

Ecology and conservation aspects of *Neurergus strauchii* (Amphibia: Salamandridae)

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Abstract. Characteristics of breeding streams and terrestrial habitats of 11 populations of *N. strauchii* are presented. Streams are fast running with rock pools. They are fed by melting snow and rain and are 0,5 to 2 meters wide. Bottom consists of rocks, big stones and stone chippers added with gritty sand. The terrestrial habitat is rocky with mostly only herbaceous vegetation and hardly any shrub or tree layer. Terrestrial habitat degradations are caused by overgrazing, sometimes the establishment of cultivated grounds. Conservation aspects and future research aspects are discussed. Conservation should be first focussed on *N. s. barani*.

Introduction

Few ecological data are available concerning the salamandrid genus *Neurergus*. The genus comprises four species of which two are found in Turkey: *Neurergus strauchii* (Steindachner, 1887) and *N. crocatus* Cope, 1862 (Baran and Öz, 1986). The nominate subspecies of *N. s. strauchii* (Steindachner, 1887) is known south and west of lake Van (Schmidtler and Schmidtler, 1970) up to south of Hazar Gölü (Pasmans et al., 2006). In 1994, the subspecies *N. s. barani* Öz, 1994 was described from the Kubbe mountains on the Malatya – Pütürge road (Öz, 1994) and seems to be restricted to these and surrounding mountains (Pasmans et al., 2006). Both subspecies are probably separated by the river Euphrates (Pasmans et al., 2006).

N. strauchii is strictly protected species by the Convention on the Conservation of European Wildlife and Natural Habitats (also known as Bern Convention) and listed on appendix II, ratified by Turkey on the 2nd of May 1984. Artikel 6 states for these species that each Contracting Party shall take appropriate and necessary legislative and administrative measures to ensure the special protection of the wild fauna species specified in Appendix II. The following (in short) will in particular be prohibited for these species: all forms of deliberate capture, keeping, killing, disturbance, insofar as disturbance would be significant in relation to the objectives of this Convention, deliberate destruction or taking of eggs from the wild and possession of and trade in these animals, alive or dead. In Resolution No. 6 (1998) of the Standing Committee, *N. strauchii* is listed

as a species requiring specific habitat conservation measures.

Aims of our study were to determine the presence of populations of *N. strauchii* outside the known areas, to collect data on their morphology and ecology, to assess the level of molecular and morphological differentiation among them and to determine possible threats. Here we present ecological data and aspects for conservation measures. Morphological and molecular data concerning biogeography are published elsewhere (Pasmans et al., 2006).

Materials and methods

Four field trips to Turkey were undertaken in the period between April –May 2000, 2001, 2003 and 2005. In 2001 and 2003 the area between Malatya and Bitlis was investigated. In 2005 special attention was paid to the mountain areas west and south of the Malatya mountains and the area between Malatya and Muş. The breeding streams and terrestrial habitats were characterized with methods used in previous studies (see Winden & Bogaerts, 1992). Roughly 35 streams were investigated by walking along and in the stream in search for newts. Mostly 15 to 30 minutes were spent per stream. Of streams in which newts were present width, type of substrate in the streams, presence of vegetation in the stream and the percentage of vegetation coverage within roughly 10 meters on both sides of the stream were estimated and presence of human activity was noted.

Results

In 11 streams *N. strauchii* was found present out of 35 streams investigated. Numbers of localities are presented in figure 1. *N. strauchii* could not be found west or south of the Malatya mountains area or in streams in mountain areas north of the Euphrates between Malatya and Muş. Adult newts were found in breeding condition in mountain brooks in all localities with the exception of two localities (4, 9) where also animals were found on land. At locality 4, 14 sub-adult and 4 adult individuals were found on land under in between crevices of rocks and under stones in the only rock formation available

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Figure 1. Distribution of *Neurergus strauchii* in Turkey. Numbers refer to the locations in Tables, Figures and the text.

in the valley about 10 meters away from the stream, and at locality 9 one adult female was found on land under a stone about 0,5 m from the stream having just left the water after laying eggs. In all streams animals were found active at day time. Location 1 was also visited at night where approximately two to three times as many animals were observed. Cyprinid fish (species undetermined) were present at location 11; newts were remarkably shy at this location. We found fresh spawn at several locations (1, 9, 10) up to 93 eggs (10) on the underside of rocks. Mostly large groups of eggs (> 20) were found with some exceptions (2-14). At location 9 we found eggs attached to the rock bottom and branches exposing the eggs to direct sunlight.

In table 1 habitat characteristics of 11 localities are presented. There are no obvious differences between the habitats of the two subspecies. Breeding streams are 0,5 to 2 meters wide, only one stream was 2-4 meters wide.

Half of them are 0,5 to 1 meter wide, 25 % is 1 to 1,5 meters wide and 25% is up to two meters or more wide. Bottom coverage consists of solely rocks, big stones and stone chippers (36 %) added with gritty sand (45 %) or gritty and fine sand (18 %). Parts with loam were only found at isolated spots in the streambed, but never over several meters. Only in three streams vegetation was present.

The terrestrial habitat of *N. strauchii* is only sparsely covered with vegetation. A layer of herbs is always present. Only in two localities this layer was dense (81-100%). In all other cases herb coverage varied between 11 – 40% (n = 4) or 41 – 80% (n = 5). Shrubs were present at only 7 localities and coverage varied between 0 – 11% (n = 5) to 11- 40% (n = 2). Trees were only scarcely present or absent. They consisted of planted willows or poplars (n = 3) or of single natural trees (n = 3). Location 3 had the richest vegetation structure along the stream.

Human activities consisted mainly of grazing by goats and sheep (or even cows at location 1). In most cases the area's outside the roughly 10 meter zone surrounding the

Table 1. Characteristics of the breeding stream and land habitat of *Neuregerus strauchii*. Breeding stream characteristics determined on the area of approximately 50 m of the stream where adults were present. Coding of the bottom coverage. 1 = rock – big stones, 2 = stone chippers, 3 = gritty sand, 4 = fine sand and 5 = loam or clay.

Land habitat characteristics determined on the area of approximately 10 m wide on both sides of the stream. Herb = vegetation lower than 0,5 meter, shrub is vegetation 0,5 to 3 meter and tree is vegetation higher than 3 m. Coding of the vegetation coverage. 1 = 0 – 10 %, 2 = 11 – 40 %, 3 = 41 – 80 % and 4 = 81 – 100 %.

Locality	Date	Width (m)	Bottom coverage	Aquatic vegetation	Herb	Shrub	Tree	Type of tree	Human activities
38°15'N;38°37'E(1)	30-4-2001	0.5 - 1	1, 2	Algae and grass	3	0	0		grazing with goats and cows
38°15'N;38°39'E(6)	30-4-2001	0.5 - 1	1, 2	None	3	1	1	willow	cultivated grounds
38°15'N;38°38'E(7)	30-4-2001	0.5 - 1	1, 2, 3	None	2	0	1	poplar	none observed
38°21'N;42°15'E(2)	4-5-2001	0.5 - 1	1, 2, 3	None	3	1	0		grazing with goats
38°24'N;42°05'E(8)	4-5-2001	2 - 4	1, 2, 3	None	4	0	1	div	grazing with goats, cultivated grounds, houses
38°34'N;39°44'E(3)	25-4-2003	1 - 2	1, 2	Grass	3	2	2	div	grazing with goats, cultivated grounds
38°44'N;40°32'E(4)	26-4-2003	0.5 - 1	1, 2, 3, 4	None	4	1	1	div	grazing with goats
38°40'N;40°27'E(5)	26-4-2003	1 - 1.5	1, 2, 3, 4	None	3	1	1	div	grazing with goats
38°17'N;38°35'E(9)	14-5-2005	0.5 - 1	1, 2	None	2	2	0	oaks	none observed
38°36'N;40°01'E(10)	15-5-2005	1 - 1.5	1, 2, 3	None	2	0	1	willow	none observed
38°41'N;41°11'E(11)	16-5-2005	1 - 2	1, 2, 3	Algae	2	1	1	div	none observed

stream were used as meadows (n = 6) and/or cultivated grounds (n = 3). At location (8) houses were very close to the stream. Stream 3 was used by local people of a small village nearby for drinking water. Near all streams roads were present, parallel along the stream or crossing it.

The following species of amphibians and reptiles were found along the streams in which *N. strauchii* was found: *Rana macrocnemis*, *Rana ridibunda* complex, *Bufo viridis*, *Hyla savigny*, *Testudo graeca*, *Ophisops elegans*, *Lacerta cappadocica*, and *Lacerta media*. Both *Rana macrocnemis* and *Lacerta media* were found very frequently along side the streams. *B. viridis* was found breeding in the same stream as *N. strauchii* (1).

Discussion

The finding of five new populations of *N. s. strauchii* (locations 3, 4, 5, 10, 11) has expanded the distribution range approximately 300 km to the west (Pasmans et al., 2006). The presence of *N. s. barani* seems restricted to the Kubbe mountains where only one new location (9) was found just outside the Kubbe valley (Pasmans et al., 2006). The aquatic and land habitats of *N. strauchii* are for the first time characterised.

The terrestrial habitat is always situated in rocky surroundings with a scarce shrub layer and hardly any trees present. On only two occasions we could find animals on land, despite intensive searching at all localities. Slopes providing deep crevices through

compilation of rubble might be very important for the survival of newts on land. Schmidler and Schmidler (1970) found *N. strauchii* hibernating at 25 meters away from the stream and about 5 meters higher in a heap of stones. There is more information needed on how far newts migrate from the streams. Most areas are grazed by sheep and goats. Overgrazing can cause erosion which could turn out negative for the populations of *N. strauchii*. Newts were not found in optical suitable habitats where stream bottoms are covered with loam or clay. In wide streams (wider than 2 meters) it is difficult to detect newts and it is possible that in those streams newts are present but not detected.

Papenfuss et al. (2004) lists *N. strauchii* as “vulnerable” because its area of occupancy is less than 2,000 km², its distribution is severely fragmented, and there is continuing decline in the extent and quality of its habitat in Turkey. We estimate the distribution area of *N. s. strauchii* to be around 7,500 km² and that of *N. s. barani* to be 1,000 km². It seems that different populations are isolated from each other. We could notice disturbance of *N. strauchii* terrestrial and breeding habitat on several occasions: road construction works, tapping of sources, household sewage and overgrazing. These threats are also noted for *N. microspilotus* (Sharifi and Assadian, 2004) and to a lesser extent for *N. kaiseri* in Iran (Sharifi et al., in press). Collecting of adult animals during breeding season by animal traders has occurred as *Neuregerus strauchii barani* were offered for sale in

Figure 2. Breeding habitat of *Neurergus strauchii* near Bitlis (nr. 8).



2002 and 2003 in Germany (personal observations). All these single threats combined might lead to local extinction of *N. strauchii* throughout its known range. The Bern Convention is not implemented in Turkish national law yet. The new Nature Conservation Law, is in preparation and it will include the concept of “protected species” (Güven Eken, pers. comm.). However, strict protection of habitats is required to conserve the current status and prevent local extinction. We propose to concentrate conservation first on *N. s. barani*. Only four populations are known. Threats are current like road reconstructions close to the breeding streams and the construction of a dam is planned on the river catchments in the Kubbe Dağı (Wagener, 2003). The area is also of great importance for the butterfly *Polyommatus dama dama* of which the only population worldwide is found (Wagener, 2003). Data on population numbers, size and range and population dynamics are urgently needed when conservation of this species is taken seriously (see also Papenfuss et al., 2004). More research is needed to determine the exact distribution of *N. strauchii* south, south-east and east of Lake Van and in the area’s between the known populations.

We propose education to the people living in these remote areas that treating the streams and surroundings with more care is essential for the survival of newts and people both using these streams as primary water source.

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