body; limbs lighter and browner than the body.

Three specimens were observed from Kuh-e Bafq P. A. at elevations 1,330 to 1,600 m a.s.l. We were not able to capture and measure the SVL, but Kamali (2013) stated the SVL of adult specimens to be 165 mm. All specimens were found on the foothills near dry or running springs, on or beneath rocks. The vegetation, mainly consisted of *Amygdalus scoparia* and *Artemisia aucheri*. Also, there is a possibility that *E. persicus* presents in the study area but we did not find any specimen.

Global distribution: Turkey, Levant, Iraq, N Arabian Peninsula, Transcaucasia, Iran, S Turkmenistan, Uzbekistan, Tajikistan, Afghanistan (Faizi et al., 2021).

Distribution in Iran: “Most of western and southern Iran in a continuous belt from West Azerbaijan Prov. along with the Zagros range through Fars Province. Also present in the Alborz and Kopet

Dagh foothills but absent from the deserts in central."

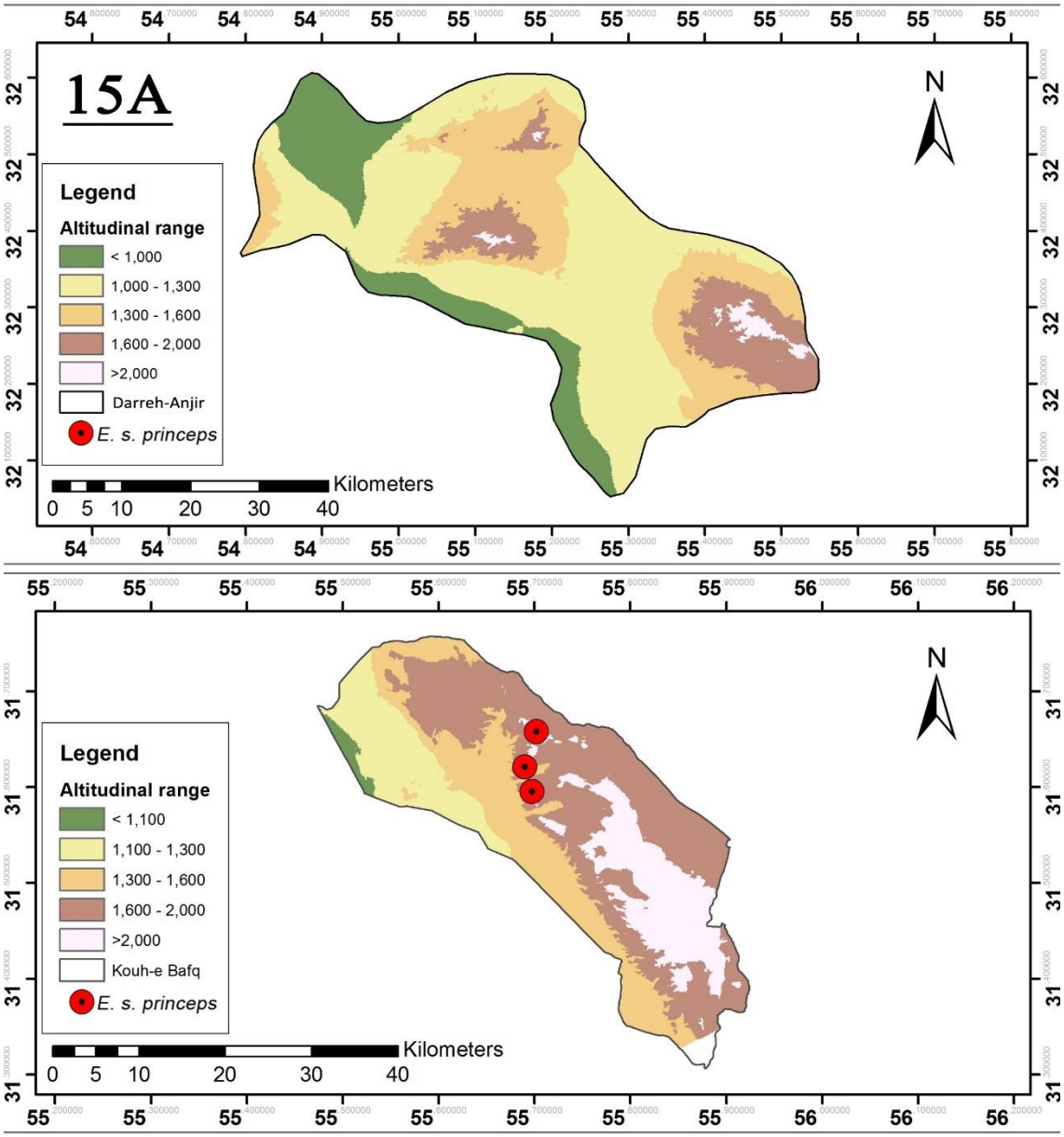

Figure 15A. Presence points of *Eumeces schneideri princeps*.

Figure 15B. *E. s. princeps*.

Family Sphaerodactylidae Underwood, 1945

Genus *Teratoscincus* **Strauch, 1863**

Teratoscincus bedriagai Nikolsky, 1900: (Fig. 16A, 16B)

A medium-sized lizard with small scales on the body and specifically large cycloid dorsal scales not extending forward beyond shoulders; neck covered by small granular scales; ventral scales slightly smaller than or subequal to dorsals; 9-11 supralabials; 9-10 infralabials; dorsum light sandy or cream, head with a brown crescentic mark from eyes onto occiput, dark ventral bars on the snout, below the eye, and on temporal region, back with four or five brown caudally-pointing chevrons, lighter and broken up in adults; tail with two or three brown crossbars.

One specimen of unknown gender was found in Patkestan, near Kuh-e Bafq, at an elevation of 1,250 m a.s.l. The SVL was 68.1 mm. The vegetation was low and consisted of psammophyte plants such as *Colligonum* sp., *Seidlitzia rozmarinus*, and *Haloxylon* sp.

Although we observed some tracks of these lizards in a sandy area near Darreh-Anjir, we cannot confirm the species' presence because the tracks could belong to *T. keyserlingii* or *T. bedriagai*. Rajabizadeh et al. (2009) reported *T. keyserlingii* from Siahkooh National Park, Yazd Province, nevertheless, we found *T. bedriagai* from sandy areas near Shokr mosque, Tabas junction (the road between Saqand and Tabas counties), a short distance from Darreh-Anjir.

Global distribution: "Iran, W Afghanistan."

Distribution in Iran: “Deserts of the central and eastern Iranian Plateau south of the Alborz and Kopet Dagh and along the Afghanistan border.”

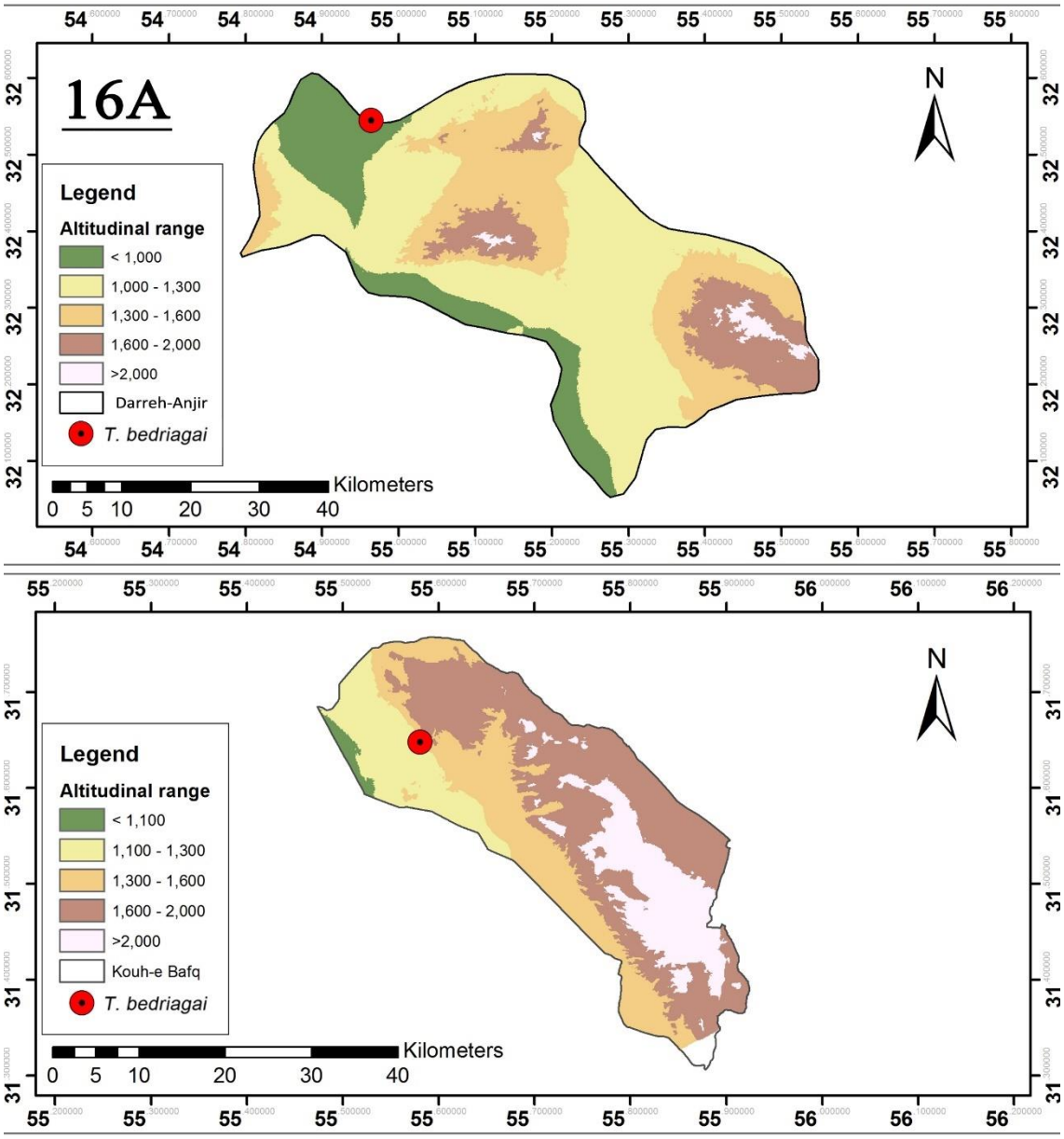

Figure 16A. Presence points of *Teratoscincus bedriagai*.

Figure 16B. *T. bedriagai* in Bafq P. A.

Family Varanidae Gray, 1827

Genus *Varanus* **Merrem, 1820**

Varanus griseus (Daudin, 1803): (Fig. 17A, 17B)

A very large lizard with a tail round in cross-section proximally and compressed distally, with a distinct dorsal keel; dorsum with 5-8 —usually 6- sepia bars in addition to nuchal crossbar; tail with 13-19 dark crossbars, the tip of tail light in color, without a pattern in adults (young specimens may have tail barred throughout length).

Two males and one female were observed at elevations < 1,700 to < 1,900 m a. s. l. SVL of an adult male measured 682 mm. One male specimen was found outside the borders of Darreh-Anjir. The habitats were dry waterways, steppes, sand dunes, and sandy deserts. The vegetation at the localities mainly consisted of *Pteropyrum* sp., *Zygophyllum* sp., *Astragalus* sp. and *Artemisia sieberi*. It appears that Kuh-e Bafq P. A. has a larger population of this species than Darre-Anjir W. R., which is probably related to the greater habitat diversity of Kuh-e Bafq P. A.

Global distribution: “North Africa from Western Sahara to Egypt, eastwards through the Arabian Peninsula and Levant, Iraq and S Turkey to Iran, Pakistan, NW India, Afghanistan, and the Central Asian Republics.”

Distribution in Iran: “Seemingly disjunct distribution caused more probably by a lack of records than by a real hiatus in the range. The western part of the range spans across the Mesopotamian

Plain, Bushehr, Fars, Isfahan, Qom, Tehran, and Westernmost Semnan Prov. There are no available distributional data from about 500 km wide longitudinal belt across the central Iranian Plateau and along the central Persian Gulf coast. The second part of the range stretches along with the Afghanistan and Pakistan border from Sistan and Baluchistan to Khorasan Razavi Province."

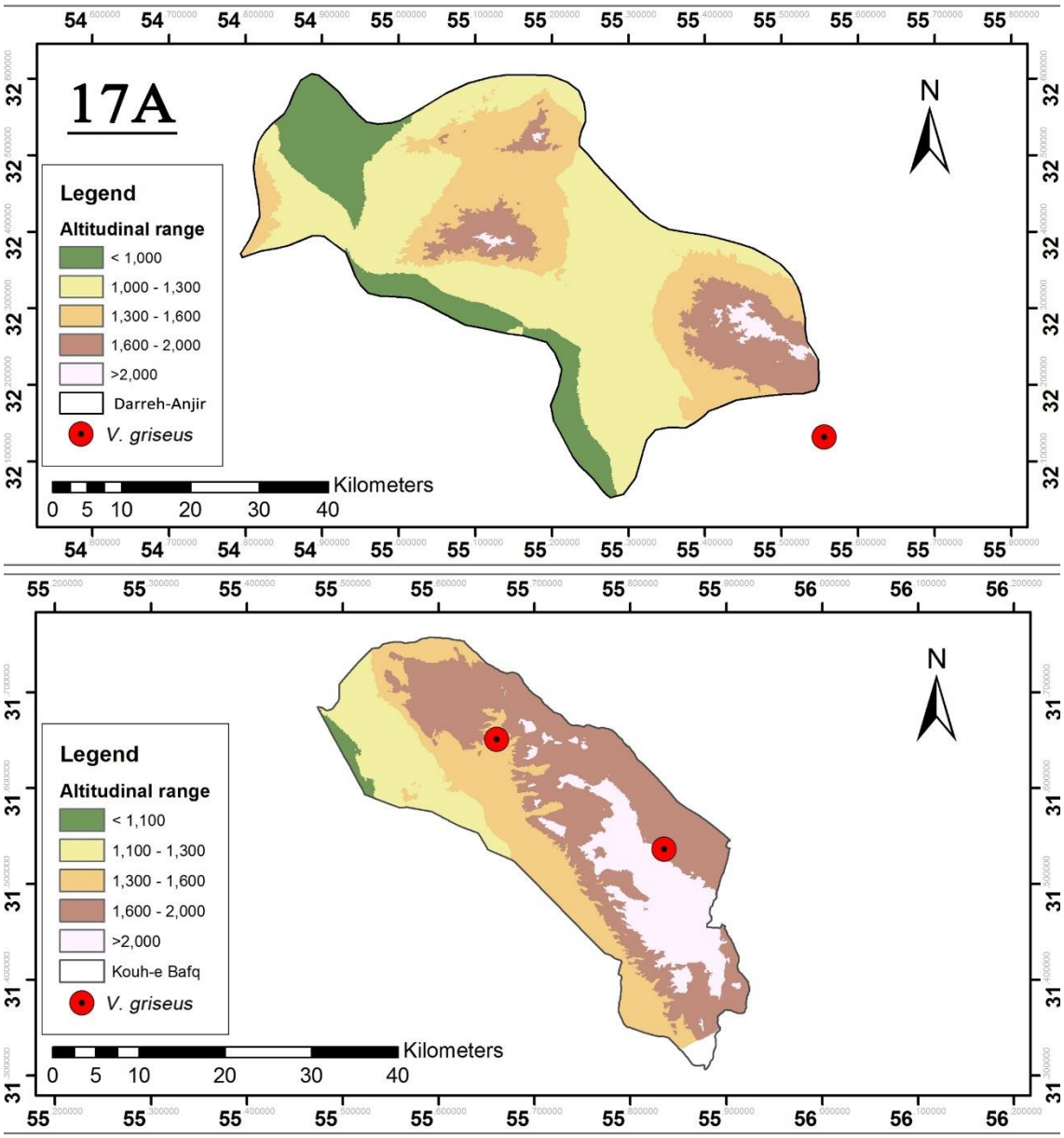

Figure 17A. Presence points of *Varanus griseus*.

Figure 17B. *V. griseus* in Bafq P. A.

Discussion

During our surveys, many environmental limitations were detected, i.e., mining activities, deforestation and chronic drought; although the habitats are extraordinarily diverse and phytodiversity is rich in these two areas (our observations), the number of species was relatively low. Physical disturbance, habitat degradation and destruction, climate change, severe droughts, and overgrazing are among the most threatening factors for wildlife in these areas. Hence, these factors seem to be the most important reasons for this low diversity (specially species evenness).

In comparison with other places in Table 1, Kuh-e Bafq Protected Area (883 km^2) and Darreh-Anjir (1752 km^2) (2,638 km^2 total area), have a high diversity of reptiles in a relatively small area with having 16 species of lizards; the main reason might be the number of different types of habitats and ecosystems within these two areas, particularly in Kuh-e Bafq P. A., which is one of the phytodiversity hotspots in Yazd Province (Ariapour & Asghari, 2012; Mozafarian, 2000). This variation is owing to the different habitats with different altitudinal ranges and microclimates. Plant cover is affected by soil texture alongside the topographic features, which are important variables for substrate-dependent species such as lizards. It could be varied habitats within a small area that support a rich lizard fauna compared to other areas in the Central Plateau. Based on the Anderson's (1999) division on the geography of Iran relative to lizard distribution (Fig. 1), all the species we found in this study are exclusive to the Central Plateau and therefore, there is a minor

influence of other regions like the Zagros mountains or Iranian Baluchistan. Generally, perhaps at the local scale, the discontinuous mountain range of Sahand-Bazman acts as a barrier, isolating the study area from other places such as the Kavir-e Lut desert, Isfahan, and Kerman Provinces. The habitat range of each species with dominant vegetation has been demonstrated in Figure 18 as the profile of topology, vegetation, and species; besides, a graph of richness/altitude has been presented in Figure 19.

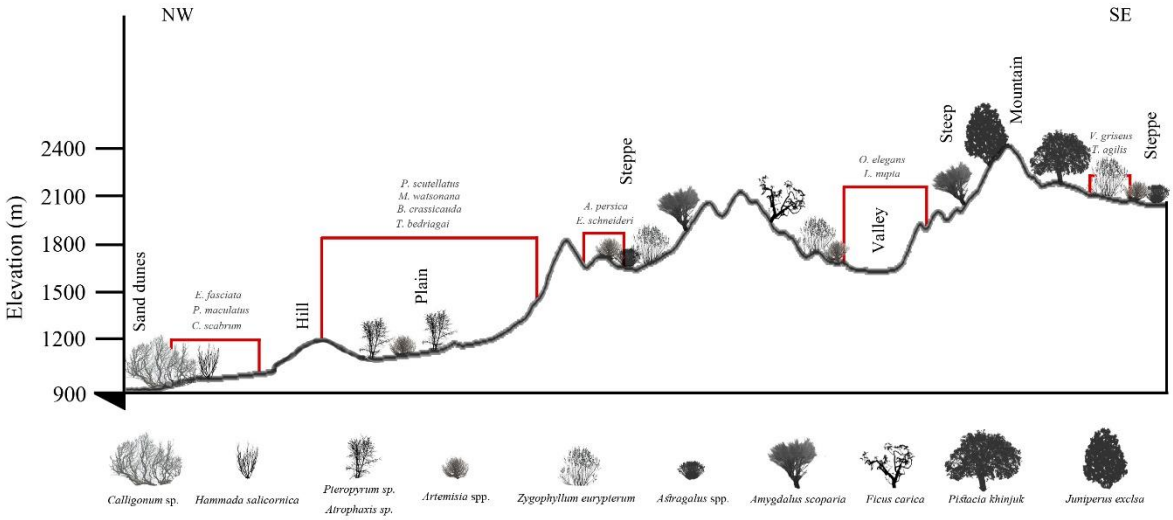

Figure 18. Profile of topology, vegetation and lizard species within the study area (Pourchitsaz, 2009; Irannejad Parizi, 2012).

Table 1. Records of Lizards in Other Similar Places of the Central Plateau.

Location	Number of species	Total area (km^2)	Reference
Semnan Province, Iran	28	97491	Salehi et al., 2010
Qom Province, Iran	23	11340	Kazemi et al., 2015
Damghan County, Semnan Province, Iran	17	12110	Hojjati et al., 2006
Sefid Kouh-Aresk No-Hunting Area, Semnan Province, Iran	7	6660	Soleimanfallah et al., 2018
Arak County, Markazi Province, Iran	19	29127	Eftekharzadeh & Rastegar-Pouyani, 2010
Nazmabad Village, Markazi Province, Iran	6	50	Sabbaghzadeh & Mashayekhi, 2015
Bidoieh Protected Area, Kerman Province, Iran	13	1680	Shafiei et al., 2004
Saadi Protected Area, Kerman Province, Iran	9	883	Shafiei et al., 2021

Ghameshloo Wildlife Refuge and National Park, Isfahan Province, Iran	11	887	Rafiei, 2011
Farah, Herat and Ghor Provinces, Afghanistan (at similar latitude as Central Iran)	20	139,728	Wagner et al., 2016

The high diversity of reptiles in this region can be attributed to the extensive landscapes and habitat diversity of the area. Although Yazd Province has one of the harshest and arid climates and environments in Iran, surprisingly, these two areas have one of the richest lizard fauna in the Central Plateau. The environmental conditions in Darreh-Anjir are harsher than in Bafq, therefore the lizard diversity is less than Bafq.

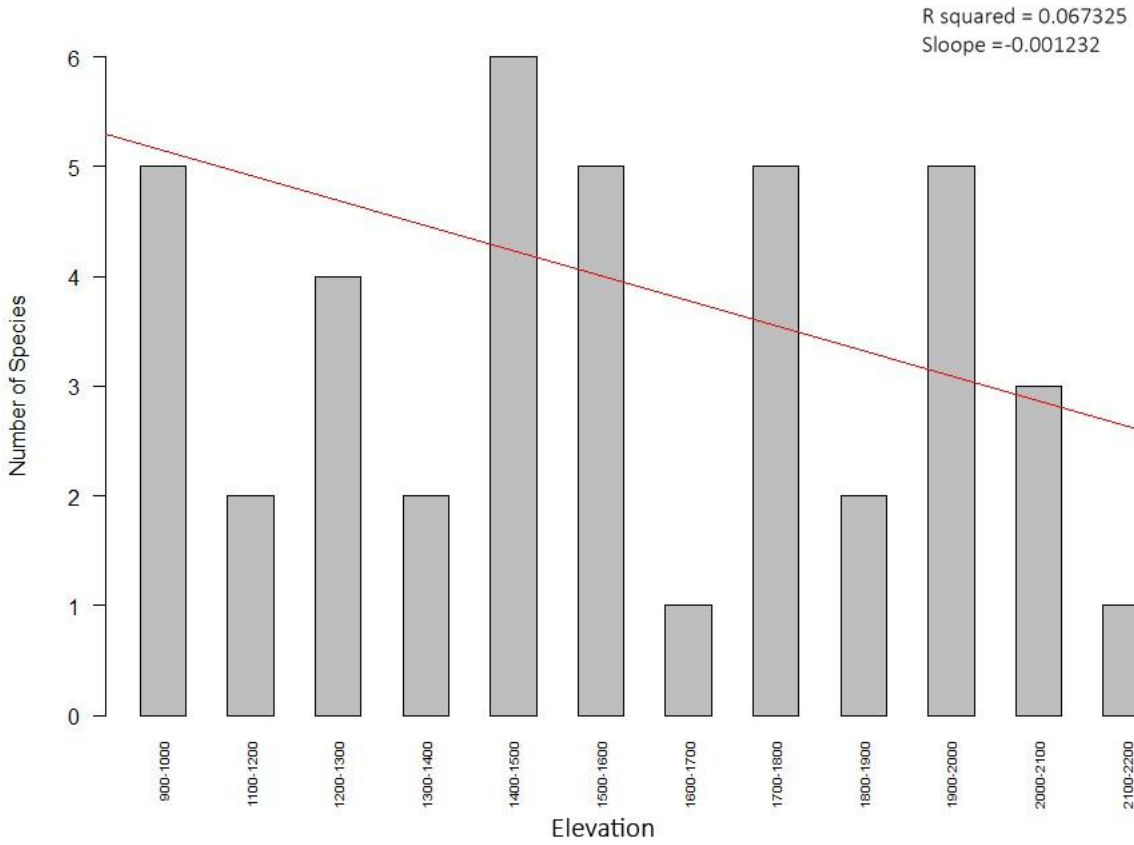

Figure 19. Richness/altitude graph of the lizard species within the study area. Regression line indicates that the species richness decreases at higher elevations.

Conclusion

The herpetofauna of Yazd Province is among the least known in Iran. Nevertheless, the present study provided some basic information on the lizard fauna in two important protected areas of this region, resulting in the identification of 16 species. Our results showed that the Bafq P. A. has a higher species richness than the Darreh-Anjir W. R., which is likely due to the higher habitat diversity of the former. Severe droughts, mining activities, climate change and overgrazing are among the most threatening factors for wildlife in these areas.

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Appendix. Coordinates of each species from the study areas and nearby, provided by the authors.

Species	Coordinates
Laudakia nupta	Longitude: 55.79305° E, Latitude: 31.570208° N; 54.381096° E, 32.337411° N; 55.169157° E, 32.444411° N; 55.158828° E, 32.434326° N
Phrynocephalus maculatus	55.56607° E, 31.580016° N; 55.576683° E, 31.581107° N; 55.660888° E, 31.650976° N; 54.96397° E, 32.544701° N; 55.024168° E, 32.615623° N; 54.972088° E, 32.597053° N; 55.660888° E, 31.650976° N; 55.576683° E, 31.581107° N; 55.56607° E, 31.580016° N
Phrynocephalus scutellatus	55.729642° E, 31.674494° N; 55.841931° E, 31.337253° N; 55.17058° E, 32.444583° N
Saara asmussi	55.224861° E, 32.591543° N; 55.139099° E, 32.451845° N
Trapelus agilis	55.552186° E, 32.135055° N; 55.170003° E, 32.460866° N; 55.497956° E, 32.274995° N
Agamura persica	55.660376° E, 31.697212° N; 55.628° E, 31.623095° N; 55.853475° E, 31.548472° N; 55.772971° E, 31.562772° N; 55.160722° E, 32.439647° N; 55.158385° E, 32.433847° N; 55.159367° E, 32.43225° N; 55.139379° E, 32.414289° N
Bunopus crassicauda	55.737821° E, 31.666078° N; 55.16726° E, 32.441022° N; 55.170447° E, 32.43672° N
Cyrtopodion scabrum	55.601254° E, 31.572592° N; 55.4013° E, 31.617428° N

Eremias fasciata	55.634739° E, 31.616501° N; 54.961681° E, 32.546657° N; 54.9644° E, 32.544479° N; 55.398112° E, 32.763561° N
Eremias persica	55.687405° E, 31.712607° N; 55.842354° E, 31.542019° N; 55.850684° E, 31.546338° N
Mesalina watsonana	55.686838° E, 31.708965° N; 55.843918° E, 31.555541° N; 55.169148° E, 32.444478° N
Ophisops elegans	55.843835° E, 31.555603° N; 55.816629° E, 31.536629° N
Ablepharus pannonicus	55.404366° E, 31.607291° N
Eumeces schneideri princeps	55.702446° E, 31.657867° N; 55.697673° E, 31.595572° N; 55.690112° E, 31.621359° N
Teratoscincus bedriagai	55.580833° E, 31.648033° N; 54.964345° E, 32.544537° N
Varanus griseus	55.835689° E, 31.536184° N; 55.660888° E, 31.650976° N; 55.556375° E, 32.131483° N