Short Notes

Ecological observations on the Sardinian grass snake, *Natrix natrix cetti*

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The grass snake (*Natrix natrix*) is one of the most common snake species of the Italian peninsula, where it occurs from the northern Alpine to the southern Mediterranean regions (Lanza, 1983). There is little genetical or morphological differentiation among mainland populations, but Sardinian populations (*Natrix natrix cetti*) are extremely divergent and Corsican populations (*Natrix natrix corsa*) are equidistantly intermediate between the Sardinian and mainland populations (Thorpe, 1975a, 1975b, 1979, 1980). According to Thorpe (1980), it is possible that the Corsican populations were the product of a preglacial migration from the mainland by a few founders and that the Sardinian populations were in turn founded from the Corsican grass snakes.

Very little is known about the biology, conservation and present distribution of *Natrix natrix cetti*, though some authors (Puddu et al., 1988; Corbett, 1989) have hypothesized that the taxon seems to have become very rare in recent years. Based on a small number of Museum specimens (*N* = 4), Stefani (1983), in the only recent paper on the Sardinian grass snake, reported that it inhabits sunny and rocky spots far from water bodies, normally at high elevations. This author also stated that the general ecology of this rare snake is remarkably different from that of the mainland populations of *Natrix natrix*, which in Mediterranean regions are strictly confined to wet or marshy places.

In this paper we report some observations on the ecology of *Natrix natrix cetti*. We carried out the study in the “Supramonte of Oliena” (Province of Nuoro), at about 800 m elevation, during April 1992 and April 1993, and during September 1993. On the whole, we spent 38 days in the field. When a grass snake was seen, it was captured by hand, sexed, measured for total length (TL, to the nearest ± 1 mm), weighed (to the
nearest 0.1 g), palpated in order to obtain any food item in the stomach (see Luiselli and Rugiero, 1991, for the methods employed), and, if a female, to determine if it was gravid. Weight status (see Forsman and Ås, 1987) was used as a measure of physical conditions of both males and females. The time and the type of activity shown by the snake were also recorded.

We captured 18 specimens of *Natrix natrix cetti*. Two specimens, found already dead in the field (squashed by cars), were collected and are deposited in the private herpetological collection of one author (MC). The remaining sample consisted of 10 males and 8 females (apparent sex-ratio not significantly different from equality, $\chi^2$ test with df = 1). Females were bigger than males (mean female TL = $62.65 \pm [SD] 11.61$ cm, mean male TL = $47.3 \pm 4.66$ cm; medians, 63 cm versus 48.5 cm; two-tailed Student $t = 3.86$, df = 16, $p < 0.002$; mean female mass = $73.62 \pm 23.19$ g, mean male mass = $40.3 \pm 7.13$ g; two-tailed $t = -4.32$, df = 16, $p < 0.0005$). Length and mass were positively correlated both in males ($r = 0.68$, $r^2 = 47.28\%$, ANOVA: $F_1 = 7.175$, $p = 0.02$) and in females ($r = 0.92$, $r^2 = 84.36\%$, ANOVA: $F_1 = 32.25$, $p = 0.01$). Physical condition was better in females (mean weight status = $0.114 \pm 0.022$) than in males (mean male weight status = $0.084 \pm 0.01$; two sample differences: $t = -3.64$, df = 16, $p < 0.005$). We suspect that this difference may depend on an earlier start to the annual feeding activity in females affecting April samples, as demonstrated for other European snakes such as *Vipera aspis* (Luiselli and Agrimi, 1991). Correlation between weight status and TL was slightly significant in females ($r = 0.68$, $r^2 = 46.55\%$, ANOVA: $F_1 = 5.23$, $p = 0.05$), but not in males ($r = 0.11$, $r^2 = 2.58\%$, ANOVA: $F_1 = 0.211$, $p > 0.5$), and the slopes of the two regressions did differ significantly ($p < 0.01$, ANCOVA test).

All of the specimens were found within 10 m of mountain streams or swimming in the stream water. No snake were found far from streams, despite our very intensive searches. This appears to contradict the statement by Stefani (1983) that *Natrix natrix cetti* is much more terrestrial than mainland grass snakes, possibly because of the strong competition with viperine snakes (*Natrix maura*). Occasional observations carried out on the Limbara Mountain agreed with our data (E. Pozio, personal communication).

Most of the specimens were captured while moving and hunting, in water, during night (table 1), often when ambient temperature was low (< 15°C). Some were captured at times (e.g. April) when grass snakes living in central Italy (province of Rome) are strictly diurnal (Rugiero et al., unpublished observations). Thus, our opinion is that *Natrix natrix cetti* could be primarily nocturnal all the year, while mainland (central Italian) grass snakes are nocturnal only during summer, when diurnal temperatures become too high (see discussion in Agrimi and Luiselli, 1994). The four diurnal observations of *Natrix natrix cetti* were of inactive individuals found under stones.

Twelve food items (from nine snake stomachs) were found during this research. *Hyla sarda*, the commonest amphibian species in the area (Capula et al., unpublished observations), appeared to be the main prey type of *Natrix natrix cetti*; 6 adults and 5 tadpoles were found. The only other prey was a single lizard (*Podarcis tiliguerta*). Surprisingly, *Discoglossus sardus* were not found in snake stomachs, although elsewhere the species may