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Distribution, Oviposition Guilds, Behavior and New Host Records from Latin America for *Algarobius* Bridwell, *Scutobruchus* Kingsolver and *Pseudopachymerina* spinipes (Erichson) (Coleoptera: Bruchidae)

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DISTRIBUTION, OVIPOSITION GUILDS, BEHAVIOR AND NEW HOST RECORDS FROM LATIN AMERICA FOR *ALGAROBIOUS* BRIDWELL, *SCUTOBRUCHUS* KINGSOLVER AND *PSEUDOPACHYMERINA* SPINIPES (ERICHSON) (COLEOPTERA: BRUCHIDAE)

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Abstract

Species in the Mature pod oviposition guild are *Acanthoscelides longescutus* (Pic), *Pseudopachymerina spinipes* (Erichson), *Scutobruchus ceratioborus* (Philippi), four species of *Algarobius* Bridwell and seven species of *Rhipibruchus* Bridwell. *Acanthoscelides longescutus*, *Scutobruchus ceratioborus*, and three species of *Algarobius* do not glue eggs to seeds or pods as many bruchids do, but the females insert the glueless eggs into cracks or crevices in the pods of species of *Prosopis* L. Seven species of *Rhipibruchus* feed in seeds of *Prosopis* but glue their eggs to the outside of the pod valves. *Pseudopachymerina spinipes* glues eggs to pod valves of *Acacia tortuosa* (Linnaeus) Willdenow. Several examples are presented that show that the natural distributions of some species of bruchids in North America and some in southern South America terminate in northern South America, especially in central Ecuador. The species from southern South America seem to be ecological equivalents of those in North America in host preference and oviposition behavior but not necessarily in taxonomic affinities.

Much of the research on *Algarobius* Bridwell, *Scutobruchus* Kingsolver and *Pseudopachymerina spinipes* (Erichson) has been on their taxonomy and to a lesser extent their hosts (e.g., Kingsolver 1967, 1968, 1972, 1982, 1983, 1986; Kingsolver *et al.* 1977; Terán 1962, 1990; Johnson 1983a,b,c; Muruaga de L'Argentier 1991, 1992).

Larvae of all species of *Algarobius* and *Scutobruchus* feed in the seeds of *Prosopis* L. Larvae of *Pseudopachymerina spinipes* feed mostly in the seeds of *Acacia* Miller.

Species of *Prosopis* (mesquite, algarrobo) are of economic importance because their fruits and leaves are eaten by domestic animals, and the wood is burned for fuel. They are sometimes considered to be weeds. Therefore, economic research on bruchid beetles that feed in *Prosopis* seeds has been mostly on using bruchids as biocontrol agents or eradicating them because they destroy pods whose starchy, sweet valves are used for food, seeds for propagation, etc. (e.g., Kingsolver *et al.* 1977; Johnson 1983a,b,c; Zimmerman 1991; Hoffman *et al.* 1993a,b; Roy Johnson, pers. comm.).

In this paper we examine the bruchid guilds (Johnson 1981) into which the above genera and *Rhipibruchus* Bridwell, *Mimosestes* Bridwell, and *Acanthoscelides longescutus* (Pic) fit. We also examine the oviposition behavior, host preferences, and distribution of species in the above genera as it relates to ecological equivalents in North and South America. We also report new host and distribution records for *Algarobius nicoya* Kingsolver, *A. riochama*

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Kingsolver, *Scutobruchus ceratioborus* (Philippi), and *Pseudopachymerina spinipes*.

Methods and Materials

Specimens used in this study were acquired during collecting trips to the study areas (Appendix 1). Our technique for rearing bruchids is to collect seeds and voucher specimens of plants in the field (see Johnson and Siemens 1995 for additional information). Most of the voucher plant samples that we collected and from whose seeds we reared bruchids were deposited in the Missouri Botanical Garden, St. Louis, with duplicates in the Deaver Herbarium, Northern Arizona University, Flagstaff. A seed and pod collection of many of these plants is maintained in the C. D. Johnson collection, where the beetles are also deposited.

Results and Discussion

Bruchid guilds. Johnson (1981) described three guilds of bruchids whose females oviposit either (A) on the pod while on the plant (Mature pod guild), or (B) on seeds while on the plant (Mature seed guild), or (C) on seeds after they had been exposed on the substrate (Scattered seed guild). All species of *Algarobius* Bridwell, *Rhipibruchus* and *Scutobruchus* treated in this paper, as well as *Acanthoscelides longescutus* and *Pseudopachymerina spinipes*, are in guild A. Thus, the females oviposit on fruits and the adult beetles emerge through the pod. The larvae of these species (but not all species of Guild A) also feed only in seeds inside fleshy, indehiscent fruits (pods).

Oviposition behavior. Females of *Algarobius prosopis* (LeConte) do not cement eggs to seeds or pods as many bruchids do, but insert the glueless eggs into cracks or crevices in the pods of *Prosopis* spp. (Bridwell 1920, Kingsolver *et al.*, 1977, Johnson 1983a,b,c). We found that the oviposition behavior of *Algarobius johnsoni*, *A. riochama*, and *Scutobruchus ceratioborus* is essentially the same as *A. prosopis*. Another species, *Acanthoscelides longescutus* (Pic), has similar behavior in that females oviposit into crevices on pods of *Prosopis strombulifera* (Strom.) Benth in Argentina, except that eggs are also placed onto the outside of the pods. Because the eggs lack an adhesive, they do not stick to the pod valves (Muruaga de L'Argentier 1992).

Females of other species that feed in seeds of *Prosopis* but glue their eggs to the outside of the pod valves are *Rhipibruchus atratus* Kingsolver, *R. jujuyensis* Muruaga de L'Argentier & Kingsolver, *R. oedipygus* Kingsolver, *R. picturatus* (Fåhraeus), *R. prosopis* Kingsolver, *R. psephenopygus* Kingsolver and *R. rugicollis* Kingsolver (Muruaga de L'Argentier 1991). We also observed that females of *Pseudopachymerina spinipes* glue their eggs to pod valves of *Acacia tortuosa* (L.) Willdenow (Appendix 1) (see also Terán 1962).

Host preferences. The host preferences of species in the above bruchid genera may in large part be attributed to the indehiscent fruits of their hosts. The distinct differences in the species of hosts fed upon by larvae of most of the above species, and larvae of most species of *Merobruchus* and *Stator*, are attributable to oviposition upon partially dehiscent pods (*Merobruchus*) or directly upon seeds (*Stator*) (Johnson and Siemens 1995, 1996; Siemens and Johnson 1995). Thus, the larvae of most of the above species prefer indehiscent fruits but most species of *Merobruchus* and *Stator* prefer partially dehiscent fruits.

Species of *Algarobius*, *Scutobruchus*, and *Rhipibruchus* and *Acanthoscelides*

longescutus feed only in the seeds of the legume genus *Prosopis* (Appendix 1). *Pseudopachymerina spinipes* feeds mostly in seeds of species of *Acacia*.

New host and distribution records collected since 1973 are in Appendix 1.

Distribution. When the distribution of various genera and species of bruchids that feed in *Prosopis* and *Acacia* is examined, there is an abrupt change from one genus or species of bruchids feeding in plants in northern South America to those feeding in similar plants in southern South America. Bruchids with similar behavior and hosts are very different taxonomically north and south of central Ecuador, where the most abrupt changes occur. Thus, the taxa appear to be ecological equivalents. For example, *Acanthoscelides longescutus*, *Pseudopachymerina spinipes* and species of the genera *Scutobruchus* and *Rhipibruchus* are distributed in South America, more or less south and east of central Ecuador ("South American" species). Species of *Mimosestes* and *Algarobius* occur from north and west of central Ecuador (e.g., Colombia, Venezuela, Ecuador) to North America ("North American" species). Based on oviposition behavior and host preferences, the "South American" species seem to be ecological equivalents or replacements of the "North American" species. For example, larvae of *Pseudopachymerina spinipes* feed in seeds of *Acacia* and glue their eggs to pod valves. Although *P. spinipes* has been imported into various parts of the Old World, its apparent original distribution was in Argentina, Brazil, Chile, Peru, and Ecuador. Its apparent ecological equivalent is *Mimosestes nubigens* which has similar habits but occurs from Florida to California, and in Hawaii, Mexico, Costa Rica, Cuba, Colombia and Ecuador (it has apparently been introduced into Brazil). It has been reared from seeds in northern Ecuador but does not overlap in distribution with *P. spinipes* (Johnson and Siemsen 1992).

Larvae of species of *Algarobius* feed only in seeds of *Prosopis*, females do not glue their eggs to pods but insert them into openings in the pods, and occur from the USA to Mexico, Guatemala, Costa Rica, Nicaragua, Colombia and Venezuela. *Acanthoscelides longescutus* and species of *Scutobruchus* also have hosts in the genus *Prosopis* and habits similar to *Algarobius*. They occur mostly in Argentina, Chile and Bolivia but the distribution of *S. ceratioborus* extends from Argentina to Chile, Peru, and Ecuador, including the Galapagos Islands. Based on oviposition behavior and host preferences, the "South American" species seem to be ecological equivalents or replacements of the "North American" species.

Mimosestes amicus occurs from Texas to California, and in Hawaii, Mexico and Costa Rica; *M. protractus* occurs from the southwestern USA to Central Mexico (Michoacán and Nuevo León); and *M. insularis* occurs in Hawaii, Puerto Rico, the Dominican Republic, Jamaica, Curaçao, Colombia and Venezuela. Larvae of all three species feed in *Prosopis*. *Mimosestes insularis* larvae feed also in *Acacia* and *M. amicus* also consumes seeds of the legume genera *Acacia*, *Cercidium* Tulasne and *Parkinsonia* L. Females of all three species glue eggs to the outside of pod valves. Species of *Rhipibruchus* are in Argentina, Bolivia, Chile, Uruguay and Colombia, and feed only in species of *Prosopis*. They glue their eggs to the outside of pod valves. Based on oviposition behavior and host preferences, the "South American" species seem to be ecological equivalents of the "North American" species.

At the species level, *Algarobius riochama* occurs in Colombia and Venezuela but has not been reported in Ecuador. *Scutobruchus ceratioborus* (Galapagos, Ecuador, Chile, Peru, Argentina) does occur in Ecuador. Both *A. riochama* and *M. insularis* feed in seeds of *Prosopis* and have similar oviposition

behavior. Based on their distribution patterns and host preferences, *S. ceratiborborus* appears to be the ecological equivalent of *Algarobius riochama* in *Prosopis*.

Johnson and Siemens (1992) hypothesized that the natural distributions of some species terminate in northern South America, especially in central Ecuador. It seems that this has also occurred in these instances. Although competition between species may occur where species overlap, neither competition nor competitive exclusion has been demonstrated.

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Appendix 1

New host and locality records for *Algarobius riochama*, *A. nicoya*, *Scutobruchus ceratioborus*, and *Pseudopachymerina spinipes* (Erichson) from Venezuela and Ecuador. The collection numbers refer to lot numbers in the field notebooks of C. D. Johnson.

Algarobius nicoya Kingsolver

- Prosopis juliflora* (Sw.) DC. Mexico.** Colima: beach, 4 mi W Manzanillo, III-8-73 (410-73). Jalisco: 52 mi NW La Barra de Navidad, III-9-73 (441-73).
- Prosopis velutina* Wootton. Mexico.** Guerrero: 24 km W Tecpan, XII-28-79 (1151-79).

Algarobius riochama Kingsolver

- Prosopis juliflora* (Sw.) DC. Venezuela.** Carabobo: Puerto Cabello, pods on ground, VII-12-82 (2416-82); 3 km S Puerto Cabello, VII-12-84 (#3353-84). Falcón: Coro, VII-18-84 (3374-84); 33 km S Coro, IX-18-83 (2828-83); near Guaiabacoa, VII-18-84 (#3372-84); 34 km NW Churuguara, VII-17-84 (#3369-84); 15 km S La Cruz de Taratara, IX-19-83 (2832-83); 1 km S Pueblo Nuevo, Península de Paraguana, IX-19-83 (2844-83). Lara: 17 km N Barquisimeto, VII-13-84 (#3356-84). Zulia: ca 50', 19 km NE Ancon de Iturre, I-29-85 (#3836-85). Sucre: 5 km S Cumana, VIII-6-84 (#3445-84).

Scutobruchus ceratioborus (Philippi)

- Prosopis juliflora* (Sw.) DC. Ecuador.** Guayas: 30 km W Guayaquil, I-13-89 (#4169-89 & 4173-89); 52 km W Guayaquil, I-13-89 (#4181-89); 9 km SE Santa Elena, I-15-89 (#4196-89). El Oro: 1 km NW Arenillas, I-19-89 (#4247-89); 9 km NW Arenillas, I-19-89 (#4255-89); 16 km SW Santa Rosa, I-18-89 (#4242-89).

Pseudopachymerina spinipes (Erichson)

Acacia tortuosa (Linnaeus) Willdenow. Ecuador. Guayas: 19 km N Santa Elena, I-14-89 (#4182-89, new + seeds of previous crop on ground, #4183-89, pods of previous crop on ground, #4186-89, pods of current crop on ground).

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