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FIELD BODY TEMPERATURES
IN A MICRO-INSULAR LIZARD COMMUNITY
(*Squamata Sauria*)

RIASSUNTO

Temperature corporee in una comunità micro-insulare di Sauri. Vengono illustrati e discussi i dati relativi ad alcuni aspetti dell'ecologia termica dello Scincide *Chalcides ocellatus* (Forskål, 1775) e del Lacertide *Podarcis filfolensis* (Bedriaga, 1876), che compongono la piccola comunità erpetologica dell'Isolotto di Lampione (Isole Pelagie, Canale di Sicilia). In entrambe le specie, le temperature corporee presentano un'ampia variazione tra i valori minimi e massimi (~ 12,0 °C); inoltre, la media dei valori per *C. ocellatus* (34,1 °C) è risultata leggermente superiore a quella di *P. filfolensis* (32,8 °C). Le differenze significative riscontrate tra le mediane riflettono probabilmente la diversa morfologia, biologia ed ecofisiologia delle due specie, sebbene entrambe mostrino sull'isolotto simili preferenze ambientali e utilizzino i medesimi microhabitat. Per *C. ocellatus* è stata riscontrata una scarsa correlazione tra le temperature corporee con i valori termici ambientali (dell'aria e del substrato), probabilmente spiegabile con la maggiore efficienza di questa specie nei processi di termoregolazione rispetto a *P. filfolensis*, che invece mostra una correlazione significativa fra questi parametri termici.

SUMMARY

Data on the field body temperatures of *Chalcides ocellatus* and *Podarcis filfolensis* from Lampione Islet (Pelagie Islands, Channel of Sicily) are presented and discussed. Both lizard species show a wide range (about 12.0 °C) between minimum and maximum. Mean body temperatures resulted rather higher in *C. ocellatus* (34.1 °C) than in *P. filfolensis* (32.8 °C), and their medians differ significantly. *C. ocellatus* seems to be less dependent on environmental factors and slightly more efficient than *P. filfolensis* as regard thermoregulation.

INTRODUCTION

Body temperatures represent a basic information in order to understand how lizards interact with their thermal environments. In fact, the mean body temperature, obtained from temperatures recorded in the field on active animals, is commonly used as a measure of the thermal status of a specimens, even if a better statement of this method also requires information about the environmental conditions involved during thermoregulation processes (HUEY, 1982; CASTILLA *et al.*, 1999). Interaction between lizards and their thermal environment may constrain biochemical and physiological performances (GRANT & DUNHAM, 1988; HUEY *et al.*, 1989; ADOLPH, 1990) and may conflict with requirements for food, reproduction, competition, avoidance of predators (HUEY, 1982; JI *et al.*, 1996). These statements are particularly evident for lizards inhabiting micro-insular Mediterranean environments, which are generally subject to chronic scarcity of trophic resources and strong temporal changes in both abiotic and biotic conditions (PÉREZ-MELLADO, 1989; CASTILLA & BAUWENS, 1991; LO CASCIO, 2006).

This paper deals with some aspects of the thermal ecology of two lizard species inhabiting a small Mediterranean islet, in order to explain the difference observed in their thermoregulatory strategies.

STUDY AREA

The investigated islet is Lampione (35°33'00"N–12°19'11"E Greenwich), a small islet located in the Channel of Sicily, about 17 Km off the W coast of Lampedusa (Pelagie Islands). Its area is 0.021 Km² and the maximum elevation is 36 m a.s.l. The substrate is mainly rocky (Fig. 1) and composed by dolomitized carbonates, while bare spots of soil are strongly affected by wind erosion and by the occurrence of a large colony of breeding Yellow-legged gulls *Larus michahellis* Naumann, 1840. The climate is arid, characterized by strong drought period in summer and an average annual rainfall less than 300 mm. The vegetation consists of alo-nitrophilous perennial shrubs and a few nitrophilous herbs, like *Malva veneta* (Mill.) Soldano, Banfi et Galasso, mainly concentrated on the top of the islet (CORTI *et al.*, 2002).

MATERIAL AND METHODS

The investigation was carried out on the only two lizard species inhabiting Lampione islet, namely a Lacertidae, the Maltese wall lizard, *Podarcis fil-*

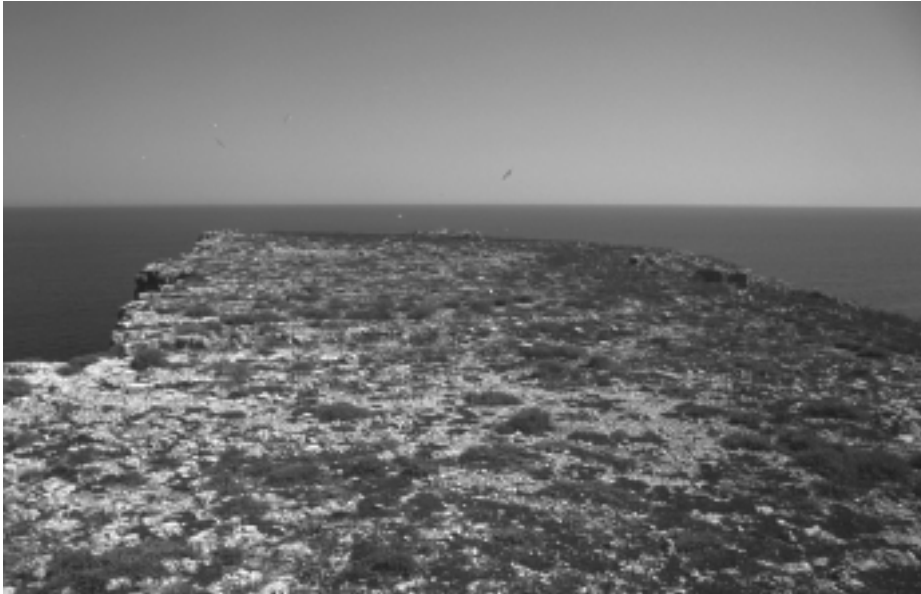


Fig. 1 — The flat top of Lampione Islet.

folensis (Bedriaga, 1876), and a Scincidae, the Ocellated skink, *Chalcides ocellatus* (Forskål, 1775). The occurrence of the first species on this islet has been ascribed to a probable human-mediated introduction (LA MANTIA & LO CASCIO, 2008; LO CASCIO & TURRISI, 2008, and references therein). Population density is extremely high for both species, even if just for *P. filfolensis* it was previously calculated using standard methods (7500-8000 specimens/ha: LO CASCIO *et al.*, 2006). From field observations, the ratio between this latter and *C. ocellatus* is estimated about 3:1 specimens.

Field work was carried out during four visits in late spring-early summer of 2004 and 2005, when both species show the peak of annual activity; data were recorded exclusively during sunny weather, hence the samples of the different sessions were pooled in the present study. Body temperatures (T_b) were taken from active lizards noosed or captured by hand and released immediately after examination, using a quick reading cloacal thermometer “Miller & Weber” (0.2 °C of accuracy) and taking care to minimise heat flow during handling. On the whole, 71 lizards were sampled, of which 40 *Chalcides ocellatus* (snout-vent mean length = 103.30 mm, standard deviation = 13.87, standard error = 2.19) and 31 (21 males and 10 females) *Podarcis filfolensis* (mean SVL = 65.79 mm, sd = 5.25, se = 1.15 for males; 58.81 mm, sd = 5.87, se = 1.86 for females). Since the mean T_b values did not differ significantly

between males (32.98 °C, sd = 2.48, se = 0.54) and females (32.63 °C, sd = 2.11, se = 0.67) (one-way ANOVA: $F = 0.15$, $P = 0.7$), data of both sexes of *P. filfolensis* were pooled for further analysis. The specimens of *C. ocellatus* have not been sexed due to the weak sexual dimorphism and the non-suitable detection of the gender in field (see BADIR, 1959; CAPULA & LUISELLI, 1994). Air temperatures (T_a) were recorded at 2 cm above the soil surface with shaded bulb. Substrate temperatures (T_s) were measured from just below the soil surface, with about one layer of soil particles covering the top of the bulb. Morphometric measures were taken using a calliper (0.1 mm of accuracy).

Statistical analyses were done by using SPSS® 11.5 for Windows PC package, with alpha set at 5% and all tests being two-tailed.

RESULTS

Mean T_b of *Chalcides ocellatus* resulted higher (34.10, sd = 2.29, se = 0.36; min-max: 26.4-38.6 °C) than mean T_b of *Podarcis filfolensis* (32.87, sd = 2.34, se = 0.42; min-max: 24.8-36.4 °C), and significant differences were found between median T_b s of both species (Mann-Whitney U test: $Z = 2.095$, $P = 0.03$).

A positive linear correlation between values of T_b and T_a (*C. ocellatus*: $r = 0.396$, $P = 0.01$; *P. filfolensis*: $r = 0.456$, $P = 0.01$) was obtained (Fig. 2); moreover, T_b of *P. filfolensis* resulted significantly correlated with T_s ($r = 0.425$, $P = 0.01$), whereas correlation between T_b and T_s for *C. ocellatus* was not significant ($r = 0.310$, $P > 0.05$) (Fig. 3).

DISCUSSION

In both species, body temperatures have a wide range of variations, of about 12.0 °C. This clearly suggests a remarkable plasticity in their respective thermal eco-physiology. For *Chalcides ocellatus* a comparable range of body temperatures was reported for both continental and small insular areas (SCHLEICH *et al.*, 1996; LO CASCIO & CORTI, 2008), whereas no data are still available for *Podarcis filfolensis*. Mean body temperature of *C. ocellatus* (34.0 °C) at Lampione resulted rather higher than those recorded in other Pelagian islands (about 31-32 °C, see LO CASCIO & CORTI, 2008). Despite the lack of information concerning the thermal status of *P. filfolensis*, its mean body temperature (>32.0 °C) seems to be congruent with the field body temperatures known for other lacertid species occurring in the Mediterranean area (ranging between 31.9 and 35.5 °C, CASTILLA *et al.*, 1999).

The significative differences between the median body temperatures of

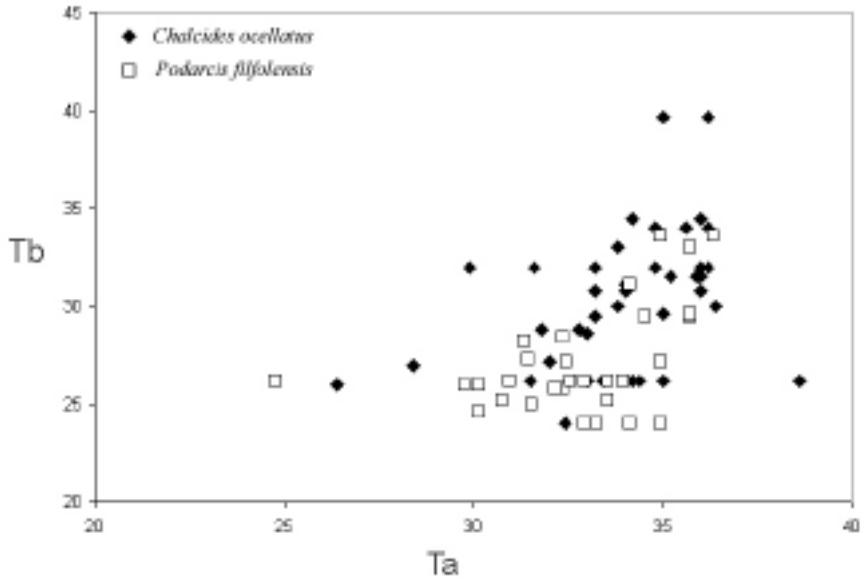


Fig. 2 — Scatterplot of the relationships between body (T_b) and air temperatures (T_a) in *Chalcides ocellatus* and *Podarcis filfolensis*. Axes values are expressed in °C.

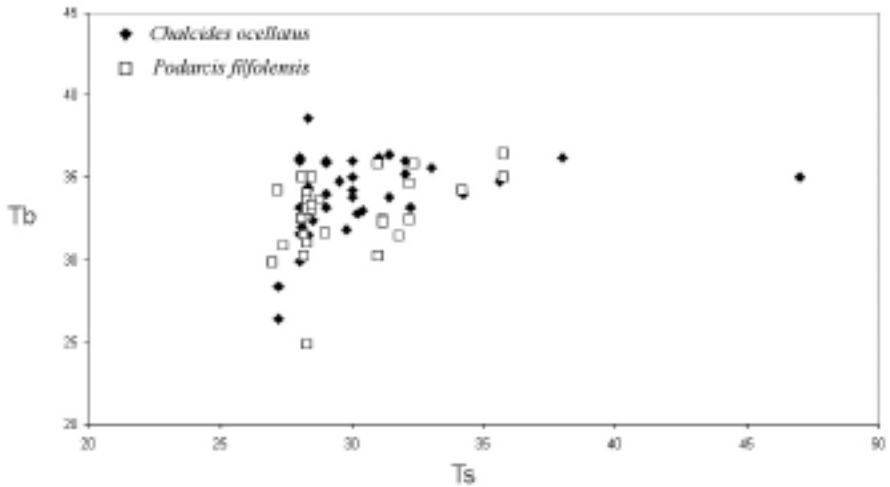


Fig. 3 — Scatterplot of the relationships between body (T_b) and substrate temperatures (T_s) in *Chalcides ocellatus* and *Podarcis filfolensis*. Axes values are expressed in °C.

the two investigated lizard species seems to depend on their respective different features, both morphological and eco-physiological (e.g. different tegumentary structure, body mass index, locomotion, metabolism and reproductive cycle). However, ongoing researches have been stated that both species share a similar use of the same micro-habitat and occupy a very similar trophic niche in this islet (CARRETERO *et al.*, in press). Generally considered as elusive species, *C. ocellatus* at Lampione seems to spend more time in open ground, shuttling active foraging and basking, probably in relation to the low predation pressure which occurs in the islet. As far as is known, this skink usually performs a mixed helio-thigmothermic strategy (AL-SAADON & SPELLERBERG, 1985, 1987; SCHLEICH *et al.*, 1996), while *P. filfolensis*, as the other lacertids, adopts a strictly heliothermic strategy. The results clearly indicate the occurrence of a relationship between air and body temperatures, but conversely a low correlation between these latter and the substrate temperatures for the partial thigmothermic *C. ocellatus*. According to the model proposed by HUEY & SLATKIN (1976), *C. ocellatus* seems to be a slightly more efficient thermoregulator rather than *P. filfolensis*, since its slope value is closer to zero and the mean body temperature is different from the corresponding T_a and T_s . A similar pattern was also observed within the population inhabiting Isola dei Conigli, a small islet close to Lampedusa Island (in the same archipelago), whereas in this latter T_b of *C. ocellatus* is markedly correlated with the environmental temperatures (LO CASCIO & CORTI, 2008).

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