Notes on the postembryonic development
of two species of *Microtityus* Kjellesvig-Waering
from Trinidad and Dominican Republic
(Scorpiones, Buthidae)

Notas sobre o desenvolvimento pós-embrionário
de duas espécies de *Microtityus* Kjellesvig-Waering
de Trinidad e da República Dominicana
(Scorpiones, Buthidae)

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The genus *Microtityus* was originally described from Trinidad by KJELLESVIG-WAERING (1966). This genus represented the first group of micro-scorpions to be discovered in the Neotropical region. According to several authors (e. g. LOURENÇO & EICKESTEDT, 1983) the delay in describing this genus is almost certainly due to the fact that previous authors have misidentified specimens as being immature forms of species of *Tityus* Koch. Furthermore, many if not most of the species known today are extremely rare, and this also probably contributed to the fact that the genus was not described until quite recently.

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Since the description of both genus and species in 1966, many other species have been discovered and described both from the Caribbean islands and from South America. Already, 15 species are known from Cuba, the Dominican Republic, US Virgin Islands, Trinidad, Brazil and Venezuela, as well as an Oligocene amber fossil from the Dominican Republic (LOURENÇO & EICKSTEDT, 1983 ; LOURENÇO & HUBER, 1999). Even if the genus is distributed from Brazil and Venezuela to Cuba, it is evidently centred mainly in the Caribbean region. Although the number of new species is always increasing (LOURENÇO & HUBER, 1999), nothing was known until the present about the biology of these micro-scorpions. GONZALEZ-SPONGA (1984), however, did show that the litter size of *Microtityus joseantonioi* Gonzalez-Sponga, is quite small and averages only 6 or 7 young.

The life cycles of two species belonging to the genus *Microtityus* have recently been studied. Both the duration of embryonic development, and the number of molts necessary for the attainment of the different juvenile instars and adulthood have now been noted in both *Microtityus consuelo* Armas & Marcato Fondeur, 1987 from the Dominican Republic and *Microtityus rickyi* from Trinidad. The results are presented below.

MATERIAL AND METHODS

Scorpions were reared according to standard methods using plastic terraria of different sizes. These contained a layer of soil, 2-3 cm in depth, as well as a few pieces of bark and a small Petri dish containing water. Food, consisting of crickets and spiders, was provided once every week or ten days. Temperatures ranged from 22 to 26 ° C but humidity was maintained at saturation level. After each molt the exuvia were removed from the terraria and stored in boxes - one for each individual scorpion. Morphometric growth values were measured on both dead specimens and on the exuvia. Three parameters were recorded : Carapace length ; metasomal segment V length ; and movable finger length (LOURENÇO 1979, 1992).

The available voucher material has been deposited in Muséum National d'Histoire Naturelle, Paris.

RESULTS

CHARACTERISTICS OF *MICROTITYUS*

1. SIZE OF THE LITTERS

GONZALEZ-SPONGA (1984) was the first to indicate that the litter size of any species of *Microtityus* (*M. joseantonioi* Gonzalez-Sponga), was particularly small and comprised, on average, only 6 or 7 young.

The observations we made both on *M. consuelo* and on *M. rickyi* agreed with this. In both species, the broods were composed of very small numbers 3 to 5 for *M. consuelo* and 4 to 6 for *M. rickyi* (Figs. 1 and 2). In contrast the size of immatures at birth is large (LOURENÇO, 1992). In the observed species of *Microtityus*, the orientation of first instar on the mother's back shows a distinctive pattern, contrarily to other buthid species in which first instar juveniles are randomly positioned (see Fig. 1).

2. DEVELOPMENTAL PERIOD

The duration of embryonic development ranged from 3 to 4 months, while the molts necessary for the attainment of the different juvenile instars and adulthood averaged : 6, 127, 167, and 229 days for *M. consuelo*, and 8, 134, 186, and 249 days for *M. rickyi*. These developmental periods are not greatly different from those in species of other genera belonging to the family Buthidae, but the values of growth rates observed for the different instars are more important than those of other species of the family Buthidae that have been studied. Growth parameters, based on morphometric values, measured both on dead individuals and on exuvia, are shown in Fig. 3.

The adult life span of *Microtityus* species probably extends for 30 to 35 months or even more. It is nevertheless shorter than what has been observed in other neotropical buthid species (LOURENÇO 1992).

Figs. 1 and 2. *Microtityus rickyi*. 1, female carrying first-instar young. To notice the distinctive pattern of orientation; 2, Female with second instar juveniles.

Fig. 3. The distribution of morphometric values (in mm X 10), for juvenile and adult instars of *Microtityus consuelo* and *Microtityus rickyi*. [Car. L. = Carapace length. M.S.V. L. = Metasomal segment V length. M.F. L. = Movable finger length. Courbes: 1 = Car. L. vs. M.S.V. L. (*M. consuelo*); 2 = M.F. L. vs M.S.V. L. (*M. consuelo*); 3 = Car. L. vs. M.S.V. L. (*M. rickyi*); 4 = M.F. L. vs M.S.V. L. (*M. rickyi*)].

DISCUSSION

The growth values of the different instars of both species of *Microtityus* studied are above in average when compared with those of other species of the family Buthidae that have been investigated. This can probably be explained by the following:

(a) - The number of molts necessary to reach adulthood is only 4 compared with 5 or 6 observed in other species of Buthidae (LOURENÇO 1979, 1988, 1989, 1992 ; LOURENÇO & EICKESTEDT 1988 ; LOURENÇO & CLOUDSLEY-THOMPSON 1998, 1999).

(b) - *Microtityus* litters contain only a very small number of young - 4 to 7, as against 15 to 25 on average, in most other species of Buthidae. The initial body size of *Microtityus* pre-juveniles at birth is also much larger (in relation to mother's body size), than are those observed in species belonging to genera as *Tityus* Koch, *Centruroides* Marx or *Rhopalurus* Thorell (LOURENÇO, 1979, 1988, 1989). The initially more complete embryonic development resulting from this may be correlated with post-embryonic development involving a smaller number of instars.

The theoretical morphometric growth values defined by DYAR (1890) and PRZIBRAM and MEGUSAR (1912) for the development of arthropods is = to 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 both *Microtityus consuelo* and *Microtityus rickyi*, the growth values observed were : Carapace length ; 1:31 and 1:28. Metasomal segment V length ; 1:55 and 1:50. Movable finger length ; 1:28 and 1:31.

RESUMO

O gênero *Microtityus* Kjellesvig-Waering, 1966 se distribui desde o Brasil e a Venezuela até Cuba, apresentando porém um centro de dispersão situado nas Antilhas. Depois da descrição do gênero para acomodar a espécie *M. rickyi* de Trinidad, diversas novas espécies foram descritas (LOURENÇO & HUBER, 1999), nada porém se conhece sobre a biologia desses micro-escorpiões até o momento. Os ciclos de vida de duas espécies de *Microtityus* foram observados recentemente.

A duração do desenvolvimento embrionário de *Microtityus consuelo* Armas & Marcano Fondeur, 1987 da República Dominicana e de *Microtityus rickyi* de Trinidad varia de 3 a 4 meses, enquanto que as mudas necessárias para a aquisição dos diferentes estágios juvenis e do estágio adulto ocorrem em idades médias de: 6, 127, 167 e 229 dias para *M. consuelo* e 8, 134, 186 e 249 dias para *M. rickyi*. Os períodos observados para o desenvolvimento dos *Microtityus* não diferem muito daqueles já observados para outras espécies da família dos Buthidae. Os valores médios de taxa de crescimento observados entre os diferentes estágios são no entanto mais importantes que aqueles constatados para outras espécies da família dos Buthidae.

PALAVRAS CHAVE: Escorpião, *Microtityus*, Trinidad, República Dominicana, Ciclo de Vida.

SUMMARY

The genus *Microtityus* Kjellesvig-Waering, 1966 is distributed from Brazil and Venezuela to Cuba, and is centred mainly in the Caribbean region. Since the creation of this genus for the species *M. rickyi* from Trinidad, several new species have been described (LOURENÇO & HUBER, 1999), however nothing has been known until now about the biology of these micro-scorpions. The life cycles of two species of *Microtityus* have recently been investigated. The duration of embryonic development in both *Microtityus consuelo* Armas & Marcano Fondeur, 1987 from the Dominican Republic and *Microtityus rickyi* from Trinidad, ranged between 3 and 4 months, while the molts necessary for attainment of the different juvenile instars and adulthood took place at ages that averaged : 6, 127, 167, and 229 days for *M. consuelo*, and 8, 134, 186, and 249 days for *M. rickyi*. These developmental periods are not greatly different from those recorded in species of other genera belonging to the family Buthidae. However, the mean values of the growth rates observed between different instars are considerably greater than those of the other species of the family Buthidae that have been studied.

KEY WORDS: Scorpion, *Microtityus*, Trinidad, Dominican Republic, Life History.

RÉSUMÉ

Le genre *Microtityus* Kjellesvig-Waering, 1966 est distribué depuis le Brésil et le Venezuela jusqu'à Cuba, mais son centre de répartition est de toute évidence située aux Antilles. Depuis la création de ce genre pour l'espèce *M. rickyi* de Trinidad, plusieurs nouvelles espèces ont été décrites (LOURENÇO & HUBER, 1999), cependant rien n'était connu juste à présent sur la biologie de ces micro-scorpions. Les cycles de vie de deux espèces de *Microtityus* ont été récemment observés. La durée du développement embryonnaire de *Microtityus consuelo* Armas & Marcano Fondev, 1987 de la République Dominicaine et de *Microtityus rickyi* de Trinidad a varié entre 3 et 4 mois, tandis que les mues nécessaires à l'acquisition des différents stades juvéniles et du stade adulte ont eu lieu à des âges moyennes de : 6, 127, 167 et 229 jours pour *M. consuelo* et 8, 134, 186 et 249 jours pour *M. rickyi*. Les durées observées pour les développements des *Microtityus* ne sont pas très différentes de celles déjà constatées pour d'autres espèces de la famille des Buthidae. Les valeurs moyennes des taux de croissance observées entre les stades sont cependant plus importantes que celles constatées pour d'autres espèces de la famille des Buthidae.

MOTS CLÉS: Scorpion, *Microtityus*, Trinidad & Tobago, République Dominicaine, Cycle de vie.

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