

Multivariate analysis of the population systematics of the ringed snake, *Natrix natrix* (L).*

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SYNOPSIS

The racial affinities of the widely distributed (palearctic) ringed snake, *Natrix natrix* were assessed using a large number of phenotypic characters from a wide range of features. These characters show a considerable amount of complex geographic variation which is further complicated by geographic variation in the extent of their sexual, ontogenetic and local variation. Nevertheless, extensive analysis of the data using univariate statistics, numerical taxonomy and a wide range of multivariate statistics allowed the primary patterns of 'racial' differentiation to be elucidated.

The dominant feature of the racial affinities is the division of the majority of the complex into distinct eastern and western forms which meet along a 'hybrid zone'. The nature of this zone is analysed in detail and discussed in relation to aspects of evolutionary theory such as gene flow. The island populations of Corsica and Sardinia are also extremely divergent. The evolution and taxonomy of the four primary subdivisions of the complex (east, west, Corsica, Sardinia) are discussed in relation to Pleistocene history, evolutionary theory, species concepts (phenetic and biological) and subspecies concepts, etc. These four subdivisions border on the species rank and may be regarded by some as semispecies. They are formally recognised as subspecies. Attention is drawn to the difficulties of intraspecific taxonomy and the arbitrary nature of the four taxa given formal recognition.

INTRODUCTION

The aim of this study is to investigate the primary patterns of racial differentiation within the ringed or grass snake *Natrix natrix* (L). Whilst some of the pertinent evidence has been outlined in a prior paper (Thorpe 1975a) this study is more comprehensive and covers much new ground.

N. natrix is distributed across much of the palearctic with both contiguous (parapatric) and isolated (allopatric) populations. Since it is widely distributed it has to tolerate a wide range of climatic and environmental conditions. Unfortunately there is little published information on the ecogenetics or precise ecological requirements of this species throughout its range.

This snake is essentially terrestrial but associated with fresh water habitats. This is reflected in its diet of mainly amphibians and fish in much, but not all, of its range.

N. natrix is a very variable 'species'. As well as showing extensive and complex geographic variation it also exhibits considerable sexual, ontogenetic and intra-locality (local) variation which also varies geographically.

There have been several formal attempts at categorising the geographic variation in *N. natrix*. Boulenger (1893) recognised five partly geographical forms. Hecht (1930) recognised 21 subspecies whilst Mertens (1947, 1957, 1966) finally recognised 10 subspecies to which Kramer (1970) later added an eleventh.

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