

## **Clutch sizes of lizards: to Ashmole's hypothesis and (a little) beyond**

**Shai Meiri**<sup>1,2</sup>

<sup>1</sup> School of Zoology, Tel Aviv University, Tel Aviv, 6997801, Israel

<sup>2</sup> Steinhardt Museum of Natural History, Tel Aviv University, Tel Aviv, 6997801, Israel

A strong tendency for bird clutch sizes to increase with latitude has been known for decades. Often going by the name of Ashmole's hypothesis, it is generally ascribed to increasing seasonality in resources and predation pressures with latitudes. Although it was developed for, and mostly tested in birds, few of the suggested underlying mechanisms have feathers in them. But despite occasional local tests it is seldom examined in other taxa.

I used literature data to test how latitude, climate and other factors are related to clutch sizes across ~4850 lizard species. I found strong effects for phylogeny and positive association with body size, primary productivity, latitude and (separately), rainfall seasonality and temperature seasonality, as predicted. Clutch sizes decrease with temperature and, surprisingly with rainfall. Other factors that are associated with small clutches include nocturnality, herbivorous diet, insularity and scansoriality (inhabiting trees and rocks). Reproductive mode (viviparous/oviparous) was unrelated to clutch size, and neither, surprisingly, was the length of the activity season (for which, however, data only covered ~420 species). Analysing only species with maximum clutch sizes >2 (i.e., excluding most geckos and anoles as well as members of some other lineages), most of these relationships are retained. However, activity time and microhabitat choice become non-significant, and viviparous species emerge as having smaller broods. These results also hold when skinks, the largest, most varied lizard clade, are analysed separately, suggesting phylogenetic effects were not fully accounted for in the global model. These results suggest that Ashmole's hypothesis and several other well known or suspected mechanisms affect lizard clutch sizes. It also raises interesting potential reasons why geckos, anoles and other fixed clutch taxa are restricted to tropical climates, and abundant on rocks, trees, and islands, suggesting appealing avenues for future studies.