

Insects Associated with Broom Snakeweed [*Xanthocephalum sarothrae*] and Threadleaf Snakeweed [*Xanthocephalum microcephala*] in West Texas and Eastern New Mexico

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Abstract

Immature and adult insects representing 8 orders, 86 families, and 338 species were collected from broom snakeweed (*Xanthocephalum sarothrae*) or threadleaf snakeweed (*X. microcephala*) in the western half of Texas and eastern New Mexico during 1976 and 1977. Most of the 46 sampling locations were visited three times each year. Insects were collected by hand, sweep net, or D-Vac. The aboveground vegetation of 30 plants and the root systems of 10 plants were sampled at each location during most visits. Immature forms were determined by rearing or association. Several native insect species inflict damage to broom snakeweed and threadleaf snakeweed, including a leaf-tying moth, (*Synnoma lynosyrana*), a weevil (*Myrmex* sp. nr. *lineata*), roundheaded borers (*Crossidius discoideus* and *Crossidius pulchellus*), a flatheaded borer (*Agriilus gibbicollis*), and two species of mealybugs (*Phenacoccus helianthi* and *Eriococcus cryptus*).

Broom snakeweed [*Xanthocephalum sarothrae* (Pursh) Britt. & Rusby], also known as perennial broomweed, turpentine weed, or slinkweed, occurs over much of western North America from Saskatchewan to northern Mexico, whereas threadleaf snakeweed [*Xanthocephalum microcephala* (DC.) A. Gray] is found in western Colorado, southern Utah, Nevada, California, western Texas, and north-central Mexico (Solbrig 1960). These species infest extensive areas of rangeland in the western half of Texas and eastern New Mexico. Both species are relatively short-lived, perennial half-shrubs. Although populations of both species are cyclic and often increase on rangeland in response to overgrazing or drought (Ragsdale 1969; Stoddart et al. 1975), their abundance is not a definite indicator of overgrazing (Valentine 1971). Both broom snakeweed and threadleaf snakeweed are toxic to cattle, sheep, goats, and other animals (Sperry et al. 1964). Abortion or the delivery of dead or small, weak calves is the most common manifestation of snakeweed poisoning in cattle. It may affect up to 60% of the pregnant cows pastured on sandy soils infested by these weeds (Dollahite and Anthony 1956; Sperry et al. 1964). Economic loss resulting from the toxic properties of broom snakeweed is

compounded by apparent severe competition with desirable forage plants. Ueckert (1979) reported that forage production increased by 324% (2,201 kg/ha) during the second growing season after removal of broom snakeweed.

Several approaches to control of snakeweed have been explored with mixed results. Burning during June has successfully controlled broom snakeweed in New Mexico (Dwyer 1967). Chemical control has been erratic (Sosebee et al. 1979). One largely unexplored strategy of control is the use of insects, both native and exotic, either alone or in conjunction with other control techniques. Andres (1971) suggested that the conservation and augmentation of endemic phytophagous insects are feasible and advantageous in many cases.

Species of *Xanthocephalum* native to South America (Solbrig 1966) harbor a number of insect species potentially useful for biological control of this genus in other countries¹. Before the search for exotic insects is far advanced, a thorough understanding of the native arthropod fauna of broom snakeweed and threadleaf snakeweed is essential. No extensive survey of insects associated with broom snakeweed or threadleaf snakeweed has been previously attempted. Lavigne (1976) reported on several insects associated with broom snakeweed in northern Colorado. A few contributions dealing with specific insects have also been reported (Falkenhagen 1978; Penrose 1973; Powell 1976). This study was initiated to gather base line data on the distribution, seasonal occurrence, and relative abundance of insects associated with broom snakeweed and threadleaf snakeweed in west Texas and eastern New Mexico and to identify native species that exercise some degree of natural control and warrant more extensive study.

Methods and Materials

During 1976 and 1977 the insect faunas associated with broom snakeweed and threadleaf snakeweed were studied at 46 sites in the Rolling Plains, High Plains, Edwards Plateau, and Trans-Pecos vegetative zones of Texas as defined by Gould (1975), and in adjacent areas of eastern New Mexico (Table 1). Most localities were visited three times each year to collect insects along with data on their abundance and activity. Collections were made during the spring, summer, and fall at a time when the host-plants were in their early vegetative, mature vegetative, or flowering stages, respectively.

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Table 1. Insects collected from broom snakeweed and threadleaf snakeweed in western Texas and eastern New Mexico.

Species collected	Collection site ^a	Relative frequency ^b	Stage collected ^c	Collection method ^d	Growth stage of host ^e	Species of host ^f
Coleoptera						
Alleculidae						
<i>Hymenorus densus</i> LeC.	4	R	A	D	B	M
Anobiidae						
<i>Tricorynus gibbulum</i> (Fall)	24	O	A	D	EV	S
<i>Xyletinus</i> sp. nr. <i>lugubris</i> LeC.	6	R	A	D	B	S
Anthicidae						
<i>Anthicus</i> nr. <i>scabriceps</i> LeC.	36	R	A	D	EV	S
<i>Ischyropalpus</i> sp.	39	R	A	D	EV	S
<i>Notoxus</i> spp.	18,24,26,27,31	O	A	D,S	MV,B	S
Anthribidae						
<i>Trigonorhinus limbatus</i> (Say)	8,45	C	A	D	B	S
<i>T.</i> spp.	2,11,15,31,40,42	C	A	D,S	EV,MV,B	S
Bruchidae						
<i>Acanthoscelides aequalis</i> (Sharp)	8	R	A	D	B	M
<i>A. compressicornis</i> (Schaeff.)	38,44	R	A	D	EV	S
<i>A. obrienorum</i> Johnson	2	R	A	D	B	S
<i>A. schrankiae</i> (Horn)	10,27,36,42	O	A	D,H	EV,B	S
<i>Algarobius prosopis</i> (LeC.)	11,14,18,19,26	C	A	S,D	MV,B	M,S
<i>Merobruchus julianus</i> (Horn)	10	R	A	H	B	M
<i>Mimosestes amicus</i> (Horn)	2,6,10,14,15,16,18,19,20,23,26	C	A	D,S	MV,B	M,S
<i>M. protractus</i> (Horn)	15,29,36	O	A	D,S	MV,B	M,S
<i>Sennius morosus</i> (Sharp)	10,15,26	O	A	D,S	MV,B	M,S
<i>Stator limbatus</i> (Horn)	1,20	R	A	D	B	M,S
<i>S. pruininus</i> (Horn)	1,12,20	R	A	D	B	M,S
<i>Zabrotes spectabilis</i> Horn	39	O	A	D	EV	S
Buprestidae						
<i>Acmaeodera scalaris</i> Mann.	1,2,18,26	O	A	D	B	S
<i>Agrilus gibbicollis</i> Fall	1,11,12,31,36,41,43,45	C	L,P,A	D,R,S	EV,MV,B	S
<i>A.</i> sp.	4	R	A	D	B	M
Cantharidae						
<i>Chauliognathus discus</i> LeC.	7	O	A	D	B	S
<i>C. marginatus</i> Fab.	1	R	A	D	B	S
<i>C. scutellaris</i> LeC.	10,20,40	C	A	D,H	EV,B	M,S
<i>Tryptherus</i> sp.	6	R	A	D	B	S
Carabidae						
<i>Philophuga viridis</i> Dej.	2	R	A	D	B	S
Cerambycidae						
<i>Crossidius discoideus</i> (Say)	10	O	L,P,A	D,H	MV,B	S
<i>C. pulchellus</i> LeC.	1,8,12,20,26	C	L,P,A	D,S,H,R	EV,MV,B	S
<i>Placosternus difficilis</i> (Chev.)	3	R	A	S	B	M
Chrysomelidae						
<i>Altica foliacea</i> LeC.	26,40	R	A	D,S	EV,B	S
<i>Babia tetraspilota</i> LeC.	38,42	R	A	D,S	EV,B	S
<i>Chaetocnema pulicaria</i> Melsh.	15,31,36	O	A	D,S	MV,B	S
<i>Chlamisus</i> sp. nr. <i>foveolatus</i> (Knoch)	15,26,28,29,38,40,41	C	L,A	D,S,H	EV,MV,B	S
<i>Colaspoides</i> sp.	27	R	A	D	B	S
<i>Coscinoptera mucorea</i> (LeC.)	44	R	A	D	EV	S
<i>Cryptocephalus amatus</i> Hald.	11	R	A	D	EV	S
<i>C. brunneovittatus</i> Schaeff.	12	R	A	D	EV	S
<i>C. cerinus</i> White	22	O	A	D	EV	S
<i>C. confluens</i> Say	4	R	A	D	B	M
<i>C. spp. spurcus-cerinus</i> complex	6,22,27,29	C	L,A	D,S,H	EV,MV,B	S
<i>Diabrotica longicornis longicornis</i> (Say)	10	R	A	D	B	S
<i>D. tricolor</i> (Say)	10,11,20	O	A	D,S	MV,B	S
<i>D. undecimpunctata howardi</i> Barber	2,10,20	C	A	D,H	B	M,S
<i>Diachus auratus</i> (Fab.)	1,2,45	C	A	D	B	S
<i>Distigmoptera apicalis</i> Blake	39	C	A	D	EV	S
<i>Epitrix</i> sp. nr. <i>hirtipennis</i> (Melsh.)	14	R	A	S	MV	M
<i>Euryscopa pilatei</i> Lac.	15	R	A	S	MV	M
<i>Exema mormana</i> Karren	8	R	A	D	B	M
<i>Gastrophysa dissimilis</i> (Say)	36	R	A	D	B	S
<i>Glyptina cerina</i> (LeC.)	26	O	A	D	B	S
<i>G. spuria</i> LeC.	8,12,17	C	A	D	B	M
<i>Monoxia apicalis</i> Blake	5	O	A	D	EV	S
<i>M. puberula</i> Blake	3,17,19,20,46	C	L,A	D,H	EV,MV,B	S
<i>Pachybrachys nero</i> Bowditch	1,4,5,6,11,14,15,20,21,29,31,36,41,43,44	C	A	D,S	EV,MV,B	M,S

Table 1. Continued.

Species collected	Collection site ^a	Relative frequency ^b	Stage collected ^c	Collection method ^d	Growth stage of host ^e	Species of host ^f
<i>P. vau</i> Fall	11,21,23,28,29, 42	C	A	D,S	EV,MV,B	M,S
<i>P. sp.</i>	12,33	R	A	D	B	S
<i>Phyllotreta sp.</i>	12	R	A	D	B	S
<i>Saxinis knausi</i> Schaefer.	11	R	A	D	EV	S
<i>S. sp.</i>	43	R	A	D	EV	S
<i>Systema blanda</i> (Melsh.)	11,21,22,24,31 36,39	C	A	D,S	EV,MV	S
<i>Zygogramma disrupta</i> Rogers	41	R	A	D	EV	S
Cleridae						
<i>Enoclerus laetus</i> (Klug)	28	C	L,P,A	D,H,S,R	EV,MV,B	S
<i>E. coccineus</i> (Schenk.)	23,24,29	C	L,P,A	H,S,R	EV,MV,B	S
<i>Phyllobaenus discoideus</i> (LeC.)	10	R	A	D	EV	S
Coccinellidae						
<i>Anovia virginialis</i> (Wickham)	16	R	A	D	B	S
<i>Diomus debilis</i> (LeC.)	24	R	A	D	EV	S
<i>Hippodamia convergens</i> Guerin	10,12,14,25,38, 45	C	L,A	D	EV,MV,B	S
<i>Hyperaspidius comparatus</i> Casey	28	O	A	D	EV	S
<i>H. insignis</i> Casey	14	R	A	D	MV	M
<i>Hyperaspis fimbriolata</i> (Melsh.)	18,35	R	A	D	EV	S
<i>H. lateralis</i> Mulsant	18,43	R	A	S	MV	S
<i>Olla abdominalis</i> (Say)	5	O	L,A	D	EV	S
<i>Psyllobora renifer</i> (Casey)	24,44	O	L,A	D	EV	S
<i>Nephus (Scymnobius) jintrusus</i> Horn	41,43	R	A	D	EV	S
<i>Scymnus ardelio</i> Horn	18,21,28	C	A	D,S	EV,MV	M,S
<i>S. creperus</i> Muls.	40	R	A	D	EV	S
<i>S. horni</i> Gorham	11,20,23,40	C	A	D,S,H	EV,MV,B	S
<i>S. loewii</i> Muls.	21,26,36,40	C	A	D,S	EV,MV,B	S
<i>S. pallens</i> LeC.	42	R	A	S	MV	S
<i>Zagloba hystrix</i> Casey	15,43,45	R	A	D,S	EV,MV	M,S
Curculionidae						
<i>Anthonomus decipiens</i> LeC.	8,14,18,38,40, 42,44	C	A	D,S	EV,MV,B	M,S
<i>A. sp. nr. decipiens</i> LeC.	10,14,19	O	A	D,S	B	M
<i>A. tenuis</i> Fall	12,46	C	A	D	EV,MV,B	S
<i>Apion amaurum</i> Kissinger	3,28,40,44	C	A	D,S	EV,MV	S
<i>A. impunctistriatum</i> Smith	1,8	R	A	D	B	M,S
<i>A. sp.</i>	1,2,5,6,8	C	A	D	EV,B	M,S
<i>Centrinaspis sp.</i>	2,6	C	A	D	B	S
<i>Cylindrocopturus sp.</i>	1	R	A	D	B	S
<i>Dorytomus brevicollis</i> LeC.	11	R	A	S	MV	S
<i>Epimechus curvipes</i> Dietz	12,39,43,45	C	A	D	B	S
<i>E. sp.</i>	21,22,23,26,28 29,31,33,35,36	C	A	D,S	EV,MV,B	S
<i>E. sp.</i>	5,38,44	R	A	D	EV	S
<i>Minyomerus laticeps</i> (Casey)	45	R	A	D	EV	S
<i>M. sp.</i>	5,15,17,22,28 31,33,35,39	C	A	D,S	EV,MV,B	M,S
<i>M. sp.</i>	21,26	O	A	D,S	EV,MV	S
<i>Mitostylus setosus</i> (Sharp)	5,6,11,20,27,44	C	A	D,S	EV,MV,B	S
<i>M. tenuis</i> Horn	1,38,41	C	A	D	EV	S
<i>Myrmex lineata</i> (Pascoe)	10,21	R	A	D	B	S
<i>M. sp. nr. lineata</i> (Pascoe)	3,4	C	L,P,A	D,S,R	B	M
<i>M. sp.</i>	23	R	A	S	MV	S
<i>Ophryastes latirostris</i> LeC.	39	R	A	D	EV	S
<i>O. sp.</i>	20,31	R	A	D	EV,B	S
<i>Pantomorus elegans</i> (Horn)	31	R	A	D	EV	S
<i>P. obscurus</i> (Horn)	44	R	A	D	EV	S
<i>Peritaxia sp.</i>	24	R	A	D	EV	S
<i>Sibinia sp.</i>	42	R	A	S	B	S
<i>Smicronyx lutulentus</i> Dietz	5,6	O	A	D,S	EV,MV,B	S
<i>S. sordidus</i> LeC.	1,15,26	O	A	D	MV	S
<i>S. spretus</i> Dietz	10,14,16,18 19,20	C	A	D	B	M,S
<i>S. tessellatus</i> Dietz	38	R	A	D	EV	S
<i>S. sp. nr. pleuralis</i> Casey	43	R	A	D	EV	S
<i>S. spp.</i>	15,31,36,41,44	O	A	D,S	EV,MV,B	M,S
<i>Tychius sp.</i>	39	R	A	D	EV	S
Dermestidae						
<i>Cryptorhopalum balteatum</i> LeC.	2	R	A	D	B	S

Table 1. Continued

Species collected	Collection site ^a	Relative frequency ^b	Stage collected ^c	Collection method ^d	Growth stage of host ^e	Species of host ^f
Elatерidae						
<i>Conoderus vespertinus</i> (Fab.)	26	R	A	D	EV	S
<i>Megapenthes</i> sp.	43	R	A	S	MV	S
Lathridiidae						
<i>Melanophthalmus</i> sp.	36,42	O	A	D,S	EV,B	S
Meloidae						
<i>Epicauta ferruginea</i> (Say)	6	C	A	D	B	S
<i>E.</i> spp.	2,26,28	C	A	D,S	MV,B	M,S
<i>Zoniitis atripennis</i> (Say)	2	R	A	D	B	S
Melyridae						
<i>Amphivectura</i> sp.	24	R	A	D	EV	S
<i>Attalus lecontei</i> Champ.	45	R	A	D	EV	S
<i>Collops balteatus</i> LeC.	1	R	A	S	B	S
<i>C. confluens</i> LeC.	36	R	A	S	MV	S
<i>C. limbellus</i> G. & H.	28	R	A	D	B	S
<i>C. punctatus</i> LeC.	36	R	A	S	MV	S
<i>C. quadrimaculatus</i> (Fab.)	18,36,40	O	A	D,S	MV,B	S
<i>C. vittatus</i> (Say)	36,38,40	O	A	D,S	MV,B	S
<i>Hypebaeus</i> spp.	6,15,24	O	A	D,S	EV,MV,B	M,S
<i>Trichoehrous</i> spp.	4,10,12,14,20	C	A	D	B	M,S
Mordellidae						
<i>Diclidia</i> sp.	24	R	A	D	EV	S
<i>Mordella melaena</i> Germar	40	O	A	D	B	S
<i>Mordellistena</i> spp.	15,24,31,36,38,42	O	A	D	EV	M,S
Pedilidae						
<i>Eurygenius</i> sp.	45	R	A	D	MV	S
Phalacridae						
<i>Olibrus</i> sp.	42	R	A	D	EV	S
<i>Phalacrus</i> spp.	23,41,42,45	O	A	D	EV,B	S
Scarabaeidae						
<i>Cotinis mutabilis</i> (G. & P.)	2	R	A	D,S	B	S
<i>Diplotaxis subangulata</i> LeC.	17,35	O	A	D	B	M,S
Scolytidae						
<i>Dendrocranus</i> sp.	41	R	A	S	MV	S
Tenebrionidae						
<i>Bothrotes canaliculatus acutus</i> LeC.	1	R	A	S	B	S
<i>B. plumbeus plumbeus</i> (LeC.)	10,16,20,37	O	A	D,H	B	M,S
<i>B.</i> sp.	3	R	A	S	B	M
<i>Eleodes extricatus</i> (Say)	17,25	R	A	D	EV	M,S
<i>E. fusiformis</i> LeC.	29	R	A	D	EV	S
<i>E. obsoleta</i> (Say)	26	O	A	D,S,H	EV,MV,B	S
<i>E. tricostata</i> (Say)	37,41	R	A	D	EV,B	S
<i>Eusattus reticulatus</i> (Say)	20	R	A	D	B	M
<i>Metoponium</i> nr. <i>cognitum</i> Casey	28	R	A	D	EV	S
<i>Steriphanus</i> spp.	18,31	R	A	D,S	EV,MV	S
Collembola						
Sminthuridae						
<i>Sminthurus sylvestris</i> Banks	31,33,42	R	N,A	D,S	EV,MV,B	S
Diptera						
Anthomyiidae						
<i>Hylemya</i> sp.	1	R	A	S	MV	S
Bibionidae						
<i>Dilophus</i> sp.	35,38	R	A	D,S	EV,B	S
Calliphoridae						
<i>Cochliomyia macellaria</i> (Fab.)	2	C	A	D	B	S
Cecidomyiidae						
<i>Asphondylia</i> sp.	38,44	R	L,A	R,D	MV,B	S
<i>Rhopalomyia</i> sp.	12	C	L	R	EV	S
Chamaemyiidae						
<i>Leucopis</i> sp.	45	R	A	D	B	S
Chloropidae						
<i>Chlorops 5-punctatus</i> Lw.	15	R	A	D	EV	M
<i>C. n.</i> sp.	1	R	A	D	MV	S
<i>C. n.</i> sp.	15	C	A	S	MV	M
<i>Conioscinella nuda</i> (Adams)	28,40	R	A	D,S	EV,MV	S
<i>Meromyza</i> sp.	20	R	A	D	B	S
<i>Neodiploxa pulchripes</i> (Lw.)	36	R	A	D	EV	S
<i>Opetiophora straminea</i> Lw.	40	R	A	D	EV	S
<i>Siphonella nigripalpis</i> (Mall.)	6,11,28,35,44	O	A	S	MV,B	S
<i>Thaumatomyia glabra</i> (Mg.)	21	R	A	S	MV	S

Table 1. Continued

Species collected	Collection site ^a	Relative frequency ^b	Stage collected ^c	Collection method ^d	Growth stage of host ^e	Species of host ^f
Ephydriidae						
<i>Paralimna punctipennis</i> (Wied.)	36	R	A	S	B	S
Lauxaniidae						
<i>Camptoprosopella inaequalis</i> Shewell	11,29,31,36	O	A	D,S	EV,MV	S
Otitidae						
<i>Tritoxa cuneata</i> Loew	40	R	A	S	B	S
Sarrothogidae						
<i>Blaesoxipha</i> sp.	28	R	A	S	MV	S
<i>B.</i> sp.	28	R	A	S	MV	S
<i>Ravinia derelicta</i> (Walker)	1,20	R	A	S	MV,B	M,S
<i>R. iherminieri</i> (R. & D.)	29	R	A	D	EV	S
<i>R. planifrons</i> (Ald.)	26,29	R	A	S	MV	S
<i>Senotainia rubriventris</i> Macq.	18	O	A	D,S	EV,MV,B	S
Sepsidae						
<i>Sepsis neocynipsea</i> Melander & Spuler	11,18,36,42	O	A	D,S	EV,MV,B	S
Stratiomyiidae						
<i>Eulalia</i> sp.	1	R	A	D	B	S
<i>Nemotelus</i> sp.	1,33	R	A	D,S	MV,B	S
Syrphidae						
<i>Allograpta exotica</i> (Wied.)	43	R	A	S	MV	S
<i>Toxomerus marginatus</i> (Say)	1,10,26,38,44	C	A	D,S	MV,B	S
Tachinidae						
<i>Leucostoma</i> sp.	15	R	A	S	MV	M
<i>Microchaetina</i> sp.	20	R	A	D	B	M
<i>Paradidyma</i> sp.	10	R	A	D	B	S
<i>Prosenoides</i> sp.	11	R	A	D	MV	S
<i>Schizactia</i> sp.	42	R	A	S	B	S
<i>Siphophyto</i> sp.	11	R	A	S	MV	S
<i>Sitophaga</i> sp.	18	R	A	S	MV	S
Tephritidae						
<i>Euaestoides acutangulus</i> (Thoms.)	2	R	A	D	B	S
<i>Neaspilota</i> sp.	15,42	R	A	D,S	EV,MV	M,S
<i>Trupanea actinobola</i> (Lw.)	4,6,33,38,39,43	C	A	D,S	MV,B	M,S
	44	C	A	D,S	MV,B	M,S
<i>T. signata</i> Foote	39,43	R	A	D	B	S
Therevidae						
<i>Psilocephala</i> sp.	42	R	A	S	B	S
Hemiptera						
Lygacidae						
<i>Xyonysius californicus</i> (Stal)	8,45	C	A	D	B	M,S
Miridae						
<i>Coquillettia mimetica</i> Osborn	20	O	A	D	B	S
Pentatomidae						
<i>Mecidea major</i> Sailer	8	R	A	D	B	M
Rhopalidae						
<i>Liorhysus hyalinus</i> (Fab.)	8	C	A	D	B	M
Tingidae						
<i>Corythucha morrilli</i> Osborn & Drake	18	R	N,A	D	B	S
Homoptera						
Acanaloniidae						
<i>Acanalonia invenusta</i> Doering	11,12,15,26,42	C	A	D,S	EV,MV,B	M,S
<i>A. parva</i> Doering	1	C	A	D	B	S
Aphidae						
<i>Aphis gutierrezis</i> (Pack & Knowlton)	28,42	C	N,A	D,H,S	MV,B	S
<i>Dactynotus zerogutierreziae</i> (Smith & Knowlton)	15,25,27,39,40	C	N,A	D,H,S	EV,MV,B	S
Cercopidae						
<i>Clastoptera lincatocollis</i> Stal	2,18,20,26,28	O	N,A	D,S	MV,B	M,S
Cercococcidae						
<i>Cerococcus artemisiae</i> (Ckll.)	33,39	C	N,A	H	EV	S
Cicadellidae						
<i>Aceratagallia sanguinolenta</i> (Prov.)	39,43	R	A	D	B	S
<i>A. uhleri</i> (VanDuzee)	11,12,14,17,19					
	22,23,26,27,28					
	31,36,38,39,40					
	42,44,45	C	N,A	D,S	EV,MV,B	S
<i>Acinopterus bakeri</i> Lawson	2,38,44	R	A	D	B	S
<i>Athysanella argenteola</i> (Uhler)	6,29,36,40,42	O	N,A	D,S	EV,MV,B	S
<i>A. clavata</i> Ball & Beamer	40,43,44	O	N,A	D,S	EV,MV,B	S
<i>Balclutha guajanae</i> (DeLong)	1	R	A	D	B	S

Table 1. Continued

Species collected	Collection site ^a	Relative frequency ^b	Stage collected ^c	Collection method ^d	Growth stage of host ^e	Species of host ^f
<i>B. neglecta</i> (DeLong & Davidson)	11,15,26,29 33,36	O	N,A	D,S	EV,MV,B	M,S
<i>B.sp.</i>	1	R	A	D	B	S
<i>Ceratagallia bigeloviae</i> (Baker)	1,11,15,18,21, 24,26-29,31,33, 35,36,38,39,40- 44,45	C	N,A,	D,S	EV,MV,S	S
<i>Chlorotettix spatulatus</i> Osborn & Ball	1,40,43,44	R	A	D,S	EV,MV,B	S
<i>C. sp.</i>	2	R	A	D	B	S
<i>Ciminius sidanus</i> (Ball)	1	R	A	D	B	S
<i>Cuerna arida</i> Oman & Beamer	24	R	A	D	EV	S
<i>C. costalis</i> (Fab.)	38	R	A	D	EV	S
<i>C. obesa</i> Oman & Beamer	10,11,29,31,36	C	N,A	D,S	EV,MV,B	S
<i>C. striata</i> (Walker)	11,20	O	N,A	D,S	EV,MV,B	S
<i>Driotura vittata</i> Ball	15,23,24,28,29 33,35,36	C	N,A	D,S	EV,MV,B	M,S
<i>D. vittata nigra</i> Lawson	29,31,33	O	N,A	S	MV	S
<i>Empoasca alboneura</i> Gillette	5,6,11,15,18,21- 23, 26-29, 31, 33, 35, 36, 39,40,42	C	N,A	D,S	EV,MV,B	M,S
<i>E. mexicana</i> Gillette	12	C	N,A	D	EV,MV,B	S
<i>Exitianus exitiosus</i> (Uhler)	20,27,29,33,44	O	N,A	D,S	EV,MV,B	S
<i>Flexamia abbreviata</i> (Osborn & Ball)	36	R	A	D	EV	S
<i>F. flexulosa</i> (Ball)	39,40	R	A	D,S	EV,MV	S
<i>Gillettella labiata</i> (Gillette)	29	C	A	D	EV	S
<i>Graminella sonora</i> (Ball)	14,19,36	R	N,A	D	B	S
<i>Graphocephala marathonsensis</i> (Olsen)	12	C	A	D	EV	S
<i>Gyponana delta</i> Ball	15,22,23,31,35, 36,40,42,43	C	N,A	D,S	EV,MV,B	M,S
<i>Keonolla dolobrata</i> (Ball)	2,15	C	A	D	MV,B	S
<i>Norvellina pulchella</i> (Baker)	4	R	A	D	B	M
<i>Opsius stactogalus</i> Fieber	36	R	A	S	B	S
<i>Polyamia sp.</i>	1	R	A	D	B	S
<i>Psammotettix sp.</i>	31	R	A	S	MV	S
<i>Scaphytopius irroratus</i> (VanDuzee)	12	R	A	D	MV	S
<i>Stirellus bicolor</i> (VanDuzee)	1,6,15,26	R	N,A	D,S	EV,MV,B	M,S
<i>Stragania bisignata</i> Ball	20,23,26	O	N,A	D,S	EV,B	S
<i>S. robusta</i> (Uhler)	1,39,43	R	A	D	MV,B	S
<i>Texananus latipex</i> DeLong	15,26,28,33	O	N,A	D	EV	M,S
<i>Tinobregmus vittatus</i> VanDuzee	43	R	A	D	EV	S
<i>Xerophloea peltata</i> (Uhler)	26,36,40	O	N,A	D	EV,B	S
Cixiidae						
<i>Cixius sp.</i>	23	R	A	S	B	S
<i>Oecleus nolius</i> Ball & Klingenberg	35	R	A	D	EV	S
<i>Oliarus sp.</i>	27	R	A	S	B	S
<i>O. sp.</i>	1	R	A	D	B	S
Delphacidae						
<i>Bostaera nasuta</i> Ball	6,26	R	A	D,S	EV,B	S
Dictyopharidae						
<i>Scolops grossus</i> Uhler	36	R	A	S	B	S
<i>S. pungens</i> (Germar)	10,14,27,33,42	R	N,A	S	MV,B	M,S
Eriococcidae						
<i>Eriococcus cryptus</i> Ckll.	5,11,18,27-29, 33,40,41,42	C	N,A	H	EV,MV	S
<i>E. sp. possibly dubius</i> Ckll.	35	C	N,A	H	EV	S
Flatidae						
<i>Misthamophantia sonorana</i> Kirkaldy	6,15,18,26	R	N,A	D,S	EV,MV,B	M,S
Issidae						
<i>Fitchiella rufipes</i> Lawson	40	R	A	D	EV	S
<i>Hysteropterum sepulchralis</i> Ball	24	R	A	D	EV	S
Kerriidae						
<i>Tachardiella glomerella</i> (Ckll.)	5	O	A	H	EV	S
Kinnaridae						
<i>Oeclidius nanus</i> VanDuzee	4	R	A	D	B	M
Margarodidae						
<i>Steatococcus townsendi</i> (Ckll.)	6,16,18,26,33	C	N,A	H	EV,MV,B	M,S
Membracidae						
<i>Micrutalis calva</i> (Fitch)	15	R	A	S	MV	M
<i>Spissistilus festinus</i> (Say)	12,15,20,24,40	C	N,A	D,S	EV,MV,B	M,S
<i>Stictopelta marmorata</i> Goding	27,36	R	A	S	B	S

Table 1. Continued

Species collected	Collection site ^a	Relative frequency ^b	Stage collected ^c	Collection method ^d	Growth stage of host ^e	Species of host ^f
<i>Vanduzee laeta</i> Goding	15,27,36	R	N,A	S	MV,B	M,S
Pseudococcidae						
<i>Chorizococcus</i> sp.	33,,39	O	N,A	H	EV	S
<i>Phenacoccus gossypii</i> Town. & Ckll.	31	C	N,A	H	EV	S
<i>P. helianthi</i> (Ckll.)	33,39,40,42	C	N,A	H	EV	S
<i>Spilococcus</i> sp.	42	O	N,A	H	EV	S
Psyllidae						
<i>Craspedolepta gutierreziae</i> (Klyver)	11,15,21,27,28	C	N,A	D,S	EV,MV,B	M,S
<i>C.</i> sp.	42	R	N,A	S	B	S
<i>Heteropsylla taxana</i> Crawford	11,12,22,23 26-					
	29,31,36	C	N,A	D,S	EV,MV,B	S
<i>Kuwayama medicaginis</i> Crawford	24,27,29	O	A	D,S	EV,MV,B	S
<i>Rhinopsylla dimorpha</i> Caldwell	40,24	O	A	S	B	S
<i>Trioza diospyri</i> Ashmead	26	R	A	D	EV	S
Hymenoptera						
Andrenidae						
<i>Perdita ignota</i> Ckll.	15,20,28,40	O	A	D,S	EV,MV,B	M,S
<i>P.</i> sp. nr. <i>lacteipennis</i> Swenk & Ckll.	15	R	A	S	MV	M
<i>P.</i> sp. nr. <i>stottleri</i> Ckll.	10	R	A	D	B	S
<i>Pseudopanurgus</i> sp.						
Anthophoridae						
<i>Exomalopsis</i> sp.	2	R	A	D	B	S
<i>Melissodes</i> sp. nr. <i>verbesinarum</i> Ckll.	14	"	A	D	B	S
Apidae						
<i>Bombus sonorus</i> Say	6	R	A	S	B	S
Argidae						
<i>Schizocerella pilicornis</i> (Holmgren)	35	R	A	S	B	S
Bethylidae						
<i>Holepyris</i> sp.	23	R	A	D	EV	S
<i>Parasierola</i> sp.	15,24	R	A	D	EV	M,S
Colletidae						
<i>Hyaleus</i> sp.	14	R	A	D	B	S
Cynipidae						
<i>Alloxysta</i> sp.	23	R	A	D	EV	S
Figitidae						
<i>Melanips</i>	44	R	A	S	MV	S
Formicidae						
<i>Camponotus vicinus</i> Mayr	31	C	A	H	EV	S
<i>Conomyrma insana</i> (Buckley)	21,23,26,29					
	33,35,43	C	A	D,S	EV,MV,B	S
<i>Crematogaster punctulata</i> Emery	6,15,21,26,27,					
	33,36,38,43,44	C	A	D,S,H	EV,MV,B	MS
<i>Forelius foetidus</i> (Buckley)	23,26,31	R	A	S	EV,MV	S
<i>Iridomyrmex pruinosus</i> (Roger)	26,27,3340-42	C	A	D,S	EV,B	S
<i>Leptothorax pergandei</i> Emery	23,26,43	O	A	D,S	EV,MV,B	S
<i>Monomorium minimum</i> (Buckley)	41	O	A	D	EV	S
<i>Myrmecocystus depilis</i> Forel	18,26	R	A	D	B	S
<i>M. mimicus</i> Wheeler	6,26,31	O	A	D,S	MV,B	S
<i>Novomessor cockerelli</i> André	1%	R	A	S	MV	M
<i>Paratrechina</i> sp.	27,43	R	A	D,S	EV,MV	S
<i>Pheidole</i> sp.	26,29,33,43	O	A	D,S	EV,MV	S
<i>Pogonomyrmex rugosus</i> Emery	29,33	O	A	D,S	EV,MV,B	S
<i>Solenopsis aurea</i> Wheeler	35	O	A	DEV	S	S
<i>S. xyloni</i> McCook	23	R	A	D	EV	S
Halictidae						
<i>Agapostemon texanus</i> Cresson	26	O	A	S	B	S
<i>Dialictus clematisellus</i> (Ckll.)	110	A	S	MV	S	S
<i>D.</i> sp. nr. <i>hunteri</i> (Cwfd.)	2	R	A	D	B	S
<i>D.</i> sp.	24,27	R	A	D	EV	S
<i>Halictus (Sceladonia) tripartitus</i> (Ckll.)	43	R	A	D	EV	S
Megachilidae						
<i>Ashmeadiella buconis</i> (Say)	40	R	A	S	B	S
<i>Megachile texana</i> Cresson	6	R	A	D	B	S
Mutillidae						
<i>Pseudomethoca</i> sp.	31	R	A	D	EV	S
Pompilidae						
<i>Anoplus</i> sp.	18	R	A	D	EV	S
<i>Episyrus snowi</i> Viereck)	6	R	A	D	B	S
<i>Psorthaspis macronotum cressoni</i> Bladley	6	R	A	D	B	S

Table 1. Continued

Species collected	Collection site ^a	Relative frequency ^b	Stage collected ^c	Collection method ^d	Growth stage of host ^e	Species of host ^f
Sphecidae						
<i>Cerceris</i> sp.	26	"	A	S	MV	S
<i>Oxybelus</i> sp.	18	R	A	D,S	B	S
Tiphiidae						
<i>Paratiphia mitchelli</i> Allen	10,20,23	R	A	D,S	B	S
Lepidoptera						
Arctiidae						
<i>Cisthene tenuifascia</i> (Harv.)	2	R	A	D	B	S
Geometridae						
<i>Eubaphe unicolor</i> (Robinson)	2R	A	D	B	S	
<i>Melanochroia chephise</i> (Cram.)	1	R	A	D	MV	S
<i>Pergama radiosaria</i> (Hulst)	1	R	L	R	EV	S
<i>Tornos scolopacinarius</i> (Gn.)	45	C	L	R	EV	S
Noctuidae						
<i>Acontia</i> sp.	1	C	A	D	MV	S
<i>Spragueia jaguaralis</i> Hmps.	2	R	A	D	MV	S
Sesiidae						
<i>Carmenta prosopis</i> (Edw.)	6	R	A	D	B	S
Tortricidae						
<i>Synnoma lynosyrana</i> Walsingham	14-19,21,23,24	C	L,P,A	D,H,S,R	EV,MV,B	M,S
Yponomeutidae						
<i>Atteva punctella</i> (Cramer)	2,3	C	A	D	B	M,S
Neuroptera						
Hemerobiidae						
<i>Micromus subanticus</i> (Walk.)	23,24,29,40	R	A	D	EV	S
Chrysopidae						
<i>Chrysopa carnea</i> Steph.	23,26	R	A	D	B	S
Mantispidae						
<i>Mantispa sayi</i> Bks.	3	R	A	S	B	M

^a1=15 m. WSW, Uvalde, Maverick Co., TX; 2=10 m. E, Del Rio, Val Verde Co., TX; 3=20 m. W, Del Rio, Val Verde Co., TX; 4=4 m. W, Comstock, Val Verde Co., TX; 5=13 m. E, Dryden, Terrell Co., TX; 6=14 m. N, Dryden, Terrell Co., TX; 7=34 m. N, Dryden, Terrell Co., TX; 8=2 m. W, Iraan, Pecos Co., TX; 9=28 m. E, Marathon, Brewster Co., TX; 10=20 m. E, Marathon, Brewster Co., TX; 11=9 m. E, Marathon, Brewster Co., TX; 12=6 m. E, Alpine, Brewster Co., TX; 13=1 m. N, Alpine, Brewster Co., TX; 14=33 m. SW, Fort Stockton, Pecos Co., TX; 15=8 m. W, Crane, Crane Co., TX; 16=22 m. W, Crane, Crane Co., TX; 17=7 m. S, Monahans, Ward Co., TX; 18=5 m. W, Pyote, Ward Co., TX; 19=13 m. S, Pecos, Reeves Co., TX; 20=22 m. S, Van Horn, Culberson Co., TX; 21=13 m. W, Van Horn, Hudspeth Co., TX; 22=22 m. W, Van Horn, Hudspeth Co., TX; 23=10 m. S, Cornudas, Hudspeth Co., TX; 24=6 m. W, Cornudas, Hudspeth Co., 25=3 m. E, Jal, NM, in Andrews Co., TX; 26=4 m. N, Jal, Lea Co., NM; 27=14 m. E, Seminole, Gaines Co., TX; 28=12 m. NE, Lovington, Lea Co., NM; 29=2 m. E, Milnesand, Roosevelt Co., NM; 30=1 m. S, Melrose, Curry Co., NM; 31=6 m. N, Fort Sumner, De Baca Co., NM; 32=12 m. SE, Santa Rosa, Guadalupe Co., NM; 33=10 m. E, Tucumcari, Quay Co., NM; 34=2 m. W, San Jon, Quay Co., NM; 35=8 m. S, Channing, Oldham Co., TX; 36=1 m. E, Four Way, Moore Co., TX; 37=14 m. E, Crosbyton, Crosby Co., TX; 38=14 m. SE, Guthrie, King Co., TX; 39=3 m. S, Wilson, Lynn Co., TX; 40=2 m. N, Justiceburg, Garza Co., TX; 41=2 m. W, Noodle, Jones Co., TX; 42=12 m. SW, Patricia, Dawson Co., TX; 43=16 m. N, San Angelo, Tom Green Co., TX; 44=4 m. E, Barnhart, Irion Co., TX; 45=15 m. N, Ozona, Crockett Co., TX; 46=26 m. N, Deming, Grant Co., NM.

^bR=rare, O=occasional, C=common

^cN=nymph, L=larva, P=pupa, A=adult

^dD=D-Vac, S=sweep net, H=hand collecting, R=rearing

^eEV=early vegetative, MV=mature vegetative, B=bloom

^fS=*Xanthocephalum sarothrae*

M=*Xanthocephalum microcephala*

Immature and adult insects were collected by hand or with the aid of a D-Vac[®] insect vacuum or sweep net. D-Vac and sweep net collections were made by sampling the aboveground portion of 30 plants at each site. Hand collected samples included both aboveground and belowground portions of 10 plants from each location. The roots and stems of hand-sampled plants were opened and examined. Infested plant tissues were returned to the laboratory for rearing. Wherever possible, immature stages were reared on greenhouse plantings of the appropriate host. In some instances immature stages were identified by association.

The relative abundance of various insect species at each site was categorized as common, occasional, or rare. Insects ranked as common were relatively abundant and usually present on a majority of the host-plants sampled. Occasional occurrence was indicative of species that occurred at low population densities and usually occurred on a limited number of host-plants. Rare insects were those encountered at a given locality only infrequently.

Results and Discussion

Specimens of 338 species of insects from 8 orders and 86 families

were collected from broom snakeweed and threadleaf snakeweed in western Texas and eastern New Mexico along with data on their distribution, seasonal occurrence and abundance (Table 1).

The phytophagous habits of several insect species were particularly devastating to their hosts and apparently resulted in localized reduction in abundance of these weeds. Among these, *Synnoma lynosyrana* Walsingham, a leaf tying tortricid moth associated with broom snakeweed in California (Powell 1976), was responsible for defoliating populations of both snakeweed species in localized areas in the Trans-Pecos vegetation zone. Larvae of an unidentified weevil, *Myrmex* sp., bore extensively in the roots of broom snakeweed while the larvae of *Myrmex ventralis* Van Dyke damaged the roots of threadleaf snakeweed. Two cerambycid species, *Crossidius discoideus* (Say) and *Crossidius pulchellus* LeC., infested nearly 100% of broom snakeweed plants at several locations. A widely distributed buprestid, *Agrilus gibbicollis* Fall, bored extensively under the bark of broom snakeweed. One mealybug species, *Phenacoccus helianthi* (Ckll.), occurred on the foliage, stems, and roots of both snakeweed species, whereas another, *Eriococcus cryptus* Ckll., was abundant on the roots of broom snakeweed.

Because specialists in Orthoptera and two families of Hymenoptera, Braconidae and Ichneumonidae, were unavailable to make identifications, representatives of these groups are not included in Table 1, although one grasshopper species, *Hesperotettix viridis* (Thomas), is known to be specific to snakeweed and a few closely related plants (Mulkern et al. 1969). All specimens collected as part of this study were deposited in the collections of the Texas Tech University Museum; the Blacklands Conservation Research Laboratory, U.S. Dep. Agr., Agr. Res. Serv., Temple, Texas; or the National Museum of Natural History.

²The following specialists identified insects upon which this study was based: D.M. Anderson, S.W.T. Batra, O.L.L. Flint, R.H. Foote, D.C. Ferguson, R.J. Cagne, R.D. Gordon, J.M. Kingsolver, J.P. Kramer, P.M. Marsh, W.N. Mathis, A.S. Menke, D.R. Miller, C.W. Sabrosky, D.R. Smith, T.J. Spilman, G.C. Steyskal, M.B. Stoetzel, F.C. Thompson, R.E. White, D.R. Whitehead, and W.W. Wirth, Systematic Entomology Laboratory, ARS, U.S. Dep. Agr., Beltsville, Md.; J.F.G. Clark, R.C. Froeschner, and W.N. Mathis, National Museum of Natural History, Washington, D.C.; W.F. Barr, University of Idaho, Moscow; H.R. Burke, Texas A&M University, College Station; T.D. Eichlin, SEL, Sacramento, Calif.; D.L. Wray, North Carolina Department of Agriculture, Raleigh.

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Range Ecologist

POSITION: The Range Science Department, Colorado State University has an open tenure track teaching and research position. Emphasis in teaching will be on the structure of range plant communities, field identification of range plants, and range improvements. The research program will depend upon the individual's specific interest, but preference will be given to a strong management orientation.

A Ph.D. degree is required with specialization in range science or closely related field, such as natural resources, soil science, or ecology. All requirements for the Ph.D. degree must be completed by the closing date of applications. Starting date not later than 20 August 1982.

Applicants should send a letter of application, a resume of professional experience, and names, addresses, and telephone numbers of at least three individuals familiar with the candidate's professional competence. For applicants with less than three (3) years' experience, transcripts should be included. Detailed criteria and further description of the position available upon request.

Completed applications must be received by Dr. Robert G. Woodmansee, Chairman, Search Committee, Range Science Department, Colorado State University, Fort Collins, Colorado 80523 by 20 February 1982.

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