The Coleopterists Bulletin, 49(2):133–142. 1995.

BRUCHID GUILDS, HOST PREFERENCES, AND NEW HOST RECORDS FROM LATIN AMERICA AND TEXAS FOR THE GENUS *STATOR* BRIDWELL (COLEOPTERA: BRUCHIDAE)

CLARENCE DAN JOHNSON AND DAVID H. SIEMENS[1]

Department of Biological Sciences, Northern Arizona University, Flagstaff, AZ 86011, U.S.A.

ABSTRACT

The oviposition guilds of bruchid beetles are: bruchids oviposit (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). *Stator vittatithorax* (Pic), *S. trisignatus* (Sharp) and *S. monachus* (Sharp) are members of Guild A. *Stator limbatus* (Horn), *S. pruininus* (Horn), *S. beali* Johnson and *S. championi* (Sharp) are the members of Guild B. *Stator chihuahua* Johnson and Kingsolver, *S. generalis* Johnson and Kingsolver, *S. pygidialis* (Schaeffer), *S. sordidus* (Horn), *S. testudinarius* (Erichson) and *S. vachelliae* Bottimer are members of Guild C. We report upon and discuss the behavior and distribution of these species. Both generalist species of *Stator, S. pruininus* and *S. limbatus,* are in Guild B. *Stator pruininus* has been reported to feed in seeds of 55 host species and *S. limbatus* feeds in seeds of 74 host species. Species of *Stator* discussed here show a marked preference for seeds of species in the genus *Acacia* Miller.

Johnson and Kingsolver (1976) revised the North and Central American species of the genus *Stator* Bridwell and published many new host records for its species. Johnson *et al.* (1989) revised the species of *Stator* from South America. They contributed keys and descriptions for all species from South America and listed hosts for some of the species. Other primary sources of hosts for *Stator* are Johnson (1984) and Hetz and Johnson (1988).

We provide here a list of new host and distribution data for many of the species from northern South America and for some species from Texas and Mexico. We discuss how species of *Stator* from South America fit the oviposition guilds of bruchid beetles that were first observed and then published by Johnson (1981a). The relationships between the insects and their hosts are also discussed.

Considerable basic research has been completed on the systematics of *Stator* and their hosts. Most species of *Stator* are excellent experimental animals because they breed in the lab. This has led to a profusion of papers on the ecology and behavior of species of *Stator,* especially *S. limbatus* (Horn) and *S. vachelliae* Bottimer (*e.g.,* Janzen 1980; Johnson 1981a,b, 1982, 1984; Johnson and Janzen 1982; Johnson and Siemens 1991; Nilsson and Johnson 1993;

---

[1] Present address: Division of Biological Sciences, University of Montana, Missoula, MT 59812.

Siemens and Johnson 1990, 1992, 1995; Siemens *et al.* 1991, 1992, 1994; Traveset 1990a,b, 1991, 1992).

Most of the host records in Appendix 1 are new and all are new distribution records.

Economic Importance of *Stator*

Several species utilize plants with economic significance. *Stator championi* (Sharp) feeds in the cultivated plant *Bixa orellana* Linnaeus whose seeds are surrounded by a pulp that contains annatto dye. This dye is used to color butter, cheese, snack foods, beverages, cereals, lipstick, to dye silk and by Native Americans to paint their bodies. The plant is used as an ornamental and as a possible trap crop for insects (Pesman 1962; Aparnathi *et al.* 1990; Peregrine 1991; Nish *et al.* 1991).

Stator pruininus (Horn), *S. limbatus* and several species of *Acanthoscelides* Schilsky feed in seeds of species of *Leucaena* Bentham, a tropical forage shrub or tree that has only become of economic importance in recent years (National Academy of Sciences 1977, 1979; Johnson 1985). It has numerous economic uses. There are many papers in the recent literature on *Leucaena* (*e.g.,* Xu *et al.* 1993; Grewal *et al.* 1993; Larbi *et al.* 1993; Mtenga and Laswai 1994).

The other species of *Stator* have no economic impact, although they have the potential to become of economic importance if plants that they feed in become commercial crops (Johnson 1985) as has *Leucaena.*

Stator pruininus has the potential to feed in hosts other than those in nature, even cultivated hosts. An unpublished study conducted in the lab by M. Hetz and C. Kern demonstrated that *S. pruininus* could breed in seeds of lentils (*Lens culinaris* Medikus) for at least two years.

These host records are also presented here because they are needed for phylogenetic studies currently in progress.

Methods and Materials

Specimens used in this study were acquired during specialized collecting trips to the study areas (Appendix 1). Rearing from seeds is of great value because large numbers of specimens and valuable ecological and behavioral data were obtained.

Our technique for rearing bruchids is to collect seeds and voucher specimens of plants in the field. The seeds are placed in brown paper bags and taken to the laboratory. Once there, the bags are carefully opened, and any adult bruchids that have emerged are collected and killed. The seeds are then put into jars, the openings of which are covered with paper towels that have been treated with a solution of 0.5–1.0% Kelthane in acetone. The jars are placed on shelves covered with towels that have had a similar treatment. We have found this to be an excellent method to kill any mites in the family Pyemotidae that may prey on the immature bruchids. The cultures in the jars are examined weekly to extract any adult bruchids that may have emerged.

Once the bruchids have been mounted and labelled, they are sorted to species with the use of a dissecting microscope. Then various ecological and behavioral data and host plant preferences are recorded.

Most of the voucher plant samples that we collected and from whose seeds we reared species of *Stator* are deposited in the Missouri Botanical Garden, St. Louis, with duplicates in the Deaver Herbarium, Northern Arizona Uni-

versity, Flagstaff. A seed and pod collection of many of these plants is maintained in the C. D. Johnson collection.

In the text of this paper, C. D. Johnson is abbreviated as CDJ.

Results and Discussion

Oviposition guilds of the Bruchidae. Johnson (1981a) described three guilds of bruchids that 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). Species of *Stator* usually are in Guilds B and C. In this paper we have listed the species under their respective guilds.

Guild A. Johnson (1981a) listed ten species of *Acanthoscelides* Schilsky, *Merobruchus* Bridwell and *Mimosestes* Bridwell as members of this guild but no species of *Stator* were known to oviposit on mature fruits on the plant. Johnson (1984) considered *S. vittatithorax* (Pic) and possibly *S. trisignatus* (Sharp) to be members of this guild. We present evidence here which indicates that both of these species, and *S. monachus* (Sharp), are indeed members of Guild A. *Stator trisignatus* feeds in seeds of a "tree legume" and *Acacia tamarindifolia* (Linnaeus) Willdenow (Appendix 1). In both of these samples only *S. trisignatus* adults emerged from the seeds. Fruits of the "tree legume" are indehiscent, fragment around each seed and do not dehisce in the slightest in the lab, even after several years of storage. These fruits had many exit holes of adult bruchids in them and we collected about 50 *S. trisignatus* when they emerged in the lab. No eggs were attached to the fruits nor were larval entry holes visible in the fruits. The pods of *A. tamarindifolia* are tardily dehiscent. Only ten *S. trisignatus* emerged from culture 4716-89 (Appendix 1), but these emerged only through the pod valves. There were no eggs or larval entry holes visible on the pod valves or seeds. Because no eggs or larval entry holes were found on either sample of these pods, it is possible, indeed probable, that the eggs were laid on the valve surface when the pods were immature, and after the larvae entered, the entry holes grew together, obliterating the holes.

The fruits of *A. polyphylla* DC. are tardily dehiscent. Two adult *S. monachus* and three adult *S. limbatus* emerged from seeds of *A. polyphylla* culture 3534-84 (Appendix 1). Bruchid eggs were glued to and scattered over the surfaces of the seeds and fruit valves. Adult exit holes were chewed in the seeds and pod valves. The same was true for *A. polyphylla* (3839-85) except 27 adult *S. monachus,* nine *S. vittatithorax,* and one *S. limbaus* emerged. Eggs were glued only to the pod valves and exit holes were only in the pod valves. Obviously *S. monachus* and *S. vittatithorax* were the only species to feed in these seeds in abundance. Because *S. limbatus* has never been observed to oviposit on anything but seeds, we speculate the eggs on the pod valves were those of *S. monachus* and *S. vittatithorax.* Thus they are members of Guild A.

Stator limbatus, S. monachus, and *S. vittatithorax* emerged from seeds of *A. tamarindifolia* (4722-89, 3859-85, 3979-85, Appendix 1). About 200 *S. vittatithorax,* 120 *S. limbatus,* and 25 *S. monachus* emerged from 4722-89; 17 *S. monachus,* 36 *S. vittatithorax* and 62 *S. limbatus* from 3859-85; and 280 *S. vittatithorax,* 44 *S. monachus,* and 42 *S. limbatus* from 3979-85. The bruchids emerged from these seeds through exit holes in the seeds and the pod valves. There were eggs glued to the outside of the pod valves and to the seeds. Because there are no visible differences between eggs of these species we hypothesize that *S. limbatus,* because of many previous observations, oviposited

on the seeds and the other two species, for reasons mentioned above, oviposited on the pod valves. Therefore *S. vittatithorax* and *S. monachus* are indeed in Guild A. *Stator limbatus* is thus in Guild B.

GUILD B. Species in this guild oviposit on seeds while they are in partially dehisced fruits on the plant (Johnson 1981a). Johnson (1981a) reported only *S. limbatus* and *S. pruininus* to be members of this guild. We report here that *S. beali* Johnson and *S. championi* are other members of the guild.

Chloroleucon ebano (Berlandier) L. Rico (= *Pithecellobium flexicaule* (Bentham) Coulter), the plant to which *S. beali* is apparently restricted, has only slightly dehiscent pods. Adults of *S. beali* gain entry for oviposition on seeds through exit holes of other bruchids and the slight crack between pod valves. *Stator beali* is closely related to the widespread *S. limbatus* and hybridizes with it in the lab but does not produce fertile offspring (Nilsson and Johnson 1993; C. Fox, *in litt.*).

All but one of the species of *Stator* whose hosts are known feed in the seeds of the Leguminosae. *Stator championi* larvae feed in and the adults oviposit on the seeds of the economically important *Bixa orellana* and its close relative *B. urucurana* Willdenow (Bixaceae) (Appendix 1). Eggs of *S. championi* have a "flange" around them similar to *Amblycerus vitis* (Schaeffer) (Johnson and Kingsolver 1975) when glued to seeds. The adults emerge from the seeds through a typical, round, exit hole. We collected the seeds and bruchids from Ecuador, Colombia and Venezuela.

GUILD C. Species in this guild oviposit on seeds after they have been exposed on the substrate (Johnson 1981a). Johnson (1981a) reported *S. chihuahua* Johnson and Kingsolver, *S. generalis* Johnson and Kingsolver, *S. pygidialis* (Schaeffer), *S. sordidus* (Horn) and *S. vachelliae* Bottimer as members of this guild. Johnson and Siemens (1992) reported *S. testudinarius* (Erichson) as a new member of the guild. We report no new guild members, but discuss the behavior and distribution of *S. generalis, S. sordidus* and *S. vachelliae.*

Stator generalis is interesting, as are others in this guild, because it oviposits only on seeds after they have fallen to the substrate. It only feeds in the widely distributed tropical ornamental *Enterolobium cyclocarpum* (Jacquin) Grisebach (Johnson 1982; Johnson and Janzen 1982). Surprisingly it only feeds in these seeds south of Costa Rica, although *E. cyclocarpum* has a distribution to northern Mexico (Johnson 1982; Johnson and Janzen 1982). We report many new records of and distributional data for *S. generalis* (Appendix 1). We have only collected this bruchid species in Panama and Venezuela (Appendix 1).

The spectrum of hosts for *S. sordidus* is not as wide as that of *S. pruininus* but it rivals it in diversity. It feeds in five species of *Acacia* Miller (Johnson and Kingsolver 1976; Johnson 1984; Hetz and Johnson 1988), two of *Pithecellobium* Martius (Johnson 1984), one of *Lysiloma* Bentham (Johnson 1979, 1984; Hetz and Johnson 1988; Johnson *et al.* 1989), two of *Caesalpinia* Linnaeus (Johnson and Lewis 1993), one of *Parkinsonia* Linnaeus, one of *Mimosa* Linnaeus (Johnson 1979), two of *Piptadenia* Bentham, and one of *Combretum* (Combretaceae) (Janzen 1980). Here we report on several factors in the behavior and ecology of *S. sordidus. Stator sordidus* is one of two species of *Stator* that can readily penetrate the seed coat and feed in the seeds of *Parkinsonia aculeata* Linnaeus but this has only been observed in Venezuela (Appendix 1). It was also found to feed in seeds of *Pithecellobium saman* (Jacquin) Bentham only in Venezuela (Appendix 1). Another unique factor about this record was that *S. vachelliae* was also feeding in these seeds (Johnson

and Siemens 1991). This is the first observation of *S. sordidus* feeding in seeds with other scattered-seed bruchids. One specimen each of *S. sordidus* was observed to feed in seeds (Appendix 1) collected on the plants of *Piptadenia,* a heretofore unreported behavior for this species. These are probably reliable records but only exhibit that, on occasion, these bruchids deviate from expected behavior.

Bottimer (1973) reported *S. vachelliae* to feed in seeds of *Acacia farnesiana* (Linnaeus) Willdenow. Subsequently it has been found to feed in seven additional species of *Acacia* (Johnson and Kingsolver 1976; Johnson 1979, 1984, 1988; Hetz and Johnson 1988; Johnson et al. 1989; Johnson and Siemens 1991, 1992; Traveset 1990b) as well as *Parkinsonia aculeata* (Johnson 1984, 1988; Johnson and Siemens 1991, 1992) and *Pithecellobium saman* (Johnson and Siemens 1992). Its range is extensive in North, Central, and South America. Further, not only does it feed in seeds of *P. aculeata* in Venezuela (Johnson 1988), but in Texas as well (Appendix 1). That it feeds on the two non-acacias is probably due to the seeds of the non-acacias being in close proximity to an *Acacia* host. For example, *Pithecellobium saman* is abundant in many areas of the neotropics and produces many seeds but *S. vachelliae* does not breed abundantly in its seeds and feeds only in seeds at specific locales.

HOST PREFERENCES. Members of the genus *Stator* discussed here show a preference for species in the genus *Acacia* (*i.e., S. monachus* feeds in 6 species of *Acacia, S. limbatus* 30, *S. trisignatus* 2, *S. vittatithorax* 11, *S. sordidus* 5, *S. vachelliae* 8, *S. pruininus* 14; see the following for hosts: Center and Johnson 1976; Johnson and Kingsolver 1976; Janzen 1977, 1978, 1980; Johnson 1979, 1984, 1988; Hetz and Johnson 1988; Johnson *et al.* 1989; Johnson and Siemens 1991, 1992).

Stator monachus and *S. trisignatus* have only been reliably reported from seeds of *Acacia.* Eleven of the 13 hosts of *S. vittatithorax* are species of *Acacia.*

Stator pruininus is a generalist species for a bruchid as it has been reliably reported to feed naturally in seeds of 55 host plants (including those reported here). Twenty of the hosts are in the genus *Mimosa,* 14 in *Acacia,* and nine in the genus *Desmanthus* Willdenow (CDJ database). So 43 of the known hosts are in these genera and its primary hosts are in the Mimosoideae. It is also reported to feed in seeds of the Papilionoideae. *Stator pruininus* and *S. sordidus* are the only two species of *Stator* discussed in this paper that feed in seeds of *Mimosa. Stator pruininus* has an almost completely different group of hosts from *S. limbatus,* the other generalist species of *Stator.* Of the 74 known hosts for *S. limbatus,* 30 are in the genus *Acacia,* 16 in *Pithecellobium,* seven in *Albizia* Durazzo and none in *Mimosa.* Most of the hosts are in the subfamily Mimosoideae but four are in the subfamily Caesalpinioideae. *Stator beali, S. championi,* and *S. generalis* are known only to feed in one or two hosts and these are not acacias.

ACKNOWLEDGMENTS

We are grateful to Margaret Johnson for assistance in the field and lab; to Ron Liesner and Jim Zarucchi for plant identifications; and to NSF Grant BSR88-05861 for financial assistance.

LITERATURE CITED

APARNATHI, K. D., *ET AL.* 1990. Annatto (*Bixa orellana* L.)—its cultivation, preparation and usage. Intern. J. Trop. Agric. 8(1):80.

BOTTIMER, L. J. 1973. Two new American bruchids in the *sordidus* group of *Stator* (Coleoptera: Bruchidae) with notes on other species. Can. Entomol. 105:545–551.

CENTER, T. D., AND C. D. JOHNSON. 1976. Host plants and parasites of some Arizona seed-feeding insects. Ann. Entomol. Soc. Amer. 69(2):195–201.

GREWAL, S. S., *ET AL.* 1993. Productive and protective role of *Leucaena*-based agroforestry in comparison with rainfed field crops on a gravelly soil. Indian J. Agric. Sci. 63(9):565.

HETZ, M., AND C. D. JOHNSON. 1988. Hymenopterous parasites of some bruchid beetles of North and Central America. J. Stored Prod. Res. 24(3):131–143.

JANZEN, D. H. 1977. The Interaction of Seed Predators and Seed Chemistry [pp. 415–428]. *In*: V. Labeyrie (editor). Colloques Internationaux du C.N.R.S., Paris. 493 pp.

———. 1978. The ecology and evolutionary biology of seed chemistry as relates to seed predation [pp. 163–206], *In*: J. B. Harborne (editor), Biochemical aspects of plant and animal coevolution. Academic Press, London. xvii + 435 pp.

———. 1980. Specificity of seed-attacking beetles in a Costa Rican deciduous forest. J. Ecol. 68:929–952.

JOHNSON, C. D. 1979. New host records in the Bruchidae (Coleoptera). Coleopts Bull. 33(1):121–124.

———. 1981a. Interactions between bruchid (Coleoptera) feeding guilds and behavioral patterns of pods of the Leguminosae. Environ. Entomol. 10:249–253.

———. 1981b. Host preferences of *Stator* (Coleoptera: Bruchidae) in non-host seeds. Environ. Entomol. 10:857–863.

———. 1982. Survival of *Stator generalis* (Coleoptera: Bruchidae) in host seeds from outside its geographical range. J. Kans. Entomol. Soc. 55(4):718–724.

———. 1984. New host records and notes on the biology of *Stator* (Coleoptera: Bruchidae). Coleopts Bull. 38(1):85–90.

———. 1985. Potential useful tropical legumes and their relationships with bruchid beetles [pp. 206–210]. *In*: K.C. Misra (editor), Ecology and resource management in tropics. Vol. 1. Presented papers, Silver Jubilee Symposium of International Society for Tropical Ecology. Bhargava Book Depot, Varanasi, India. xi + 324 pp.

———. 1988. The possible beginning of adaptation to a new host by bruchid beetles in Venezuela. Biotropica 20(1):80–81.

———, AND D. H. JANZEN. 1982. Why are the seeds of the Central American guanacaste tree (*Enterolobium cyclocarpum*) not attacked by bruchids except in Panama? Environ. Entomol. 11:373–377.

———, AND J. M. KINGSOLVER. 1975. Ecology and redescription of the Arizona grape bruchid *Amblycerus vitis* (Coleoptera). Coleopts Bull. 29(4):321–331.

———, AND ———. 1976. Systematics of Stator of North and Central America (Coleoptera: Buchidae). U. S. Dept. Agric. Tech. Bull. 1537. 101 pp.

———, AND G. P. LEWIS. 1993. New host records for *Stator sordidus* and *S. limbatus* (Coleoptera: Bruchidae), with comments on bruchid feeding guilds. Coleopts Bull. 47(3):246–248.

———, *ET AL.* 1989. Sistemática del Género *Stator* (Insecta: Coleoptera: Bruchidae) en Sudamérica. Opera Lilloana 37. Tucumán, República Argentina. 105 pp.

———, AND D. H. SIEMENS. 1991. Expanded oviposition range by a seed beetle (Coleoptera: Bruchidae) in proximity to a normal host. Environ. Entomol. 20(6): 1577–1582.

———, AND ———. 1992. Observations on host plant and biogeographical differences in bruchid beetles in southern Ecuador. Biotropica 24(2a):195–199.

LARBI, A., *ET AL.* 1993. Effect of taking a fodder crop on maize grain yield and soil chemical properties in *Leucaena* and *Gliricidia* alley farming systems in western Nigeria. Exp. Agric. 29(3):317.

MTENGA, L. A., AND G. D. LASWAI. 1994. *Leucaena leucocephala* as feed for rabbits and pigs: detailed chemical composition and effect of level of inclusion on performance. For. Ecol. and Managm. 64(2/3):249.

NATIONAL ACADEMY OF SCIENCES. 1977. *Leucaena*: promising forage and tree crop for the tropics. 118 pp.
———, AND ———. 1979. Tropical legumes: resources for the future. 331 pp.
NILSSON, J. A., AND C. D. JOHNSON. 1993. Laboratory hybridization of *Stator beali* and *S. limbatus,* with new host records for *S. limbatus* and *Mimosestes amicus* (Coleoptera: Bruchidae). Southwest. Nat. 38(4):385–387.
NISH, W. A., *ET AL.* 1991. Anaphylaxis to annatto dye: a case report. Ann. Allergy 66(2):129–131.
PEREGRINE, W. T. H. 1991. Anatto—a possible trap crop to assist control of the mosquito bug (*Helopeltis schoutedeni* Reut.) in tea and other crops. Trop. Pest Managm. 37(4):429–430.
PESMAN, M. W. 1962. Meet Flora Mexicana. King, Globe, Arizona. 278 pp.
SIEMENS, D. H., AND C. D. JOHNSON. 1990. Host-associated differences in fitness of a seed beetle (Bruchidae): effects of plant variability. Oecologia 82(3):408–413.
———, AND ———. 1992. Density-dependent egg parasitism as a determinant of clutch size in bruchid beetles (Coleoptera: Bruchidae). Environ. Entomol. 21(3):610–619.
———, AND ———. 1995. Number of seeds per pod in three species of perennial legumes: a compromise between ecological and physiological constraints? Amer. Midl. Natur. (In press).
———, *ET AL.* 1991. Determinants of host range in bruchid beetles. Ecology 72(5): 1560–1566.
———. 1992. Alternative seed defense mechanisms in congeneric plants. Ecology 73(6): 2152–2166.
———. 1994. Alternative seed defence mechanisms in a palo verde hybrid zone: effects on bruchid beetle abundance. Ecol. Entomol. 19(4):381–390.
TRAVESET, A. 1990a. Bruchid egg mortality on *Acacia farnesiana* caused by ants and abiotic factors. Ecol. Entomol. 15(4):463–467.
———. 1990b. Post-dispersal predation of *Acacia farnesiana* seeds by *Stator vachelliae* (Bruchidae) in Central America. Oecologia 84:506–512.
———. 1991. Pre-dispersal seed predation in Central American *Acacia farnesiana*: factors affecting the abundance of co-occurring bruchid beetles. Oecologia 87:570–576.
———. 1992. Effect of vertebrate frugivores on bruchid beetles that prey on *Acacia farnesiana* seeds. Oikos 63(2):200–206.
XU, Z. H., *ET AL.* 1993. Nitrogen cycling in leucaena (*Leucaena leucocephala*) alley cropping in semi-arid tropics. II. Response of maize growth to addition of nitrogen fertilizer and plant residues. Plant Soil 148(1):73–82.

(Received 1 August 1994; accepted 1 December 1994)

Appendix 1. New host records for some species of *Stator* from Latin America and Texas.

Stator beali Johnson

Chloroleucon ebano (Berlandier) L. Rico. United States. Texas. *Cameron Co.*: Brownsville, IX-19-92, IX-21-92 & IX-21-92 (CDJ#4883-92, 4886-92 & 4893-92). *Starr Co.*: 14 mi SE Rio Grande City, IX-23-92 (CDJ#4902-92). *Zapata Co.*: 3 mi S Zapata, IX-24-92 (CDJ#4906-92).

Stator championi (Sharp)

Bixa orellana Linnaeus. Colombia. *Valle*: Palmira, XI-4-83 (CDJ#3179-83). Ecuador. *El Oro*: 10 km S Santa Rosa, I-20-89 (CDJ#4277-89).

B. urucurana Willdenow. Venezuela. *Zulia*: 31 km SW Machiques, I-28-85 (CDJ#3813-85).

Stator generalis Johnson and Kingsolver

Enterolobium cyclocarpum. Venezuela. *Bolivar*: Upata, X-8-83, VII-30-84, III-11-89 (CDJ#3024-83, 3413-84, 4704-89); 6 km N San Juan Nepomuceno, X-29-83 (CDJ#3157-83); El Dorado, VII-30-84 & II-12-85 (CDJ#3417-84 & 3990-85); Ciudad Bolivar, VII-27-84 (CDJ#3403-84); 3 km S Ciudad Bolivar, II-10-85 (CDJ#3975-85). *Lara*: 47 km S Barquisimeto, VII-16-84 (CDJ#3360-84); ca. 800′, 49 km S Barquisimeto, I-22-85 (CDJ#3738-85); 52 km S Barquisimeto, II-16-89 (CDJ#4474-89). *Zulia*: 12 km E Lagunillas, VII-19-84 (CDJ#3375-84); 24 km E Lagunillas, VII-19-84 (CDJ#3379-84). *Monagas*: 43 km NW Maturin, VIII-3-84 (CDJ#3443-84). *Aragua*: Maracay, VII-11-84, II-6-85, II-7-85 (CDJ#3343-84, 3907-85, 3909-85); 7 km E Maracay, II-7-85 & II-26-89 (CDJ#3910-85 & 4584-89); 6 km E San Sebastian, II-7-85 (CDJ#3916-85); La Victoria, II-6-89 (CDJ#4380-89). *Portuguesa*: 2 km SE Piritu, I-22-85 (CDJ#3739-85); Acarigua, II-16-89 (CDJ#4476-89); 6 km W Acarigua, II-16-89 (CDJ#4482-89); 47 km SW Acarigua, II-17-89 (CDJ#4488-89). *Barinas*: 18 km NW Libertad, I-23-85 (CDJ#3770-85); 7 km SW Barinas, I-24-85 (CDJ#3774-85); 2 km NE Barinas, II-17-89 (CDJ#4499-89). *Guarico*: 3 km NW San Juan de Los Morros, II-8-85 (CDJ#3921-85); 13 km S San Juan de Los Morros, II-8-85 (CDJ#3924-85); San Juan de Los Morros, III-3-89 (CDJ#4586-89); 37 km SE San Juan de Los Morros, III-4-89 (CDJ#4593-89); 13 km SW Calabozo, II-8-85 (CDJ#3943-85); 14 km SW Calabozo, III-4-89 (CDJ#4608-89); 9 km SW Calabozo, III-4-89 (CDJ#4610-89); 30 km E El Sombrero, III-5-89 (CDJ#4622-89). *Sucre*: 11 km W Casanay, II-16-85 (CDJ#4053-85); 32 km SE Cumana, III-9-89 (CDJ#4677-89). *Carabobo*: 22 km N Valencia, II-10-89 (CDJ#4426-89). *Anzoategui*: 64 km N Anaco, III-7-89 (CDJ#4668-89).

Stator limbatus (Horn)

Acacia polyphylla DC. Colombia. *Cundinamarca*: ca. 2,400′, 1 km NE Anapoima, X-17-84, (CDJ#3534-84). Venezuela. *Zulia*: ca. 50′, 13 km SE Altagracia, I-29-85 (CDJ#3839-85).

A. tamarindifolia (Linnaeus) Willdenow. Venezuela. *Lara*: ca. 2,000′, 33 km N Barquisimeto, I-31-85 (CDJ#3859-85). *Bolivar*: 22 km SE Upata, II-12-85 (CDJ#3979-85); 21 km SE Upata, III-11-89 (CDJ#4722-89). *Anzoategui*: ca. 1,000′, 3 km NE Santa Rosa, II-18-85 (CDJ#4081-85).

Stator monachus (Sharp)

Acacia tamarindifolia (Linnaeus) Willdenow. Venezuela. *Bolivar*: 21 km SE Upata, III-11-89 (CDJ#4722-89); 22 km SE Upata, II-12-85 (CDJ#3979-85). *Lara*: ca. 2,000′, 33 km N Barquisimeto, I-31-85 (CDJ#3859-85). *Anzoategui*: ca. 1,000′, 3 km NE Santa Rosa, II-18-85 (CDJ#4081-85).

A. polyphylla DC.: Colombia. *Cundinamarca*: ca. 2,400′, 1 km NE Anapoima, X-17-84, (CDJ#3534-84); ca. 1,100′, 3 km N Girardot, X-17-84 (CDJ#3548-84). Venezuela. *Zulia*: ca. 50′, 13 km SE Altagracia, I-29-85 (CDJ#3839-85).

Stator pruininus (Horn)

Desmanthus virgatus (Linnaeus) Willdenow. Venezuela. *Anzoategui*: 27 km N San Mateo, II-20-85 (CDJ#4125-85). *Barinas*: 10 km NW Libertad, I-23-85 (CDJ#3771-85). *Guarico*: 16 km W Chaguaramas, II-9-85 (CDJ#3961-85 & 3964-85). *Falcon*: Coro, IX-21-83 (CDJ#2853-83).

Mimosa adenocarpa Bentham. Venezuela. *Guarico*: Calabozo, IX-29-83 (CDJ#2932-83).

M. martensis Britton & Rose vel sp. aff. Venezuela. *Portuguesa*: 26 km SW Acarigua, I-23-85 (CDJ#3761-85).

Sesbania sp. Venezuela. *Carabobo*: ca. 1,400′, 6 km NE Valencia, I-18-85 & II-10-89 (CDJ#3676-85 & 4421-89).

Sesbania emerus (Aublet) Urban. Venezuela. *Guarico*: Calabozo, IX-29-83 (CDJ#2933-83).

S. grandiflora (Linnaeus) Persoon. Venezuela. *Sucre*: Guiria, X-5-83 (CDJ#2996-83).

S. sesban (Linnaeus) Merrill. Venezuela. *Carabobo*: Puerto Cabello, I-18-85 (CDJ#3684-85).

Stator sordidus (Horn)

Acacia macracantha (Humboldt & Bonpland) Willdenow. Venezuela. *Aragua*: 7 km S Cagua, II-6-89 (CDJ#4384-89).

Mimosa laxiflora Bentham. Mexico. *Sonora*: 7 mi W San Carlos Bay, X-30-92 (CDJ#4921-92).

Parkinsonia aculeata Linnaeus. Venezuela. *Guarico*: 30 km E El Sombrero, III-5-89 (CDJ#4621-89).

Piptadenia obliqua (Persoon) Macbride vel sp. aff. Venezuela. *Anzoategui*: ca. 700′, 33 km SE El Tigre, II-10-85 (CDJ#3974-85).

P. inaequalis Bentham. Venezuela. *Bolivar*: ca. 1,400′, 14 km SE Upata, II-12-85 (CDJ#3977-85).

Pithecellobium dulce (Roxb.) Bentham. Mexico. *Sonora*: Alamos, II-18-93 (CDJ#4946-93).

P. saman (Jacquin) Bentham. Venezuela, *Guarico*: 14 km SW Calabozo, III-4-89 (CDJ#4607-89); 9 km SW Calabozo, III-4-89 (CDJ#4609-89).

Stator trisignatus (Sharp)

Acacia tamarindifolia (Linnaeus) Willdenow. Venezuela. *Bolivar*: 14 km SE Upata, III-11-89 (CDJ#4716-89).

Tree legume. Venezuela. *Zulia*: Encontrados, II-21-89 (CDJ#4539-89).

Stator vachelliae Bottimer

Acacia arenosa (Willdenow) Poiret. Venezuela. *Sucre*: 26 km E Cumana, VIII-7-84 (CDJ#3448-84).

A. farnesiana. Venezuela. *Merida*: ca. 2,700′, 10 km SW Merida, II-20-89 (CDJ#4507-89). *Anzoategui*: 14 km N Anaco, III-7-89 (CDJ#4660-89). *Guarico*: 43 km E Santa Maria de Ipire, III-15-89 (CDJ#4777-89). Mexico. *Sonora*: 10 mi W Hermosillo, XII-16-89 (CDJ#4839-89). United States. Texas. *Brewster Co.*: ca. 1,850′, Rio Grande Village, Big Bend Nat'l. Pk., IX-14-92 (CDJ#4853-92). *Val Verde Co.*: ca. 1,750′, 3 mi W Comstock (CDJ#4875-92); ca. 1,100′, 22 mi SE Del Rio, IX-18-92 (CDJ#4877-92). *Cameron Co.*: Brownsville, IX-19-92 & IX-22-92 (CDJ#4884-92 & 4897-92). *Zapata Co.*: 3 mi S

Zapata, IX-24-92 (CDJ#4904-92); 25 mi SE Zapata, IX-24-92 (CDJ#4909-92).

A. flexuosa Humboldt & Bonpland ex. Willdenow. Venezuela. *Carabobo*: Puerto Cabello, II-12-89 (CDJ#4430-89 & 4432-89); Puerto Cabello, II-26-89 (CDJ#4581-89, 4582-89, 4583-89).

A. macracantha. Venezuela. D. F. 42 km SW Caracas, VII-11-84 (CDJ#3340-84). *Falcon*: ca. 2,500′, 25 km E Churuguara, VII-17-84 (CDJ#3366-84 & 3367-84). *Zulia*: 12 km E Lagunillas, VII-19-84 (CDJ#3376-84). *Bolivar*: 8 km N El Callao, VII-31-84 (CDJ#3425-84); 22 km SE Upata, VII-30-84 (CDJ#3414-84); Villa Lola, III-13-89 (CDJ#4752-89). *Sucre*: 19 km S Cumana, VIII-6-84 (CDJ#3446-84 & 3447-84). *Carabobo*: Puerto Cabello, VII-12-84 (CDJ#3344 & 3345-84); 6 km NE Valencia, II-10-89 (CDJ#4425-89). *Aragua*: 7 km S Cagua, II-6-89. *Guarico*: 13 km E Tucupido, III-6-89 (CDJ#4655-89); Valle de la Pascua, III-6-89 (CDJ#4636-89). *Anzoategui*: 60 km NW Aragua de Barcelona, III-6-89 (CDJ#4656-89 & 4657-89). *Monagas*: 18 km NW Aragua de Maturin, III-9-89 (CDJ#4688-89).

A. tortuosa (Linnaeus) Willdenow. Venezuela. *Carabobo*: Puerto Cabello, VII-12-82 (CDJ#2418-82).

Parkinsonia aculeata Linnaeus. United States. Texas. *Zapata Co.*: 3 mi S Zapata, IX-24-92 (CDJ#4903-92).

Pithecellobium saman (Jacquin) Bentham. Venezuela. *D. F.*: 42 km SW Caracas, VII-11-84 (CDJ#3342-84).

Stator vittatithorax (Pic)

Acacia tamarindifolia (Linnaeus) Willdenow. Venezuela. *Bolivar*: 21 km SE Upata, III-11-89 (CDJ#4722-89); 22 km SE Upata, II-12-85 (CDJ#3979-85). *Lara*: ca. 2,000′, 33 km N Barquisimeto, I-31-85 (CDJ#3859-85). *Anzoategui*: ca. 1,000′, 3 km NE Santa Rosa, II-18-85 (CDJ#4081-85).

A. polyphylla DC. Venezuela. *Zulia*: ca. 50′, 13 km SE Altagracia, I-29-85 (CDJ#3839-85).

The Coleopterists Bulletin, 49(2):142. 1995.

LITERATURE NOTICES

COULON, G. 1994. Contribution á la connaissance du genre *Elaphidipalpus* Jeannel, 1964 et description de trois espèces nouvelles (Coleoptera, Pselaphidae, Pselaphinae). Bull. Annls Soc. r. belge Ent. 130:143–158.

MEHENNI, M. T., AND R. BOSMANS. 1994. Contribution á l'étude des Carabidae (Coleoptera) des cédraies d'Algérie. Première partie. Bull. Annls Soc. r. belge Ent. 130:169–201.

CAMMAERTS, R., AND M-C. CAMMAERTS. 1994. Suprageneric taxonomy, appeasement behavior, sex ratio and other aspects of the biology of the myrmecophilous beetle *Thorictus grandicollis* (Dermestidae, Thorictinae). Bull. Annls Soc. r. belge Ent. 130:203–230.

OLIVA, A. 1994. A revision of the genus *Hemiosus* Sharp, 1882 in South America (Coleoptera: Hydrophilidae). Bull. Annls Soc. r. belge Ent. 130:267–303.

ANTOINE, PH. 1994. Contribution á la connaissance des Cetoniidae malgaches (Coleoptera, Scarabaeoidea). Revue fr. Ent. (N.S.) 16:137–142.