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Thermoregulatory challenges in the habitat of the world's smallest tortoise, *Chersobius signatus*

Victor J.T. Loehr

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Action Statement 20 20 Statement 20 Statement 20 Statement 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20			CONTENTS
Numerical System Data Data <thdata< th=""> Data Data</thdata<>	Jusi A. Diar, Pablo Irasta and	297	Seasonality provides a shift of thermal preferences in a sumperate listed,
And Landswitz 10 Non-Name March Mark Control 10 Non-Name March Mark Control 10 Non-Name March Mark Control 10 Non-Name Mark Control 10 Non-Name Non-Name Mark Control 10 Non-Name Non-Name Non-Name Mark Control 10 Non-Name Non-Nam Non-Nam Non-Nam<	S. Larcon and I. Bergland	243	Themas performance of pressile Adamic solenon (Solno noise L.) of Bolic Sociality
Testing Logitation (Line) 10 March to many thank this regimes to than than and that is regime to the first to the set of	Jeffrey J. Kevatch, F. Rood Haineworth and Junet Perse	247	Analysis methods for two types of second-order thermal transients.
Chemist Theorem 2010 Cale Cale<	Hong-Liang Lu, Xiang Ji, Long-Hui Lin and Lian Zhano	256	Relatively low apper threshold temperature in laseds from ovel habitats
Add Lakes, Statement 20 Tor or state affect data between references at external own data? Add Lakes, Statement 20 Tor or state affect data between references at external own data? Add Lakes, Statement 20 Tor or state affect data between references at external own data? Add Lakes, Statement 20 Tor or state affect data between references at external own data? Add Lakes, Statement 20 Tor or state affect data between references at external own data?	Chabvick J. Hanna and Viscont A. Cobb	262	Effect of temperature on hatching and not site adoction in the groot here update <i>Processis visions</i> (Armerge/Descretified)
Fundamentary from the second s	John Llewelyn, Richard Shine and Jonathan K. Webb	268	Time of testing affects locomotor performance in nontarnal senses diarnal status
J. Trave. Joint a Distribution Version. Const. Obst. Obst. Dist. Nat. Sci. Const. Biol. Dist. Nat. Sci. Sci. Biol. 2004. (2014) - Const. Distribution. The Ministra A. Manistra, Sci. Sci. Distribution of Ministra A. Manistra, Ministra, Ministra			β continued on antide back cover
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ACCEPTED MANUSCRIPT

Thermoregulatory challenges in the habitat of the world's smallest tortoise, Chersobius

signatus

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Abstract

Ectotherms have various means of dealing with low environmental temperatures, but relatively few species have been rigorously investigated. Consequently, we have little information to predict how ectotherm populations might respond to global temperature changes. Tortoises from temperate and subtropical regions often overcome periodically cool conditions by hibernation, but speckled dwarf tortoises (*Chersobius signatus*) need to remain active to exploit ephemeral resources in their arid winter-rainfall habitat. This study investigated how dwarf tortoises cope with low temperatures in winter and spring, by measuring thermal habitat quality and thermoregulation based on differently-sized operative temperature models in sun, shade, and in deep crevices. Investigations continued in summer and autumn to obtain a year-round picture of thermoregulatory challenges. Although large models (i.e., larger than dwarf tortoises) were expected to have lower operative temperatures than smaller models, due to the former's larger thermal inertia, all model sizes had similar temperatures. Hence, the species' small body size does not appear constrained by obtainable body temperatures in cool seasons. Nevertheless, low operative temperatures in winter posed a challenge for the tortoises, which reached their field-

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