University of Colorado at Boulder

Museum

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1 March, 1995

Matt Jones
City of Boulder Open Space
1300 Canyon Blvd.
Boulder CO 80306

Dear Matt:

Enclosed you will find the final report for the 1994 Invertebrate Survey of the Doudy Draw / Eldorado Mountain Region. Also, I am providing a disk containing the data for the determined specimens (IBM disk, delimited text file).

Object 3 in our proposal to do this study included mapping locations of any rare insect species on USGS 7.5' Topographic maps. We did not find anything that falls into the category of rare, however, I am more than willing to meet with someone to map the location of our collecting sites.

If, after reading this report, you are interested in continuing funding for Invertebrate research, feel free to contact me. At this time I am unsure of our labor force for this coming summer. We may be able to design a more limited project that will benefit both Open Space and the Entomology Section at the University of Colorado Museum.

As per our contract, if this report satisfies Open Space, I understand we should be receiving a final payment of $1500.00. If you require additional information before considering the 1994 study completed, please contact me.

Thank you,

Virginia Scott
Collections Manager - Entomology
(303) 492-6270

1994 Invertebrate Survey

Doudy Draw / Eldorado Mountain Area

Virginia Louise Scott

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Introduction

Surveys of animal and plant life should be undertaken when areas are being considered for development or alteration. Since insects are very important components of any ecosystem and good indicators of the environment it is important to include these animals in any such study.

In order to survey the insects in an area it is necessary to intensively collect using a variety of methods in a variety of habitats, and note the habitat information on each specimen. In addition to collecting in a variety of habitats, it is important to collect a variety of insects and not focus on one or several groups. Sometimes it is not the "showy" insects that offer the most information.

Certain target species, such as those listed as threatened or endangered, and those species under consideration for listing must be included in such survey work. One result of this sort of study may be to find additional species that should be considered for protection.

Insects collected for such studies must, after preparation, be identified. One way is to compare them with material in an Insect Collection. In this case, specimens can be compared with material at the University of Colorado. This collection contains specimens collected in Boulder County over the past 100 years. Sometimes the specimens must be shipped to experts in order to obtain accurate identifications. New arrivals to the Boulder area or a specimens rarely found in Boulder County would certainly be exciting findings.

After identification these specimens should be deposited in a permanent collection (in this case at the University of Colorado Museum). They will then become a permanent record of what has inhabited the study area. Whether the area becomes developed or not, the specimens add to the historical record. In addition, any changes over time can be traced. In areas that are

developed, there will be a record of what used to live in the area that could be compared with what moves in after development.

Objectives

1. To survey the insects of the Doudy Draw/Eldorado Mountain Area.

2. To document and map any threatened, endangered, or rare insects, or any rare insect habitats that could be negatively effected by the proposed hydroelectric project or by recreational activities.

3. To map locations of rare insect species and habitats on USGS 7.5' topographic maps.

4. To enter the data from the survey in the Boulder County Entomological Database at the University of Colorado Museum.

5. To properly curate the specimens and associated data for present and future researchers.

6. To report findings to the City of Boulder Open Space Department.

Work products

1. Preliminary report delivered by February 1, 1995 that includes a summary of the information collected, observations and recommendations.

2. Final report delivered by March 1, 1995 that includes a summary of the information collected, observations and recommendations. 7.5' Topographic maps depicting locations where rare species were collected, and a copy of the data collected from the Boulder County Entomological Database.

Methods

Insect specimens were collected during 1994 at the Doudy Draw Region using a variety of trapping methods. Different trapping methods used provide a variety of insect for study. Light traps collect mostly Lepidoptera, Coleoptera and adult aquatic insects. Malaise traps collect day flying insects including Hymenoptera, Diptera, Homoptera, and Lepidoptera. Pitfall traps yield Coleoptera, Hymenoptera and other ground dwelling insects. Trap-nesting yield Hymenoptera, specifically solitary bees and wasps and their parasites. Sweep-netting results in the collection of Homoptera, Hemiptera, Coleoptera, Diptera and Hymenoptera. General hand-netting provides insects that are less often trapped, and allows the researchers to get a more accurate view of the overall insect fauna and the microhabitats.

Insect collectors for this study include Museum Personnel (Virginia Scott and Bryan McCormack), a summer employee (Sandy Schmidt), and a volunteer with the University of Colorado Museum (Luc D'Aignault). Additional volunteers (obtained through the University of Colorado) assisted with placement of the pitfall traps in the field.

Specimens collected as part of this study have been prepared for inclusion in the Entomology Collection at the University of Colorado Museum. Pinning and labeling were handled as soon as possible, with temporary storage in alcohol or freezers. Identifications (family level or more specific) were made during the winter months. Specimens are in the process of being incorporated into the Insect Collection at the University of Colorado Museum and have been added to the Boulder County Entomological Database.

Results

We focused our collecting at six study sites (Figure 1). Site A (Pine Savannah) was located south of the proposed site for the lower reservoir. Site B (Mixed Grassland) was located in the meadow at the edge of the road entering private property near the southern edge of the proposed lower reservoir. Site C (Plains Riparian Shrubland) was located in creek bed that runs through the area to be flooded by the proposed lower reservoir. Site D (Pond Shoreline) was located along the eastern edge of the pond that is created from the leak in the diversion canal. Site E (Pine Forest) was located north of the area proposed to be flooded. Site F (Bulrush Marsh) was located in a sedgy wet meadow between the northern-most sharp curve in the service road and the small cattail pond.

A total of 2824 insect specimens were collected and identified to family (or order in the case of some of the "minor" orders. Data has been entered into the Boulder County Entomological Database (including the specimens collected in Jefferson County). These specimens represent over 120 families of insects in 16 orders (Table 1).

The number of insect families collected at each of the different sites is shown in Figure 2. The number of insect families present at each of the six collecting sites was not equally distributed (X^2=56.35, P<0.05, 5 d.f.) with Site A having fewer insect families represented and Site C having more insect families represented than expected.

To eliminate collecting method bias (due to unforeseen circumstances, not all collecting techniques could be used at all sites) two additional comparisons are presented. Pitfall trapping was used at all six of the sites. Figure 3 show the number of insect families by order collected by pitfall trapping at each of the six collecting sites. The differences in total number of insect families collected by pitfall trapping per site (summed across all eight orders collected) were not

significantly different from each other (X2=5.03, n.s., 5 d.f.), thus the same numbers of insect families were collected at all the different sites. Pitfall traps collect ground dwelling species including Carabids (Ground Beetles), Formicids (Ants), Forficulids (Earwigs), Cicadellids (Leafhoppers) and Acridids (Grasshoppers). Many of these are vegetarians or scavengers and thus at the bottom of the food chain (though Carabids are predaceous).

A similar analysis was done for the three sites where Malaise trapping was used. These data are summarized in Figure 4. Unlike the Pitfall data, the number of insect families collected by Malaise trapping among Sites C, D, and E were not equally distributed (X2=49.12, P<0.05, 5 d.f.) with Site C showing many more families present than at the other two locations. Malaise traps collected flying insect of eleven insect orders including many families within the Hymenoptera. These tend to be parasitic in habit and thus at the top of the food chain. As a result from the overall and Malaise trapping, Site C, the creek bed, shows more insect diversity (at the family level) than the other sites.

Neither of the two species of Lepidoptera that are Federally Listed as either Threatened or Endangered were collected during this study. The threatened Pawnee Montane Skipper, *Hesperia leonardus* (=*pawnee*) *montana* (Skin.) occurs in a very restricted area along the South Platte River Canyon in Jefferson County Colorado. The endangered Uncompahgre Fritillary, *Boloria* (=*Clossiana*) *improba acrocnema* (Gall & Sperling) is restricted to several mountain tops in the San Juan Mountain Range above tree line.

There are several species of Lepidoptera that are Candidates for Federal listing. None of the butterflies collected at the Doudy Draw region were on this list and the moths await species level identifications before conclusions can be made.

Colorado Natural Heritage has a list of Colorado Insects of Special Concern. None of the Coleoptera, Lepidoptera or Odonata specimens collected at the Doudy Draw region are species listed by Colorado Natural Heritage. The 608 Formicid (Ant) specimens collected will need to be identified to species before we can know if any are species that Colorado Natural Heritage considers to be rare.

As a matter of research news, insects from four families collected at the Doudy Draw / Eldorado Mountain Area have been used by researchers at institutions other than University of Colorado, and two more loans are in preparation. Dr. Boris Kondratieff at Colorado State University requested our Colorado Dytiscids (Predaceous Diving Beetles) for a study he is undertaking. Dr. Brian Brown at the Natural History Museum of Los Angeles County is revising a group of Phorids (Humpbacked Scavenger Flies) and requested all our undetermined material (see below). Dr. Howard and Mary Alice Evans from Colorado State University identified some of our wasps and dragonflies respectively. The two loans in preparation include the Curculionids (Weevils) which will be going to Dr. Robert Anderson at the Canadian Museum of Nature, and the Noctuid moths (and microlepidoptera) will be loaned to Paul Opler, of Rocky Mountain Lepidoptera fame.

The Phorid study raises an interesting point. Prior to the Doudy Draw collecting the entire Phorid collection at the University of Colorado consisted of 5 determined specimens of 3 species and 46 unidentified specimens. (Keep in mind University of Colorado Museum has one of the most complete insect collections in Colorado.) The Doudy Draw collecting added an additional 142 specimens to the collection, essentially increasing it four-fold. Dr. Brown requested to see our specimens for his research. The specimens were loaned to him and most were returned. (It is customary for researchers to keep a portion of loaned specimens in

exchange for their identification services.) We now have a collection of 190 specimens identified to genus or species (Table 2). The majority of our Phorid collection is from the Doudy Draw region, including 7 genera represented exclusively from Doudy Draw. Now for the question, are these flies "rare" or are they "rarely collected"? Phorids proved to be quite easy to catch, showing up in the Malaise traps, pitfall traps and yellow-pan traps in great numbers. But, the largest Phorid collected in this study was 5 mm in length. I asked Dr. Brown to let me know if he found any specimens that were undescribed, out of range or rare. He did not, so I believe these are not "rare", but merely rarely collected. Unfortunately, this leads me to the conclusion, that we do not know nearly enough about the insects that surround us. If Open Space wishes to continue surveying the invertebrates in the Doudy Draw region, I suggest future studies be limited to very specific groups. Two good candidates would be the Odonata (Dragon- and Damsel-flies) and Formicids (Ants) because the Colorado species are well known and catalogued. Additional groups might include butterflies and Carabids (Ground Beetles).

Conclusions

A total of 2824 insect specimens from six collecting sites a the Doudy Draw / Eldorado Mountain region were collected during the summer of 1994, identified and databased. The specimens are now housed at the University of Colorado Museum's Entomological Collection. Whether the site is turned into a reservoir or not, some specimens will remain so the present fauna will be recorded.

No Federally listed Threatened or Endangered species were located in the Doudy Draw / Eldorado Mountain Region. No Candidate species for the Federal List were found, however some moths collected remain to be identified to species level. Colorado Natural Heritage's List of Colorado Insects of Special Concern lists no species that we collected at the Doudy Draw region, however the ants remain unidentified to species.

Based on overall collecting and Malaise trap samples, Site C, the creek bed site (Plains Riparian Shrubland) had significantly higher numbers of insect families represented than the other collecting sites. In addition, Site A (Pine Savannah) had significantly fewer insect families collected than at the other sites. Sites B, D, E, and D (Grassland, Pine Forest, Pond Shoreline and Bulrush Marsh respectively) had equal number of insect families represented.

If continued study of Invertebrates is desired, restricting the work to several groups would provide the best results. Odonata (Dragon- and Damselflies), Formicids (Ants), Carabids (Ground Beetles) and Butterflies would be good groups for study.

ORDER	FAMILY	Common Name	Site A	Site B	Site C	Site D	Site E	Site F	Other	Total
Coleoptera	Bruchidae	Seed Beetles					1			1
Coleoptera	Buprestidae	Metalic Wood-boring Beetles			1					1
Coleoptera	Cantheridae	Soldier Beetles							2	2
Coleoptera	Carabidae	Ground Beetles	17	17	18	7	10	2	9	80
Coleoptera	Cerambycidae	Long-horned Beetles		1					9	10
Coleoptera	Chrysomelidae	Leaf Beetles		4	1			1	12	18
Coleoptera	Cicindelidae	Tiger Beetles							1	1
Coleoptera	Cleridae	Checkered Beetles			2			1	3	6
Coleoptera	Coccinellidae	Ladybird Beetles			2			1	6	9
Coleoptera	Corylophidae	Minute Fungus Beetles			2					2
Coleoptera	Cucujidae	Flant Bark Beetles							1	1
Coleoptera	Curculionidae	Snout Beetles	6	1	5	2	3	2	32	51
Coleoptera	Dytiscidae	Predaceous Diving Beetles				1				1
Coleoptera	Eucnemidae	False Click Beetles	1	2	1			3		7
Coleoptera	Histeridae	Hister Beetles					2			2
Coleoptera	Hydrophilidae	Water Scavenger Beetles			1			5		6
Coleoptera	Inopeplidae	Inopeplid Beetles						1		1
Coleoptera	Meloidae	Blister Beetles	1		1	1			16	19
Coleoptera	Melyridae	Soft-winged Flower Beetles							1	1
Coleoptera	Mordellidae	Tumbling Flower Beetles		1	12	1	8		18	40
Coleoptera	Phalacridae	Shining Flower Beetles							3	3
Coleoptera	Scarabaeidae	Scarab Beetles	8	7	1	2	18	3	22	61
Coleoptera	Scolytidae	Bark Beetles							1	1
Coleoptera	Silphidae	Carrion Beetles				2		42	1	45
Coleoptera	Staphylinidae	Rove Beetles	8	2	7	4	41	20		82
Coleoptera	Tenebrionidae	Darkling Beetles		2	4	1			3	10

Table 1. List of the total number of specimens of each insect family caught per collecting site, Doudy Draw 1994. *(five pages)*

ORDER	FAMILY	Common Name	Site A	Site B	Site C	Site D	Site E	Site F	Other	Total
Diptera	Anthomyiidae	Anthomyiid Flies	5		1	8	7	1		22
Diptera	Asilidae	Robber Flies				6	8		6	20
Diptera	Bombyliidae	Bee Flies	1		11	3	3		5	23
Diptera	Calliphoridae	Blow Flies	1		4				2	7
Diptera	Cecidomyiidae	Gall Gnats					3			3
Diptera	Ceratopogonidae	Biting Midges			1		1			2
Diptera	Culicidae	Mosquitoes			1					1
Diptera	Dolichopodidae	Long-legged Flies			1					1
Diptera	Heleomyzidae	Heleomyzid Flies					1			1
Diptera	Hippoboscidae	Louse Flies							1	1
Diptera	Leptogastridae	Leptogastrid Flies			1		2			3
Diptera	Muscidae	Muscid Flies	8		5	5	12		1	31
Diptera	Phoridae	Humpbacked Scavenger Flie	11	11	52	10	52	3	3	142
Diptera	Sarcophagidae	Flesh Flies	2	3	5			2	2	14
Diptera	Sciomyzidae	Marsh Flies						1		1
Diptera	Sphaeroceridae	Small Dung Flies						1		1
Diptera	Stratiomyidae	Soldier Flies			8		1			9
Diptera	Syrphidae	Hover Flies			16		1		1	18
Diptera	Tabanidae	Deer Flies	0		6		1		3	10
Diptera	Tachinidae	Tachinid Flies	1		17	2		1	7	28
Diptera	Tephritidae	Fruit Flies		2	15		1		15	33
Diptera	Therevidae	Stiletto Flies			1	2	8		1	12
Diptera	Tipulidae	Crane Flies			1			1		2

Table 1. List of the total number of specimens of each insect family caught per collecting site, Doudy Draw 1994. (five pages)

ORDER	FAMILY	Common Name	Site A	Site B	Site C	Site D	Site E	Site F	Other	Total
Hemiptera	Alydidae	Broad-headed Bugs		6	3	4			6	19
Hemiptera	Berytidae	Stilt Bugs							12	12
Hemiptera	Lygaeidae	Seed Bugs		8	2	1			13	24
Hemiptera	Miridae	Plant Bugs	1	1					22	24
Hemiptera	Nabidae	Damsel Bugs		2					6	8
Hemiptera	Pentatomidae	Stink Bugs							3	3
Hemiptera	Reduviidae	Assassin Bugs							3	3
Hemiptera	Rhopalidae	Scentless Plant Bugs							6	6
Hemiptera	Saldidae	Shore Bugs						4		4
Hemiptera	Scutelleridae	Shield-backed Bugs		1		1			6	8
Hemiptera	Tingidae	Lace Bugs			1		1			2

ORDER	FAMILY	Common Name	Site A	Site B	Site C	Site D	Site E	Site F	Other	Total
Homoptera	Aphididae	Aphids			2			2	1	5
Homoptera	Cercopidae	Froghoppers	1	2				1	4	8
Homoptera	Cicadellidae	Leafhoppers	24	41	46	5	9	13	24	162
Homoptera	Dictyopharidae	Dictyopharid Planthoppers			1				2	3
Homoptera	Psyllidae	Psyllids							1	1

Table 1. List of the total number of specimens of each insect family caught per collecting site, Doudy Draw 1994. *(five pages)*

ORDER	FAMILY	Common Name	Site A	Site B	Site C	Site D	Site E	Site F	Other	Total
Hymenoptera	Andrenidae	Andrenid Bees							6	6
Hymenoptera	Anthophoridae	Anthophorid Bees							5	5
Hymenoptera	Aphelinidae	Aphelinid Wasps			1					1
Hymenoptera	Apidae	Bumble and Honey Bees		1	1	1			8	11
Hymenoptera	Bethylidae	Bethylid Wasps			8					8
Hymenoptera	Braconidae	Brachonid (Death) Wasps		1	42	1	2	1	19	66
Hymenoptera	Ceraphronidae	Ceraphronid Wasps	3	4	1		2	4	2	16
Hymenoptera	Chalcididae	Chalcid Wasps			3					3
Hymenoptera	Charipidae	Charipid Gall Wasps			1					1
Hymenoptera	Chrysididae	Cuckoo Wasps			4		1		1	6
Hymenoptera	Colletidae	Yellow-faced Bees			2				1	3
Hymenoptera	Diapriidae	Diapriid Wasps		1	30		4	1	12	48
Hymenoptera	Elasmidae	Elasmid Wasps			7					7
Hymenoptera	Encyrtidae	Encrytid Wasps	3	26	9	2			3	43
Hymenoptera	Eucoilidae	Eucoilid Gall Wasps		1						1
Hymenoptera	Eulophidae	Eulophid Wasps			11				4	15
Hymenoptera	Eupelmidae	Eupelmid Wasps			5					5
Hymenoptera	Eurytomidae	Eurytomid Wasps			12					12
Hymenoptera	Formicidae	Ants	57	19	182	139	18	170	23	608
Hymenoptera	Halictidae	Sweat Bees		6	142	2		9	22	181
Hymenoptera	Ichneumonidae	Ichneumon flies		2	76	1	6		8	93
Hymenoptera	Megachilidae	Leaf-cutting Bees			6				9	15
Hymenoptera	Megaspilidae	Megaspilid Wasps			5	1			1	7
Hymenoptera	Mutillidae	Velvet Ants	1		9	1				11
Hymenoptera	Mymaridae	Fairy flies		6	27			2		35
Hymenoptera	Perilampidae	Perilampid Wasps			2					2
Hymenoptera	Platygastridae	Platygasterid Wasps			2				1	3
Hymenoptera	Pompilidae	Spider Wasps		2	6		1		2	11
Hymenoptera	Proctotrupidae	Proctotrupid Wasps			1					1
Hymenoptera	Pteromalidae	Pteromalid Wasps		11	16			1	15	43
Hymenoptera	Scleonidae	Scleonid Wasps	10	20	82	4	1	12	13	142
Hymenoptera	Sphecidae	Spechid Wasps			9		6		5	20
Hymenoptera	Tenthredinidae	Common Sawfly			1					1
Hymenoptera	Tiphiidae	Tiphiid Wasps							1	1
Hymenoptera	Torymidae	Torymid Wasps			4					4
Hymenoptera	Vespidae	Yellowjackets			17	6	3	1	6	33

Table 1. List of the total number of specimens of each insect family caught per collecting site, Doudy Draw 1994. (five pages)

ORDER	FAMILY	Common Name	Site A	Site B	Site C	Site D	Site E	Site F	Other	Total
Lepidoptera	Geometridae	Geometer Moths			1				6	7
Lepidoptera	Hesperiidae	Skippers			2		1		4	7
Lepidoptera	Lycaenidae	Hairstreak Butterflies							1	1
Lepidoptera	Noctuidae	Noctuid Moths			34				1	35
Lepidoptera	Nymphalidae	Brush-Footed Butterflies			1				3	4
Lepidoptera	Papilionidae	Swallowtail Butterflies							1	1
Lepidoptera	Pieridae	Sulfur Butterflies							1	1
Lepidoptera	Pyralidae	Snout Moths			1					1
Lepidoptera	Satyridae	Satyr Butterflies			1			4	1	6
Lepidoptera	Sphingidae	Hawk Moths			1				8	9
Odonata		Damsel Flies							4	4
Odonata	Aeshnidae	Darner Dragonflies						4		4
Orthoptera	Acrididae	Short-horned Grasshoppers	2	5	1				3	11
Orthoptera	Gryllacrididae	Ground Grickets		2	1	1				4
Orthoptera	Gryllidae	Crickets		3	1			1		5
Orthoptera	Tetrigidae	Pygmy Grasshoppers						3		3
Collembola		Springtails			1	10	2			13
Dermaptera	Forficulidae	Common Earwigs	3		2					5
Neuroptera	Myrmeleontidae	Antlions			1		1			2
Psocoptera		Barklice			2					2
Strepsiptera	Halictophagidae	Twisted-winged Parasites			2					2
Thysanoptera		Thrips			3	1				4
Thysanura	Machilidae	Jumping Bristletails	2							2
Trichoptera		Caddisflies			4	1				5

Table 1. List of the total number of specimens of each insect family caught per collecting site, Doudy Draw 1994. (five pages)

Phorid Genera	Doudy Draw	Other Colorado	Non-Colorado
Aenigmatias	1		
Anevrina	1		
Conicera	1		1
Diplonevra	1		
Dohrniphora	2		
Gymnophora		2	
Megaselia	83	38	2
Melaloncha			1
Metopina	46		
Myriophora	1		
Phora	2	7	
Puliciphora	1		

Table 2. Number of Phorid Fly specimens of each genus in the University of Colorado Museum, listed by loaction of collection.

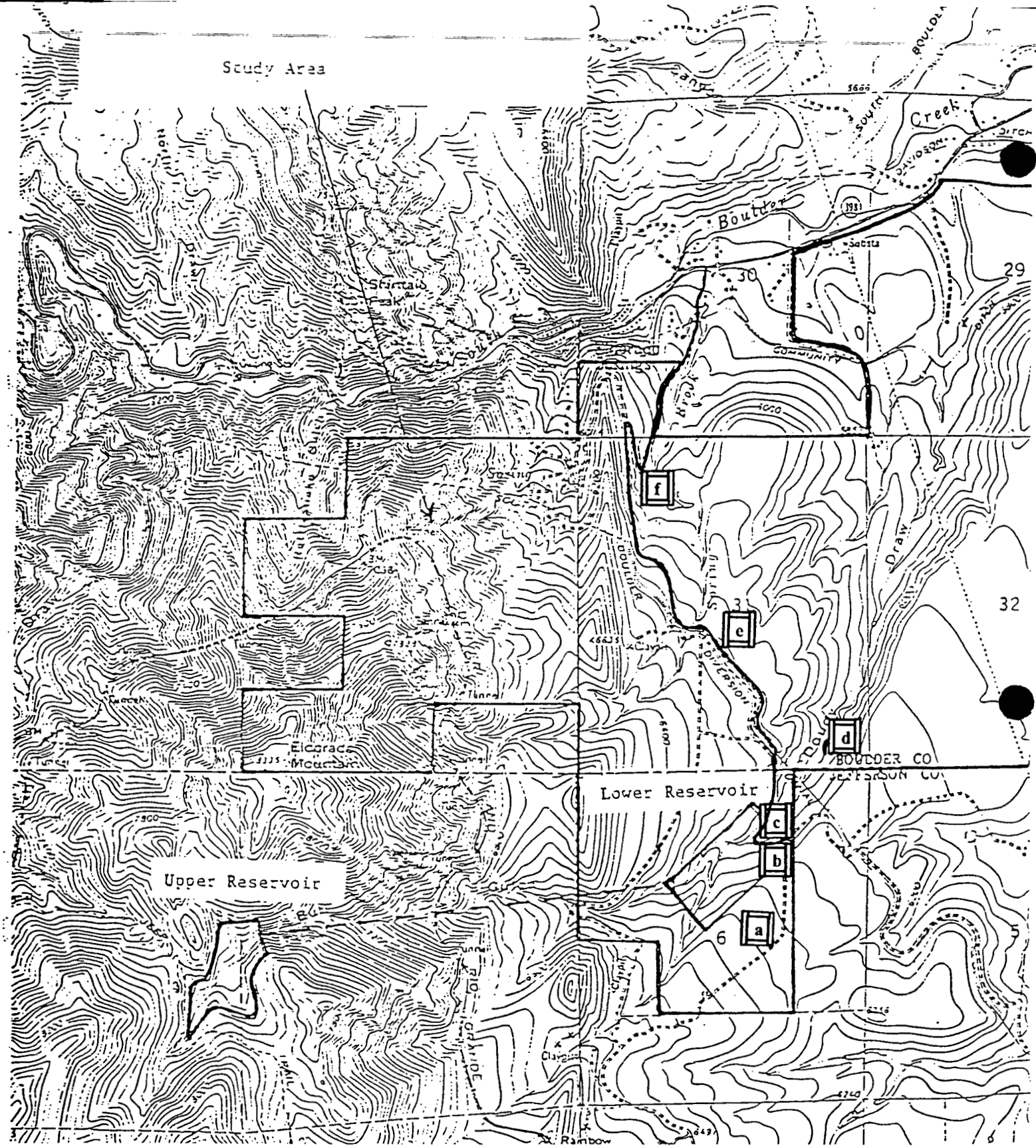


Figure 1. Six study sites where insects were collected for the Invertebrate Survey of the Doudy Draw / Eldorado Mountain Region, summer of 1994.

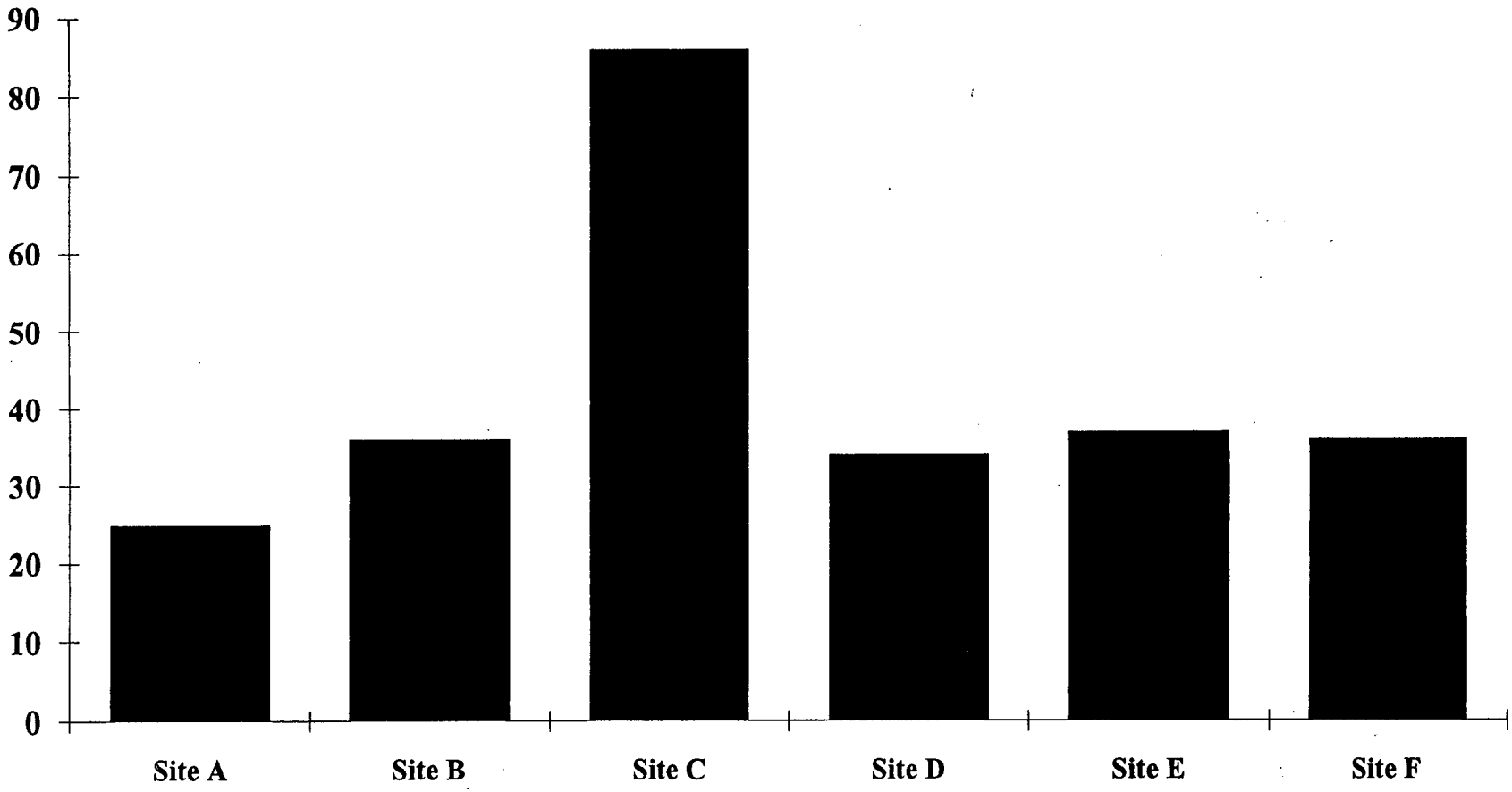
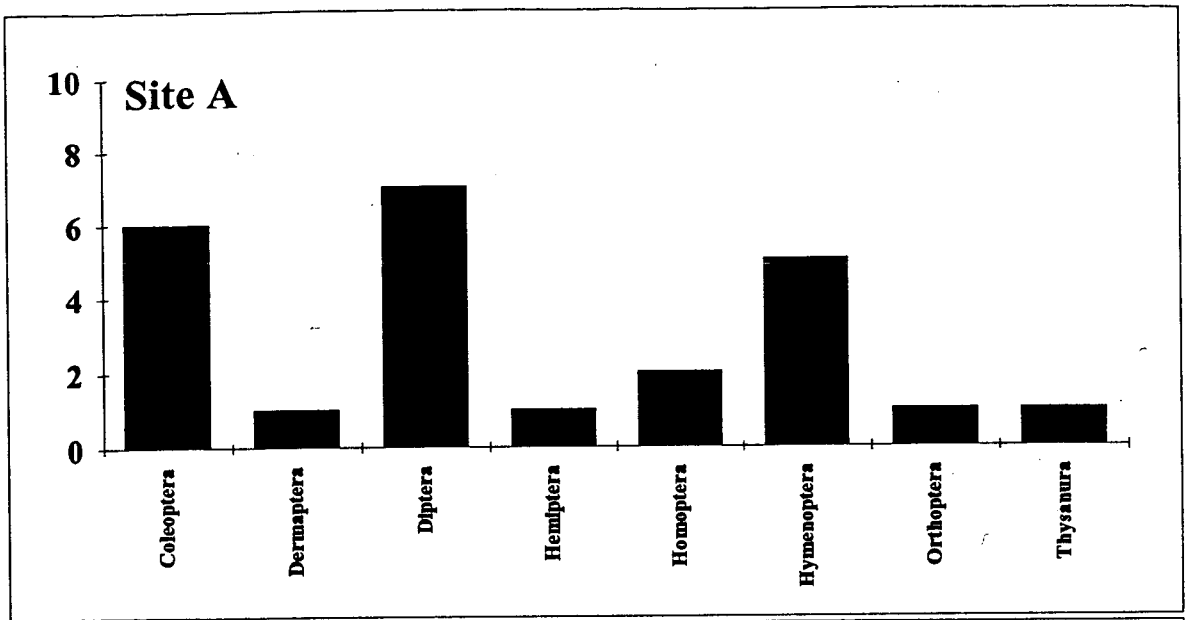
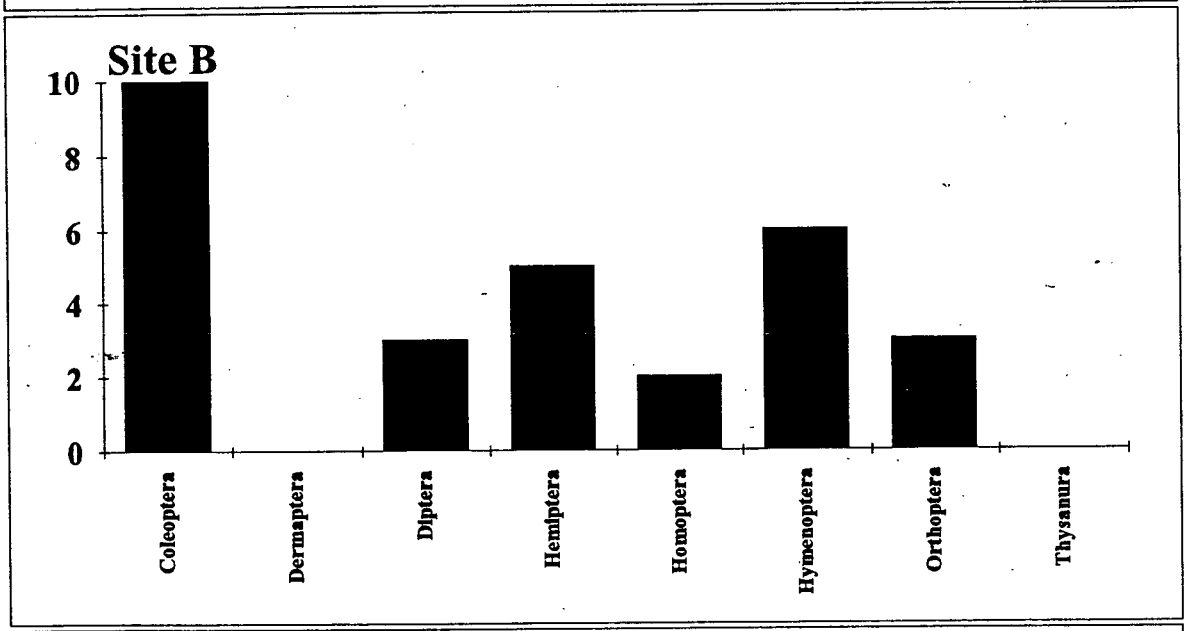


Figure 2. Number of insect families collected at each of six collecting sites, Doudy Draw 1994.





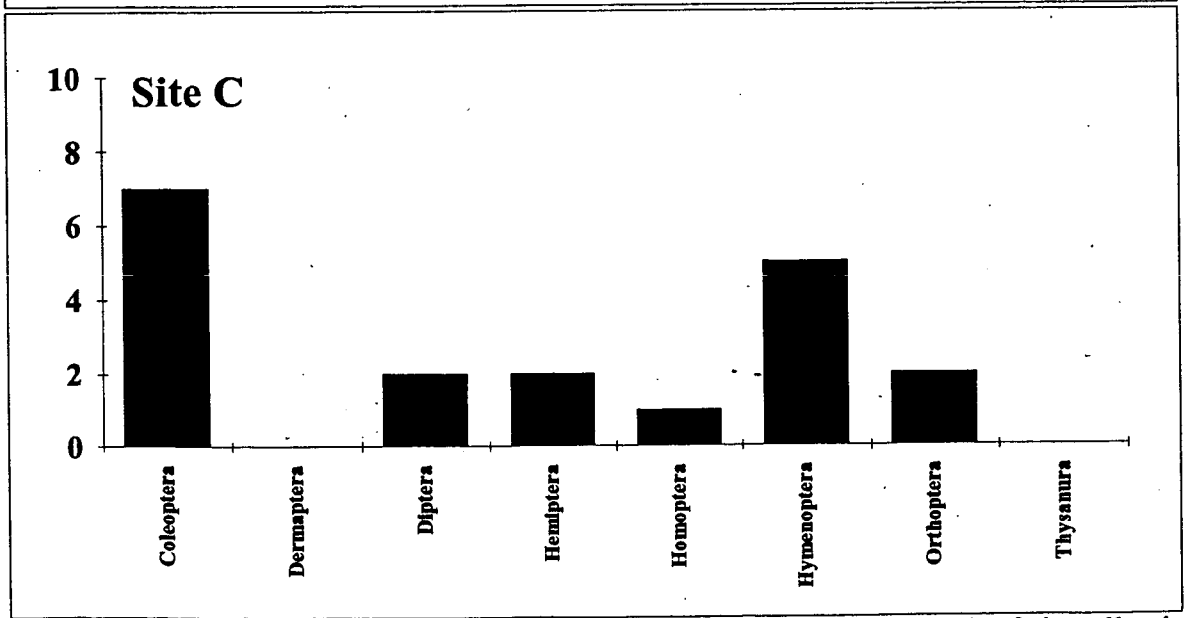
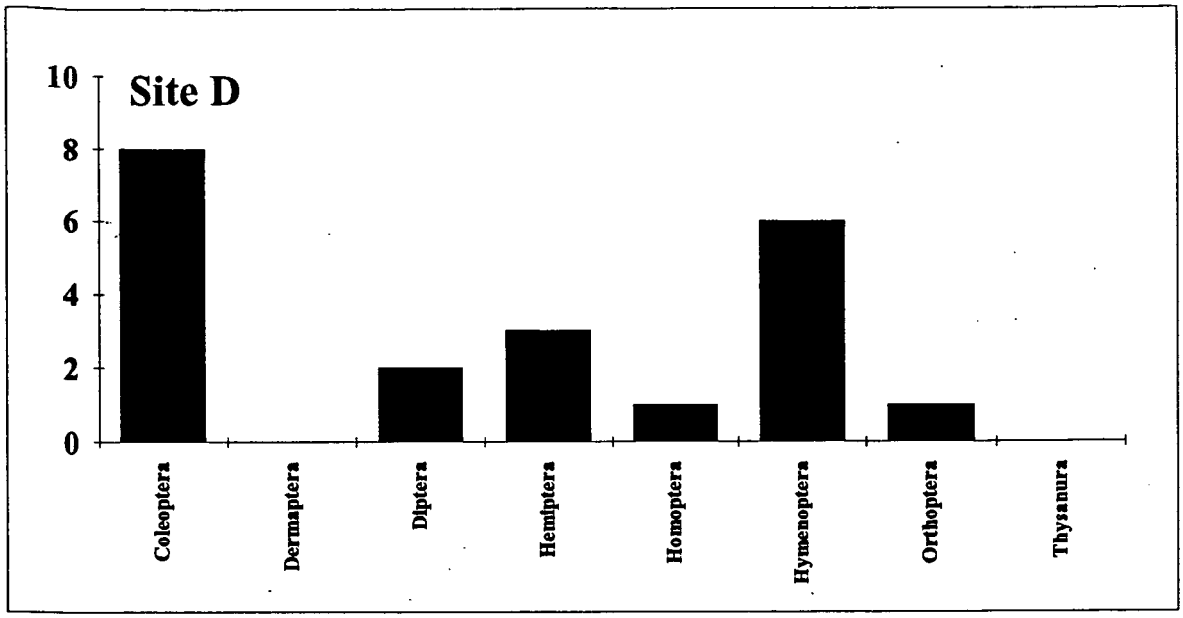
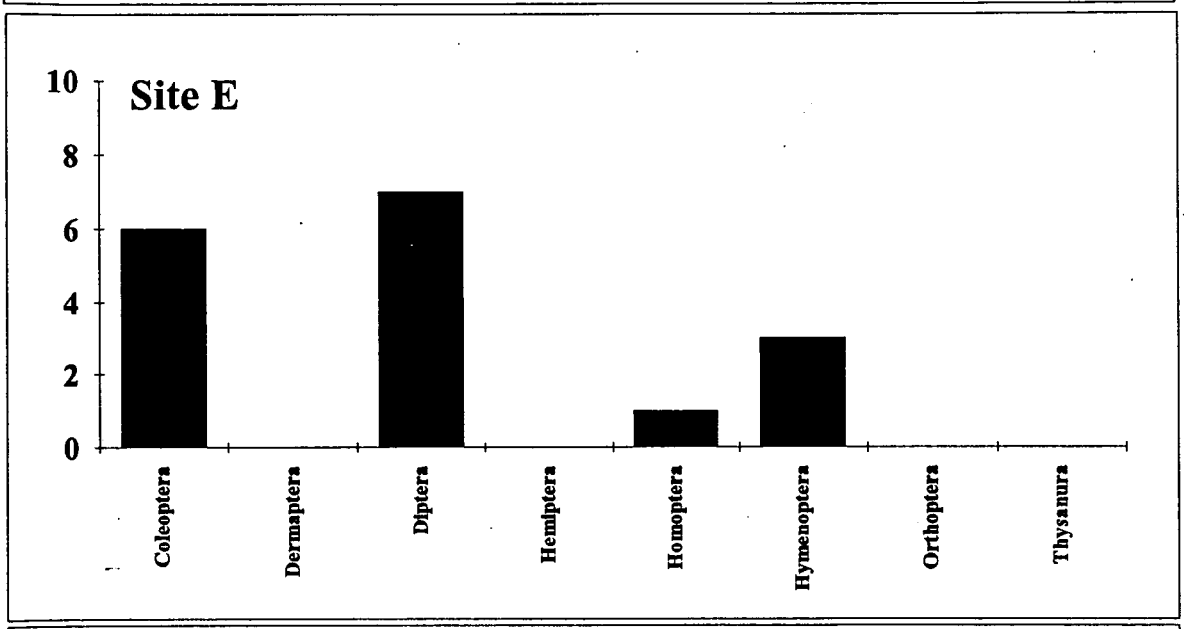


Figure 3. Number of insect families per order caught by Pitfall trapping at each of six collecting sites, Doudy Draw 1994. (two pages)





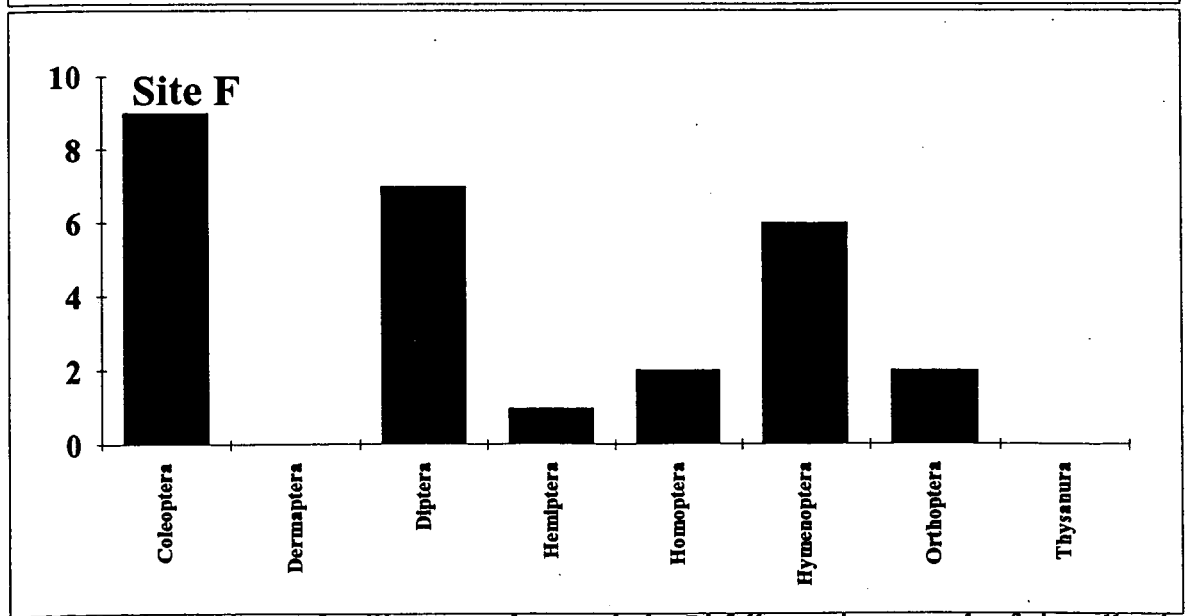


Figure 3. Number of insect families per order caught by Pitfall trapping at each of six collecting sites, Doudy Draw 1994. (two pages)

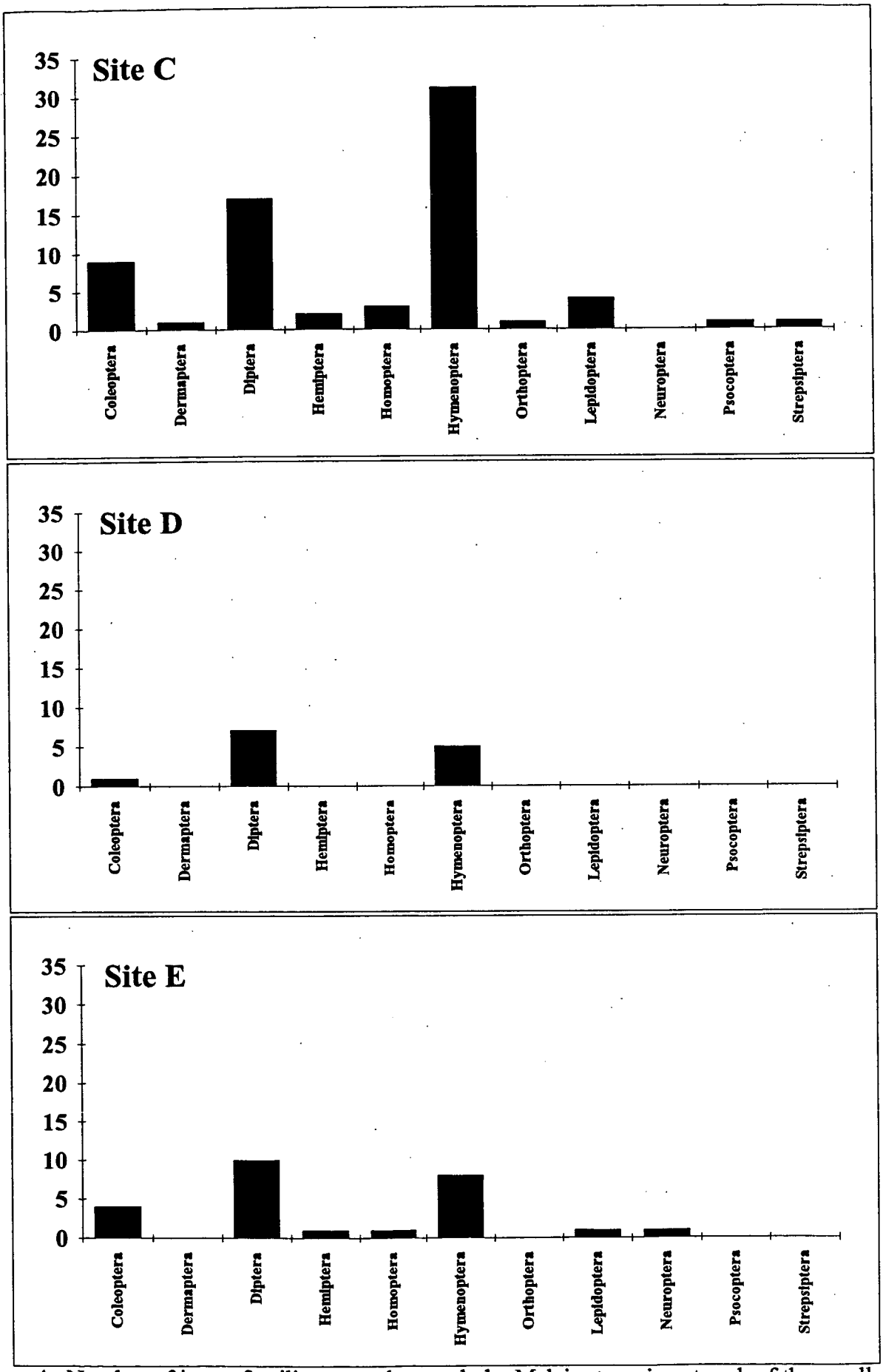


Figure 4. Number of insect families per order caught by Malaise trapping at each of three collecting sites, Doudy Draw 1994.