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Scott A. Elias
University of Colorado, Boulder

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COLORADO GROUND BEETLES (COLEOPTERA: CARABIDAE) FROM THE ROTGER COLLECTION, UNIVERSITY OF COLORADO MUSEUM

Scott A. Elias¹

ABSTRACT.—Ground beetles from Rotger's collection of Colorado specimens have been identified, principally by the author, and a faunal list of 161 species from 80 localities is presented. The list includes 35 species not previously recorded from Colorado. Comparisons are made with Armin's (1963) carabid list from Boulder County and the diversity of species along transects through four elevational zones from the plains to the alpine.

In 1986 the University of Colorado acquired an insect collection from the estate of the Reverend Bernard Rotger. Fr. Rotger, C.R., was a member of the order of Theatine Fathers of southern Colorado, and 19,000 specimens from his collection are now in the University of Colorado Museum. Rotger's collection of Coleoptera included 970 specimens of ground beetles (Carabidae) collected from sites in Colorado. Most of these specimens (88%) were unidentified when the museum obtained them. I have subsequently identified these specimens, and I present here a list of all the carabid species from Rotger's Colorado collection at the University of Colorado museum (Table 1). This collection comprises 161 species from 80 collecting localities in 26 Colorado counties (Table 2). Most of the collecting localities are in the southern half of the state. The sites range in elevation from 1,100 m above sea level at Rocky Ford to 3,810 m in the Blanca Mountains.

The Colorado carabid fauna is poorly known, in that the most recent published list of taxa is that of Wickham (1902). Armin's (1963) list covers only Boulder County, and Lindroth (1961–1969) gives only occasional mention of Colorado localities for various species. The list provided in Table 1 is the beginning of a modern list for the state, but it represents only one collection, and that mostly of southern Colorado specimens.

METHODS

The specimens were identified with the aid of Lindroth's (1961–1969) keys to the Cara-

bidae of Canada and Alaska. Nearly all of Rotger's specimens were successfully identified through Lindroth's keys, but about 50 specimens did not appear to represent species treated by Lindroth. These specimens remain unidentified and are not cited in Table 1. Specimens of *Elaphrus*, identified by George Ball, were rechecked against Goulet's (1983) revision of that genus.

Some of Rotger's original locality labels included site elevations, especially his high-mountain localities. Most other locality labels had no elevation data. Wherever possible, I have provided the elevations of these localities as published in maps and gazetteers (Table 2). For some localities I could only provide rough estimates or ranges of possible elevations (e.g., localities cited from stream and river banks), and for a few localities I was unable to find any elevational citation from maps or from Gannett's (1906) state gazetteer.

For the purposes of elevational zone grouping, beetles collected below elevations of 2,000 m were designated as plains specimens. The foothills/lower montane zone was defined as greater than 2,000 m and less than 2,500 m. The subalpine zone was defined as greater than 2,500 m and less than 3,000 m. The alpine zone was defined as greater than 3,000 m.

DISCUSSION

Table 1 lists 35 species not previously cited (i.e., Wickham 1902, Lindroth 1961–1969, Armin 1963) for Colorado. Some of these species may be more common in southern Colorado, a region which has received little prior

¹Institute of Arctic and Alpine Research, Box 450, University of Colorado, Boulder, Colorado 80309.

TABLE I. List of Carabidae identified from the Rotger Collection of Colorado specimens.

Species	Collecting localities	Dates collected	Elevational range			
			Plains	Foothills/ Lower montane	Subalpine	Alpine
<i>Scaphinotus elevatus</i> Fabr.	10	?		+		
<i>Carabus serratus</i> Say ¹	48	VI		+		
<i>Carabus taedatus agassii</i> LeC.	2, 6, 8-10, 13, 16, 18, 30, 33, 34, 54, 60, 63, 79	V/2-IX/6	+	++	+	+
<i>Calosoma obsoletum</i> Say	31	VII		+		
<i>Nebria arkansana</i> Csy.	21, 30, 54, 60	VI/7-VIII/21		+		
<i>Nebria gyllenhali</i> Schonh. ²	3, 33, 63, 69, 76, 79	V/21-VIII/16			+	+
<i>Nebria hudsonica</i> LeC. ²	33, 76	V/21-VI/13			+	+
<i>Nebria metallica</i> Fisch.*	53, 79	VI/6-VIII/6			+	
<i>Nebria obliqua</i> LeC. ²	14	VI	+			
<i>Nebria obtusa</i> LeC. ²	17	VII/4			+	
<i>Nebria pallipes</i> Say*	53	VIII/6			+	
<i>Nebria purpurata</i> LeC. ²	3, 54, 60, 63	VI/18-VII/16	+		+	+
<i>Nebria trifaria</i> LeC.	21, 37, 53	VI/6-VIII/21		+	+	+
<i>Nebria trifaria catenata</i> Csy. ²	21, 60, 76, 77	V/21-VIII/21		+	+	
<i>Opisthius richardsoni</i> Kby.* ¹	14	VI/12	+			
<i>Notiophilus aquaticus</i> L.	14, 63	V/12-VI/13	+			+
<i>Notiophilus semistriatus</i> Say	75	VII/26				+
<i>Notiophilus simulator</i> Fall	57	IV/20		+		
<i>Elaphrus californicus</i> Mannh. ³	28, 34, 67	VI/8-VI/12	+	+		
<i>Elaphrus lecontei</i> Crotch. ³	4	VI		+		
<i>Loricera pilicornis</i> F.	24, 36	V	+	+		
<i>Pasimachus elongatus</i> LeC.	36, 47, 70	IV/29-IX/22		+		
<i>Pasimachus obsoletus</i> LeC.	45, 80	V/10-VIII/13	+			
<i>Clivina impressifrons</i> LeC.*	67	VI	+			
<i>Patrobus septentrionis</i> Dej.	60	VII			+	
<i>Diplous aterrimus</i> Dej.	14, 17, 33, 37, 42, 54, 62, 63, 67, 76	V/12-VIII/14	+		+	+
<i>Trechus apicalis</i> Mots.*	33	VI				+
<i>Trechus chalybeus</i> Dej.	13, 51, 79	V-IX/4		+	+	
<i>Trechus coloradensis</i> Schaeff.	33, 60, 76	V/21-VI/13			+	+
<i>Bembidion bifossulatum</i> LeC.	24, 36, 71	V/3-VII/1	+	+		
<i>Bembidion cordatum</i> LeC.	36	V	+			
<i>Bembidion diligens</i> Csy.*	52, 64	VI/7-IX/7	+	+		
<i>Bembidion grapei</i> Gyll.	79	VI			+	
<i>Bembidion graphicum</i> Csy.*	4, 24, 36, 60	V/3-VI	+	+	+	
<i>Bembidion haruspex</i> Csy.*	2, 63, 68, 76	V/21-VII/13			+	+
<i>Bembidion impotens</i> Csy.	71	X/1	+			
<i>Bembidion incrematum</i> LeC.*	71	X/1	+			
<i>Bembidion levigatum</i> Say*	73	X/4	+			
<i>Bembidion mormon</i> Hayw.*	24	V		+		
<i>Bembidion nebraskense</i> LeC.	24, 52	V-IX		+		
<i>Bembidion obscurellum</i> Mots.	30	VII/1		+		
<i>Bembidion patrule</i> Dej.*	20	IV		+		
<i>Bembidion planiusculum</i> Mannh.	24	?		+		
<i>Bembidion rapidum</i> LeC.	72, 73	X/1-X/4	+			
<i>Bembidion sordidum</i> Kby.*	52	IX/7		+		
<i>Bembidion timidum</i> LeC.	67, 72	VI/13-X/1	+			
<i>Bembidion versicolor</i> LeC.	52, 67	VI/13-IX/7	+	+		
<i>Tachys anceps</i> LeC.	64	VI/7	+			
<i>Tachys granarius</i> Dej.*	11, 52, 73	IX/7-X/4	+	+		
<i>Pterostichus adstrictus</i> Eschz.	6, 12, 23, 38, 39, 46, 47, 79	IV/19-X/30	+	+	+	
<i>Pterostichus caudicalis</i> Say	48	V		+		
<i>Pterostichus chalcites</i> Say*	66	VI/12	+			
<i>Pterostichus fatuus</i> Mannh.*	36	IV/12	+			
<i>Pterostichus femoralis</i> Kby.	36, 38, 79	III/29-VI/16	+		+	
<i>Pterostichus leconteianus</i> Ltsch.	26	IV/22	+			
<i>Pterostichus longulus</i> LeC. ³	32	VI/13				+
<i>Pterostichus lucublandus</i> Say	12	IV/21		+		

Table I continued.

Species	Collecting localities	Dates collected	Elevational range			
			Plains	Foothills/ Lower montane	Subalpine	Alpine
<i>Pterostichus protractus</i> LeC. ³	10,16,39,79	IV/30-IX/1		+	+	
<i>Pterostichus scitulus</i> LeC.	20,24,56	IV-IX/7	+	+		
<i>Pterostichus surgens</i> LeC.	33,39,51,63,76,79	IV/30-IX/4			+	+
<i>Pterostichus torvus</i> LeC.	7,40,43,72	III/29-X/1	+			
<i>Calathus advena</i> LeC. ³	37,62,76,78	V/20-VI/16			+	+
<i>Calathus ingratus</i> Dej. ¹	63	VI/18				+
<i>Calathus opaculus</i> LeC.	40,75	III/29-VII	+			+
<i>Synuchus dubius</i> LeC.	24	VIII/6		+		
<i>Agonum alceoneum</i> Bates* ³	15,36	IV/3-V/29	+			
<i>Agonum californicum</i> Dej.	22,24,39,67	V-VII/8	+	+		
<i>Agonum corvus</i> LeC. ³	15,20	IV-V/3		+		
<i>Agonum cupreum</i> Dej. ³	12	V/21		+		
<i>Agonum cupripenne</i> Say ³	15	V/3				?
<i>Agonum extensicolle</i> Say ³	1,7,38,47,49	III/29-VIII	+	+		
<i>Agonum ferruginosum</i> Dej. ³	15,33	V/3-VI/13			+	
<i>Agonum subsericeum</i> LeC.	24	V/12		+		
<i>Amara aeneopolita</i> Csy.*	68	VI/2			+	
<i>Amara alpina</i> Payk.	52,69	VII-IX/7		?		+
<i>Amara carinata</i> LeC.	38,56,71,72,73	III/29-X/4	+			
<i>Amara coelebs</i> Hayw.	68	VI/2			+	
<i>Amara cf. confusa</i> LeC.	68	VI/2			+	
<i>Amara convexa</i> LeC.	12,67,74	IV/21-VI/27	+	+		
<i>Amara crassispina</i> LeC.*	12,36	IV/21-IV/29	+	+		
<i>Amara ellipsis</i> Say*	78	V/20	?	?		
<i>Amara erratica</i> Duft.	76	V/21			+	
<i>Amara farcta</i> LeC.	23,24,36,72	V/3-X/1	+	+		
<i>Amara idahoana</i> Csy.*	63,68	VI/2-VI/13			+	+
<i>Amara impuncticollis</i> Say	4,12,56,67,78	IV/21-VII/10	+	+	+	
<i>Amara laevipennis</i> Kby.*	20,74,76	IV-VI/27		+	+	
<i>Amara latior</i> Kby.	7,24,41,60,65,75	IX/30-X/10	+	+	+	+
<i>Amara lunicollis</i> Schiödte.*	12,74	IV/21-VI/27		+		
<i>Amara obesa</i> Say	24	VIII/6		+		
<i>Amara patruelis</i> Dej.	68	VI/2			+	
<i>Amara quenseli</i> Schonnh.	63,68	VI/20-VII/11			+	+
<i>Amara sinuosa</i> Csy.	68	VI/2			+	
<i>Amara thoracica</i> Hayw.	10,11,13,23,24	V/17-IX/19		+		
<i>Cratacanthus dubius</i> Beauv.	6,67	VI/12-VII/4	+	+		
<i>Piosoma setosum</i> LeC.	65,74	VI/27-VII/29	+	+		
<i>Euryderus grossus</i> Say	4,67,80	VII/7-VIII	+	+		
<i>Harpalus amputatus</i> Say	4,6,11,15,20,23,24,36, 56,65,72,79	IV/29-IX/19	+	+	+	
<i>Harpalus bicolor</i> Fabr.	67	VI/12	+			
<i>Harpalus caliginosus</i> Fabr.	5,36,67	V/11-VII/8	+			
<i>Harpalus desertus</i> LeC.	41,70	IV/30-IX/22	+			
<i>Harpalus egregius</i> Csy.	34	VI/8		+		
<i>Harpalus erraticus</i> Say	4	VII-IX		+		
<i>Harpalus fallax</i> LeC.	24	V/17		+		
<i>Harpalus faunus</i> Say	5,24	VII/6		+		
<i>Harpalus fraternus</i> LeC.	6,9,29,35,56	V/26-IX/7	+	+		
<i>Harpalus fuliginosus</i> Duft.*	20,72,78	V/20-X/1	+	+	+	
<i>Harpalus funerarius</i> Csiki	56,67,70	VII/8-IX/22	+			
<i>Harpalus herbivagus</i> Say	50	V/19	+			
<i>Harpalus lecontei</i> Csy.	56	IX/7	+			
<i>Harpalus opacipennis</i> Hald.	1,6,12,20,24,36,58	IV-VII/30	+	++		
<i>Harpalus paratus</i> Csy.	4,56	VII-IX/7	+	+		
<i>Harpalus pleuriticus</i> Kby.	24	V/17		+		
<i>Harpalus seclusus</i> Csy.	2,6,12,16,20,24,27,30, 37,50,56,63,72,78	IV/19-X/1	+	++	+	+
<i>Harpalus uteanus</i> Csy.	12,20	IV/21		+		
<i>Selenophorus pedicularis</i> Dej.	2,19,46,71	V/23-VII/20	+	+		+

Table 1 continued.

Species	Collecting localities	Dates collected	Elevational range		
			Plains	Foothills/ Lower montane	Subalpine Alpine
<i>Selenophorus planipennis</i> LeC.	24,36,39,47,74	IV/30–VI/27	+	++	
<i>Discoderus parallelus</i> Hald.	67,71	VI/13	+		
<i>Anisodactylus harrisi</i> LeC.	36,48,49	IV/27–V/3	+	+	
<i>Trichocellus cognatus</i> Gyll.	12	IV/21		+	
<i>Bradycellus congener</i> LeC.	11,24	V/17–IX/19		+	
<i>Bradycellus leconetei</i> Csiki	12	IV/21		+	
<i>Stenolophus anceps</i> LeC.*	20	IV		+	
<i>Stenolophus comma</i> F.	20,24,36,38,67	III/24–V1	+	+	
<i>Stenolophus conjunctus</i> Say	6,36,49	IV/27–V/4	+	+	
<i>Stenolophus fuscatus</i> Dej.*	24	V		+	
<i>Stenolophus rotundatus</i> LeC.*	16,40	III/29–IV	+	+	
<i>Stenolophus rontundicollis</i> Haldem.*	12,24	V/21		+	
<i>Stenolophus unicolor</i> Dej.	20,24	IV–V		+	
<i>Acupalpus indistinctus</i> Dej.*	24,48,49	IV/27–V/17		+	
<i>Dicaelus laevipennis</i> LeC.	7	VIII	+		
<i>Badister neopulchellus</i> Lth.*	20	IV		+	
<i>Chlaenius cordicollis</i> Kby.*	64	VI/7	+		
<i>Chlaenius leucoscelis</i> Chevr.	7	VIII	+		
<i>Chlaenius nebraskensis</i> LeC.	15,20,24	IV–V/3		+	
<i>Chlaenius pennsylvanicus</i> Say	24	V		+	
<i>Chlaenius sericeus</i> Forst.	1,48	V/6	+	+	
<i>Chlaenius tricolor</i> Chd.	11,24	IX/19		+	
<i>Lebia viridis</i> Say	10,24	V/17–IX/7		+	
<i>Lebia vittata</i> Fabr.	67	VI/13	+		
<i>Apristus constrictus</i> Csy.	64	VI/7	+		
<i>Apristus pugetanus</i> Csy.*	68	VI/2			+
<i>Microlestes linearis</i> LeC.	52	IX/7		+	
<i>Metabletus americanus</i> Dej.	12,68	IV/21–VI/2		+	+
<i>Calleida viridis</i> Dej.	24	VIII/6		+	
<i>Cymindis americana</i> Dej.	16,68	IV/19–VI/2		+	+
<i>Cymindis borealis</i> LeC.	11,52,70	IX/7–IX/22	+	+	
<i>Cymindis planipennis</i> LeC.	52	IX/7		+	
<i>Cymindis unicolor</i> Kby.	27,60,68,80	VI/2–VIII/13	+	+	+
<i>Brachinus medius</i> Harr.	36	V/3	+		

¹Specimens identified by Rotger.

²Specimens identified by David Kavanaugh, California Academy of Sciences.

³Specimens identified by George Ball, University of Alberta.

*New published record for the state of Colorado.

attention, whereas others may be widely distributed in the state but simply not previously collected or identified for publication. Additional statewide collecting may clarify this situation for the species in question.

Most species in the Rotger list appear to occur within the habitat range suggested by Lindroth (1961–1969) for specimens collected in Canada, Alaska, and elsewhere in North America. The most diverse carabid fauna was identified from the foothill and lower montane forest regions (45 species, Fig. 1B). The plains zone produced 29 species, followed by the subalpine with 15 and the alpine zone with five species. Forty-six species were found in two zones, especially overlapping between

the plains and foothills/lower montane zones (29 species). Seven species were found in three zones, and three species were found in all four zones.

This distribution of species through four altitudinal zones contrasts with the distribution of species through the same zones in Boulder County (Fig. 1A), as described by Armin (1963). In Armin's study the plains zone contained the most diverse carabid fauna (61 species), followed by the foothills/montane with 34 species, the subalpine with 21, and the alpine zone with only one species. Armin noted many species which occurred in two or more zones, but the patterns of zonal overlap are quite different from those in the

TABLE 2. List of collecting localities for specimens listed in Table 1.

Site and elevation	County
1. Brighton (1,520 m)	Adams
2. Blanca Mountains (3,660 m)	Alamosa
3. Blanca Mountains (3,810 m)	Alamosa
4. Great Sand Dunes Nat'l. Mon. (2,440 m)	Alamosa/Saguache
5. Archuleta County (no specific site)	Archuleta
6. Archuleta Mesa (2,500 m)	Archuleta
7. Arboles (1,830 m)	Archuleta
8. Blanca Basin (2,560 m)	Archuleta
9. Near Blanco River at Hwy. 84 (2,380 m)	Archuleta
10. Burns Canyon near Trujillo (2,040 m)	Archuleta
11. Near Chromo (2,225 m)	Archuleta
12. Devil's Creek (ca 2,130 m)	Archuleta
13. Devil's Mountain (2,740 m)	Archuleta
14. East Fork, San Juan River (ca 1,980 m)	Archuleta
15. Echo Lake	Archuleta
16. Eight Mile Fire Lookout (2,440 m)	Archuleta
17. Fish Creek (ca 2,900 m)	Archuleta
18. Four Mile Creek (ca 1,980 m)	Archuleta
19. Frances Martinez Creek (ca 2,130 m)	Archuleta
20. Lake Pagosa (2,160 m)	Archuleta
21. Little Sand Creek (ca 2,590 m)	Archuleta
22. Pagosa Junction (1,910 m)	Archuleta
23. Pagosa Springs (2,160 m)	Archuleta
24. Stevens Reservoir (2,320 m)	Archuleta
25. Rio Conejos C2	Archuleta
26. Boulder (1,660 m)	Boulder
27. Rio Conejos (ca 2,440 m)	Conejos
28. Rio San Antonio near Manassa (2,350 m)	Conejos
29. Blanca (2,360 m)	Costilla
30. Forbes Road (2,590 m)	Costilla
31. West of Jaroso (2,310 m)	Costilla
32. La Veta Pass (2,870 m)	Costilla
33. Pass Creek near La Veta Pass (ca 2,800 m)	Costilla
34. Rito Seco (ca 2,590 m)	Costilla
35. San Luis (2,430 m)	Costilla
36. Denver (1,610 m)	Denver
37. Vicinity of Ophir (2,830 m)	Dolores
38. Near Denver (1,610 m)	Douglas
39. Devil's Head Mountain (ca 2,740 m)	Douglas
40. Near Franktown (1,870 m)	Douglas
41. Near Sedalia (1,800 m)	Douglas
42. Weminuche Pass (3,240 m)	Hinsdale
43. Hwy. 10 at Cucharas River (1,890 m)	Huerfano
44. Huerfano (1,730 m)	Huerfano
45. Near Tioga (ca 1,730 m)	Huerfano
46. Golden (1,730 m)	Jefferson
47. Morrison (2,410 m)	Jefferson
48. Near Morrison (ca 2,410 m)	Jefferson
49. One mile W of Morrison (ca 2,560 m)	Jefferson
50. East of Jefferson County	?
51. Cold Water Creek (ca 2,870 m)	La Plata
52. Hersperus (2,470 m)	La Plata
53. La Plata Creek (ca 3,200 m)	La Plata
54. La Plata Mountains (ca 3,200 m)	La Plata
55. La Plata Mountains (3,200 m)	La Plata
56. La Posta (1,920 m)	La Plata
57. Vallecitos (2,340 m)	La Plata
58. Rist Canyon	Larimer
59. Pass Creek (ca 3,200 m)	Mineral
60. Wolf Creek Pass (3,200 m)	Mineral
61. Wolf Creek Pass (3,310 m)	Mineral
62. Wolf Creek Pass (3,320 m)	Mineral

Table 2 continued.

Site and elevation	County
63. Wolf Creek Pass (3,410 m)	Mineral
64. Four Corners (ca 1,520 m)	Montezuma
65. Paradox (1,610 m)	Montrose
66. La Junta (1,240 m)	Otero
67. Rocky Ford (1,270 m)	Otero
68. Park County (no specific locality)	Park
69. Mount Evans (3,810 m)	Park
70. 16 miles S of Lamar (1,100 m)	Prowers
71. Pueblo (1,430 m)	Pueblo
72. 10 miles E of Pueblo (1,420 m)	Pueblo
73. St. Charles River (ca 1,430 m)	Pueblo
74. Del Norte (2,400 m)	Rio Grande
75. Elwood Pass (3,350 m)	Rio Grande
76. Copper Gulch (ca 2,830 m)	San Juan
77. Cunningham Gulch (ca 2,740 m)	San Juan
78. Placer Gulch	San Juan
79. Vicinity of Ophir (2,830 m)	San Miguel
80. Roggen (1,430 m)	Weld

Rotger faunal list. Armin found only 16 species living both on the plains and in the foothills/montane zones, and a broader overlap of species between the montane and subalpine zones than was found in the Rotger list. Also, Armin identified 18 species living throughout four zones, compared with only three species in the Rotger list. It may be that these differences in faunal diversity along altitudinal transects represent real differences between the carabid faunas of southern and northern Colorado. On the other hand, Armin's habitat preference data may be more reliable than that derived from the Rotger list because Armin systematically collected along altitudinal transects in Boulder County through four field seasons, identifying a collection of more than 5,000 specimens, whereas Rotger's collecting appears to have been much more sporadic, with no apparent effort to collect specimens along altitudinal transects. Hence, some elevational ranges and types of habitats are poorly represented in Rotger's collection. Again, additional collecting must be done if we are to fully understand the ecological requirements and distributions of the Colorado carabid fauna.

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LITERATURE CITED

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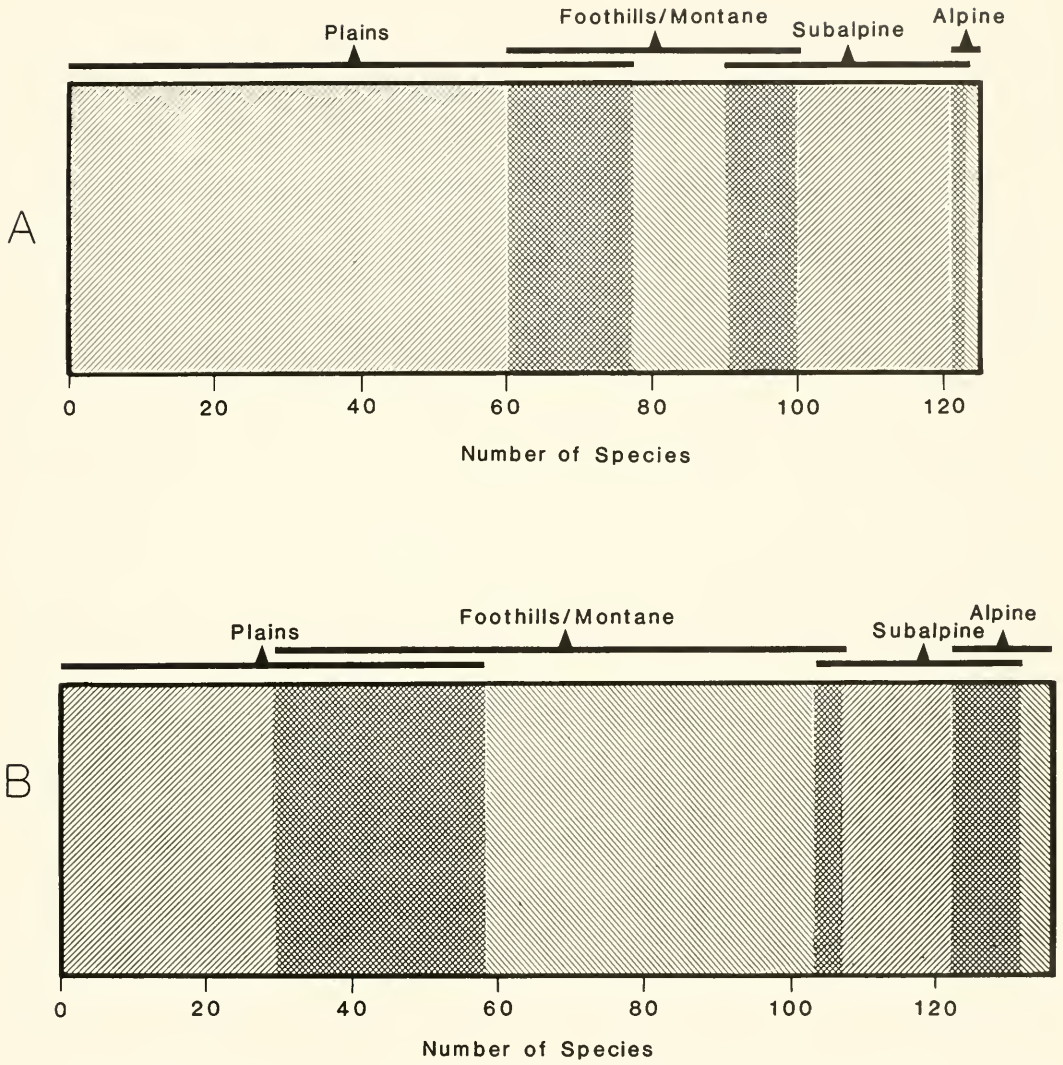


Fig. 1. Number of identified carabid species found in four elevational zones: (A) Armin (1963) in Boulder County, (B) the Rotger collection of Colorado specimens. Cross-hatched zones indicate species that overlap adjacent elevational zones. Species occupying three or more zones are excluded from the figure.