

## Short Notes

### Intraspecific variability in nucleolar organiser position in *Lacerta (Timon) lepida*

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The Lacertidae are karyotypically conservative, and most exhibit a fundamental number (FN) of 38 with a diploid chromosome complement of 38 (all acrocentric; the 19th pair characterised by microchromosomes) (Gorman, 1973; Olmo, 1986; Olmo et al., 1990, 1991). *Archaeolacerta monticola*, *Lacerta horvathi* and *Zootoca vivipara*, 2N = FN = 36 (De Luca and Dulic', 1988; Chevalier et al., 1979; Odierna et al., 1996), *A. aurelioi*, 2N = 26, FN = 36, and *A. bonnali*, 2N = 24, FN = 36 (Odierna et al., 1996), *Gallotia*, 2N = FN = 40 (Cano et al., 1984; López-Jurado et al., 1986), *Takydromus amurensis*, 2N = FN = 40 and *T. sexlineatus*, 2N = FN = 42 (Olmo et al., 1986) and, with an FN of 38, *Lacerta parva*, 2N = 24 and members of the *Lacerta (Timon) lepida* complex, 2N = 36 (Gorman, 1969; Kupriyanova, 1980) are exceptions, however. The karyotype of *Lacerta lepida* differs from most in the family by having only 36 chromosomes (32 acrocentric macrochromosomes, two metacentric macrochromosomes derived by fusion of two acrocentric chromosomes, and two microchromosomes) (Matthey, 1939; Giménez-Martin and Abian-Burgos, 1957; Odierna et al., 1990b; Olmo et al., 1990). Acrocentric chromosome fusion is seen also in three species closely related to *Lacerta lepida*: *L. tangitana* — sensu Mateo et al., 1996 — specimens from Bab el Arba, Morocco, (Odierna

et al., 1990b), *L. pater* — sensu stricto — specimens from Algeria (Odierna et al., 1990b) and *L. princeps* (Rykena and Nettmann, 1986).

The position and number of nucleolar organisers (NORs) within the Lacertidae is variable, however, and this variation is sometimes useful in systematic studies (see Amemiya and Gold, 1988; Odierna et al., 1987; Olmo et al., 1990, 1991, 1993). Odierna et al. (1990b) state “a remarkable difference can be seen between *L. lepida* and *L. pater*”. NOR presence in *Lacerta lepida*, *Lacerta viridis*, *Lacerta princeps* and other species within the genus is of the L-type (with NORs located in a pair of large (= L) acrocentric chromosomes, the fifth or so) (Odierna et al., 1990b; Olmo et al., 1990; 1991) whereas NOR presence in *L. pater* (this taxon including now *L. tangitana*!) is of the L + MS-type (with two NORs: one localised on the 5th chromosome pair and the other on the 16th — medium small = MS — chromosome pair) according to the classification of Olmo et al. (1990).

NOR differences may include “the number of NOR bearing chromosomes per genome, the chromosomal position(s) of the NORs, and the type(s) of chromosomes upon which the NORs are located” (Amemiya and Gold, 1988). Intraspecific chromosomal variation exists as differences in morphology and/or chromatin distribution in populations of *Zootoca vivipara* (Olmo et al., 1997) but intraspecific variation in NOR position has not been reported previously in the Lacertidae (Olmo et al., 1993, Odierna et al., 1996).

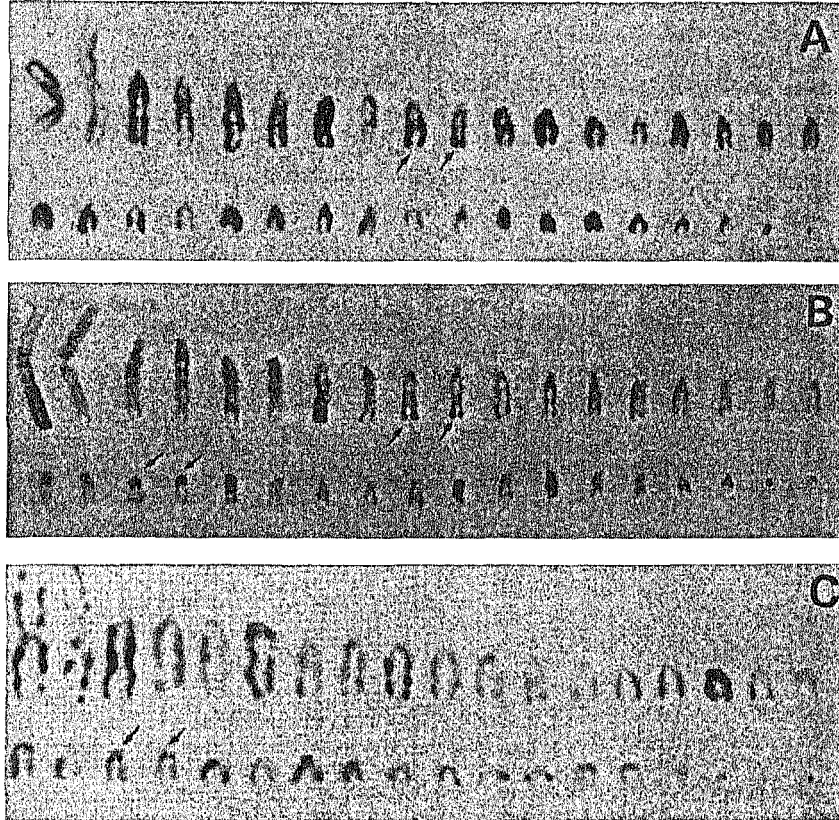
Cytogenetic analyses were performed on 41 *Lacerta lepida* from several localities. Seventeen specimens (five from Almería (36°39'N, 2°27'W), four from Villanueva de las Minas (37°39'N, 5°42'W), four from Cazorla (37°55'N, 3°00'W), and four from Badajoz (38°53'N, 6°58'W) represent *L. l. lepida*, while the remaining 24 specimens (4♂, 2♀ from San Martín de Cies island (42°12'N, 8°55'W); 6♂, 5♀ from Donón (42°30'N, 8°47'W) and 3♂, 4♀ from Sálvora island (42°28'N, 9°01'W) represent *L. l. iberica* (Mateo and Castrovicjo, 1990). Somatic mitosis spreads were obtained using the silver staining method of Cano et al. (1984) and NOR position was determined by the technique of Howell (1977) and Rufas and Gosálvez (1982).

All 41 *L. lepida* exhibited two metacentric macrochromosomes and two microchromosomes. While the 17 *L. l. lepida* (9♂, 8♀) had a single pair of NORs in sub-telomeric position on the fifth pair of large (= L) macrochromosomes (fig. 1A), three different patterns for number and position of NORs were observed in our sample of 24 *L. l. iberica*:

1) The pattern previously described for *L. l. lepida* (fig. 1A), a single pair of NORs in sub-telomeric position on the fifth pair of L chromosomes. Observed in seven specimens (4♂, 2♀ from San Martín de Cies island, and one male from Donón).

2) Two pairs of NORs (one in sub-telomeric position on the 5th [= L], the other in peri-centromeric position on the 11th [middle size (=M)] [L + M-type, fig. 1B]). Observed in three specimens (2♂, 1♀ from Donón).

3) A single pair of NORs in peri-centromeric position on a pair of middle size chromosomes (the eleventh or so) (fig. 1C). Observed in seven specimens (3♂, 4♀) from Sálvora island and seven (3♂ and 4♀) from Donón.



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**Figure 1.** Disposition of the nucleolar organisers. A: Pattern 1, NOR position on the 5th pair (*Lacerta l. lepida* from Cazorla). B: Pattern 2, NORs position on the 5th and the 11th pairs (*L. l. iberica* from Donón). C: Pattern 3, NOR position on the 11th pair of chromosomes (*L. l. iberica* from the Sálvora island).

We interpret pattern 1 as plesiomorphic; it exists in most *L. lepida* and *L. princeps* examined. Pattern 2 is considered apomorphic and may be karyologically derived. Pattern 3, apomorphic as well, may result from chromosomal translocation accompanied by inversion from pattern 1 (in which case we suspect that pattern 2, with two NORs, is a hybrid between patterns 1 and 3) or from the loss of one NOR from pattern 2.

All three patterns coexist in the continental population of *L. l. iberica* at Donón without important phenotypic differentiation. Each insular population, however, has fixed one of the three patterns, probably by a “bottle-neck” phenomenon.

The existence of two pairs of NORs has been demonstrated among five species of Lacertidae: three species within *Pedioplanis* (Odierna et al., 1990a), *L. tangitana* and *L. pater* (Odierna et al., 1990b). Because *L. tangitana* and *L. pater* are phylogenetically

close to *L. lepida* (see Bischoff, 1982; Odierna et al., 1990b, Mateo et al., 1996), the existence of two pairs of NORs in these species could be due to the same process.

Kupriyanova (1980) suggested that intraspecific variations and chromosomal anomalies preferentially occur in populations either peripheral with regard to the species distribution, or in populations subject to special ecological conditions. The coast of Galicia (north-west of the Iberian peninsula) is the only region in the distribution area of *L. lepida* that lies outside of the Mediterranean climatic domain (sensu Quezel, 1985). The ocellated lizards inhabiting this country exhibit notable morphological differences (size, body-shape, and colour) justifying their sub-specific status (Mateo and Castroviejo, 1990), eco-ethological differences (i.e., reproductive strategies, Mateo and Castanet, 1994), and some karyological differences (Cano, in Olmo et al., 1986; this work). Although we may not conclude a direct connection between morphological and/or eco-ethological characteristics and karyological conformation, our results showing the existence of three different patterns in number and position of NORs in a relatively restricted and particular area of distribution for *L. lepida* support the hypothesis of Kupriyanova (1980).

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## Habitat characteristics of the spectacled salamander *Salamandrina terdigitata* (Lacépède, 1788) in southern Latium (Central Italy)

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The spectacled salamander, *Salamandrina terdigitata* (Lacépède, 1788), is endemic to Italy, protected by the Latium administrative region (regional law no. 18, dated April