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Some remarks on *Darevskia raddei raddei* (BOETTGER, 1892) (Sauria:Lacertidae) habitat loss in Arasbaran, East Azerbaijan, Iran

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Abstract: In this article we present the effects of waste water of the Sungun copper mine on *Darevskia raddei* habitat in the Arasbaran protected region, a UNESCO registered biosphere reserve since 1976, and appeal to the Department of Environment of East Azarbaijan province to more consideration on control and precautions regarding the water waste of the Sungun mine.

Keywords: Arasbaran, UNESCO biosphere reserve, *Darevskia raddei raddei*, habitat loss, Sungun copper mine,waste water.

Introduction:

Darevskia raddei raddei has its distribution range in Armenia, Northeastern Turkey, Southern Azerbaijan and the East and West Azerbaijan provinces in Northwestern Iran. Our study site is situated inside the Arasbaran protected region, a UNESCO registered biosphere reserve since 1976 in the East Azerbaijan province of Iran. Arasbaran protected area, designated by the Iranian Department of Environment, is confined to the Aras river in the north, Meshgin Shahr county and Moghan in the east, Sarab county in the south, and Tabriz and Marand counties in the west, with an elevation from 256 m. in the vicinity of the Aras river up to 2896 m. in central regions, and has a surface of 78560 hectares. Inside the Arasbaran protected region, located 38º 38' 20" north and 46º 45' 35" east, operates the Sungun mine, which is the most important geologic and industrial feature in the area, and the largest open-cast copper mine of Iran (NABI BIDHENDI et al. 2007).

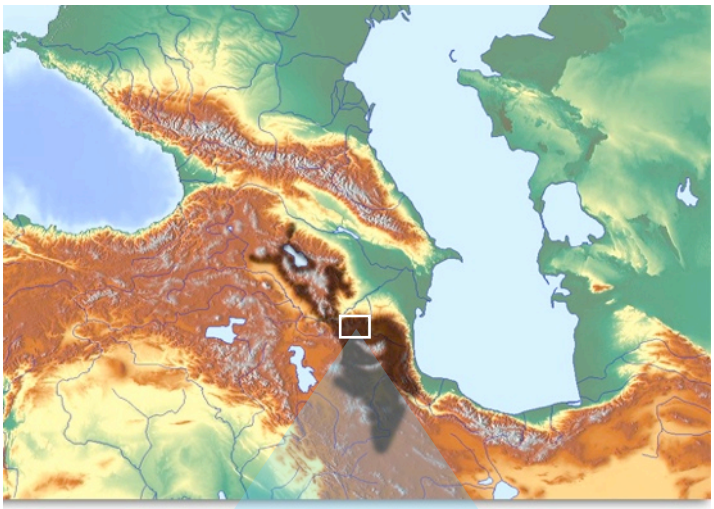

Fig. 1: Distribution range of *Darevskia raddei raddei*. with the Arasbaran protected area outlined.

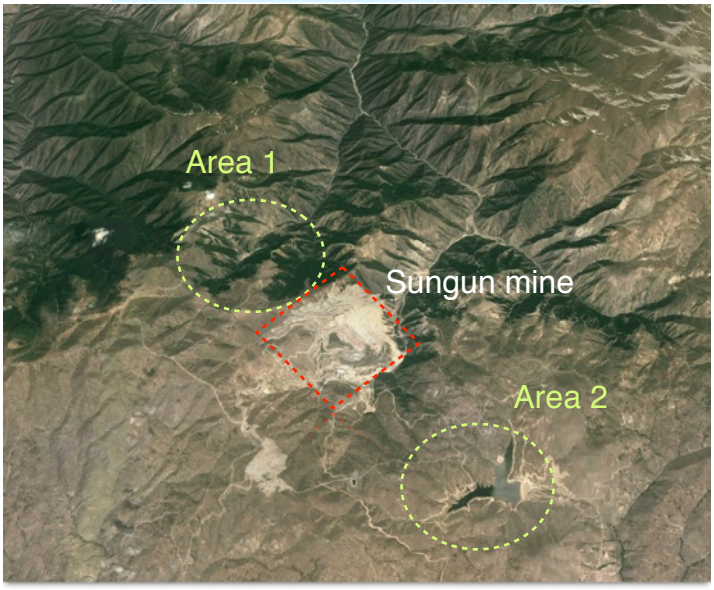

Fig. 2: Study **area 1**, not affected by he operation of the **Sungun** open-cast copper mine, and study **area 2**, heavily affected by the mine through the effects of water pollution..

The habitat of *Darevskia raddei* is the high steppe and rocky areas close to streams (ANDERSON 1999), and this lizard can also be found in high altitude forests. The flora found in *Darevskia raddei* habitat consist of about 56 species, among them are: *Fragaria vesca L, Cotinus coggygria, Rhus coriaria L, Berberis vulgaris L, Anthemis nobilis, Cornus mas L, Euphorbia helioscopia L, Lamium album L* and *Salvia sclarea L.*(Fig .3).

In order to establish the influence of the mining activities of the Sungun copper mine on *Darevskia raddei raddei* habitat, we performed this study.

Materials and Methods:

Field survey was conducted in the period from May 2012 till June 2013, around the Sungun copper mine, in two areas:
Area 1: behind the Sungun mine, uphill and with a watershed relative to the mine.
Area 2: downhill and downstream from the mine, around a waterbasin, intentionally created to collect the mineral waste, washed away from the mine.

During this survey we analyzed the number of specimens of *Darevskia raddei raddei*, and searched for evidence of their habitat degradation.

Results:

In **Area 1** no evidence of habitat loss was found, and a good population of *Darevskia raddei raddei* was observed.

In **Area 2** we encountered a severe degradation in the diversity of plant species, and in spite of extensive searching in this area, only one living specimen of *Darevskia raddei raddei* was found and captured on a high steppe where the habitat was still intact. This specimen was carried to the Zoological lab of Tabriz University, and identified by reliable reference (ANDERSON 1999 ; RASTEGAR-POUYANI 2007). Beside this living specimen, we observed several dead corpses of *Darevskia raddei raddei* in this area, which is uncommon under normal circumstances.

Fig. 3: Unaffected high steppe habitat.

Discussion:

In the mountain areas in northwestern Iran, most mountainous lizards like *Paralaudakia caucasia* (HOSSEINIAN YOUSEFKHANI et al. 2013) and *Darevskia raddei raddei* are restricted by environmental factors, such as temporal and rainfall percentage in winter. Medium winter precipitation is a limitating factor in their distribution, because they cannot tolerate the more arid condition.

Fig. 4: Sungun open-cast copper mine.

Apart from the direct habitat loss of open-cast mining at the mining site, the accompanying destruction of forest can effect negatively on the plant growth and variation in the forest area (GOODE et al. 1998), and is continuum from small scale to large scale degradation of habitat, even leading to final destruction of habitat. The forests in Arasbaran are ancient and won't be replaced soon by new ones. The rock dwelling lizards like *Darevskia raddei raddei* are depending on the canopy cover height in the forests, because with the destruction of the trees, aridity in the region will increase, which is one of the negative factors on lizard variability and availability. The most comprised effects can cause lizard declination from an area (ADAMS & COMRIE 1997 ; GOODE et al. 1998).

Fig. 5: Sungun open-cast copper mine.

The third factor, with probably the greatest impact on the environment as a whole, is water pollution. The waste of this mine has high concentrations of toxic chemicals, such as arsenic, sulfuric acid, and mercury over a significant area of surface and

Fig. 6: *Darevskia raddei raddei*.

subsurface. Weathering of mine waste piles can increase concentrations of toxic elements downstream from the mine site as reduced phases in their host minerals oxidize (LOTTERMOSER et al. 1999 ; MUNROE et al. 1999 ; BANWART & MALMSTRÖM 2001 ; BABA & GUNGOR 2002).

Primary the water pollution has a degrading effect on the high steppe habitat and intoxication of trophic resources of the lizards. Although not investigated, we believe the lizards were directly or indirectly affected by toxic substances, leading to the observed dead corpses.

Water pollution also has a secondary effect on the lizards by the above mentioned problem of deforestation, in this case directly from the negative effects of water pollution on the canopy cover height, with the accompanying aridification.

Conclusion:

Without extra measures, increasing negative effects of planned future expansion of the Sungun mine on biodiversity in the Arasbaran protected area are to be expected. This is not in accordance with the intentions of being a UNESCO biosphere reserve, a site of excellence where new and optimal practices to manage nature and human activities are tested and demonstrated, regarding sustainable development and conservation of biodiversity. Therefore we appeal to the Department of Environment of East Azarbaijan province to more consideration in this area on control and precautions regarding the water waste of the Sungun mine.

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