

A conservation reassessment of the Critically Endangered, Lorestan newt *Neurergus kaiseri* (Schmidt 1952) in Iran

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Abstract The Lorestan newt (*Neurergus kaiseri*, Schmidt 1952) is an endemic salamander species to Iran, listed as “Critically Endangered” in the 2006 IUCN Red List due to population declines of 80%, over collection for the pet trade; area of occupancy less than 10 km², fragmented populations, less than 1,000 adults, and continuing habitat degradation and loss. However, the Red List assessment was limited to surveys only around the type location of *N. kaiseri*. We conducted a series of field surveys over the previously known region inhabited by *N. kaiseri*, and over some other areas that appeared to provide suitable habitat for *N. kaiseri*. Two Iranian provinces of Khuzestan and Lorestan were surveyed with 20 aquatic sites inhabited by *N. kaiseri* distributed over an area of ~10,000 km² that included 14 new sites, with 11 of these remote from previously recorded sites. We estimate a minimum total population of greater than ~9,000 adult *N. kaiseri* at the sites we surveyed. The total population of *N. kaiseri* is certainly considerably greater than 9,000, because we surveyed only a small area of the potential range of *N. kaiseri*, and because more breeding sites appear during exceptionally wet periods. We consider that *N. kaiseri* needs greater conservation planning and implementation, habitat and legal protection, and increasing support for the expansion of community conservation programs. Conservation initiatives for *N. kaiseri* will also benefit many other threatened species including the Iran cave barb (*Iranocypris typhlops*), spur-thighed tortoise (*Testudo graeca*), Persian leopard (*Panthera pardus ciscaucasica*), brown bear (*Ursus arctus*), Caucasian squirrel (*Sciurus anomalus*) and saker falcon (*Falco cherrug*). The information provided by our survey warrants a reassessment of the IUCN Red List conservation status of *N. kaiseri*. However, to guide this reassessment a conservation action plan should be prepared by the Department of the Environment of Iran, with contributions by Iranian and International experts on all facets of the conservation of *Neurergus* species especially including the expansion of community conservation programs.

Key words. Lorestan newt, *Neurergus*, *Neurergus kaiseri*, IUCN Red List, Conservation assessment, Sustainable Management, Department of the Environment of Iran, Critically Endangered

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Introduction. The Lorestan newt (*Neurergus kaiseri*, Schmidt 1952) is an endemic salamander species to Iran with a limited range in the southern Zagros Mountains (Figure 1). The aquatic breeding habitats of *N. kaiseri* are highland streams and ponds that are often spring fed and often largely ephemeral with only the more elevated reaches having water except during periods of heavy rain (Figure 2). When the streams or ponds inhabited by *N. kaiseri* during spring and early summer dry the newts migrate from the ponds into the surrounding rugged mountains. These rugged mountains are covered with arid woodlands and scrublands, however, very little is known about this terrestrial life stage (Sharifi et al. 2009, 2013; Torki 2012).

Neurergus kaiseri was listed “Critically Endangered” in the 2006 IUCN Red List based on criteria A2d; B2ab (iii,v):

1) because there appeared to be a drastic population decline, estimated to be more than 80% over within four years (2001-2005) (Mozafar Sharifi and Theodore Papenfuss pers. comm. September, 2008); 2) because of over collection for the pet trade; 3) an Area of Occupancy of less than 10 km²; 4) severely fragmented populations; 5) a continuing decline in the extent and quality of its habitat; 6) a decline in the number of mature individuals due to overharvesting.”(Sharifi et al. 2009). In the section “Population” the IUCN assessment states “This is now a relatively rare species, with a dramatic decline within the previous ten years (Mozafar Sharifi and Theodore Papenfuss pers. comm. September 2008). The population is estimated to number fewer than 1,000 mature individuals.”



Figure 1. The mountain terrain inhabited by *Neurergus kaiseri*. Image Asghar Mobaraki.

In the section “Range” the IUCN assessment states “This species is endemic to four streams (in a single catchment area) within a restricted area of the southern Zagros Mountains of Lorestan (Shahbazan region), Iran.” (Sharifi et al. 2009). It has an altitudinal range of 1,500 to 2,000 m asl.”

Since the IUCN assessment two major articles have described surveys that increased the range of *N. kaiseri*. Torki (2012) reported eight new sites at a location remote from the original location with a population of several thousand adults. Sharifi et al. (2013) surveyed the distribution of *N. kaiseri* at or near the reported original four localities, however, Sharifi et al. (2013) does not refer the earlier article by Torki (2012). The known range of *N. kaiseri* was reported to have increased from 212 km² (minimum convex polygon) to 789 km² at elevations between 930–1395 meters. The localities nearest neighbor spacing averaged 4.61 km (range, 0.93–12.39 km). A total of ~1,300 adults, sub-adults, and larvae were found in a total of ~4 km of stream with 86% found at just two localities.

Because of its considered rarity *N. kaiseri* has received considerable public attention as an icon for amphibian conservation (ZSL 2013). *Neurergus kaiseri* has also been listed as one of the top priority amphibian species for conservation by representatives of the IUCN Species Survival Commission Specialist Groups (Baillie and Butcher 2012). Wikipedia (2013) even states that *N. kaiseri* is extinct in the nature “By January, 2013, all Kaiser’s (Loristan) newts were gone from the wild, and only live in captivity.” There are also *ex situ* programs for the

conservation of *N. kaiseri* based on its IUCN Red List status where privates in Europe have well established conservation breeding programs for *N. kaiseri*, and numerous specimens of *N. kaiseri* are held by privates and zoos as *N. kaiseri* is easily bred and popular in the pet trade (Peter Janzen pers. comm.)



Figure 2. *Neurergus kaiseri* inhabits springs and many of the resultant streams dry as they descend the scree slopes onto the plains. This heavily populated stream had travelled through more than 300 m of heavily grazed land, and was within 50 m of a long term settlement. Image Robert Browne.



Figure 3. Officers of the Department of the Environment of Iran work closely with the community to complete surveys for *Neurergus kaiseri* and develop community activities for threatened species conservation. Dr. R. K. Browne on right. *Image anon.*

Considering the conservation and public status of *N. kaiseri*, and the basing of the IUCN 2006 assessment on limited scientific knowledge of the range, distribution, and population of *N. kaiseri*, the Department of the Environment of Iran with community involvement conducted a series of field surveys over the previously known region inhabited by *N. kaiseri*, and over some of the other areas that appeared to provide suitable habitat for *N. kaiseri*.

Methods. Surveys were planned and conducted by Department of the Environment of Iran (DOE) through departmental officers; expert and guard groups in Lorestan and Khuzestan provinces. Information provided by local people and the cooperatives of Department of the Environment of Iran, in the southern Zagros region, were key elements in our finding of new sites (Figure 3, 4).

Most of the sites were in remote mountainous areas only accessible by long distances of hiking. The sites were visited by Department of the Environment of Iran experts and guards in Lorestan and Khuzestan Provinces from 2010 to 2012 and the GPS points marked (Figure 3). The number of adults in the chain pools and ponds were directly counted in a represented portion of each site, and population estimates were made by extrapolation of population densities to the available habitat at each site. The main local threatening factors were noted and the information compiled as Table 1. During the survey period we also worked on increasing the legal protection of *N. kaiseri* to prevent illegal harvesting and trade. Many threatened species also rely on habitat conservation over the range of *Neurergus kaiseri* (Figure 5).

Results. Surveys in Lorestan and Khuzestan Provinces over different seasons resulted in surveying 20 aquatic sites inhabited by *N. kaiseri* in total with 14 new sites discovered, with an estimated total population of more than 9,000 adults (Table 1, Figure 6). Our survey site 14 (approximated site

7), our site 16 (approximated site 3), and our site 18 (approximated site 5) respectively, as reported by Torki (2012). All sites surveyed by Torki (2012) were clustered at the Vojhenab Reservoir or just upstream on the Cezar River. Our site 17 was the original location recorded as four streams by Sharifi et al. (2009), and approximately for the 13 localities in total recorded at and near our site 17 by Sharifi et al. (2013). Consequently, we consider our survey sites except for 14, 16, 17, and 18, as 15 new sites for *N. kaiseri*, with sites 1-10, and site 13 remote from previously reported sites. Together, all these sites cover an irregular shaped range of 40 x 250 km totaling ~10,000 sq km. The original four streams listed in the IUCN assessment are shown by a pink square and numbered site 11, where we estimated the adult population of *N. kaiseri* as 400 individuals (Figure 6; Table 1).



Figure 4. Identification cards are given to community members that participate in the Department of the Environment of Iran conservation program for *Neurergus kaiseri*. *Image Robert Browne.*

Table 1. The 20 sites identified with *Neurergus kaiseri* during our survey, sites' provinces, local names, longitude (Long. E), latitude (Lat. N), minimum estimation of population (Est. Pop.), and threatening factors. Observed threats to *N. kaiseri* are: Eco-tourism (E); Illegal harvest (H); Pollution caused by pesticides and tickicides (P); Utilization of the habitats for livestock (U); Water extraction from streams and the wells (W). All sites are threatened by drought and the possible introduction of exotic disease.

Site	Province	Local name of the site	Long. E	Lat. N	Est. Pop.	Threatening factors
1	Khuzestan	Shevi (tale zang)	296648	3630776	1,000	E H P W
2		Darreh dioni	284086	3613422	500	H
3		Emamzadeh haft tanan	302055	3610121	500	E H W
4		Dej-e mohammad ali khan	296946	3611769	300	E H W
5		Shovalander	357546	3546264	800	P
6		Haji barik ab (ab chenar , ab alen , manjeer springs)	249995	3639025	1,000	E H P W
7		Shahzadeh ahmad (moolik spring)	270532	3646505	700	E H W P
8		Shahzadeh ahmad (bozorg ab waterfall)	263851	3647989	300	E H P W
6		Shahzadeh ahmad (dodut spring)	270291	3646363	500	E H P W
10		Sar gach	377857	3511957	500	
11		Shahbazan	284907	3631369	400	E H
12		Mazoo	277137	3638767	300	H P
13	Lorestan	Tafav	241456	3650804	200	E H
14		Kerser	239109	3650553	700	E H W
15		Vojenab	278559	3655452	400	E
16		Darkhorma	231843	3653214	650	P W
17		Veroun Nargeseh	232545	3641379	20	
18		Mordastan	237925	3656039	200	E W
19		Choovah	240405	3650380	50	E H P U
20		Kool chap	238498	3646465	200	E H P U W
Total Minimum Estimated Population					9220	



Figure 5. Many threatened species also rely on habitat conservation over the range of *Neurergus kaiseri*. From top left; brown bear (*Ursus arctus*), Caucasian squirrel (*Sciurus anomalus*), Iran cave barb (*Iranocypris typhlops*), saker falcon (*Falco cherrug*), spur-thighed tortoise (*Testudo graeca*), and the Persian leopard (*Panthera pardus ciscaucasica*). For attribution of all images except the Iran cave barb (*Iranocypris typhlops*) see Wikipedia Commons (2014).

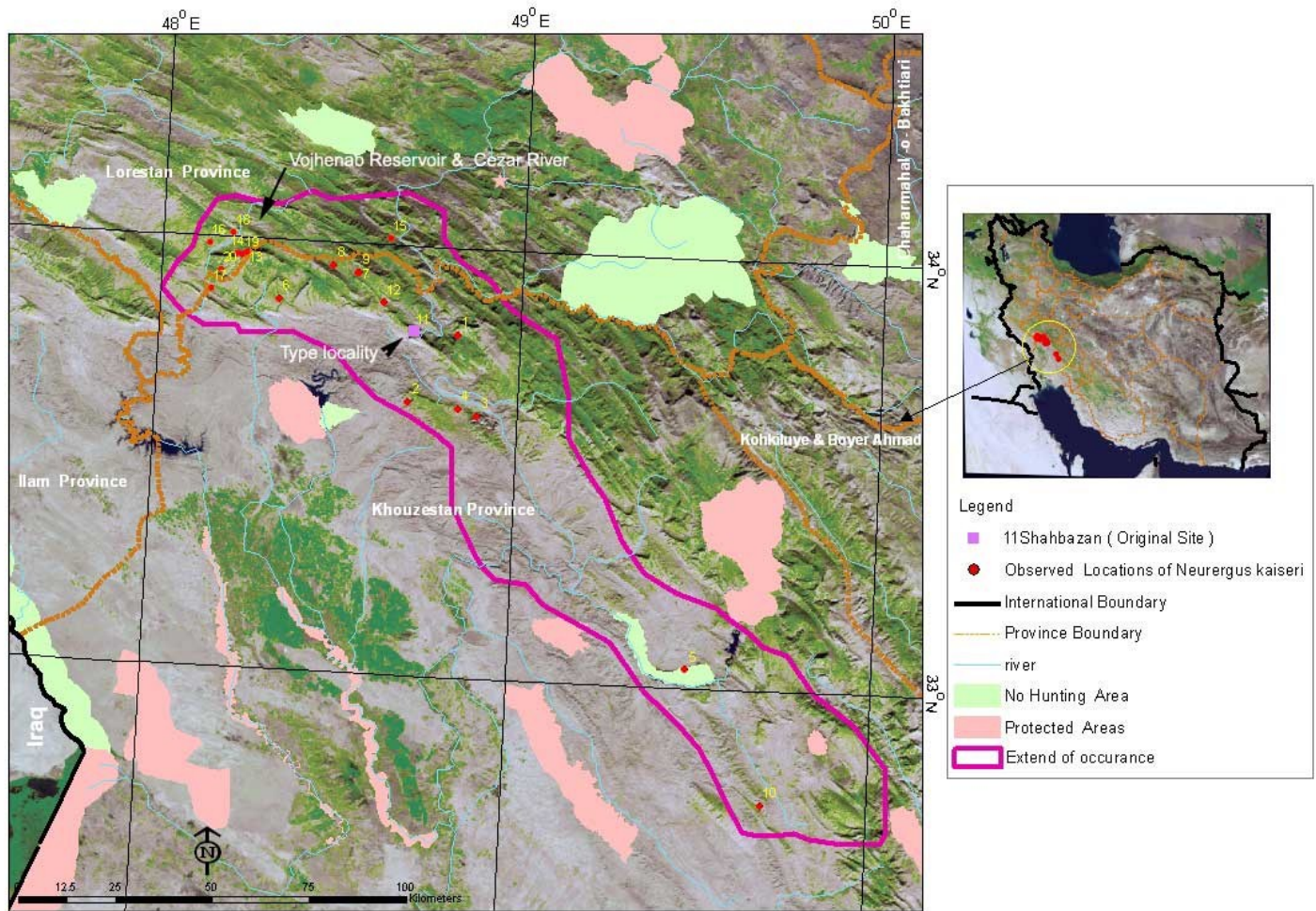


Figure 6. A map showing the 20 numbered sites that we surveyed with *Neurergus kaiseri*, the estimated area of occurrence of *N. kaiseri*. We consider sites 1-13, 15, and 19 as new sites for *N. kaiseri* with sites 1-10, and site 13 remote from previously reported sites. The Vojhenab Reservoir and the Cezar River (arrow - top left of extent of occurrence) were the survey areas of Toriki (2012), and type locality.

During our surveys *N. kaiseri* adults were observed far from water in deep valleys, and also climbing up cliffs for 1,100 meters. *Neurergus kaiseri* were also observed using holes and splits in the rocks as refuges (Figure 7). We observed that in some sites, anthropogenic threats are both directly and indirectly affecting the populations and habitats of *N. kaiseri*. These threats include exploitation of water resources by local people for domestic use, irrigation, and for livestock, habitat modification by grazing and agriculture, and pollution of water by agricultural chemicals (pesticides). There is also an undetermined harvest of *N. kaiseri* for trade in pet shops in Iran and possibly internationally (Table 1).

We also observed that *N. kaiseri* was abundant in some locations where traditional sheep grazing was apparent. *Neurergus kaiseri* was even abundant in a stream that had travelled through more than 300 meters of heavily grazed land and that was within 50 m of a long term settlement (Figure 8). Very high densities of *N. kaiseri* were found in very small (1.4 x 0.8 x 20 cm deep) seep fed pools high in the mountains (Figure 9).



Figure 7. *Neurergus kaiseri* adults were observed hundreds of meters from water on rock faces and cliffs using holes and splits in the rocks as refuges. Image Asghar Mobaraki.

Our work toward increasing the legal protection of *N. kaiseri* to prevent illegal harvesting and trade contributed to the listing of *Neurergus kaiseri* in CITES Appendix 1 in COP 15 meeting in 2010 in Doha, and the fine for illegal harvest for each individual being increased from 40 thousand to 2 million Rls.



Figure 8. *Neurergus kaiseri* can be found in high densities in spring fed streams in locations subject to agriculture. Image Asghar Mobaraki.

Discussion. Our surveys showed that the minimum range of occurrence, and minimum population estimate, of *N. kaiseri* are far greater than those in the IUCN 2006 Red List assessment (Sharifi et al. 2009), and Sharifi et al. (2009, 2013). Our surveys showed a range was more than 8,000 sq km, in contrast to the IUCN 2006 Red List assessment of 10 km², or the estimate of 200 km² by Sharifi et al. (2013). Our estimated population was over 9,000 adults in contrast to the IUCN 2006 Red List assessment estimate of less than 1,000, and similar number by Sharifi et al. (2013). We also identified 14 new locations, besides those at the original location (Sharifi et al. 2009) and those of Torki (2012) in the Vojhenab and Talezang areas, with 11 of our locations these being remote from previously described sites. Our population estimate of more than 9,000 adult *N. kaiseri* is conservative when compared to that of Torki, (2012) of 10,000 individuals from their cluster of 7 sites in the north-eastern part of our surveyed area.

If the average population density was the same as recorded by Sharifi et. al. (2013) our conservative range estimate of 8,000 km² could provide habitat for 40,000 *N. kaiseri*. Sharifi et. al. (2013) reported that the significance



Figure 9. Approximately 50% of the area of a small spring fed pool high on cliffs showing 12 *Neurergus kaiseri*. This pool is fed with water only coming from seeps from the rocks. Image Asghar Mobaraki.

concerning population estimates of their observations, of only a few newts is some small ephemeral streams (range in population of 13 streams of 2–650), is not clear without an improved knowledge of seasonal occupation of aquatic habitats.

The Zagros region is defined as a distinct ecoregion by its elevation and topography, climate, biodiversity including vegetation. Therefore, the range of *N. kaiseri* is predicted to include many more sites in the Kohgiluyeh and Boyer-Ahmad and Chaharmahal-o-bakhtiari provinces close to the Lorestan and Khuzestan. Moreover, this area is largely remote, rugged and difficult to survey. We already have reports from local people of sites we have not yet investigated that are supposedly inhabited by *N. kaiseri*. The total population may also be considerably more than our surveys show, as productive surveys are dependent on the existence of suitable aquatic habitats (Figure 10). Consequently, surveys during exceptional wet seasons when streams increase in flow and in length and new ponds appear, are likely to reveal many new aquatic sites with *N. kaiseri*.

Therefore, there is a possibility of a much greater extension of the range of *N. kaiseri* over all suitable habitats to more than 10,000 sq km and the likely finding of new sites during exceptionally wet periods suggests that our survey estimates a population of over 9,000 adults is very conservative.

The observed threats to *N. kaiseri* were drought, water extraction from streams and the wells, illegal harvest, utilization of the habitats for livestock, ecotourism, pollution caused by pesticides and tickcides, and the possibility of exotic disease. To ameliorate threatening processes measures at both national and international levels are needed.



Figure 10. Sheep grazing next to a stream with an abundant population of *Neurergus kaiseri*. The communities in the region are heavily dependent on sheep grazing that has been a tradition for hundreds of years. Streams in areas grazed by sheep still provide habitat for large numbers of *N. kaiseri*. Image Robert Browne.

Threatening processes can be addressed nationally by increasing the cultural awareness of local people through increasing their knowledge about the importance of *N. kaiseri* conservation, and through the provision of protected areas for important sites. In particular, the expansion of the Zagros Oak Forest to include the range of *N. kaiseri* would provide a strong legal framework for tackling current levels of habitat destruction (Baillie and Butcher 2012). However, our observation of abundant populations of *N. kaiseri* in heavily grazed landscapes shows that the relationship between the survival of *N. kaiseri* and traditional farming methods is unclear (Figure 10,11). An important aspect of the conservation of *N. kaiseri* is the support of traditional communities and their culture, and their inclusion in the conservation of *N. kaiseri* and other threatened species through the community involvement program of the DOE (Figure 3, 4, 9).



Figure 11. A dwelling of a community custodian working with the *Neurergus kaiseri* program. The local community has a low environmental impact, especially a low greenhouse footprint, and provides a key element for the sustainable management of the habitats of *N. kaiseri*. Image courtesy of Robert Browne.

The IUCN (2013) assessment states “there appears to have been drastic population decline, estimated to be more than 80% over within ten years (2001-2005) (Mozafar Sharifi and Theodore Papenfuss pers. comm. September, 2008), because of over collection for the pet trade.” Our surveys could not estimate population loss over the last ten years to 2013 and we could find no reference to how the Sharifi and Papenfuss (2008) estimate of population loss was made. However, many of our sites clearly had robust populations of *N. kaiseri*.

Particularly, for such an iconic species, the current IUCN 2006 assessment was based on limited information. Our current survey results warrant a reassessment of the conservation status of *N. kaiseri* in the IUCN Red List. However, further surveys are needed to find the extent of the range, distribution, and populations of *N. kaiseri* for a fully informed assessment.

This assessment of the conservation priorities for *N. kaiseri* should include; 1) genetic studies to identify evolutionary significant populations, and 2) an assessment of the extent and effect of the pet trade, both within Iran and internationally.

To assure the sustainable management of *N. kaiseri* a conservation action plan should be prepared by experts including the Department of the Environment of Iran with the support of Iranian and International experts on all facets of the conservation of *Neurergus* species. This conservation action plan should include; 1) surveys to assess the total range, distribution, and population of *N. kaiseri*, 2) the role of zoos and privates in conservation breeding programs and support for in situ conservation, 3) other threatened species that would benefit by better protection of *N. kaiseri* including the Iran cave barb (*Iranocypris typhlops*); spur-thighed tortoise (*Testudo graeca*); Persian leopard (*Panthera pardus*); brown bear (*Ursus arctos*); Caucasian squirrel (*Sciurus anomalus*); saker falcon (*Falco cherrug*), and a strong support for community involvement in conservation.

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File:Falco_cherrug_%28Marek_Szczepanek%29.jpg), spur-thighed tortoise (*Testudo graeca*; <http://en.wikipedia.org/wiki/File:Tortoise.spur-thighed.arp.750pix.jpg>), and the Persian leopard (*Panthera pardus ciscaucasica*; http://en.wikipedia.org/wiki/File:Persian_Leopard_sitting.jpg). [Accessed 19th April 2014]

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