HEAD SHAPE AND SIZE HERITABILITY IN THE COMMON WALL LIZARD (*Podarcis muralis*)

Stefano SCALI[1], Roberto SACCHI[2], Marco MANGIACOTTI[1,2], Michele GHITTI[2], Marco A. L. ZUFFI[3], and Beatrice BINDOLINI[2]

1. Museo Civico di Storia Naturale di Milano, Corso Venezia 55, I-20121 Milano, Italy, Email: stefano.scali@comune.milano.it

2. Dipartimento di Scienze della Terra e dell'Ambiente, Università di Pavia, Via Taramelli 24, I-27100 Pavia (Italy)

3. Museo di Storia Naturale, Università di Pisa, via Roma 79, I-56011 Calci (Pisa, Italy)

Head shape in lizards correlates with a wide range of environmental pressures, supporting the hypothesis that patterns of phenotypic change represent adaptive responses to selective processes. However, natural selection promotes evolutionary adaptation only if the trait under selection has enough heritable variation. The trait heritability (h^2) measures the fraction of the variability in a trait that can be inherited by offspring, and is used to assess if natural selection may drive evolution of that trait. We used geometric morphometrics and quantitative genetics to assess heritability of head shape and size in *Podarcis muralis*. A total of 139 newborns from 35 clutches derived from 35 females that were collected by noose and transferred to the laboratory were analysed. Eggs were incubated individually and all newborns and females were returned to the original sites. The heads of newborns and mothers were photographed and 13 homologous landmarks were recorded on each specimen. Genetic and environmental components of head shape and size variation were estimated using animal models, which use linear mixed models to estimate the additive genetic variance component after controlling for the pedigree of the population. Head size h^2 was 0.53 and offspring were very similar in size within a clutch. The animal model for shape variables provides a partition of the phenotypic covariance matrix P in the additive genetic G, environmental M, and residual R covariance matrices, and the eigenvalues of the matrix GP^{-1} were used as the multivariate analogue of heritability. The first five eigenvalues ranged between 0.69-0.95, suggesting that a considerable proportion of head shape variation was genetically inherited. The corresponding five axes accounted for different patterns of shape variation that represent different directions on which natural selection could act. The outcome of our study confirms that morphological differentiation may be regarded as the result of adaptive processes driven by natural selection.