

Small-scale spatiotemporal variability in body size of two common carabid beetles

Research Article

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Abstract: Adult body size is one of the most ecologically relevant quantitative traits that underlies many other life-history traits of particular organism. In insects, there is positive intraspecific relationship between body size and female fecundity. In this study small scale temporal and spatial and space variability in structural body size of *Poecilus cupreus* and *Anchomenus dorsalis* was investigated. The beetles were collected in four fields near Prague-Suchbát in autumn 2009 and 2010, and in spring 2010, 2011 and 2012. In both species structural body size was significantly affected by sex (females were the larger sex). In *A. dorsalis* structural body size was also significantly affected by arable field identity, overwintering (post-overwintering individuals collected in spring were larger in comparison to pre-overwintering individuals collected in autumn), sampling year, overwintering by year and arable field by year interactions. Our results suggest that spatiotemporal variation in environmental conditions experienced by *A. dorsalis* during larval growth resulted in differences in adult structural body size among particular fields and particular sampling years. In addition, mean structural body size in *A. dorsalis* was affected by overwintering, which was probably caused by size-specific winter mortality. Moreover, effect of overwintering varied among years, probably according to the specific weather conditions during a particular winter.

Keywords: Agricultural landscape • *Anchomenus dorsalis* • Arable field • Overwintering • *Poecilus cupreus* • Seasonal variation • Structural body size

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1. Introduction

Adult body size is a noticeable feature of each organism and one of the most ecologically relevant quantitative individual characteristics [1,2]. Individual body size determines many other life-history traits of particular organism, including ecological, physiological and ethological traits [2,3]. In insects, there is quite close intraspecific relationship between body size and fecundity in females, where fecundity increases with increasing body size [4]. In addition to higher fecundity, bigger individuals commonly have higher mating success, enhanced longevity and winter survival in comparison to smaller ones [5-7].

Intraspecific variation in body size is frequently studied at large spatial scale, e.g. variation along latitudinal or altitudinal gradients. Such variation in body size at large scale stimulated searching for zoogeographical rules, for example Bergmann's rule or converse Bergmann's

rule [3,8]. In insects, continuum of latitude and altitude effects on body size was reported by Blanckenhorn and Demont [1], who suggested that with increasing latitude or altitude and thus decreasing temperature, specimens of large species with typically longer developmental time become smaller (converse Bergmann's rule), whereas specimens of smaller species with typically shorter developmental time become bigger (Bergmann's rule). Changes in body size with altitude or latitude could be caused either by adaptation of local populations or by phenotypic plasticity [8,9]. For example, increase in rearing temperature generally leads to decrease in body size in insects, a phenomenon known as temperature-size rule (TSR) [10].

Interestingly, studies focused on small-scale spatial and temporal variation in body size are lacking. To our knowledge, the only exception for carabids is the study performed by Östman [11], who studied variation in structural body size and body condition of beetles

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on 10 farms around Uppsala in Sweden in two subsequent years. It is important to note that two different measures of body size could be measured: structural body size (e.g. elytron length) and body mass (sometimes corrected for structural body size and then called “body condition”) [12]. Structural body size (SBS) is determined during juvenile development and is affected by genetic predispositions as well as by temperature (see TSR above), food quantity and quality [13,14]. In contrast, adult body mass (and body condition derived from it) in income breeding insects is determined by environment condition, e.g. food availability, experienced by adults [14–16]. Carabids inhabiting arable fields are known to be food limited as adults, which could have substantial effects on their reproductive success [17,18]. Thus variation in body condition of carabids is frequently investigated in agricultural landscape [13,19,20]. Carabids are holometabolous insects in which different life stages (e.g. larvae and imago) frequently occupy various niches and experience diverse environmental conditions, e.g. food availability, at the same locality [15,18]. Thus, adult body condition (computed from body mass measurement) may not to be tightly correlated to structural body size. However, studies investigating variability in SBS of carabids are rare [11].

Agroecosystems are suitable habitats to study small-scale spatial and temporal variation in body size of predatory insects as food availability could vary between particular fields based on their properties, such as field area, crop identity or agricultural management [13,19]. Moreover, agroecosystems host several ubiquitous and abundant carabid species, which makes them suitable for performance of a study investigating spatio-temporal variation in SBS. These species typically overwinter in field boundaries neighbouring the arable land [21]. Therefore beetles are aggregated in field margins in autumn and in early spring, enabling collection of large numbers of specimens. In addition, autumn and spring sampling enable to investigate effect of overwintering on SBS, i.e. size-specific winter survival. Winter is thought to be a period with substantial mortality risk for temperate insects, reaching up to 90% in some species [22].

In present study, we investigate small-scale spatial and temporal variation in SBS of two carabid beetles: *Anchomenus dorsalis* and *Poecilus cupreus* in agricultural landscape. We hypothesize that: SBS in both species is affected by gender as a result of selection pressure on large body size in females; SBS is affected by arable field identity as a result of different food availability among particular fields; SBS is affected by sampling year as a result of different food availability among particular seasons (due to variation in the course

of weather conditions). In order to test these hypotheses we address the following questions: 1) Does SBS vary among particular fields?; 2) Does SBS vary among years?; 3) Does SBS differ between autumn and subsequent spring?; 4) Does SBS vary between males and females?; 5) Is there any other complex effect of above mentioned variables on SBS represented by their interactions?

2. Experimental Procedures

2.1 Study species

Poecilus cupreus (Lineaus, 1758) (Coleoptera: Carabidae) and *Anchomenus dorsalis* (Pontoppidan, 1763) (Coleoptera: Carabidae) are open habitat generalist species differing in body size, *A. dorsalis* is 5.6 – 7.7 mm long and *P. cupreus* is 9.6 – 14.0 mm long [23]. Both are common in agricultural landscapes and frequently occur also in arable fields [24]. However, non-crop habitat plays crucial role for their overwintering and reproduction [13,24]. *A. dorsalis* and *P. cupreus* are typical spring breeders, i.e. species reproducing in spring and early summer, larval growth takes place during summer and overwintering stage are adult beetles. Both species are polyphagous predators of diverse arthropods including these considered as serious pests, e.g. aphids, thus *A. dorsalis* and *P. cupreus* are classified as beneficial organisms with biocontrol potential [13,15,19,24].

2.2 Experimental design

Carabid beetles were collected repeatedly in four arable fields situated few kilometers north-west of Prague, the Czech Republic (Figure 1). Fields were distanced few kilometers from each other, differed in size (area), but were similar in structure of field boundaries. All fields were conventionally managed during sampling period (2009–2012), however crops planted in particular fields differed (for details see Supplementary material Table S1). Within each field two field margin sites, one neighbouring forest boundary and second neighboring grassy boundary, were sampled using pitfall traps. Traps were made of plastic gutters 80 cm long, 15 cm wide and 15 cm deep, which were buried in the ground. The rim of the traps was precisely flushed with the soil level to enhance trap efficiency for smaller specimens. So-called “live traps” were employed, i.e. traps were not filled with any conservation fluid. Each trap was covered by metal plate (90 x 30 cm) made of aluminium, fixed by large (15 cm long) nails. At each site (neighbouring forest or grassy boundary) three pitfall traps were operated. Traps were emptied every other day.

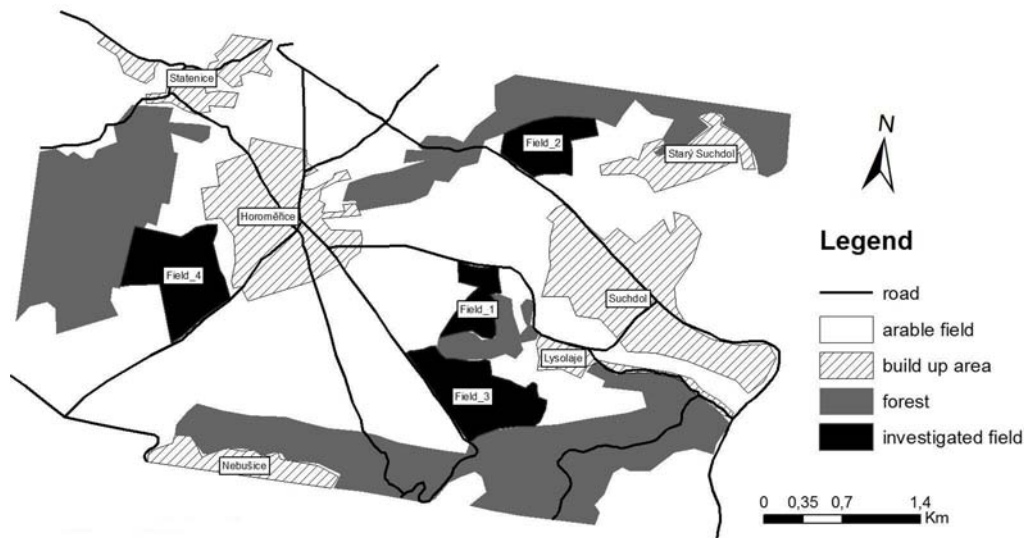


Figure 1. Map of localities investigated in this study. Investigated arable fields were situated near Prague-Suchdol, the Czech Republic (GPS coordinates of field centres: field 1 – 50°7'46.942"N 14°21'37.574"E, field 2 50°8'28.480"N 14°21'54.754"E, field 3 – 50°7'16.933"N 14°21'44.419"E, field 4 – 50°7'38.451"N 14°19'30.361"E).

At the same sites, beetles were collected in autumn (October) 2009 and 2010, and in spring (April) 2010, 2011 and 2012. At each site in each sampling period we tried to collect 40 specimens per particular species (*A. dorsalis* or *P. cupreus*), i.e. 80 specimens per particular species per field. To prevent depletion of local populations, sampling of beetles at particular site was terminated immediately after sufficient number of specimens was collected. Live beetles were transported to the laboratory, killed by freezing and stored in a freezer at -20°C until sample processing. Before size measurements, specimens of particular species from particular site and particular sampling period were sexed and 15 males and 15 females were selected at random. If there were fewer than 15 males or females per site, then all available specimens were used (see Supplementary material Table S1). Elytron length, hind femur length and pronotum width were subsequently measured for all selected specimens using digital calliper with a precision to 0.01 mm. Although it is a common practice to measure only one size, it was shown that measurement of more sizes is meaningful in carabids, because individuals of particular length could be either wide or thin [12].

In *A. dorsalis* we analyzed two datasets: overwintering dataset (A1) consisted of two autumn sampling events (2009 and 2010) and two spring sampling events (2010 and 2011); spring dataset (A2) consisted of three spring sampling events (2010, 2011 and 2012). Low abundances or activity of *P. cupreus* in some sampling events resulted in insufficient numbers of collected specimens from some sites. Therefore, we had to analyze only limited datasets for this species.

Overwintering dataset for *P. cupreus* (P1) consisted of one autumn sampling event (2009) and one spring sampling event (2010). Spring dataset for *P. cupreus* (P2) consisted of two spring sampling events (2010 and 2011). Complete dataset including morphometrical measurements for all specimens analyzed in this study is attached (see Supplementary material Table S2).

2.3 Statistical analyses

To analyze effects of sex, field, overwintering (autumn or spring), sampling year and their interactions on body size, we employed direct multivariate ordination techniques called Redundancy analysis (RDA). All three measured sizes, i.e. elytron length, hind femur length and pronotum width, were used as dependent variables. Data were analysed separately for particular datasets (A1 and A2 for *A. dorsalis* and P1 and P2 for *P. cupreus*; see above), whereas all possible explanatory variables (e.g., sex, field, year for A2 dataset) and their interactions were included for each particular dataset.

Significant terms were identified using forward selection procedure and significance of the final model (all canonical axes together) was tested using randomisation test with 999 permutations. Subsequently, net effects of particular significant terms were analysed and tested. For such purposes all other significant terms in particular model were used as covariates and randomisation tests with 999 permutations were performed under restricted permutation scenarios (permutations were made only within blocks defined by main effect covariates, i.e. non-interaction covariates). All analyses were performed in Canoco for Windows 4.5 software [25].

3. Results

In total, we collected and measured 1133 individuals of *A. dorsalis* (934 were analyzed in overwintering dataset A1 and 677 were analyzed in spring dataset A2) and 683 individuals of *P. cupreus* (468 were analyzed in overwintering dataset P1 and 455 were analyzed in spring dataset P2; for details see Supplementary material Table S1).

Structural body size of *A. dorsalis* was significantly affected by sex (females are larger in comparison to males), field of origin, overwintering (post-overwintering individuals collected in spring were larger in comparison to pre-overwintering individuals collected in autumn) and overwintering $\times$ year interaction (Table 1; Figure 2). All other investigated interactions were insignificant ($P > 0.05$). Effect of sampling year was not significant in overwintering dataset (2 years sampling; RDA: $F = 2.77$, $P = 0.085$), but it became significant when spring data were analyzed (3 years sampling; RDA: $F = 4.02$, $P = 0.013$). In spring dataset, there was also significant field $\times$ year interaction (Table 2; Figure 3). Other interactions between investigated terms were insignificant ($P > 0.05$).

In *P. cupreus*, body size was significantly affected by sex (females are larger than males; RDA: overwintering 1 year dataset: $F = 5.31$, $P = 0.009$; spring 2 years dataset: $F = 9.66$, $P = 0.002$). There was no significant effect of field of origin (RDA; overwintering 1 year

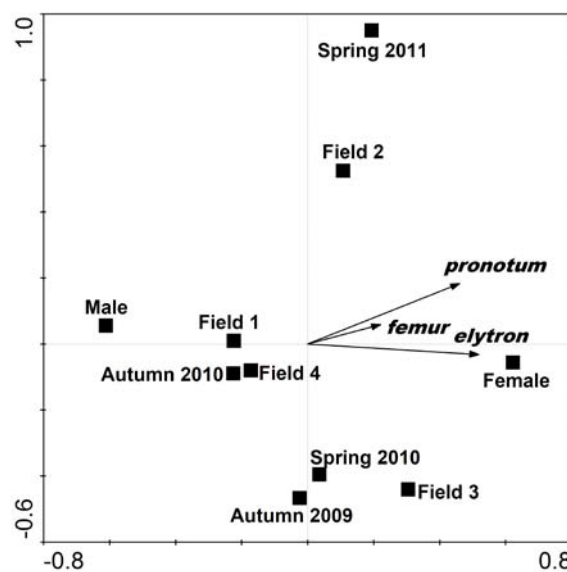


Figure 2. The effects of sex, field and interaction between overwintering and year on structural body size in *Anchomenus dorsalis*. Ordination diagram displays results of redundancy analysis (RDA) performed on „overwintering dataset“ (A1 – see Experimental Procedures). Total variability in data explained by environmental variables included in the final model was 22.9% (the first canonical axis explained 22.1% of variability in data, the second canonical axis explained 0.5% of variability in data; permutation test for all canonical axes: $F = 39.235$; $P = 0.001$). The first canonical axis is strongly correlated with structural body size of *A. dorsalis*.

	Term	F-value	P-value	R ²
Forward selection	Sex	216.51	0.001	
	Field	19.43	0.001	
	Overwintering	8.06	0.002	
	Year #	2.77	0.069	
	Overwintering $\times$ Year	4.78	0.018	
Net effects	Sex	225.78	0.001	0.189
	Field	10.60	0.001	0.027
	Overwintering	7.98	0.004	0.007
	Year #	2.77	0.085	0.002
	Overwintering $\times$ Year	4.78	0.027	0.004
	all together †	39.24	0.001	0.229

Table 1. The effects of sampling site, sampling year and overwintering on structural body size in *Anchomenus dorsalis*. Presented results are outcome of direct linear multivariate ordination analyses (RDA) performed on dataset consisting of beetles sampled repeatedly at four field sites in autumn and spring during two subsequent years. Structural body size is represented by elytron length, hind femur length and pronotum width. Final model presented in the table was selected using forward selection procedure, where selection was made among following terms: sex, field, overwintering, year and all their possible interactions.

there was no significant (at $P = 0.05$) main effect of year, however the term was included in the final model because of significant overwintering $\times$ year interaction

† represents the final model (shown in Figure 2) including all above mentioned terms

	Term	F-value	P-value	R ²
Forward selection	Sex	188.91	0.001	
	Year	6.29	0.013	
	Field	6.03	0.010	
	Field×Year	15.85	0.001	
Net effects	Sex	193.62	0.001	0.219
	Year	4.02	0.013	0.009
	Field	3.83	0.009	0.013
	Field×Year	4.24	0.001	0.028
	all together [†]	20.33	0.001	0.269

Table 2. The effects of sampling site, sampling year on structural body size in *Anchomenus dorsalis*. Presented results are outcome of direct linear multivariate ordination analyses (RDA) performed on dataset consisting of beetles sampled repeatedly at four field sites in spring during three subsequent years. Structural body size is represented by elytron length, hind femur length and pronotum width. Final model presented in the table was selected using forward selection procedure, where selection was made among following terms: sex, field, year and all their possible interactions.

[†] represents final model (shown in Figure 3) including all above mentioned terms

dataset: $F = 3.11$, $P = 0.059$; spring 2 years dataset: $F = 2.84$, $P = 0.069$) neither sampling year (RDA; spring 2 years dataset: $F = 1.48$, $P = 0.217$). There were no significant interactions between investigated terms (all $P > 0.05$).

4. Discussion

There are only few studies investigating small-scale spatial and temporal variation in SBS in insects. The only study on carabid beetles was published by Östman [11], who studied variation in SBS and body condition of carabid beetles in two subsequent years at several farms in Sweden. To our knowledge, this is the first study investigating effect of winter period on shift in SBS of carabid beetle within populations at several sites in two subsequent years. Our results indicate that SBS in *Anchomenus dorsalis* differed between autumn and subsequent spring, varied among sites and this spatial variation was asynchronous through time. Interestingly, for the second studied species (*Poecilus cupreus*) there were no significant effects of site, overwintering or sampling year on SBS. Possible cause could be slightly higher within sample variability (measured as coefficient of variation for particular sample) in body size in *P. cupreus* in comparison to *A. dorsalis* or lower number of collected specimens in *P. cupreus*. SBS in both species was significantly influenced by sex, where females were larger than males. Female biased sexual size dimorphism in investigated species is in agreement with general trends observed in insects [26]. Bigger females are able to reach greater fecundity [4], thus

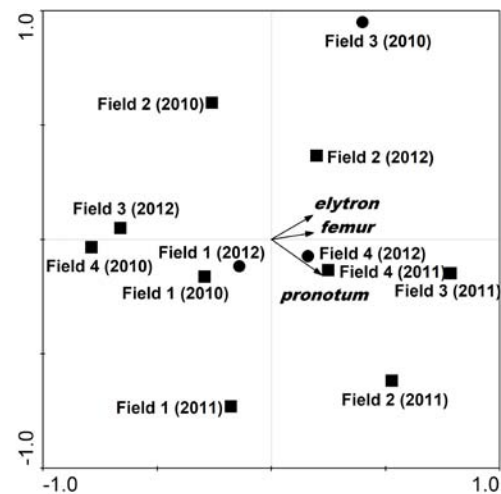


Figure 3. The effects of field identity and year on structural body size in *Anchomenus dorsalis*. Ordination diagram displays results of redundancy analysis (RDA) performed on „spring dataset“ (A2 – see Experimental Procedures). Samples from particular fields in particular years were classified according to crop type grown there in preceding year (i.e. time of larval growth of collected specimens): squares represent field with cereal crop, circles represent field with other crop than cereal (sugar beet, rape or poppy). Total variability in data explained by field, year and their interaction was 5.0% (the first canonical axis explained 4.6%, the second canonical axis explained 0.4%; permutation test for all canonical axes: $F = 4.127$; $P = 0.001$; sex was used as covariable in the analysis). The first canonical axis is strongly correlated with structural body size of *A. dorsalis*.

body size in females is under strong selection favoring larger size [27].

SBS in *A. dorsalis* was significantly affected by overwintering. Specimens of species collected in autumn

were bigger than these collected in subsequent spring. Possible explanation for this pattern is size-dependent winter mortality (*i.e.* large individuals have higher probability of surviving). As adult SBS is determined during preimaginal development [18,28], it is possible that survival of beetles during winter is indirectly influenced by food and temperature experienced during preimaginal stages. Interestingly, SBS differed between beetles collected in autumn and in subsequent spring mainly during winter in 2010-2011 (there was significant interaction between overwintering and year). Season-specific effect of physiological condition on winter survival in carabids has been previously reported by van Dijk [28]. Winter mortality in insects is substantially affected by temperature and other environmental conditions [22,29]. Carabids could suffer from extremely low winter temperatures causing chill injuries as well as from mild winters causing depletion of energy reserves, whereas probably the most unfavorable conditions correspond to temperature fluctuations around zero point (which was the case of the winter 2010-2011) [29]. The course of winter temperatures differ strongly among particular years in Central Europe, thus varying effects of overwintering on SBS is not surprising.

Variation in SBS among particular years is probably caused by year to year variation in environmental conditions. The weather, mainly temperature and moisture, could substantially affect abundance of prey and thus determine feeding conditions of carabid larvae [18]. Moreover, preimaginal growth and final adult SBS are also affected by experienced temperature *per se*. In general, body size of individuals experienced lower temperatures during preimaginal development is larger than those experienced higher temperatures (so-called temperature-size rule) [10].

Variation in SBS of *A. dorsalis* among fields could be a result of difference in local feeding conditions, which could be affected for example by landscape parameters (structure) or by agricultural management taking place at a particular field [19]. Bommarco [13] reported that body size of beetles increases as area of arable field and perimeter-to-area of a particular field decreases. However, it is difficult to identify particular causes of variation in SBS of beetles among fields in this study as only four fields were investigated. It is important to note that just developmental plasticity (proximate

causes) is discussed above. However, variation in SBS could be also caused by local adaptation of particular populations (ultimate causes). But at a small spatial scale investigated in this study ultimate causes are unlikely. We assume that beetles have been able to move among the particular investigated fields. The majority of ground beetles, including both species investigated in this study, have quite high dispersal ability as they are able to fly [24]. Thus, high gene flow probably leads to low level of genetic differentiation in our study system [30].

Inconsistency of variation in SBS of *A. dorsalis* among fields in time (significant field and year interaction) could be caused by rotation of annual crops grown. Crop identity and connected specific agricultural operations and their timing may substantially alter environmental conditions within fields [13,24]. Unfortunately, limited extent of our study (just four fields investigated) do not allow us to investigate the effect of crop identity rigorously.

In conclusion, SBS in both investigated species was determined mainly by gender. However, smaller portion of variation in body size of *A. dorsalis* was also explained by field identity, sampling year, overwintering, interaction of overwintering and year and interaction of field identity and year. This small-scale spatial and temporal variation in SBS was probably caused by differences among particular fields in larval food supply and differences in weather conditions of particular years. This study shows that it is important to perform long-term research (spanning more than one year) in order to record not only spatial variation, but also temporal variation in body size.

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Supplementary material

	Crop			Number of specimens measured							
	2009	2010	2011	Autumn 2009		Spring 2010		Autumn 2010	Spring 2011		Spring 2012
				Ad*	Pc*	Ad	Pc	Ad	Ad	Pc	Ad
Field 1	winter wheat	winter wheat	poppy	60	60	60	59	60	60	58	47
Field 2	winter wheat	spring barley	spring barley	60	49	60	60	46	60	52	60
Field 3	winter rape	winter wheat	winter wheat	60	60	60	60	51	60	52	57
Field 4	spring barley	winter wheat	sugar beet	60	60	59	60	60	58	54	36

Table S1. List of crops planted and numbers of specimens measured in particular fields.

* Ad = *Anchomenus dorsalis*; Pc = *Poecilus cupreus*

Sampling period	Site	Field	Sex	Elytron	Pronotum	Femur	Y10	Y11	M	F	F1	F2	F3	F4
s10	F1 - 1	F1	M	7.30	3.61	2.94	1	0	1	0	1	0	0	0
s10	F1 - 1	F1	M	7.43	3.66	3.16	1	0	1	0	1	0	0	0
s10	F1 - 1	F1	M	7.63	3.74	3.22	1	0	1	0	1	0	0	0
s10	F1 - 1	F1	M	7.47	3.42	3.04	1	0	1	0	1	0	0	0
s10	F1 - 1	F1	M	8.17	3.83	3.15	1	0	1	0	1	0	0	0
s10	F1 - 1	F1	M	8.02	3.66	3.04	1	0	1	0	1	0	0	0
s10	F1 - 1	F1	M	7.69	3.43	3.12	1	0	1	0	1	0	0	0
s10	F1 - 1	F1	M	7.58	3.60	2.90	1	0	1	0	1	0	0	0
s10	F1 - 1	F1	M	8.10	3.47	3.17	1	0	1	0	1	0	0	0
s10	F1 - 1	F1	M	8.32	3.83	2.89	1	0	1	0	1	0	0	0
s10	F1 - 1	F1	M	8.02	3.78	3.23	1	0	1	0	1	0	0	0
s10	F1 - 1	F1	M	8.40	3.87	3.12	1	0	1	0	1	0	0	0
s10	F1 - 1	F1	M	8.08	3.82	3.18	1	0	1	0	1	0	0	0
s10	F1 - 1	F1	M	8.06	3.69	3.43	1	0	1	0	1	0	0	0
s10	F1 - 1	F1	M	8.10	3.73	3.24	1	0	1	0	1	0	0	0
s10	F1 - 1	F1	F	8.44	3.68	3.29	1	0	0	1	1	0	0	0
s10	F1 - 1	F1	F	7.85	3.75	3.87	1	0	0	1	1	0	0	0
s10	F1 - 1	F1	F	8.21	3.71	2.90	1	0	0	1	1	0	0	0
s10	F1 - 1	F1	F	8.17	3.93	3.08	1	0	0	1	1	0	0	0
s10	F1 - 1	F1	F	7.80	3.61	2.77	1	0	0	1	1	0	0	0
s10	F1 - 1	F1	F	8.04	3.88	3.24	1	0	0	1	1	0	0	0
s10	F1 - 1	F1	F	7.44	3.21	3.17	1	0	0	1	1	0	0	0
s10	F1 - 1	F1	F	7.80	3.64	3.21	1	0	0	1	1	0	0	0
s10	F1 - 1	F1	F	7.20	3.67	3.09	1	0	0	1	1	0	0	0
s10	F1 - 1	F1	F	8.11	3.90	3.42	1	0	0	1	1	0	0	0
s10	F1 - 1	F1	F	7.95	3.75	3.15	1	0	0	1	1	0	0	0

Table S2. Raw morphometrical data for each particular specimen analyzed in this study.

Sampling period	Site	Field	Sex	Elytron	Pronotum	Femur	Y10	Y11	M	F	F1	F2	F3	F4
s10	F1 - 1	F1	F	8.10	3.73	3.32	1	0	0	1	1	0	0	0
s10	F1 - 1	F1	F	8.10	3.69	3.17	1	0	0	1	1	0	0	0
s10	F1 - 1	F1	F	7.99	3.78	3.19	1	0	0	1	1	0	0	0
s10	F1 - 1	F1	F	7.85	3.99	3.04	1	0	0	1	1	0	0	0
s10	F1 - 2	F1	M	7.82	3.28	3.19	1	0	1	0	1	0	0	0
s10	F1 - 2	F1	M	8.22	3.95	3.30	1	0	1	0	1	0	0	0
s10	F1 - 2	F1	M	8.32	3.86	3.35	1	0	1	0	1	0	0	0
s10	F1 - 2	F1	M	7.60	3.43	3.21	1	0	1	0	1	0	0	0
s10	F1 - 2	F1	M	8.03	3.85	2.99	1	0	1	0	1	0	0	0
s10	F1 - 2	F1	M	8.06	3.73	3.17	1	0	1	0	1	0	0	0
s10	F1 - 2	F1	M	7.94	3.34	3.19	1	0	1	0	1	0	0	0
s10	F1 - 2	F1	M	8.26	3.94	3.34	1	0	1	0	1	0	0	0
s10	F1 - 2	F1	M	7.70	3.55	3.00	1	0	1	0	1	0	0	0
s10	F1 - 2	F1	M	8.12	3.59	3.29	1	0	1	0	1	0	0	0
s10	F1 - 2	F1	M	7.72	3.60	3.22	1	0	1	0	1	0	0	0
s10	F1 - 2	F1	M	7.89	3.60	3.10	1	0	1	0	1	0	0	0
s10	F1 - 2	F1	M	8.49	3.94	3.31	1	0	1	0	1	0	0	0
s10	F1 - 2	F1	M	8.78	3.97	3.30	1	0	1	0	1	0	0	0
s10	F1 - 2	F1	M	8.45	3.88	3.24	1	0	1	0	1	0	0	0
s10	F1 - 2	F1	F	7.87	3.56	2.77	1	0	0	1	1	0	0	0
s10	F1 - 2	F1	F	7.64	3.34	2.98	1	0	0	1	1	0	0	0
s10	F1 - 2	F1	F	8.33	3.96	3.40	1	0	0	1	1	0	0	0
s10	F1 - 2	F1	F	8.09	3.68	3.16	1	0	0	1	1	0	0	0
s10	F1 - 2	F1	F	8.35	3.87	3.24	1	0	0	1	1	0	0	0
s10	F1 - 2	F1	F	8.83	4.01	3.37	1	0	0	1	1	0	0	0
s10	F1 - 2	F1	F	7.62	3.63	3.11	1	0	0	1	1	0	0	0
s10	F1 - 2	F1	F	8.54	3.71	3.45	1	0	0	1	1	0	0	0
s10	F1 - 2	F1	F	8.06	3.56	3.12	1	0	0	1	1	0	0	0
s10	F1 - 2	F1	F	8.07	3.70	3.23	1	0	0	1	1	0	0	0
s10	F1 - 2	F1	F	7.61	3.64	3.15	1	0	0	1	1	0	0	0
s10	F1 - 2	F1	F	8.06	3.90	3.22	1	0	0	1	1	0	0	0
s10	F1 - 2	F1	F	8.28	3.96	2.98	1	0	0	1	1	0	0	0
s10	F1 - 2	F1	F	8.14	3.65	3.22	1	0	0	1	1	0	0	0
s10	F2 - 1	F2	M	8.40	3.79	2.83	1	0	1	0	0	1	0	0
s10	F2 - 1	F2	M	8.26	3.63	3.17	1	0	1	0	0	1	0	0
s10	F2 - 1	F2	M	8.19	3.85	3.22	1	0	1	0	0	1	0	0
s10	F2 - 1	F2	M	8.42	3.83	3.35	1	0	1	0	0	1	0	0
s10	F2 - 1	F2	M	8.21	3.68	3.26	1	0	1	0	0	1	0	0
s10	F2 - 1	F2	M	7.94	3.63	3.27	1	0	1	0	0	1	0	0
s10	F2 - 1	F2	M	7.64	3.67	3.08	1	0	1	0	0	1	0	0
s10	F2 - 1	F2	M	8.68	4.03	3.30	1	0	1	0	0	1	0	0

continued **Table S2.** Raw morphometrical data for each particular specimen analyzed in this study.

Sampling period	Site	Field	Sex	Elytron	Pronotum	Femur	Y10	Y11	M	F	F1	F2	F3	F4
s10	F2 - 1	F2	M	8.30	3.88	3.25	1	0	1	0	0	1	0	0
s10	F2 - 1	F2	M	8.10	3.84	3.28	1	0	1	0	0	1	0	0
s10	F2 - 1	F2	M	8.33	3.80	3.39	1	0	1	0	0	1	0	0
s10	F2 - 1	F2	F	8.58	4.16	3.22	1	0	0	1	0	1	0	0
s10	F2 - 1	F2	F	8.03	3.80	3.13	1	0	0	1	0	1	0	0
s10	F2 - 1	F2	F	7.20	3.59	2.78	1	0	0	1	0	1	0	0
s10	F2 - 1	F2	F	7.72	3.63	3.15	1	0	0	1	0	1	0	0
s10	F2 - 1	F2	F	8.44	3.90	3.22	1	0	0	1	0	1	0	0
s10	F2 - 1	F2	F	7.70	3.79	2.95	1	0	0	1	0	1	0	0
s10	F2 - 1	F2	F	8.18	3.81	2.79	1	0	0	1	0	1	0	0
s10	F2 - 1	F2	F	7.90	3.57	3.21	1	0	0	1	0	1	0	0
s10	F2 - 1	F2	F	7.64	3.55	2.41	1	0	0	1	0	1	0	0
s10	F2 - 1	F2	F	8.40	4.05	3.04	1	0	0	1	0	1	0	0
s10	F2 - 1	F2	F	8.04	3.80	3.15	1	0	0	1	0	1	0	0
s10	F2 - 1	F2	F	8.53	4.01	3.46	1	0	0	1	0	1	0	0
s10	F2 - 1	F2	F	8.27	3.86	3.33	1	0	0	1	0	1	0	0
s10	F2 - 1	F2	F	7.99	3.64	3.04	1	0	0	1	0	1	0	0
s10	F2 - 1	F2	F	8.45	3.95	3.30	1	0	0	1	0	1	0	0
s10	F2 - 1	F2	F	8.60	3.97	3.33	1	0	0	1	0	1	0	0
s10	F2 - 1	F2	F	8.11	3.53	3.03	1	0	0	1	0	1	0	0
s10	F2 - 1	F2	F	8.03	3.91	2.96	1	0	0	1	0	1	0	0
s10	F2 - 1	F2	F	8.08	3.78	3.15	1	0	0	1	0	1	0	0
s10	F2 - 2	F2	M	8.00	3.59	3.11	1	0	1	0	0	1	0	0
s10	F2 - 2	F2	M	7.60	3.70	2.95	1	0	1	0	0	1	0	0
s10	F2 - 2	F2	M	7.75	3.90	3.25	1	0	1	0	0	1	0	0
s10	F2 - 2	F2	M	7.49	3.47	2.96	1	0	1	0	0	1	0	0
s10	F2 - 2	F2	M	8.23	3.74	3.30	1	0	1	0	0	1	0	0
s10	F2 - 2	F2	M	7.35	3.48	2.99	1	0	1	0	0	1	0	0
s10	F2 - 2	F2	M	7.60	3.66	3.07	1	0	1	0	0	1	0	0
s10	F2 - 2	F2	M	7.69	3.54	3.12	1	0	1	0	0	1	0	0
s10	F2 - 2	F2	M	7.84	3.88	3.15	1	0	1	0	0	1	0	0
s10	F2 - 2	F2	M	8.12	3.70	2.94	1	0	1	0	0	1	0	0
s10	F2 - 2	F2	M	8.19	3.97	3.37	1	0	1	0	0	1	0	0
s10	F2 - 2	F2	M	7.67	3.50	3.14	1	0	1	0	0	1	0	0
s10	F2 - 2	F2	M	8.13	3.78	3.54	1	0	1	0	0	1	0	0
s10	F2 - 2	F2	M	7.20	3.48	2.90	1	0	1	0	0	1	0	0
s10	F2 - 2	F2	M	7.96	3.78	2.92	1	0	1	0	0	1	0	0
s10	F2 - 2	F2	F	8.27	4.03	3.27	1	0	0	1	0	1	0	0
s10	F2 - 2	F2	F	7.80	3.67	3.07	1	0	0	1	0	1	0	0
s10	F2 - 2	F2	F	8.28	3.81	3.21	1	0	0	1	0	1	0	0
s10	F2 - 2	F2	F	8.42	3.98	3.32	1	0	0	1	0	1	0	0

continued Table S2. Raw morphometrical data for each particular specimen analyzed in this study.

Sampling period	Site	Field	Sex	Elytron	Pronotum	Femur	Y10	Y11	M	F	F1	F2	F3	F4
s10	F2 - 2	F2	F	8.60	4.04	3.34	1	0	0	1	0	1	0	0
s10	F2 - 2	F2	F	8.20	4.04	3.70	1	0	0	1	0	1	0	0
s10	F2 - 2	F2	F	7.92	3.72	3.01	1	0	0	1	0	1	0	0
s10	F2 - 2	F2	F	7.98	3.54	3.07	1	0	0	1	0	1	0	0
s10	F2 - 2	F2	F	8.46	3.89	3.24	1	0	0	1	0	1	0	0
s10	F2 - 2	F2	F	8.27	3.67	3.31	1	0	0	1	0	1	0	0
s10	F2 - 2	F2	F	8.07	3.72	3.02	1	0	0	1	0	1	0	0
s10	F2 - 2	F2	F	8.46	4.03	3.49	1	0	0	1	0	1	0	0
s10	F2 - 2	F2	F	8.20	3.96	3.29	1	0	0	1	0	1	0	0
s10	F2 - 2	F2	F	7.96	3.91	3.21	1	0	0	1	0	1	0	0
s10	F2 - 2	F2	F	8.10	3.75	3.09	1	0	0	1	0	1	0	0
s10	F3 - 1	F3	M	8.31	3.96	3.28	1	0	1	0	0	0	1	0
s10	F3 - 1	F3	M	7.64	3.60	3.06	1	0	1	0	0	0	1	0
s10	F3 - 1	F3	M	7.80	3.46	2.76	1	0	1	0	0	0	1	0
s10	F3 - 1	F3	M	8.24	3.91	3.12	1	0	1	0	0	0	1	0
s10	F3 - 1	F3	M	8.06	3.80	3.20	1	0	1	0	0	0	1	0
s10	F3 - 1	F3	M	8.17	3.92	3.23	1	0	1	0	0	0	1	0
s10	F3 - 1	F3	M	7.94	3.64	3.19	1	0	1	0	0	0	1	0
s10	F3 - 1	F3	M	7.85	3.54	3.06	1	0	1	0	0	0	1	0
s10	F3 - 1	F3	M	8.42	3.89	3.28	1	0	1	0	0	0	1	0
s10	F3 - 1	F3	M	7.98	3.79	3.22	1	0	1	0	0	0	1	0
s10	F3 - 1	F3	M	8.22	3.83	3.12	1	0	1	0	0	0	1	0
s10	F3 - 1	F3	M	8.46	4.00	3.16	1	0	1	0	0	0	1	0
s10	F3 - 1	F3	M	8.26	3.82	3.08	1	0	1	0	0	0	1	0
s10	F3 - 1	F3	M	7.86	3.57	3.02	1	0	1	0	0	0	1	0
s10	F3 - 1	F3	M	7.77	3.82	3.10	1	0	1	0	0	0	1	0
s10	F3 - 1	F3	F	8.32	4.00	2.89	1	0	0	1	0	0	1	0
s10	F3 - 1	F3	F	8.23	3.77	3.16	1	0	0	1	0	0	1	0
s10	F3 - 1	F3	F	8.61	3.96	3.38	1	0	0	1	0	0	1	0
s10	F3 - 1	F3	F	8.26	3.73	3.40	1	0	0	1	0	0	1	0
s10	F3 - 1	F3	F	8.28	3.83	3.19	1	0	0	1	0	0	1	0
s10	F3 - 1	F3	F	8.27	3.72	3.02	1	0	0	1	0	0	1	0
s10	F3 - 1	F3	F	8.01	3.81	3.17	1	0	0	1	0	0	1	0
s10	F3 - 1	F3	F	8.27	3.80	3.26	1	0	0	1	0	0	1	0
s10	F3 - 1	F3	F	8.09	3.82	3.13	1	0	0	1	0	0	1	0
s10	F3 - 1	F3	F	8.40	4.01	3.22	1	0	0	1	0	0	1	0
s10	F3 - 1	F3	F	7.53	3.53	2.98	1	0	0	1	0	0	1	0
s10	F3 - 1	F3	F	8.45	3.75	3.22	1	0	0	1	0	0	1	0
s10	F3 - 1	F3	F	8.05	3.75	3.10	1	0	0	1	0	0	1	0
s10	F3 - 1	F3	F	7.99	3.83	2.68	1	0	0	1	0	0	1	0
s10	F3 - 1	F3	F	8.21	3.95	3.26	1	0	0	1	0	0	1	0

continued **Table S2.** Raw morphometrical data for each particular specimen analyzed in this study.

Sampling period	Site	Field	Sex	Elytron	Pronotum	Femur	Y10	Y11	M	F	F1	F2	F3	F4
s10	F3 - 2	F3	M	7.85	3.70	3.15	1	0	1	0	0	0	1	0
s10	F3 - 2	F3	M	7.83	3.84	3.21	1	0	1	0	0	0	1	0
s10	F3 - 2	F3	M	8.01	3.69	3.09	1	0	1	0	0	0	1	0
s10	F3 - 2	F3	M	7.34	3.61	3.32	1	0	1	0	0	0	1	0
s10	F3 - 2	F3	M	7.99	3.53	3.18	1	0	1	0	0	0	1	0
s10	F3 - 2	F3	M	7.40	3.88	3.05	1	0	1	0	0	0	1	0
s10	F3 - 2	F3	M	8.04	3.74	3.28	1	0	1	0	0	0	1	0
s10	F3 - 2	F3	M	8.12	3.94	2.87	1	0	1	0	0	0	1	0
s10	F3 - 2	F3	M	8.35	3.62	3.17	1	0	1	0	0	0	1	0
s10	F3 - 2	F3	M	7.81	3.44	3.06	1	0	1	0	0	0	1	0
s10	F3 - 2	F3	M	7.59	3.66	3.20	1	0	1	0	0	0	1	0
s10	F3 - 2	F3	M	7.72	3.58	3.00	1	0	1	0	0	0	1	0
s10	F3 - 2	F3	M	7.95	3.53	3.16	1	0	1	0	0	0	1	0
s10	F3 - 2	F3	M	8.19	3.85	3.01	1	0	1	0	0	0	1	0
s10	F3 - 2	F3	M	8.05	3.67	3.10	1	0	1	0	0	0	1	0
s10	F3 - 2	F3	F	7.56	3.65	2.98	1	0	0	1	0	0	1	0
s10	F3 - 2	F3	F	8.46	3.93	2.88	1	0	0	1	0	0	1	0
s10	F3 - 2	F3	F	8.34	3.70	3.34	1	0	0	1	0	0	1	0
s10	F3 - 2	F3	F	8.39	3.83	3.19	1	0	0	1	0	0	1	0
s10	F3 - 2	F3	F	7.70	3.58	3.32	1	0	0	1	0	0	1	0
s10	F3 - 2	F3	F	7.93	3.92	3.25	1	0	0	1	0	0	1	0
s10	F3 - 2	F3	F	7.90	3.84	3.20	1	0	0	1	0	0	1	0
s10	F3 - 2	F3	F	8.73	4.12	3.34	1	0	0	1	0	0	1	0
s10	F3 - 2	F3	F	8.70	3.93	3.22	1	0	0	1	0	0	1	0
s10	F3 - 2	F3	F	8.15	3.78	2.86	1	0	0	1	0	0	1	0
s10	F3 - 2	F3	F	7.76	3.60	2.93	1	0	0	1	0	0	1	0
s10	F3 - 2	F3	F	8.68	4.16	3.36	1	0	0	1	0	0	1	0
s10	F3 - 2	F3	F	7.66	3.62	3.01	1	0	0	1	0	0	1	0
s10	F3 - 2	F3	F	7.72	3.80	3.16	1	0	0	1	0	0	1	0
s10	F3 - 2	F3	F	8.35	4.01	3.37	1	0	0	1	0	0	1	0
s10	F4 - 1	F4	M	7.78	3.64	3.00	1	0	1	0	0	0	0	1
s10	F4 - 1	F4	M	7.98	3.61	3.17	1	0	1	0	0	0	0	1
s10	F4 - 1	F4	M	7.65	3.47	2.86	1	0	1	0	0	0	0	1
s10	F4 - 1	F4	M	7.90	3.76	3.15	1	0	1	0	0	0	0	1
s10	F4 - 1	F4	M	8.11	3.64	3.24	1	0	1	0	0	0	0	1
s10	F4 - 1	F4	M	8.50	3.99	3.29	1	0	1	0	0	0	0	1
s10	F4 - 1	F4	M	7.83	3.60	3.12	1	0	1	0	0	0	0	1
s10	F4 - 1	F4	M	7.70	3.53	3.08	1	0	1	0	0	0	0	1
s10	F4 - 1	F4	M	7.92	3.74	3.20	1	0	1	0	0	0	0	1
s10	F4 - 1	F4	M	7.72	3.68	2.98	1	0	1	0	0	0	0	1
s10	F4 - 1	F4	M	7.58	3.50	2.90	1	0	1	0	0	0	0	1

continued Table S2. Raw morphometrical data for each particular specimen analyzed in this study.

Sampling period	Site	Field	Sex	Elytron	Pronotum	Femur	Y10	Y11	M	F	F1	F2	F3	F4
s10	F4 - 1	F4	M	7.94	3.91	3.14	1	0	1	0	0	0	0	1
s10	F4 - 1	F4	M	8.13	3.80	3.06	1	0	1	0	0	0	0	1
s10	F4 - 1	F4	M	7.82	3.42	3.07	1	0	1	0	0	0	0	1
s10	F4 - 1	F4	M	7.80	3.70	2.95	1	0	1	0	0	0	0	1
s10	F4 - 1	F4	F	8.40	4.06	2.97	1	0	0	1	0	0	0	1
s10	F4 - 1	F4	F	8.16	3.70	3.12	1	0	0	1	0	0	0	1
s10	F4 - 1	F4	F	8.23	3.58	3.24	1	0	0	1	0	0	0	1
s10	F4 - 1	F4	F	8.00	3.64	3.06	1	0	0	1	0	0	0	1
s10	F4 - 1	F4	F	7.91	3.62	3.00	1	0	0	1	0	0	0	1
s10	F4 - 1	F4	F	8.37	4.09	3.34	1	0	0	1	0	0	0	1
s10	F4 - 1	F4	F	7.94	3.66	2.96	1	0	0	1	0	0	0	1
s10	F4 - 1	F4	F	8.40	3.88	3.27	1	0	0	1	0	0	0	1
s10	F4 - 1	F4	F	7.49	3.43	2.89	1	0	0	1	0	0	0	1
s10	F4 - 1	F4	F	8.31	3.94	3.23	1	0	0	1	0	0	0	1
s10	F4 - 1	F4	F	8.42	3.79	3.26	1	0	0	1	0	0	0	1
s10	F4 - 1	F4	F	7.98	3.72	3.04	1	0	0	1	0	0	0	1
s10	F4 - 1	F4	F	8.23	3.77	3.11	1	0	0	1	0	0	0	1
s10	F4 - 1	F4	F	8.30	3.90	3.27	1	0	0	1	0	0	0	1
s10	F4 - 1	F4	F	7.68	3.52	2.28	1	0	0	1	0	0	0	1
s10	F4 - 2	F4	M	7.54	3.62	3.09	1	0	1	0	0	0	0	1
s10	F4 - 2	F4	M	7.97	3.71	3.24	1	0	1	0	0	0	0	1
s10	F4 - 2	F4	M	8.16	3.62	3.23	1	0	1	0	0	0	0	1
s10	F4 - 2	F4	M	7.88	3.82	3.12	1	0	1	0	0	0	0	1
s10	F4 - 2	F4	M	8.11	3.82	3.03	1	0	1	0	0	0	0	1
s10	F4 - 2	F4	M	7.85	3.51	2.88	1	0	1	0	0	0	0	1
s10	F4 - 2	F4	M	8.18	3.84	3.26	1	0	1	0	0	0	0	1
s10	F4 - 2	F4	M	7.98	3.71	3.12	1	0	1	0	0	0	0	1
s10	F4 - 2	F4	M	7.75	3.63	2.86	1	0	1	0	0	0	0	1
s10	F4 - 2	F4	M	7.85	3.65	3.06	1	0	1	0	0	0	0	1
s10	F4 - 2	F4	M	7.93	3.53	2.82	1	0	1	0	0	0	0	1
s10	F4 - 2	F4	M	7.64	3.57	2.87	1	0	1	0	0	0	0	1
s10	F4 - 2	F4	M	8.26	3.81	3.16	1	0	1	0	0	0	0	1
s10	F4 - 2	F4	M	8.14	3.75	3.20	1	0	1	0	0	0	0	1
s10	F4 - 2	F4	M	7.70	3.49	3.01	1	0	1	0	0	0	0	1
s10	F4 - 2	F4	F	8.00	3.97	3.29	1	0	0	1	0	0	0	1
s10	F4 - 2	F4	F	8.02	3.90	3.22	1	0	0	1	0	0	0	1
s10	F4 - 2	F4	F	8.04	3.82	3.23	1	0	0	1	0	0	0	1
s10	F4 - 2	F4	F	8.19	3.92	3.28	1	0	0	1	0	0	0	1
s10	F4 - 2	F4	F	8.12	3.82	2.98	1	0	0	1	0	0	0	1
s10	F4 - 2	F4	F	7.30	3.54	2.99	1	0	0	1	0	0	0	1
s10	F4 - 2	F4	F	8.06	3.54	3.09	1	0	0	1	0	0	0	1

Table S2. Raw morphometrical data for each particular specimen analyzed in this study.

continued

Sampling period	Site	Field	Sex	Elytron	Pronotum	Femur	Y10	Y11	M	F	F1	F2	F3	F4
s10	F4 - 2	F4	F	8.39	3.93	3.38	1	0	0	1	0	0	0	1
s10	F4 - 2	F4	F	7.82	3.71	2.92	1	0	0	1	0	0	0	1
s10	F4 - 2	F4	F	7.88	3.74	3.13	1	0	0	1	0	0	0	1
s10	F4 - 2	F4	F	8.48	3.96	3.27	1	0	0	1	0	0	0	1
s10	F4 - 2	F4	F	8.02	3.70	2.79	1	0	0	1	0	0	0	1
s10	F4 - 2	F4	F	8.00	3.70	3.15	1	0	0	1	0	0	0	1
s10	F4 - 2	F4	F	7.62	3.47	2.97	1	0	0	1	0	0	0	1
s10	F4 - 2	F4	F	7.90	3.78	2.96	1	0	0	1	0	0	0	1
s11	F1-1	F1	M	7.78	3.55	3.15	0	1	1	0	1	0	0	0
s11	F1-1	F1	M	8.25	4.02	3.28	0	1	1	0	1	0	0	0
s11	F1-1	F1	M	8.11	3.59	2.96	0	1	1	0	1	0	0	0
s11	F1-1	F1	M	7.75	3.62	3.11	0	1	1	0	1	0	0	0
s11	F1-1	F1	M	8.25	3.93	3.27	0	1	1	0	1	0	0	0
s11	F1-1	F1	M	8.19	3.85	3.18	0	1	1	0	1	0	0	0
s11	F1-1	F1	M	8.44	3.68	3.14	0	1	1	0	1	0	0	0
s11	F1-1	F1	M	7.56	3.56	3.10	0	1	1	0	1	0	0	0
s11	F1-1	F1	M	7.19	3.62	2.85	0	1	1	0	1	0	0	0
s11	F1-1	F1	M	7.59	3.59	3.03	0	1	1	0	1	0	0	0
s11	F1-1	F1	M	8.18	3.83	3.13	0	1	1	0	1	0	0	0
s11	F1-1	F1	M	7.71	3.72	3.12	0	1	1	0	1	0	0	0
s11	F1-1	F1	M	7.35	3.84	3.23	0	1	1	0	1	0	0	0
s11	F1-1	F1	M	7.67	3.51	3.01	0	1	1	0	1	0	0	0
s11	F1-1	F1	M	7.54	3.40	3.02	0	1	1	0	1	0	0	0
s11	F1-1	F1	F	8.31	3.85	3.34	0	1	0	1	1	0	0	0
s11	F1-1	F1	F	8.08	3.73	3.22	0	1	0	1	1	0	0	0
s11	F1-1	F1	F	8.14	3.79	3.30	0	1	0	1	1	0	0	0
s11	F1-1	F1	F	7.48	3.60	3.05	0	1	0	1	1	0	0	0
s11	F1-1	F1	F	8.26	3.73	3.17	0	1	0	1	1	0	0	0
s11	F1-1	F1	F	7.94	3.62	3.13	0	1	0	1	1	0	0	0
s11	F1-1	F1	F	8.38	4.13	3.12	0	1	0	1	1	0	0	0
s11	F1-1	F1	F	7.87	3.88	3.22	0	1	0	1	1	0	0	0
s11	F1-1	F1	F	8.00	3.86	3.14	0	1	0	1	1	0	0	0
s11	F1-1	F1	F	7.50	3.62	2.92	0	1	0	1	1	0	0	0
s11	F1-1	F1	F	8.46	3.98	3.42	0	1	0	1	1	0	0	0
s11	F1-1	F1	F	7.76	3.52	3.09	0	1	0	1	1	0	0	0
s11	F1-1	F1	F	8.15	3.89	3.27	0	1	0	1	1	0	0	0
s11	F1-2	F1	M	7.78	3.67	3.16	0	1	1	0	1	0	0	0
s11	F1-2	F1	M	8.14	3.87	3.14	0	1	1	0	1	0	0	0
s11	F1-2	F1	M	8.02	3.70	3.21	0	1	1	0	1	0	0	0
s11	F1-2	F1	M	7.98	3.62	3.28	0	1	1	0	1	0	0	0
s11	F1-2	F1	M	7.89	3.69	3.08	0	1	1	0	1	0	0	0

continued Table S2. Raw morphometrical data for each particular specimen analyzed in this study.

Sampling period	Site	Field	Sex	Elytron	Pronotum	Femur	Y10	Y11	M	F	F1	F2	F3	F4
s11	F1-2	F1	M	7.70	3.88	3.16	0	1	1	0	1	0	0	0
s11	F1-2	F1	M	7.92	3.83	3.11	0	1	1	0	1	0	0	0
s11	F1-2	F1	M	8.25	3.76	3.14	0	1	1	0	1	0	0	0
s11	F1-2	F1	M	7.99	3.71	3.13	0	1	1	0	1	0	0	0
s11	F1-2	F1	M	8.23	3.87	3.27	0	1	1	0	1	0	0	0
s11	F1-2	F1	M	7.48	3.65	3.14	0	1	1	0	1	0	0	0
s11	F1-2	F1	M	7.73	3.63	3.05	0	1	1	0	1	0	0	0
s11	F1-2	F1	M	8.25	3.95	3.40	0	1	1	0	1	0	0	0
s11	F1-2	F1	M	8.24	3.96	3.24	0	1	1	0	1	0	0	0
s11	F1-2	F1	M	8.34	3.85	3.27	0	1	1	0	1	0	0	0
s11	F1-2	F1	F	8.20	3.74	3.20	0	1	0	1	1	0	0	0
s11	F1-2	F1	F	8.53	3.99	3.34	0	1	0	1	1	0	0	0
s11	F1-2	F1	F	8.00	3.86	3.23	0	1	0	1	1	0	0	0
s11	F1-2	F1	F	7.98	3.89	3.20	0	1	0	1	1	0	0	0
s11	F1-2	F1	F	7.20	3.56	3.10	0	1	0	1	1	0	0	0
s11	F1-2	F1	F	7.82	3.84	3.30	0	1	0	1	1	0	0	0
s11	F1-2	F1	F	7.74	3.54	3.03	0	1	0	1	1	0	0	0
s11	F1-2	F1	F	8.28	3.82	3.25	0	1	0	1	1	0	0	0
s11	F1-2	F1	F	8.16	4.12	3.36	0	1	0	1	1	0	0	0
s11	F1-2	F1	F	7.97	3.78	3.09	0	1	0	1	1	0	0	0
s11	F1-2	F1	F	7.25	3.60	3.04	0	1	0	1	1	0	0	0
s11	F1-2	F1	F	7.97	3.65	3.07	0	1	0	1	1	0	0	0
s11	F1-2	F1	F	7.76	3.71	3.01	0	1	0	1	1	0	0	0
s11	F1-2	F1	F	7.96	3.18	3.01	0	1	0	1	1	0	0	0
s11	F1-2	F1	F	7.70	3.74	3.14	0	1	0	1	1	0	0	0
s11	F2-1	F2	M	7.95	3.77	3.22	0	1	1	0	0	1	0	0
s11	F2-1	F2	M	7.97	3.72	3.27	0	1	1	0	0	1	0	0
s11	F2-1	F2	M	7.75	3.62	3.22	0	1	1	0	0	1	0	0
s11	F2-1	F2	M	7.98	3.53	3.22	0	1	1	0	0	1	0	0
s11	F2-1	F2	M	8.24	3.91	3.02	0	1	1	0	0	1	0	0
s11	F2-1	F2	M	7.74	3.80	3.20	0	1	1	0	0	1	0	0
s11	F2-1	F2	M	7.62	3.47	2.92	0	1	1	0	0	1	0	0
s11	F2-1	F2	M	7.99	3.68	2.80	0	1	1	0	0	1	0	0
s11	F2-1	F2	M	8.04	3.84	3.27	0	1	1	0	0	1	0	0
s11	F2-1	F2	M	7.72	3.60	2.99	0	1	1	0	0	1	0	0
s11	F2-1	F2	M	8.01	3.68	3.31	0	1	1	0	0	1	0	0
s11	F2-1	F2	M	7.78	3.59	2.93	0	1	1	0	0	1	0	0
s11	F2-1	F2	M	7.91	3.90	3.18	0	1	1	0	0	1	0	0
s11	F2-1	F2	M	8.04	3.83	2.75	0	1	1	0	0	1	0	0
s11	F2-1	F2	M	8.23	3.92	3.33	0	1	1	0	0	1	0	0
s11	F2-1	F2	F	8.22	3.96	3.20	0	1	0	1	0	1	0	0

Table S2. Raw morphometrical data for each particular specimen analyzed in this study.

continued

Sampling period	Site	Field	Sex	Elytron	Pronotum	Femur	Y10	Y11	M	F	F1	F2	F3	F4
s11	F2-1	F2	F	8.27	3.86	3.07	0	1	0	1	0	1	0	0
s11	F2-1	F2	F	8.05	3.77	3.25	0	1	0	1	0	1	0	0
s11	F2-1	F2	F	8.02	3.85	3.14	0	1	0	1	0	1	0	0
s11	F2-1	F2	F	8.13	3.90	3.22	0	1	0	1	0	1	0	0
s11	F2-1	F2	F	8.09	3.82	3.24	0	1	0	1	0	1	0	0
s11	F2-1	F2	F	7.73	3.84	2.93	0	1	0	1	0	1	0	0
s11	F2-1	F2	F	7.98	3.67	3.10	0	1	0	1	0	1	0	0
s11	F2-1	F2	F	8.16	3.85	3.22	0	1	0	1	0	1	0	0
s11	F2-1	F2	F	7.52	3.52	2.80	0	1	0	1	0	1	0	0
s11	F2-1	F2	F	8.09	3.81	3.12	0	1	0	1	0	1	0	0
s11	F2-1	F2	F	8.23	3.83	3.27	0	1	0	1	0	1	0	0
s11	F2-1	F2	F	8.16	3.97	3.40	0	1	0	1	0	1	0	0
s11	F2-1	F2	F	8.45	4.10	3.42	0	1	0	1	0	1	0	0
s11	F2-1	F2	F	7.45	3.75	3.03	0	1	0	1	0	1	0	0
s11	F2-2	F2	M	7.62	3.61	3.05	0	1	1	0	0	1	0	0
s11	F2-2	F2	M	8.02	3.80	3.36	0	1	1	0	0	1	0	0
s11	F2-2	F2	M	8.37	3.86	3.06	0	1	1	0	0	1	0	0
s11	F2-2	F2	M	8.20	3.85	3.31	0	1	1	0	0	1	0	0
s11	F2-2	F2	M	7.22	3.41	2.97	0	1	1	0	0	1	0	0
s11	F2-2	F2	M	7.55	3.64	3.28	0	1	1	0	0	1	0	0
s11	F2-2	F2	M	8.15	3.91	3.30	0	1	1	0	0	1	0	0
s11	F2-2	F2	F	8.45	3.98	3.37	0	1	0	1	0	1	0	0
s11	F2-2	F2	F	7.73	3.83	3.24	0	1	0	1	0	1	0	0
s11	F2-2	F2	F	8.55	4.12	3.37	0	1	0	1	0	1	0	0
s11	F2-2	F2	F	7.74	3.67	3.10	0	1	0	1	0	1	0	0
s11	F2-2	F2	F	8.29	3.84	3.29	0	1	0	1	0	1	0	0
s11	F2-2	F2	F	7.65	3.74	2.95	0	1	0	1	0	1	0	0
s11	F2-2	F2	F	8.17	4.02	3.01	0	1	0	1	0	1	0	0
s11	F2-2	F2	F	8.05	3.99	3.25	0	1	0	1	0	1	0	0
s11	F2-2	F2	F	7.63	3.72	3.15	0	1	0	1	0	1	0	0
s11	F2-2	F2	F	7.82	3.66	3.08	0	1	0	1	0	1	0	0
s11	F2-2	F2	F	7.50	3.63	2.82	0	1	0	1	0	1	0	0
s11	F2-2	F2	F	8.35	3.97	3.24	0	1	0	1	0	1	0	0
s11	F2-2	F2	F	7.78	3.69	3.06	0	1	0	1	0	1	0	0
s11	F2-2	F2	F	8.03	3.92	3.18	0	1	0	1	0	1	0	0
s11	F2-2	F2	F	7.92	3.59	3.06	0	1	0	1	0	1	0	0
s11	F3-1	F3	M	8.14	3.97	3.22	0	1	1	0	0	0	1	0
s11	F3-1	F3	M	7.80	3.72	3.28	0	1	1	0	0	0	1	0
s11	F3-1	F3	M	7.98	3.72	3.18	0	1	1	0	0	0	1	0
s11	F3-1	F3	M	7.81	3.65	3.16	0	1	1	0	0	0	1	0
s11	F3-1	F3	M	7.52	3.47	3.06	0	1	1	0	0	0	1	0

Table S2. Raw morphometrical data for each particular specimen analyzed in this study.

Sampling period	Site	Field	Sex	Elytron	Pronotum	Femur	Y10	Y11	M	F	F1	F2	F3	F4
s11	F3-1	F3	M	7.74	3.68	3.04	0	1	1	0	0	0	1	0
s11	F3-1	F3	M	7.84	3.82	3.28	0	1	1	0	0	0	1	0
s11	F3-1	F3	M	8.17	3.71	3.10	0	1	1	0	0	0	1	0
s11	F3-1	F3	M	7.38	3.79	2.84	0	1	1	0	0	0	1	0
s11	F3-1	F3	M	7.70	3.62	3.07	0	1	1	0	0	0	1	0
s11	F3-1	F3	M	8.12	3.80	3.14	0	1	1	0	0	0	1	0
s11	F3-1	F3	M	8.14	3.63	3.27	0	1	1	0	0	0	1	0
s11	F3-1	F3	M	8.00	3.81	3.20	0	1	1	0	0	0	1	0
s11	F3-1	F3	M	7.63	3.56	3.12	0	1	1	0	0	0	1	0
s11	F3-1	F3	M	7.82	3.51	3.08	0	1	1	0	0	0	1	0
s11	F3-1	F3	F	7.66	3.71	3.01	0	1	0	1	0	0	1	0
s11	F3-1	F3	F	7.80	3.65	3.10	0	1	0	1	0	0	1	0
s11	F3-1	F3	F	7.73	3.77	3.00	0	1	0	1	0	0	1	0
s11	F3-1	F3	F	8.43	3.74	3.23	0	1	0	1	0	0	1	0
s11	F3-1	F3	F	8.13	3.62	3.13	0	1	0	1	0	0	1	0
s11	F3-1	F3	F	8.10	3.78	3.24	0	1	0	1	0	0	1	0
s11	F3-1	F3	F	7.86	3.70	3.06	0	1	0	1	0	0	1	0
s11	F3-2	F3	M	7.98	3.76	3.22	0	1	1	0	0	0	1	0
s11	F3-2	F3	M	7.92	3.64	3.07	0	1	1	0	0	0	1	0
s11	F3-2	F3	M	7.89	3.71	3.12	0	1	1	0	0	0	1	0
s11	F3-2	F3	M	7.89	3.62	3.04	0	1	1	0	0	0	1	0
s11	F3-2	F3	M	8.16	3.63	3.26	0	1	1	0	0	0	1	0
s11	F3-2	F3	M	8.23	3.74	3.19	0	1	1	0	0	0	1	0
s11	F3-2	F3	M	8.23	3.87	3.22	0	1	1	0	0	0	1	0
s11	F3-2	F3	M	7.95	3.95	3.18	0	1	1	0	0	0	1	0
s11	F3-2	F3	M	7.71	3.62	2.92	0	1	1	0	0	0	1	0
s11	F3-2	F3	M	8.30	4.00	3.20	0	1	1	0	0	0	1	0
s11	F3-2	F3	M	7.74	3.62	3.09	0	1	1	0	0	0	1	0
s11	F3-2	F3	M	8.00	3.68	3.18	0	1	1	0	0	0	1	0
s11	F3-2	F3	M	8.24	3.79	3.25	0	1	1	0	0	0	1	0
s11	F3-2	F3	M	7.93	3.78	3.27	0	1	1	0	0	0	1	0
s11	F3-2	F3	M	8.19	3.99	3.25	0	1	1	0	0	0	1	0
s11	F3-2	F3	F	7.81	3.63	3.10	0	1	0	1	0	0	1	0
s11	F3-2	F3	F	8.19	3.61	3.00	0	1	0	1	0	0	1	0
s11	F3-2	F3	F	8.02	3.62	3.20	0	1	0	1	0	0	1	0
s11	F3-2	F3	F	8.29	3.98	3.20	0	1	0	1	0	0	1	0
s11	F3-2	F3	F	7.89	3.95	3.26	0	1	0	1	0	0	1	0
s11	F3-2	F3	F	7.90	3.62	2.77	0	1	0	1	0	0	1	0
s11	F3-2	F3	F	7.59	3.46	2.92	0	1	0	1	0	0	1	0
s11	F3-2	F3	F	8.28	3.89	3.21	0	1	0	1	0	0	1	0
s11	F3-2	F3	F	7.67	3.49	3.04	0	1	0	1	0	0	1	0

Table S2. Raw morphometrical data for each particular specimen analyzed in this study.

continued

Sampling period	Site	Field	Sex	Elytron	Pronotum	Femur	Y10	Y11	M	F	F1	F2	F3	F4
s11	F3-2	F3	F	8.09	3.70	3.26	0	1	0	1	0	0	1	0
s11	F3-2	F3	F	8.20	3.85	3.06	0	1	0	1	0	0	1	0
s11	F3-2	F3	F	8.66	4.05	3.33	0	1	0	1	0	0	1	0
s11	F3-2	F3	F	8.23	3.66	3.10	0	1	0	1	0	0	1	0
s11	F3-2	F3	F	8.25	3.91	3.24	0	1	0	1	0	0	1	0
s11	F3-2	F3	F	8.10	3.83	3.06	0	1	0	1	0	0	1	0
s11	F4-1	F4	M	8.05	3.80	3.15	0	1	1	0	0	0	0	1
s11	F4-1	F4	M	7.75	3.62	3.10	0	1	1	0	0	0	0	1
s11	F4-1	F4	M	8.51	3.78	3.20	0	1	1	0	0	0	0	1
s11	F4-1	F4	M	8.43	4.01	3.42	0	1	1	0	0	0	0	1
s11	F4-1	F4	M	7.98	3.61	3.13	0	1	1	0	0	0	0	1
s11	F4-1	F4	M	8.22	3.75	3.05	0	1	1	0	0	0	0	1
s11	F4-1	F4	M	8.31	3.84	3.25	0	1	1	0	0	0	0	1
s11	F4-1	F4	M	8.26	3.83	3.27	0	1	1	0	0	0	0	1
s11	F4-1	F4	M	7.91	3.67	3.07	0	1	1	0	0	0	0	1
s11	F4-1	F4	M	8.57	3.85	3.28	0	1	1	0	0	0	0	1
s11	F4-1	F4	M	8.16	3.84	3.30	0	1	1	0	0	0	0	1
s11	F4-1	F4	M	8.04	3.73	3.18	0	1	1	0	0	0	0	1
s11	F4-1	F4	M	8.46	3.91	3.30	0	1	1	0	0	0	0	1
s11	F4-1	F4	M	8.14	3.63	3.15	0	1	1	0	0	0	0	1
s11	F4-1	F4	M	8.33	3.95	3.22	0	1	1	0	0	0	0	1
s11	F4-1	F4	F	8.37	3.84	3.09	0	1	0	1	0	0	0	1
s11	F4-1	F4	F	7.98	3.67	3.00	0	1	0	1	0	0	0	1
s11	F4-1	F4	F	8.20	3.80	3.16	0	1	0	1	0	0	0	1
s11	F4-1	F4	F	8.57	3.94	3.14	0	1	0	1	0	0	0	1
s11	F4-1	F4	F	8.66	4.20	3.37	0	1	0	1	0	0	0	1
s11	F4-1	F4	F	7.95	3.71	3.10	0	1	0	1	0	0	0	1
s11	F4-1	F4	F	8.62	4.02	3.30	0	1	0	1	0	0	0	1
s11	F4-1	F4	F	7.73	3.74	2.76	0	1	0	1	0	0	0	1
s11	F4-1	F4	F	7.94	3.73	3.15	0	1	0	1	0	0	0	1
s11	F4-1	F4	F	7.37	3.52	2.99	0	1	0	1	0	0	0	1
s11	F4-1	F4	F	7.97	3.69	3.04	0	1	0	1	0	0	0	1
s11	F4-1	F4	F	7.99	3.77	3.01	0	1	0	1	0	0	0	1
s11	F4-1	F4	F	8.06	3.94	3.29	0	1	0	1	0	0	0	1
s11	F4-1	F4	F	7.82	3.62	2.96	0	1	0	1	0	0	0	1
s11	F4-1	F4	F	8.17	3.84	3.16	0	1	0	1	0	0	0	1
s11	F4-2	F4	M	7.99	3.70	3.10	0	1	1	0	0	0	0	1
s11	F4-2	F4	M	8.03	3.84	3.21	0	1	1	0	0	0	0	1
s11	F4-2	F4	M	7.74	3.70	3.02	0	1	1	0	0	0	0	1
s11	F4-2	F4	M	8.02	3.77	3.06	0	1	1	0	0	0	0	1
s11	F4-2	F4	M	7.67	3.52	2.97	0	1	1	0	0	0	0	1

continued Table S2. Raw morphometrical data for each particular specimen analyzed in this study.

Sampling period	Site	Field	Sex	Elytron	Pronotum	Femur	Y10	Y11	M	F	F1	F2	F3	F4
s11	F4-2	F4	M	7.65	3.52	2.95	0	1	1	0	0	0	0	1
s11	F4-2	F4	M	8.00	3.75	3.18	0	1	1	0	0	0	0	1
s11	F4-2	F4	M	8.00	3.70	3.10	0	1	1	0	0	0	0	1
s11	F4-2	F4	M	8.52	3.89	3.32	0	1	1	0	0	0	0	1
s11	F4-2	F4	F	8.32	3.80	3.30	0	1	0	1	0	0	0	1
s11	F4-2	F4	F	8.19	3.78	3.11	0	1	0	1	0	0	0	1
s11	F4-2	F4	F	7.53	3.43	3.00	0	1	0	1	0	0	0	1
s11	F4-2	F4	F	7.67	3.51	3.01	0	1	0	1	0	0	0	1
s11	F4-2	F4	F	7.39	3.40	2.94	0	1	0	1	0	0	0	1
s11	F4-2	F4	F	8.34	3.83	3.32	0	1	0	1	0	0	0	1
s11	F4-2	F4	F	7.75	3.60	2.82	0	1	0	1	0	0	0	1
s11	F4-2	F4	F	8.46	3.98	3.21	0	1	0	1	0	0	0	1
s11	F4-2	F4	F	8.47	3.82	3.25	0	1	0	1	0	0	0	1
s11	F4-2	F4	F	8.37	3.96	3.26	0	1	0	1	0	0	0	1
s11	F4-2	F4	F	8.06	3.97	3.35	0	1	0	1	0	0	0	1
s11	F4-2	F4	F	7.76	3.56	3.07	0	1	0	1	0	0	0	1
s11	F4-2	F4	F	7.80	3.60	2.84	0	1	0	1	0	0	0	1
s11	F4-2	F4	F	8.05	3.82	3.22	0	1	0	1	0	0	0	1
s11	F4-2	F4	F	7.72	3.70	3.02	0	1	0	1	0	0	0	1

Table S2. Raw morphometrical data for each particular specimen analyzed in this study.

continued