

Life history of *Caribetityus elii* (Armas & Marcano Fondeur, 1992) from the Dominican Republic (Scorpiones, Buthidae)

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Abstract

The life cycle of *Caribetityus elii* (Scorpiones, Buthidae) was investigated. The duration of embryonic development in this species ranged 3-4 months, while the moults took place at average ages of 6, 155, 313, and 447 days. These developmental periods are only slightly greater than those recorded for several species of the genus *Tityus*. Also, the mean values of the growth rates observed between different instars are not significantly different from those observed for *Tityus*. However, *Caribetityus elii* completes its postembryonic development with just four moults, rather than the five or six observed in the *Tityus* species. This reduced number of moults had previously been observed only in species of the genus *Microtityus* Kjellesvig-Waering. A comparative analysis of the reproductive traits of both genera is presented.

Key words: Scorpion, *Caribetityus*, *Tityus*, Dominican Republic, life history

INTRODUCTION

The genus *Caribetityus* Lourenço was established for two species from the Dominican Republic, *Caribetityus quisqueyanus* (Armas) and *Caribetityus elii* (Armas & Marcano Fondeur), previously assigned to the genus *Tityus* C.L. Koch, 1836. *Tityus* was originally described from Brazil. This genus is the most numerous in terms of the species described (near to 160) and is very widely distributed in the Neotropical region. In two contributions to the fauna of the Caribbean region, Armas (1982) and Armas & Marcano Fondeur (1992) described two new species for the Dominican Republic, which they placed in the genus *Tityus*. In a recent publication, Lourenço (1999) reanalysed several morphological characters of these two species using scanning electron microscopy and transferred both to a new genus, *Caribetityus*.

During fieldwork in the Dominican Republic, one of the authors (DH) was able to collect several living specimens of *Caribetityus elii* (Armas & Marcano Fondeur) in the Province of La Vega, south of Santiago and east of the central cordillera. The scorpions were found at altitudes of 1400-1500 m in a rainforest formation. Living specimens were kept under laboratory conditions in Paris and Göfis. Mating was obtained for some females, which subsequently produced broods. Both the duration of embryonic development and the number of molts were recorded. In addition, a comparative analysis of reproductive traits of *Caribetityus elii* and several species of *Tityus* is presented.

MATERIAL AND METHODS

Scorpions were reared according to standard methods (Lourenço 1979a,b) using plastic ter-

raria of different sizes. These contained a layer of soil, 2-3 cm in depth, as well as pieces of bark and a small Petri dish containing water. Food, consisting of crickets and spiders, was provided every 7-10 days. Temperatures ranged from 22-26 °C, but humidity was maintained at saturation level. After each molt, the exuviae were removed from the terraria and stored in boxes, one for each scorpion. Morphometric measures were taken from both dead specimens and exuviae. Three parameters were recorded: carapace length, metasomal segment V length, and movable finger length (Lourenço 1979a,b, 1991).

Voucher specimens are deposited in the Muséum National d'Histoire Naturelle, Paris, and in the Muséum d'Histoire Naturelle, Geneva.

RESULTS

Litter size

The observations made on *Caribetityus elii* show that the four broods obtained were composed of 10 to 12 (10, 11, 12, 12) individuals. These numbers are lower than those observed in most *Tityus* species, and only approximate values observed for some small species of the *Tityus clathratus* group (Lourenço 1991). In contrast, the size of pro-juveniles at birth is large. The first instar pro-juveniles are randomly positioned on the mother's back (Williams 1969).

Developmental period

The duration of embryonic development ranged from 3 to 4 months, while molts took place at average ages of 6, 155, 313, and 447 days. These developmental periods are not very different from those found in *Tityus* species or other genera of Buthidae, but the observed values of growth rates in the different instars are slightly greater than those of the other Buthidae that have been studied. Growth parameters, based on morphometric values, are shown in Fig. 1.

The adult lifespan of *Caribetityus elii* probably reaches 30 to 35 months, similar to that observed in some small species of the genus

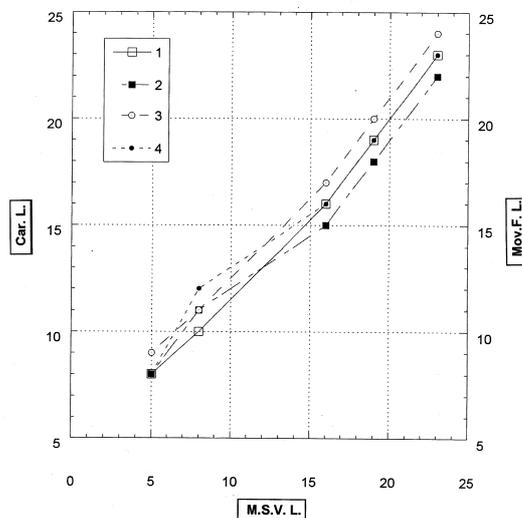


Fig. 1. Distribution of morphometric values (in mm) for juvenile and adult instars of *Caribetityus elii*. 1/3: Carapace length vs. Metasomal segment V length. 2/4: Movable finger length vs. Metasomal segment V length. 1-2: females; 3-4: males.

Tityus (Lourenço 1979; Lourenço & Cloudsley-Thompson 1998). Nevertheless, it is shorter than that observed in several other *Tityus* species (Lourenço 1991).

DISCUSSION

The analysis of the reproductive characteristics observed for *Caribetityus elii* shows that several traits are similar to those observed in species of *Tityus*. Closest similarities are found between *C. elii* and the smaller species of *Tityus*, belonging to the *T. clathratus* group. However, there are also some differences, which support the taxonomic position of *Caribetityus* as a lineage distinct from *Tityus*. Some aspects are listed below:

- The number of molts necessary to reach adulthood in *C. elii* is only 4, compared with 5 or 6 observed in *Tityus* species (Lourenço 1979a,b, 1991; Lourenço & Eickstedt 1988; Lourenço & Cloudsley-Thompson 1998, 1999).
- Caribetityus elii* litters contain a smaller number of young: 10-12, compared with an average of 15-25 in most species of *Tityus*. Only 2 out of 3 species of the *T. clathratus* group have

Table 1. Life cycle parameters of *Caribetityus* and *Tityus* species. ++: parthenogenetic females.

	Gestation period (months)	Postembryonic development (months)	Litter size	Life span (years)	Adult size (mm)
<i>C. elii</i>	3	10-12	12	5	30-35
<i>T. clathratus</i> group					
<i>T. bastosi</i>	3	12	12	3	30-35
<i>T. columbianus</i>	3	12	13	3	25-30
<i>T. mattogrossensis</i>	3	13	12	2.5-3	30-35
<i>T. bahiensis</i> group					
<i>T. bahiensis</i>	3.5-4	10-14	15-25	3.5	55-75
<i>T. fasciolatus</i>	3.5-4	18-21	13-25	3.5-4	55-75
<i>T. serrulatus</i> ++	3.5-4	15-16	15-25	3.5-4	55-70
<i>T. strandi</i>	4	12	12	3.5-4	50-70
<i>T. trivittatus</i>		15-18	15-24	3.5-4	55-70
<i>T. asthenes</i> group					
<i>T. cambridgei</i>	3.5-4	10-12	15-25	4-4.5	70-80
<i>T. fuehrmanni</i>	3	16	10-15	3.5-4	50-60
<i>T. insignis</i>	6-7	18-20	20-30	4-5	90-110
<i>T. metuendus</i> ++	7-10	10	25-35	4-4.5	70-80

similarly low numbers. The initial body size of *C. elii* pro-juveniles at birth is slightly larger (in relation to mother's body size) than that observed in species of other genera, such as *Tityus* Koch, *Centruroides* Marx and *Rhopalurus* Thorell (Lourenço 1979, 1988, 1989). This more complete embryonic development may be correlated with the smaller number of post-embryonic instars.

(c) - The average growth rates of the different instars observed for *C. elii* are similar to those observed for several species of *Tityus*. The theoretical morphometric growth rate defined by Dyar (1890) and Prizibram and Megusar (1912) for the development of arthropods is 1.26. The values observed for species of *Tityus*, *Centruroides* and *Rhopalurus* vary from 1.22 to 1.33, depending on the parameter (segment) considered (Lourenço 1979, 1988, 1989). For males and females of *C. elii*, the growth rates were: carapace length 1.22 and 1.28; metasomal segment V length 1.28 and 1.29; movable finger length 1.24 and 1.26.

(d) - Several species of *Tityus*, *Centruroides* and *Isometrus* are able to store spermatozoa in the glandular tissue of the female genital tract (Kovoor et al. 1987). These females can therefore produce multiple broods from a single insemination. This capacity to store spermatozoa was not observed in *C. elii*.

ACKNOWLEDGEMENTS

We are very grateful to Mr Didier Geffard, Paris, for technical assistance and to Mark Judson, Paris, for comments on the manuscript.

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