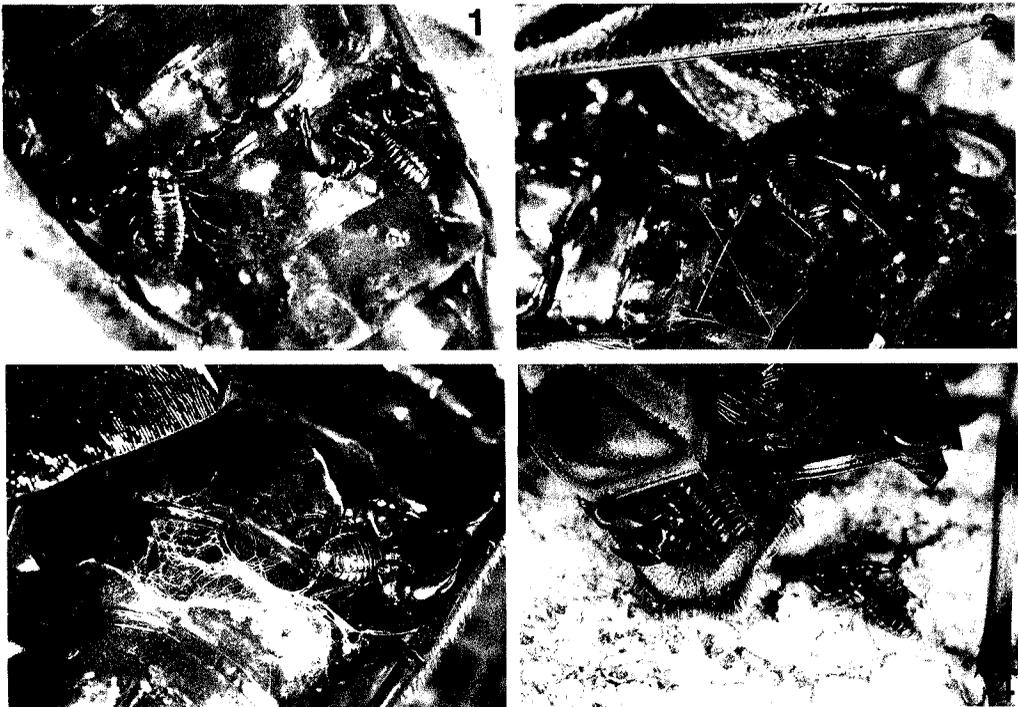


## NOVEL USE OF SILK BY THE HARLEQUIN BEETLE-RIDING PSEUDOSCORPION, *CORDYLOCHERNES SCORPIOIDES* (PSEUDOSCORPIONIDA, CHERNETIDAE)

Pseudoscorpion use of silk in the construction of nests for molting, brood production and hibernation is well documented (Weygoldt 1969). Silk for nest building is produced by glands in the cephalothorax and is extruded through the cheliceral galea (Chamberlin 1931). Males of *Serianus carolinensis* Muchmore also manufacture a second type of silk in their rectal pocket for use in the spinning of spermatophore signal threads (Weygoldt 1966). Here, we describe two additional functions of silk in the harlequin beetle-riding pseudoscorpion, *Cordylorchernes scorpoides* (L.).

Our research on the relationship between *C. scorpoides* and *Acrocinus longimanus* (L.) has established that the pseudoscorpion climbs under the elytra of the large cerambycid to disperse from old to newly-decaying trees (Zeh and Zeh in prep.). Large males exploit this dispersal mechanism by monopolizing beetle "subelytral space" as a strategic site for intercepting and inseminating dispersing females. Whereas females tend to disembark rapidly when beetles land on fresh habitats, males may remain on beetles for periods of at least two weeks.

An obvious tactical problem confronts these



Figures 1-4.—Beetle-riding tactics of the pseudoscorpion, *Cordylorchernes scorpoides*: 1, two males each use a chela to grasp an intertergal ridge of the harlequin beetle's abdomen; 2, silken safety harness connects male's pedipalpal chela with the beetle's abdomen; 3, male on a silken, nest-like structure; 4, female uses silken thread to descend from the beetle (lower right) while two males fight for control of the subelytral space (left).

beetle-riding pseudoscorpions: they must remain attached to the harlequin as it flies between trees. Risk of detachment is exacerbated by the fact that harlequin beetles fly with their bodies oriented vertically (pers. obs.). The pseudoscorpions can avoid falling off by using their pedipalpal chelae to grasp intertergal ridges on the beetle's abdomen (Fig. 1). However, this method is clearly inadequate for those males which remain on beetles for protracted periods in order to defend mobile mating territories. Not only do they experience numerous take-offs and flights, but they must also have their pedipalpal chelae free for mating. Males of *C. scorpoides* and all other chernetids maintain their grasp on females throughout mating (see Weygoldt 1969; Zeh 1987). Sudden flight of the beetle in response to predation risk, for example, could put a mating pseudoscorpion in danger of falling off.

Silk provides the solution to this dilemma. To strap themselves securely to the beetle's abdomen, males use their cheliceral galea to construct silken "safety harnesses." Initially, single threads secure the pseudoscorpion's chelae to the beetle's abdomen (Fig. 2). These are eventually elaborated into a complex nest-like structure (Fig. 3). Females have never been observed to make such structures, although they do attach with single threads.

In its interaction with the harlequin beetle, *C. scorpoides* not only uses silk to stay on the beetle but also as an aid to disembarkation. Pseudoscorpions can descend from their beetle host on a silken thread (Fig. 4). By maintaining contact with the beetle, this technique may provide dispersing individuals with the means to reconnoi-

ter new habitats and potentially use the thread as a guide to re-board. We have not observed dangling individuals climbing back up silken threads (see Weygoldt 1969, fig. 20 for an example of a pseudoscorpion climbing up a hair). However, the thread can support the weight of a pseudoscorpion (pers. obs.). A reconnoitering pseudoscorpion could therefore remain attached via the thread to a beetle which suddenly took flight.

We thank W. B. Muchmore and V. Mahnert for identifying the pseudoscorpions, V. F. Lee and P. Weygoldt for useful comments on the manuscript, and the Panamanian Instituto Nacional de Recursos Naturales Renovables (IN-RENARE) for permission to carry out the work. Both authors gratefully acknowledge fellowship support from the Smithsonian Tropical Research Institute.

#### LITERATURE CITED

- Chamberlin, J. C. 1931. The arachnid order Cheloneida. Stanford Univ. Publ. Biol. Sci., 7:1-284.  
 Weygoldt, P. 1966. Spermatophore web formation in a pseudoscorpion. *Science*, 153:1647-1649.  
 Weygoldt, P. 1969. *The Biology of Pseudoscorpions*. Harvard Univ. Press, Cambridge.  
 Zeh, D. W. 1987. Aggression, density, and sexual dimorphism in chernetid pseudoscorpions (Arachnida: Pseudoscorpionida). *Evolution*, 41:1072-1087.

**David W. Zeh and Jeanne A. Zeh:** Smithsonian Tropical Research Institute, APO Miami 34002-0011 USA, or, Apartado 2072, Balboa, República de Panamá.

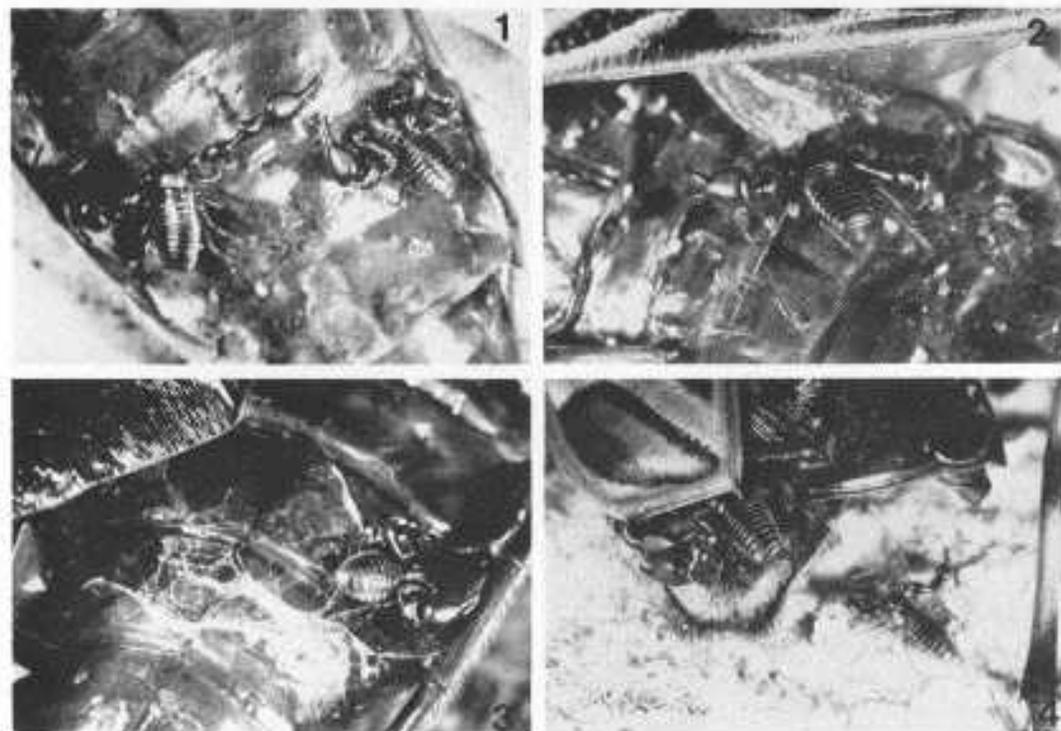
*Manuscript received February 1991, revised April 1991.*

## NOVEL USE OF SILK BY THE HARLEQUIN BEETLE-RIDING PSEUDOSCORPION, *CORDYLOCHERNES SCORPIOIDES* (PSEUDOSCORPIONIDA, CHERNETIDAE)

Pseudoscorpion use of silk in the construction of nests for molting, brood production and hibernation is well documented (Weygoldt 1969). Silk for nest building is produced by glands in the cephalothorax and is extruded through the cheliceral galea (Chamberlin 1931). Males of *Serriamus carolinensis* Muchmore also manufacture a second type of silk in their rectal pocket for use in the spinning of spermatophore signal threads (Weygoldt 1966). Here, we describe two additional functions of silk in the harlequin beetle-riding pseudoscorpion, *Cordylorchernes scorpioides* (L.).

Our research on the relationship between *C. scorpioides* and *Acrocinus longimanus* (L.) has established that the pseudoscorpion climbs under the elytra of the large cerambycid to disperse from old to newly-decaying trees (Zeh and Zeh in prep.). Large males exploit this dispersal mechanism by monopolizing beetle "subelytral space" as a strategic site for intercepting and inseminating dispersing females. Whereas females tend to disembark rapidly when beetles land on fresh habitats, males may remain on beetles for periods of at least two weeks.

An obvious tactical problem confronts these



Figures 1-4. — Beetle-riding tactics of the pseudoscorpion, *Cordylorchernes scorpioides*: 1, two males each use a chela to grasp an intertergal ridge of the harlequin beetle's abdomen; 2, silken safety harness connects male's pedipalpal chela with the beetle's abdomen; 3, male on a silken, nest-like structure; 4, female uses silken thread to descend from the beetle (lower right) while two males fight for control of the subelytral space (left).