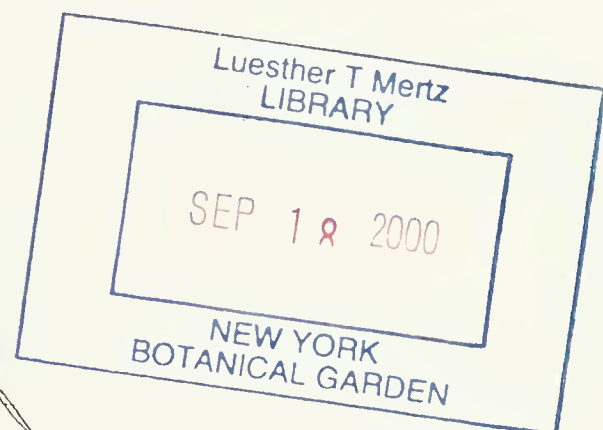


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BANISTERIA

A JOURNAL DEVOTED TO THE NATURAL HISTORY OF VIRGINIA



Grass Spider (*Agelenopsis* sp.)

The distribution and seasonal activity patterns of the five Virginian species of *Agelenopsis* are discussed on pages 36-42 of this issue

BANISTERIA

A JOURNAL DEVOTED TO THE NATURAL HISTORY OF VIRGINIA

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Foods of Birds of Prey in Virginia. Part I. Stomach Analyses

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INTRODUCTION

Determining the specific foods taken by birds of prey can be accomplished in several ways: field observations, identifying food brought to nestlings, examining regurgitated material (pellets), analyzing crop and stomach contents, locating food caches, and examining nest debris. In Virginia, for example, Golden Eagles have been observed pursuing a variety of birds and mammals, as well as consuming carrion (Johnston, 1994), and Ellzey (1888) watched a Sharp-shinned Hawk catch a Northern Bobwhite. Prey remains in or under nests of Red-tailed Hawks and Great Horned Owls were identified by Murray (1943) and Sykes (1961), respectively. Nest boxes used by Eastern Screech-Owls contained the remains of crayfish, frogs, and small birds (Reiger, 1992). Hunting and chasing behaviors of migrating raptors as they pursued small birds were described in detail by Hill (1984).

Despite these and other records published in *The Raven* and elsewhere and despite the observations by ornithologists in Virginia over the last century or more, with few exceptions relatively little is known about specific foods taken by birds of prey in the State. In this paper I present the identification of stomach contents from birds of prey in the State. Although many of the specimens came from northern parts of Virginia, the results presented here bear implications for the State as a whole.

MATERIALS

Over the past decade, 266 dead birds of prey specimens of 18 species have come into my possession. Most were road-kills. From these, records of stomach contents were kept. These records plus those gleaned from the literature are included in this paper. Many of

the birds were prepared as specimens or mounts and donated to museums and nature centers.

In the species accounts below, the "stomach contents" column for each species contains the prey items identified. The "source" column includes literature citations and providers. Also, "USFWS" refers to the food habits files of the U.S. Fish and Wildlife Service at Patuxent Wildlife Research Center in Laurel, MD. Raptor carcasses studied at the National Wildlife Health Research Center in Madison, WI are identified as "NWHRC." Several people who provided specimens are listed under "source"--Charles Ziegenfus (CZ), Lynn Sharp (LS), Roy Geiger (RG), Robert Simpson (RS), Ralph Eckerlin (RE), Clair Mellinger (CM), Martin Ogle (MO), John Rappole (JR), Ken Bass (KB), and licensed rehabilitators (Wildlife Center of Virginia, J. Freitag, A. Hocker, P. Whiddon). Appendices A and B contain the names of counties and cities abbreviated in the text and the scientific names of vertebrate prey.

RESULTS AND DISCUSSION

The most exhaustive accounts of foods of birds of prey in North America were published by A. K. Fisher (1888, 1893). Therein, he identified the stomach contents of hundreds of birds from all over North America, only a few of which were from Virginia. Other lengthy reports of raptor foods (Smyth 1894, McAtee 1935) copied Fisher's work and added little specifically for the State. May (1935) provided summaries of nonspecific food categories taken by diurnal birds of prey from previous studies.

Results of the stomach analyses are found in Table 1. As other authors have done, the specific foods can be put into general categories (e.g., insects, mice, birds) (Table 2). With few exceptions the percentages of prey in the several categories from Virginia are close to those given

Table 1. Stomach contents of birds of prey in Virginia.

SPECIES DATE	LOCATION (APPENDIX A)	AGE/ SEX	STOMACH CONTENTS	SOURCE
Turkey Vulture (<i>Cathartes aura</i>)				
1936-06-29	PRG: Camp Lee		Corn Snake, White-footed Mouse	Nelson & Greenfield 1936
Bald Eagle (<i>Haliaeetus leucocephalus</i>)				
1882-12-00	NFC		duck	Fisher 1893
1980-00-00	Unknown	Ad♂	grass	NWHRC
1981-09-28	KIG	Im♀	unidentified mass	"
1982-05-03	SUR	Im♂	fish	"
1982-08-16	Unknown	Im♀	fish	"
1985-05-11	GLO	nestling♀	fish remains	"
1985-05-15	Unknown	Ad?	fish scales, feathers	"
1986-01-22	CHS	Ad♂	plant material	"
1986-04-23	ESS	Im♂	fish remains	"
1988-01-21	WES	Ad♀	fish remains	"
1988-11-18	KIW	Ad♀	fish remains	"
1988-12-00	DIC	Ad♀	meat and hairs	"
1989-09-26	KIG	Im♀	fish remains	"
1989-10-07	YOR	Ad♂	fish remains	"
1991-03-21	KIG	Im♂	gray hairs	"
1991-04-08	CHA	Ad♂	feathers, bones	"
1991-06-03	HEN	Im♂	fish remains	"
1991-08-27	Unknown	Im♂	fish remains	"
1992-03-19	KIG	Ad♀	feathers, fur, bones	"
1992-04-19	WES	Im♀	meat and hairs	"
1993-02-02	SPO	Im♀	feathers	"
1993-09-15	CPC	Ad♀	fish remains	"
1993-12-20	HAN	Ad♂	hairs, grass	"
Northern Harrier (<i>Circus cyaneus</i>)				
1892-10-25	FAI		Meadow Mouse [Vole]	USFWS
ca. 1894	MON?		grasshoppers	Smyth 1894
ca. 1894	MON?		sparrow	"
1913-05-08	ACC: Wallops Island		Meadow Mouse [Vole]	USFWS
1913-05-12	ACC: " "		Semipalmated Sandpiper	"
1913-09-15	ACC: " "		Water Pipit, White-footed Mouse	"
1916-09-02	ACC: " "		Spotted Sandpiper	"
1916-09-02	ACC: " "		2 Semipalmated Sandpipers	"
1916-09-04	ACC: " "		Semipalmated Sandpiper	"
1916-09-16	ACC: " "		2 Black-and-white Warblers, 3 Field Sparrows, 1 <i>Dendroica</i> sp.	"
1916-09-22	ACC: " "		Clapper Rail	"
1919-09-29	ACC: " "		Meadow Mouse [Vole], Leopard Frog, grasshopper	"
1919-09-30	ACC: " "		Leopard Frog	"
1919-09-30	ACC: " "		Leopard Frog, Chorus Frog, Least Shrew, <i>Dendroica</i> sp.	"

SPECIES DATE	LOCATION (APPENDIX A)	AGE/ SEX	STOMACH CONTENTS	SOURCE
Northern Harrier				
1934-09-00	LUI: Trevilians		Meadow Mouse [Vole], White-footed Mouse, 5 katydids, 3 long-horned grasshoppers, June beetle, moth, spider	USFWS
Sharp-shinned Hawk (<i>Accipiter striatus</i>)				
1890-12-10	FAI: Dunn Loring		Hermit Thrush	Fisher 1893
1900-05-25	ARL: Rosslyn		House Mouse	USFWS
1991-04-27	ALE	Im ♀	Starling	
1991-07-05	Shenandoah Natl. Park	Ad ♂	feather fragment	JR
1992-00-00	NNC	Ad ♂	2 sets of small unidentified passerine feet	
1993-05-01	LUD	Im ♀	Northern Cardinal (♂)	
1993-10-06	ALE	Im ♀	Red-winged Blackbird (♂)	
1994-11-09	FAI: Annandale	Im ♀	House Sparrow	
1994-00-00	FAI	Im ♂	Dark-eyed Junco	RG
1997-12-07	ALE	Im ♀	feather fragments	
1998-01-14	ALE	Im ♀	House Sparrow (♂)	
1999-02-10	HAR	Im ♀	Yellow-rumped Warbler	CM
Cooper's Hawk (<i>Accipiter cooperii</i>)				
1900-12-05	S. Virginia		Northern Bobwhite	USFWS
1917-11-00	Virginia near Washington		chicken	"
1924-03-11	FAI: Boulevard		chicken	"
1937-06-23	AUG		Gray Squirrel, House Mouse, Mourning Dove, Lepidoptera larvae, insect fragments	"
1990-10-00	SHE	Im ♂	Meadow Vole, wasp, 5 scarab beetles, 2 other beetles	RS
1990-10-23	FRE: Winchester	Im ♀	fur, feathers	"
1991-00-00	N. Virginia	Im ♀	Rock Dove	MO
1995-12-23	FAI: McLean	Ad ♀	Mourning Dove	
1996-03-17	FAI: Sterling	Im ♀	Starling	RG
1997-01-19	ARL: Interstate 395	Im ♀	Starling, House Mouse	
1997-02-00	VBC	Ad ♀	Mourning Dove	
1997-10-16	FAI	Im ♀	Eastern Chipmunk	
1997-12-04	PRW: Dumfries	Im ♀	feather fragments	
1997-12-00	LUD: Leesburg	Im ♂	mouse parts	
Red-shouldered Hawk (<i>Buteo lineatus</i>)				
1888-12-01	ALB: Cobham		46 grasshoppers, 2 crickets, 30 beetles	Fisher 1893
1892-12-18	ALE		Short-tailed Shrew, mouse hair, grasshopper	USFWS
ca. 1894	MON?		large black spider	Smyth 1894
ca. 1894	MON?		grasshoppers	"
ca. 1894	MON?		grasshopper, crayfish, 2 "spring lizards"	"

SPECIES DATE	LOCATION (APPENDIX A)	AGE/ SEX	STOMACH CONTENTS	SOURCE
Red-shouldered Hawk				
1910-11-22	VBC: Lynnhaven		grasshoppers	USFWS
1911-12-00	FAC		28 grasshoppers (3 species), Painted Turtle	“
1914-10-15	VBC: Lynnhaven		grasshoppers, beetles	“
1914-10-15	VBC: Lynnhaven		moths, spider, caterpillars	“
1934-08-20	LUI: Trevilians		cicadas, snake scales, short-and long-horned grasshoppers	“
ca. 1990	N. Virginia		insect remains	
1990-03-01	FAI: Springfield	Im ♀	insect remains, hair, plant material	RE
1991-00-00	N. Virginia	Ad ♀	insect remains	
1992-03-09	FAI: Great Falls	Im ♀	Gray Squirrel	
1993-03-19	FAI	Ad ♂	Eastern Chipmunk	
1993-08-07	PRW	Im ♀	House Mouse, Norway Rat	
1994-02-09	LUD: Lovettsville	Ad ♀	Short-tailed Shrew in crop	
1994-07-26	FAI: Dunn Loring	Im ♂	fur	
1994-00-00	FAI	Ad ♀	snake scales	RG
1996-04-11	PRW: Nokesville	Ad	beetles	KB
1997-09-00	FAI	Im ♂	hair	
Broad-winged Hawk (<i>Buteo platypterus</i>)				
1889-09-20	Virginia		11 Lepidoptera larvae, 1 white grub, 1 beetle, 1 katydid, 1 stone cricket	Fisher 1893
1889-09-29	Virginia		insect larvae, beetles, katydid, stone cricket	USFWS
1892-05-13	ALB: Cobham		Five-lined Skink (im.), beetle	Fisher 1893
1892-05-13	ALB: Cobham		young rabbit, 2 Short-tailed Shrews, Five-lined Skink	“
1906-05-18	MON: Blacksburg	Ad ♀	young rat	Burns 1911
1986-06-00	PRW: Bull Run	Ad ♂	“meat”	
1987-09-20	FAI: Carlin Spring Road	Im ♂	Rough Green Snake, camel cricket, wasp, hair, long- & short-horned grasshoppers	
1994-00-00	FAI	Ad ♂	giant water bug	RG
1995-05-08	ALE: Hollin Hill	♀	scarab beetles	
1996-08-01	MON: Blacksburg		Short-tailed Shrew	LS
Red-tailed Hawk (<i>Buteo jamaicensis</i>)				
1888-01-02	PRW: Gainesville		2 House Mice	Fisher 1893
1888-09-05	FAU: The Plains		insect	“
1891-02-05	CHS: Drewry's Bluff		mouse hair	“
1934-05-04	LUI		Meadow Vole, short-horned grasshopper	USFWS
1934-05-04	LUI		2 short-horned grasshoppers	“
1934-05-04	LUI		short-horned grasshoppers, moth larvae, feather	“

SPECIES DATE	LOCATION (APPENDIX A)	AGE/ SEX	STOMACH CONTENTS	SOURCE
Red-tailed Hawk				
1934-05-04	LUI		short-horned grasshopper	USFWS
1934-09-00	LUI: Trevilians		5 short-horned grasshoppers, June beetle, hawk (sphinx) moth	"
1935-12-22	LYC		Least Shrew	"
1993-05-10	PRW: Haymarket	Ad♀	Gray Squirrel, cottontail bones	
1993-11-05	LUD: Route 606	Im♂	mouse fur	
1993-11-11	SHE: Edinburg	Im♀	crop - Meadow Vole; stomach - 3 Meadow Voles, grasshopper	RS
1993-12-09	ROB: Lexington	Ad♂	Meadow Vole	
1994-01-31	FAI: Burke	Ad♀	amorphous mass	
1994-02-09	FAI: Tyson's Corner	Im♀	crop - 2 Meadow Voles, 1 Short-tailed Shrew; stomach - 3 Meadow Voles	
1995-01-00	AUG	Ad♀	Meadow Vole	
1995-03-18	CAR: Port Royal	Im♀	Short-tailed Shrew	
1995-12-22	FAI: Fairfax Station	Im♂	Starling	
1997-02-25	FRE: Interstate 81	Ad♂	2 Meadow Voles	RS
1998-07-00	FAU	Im♀	insects	
Rough-legged Hawk (<i>Buteo lagopus</i>)				
2000-02-05	SHE: New Market	Ad♀	roadkill Eastern Cottontail	RS
Golden Eagle (<i>Aquila chrysaetos</i>)				
1930-12-24	MEC		young goat	USFWS
1989-12-00	DIC	Im♀	small hollow hairs	NWHRC
1997-11-30	SCO	Ad♂	White-tailed Deer	PS
American Kestrel (<i>Falco sparverius</i>)				
ca. 1894	MON?		sphinx moth larvae	Smyth 1894
ca. 1894	MON?		crickets	"
ca. 1894	MON?		miscellaneous insects	"
ca. 1894	MON?		Meadow Vole	"
ca. 1894	MON?		Field Sparrow	"
1895-11-27	WES: Colonial Beach		3 crickets, 1 beetle, 3 grasshoppers, 13 hairy caterpillars, 2 spiders	USFWS
1989	ROI: Hinton	♀	insect larvae	
1989-02-04	STA	Ad♂	Meadow Vole, grasshopper	
1990-12-05	FRE: near Nain	Ad♂	5 short-horned grasshoppers , 1 noctuid moth larva	RS
ca. 1990	N. Virginia		small black beetles	
1991-05-30	FAU: Paris	♂	6 spiders	RS
1992-08-00	PRW: Nokesville	♂	beetles, wasp	KB
1993-01-26	ROI: Harrisonburg	♀	Starling	CM
1993-08-07	ARL: Pentagon	Im♀	beetles	
1995-04-26	VBC: Back Bay NWR	♂	insects	
1997-00-00	ROI	♂	Orthoptera	CZ

SPECIES DATE	LOCATION (APPENDIX A)	AGE/ SEX	STOMACH CONTENTS	SOURCE
Merlin (<i>Falco columbarius</i>)				
1889-10-13	FAI		warbler	Fisher 1893
1891-11-14	ARL: Ballston		2 House Sparrows, 1 other bird (junco?)	"
1894-10-18	WES: Kinsale		moth, small bird	USFWS
1911-09-07	ACC: Wallops Island		sandpiper	"
1913-09-15	ACC: " "		Cedar Waxwing	"
1916-09-30	ACC: " "		Indigo Bunting	"
1919-09-27	ACC: " "		House Sparrow, warbler ?, dragonfly	"
1932-11-15	KIW: Pamunkey Indian Reservation		Mourning Dove	"
1997-09-23	FAI: Chantilly	♀	beetles	
Peregrine Falcon (<i>Falco peregrinus</i>)				
1980-12-29	VBC	Ad♀	feathers, small bones	NWHRC
1984-11-01	VBC	Im♀	feathers	"
1986-10-06	NOA	Im♂	skeletal muscle	"
1990-07-15	GLO	Im♂	feathers	"
1992-02-05	HMC	Ad♀	feathers, bird foot	"
1993-10-04	NOA	Im♂	unidentified mass	"
Common Barn-Owl (<i>Tyto alba</i>)				
1919-09-28	ACC: Wallops Island		2 Meadow Voles	USFWS
1940-04-16	BUK: Farmville		Meadow Vole, Short-tailed Shrew	"
1988-07-00	FRE	♀	Short-tailed Shrew	RS
1995-02-00	LUD: Gilberts Corner		Meadow Vole	"
1996-04-26	AUG: Interstate 64	♂	Meadow Vole	
Eastern Screech-Owl (<i>Otus asio</i>)				
1890-12-21	FAI		Swamp Sparrow, House Mouse	Fisher 1893
1890-12-21	FAI		2 House Mice	"
	Virginia		small piece of flesh	"
	Virginia		small piece of flesh	"
1892-02-22	FCC		Dark-eyed Junco, Meadow Vole	"
1894-04-27	ARL?: Four-mile Run		insect remains	USFWS
1894-04-27	ARL		White-eyed Vireo, spider, sparrow, mouse	"
1894-05-10	ARL		beetle, cicada larvae	"
1896-02-22	ARL?: Four-mile Run		crayfish	"
1897-11-24	ARL		small bird, shrew and mouse hair	"
1900-02-04	ARL		<i>Peromyscus</i> sp.	"
1901-11-28	ORA: Gordonsville		House Mouse, spider	"
1935-11-01	LXC		beetle larvae, hair	"
1939-12-07	AUG: Deerfield		beetle larvae	"
1946-12-26	GIL: Mountain Lake		beetle, Lepidoptera larvae, spiders	"
1978-02-00	ARL	Ad♂	White-footed Mouse	MO
1980-09-25	BOT: Troutville	♂	earwigs, beetles, spiders, caterpillars, millipedes	LS

SPECIES DATE	LOCATION (APPENDIX A)	AGE/ SEX	STOMACH CONTENTS	SOURCE
Eastern Screech-Owl				
1986-07-26	ARL	ImU	beetles	MO
1986-10-19	PAG: Luray		insects	RS
1988-10-30	ARL: Route 50	Ad♀	camel crickets	
1990-00-00	ROI: near Harrisonburg	Ad♀	Meadow Vole	CZ
1990-00-00	ROI: " "	Ad♀	hair, beetles	"
1990-00-00	ROI: " "	Ad♂	Meadow Vole, beetles	"
1990-00-00	ROI: " "	Ad♀	insect remains	"
1990-00-00	ROI: " "	Ad♂	Eastern Fence Lizard, camel cricket	"
1990-00-00	ROI: " "	AdU	beetles	"
1990-00-00	ROI: " "	Ad♀	beetles	"
1990-00-00	ROI: " "	Ad♂	scarab beetle, many grasshopper parts, spider	"
ca. 1990	FRE: near Stephens City	Juv	long- and short-horned grasshoppers, 9 noctuid and 1 sphinx moth larvae	RS
1990-09-18	WAR: Front Royal	♂	grasshoppers, tree cricket, scarab beetle	"
1990-11-03	SHE: Red Banks	♀	scarab larva, earwig, short-horned grasshopper, 13 camel crickets, noctuid moth larva	"
1991-03-91	N. Virginia	Ad♀	centipedes, noctuid moth larvae	
1991-12-11	CLA: Boyce	Ad♂	noctuid moth larvae	RS
1992-02-10	WES: Montross	Ad♀	House Mouse	
1992-02-16	WAR: 4-H Club	♂	noctuid moths, spider, scarab beetle	JR
1992-03-09	VBC: Lynnhaven Inlet		4 black crickets	
1992-04-00	WIS	♀	beetles	
1992-04-00	WIS	♂	Lepidoptera larvae, millipedes, spider	
1992-08-07	FAI: Annandale	Im♀	cricket	
1992-09-24	FAI: Clifton	Ad♂	grasshopper, beetles	
1992-12-15	MON: Ellett Valley	♂	noctuid moth larvae, earwigs, ground beetles (Carabidae)	LS
1993-01-28	LUD: Round Hill		insects	
1993-05-07	LUD: Waterford	Im♂	many scarab beetles	
1993-06-00	WAR	♀	tree cricket	JR
1993-06-00	WAR		camel crickets, geometrid moth	"
1993-08-05	GIL: Narrows	♂	Lepidoptera larvae, beetles, spiders	LS
1993-10-25	MON: Christiansburg	♂	Lepidoptera, beetles, earwigs	"
1993-11-10	MON: Blacksburg	♂	Orthoptera, caterpillars, spiders	"
1994-12-14	FAI: Tyson's Corner	♀	noctuid moth larvae, geometrid moth	
1995-01-13	FRE: Route 522	♀	noctuid moth larvae, earthworms, carabid beetle larvae	RS
1995-08-00	WAR	♂	2 spiders, praying mantis, caterpillars, Noctuidae	JR
1995-11-08	WAR: Routes 522 & 604		caterpillars, Orthoptera	"
1996-02-03	PRW: Nokesville	♀	beetles	KB
1996-02-17	FAI: Reston	♂	Northern Cardinal (♂)	RG
1996-04-13	MAT: Port Haywood	♀	caterpillars, ground beetles, centipede	
1997-04-00	ROI	♂	wasp, caterpillars	CZ
1997-06-15	VBC: Back Bay NWR		beetles, ants	

SPECIES DATE	LOCATION (APPENDIX A)	AGE/ SEX	STOMACH CONTENTS	SOURCE
Eastern Screech-Owl				
1997-fall	ROI	♂	House Mouse	CZ
1997-10-04	WAR: Front Royal	♂	beetles	
1999-03-00	ROI	♀	insects	CM
1999-03-00	ROI	♂	small bones	"
Great Horned Owl (<i>Bubo virginianus</i>)				
1888-11-23	Virginia		Eastern Cottontail, Silver-haired Bat, spider, katydid	USFWS
1926-12-07	PRE: Farmville		Eastern Cottontail	"
1927-02-07	RIC ?		Eastern Cottontail	"
1928-10-14	CUL: Culpeper		Eastern Cottontail, spider	"
1989-11-30	WAR: Linden		Meadow Vole	RS
1990-00-00	ROI: near Harrisonburg	Ad♀	American Robin, Short-tailed Shrew	CZ
1990-00-00	ROI: "	Ad♂	dobsonfly	"
1990-00-00	ROI: "		weasel (sp. ?)	"
ca. 1990	FRE: Stephens City	Ad♀	small mammal bones	RS
ca. 1990	FRE: Stephens City	Ad♂	Meadow Vole, Least Shrew	"
1991-00-00	N. Virginia	Ad♀	House Mouse	
1993-07-05	FAI: Burke	Ad♀	4 scarab beetles, 1 camel cricket	
1993-12-09	ROI: Route 259		Short-tailed Shrew	
1994-04-07	PRW: Manassas	Ad♂	crayfish	
1994-12-08	LUD: Leesburg	Ad♀	Eastern Cottontail	
1995-09-20	LUD: Hamilton	Ad♂	beetles	RS
1995-10-01	FAI: Annandale	Ad♀	Eastern Cottontail	
1995-11-08	WYT: Interstate 77	♀	Harvest Mouse	LS
1995-00-00	FRE	Ad♀	insects	RS
1997-03-06	HAR: Interstate 81	♀	Orthoptera	

Snowy Owl (*Nyctea scandiaca*)

Shufeldt (1914) examined an emaciated bird and found the "...Stomach entirely empty."

Burrowing Owl (*Athene cunicularia*)

1994-01-11 NOA: Chesapeake Bay ♀ Carabid beetle parts
Bridge Tunnel at Fisherman Island

Barred Owl (*Strix varia*)

1888-10-21	Virginia		crayfish	Fisher 1893
1888-11-21	Virginia		crayfish	USFWS
1934-09-00	LUI: Trevilians		Cooper's Hawk, rhinoceros beetle, giant water bug, ground beetle, long- and short-horned grasshoppers	"
1975-02-10	FAI: Bull Run	Ad♂	80% earthworms, 10% Lepidoptera larvae, 10% unidentified matter	RE
1978-01-15	LUD: Leesburg	Ad♀	Short-tailed Shrew	"
1989-03-13	LUD	Ad♂	crayfish, frog	

SPECIES DATE	LOCATION (APPENDIX A)	AGE/ SEX	STOMACH CONTENTS	SOURCE
Barred Owl				
ca. 1990	N. Virginia		Short-tailed Shrew	RS
ca. 1990	N. Virginia		crayfish	“
ca. 1990	PRW	Ad♀	Meadow Vole	
ca. 1990	FRE: near Stephens City	Ad♀	10 camel crickets	RS
1991-00-00	N. Virginia		Norway Rat	“
1991-01-00	FRE: near Stephens City	Ad♀	Short-tailed shrew, rodent?	“
1991-04-16	FAI	♀	Gray Squirrel	
1992-06-30	FAI: Huntley Meadows Park	Ad♀	Red-bellied Woodpecker, beetles	
1993-01-03	PRW	Ad♀	insects	
1993-08-02	FAI: Grays Point Road	Im♂	Norway Rat	
1993-12-06	MON	♂	beetles	LS
1993-12-14	Interstate 64 at Route 617	♀	4 Meadow Voles	“
1994-00-00	FAI	♂	fur and insects	RG
1994-00-00	FAI	ImU	fur	“
1994-11-26	VBC: Back Bay NWR		Orthoptera	
1995-00-00	FAI	♀	insects	
1995-12-03	KIG: Dahlgren		House Mouse	
1996-04-23	FRE: Route 340	Ad♀	beetles	RS
1996-04-28	LUD: Route 611	♂	Tenebrionidae	
1997-05-00	LUD: Leesburg	♀	Short-tailed Shrew	
1998-02-11	FRE	♀	insects	RS
1998-02-29	JCC: Interstate 64	♀	Leopard Frog	
1998-04-30	ROI: Harrisonburg	♀	spider	CM
1998-10-15	FAU: Midland	♀	Short-tailed Shrew	
1999-04-16	FAI: Springfield	♀	<i>Peromyscus</i> sp.	
Long-eared Owl (<i>Asio otus</i>)				
1888-12-16	FAI		House Mouse, White-footed Mouse	Fisher 1893
1929-12-26	ROB	Ad♀	Mourning Dove	Murray 1944
1934-05-04	LUI: Trevilians		Meadow Vole	USFWS
1989-02-02	LUD: W&OD Trail	Ad♀	Meadow Vole	MO
Short-eared Owl (<i>Asio flammeus</i>)				
1996-04-17	VBC: Back Bay NWR		Sora	
Northern Saw-whet Owl (<i>Aegolius acadicus</i>)				
1956-02-12	Chesapeake City		House Mouse	Rageot 1957
1981-winter	N. Virginia	Ad♀	House Mouse	

[Note-Whalen et al. (2000) discuss prey taken by migrating Saw-whet Owls on Virginia's Eastern Shore from 1994 to 1996.]

Table 2. Summary of prey types taken from stomachs of birds of prey in Virginia. Numbers for each prey type are the percentages of full stomachs containing that prey.

SPECIES	Number examined	Mice, voles, shrews	Chipmunks, squirrels, rabbits	Larger mammals	Fish	Amphibians, reptiles	Birds	Insects	Other ^a	Number (%) empty
Turkey Vulture	1	100				100				0
Bald Eagle	32				52		22		22	9 (28)
Northern Harrier	16	40				20	53	20		1 (6)
Sharp-shinned Hawk	39	8					92			27 (69)
Cooper's Hawk	32	36	14				71	14		18 (56)
Red-shouldered Hawk	26	33	9			19			14	5 (19)
Broad-winged Hawk	12	30	20			30		60		2 (17)
Red-tailed Hawk	26	60	5				10			6 (23)
Rough-legged Hawk	1		100							0
Golden Eagle	7			100						4 ^b (57)
American Kestrel	21	13					13	75	13	5 (24)
Merlin	9						89	35		0
Peregrine Falcon	6						67		33	0
Common Barn-Owl	9									4 (44)
E. Screech-Owl	75	20				1	10	75	20	14 (22)
Great Horned Owl	32	40	35				5	30	15	12 (38)
Snowy Owl	1									1 (100)
Burrowing Owl	1							100		0
Barred Owl	42	32	10			6	6	39	16	11 (26)
Long-eared Owl	5	75					25			1 (20)
Short-eared Owl	1						100			0
N. Saw-whet Owl	3	100								1 (33)

^a Earthworms, crayfish, millipedes, centipedes, spiders, hair (only in Bald Eagle).

^b The number of empty stomachs were from birds examined at NWHRC.

by Fisher (1893) and May (1935) for larger geographic regions. In Virginia, Red-shouldered Hawks consumed more insects and fewer small mammals, amphibians, and reptiles than nationwide. American Kestrels took fewer small mammals but more small birds in Virginia. Although Cooper's Hawks have had a long-standing reputation for capturing poultry and game birds (Fisher 1893, McAtee 1935), none of these hawks examined from Virginia after 1924 had taken poultry or game birds. Similarly, no poultry or game birds were found in Red-tailed Hawks and Great Horned Owls from Virginia.

As might be expected from previous studies, in Virginia arthropods constituted the principal prey items of Broad-winged Hawks, American Kestrels, and Eastern Screech-Owls. Birds were the principal prey items of the Northern Harrier, Sharp-shinned and Cooper's hawks, Merlins, and Peregrine Falcons. The Meadow Vole accounted for 44% of all small mammals (shrews, mice, voles) taken.

Both the kestrel and screech-owl were adept at finding and catching arthropods in the winter months in addition to mice and a few birds. Specifically, kestrel winter foods included crickets, beetles, and grasshoppers, whereas the owl took caterpillars, spiders, and moths.

The large number and high percentage of empty stomachs in the two Accipiters (Table 2) are noteworthy. For both species, 70 % of the empty stomachs came from birds obtained during fall migration. At least two interpretations can be offered for the empty stomachs. Possibly, the species are inefficient in catching prey. The Sharp-shinned Hawk, for example, was deemed an unsuccessful hunter by Hill (1984) who found that only 10.9% of migrating birds had full crops even when their chief prey (Yellow-rumped Warbler) was abundant. But, in the present study it is also possible that the migrating hawks simply had not been hunting when they were killed.

The specific foods at specific sites and dates presented here will be useful to any programs dealing with the conservation and management of birds of prey in Virginia.

ACKNOWLEDGMENTS

Assistance with some prey identifications was given by Ronald Hodges and Alma Solis (arthropods), Joseph Mitchell (reptiles), Roxie Laybourne (birds), and Charles O. Handley Jr. (mammals). I am also indebted to the individuals and organizations (identified above) for their efforts in procuring birds for this study. Walter Bulmer, Charles O. Handley, Jr., and two reviewers offered useful comments on an earlier draft of the paper.

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APPENDIX A. Abbreviations for Counties and Cities in Virginia used in the text.

ACC	Accomack Co.	LUD	Loudoun Co.
ALB	Albemarle Co.	LUI	Louisa Co.
ALE	Alexandria City	LYC	Lynchburg City
ARL	Arlington Co.	MAT	Mathews Co.
AUG	Augusta Co.	MEC	Mecklenburg Co.
BOT	Botetourt Co.	MON	Montgomery Co.
BUK	Buckingham Co.	NFC	Norfolk City
CHA	Charles City Co.	NNC	Newport News City
CHS	Chesterfield Co.	NOA	Northampton Co.
CPC	Chesapeake City	ORA	Orange Co.
CUL	Culpeper Co.	PAG	Page Co.
DIC	Dickenson Co.	PRE	Prince Edward Co.
ESS	Essex Co.	PRG	Prince George Co.
FAC	Fairfax City	PRW	Prince William Co.
FAI	Fairfax Co.	RIC	Richmond City
FCC	Falls Church City	ROB	Rockbridge Co.
FAU	Fauquier Co.	ROI	Rockingham Co.
FRE	Frederick Co.	SHE	Shenandoah Co.
GIL	Giles Co.	SPO	Spotsylvania Co.
GLO	Gloucester Co.	STA	Stafford Co.
HAN	Hanover Co.	SUR	Surry Co.
HAR	Harrisonburg	VBC	Virginia Beach City
HEN	Henrico Co.	WAR	Warren Co.
HMC	Hampton City	WES	Westmoreland Co.
JCC	James City Co.	WIS	Wise Co.
KIG	King George Co.	WYT	Wythe Co.
KIW	King William Co.	YOR	York Co.
LXC	Lexington City		

APPENDIX B. Scientific names of vertebrate prey mentioned in the text.

Amphibians

Upland Chorus Frog (probably *Pseudacris feriarum*)
 Southern Leopard Frog (*Rana sphenocephala*)

Reptiles

Painted Turtle (*Chrysemys picta*)
 Eastern Fence Lizard (*Sceloporus undulatus*)
 Five-lined Skink (*Eumeces fasciatus*)
 Corn Snake (*Elaphe guttata*)
 Rough Green Snake (*Opheodrys aestivus*)

Birds

Northern Bobwhite (*Colinus virginianus*)
 Clapper Rail (*Rallus longirostris*)
 Sora (*Porzana carolina*)
 Spotted Sandpiper (*Actitis macularia*)
 Semipalmated Sandpiper (*Ereunetes pusillus*)
 Rock Dove (*Columba livia*)
 Mourning Dove (*Zenaida macroura*)
 Red-bellied Woodpecker (*Melanerpes carolinus*)
 Water Pipit (*Anthus spinoletta*)
 American Robin (*Turdus migratorius*)
 Hermit Thrush (*Catharus guttatus*)
 European Starling (*Sturnus vulgaris*)

Cedar Waxwing (*Bombycilla cedrorum*)
 White-eyed Vireo (*Vireo griseus*)
 Yellow-rumped Warbler (*Dendroica coronata*)
 Black-and-white Warbler (*Mniotilta varia*)
 Dark-eyed Junco (*Junco hyemalis*)
 Northern Cardinal (*Cardinalis cardinalis*)
 Swamp Sparrow (*Melospiza georgiana*)
 Indigo Bunting (*Passerina cyanea*)
 Field Sparrow (*Spizella pusilla*)
 Red-winged Blackbird (*Agelaius phoeniceus*)
 House Sparrow (*Passer domesticus*)

Mammals

Least Shrew (*Cryptotis parva*)
 N. Short-tailed Shrew (*Blarina brevicauda*)
 Silver-haired Bat (*Lasionycteris noctivagans*)
 Eastern Cottontail (*Sylvilagus floridanus*)
 Eastern Chipmunk (*Tamias striatus*)
 Eastern Gray Squirrel (*Sciurus carolinensis*)
 Harvest Mouse (*Reithrodontomys humulis*)
 White-footed Mouse (*Peromyscus leucopus*)
 Norway Rat (*Rattus norvegicus*)
 House Mouse (*Mus musculus*)
 Meadow Vole (*Microtus pennsylvanicus*)
 White-tailed Deer (*Odocoileus virginianus*)

A Survey of Macrolepidopteran Moths Near Vontay, Hanover County, Virginia

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INTRODUCTION

There have only been a few reports of systematic, single-site collections of moths from locations in Virginia or nearby states (Skinner, 1921; Milne & Milne, 1945; Moulding & Madenjian, 1979; Butler & Kondo, 1991; Stein, 1993; Hall, 1999). These studies were conducted over periods ranging from one season to five years and, with the exception of Hall (1999), used one trap method to collect moths. This study, which covered two years and involved multiple collection techniques, was designed to provide a comprehensive list of the macrolepidopteran moth species (= "macro moths" or "macros") found at a single Virginia Piedmont location. This species list, along with others being gathered throughout Virginia by the Virginia Department of Conservation and Recreation's Division of Natural Heritage, is being used to ascertain the biological status of the Commonwealth's macro moths and develop a complete list of Virginia's macros. Macros have been chosen rather than the entire moth fauna because they are generally the larger, more conspicuous moths and are better known. In Virginia, the macros are contained within the following 13 families: Apatelodididae, Arctiidae, Drepanidae, Epiplemlidae, Geometridae, Lasiocampidae, Lymantriidae, Mimallonidae, Noctuidae, Notodontidae, Saturniidae, Sphingidae, and Thyatiridae.

This survey was conducted over 0.8 ha (ca. 2 acres) at the author's residence on the Virginia Piedmont, 2 km W of Vontay in western Hanover County. The terrain is relatively level with gently rolling hills. Soils are circumneutral to acidic, clay-loam mixtures. Vegetation in the vicinity of the study site is primarily second-growth upland hardwood forest of various ages from 12 to 80+ years since timber harvest operations.

The study site is part of a 1,215-2,025 ha (ca. 3,000-5,000 acres) second growth forest which includes upland pine stands and bottomland forests of the South Anna River in addition to upland hardwoods. Elevation at the sampling site is ca. 82 m above sea level. To the author's knowledge, the area's forests have not been treated with pesticides or other chemical or mechanical management that would be detrimental to the lepidopteran fauna.

Plant species at the site are typical of second-growth upland hardwood forests in the region. The most common tree species are white oak (*Quercus alba*), red oak (*Q. rubra*), tulip poplar (*Liriodendron tulipifera*), beech (*Fagus grandifolia*), and flowering dogwood (*Cornus florida*). Other frequent trees include red maple (*Acer rubrum*), southern red oak (*Q. falcata*), post oak (*Q. stellata*), hickory (*Carya* spp.), American holly (*Ilex opaca*), winged elm (*Ulmus alata*), white ash (*Fraxinus americana*), sweet gum (*Liquidambar styraciflua*), loblolly pine (*Pinus taeda*), Virginia pine (*P. virginiana*), black gum (*Nyssa sylvatica*), black locust (*Robinia pseudoacacia*), redbud (*Cercis canadensis*), and eastern redcedar (*Juniperus virginiana*). Common understory woody species include black haw (*Viburnum dentatum*), deerberry (*Vaccinium stamineum*), Japanese honeysuckle (*Lonicera japonica*), greenbrier (*Smilax* spp.), and bramble (*Rubus* sp.). Common herbs of the shaded areas include Christmas fern (*Polystichum acrostichoides*), running cedar (*Diphasiastrum digitatum*), panic grass (*Dichanthelium* spp.), sedges (*Carex* spp.), and partridge pea (*Mitchellia repens*). A powerline right-of-way adjacent to the study site features native warm season grasses including little bluestem (*Schizachyrium scoparium*), broomsedge (*Andropogon virginicus*), and Indian grass (*Sorghastrum nutans*), as well as many forb

species including tick-trefoil (*Desmodium* spp.), bush-clover (*Lespedeza* spp.), bonesets (*Eupatorium* spp.), blazing-star (*Liatris squarrosa*), black-eyed susan (*Rudbeckia hirta*), goldenrod (*Solidago* spp.), and mountain mint (*Pycnanthemum* spp.).

MATERIALS AND METHODS

During 311 nights from 30 October 1996 to 28 October 1998, six methods (baiting, incandescent light, ultraviolet light, mercury vapor light, ultraviolet light trap, and observation without collection) were used to record moths at the study site. Two to four methods were used concurrently on each night. Emphasis was placed on obtaining a species list and not a quantitative sample of macro moth species. Except when temperatures dropped to near or below freezing, sampling was conducted regardless of moon phase and weather conditions.

Baiting was employed on 126 nights from 5 November 1996 to 28 October 1998. The bait consisted of beer, sugar, and crushed bananas along with other ingredients when available, including molasses, grape jelly, red wine, cantaloupe, and watermelon. A ca. 40 x 20 cm patch of the thick liquid mixture was painted on the trunks of 12-18 trees of various species at ca. 1.5 m above the ground. The trees were painted at or prior to sunset and checked 2-5 times during the evening. Trees were also checked in the pre-dawn morning on about 10 occasions. Moths (either macro or conspicuous micro species) believed to be new to the study were caught in a jar and placed in a freezer until killed. They were left in the freezer until they could be pinned.

On 178 nights from 30 October 1996 to 25 September 1998, moths were captured at incandescent lights. The incandescent lights included 1-3 house porch lights with 60 to 100-watt bulbs. On 98 nights from 30 December 1996 to 6 June 1998, moths were captured at black lights. The black lights included 40-watt light bulbs used in one of the porch light fixtures as well as a single 15-watt standard black light fluorescent tube used in conjunction with a white sheet. On 101 nights from 18 March 1998 to the end of the study period, a 160-watt mercury vapor light was used. For all light sources, areas around lights were checked 2-5 times during the evening. They were also checked in the morning on about 50 occasions. As with baiting, if new moths were encountered, they were caught in a jar and placed in a freezer until they could be pinned.

On 13 June 1997, a standard light-trap (Martin, 1978) with a 15-watt standard black light fluorescent tube was used. The trap was operated from dusk until

dawn using ethyl acetate as the killing agent. If moths believed to be new to the study site were encountered, they were pinned. Many of the insects caught in this trap were not killed by the ethyl acetate, resulting in badly rubbed and many completely unidentifiable specimens.

Finally, diurnal and nocturnal observations were used to record a few easily-identified sphinx (Sphingidae) and silk (Saturniidae) moths that were not collected, such as the luna moth, *Actias luna* (L.).

A subset of the pinned moths was spread. All were periodically examined throughout the study period and determinations were assigned by the author with assistance from Douglas C. Ferguson, Paul Z. Goldstein, Stephen P. Hall, Eric L. Quinter, Steven M. Roble, Dale F. Schweitzer, and J. Bolling Sullivan. All but 114 specimen identifications were confirmed by Ferguson, Hall, and/or Schweitzer.

Prior to the study of moths at this site, a complete collection of vascular plant species was gathered from a ca. 4 ha area that includes the smaller area in which the moths were taken.

RESULTS AND DISCUSSION

A total of 1,898 macrolepidopteran moth specimens was pinned and identified during this study. The number of specimens would be much higher if all 30,000+ macro-moths encountered at the lights and bait were taken rather than selecting only moths that appeared to be new to the study. Even with the bias of collecting only moths that appeared to be new, 492 species of macro-moths from 286 genera in 13 families were collected or observed during this study (Table 1 and Appendix). Note that this includes five species which are given the modifier "complex" following their name due to recent revelations by experts that more than one taxon has been included within a commonly-used name (D.F. Schweitzer, pers. comm.). Six species were identified solely by observation records and six additional species identifications were not verified by experts. The Noctuidae (288 species) and Geometridae (94) were most diverse with the Arctiidae (33) and Notodontidae (31) also rich.

Using a checklist of confirmed and possible macro-moths from Virginia (Virginia Division of Natural Heritage, unpubl. data) numbering 1237 species, one estimate of the percentage of the Commonwealth's macrolepidopteran fauna represented at the Vontay site is about 40%. If the Noctuidae of Virginia are similar in richness to the noctuid faunas of Ohio (Rings et al., 1992) and Kentucky (Covell, 1999) with 708 and 616 species, respectively, an estimate of the percentage of the

Table 1. Summary of macro-moths encountered during this study by family given in order of Hodges et al. (1983).

<u>FAMILY</u>	<u>NO. OF GENERA</u>	<u>NO. OF SPECIES</u>	<u>NO. OF SPECIMENS</u>
Thyatiridae	2	2	9
Drepanidae	3	3	6
Geometridae	66	94	345
Epiplemlidae	2	2	4
Mimallonidae	1	1	5
Apatelodididae	2	2	4
Lasiocampidae	4	5	8
Saturniidae	10	11 ^a	10
Sphingidae	11	15 ^b	28
Notodontidae	16	31	127
Arctiidae	17	33	84
Lymantriidae	2	5	21
Noctuidae	150	288	1247
TOTALS	286	492	1898

^a Five species documented by sight records only

^b One species documented by sight record only

Commonwealth's noctuid fauna represented at the Vontay site is about 41 to 47%.

A species-accumulation curve (Fig. 1) for this study indicates that additional macros would be recorded at the site should collections continue. Depending upon the projected trajectory of the curve, estimates of the total number of taxa recorded from this site over 5 years may range from 550-650 macro-moth species. Eliminating bias by collecting all macros encountered would increase the number of taxa recorded. Introducing other collection techniques such as diurnal netting or use of Malaise traps is also likely to increase the total. Due to differences in trap methodology, period, and effort, it is not possible to directly compare the number of species documented during this study to other single-site studies. However, Table 2 presents a comparison of total species per site for macrolepidopteran moths in selected regional studies.

One species found during the study, *Acrionicta albarufa* Grt., represented by a single specimen, is new to the known moth fauna of Virginia. This species is rare throughout its range and was formerly a candidate for listing as a federally endangered or threatened species (U.S. Fish and Wildlife Service, 1994). Although *A. albarufa* ranges over temperate eastern North America west to Colorado and New Mexico (Forbes, 1954;

Schweitzer, 1985), it has only been collected in a handful of states within this range (D.F. Schweitzer, pers. comm.).

Three other species found during this study, *Agnorisma bollii* (Grt.), *Meropleon diversicolor* (Morr.), and *Papaipema eupatorii* (Lyman), are new to the published moth fauna of Virginia. They have all been collected in Virginia during the past decade (Virginia Division of Natural Heritage, unpubl. data). *Agnorisma bollii*, formerly known as *Xestia bollii* has been rarely collected, occurring primarily west of the Appalachians with a few isolated Maryland collections (LaFontaine, 1998). *Meropleon diversicolor* ranges throughout northeastern North America (Ferguson, 1982).

Despite intensive sampling, two Eurasian moth species were not found at the study site. The gypsy moth, *Lymantria dispar* L., a forest pest of the Northeast and northern Virginia has not reached the study site as of this report. *Noctua promuba* (L.), a recent introduction with documented collection sites throughout northeastern North America and Virginia (LaFontaine, 1998; Roble et al., 1999) was also absent.

While many moths recorded during this study were undoubtedly present as larvae at the study site, it is highly probable that a subset of the moths flew in from other areas. The reported larval host plants (Covell, 1984) of a number of the moth species recorded during this study do not occur at the study site. *Bellura anoa* (Dyar) feeds on cattails and wetland herbs and *Baileya doubledayi* (Gn.) feeds on alder, a wetland shrub. The nearest wetland is ca. 0.5 km from the sampling area. Other species are indicative of habitat types that do not occur at the study site and it is probable that they flew in from other areas. Within the Northeast, *Acrionicta albarufa* is a species found in sand barren habitat with stands of bear oak, *Quercus ilicifolia* Wagenh. (Schweitzer, 1985). Any remotely similar habitat is a great distance from the study site.

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Table 2. Comparison of total species of macro-moths documented per site in selected regional studies.

STUDY LOCATION	PERIOD OF STUDY	COLLECTION TECHNIQUES	SAMPLING INTENSITY	NUMBER OF SPECIES	SOURCE
Vontay, Hanover County, Virginia	2 years	sugar bait, incandescent, uv, mercury vapor light, observation without collection	311 trap nights, 2-4 techniques concurrently used, 1898 macros collected	492	This study
Hot Springs, Bath County, Virginia	2 months	incandescent light	Not specified	300	Skinner, 1921
Mountain Lake, Giles County, Virginia	2 summers	tungsten-filament lamps of various colors	Not specified; ca. 12,600 insects collected	149	Milne & Milne, 1945
Hutcheson Memorial Forest, Somerset County, New Jersey	5 years	uv light	293 trap-nights, 22,880 macros collected	410	Moulding & Madenjian, 1979
Cooper's Rock State Forest, Preston and Monongalia Counties, West Virginia	2 years, 7 months	uv light	ca. 90 trap-nights	400	Butler & Kondo, 1991
Burkes Garden, Tazewell County, Virginia	7 months	uv light	Not specified, ca. 1260 macros collected	142	Stein, 1993
Devil's Gut Preserve, Martin County, North Carolina	1 year, 4 months	sugar bait, uv light, diurnal collection	42 trap-nights	347	Hall, 1999

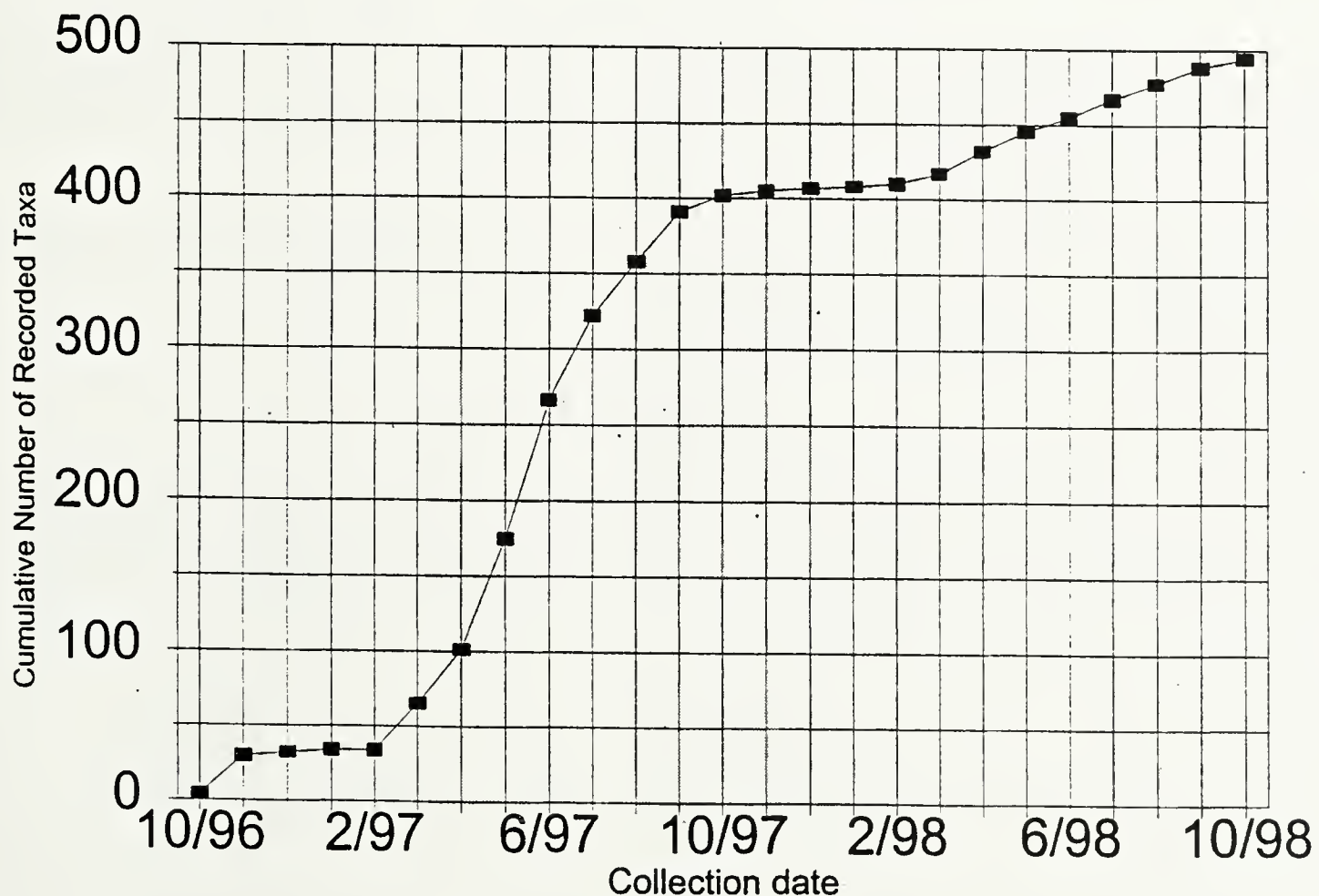


Figure 1. Species accumulation curve for macrolepidopteran moths encountered during this study.

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Appendix. Macro-moth species encountered during this study given in order of Hodges et al. (1983). Fields are: checklist number, species name, collection date (month/day/year), method (s = sugar bait, b = black light, i = incandescent light, m = mercury vapor light, t = trap, o = observation); numbers in parentheses indicate if number of specimens is > 1 for a given date and trap method. A ? is added if the specimen identification was not confirmed by Ferguson, Hall, or Schweitzer.

Thyatiridae

- 06237 *Pseudothyatira cymatophoroides* (Gn.) 07/19/97 s, 07/23/97 s (2), 07/26/97 b, s (2), 08/25/97 b
 06240 *Euthyatira pudens* (Gn.) 04/07/97 i, 04/03/98 m

Drepanidae

- 06251 *Drepana arcuata* Wlk. 04/02/98 m
 06253 *Eudeilinia herminiata* (Gn.) 08/13/97 i
 06255 *Oreta rosea* (Wlk.) 07/13/97 b, 07/28/97 i, 04/30/98 i, 06/24/98 i

Geometridae

- 06258 *Alsophila pometaria* (Harr.) 12/19/97 i (2)
 06261 *Heliomata cycladata* Grt.&Rob. 04/28/97 b, 04/18/98 m
 06270 *Protitame virginalis* (Hulst) 07/14/97 b
 06273 *Itame pustularia* (Gn.) 06/25/97 i, 07/02/97 i
 06322 *Mellilla xanthometata* (Wlk.) 05/01/97 b, 05/02/97 b, 04/08/98 m
 06326 *Semiothisa aemulataria* (Wlk.) 04/06/97 i, 04/12/97 b, 04/30/97 b, 04/08/98 m ?, 04/17/98 m
 06331 *Semiothisa promiscuata* Fgn. 06/18/97 i, 06/30/97 b, 07/23/97 b, 08/13/97 i, 09/08/97 b
 06339 *Semiothisa transitaria* (Wlk.) 09/03/98 m
 06341 *Semiothisa bicolorata* (F.) 06/09/97 i, 07/07/97 i, 05/16/98 i, m, 05/26/98 i
 06352 *Semiothisa granitata* (Gn.) 03/28/97 b, 06/27/97 b, 07/06/97 b, 09/02/97 b, 09/08/97 b,
 09/15/97 b (2), 04/21/98 m, 05/17/98 m, 05/28/98 b,
 05/30/98 b, 06/17/98 m ?, 09/02/98 m
 06353 *Semiothisa multilineata* (Pack.) 05/04/97 i, 05/11/97 i, 05/16/97 b, 05/30/97 i, 06/05/97 i,
 06/06/97 b, 06/08/97 i ?, 06/12/97 i (2), 06/27/97 i ?, 07/02/97 b,
 07/28/97 b, 08/26/97 i, 09/08/97 b, 05/07/98 m, 07/18/98 i ?
 06362 *Semiothisa continuata* (Wlk.) 03/30/97 i
 06386 *Semiothisa ocellinata* (Gn.) 06/09/97 i, 06/27/97 b, 07/22/97 b, 08/16/97 b, 06/07/98 i,
 07/22/98 m
 06443 *Glenoides texanaria* (Hulst) 07/24/97 i, 10/01/97 b, 09/25/98 i
 06449 *Glena cribrataria* (Gn.) 05/22/97 i, 07/30/97 i, 08/14/97 s, 05/07/98 m
 06452 *Glena plumosaria* (Pack.) 06/01/97 i, 05/04/98 m, 05/26/98 i
 06478 *Exelis pyrolaria* Gn. 06/14/97 b, 06/16/97 b, 06/27/97 b
 06486 *Tornos scolopacinaris* (Gn.) 08/14/97 i ?
 06584 *Anacamptodes humaria* (Gn.) 03/28/97 b, 04/10/97 b
 06586 *Anacamptodes defectaria* (Gn.) 10/30/96 i, 01/04/97 i, 07/27/97 b
 06588 *Iridopsis larvaria* (Gn.) 04/30/97 b, 07/28/97 b (2), 04/16/98 m ?, 05/10/98 m
 06590 *Anavitrinella pampinaria* (Gn.) 04/12/97 b, 05/18/97 i, 06/27/97 b, 06/21/98 m
 06594 *Cleora sublunaria* (Gn.) 03/28/98 m, 03/30/98 m (2), 04/03/98 m
 06597 *Ectropis crepuscularia* (D.&S.) 02/28/98 b, 03/19/98 m

Geometridae (continued)

- 06599 *Epimecis hortaria* (F.) 03/29/97 b, 05/25/97 b, 07/25/97 s
- 06620 *Melanolophia canadaria* (Gn.) 03/29/97 b, 04/12/97 b, 04/30/97 b, 05/02/97 b, 05/05/97 i, 06/16/97 s, 07/30/97 i, 08/10/97 i, 03/28/98 b, 04/08/98 m
- 06654 *Hypagyrtis unipunctata* (Haw.) 05/12/97 i, 05/16/97 i (2), 05/27/97 b, 06/05/97 i (2), 07/29/97 b, 09/11/97 b, 04/30/98 i, 05/11/98 m, 07/26/98 m, 08/10/98 m, 08/21/98 m
- 06655 *Hypagyrtis esther* (Barnes) 07/23/97 b, 06/06/98 b, 07/26/98 i
- 06659 *Phigalia denticulata* Hulst 12/30/96 i, 01/04/97 i (3), 12/19/97 i, 02/08/98 i(2), 02/21/98 i
- 06660 *Phigalia strigataria* (Minot) 03/02/97 i (2), 03/21/97 i, 03/28/97 b, 02/25/98 i, 02/28/98 i (2), 03/01/98 i, 03/19/98 m (2)
- 06662 *Paleacrita vernata* (Peck) 12/10/96 i, 12/30/96 i, b, 01/04/97 i, 02/08/98 i, 02/21/98 i?, 02/25/98 i, 04/03/98 m (2)
- 06665 *Erannis tiliaria* (Harr.) 11/24/96 i
- 06667 *Lomographa vestaliata* (Gn.) 04/28/97 i, 04/08/98 m
- 06677 *Cabera erythemaria* Gn. 05/12/97 i
- 06711 *Thysanopyga intractata* (Wlk.) 11/05/96 i, 03/30/97 i (2), 05/07/97 b, 09/01/97 i, 04/25/98 m, 07/02/98 i, 08/01/98 i, 09/22/98 m
- 06720 *Lytrosis unitaria* (H.-S.) 06/18/97 i, 05/28/98 b
- 06721 *Lytrosis sinuosa* Rindge 05/25/97 b (2)
- 06724 *Euchlaena serrata* (Dru.) 06/25/97 b
- 06726 *Euchlaena obtusaria* (Hbn.) 04/18/97 i, 05/22/97 i, 06/01/97 i, 06/05/97 i
- 06729 *Euchlaena johnsonaria* (Fitch) 08/13/97 i
- 06733 *Euchlaena amoenaria* (Gn.) 05/25/97 b
- 06735 *Euchlaena pectinaria* (D.&S.) 04/12/97 b, 04/25/97 i
- 06739 *Euchlaena irraria* (B.&McD.) 07/07/97 i
- 06743 *Xanthotype sospeta* (Drury) 06/01/97 b
- 06754 *Pero hubneraria* (Gn.) 04/11/97 i, 04/28/97 b, 05/01/97 i, 07/29/97 b, i, 08/07/97 b, 04/17/98 m, 04/30/98 m
- 06763 *Nacophora quernaria* (J.E.Sm.) 04/06/97 i, 04/20/98 m
- 06796 *Campaea perlata* (Gn.) 09/05/97 i, 05/17/98 i
- 06797 *Ennomos magnaria* Gn. 10/15/98 m
- 06818 *Selenia kentaria* (Grt. & Rob.) 03/28/97 i (2), 03/30/98 m
- 06822 *Metarranthis duaria* (Gn.) 05/02/97 b, 04/18/98 m
- 06826 *Metarranthis hypocharia* (H.-S.) 06/16/97 i
- 06828 *Metarranthis homuraria* (G.&R.) 05/01/97 i
- 06832 *Metarranthis obfirmaria* (Hbn.) 04/16/98 m
- 06834 *Cepphis decoloraria* (Hulst) 05/05/98 m
- 06836 *Anagoga occiduaria* (Wlk.) 04/30/97 b, 05/11/97 b, 08/10/97 i
- 06837 *Probole alienaria* H.-S. 04/03/97 b, 04/26/97 b, 05/19/97 i, 06/09/97 i, 08/13/97 i, 04/20/98 i, 04/23/98 m, 06/02/98 b
- 06838 *Probole amicaria* (H.-S.) 07/24/97 b, 08/09/97 i
- 06842 *Plagodis phlogosaria* (Gn.) 07/30/97 i
- 06843 *Plagodis fervidaria* (H.-S.) 04/11/97 b, 04/12/97 b, 04/25/97 i, 04/08/98 m

Geometridae (continued)

06844 <i>Plagodis alcoolaria</i> (Gn.)	05/07/97 b, 05/08/97 b, 05/19/97 i, 07/13/97 b, 07/20/97 b, 07/26/97 b, 07/22/98 m
06885 <i>Besma quercivoraria</i> (Gn.)	05/19/97 i, 08/24/97 b, 09/07/98 m
06892 <i>Lambdina pellucidaria</i> (Grt.&Rob.)	05/02/97 b, 05/18/97 b
06894x <i>Lambdina athasaria</i> (Wlk.) complex	03/21/97 i, 03/27/97 i, 03/30/97 i, 04/11/97 i, 05/02/97 b, 07/26/97 i, 08/08/97 i, 03/28/98 m, 04/03/98 m, 04/17/98 m
06941 <i>Eusarca confusaria</i> Hbn.	05/19/97 i, 05/25/97 b, 06/05/97 i, 06/06/97 i, 09/02/97 b, 09/11/97 b
06963 <i>Tetracis crocallata</i> Gn.	05/04/98 m
06964 <i>Tetracis cachexiata</i> Gn.	05/16/97 i, 05/22/97 b, 04/30/98 m
06966 <i>Eutrapela clemataria</i> (J.E.Sm.)	03/17/97 i, 04/25/97 i, 07/22/97 i, 08/20/97 i, 03/30/98 m, 04/01/98 m, 07/06/98 s
06974a <i>Patalene olyzonaria puber</i> (Grt.&Rob.)	10/30/96 i, 11/05/96 i, 06/07/97 i, 06/27/97 b ?, 07/19/97 b, 07/20/97 b, 07/25/97 i, 08/11/97 i, 08/13/97 i, 08/21/97 b, 10/04/97 i, 06/17/98 m
06982 <i>Prochoerodes transversata</i> (Dru.)	11/06/96 s, 06/30/97 b, 07/23/97 b, 09/26/97 i
07033 <i>Nemoria lixaria</i> (Gn.)	05/29/97 b
07046 <i>Nemoria bistraria bistraria</i> Hbn.	03/27/97 i ?, 04/03/97 i ?, 04/06/97 i (2) ?, 04/12/97 b (2) ?, 07/21/97 b, 03/28/98 m
07047 <i>Nemoria rubrifrontaria</i> (Pack.)	07/15/97 b
07053 <i>Dichorda iridaria</i> (Gn.)	05/19/97 i, 05/14/98 m
07058 <i>Synchlora aerata</i> (F.)	05/17/98 i
07071 <i>Chlorochlamys chloroleucaria</i> (Gn.)	05/03/97 b, 07/29/97 b, 05/02/98 m
07075 <i>Chloropteryx tepperaria</i> (Hulst)	06/16/97 i, 08/21/98 m
07084 <i>Hethemia pistasciaria</i> (Gn.)	05/30/98 b
07114 <i>Idaea demissaria</i> (Hbn.)	08/09/97 i ?, 08/13/97 i, 09/01/97 s, 06/18/98 m, 08/09/98 m, 08/10/98 m
07132 <i>Pleuroprucha insulsaria</i> (Gn.)	07/20/98 m, 09/25/98 i
07136 <i>Cyclophora packardi</i> (Prout)	05/11/97 i
07146 <i>Haematopis grataria</i> (F.)	06/16/97 b, 08/13/97 i, 09/02/97 b
07159 <i>Scopula limboundata</i> (Haw.)	05/29/97 b, 06/14/97 b, 07/07/97 i, 07/20/97 b, 07/21/97 i, 07/30/97 i, 09/08/97 b, 05/16/98 m ?
07179 <i>Leptostales rubromarginaria</i> (Pack.)	03/28/97 i, 04/12/97 b
07196 <i>Eulithis diversilineata</i> (Hbn.)	07/06/97 b, 07/12/97 i, 07/20/97 b, 10/12/98 m
07237a <i>Hydriomena transfigurata manitoba</i> B.&McD.	04/15/98 m ?
07292 <i>Hydria prunivorata</i> (Fgn.)	06/12/97 i, 06/17/98 m
07390 <i>Xanthorhoe lacustrata</i> (Gn.)	03/20/97 i
07414 <i>Orthonama obstipata</i> (F.)	03/28/97 b, 04/12/97 b ?, 04/28/97 b, 04/08/98 m
07416 <i>Orthonama centrostrigaria</i> (Woll.)	11/19/96 s, 05/02/97 i, 05/29/97 i (2), 06/09/97 i (2), 09/07/97b, 09/18/97 b
07417 <i>Disclisioprocta stellata</i> (Gn.)	09/20/98 m
07440 <i>Eubaphe mendica</i> (Wlk.)	06/01/97 i
07509 <i>Eupithecia herpordana</i> C.&S.	03/09/98 i (2), 03/28/98 m

Geometridae (continued)

- 07647 *Heterophleps triguttaria* H.-S. 08/13/97 i, 08/10/98 m, 08/20/98 m
 07648 *Dypsteris arbortivaria* (H.-S.) 05/10/98 m

Epiplemidae

- 07650 *Callizzia amorata* Pack. 09/02/97 i ?, 05/17/98 m, 06/06/98 b
 07653 *Calledapteryx dryopterata* Grt. 06/16/97 i

Mimallonidae

- 07659 *Lacosoma chiridota* Grt. 06/22/97 b, 07/03/97 b, 07/24/97 i, 06/02/98 b, 06/15/98 i

Apatelodididae

- 07663 *Apatelodes torrefacta* (J.E.Sm.) 07/28/97 i
 07665 *Olceclostera angelica* (Grt.) 07/30/97 i, 08/12/97 i, 05/16/98 m ?

Lasiocampidae

- 07670 *Tolype velleda* (Stoll) 10/11/97 i
 07683 *Artace cribraria* (Ljungh) 07/13/97 b (2)
 07687 *Phyllodesma americana* (Harr.) 04/02/98 m
 07698 *Malacosoma disstria* Hbn. 06/07/98 i (2)
 07701 *Malacosoma americanum* (F.) 05/25/97 b (2)

Saturniidae

- 07704 *Eacles imperialis* (Dru.) 08/01/97 i
 07706 *Citheronia regalis* (F.) 07/16/98 o
 07715 *Dryocampa rubicunda* (F.) 04/25/97 i
 07716 *Anisota stigma* (F.) 07/13/97 b, 06/21/98 m, 07/09/98 m
 07723 *Anisota virginiana* (Dru.) 06/06/97 i, 06/01/98 b
 07730 *Hemileuca maia* (Dru.) 10/25/97 o
 07746 *Automeris io* (F.) 06/16/97 b, 06/26/97 i
 07757 *Antheraea polyphemus* (Cram.) 05/06/97 o
 07758 *Actias luna* (L.) 05/03/97 o
 07765 *Callosamia angulifera* (Wlk.) 09/04/98 m
 07767 *Hyalophora cecropia* (L.) 04/28/98 o

Sphingidae

- 07775 *Manduca sexta* (L.) 08/25/98 m
 07783 *Manduca jasminearum* (Guer.) 06/29/97 b, 07/15/98 m
 07787 *Ceratomia undulosa* (Wlk.) 05/08/97 b
 07789 *Ceratomia catalpae* (Bdv.) 08/24/97 b, 06/24/98 m, 08/06/98 m
 07793 *Paratrea plebeja* (F.) 05/28/98 b
 07816 *Lapara coniferarum* (J.E.Sm.) 07/17/98 m ?, 07/29/98 m
 07821 *Smerinthus jamaicensis* (Dru.) 08/11/98 m
 07824 *Paonias excaecatus* (J.E.Sm.) 07/28/97 i, 08/13/97 i, 06/16/98 m
 07825 *Paonias myops* (J.E.Sm.) 07/06/97 b, 06/13/98 m
 07827 *Laothoe juglandis* (J.E.Sm.) 06/28/97 i, 07/21/97 i

Sphingidae (continued)

07853 <i>Hemaris thysbe</i> (F.)	07/16/97 o
07870 <i>Sphexcodina abbottii</i> (Swainson)	04/30/98 m
07871 <i>Deidamia inscripta</i> (Harr.)	04/09/98 m, 04/30/98 m
07885 <i>Darapsa myron</i> (Cram.)	06/26/97 i, 07/27/97 b, 06/28/98 m
07886 <i>Darapsa pholus</i> (Cram.)	04/30/97 b, 08/18/97 s, 05/03/98 m, 05/16/98 m

Notodontidae

07902 <i>Datana ministra</i> (Drury)	07/30/97 i, 07/28/98 m
07903 <i>Datana angusii</i> Grt. & Rob.	06/25/97 i
07906 <i>Datana contracta</i> Wlk.	07/25/97 i
07907 <i>Datana integerrima</i> G. & R.	06/16/98 m
07908 <i>Datana perspicua</i> Grt.&Rob.	07/04/97 b, 07/20/97 b, 07/07/98 m
07915 <i>Nadata gibbosa</i> (J.E.Sm.)	05/07/97 b (2), 06/05/97 i, 06/27/97 b
07917 <i>Hyperaeschra georgica</i> (H.-S.)	04/25/97 i, 05/10/97 i, 07/13/97 b, 04/08/98 m, 04/17/98 m, 07/24/98 m
07920 <i>Peridea angulosa</i> (J.E.Sm.)	05/17/98 m
07921 <i>Peridea ferruginea</i> Pack.	05/28/98 b, 06/24/98 m
07929 <i>Nerice bidentata</i> Wlk.	04/17/98 m
07931 <i>Gluphisia septentrionalis</i> Wlk.	05/12/97 i (2), 06/15/97 b, 07/23/97 b, 07/24/97 i, 08/07/97 b, 08/10/97 b, 04/25/98 i, 05/14/98 i, 06/01/98 b, 07/15/98 m, 08/06/98 m
07936 <i>Furcula borealis</i> (Guer.)	09/02/97 b
07937 <i>Furcula cinerea</i> (Wlk.)	06/16/98 i, 08/06/98 m ?
07942 <i>Cerura scitiscrupta</i> Wlk.	08/21/97 b
07951x <i>Symmerista albifrons</i> (J.E.Sm.) complex	03/27/97 i, 07/13/97 b, 08/11/97 b, 04/12/98 m
07957 <i>Dasylophia anguinea</i> (J.E.Sm.)	06/06/98 i
07958 <i>Dasylophia thyatiroides</i> (Wlk.)	05/27/97 i, 07/14/97 i, 08/13/97 i, 04/18/98 m, 05/16/98 m ?, 05/17/98 m, 08/20/98 i
07974 <i>Misogada unicolor</i> (Pack.)	06/26/97 b, 07/20/97 b
07975 <i>Macrurocampa marthesia</i> (Cram.)	07/27/97 b, 07/29/97 i, 08/08/97 i, 05/11/98 i, 05/14/98 m ?, 07/16/98 m, 07/17/98 m ?, 07/28/98 m, 08/21/98 m
07983 <i>Heterocampa obliqua</i> Pack.	07/06/97 b, 07/13/97 b, 07/30/97 i, 06/13/98 m, 07/28/98 m
07990 <i>Heterocampa umbrata</i> Wlk.	08/14/97 i, 08/26/97 i, 05/17/98 m, 06/25/98 m
07994 <i>Heterocampa guttivitta</i> (Wlk.)	06/04/97 i, 07/24/97 i, 07/30/97 i
07995 <i>Heterocampa biundata</i> Wlk.	06/06/97 i, 07/26/97 i, 05/27/98 i
07998 <i>Lochmaeus manteo</i> Doubleday	05/29/97 i, 06/04/97 i, 06/05/97 i (2), 06/15/97 s, 08/10/97 i, 08/13/97 i, 08/18/97 s, 08/21/97 s (2), 08/25/97 b, 09/02/97 b, 09/08/97 i, 07/29/98 m
07999 <i>Lochmaeus bilineata</i> (Pack.)	06/05/97 i, 07/06/97 b, 07/28/97 i, 08/10/97 i, 08/26/97 i, 09/08/97 i, 09/09/97 i, 06/06/98 i, 07/18/98 m, 07/22/98 m
08005 <i>Schizura ipomoeae</i> Doubleday	07/29/97 i, 07/30/97 i, 05/17/98 i ?, 06/17/98 m ?, 07/17/98 m, 07/24/98 m
08006 <i>Schizura badia</i> (Pack.)	06/16/98 m, 08/20/98 m

Notodontidae (continued)

08007	<i>Schizura unicornis</i> (J.E.Sm.)	04/17/98 m, 6/21/98 m, 07/16/98 m, 08/09/98 m
08011	<i>Schizura leptinoides</i> (Grt.)	06/13/97 t, 07/01/97 i, 07/28/97 i, 07/30/97 i
08012	<i>Oligocentria semirufescens</i> (Wlk.)	06/06/97 i, 07/27/97 i, 08/30/98 m
08017	<i>Oligocentria lignicolor</i> (Wlk.)	05/25/97 b, 05/30/97 i, 06/04/97 i, 06/28/97 i, 07/13/97 b, 08/25/97 b, 05/30/98 b, 06/21/98 m

Arctiidae

08045	<i>Crambidia lithosoides</i> Dyar	07/02/97 b
08046	<i>Crambidia uniformis</i> Dyar	06/16/97 b
8053x	<i>Crambidia cephalica</i> (Grt.&Rob.) complex	08/08/97 i (2), 08/10/97 b, 08/23/98 m
08061	<i>Cisthene kentuckiensis</i> (Dyar)	09/22/97 b
08067	<i>Cisthene plumbea</i> Stretch	09/06/97 b, 09/22/97 b
08072	<i>Cisthene packardii</i> (Grt.)	06/12/97 i, 06/16/97 b, 08/24/97 b
08089	<i>Hypoprepia miniata</i> (Kby.)	07/03/98 i
08090	<i>Hypoprepia fucosa</i> Hbn.	06/16/97 b, 08/11/97 i
08098	<i>Clemensia albata</i> Pack.	05/25/97 b, 09/02/97 b, i, 09/11/97 s, 05/28/98 b (2)
08099	<i>Pagara simplex</i> Wlk.	09/30/97 i, 04/22/98 m, 05/01/98 m
08107	<i>Haploa clymene</i> (Brown)	06/13/97 t (3)
08110	<i>Haploa contigua</i> (Wlk.)	06/27/97 b, 06/29/97 b, 07/06/97 b, 06/13/98 m, 06/16/98 i
08111	<i>Haploa lecontei</i> (Guer.-Meneville)	06/05/97 i
08118	<i>Holomelina opella</i> (Grt.)	06/16/97 b
08121	<i>Holomelina aurantiaca</i> (Hbn.)	05/19/97 b, 07/20/97 b, 07/27/97 b, 09/06/97 b, 09/15/97 b, 09/18/97 b
08129	<i>Pyrrharctia isabella</i> (J.E.Sm.)	05/08/97 b
08131	<i>Estigmene acrea</i> (Dru.)	04/20/98 m
08134	<i>Spilosoma congrua</i> Wlk.	04/30/97 b, i, 07/06/97 b, 08/07/97 b, 08/09/97 i, 04/15/98 m, 04/18/98 m, 07/20/98 m
08140	<i>Hyphantria cunea</i> (Dru.)	05/03/97 i, 05/07/97 i, 05/18/97 b, 05/29/97 b, 06/06/97 i, 07/13/97 b, 09/02/97 b
08146	<i>Ecpantheria scribonia</i> (Stoll)	07/06/97 b
08170	<i>Apantesis vittata</i> (F.)	08/21/98 m
08171	<i>Apantesis nais</i> (Dru.)	04/16/98 m
08171x	<i>Apantesis carlotta</i> Ferguson	07/21/97 b, 08/08/97 i, 09/07/98 m, 09/15/98 m ?, 09/30/98 m
08176	<i>Grammia anna</i> (Grt.)	06/05/97 i
08188	<i>Grammia figurata</i> (Dru.)	08/13/97 i, 06/12/98 m, 08/30/98 m
08196a	<i>Grammia parthenice intermedia</i> (Stretch)	09/14/97 i, 09/10/98 m
08197	<i>Grammia virgo</i> (L.)	09/02/97 i
08199	<i>Grammia arge</i> (Dru.)	08/14/97 i, 04/01/98 m
08203	<i>Halysidota tessellaris</i> (J.E.Sm.)	06/26/97 i, 05/16/98 i
08230	<i>Cycnia tenera</i> Hbn.	05/07/97 b, 06/07/97 i, 05/17/98 m
08231	<i>Cycnia oregonensis</i> (Stretch)	06/18/97 b
08238	<i>Euchaetes egle</i> (Dru.)	07/27/97 b, 07/11/98 m
08267	<i>Cisseps fulvicollis</i> (Hbn.)	08/14/97 i

Lymantriidae

08292 <i>Dasychira tephra</i> Hbn.	06/09/98 i
08296 <i>Dasychira basiflava</i> (Pack.)	06/07/97 i ?, 06/14/97 b, 08/28/98 m
08302 <i>Dasychira obliquata</i> (Grt.&Rob.)	07/22/97 i, 08/08/97 i, 08/10/97 i, 08/21/97 b
08314 <i>Orgyia definita</i> Pack.	11/05/96 i, 07/20/97 b, 10/04/97 i, 10/27/97 i
08316 <i>Orgyia leucostigma</i> (J.E.Sm.)	10/30/96 i, 11/05/96 i (3), 11/07/96 i, 07/13/97 b, 09/16/97 i, 10/09/97 i, 08/02/98 m

Noctuidae

08322 <i>Idia americalis</i> (Gn.)	11/05/96 i, 11/06/96 s(2), 08/17/97 s, 09/15/97 s, 10/19/98m?
08323 <i>Idia aemula</i> Hbn.	11/06/96 s (3), 11/07/96 s, 11/18/96 s, 05/08/97 b, 06/05/97 b, 06/12/97 i
08327 <i>Idia forbesi</i> (French)	06/06/97 s, 06/15/97 s
08328 <i>Idia julia</i> (B.&McD.)	06/12/97 s, 06/15/97 s, 06/16/97 i, 08/25/97 s, 09/11/97 s
08333 <i>Idia denticulatus</i> (Harv.)	06/26/97 i, 07/13/97 s, 07/19/97 s, 08/07/97 s, 07/17/98 s
08334 <i>Idia lubricalis</i> (Gey.)	06/26/97 s, 07/06/97 s, 07/20/97 b, 07/02/98 s
08338 <i>Phalaenophana pyramusalis</i> (Wlk.)	05/19/97 b, 07/29/97 i, 05/01/98 m, 07/04/98 m
08340 <i>Zanclognatha lituralis</i> (Hbn.)	08/02/98 m
08345 <i>Zanclognatha laevigata</i> (Grt.)	07/29/98 s
08347 <i>Zanclognatha obscuripennis</i> (Grt.)	05/08/97 b (2), 05/18/97 i, 06/01/97 b, 06/08/97 i, 07/24/97 b, 07/29/97 b, 08/07/97 s, 08/18/97 i, 07/26/98 s, 08/09/98 s ?, 09/12/98 s ?
08348 <i>Zanclognatha pedipilalis</i> (Gn.)	07/19/97 s
08349 <i>Zanclognatha protumnusalis</i> (Wlk.)	07/02/97 i ?
08351 <i>Zanclognatha cruralis</i> (Gn.)	05/29/97 b, 06/02/97 b, 09/04/97 s
08355 <i>Chytolita morbidalis</i> (Gn.)	06/05/97 i, 06/06/97 s, 05/17/98 m
08356 <i>Chytolita petrealis</i> Grt.	05/25/97 b, 08/01/97 i
08358 <i>Macrochilo litophora</i> (Grt.)	06/12/97 i, 06/14/97 i
08364 <i>Phalaenastola larentioides</i> Grt.	05/18/97 b, 05/29/97 b, 07/14/97 i, 07/20/97 b (2), 08/10/97 b, 09/06/97 b, 09/27/97 b, 05/17/98 m
08366 <i>Tetanolita mynesalis</i> (Wlk.)	05/19/97 b, 05/27/97 b, 07/20/97 b, 09/02/97 b, 09/15/97 b, 09/22/97 b, 09/27/97 b
08368 <i>Tetanolita floridana</i> (Sm.)	07/10/97 i, 09/01/97 s, 08/11/98 s
08370 <i>Bleptina caradrinalis</i> Gn.	05/08/97 b, 06/09/97 b, 08/10/97 s, 08/18/97 s, 09/24/97 s, 05/04/98 m, 08/10/98 s
08378 <i>Renia salusalis</i> (Wlk.)	06/09/97 s
08381.x <i>Renia</i> sp. near <i>discoloralis</i> Gn.	06/12/97 i, 06/18/97 s, 07/04/97 i, 08/07/97 i, 08/24/97 b, 09/01/97 s, 09/06/97 s, 09/07/97 s, 09/09/97 i, 09/11/97 s, 09/22/97 s, 09/29/97 s, 10/06/97 b, 07/09/98 s, 07/26/98 s (2), 08/01/98 s
08384.1 <i>Renia flavipunctalis</i> (Gey.)	07/19/97 s
08385 <i>Renia fraternalis</i> Sm.	06/01/97 i
08387 <i>Renia sobrialis</i> (Wlk.)	08/21/97 s, 08/24/97 s, 09/01/97 s
08393 <i>Lascoria ambigualis</i> Wlk.	04/11/97 i, 04/12/97 i, 04/30/97 b, 05/18/97 i
08397 <i>Palthis angulalis</i> (Hbn.)	04/28/97 b, 06/18/97 b, 09/24/97 s

Noctuidae (continued)

08398 <i>Palthis asopialis</i> (Gn.)	06/16/97 i, 09/28/97 i, 10/05/97 i
08401 <i>Redectis vitrea</i> (Grt.)	08/11/97 i
08404 <i>Rivula propinquais</i> Gn.	04/26/98 m
08426 <i>Dyspyralis illocata</i> Warr.	08/10/98 s, 08/21/98 s
08427 <i>Dyspyralis punticosta</i> (Sm.)	07/25/97 s
08428 <i>Dyspyralis nigella</i> (Stkr.)	07/21/97 b, 07/16/98 m
08430 <i>Parahypenodes quadralis</i> B.&McD.	08/09/98 s
08440 <i>Nigetia formosalis</i> Wlk.	09/07/97 i, 09/15/97 s
08441 <i>Bomolocha manalis</i> (Wlk.)	09/07/97 i
08442 <i>Bomolocha baltimoralis</i> (Gn.)	04/06/97 b, 05/07/97 b, 07/03/97 i, 08/08/97 i
08443 <i>Bomolocha bijugalis</i> (Wlk.)	04/26/97 i, 05/11/97 i, 08/25/97 s, 04/16/98 m ?, 05/10/98 m, 07/17/98 m
08444 <i>Bomolocha palparia</i> (Wlk.)	06/13/97 t
08445 <i>Bomolocha abalienalis</i> (Wlk.)	04/29/97 b, 05/02/97 b, 09/02/97 b, 06/14/98 m
08446 <i>Bomolocha deceptalis</i> (Wlk.)	07/06/97 b, 06/14/98 m
08447 <i>Bomolocha madefactalis</i> (Gn.)	08/07/97 b, 05/17/98 m, 06/17/98 i, 07/17/98 m, 07/22/98 m
08465 <i>Plathypena scabra</i> (F.)	11/05/96 i (2), 11/07/96 i, 11/18/96 s, 11/19/96 s, 12/01/96 s (2), 12/30/96 s (2), 05/19/97 i, 05/29/97 i, 06/09/97 i, 07/02/97 i, 07/04/97 i, 07/12/97 i, 08/10/97 i, 09/02/97 b, 09/27/97 b, 02/08/98 i, 05/03/98 m, 05/29/98 b
08479 <i>Spargaloma sexpunctata</i> Grt.	05/07/97 i, 05/08/97 b, 06/08/97 i, 05/11/98 m, 05/14/98 m
08490 <i>Pangrapta decoralis</i> Hbn.	05/12/97 i, 05/25/97 i, 06/09/97 s, 06/15/97 s, 06/16/97 b, 07/26/97 b, 09/02/97 s, 06/11/98 i, 06/14/98 i ?, 07/22/98 m
08493 <i>Isogona tenuis</i> (Grt.)	07/25/97 s, 07/27/97 i, 06/21/98 m ?, 08/23/98 m
08499 <i>Metalectra discalis</i> (Grt.)	06/09/97 s (2), 06/12/97 s, 06/14/97 i, s, 06/15/97 s, 09/07/97 i, s, 10/08/97 s
08500 <i>Metalectra quadrisignata</i> (Wlk.)	06/06/97 s (2), 06/16/97 s, 06/27/97 s, 07/12/97 s, 09/04/97 s, 09/11/97 s, 07/17/98 s, 07/26/98 s
08502 <i>Metalectra tantillus</i> (Grt.)	07/20/97 b, 07/18/98 m
08505 <i>Metalectra richardsi</i> Brower	09/14/98 m
08509 <i>Arugisa latiorella</i> (Wlk.)	07/26/98 m
08514 <i>Scolecocampa liburna</i> (Gey.)	06/29/97 i, 07/06/97 b
08525 <i>Phyprosopus callitrichoides</i> Grt.	05/18/97 b, 5/10/98 i
08528 <i>Hypsoropha hormos</i> Hbn.	07/13/97 b, 08/08/97 i, 08/20/97 i, 05/27/98 b, 06/17/98 m ?
08534 <i>Plusiodonta compressipalpis</i> Gn.	05/14/98 m (2)
08536 <i>Calyptra canadensis</i> (Bethune)	06/01/97 i, 08/10/97 s
08574 <i>Anticarsia gemmatalis</i> Hbn.	10/01/97 s, 09/26/98 m, 10/10/98 s, 10/13/98 m (2)
08587 <i>Panopoda rufimargo</i> (Hbn.)	06/01/97 b (2), 07/02/97 i, 07/06/97 b, 07/21/97 b, 07/30/97 i, 08/24/97 s, 09/02/97 b
08588 <i>Panopoda carneicosta</i> Gn.	06/01/97 i, 06/29/97 b, 04/26/98 m
08591 <i>Phoberia atomaris</i> Hbn.	03/01/97 b, 03/10/97 i (2)
08592 <i>Cissusa spadix</i> (Cram.)	04/11/97 i

Noctuidae (continued)

08651 <i>Lesmone detrahens</i> (Wlk.)	05/30/97 i, 06/01/97 i, 06/14/97 s, 06/22/97 i, 07/09/97 s, 07/26/97 s, 07/29/97 s, 08/14/97 s, 08/17/97 s, 10/01/97 b, 05/07/98 m, 07/14/98 s ?, 09/04/98 m
08689 <i>Zale lunata</i> (Dru.)	11/06/96 s (6), 04/07/97 i, 06/12/97 s, 07/22/97 s
08692 <i>Zale galbanata</i> (Morr.)	06/12/97 s, 07/20/97 s, 07/25/97 s, 07/27/97 s, 04/16/98 m, 06/24/98 s, 07/06/98 s, 07/20/98 s
08694 <i>Zale aeruginosa</i> (Gn.)	04/12/97 b (2)
08695 <i>Zale undularis</i> (Dru.)	06/22/97 s, 07/19/97 s, 05/29/98 s
08697 <i>Zale minerea</i> (Gn.)	04/28/97 b, 07/28/97 s
08704 <i>Zale helata</i> (Sm.)	05/25/97 b, 04/16/98 i, 05/01/98 i
08705 <i>Zale bethunei</i> (Sm.)	04/03/97 i, 04/01/98 m
08707 <i>Zale metatoides</i> McD.	05/03/98 m, 06/14/98 s, 06/20/98 m
08713 <i>Zale lunifera</i> (Hbn.)	03/21/97 b, 03/27/98 m, 04/19/98 m
08716 <i>Zale unilineata</i> (Grt.)	03/28/97 s, 05/08/97 i
08717 <i>Zale horrida</i> Hbn.	05/11/97 i
08719 <i>Euparthenos nubilis</i> (Hbn.)	05/25/97 b, 06/12/97 s, 07/22/97 s
08721 <i>Allotria elonympha</i> (Hbn.)	06/12/97 s (2), 06/22/97 b, 07/29/97 s, 08/25/97 s, 09/01/97 s, 07/16/98 m
08727 <i>Parallelia bistriaris</i> Hbn.	05/08/97 b, 05/22/97 i, 08/07/97 s, 05/07/98 i
08733 <i>Caenurgia chloropha</i> (Hbn.)	08/25/97 s, 09/24/97 s
08738 <i>Caenurgina crassiuscula</i> (Haw.)	07/23/97 b, 07/28/97 b, 09/02/97 b, 09/06/97 s, 09/11/97 s
08739 <i>Caenurgina erechtea</i> (Cram.)	06/18/97 b, 07/20/97 s, 07/26/97 s, 09/30/97 i, 09/14/98 m ?
08743 <i>Mocis latipes</i> (Gn.)	10/13/97 s
08745 <i>Mocis texana</i> (Morr.)	05/19/97 i, 05/29/97 b, 07/29/97 s, 04/30/98 m, 05/17/98 m
08747 <i>Celiptera frustulum</i> Gn.	05/30/97 i, 06/07/97 s (2), 06/12/97 s, 06/27/97 b, 05/01/98 m, 07/29/98 s
08764 <i>Argyrostotis anilis</i> (Dru.)	08/24/97 s
08769 <i>Spiloloma lunilinea</i> Grt.	06/29/97 b, 07/11/98 s
08770 <i>Catocala innubens</i> Gn.	07/01/97 s, 07/14/97 s, 07/27/97 s, 08/10/97 s, 07/14/98 s
08771 <i>Catocala piatrix</i> Grt.	09/27/97 s (2), 10/18/97 i, 08/22/98 m, 09/22/98 s
08773 <i>Catocala epione</i> (Dru.)	07/28/97 s, 06/25/98 i
08782 <i>Catocala flebilis</i> Grt.	07/09/98 s
08792 <i>Catocala vidua</i> (J.E.Sm.)	08/21/97 s, 09/02/97 b, 09/22/97 s, 10/19/98 s
08794 <i>Catocala lacrymosa</i> Gn.	09/27/97 s, 08/06/98 m
08798 <i>Catocala neogama</i> (J.E.Sm.)	08/21/97 s, 09/06/97 s, 09/08/97 s, 07/06/98 s, 07/26/98 s
08801 <i>Catocala ilia</i> (Cram.)	06/26/97 s, 06/28/97 s, 07/01/97 s, 07/20/97 s, 07/26/97 s, 08/10/97 s (2), 08/24/97 s, 09/06/97 s, 10/01/97 s, 06/21/98 s, 06/25/98 m, 07/16/98 s (2), 07/29/98 s, 08/21/98 s
08801.x <i>Catocala</i> sp. near <i>ilia</i> (Cram.)	08/21/97 s
08802 <i>Catocala cerogama</i> Gn.	08/11/97 s, 09/07/97 s
08847 <i>Catocala gracilis</i> Edw.	07/17/98 m
08849 <i>Catocala andromedae</i> Gn.	07/13/97 b

Noctuidae (continued)

- 08851 *Catocala coccinata* Grt. 07/21/97 s, 07/11/98 m
08857 *Catocala ultronia* (Hbn.) 06/27/97 s, 07/19/97 s, 06/21/98 m
08864 *Catocala grynea* (Cram.) 06/27/97 b, 07/27/97 b, 6/25/98 i
08872 *Catocala clintoni* Grt. 06/16/97 s
08878 *Catocala amica* (Hbn.) 07/27/97 s
08878.1 *Catocala lineella* Grt. 07/04/98 s
08887 *Trichoplusia ni* (Hbn.) 10/30/96 i, 08/21/97 s, 08/30/98 m
08889 *Agrapha oxygramma* (Gey.) 09/16/98 m
08890 *Pseudoplusia includens* (Wlk.) 09/02/97 b, 09/07/97 b, 09/28/97 i, 10/11/97 s, 08/30/98 m
08898 *Allagrapha aerea* (Hbn.) 08/07/97 i, 07/09/98 m ?
08907 *Autographa biloba* (Steph.) 07/22/98 m
08908 *Autographa precatationis* (Gn.) 04/03/97 i, 05/04/97 i, 07/10/97 i, 07/25/97 i, 04/08/98 m,
06/26/98 m, 07/17/98 m, 07/26/98 m, 07/29/98 m
08924 *Anagrapha falcifera* (Kby.) 04/02/98 m, 05/26/98 i ?
08955 *Marathyssa inficita* (Wlk.) 06/19/97 i, 06/27/97 b
08957 *Paectes oculatrix* (Gn.) 07/15/98 m, 08/21/98 m ?
08959 *Paectes pygmaea* Hbn. 06/16/97 b, 07/28/97 i, 06/02/98 b, 06/14/98 m
08962 *Paectes abrostoloides* (Gn.) 11/07/96 s, 05/29/97 i, 07/28/97 i, 08/21/97 s, 04/02/98 m,
07/28/98 m, 08/02/98 s ?, 09/16/98 m ?
08969 *Baileya doubledayi* (Gn.) 04/21/98 i
08970 *Baileya ophthalmica* (Gn.) 05/29/97 b (2), 05/30/97 i
08971 *Baileya dormitans* (Gn.) 05/18/97 b, 04/03/98 m, 07/17/98 m
08973 *Baileya australis* (Grt.) 07/28/97 i, 08/14/97 i, 04/26/98 m, 05/04/98 m
08975 *Nycteola frigidana* (Wlk.) 03/28/98 m
08983 *Meganola phylla* (Dyar) 05/02/97 b, 05/25/97 b, 08/01/97 i, 04/25/98 m, 05/17/98 m
08983.2 *Meganola spodia* Franc. 05/26/98 m, 05/28/98 b
08990 *Nola cilicoides* (Grt.) 07/07/97 i, 07/09/98 m
08996 *Nola clethrae* Dyar 06/01/97 i
09025 *Oruza albocostaliata* (Pack.) 06/16/97 b, 08/23/98 m
09037 *Hyperstrotia pervertens* (B.&McD.) 04/29/97 i, 06/12/97 i, 07/07/97 i, 08/13/97 i, 07/13/98 m
09038 *Hyperstrotia villificans* (B.&McD.) 05/08/97 i, 05/29/97 b, 06/13/97 t, 06/18/97 i, 05/17/98 m
09040 *Hyperstrotia secta* (Grt.) 07/21/97 b, 07/26/97 b, 07/29/97 b, 08/08/97 i, 08/11/97 b,
08/24/97 b, 05/01/98 m, 05/10/98 m, 08/16/98 m
09044 *Thioptera nigrofimbria* (Gn.) 06/01/97 i, 06/09/97 i, 09/11/97 b
09047 *Lithacodia muscosula* (Gn.) 05/19/97 i, 06/14/97 b, 06/16/97 b, i, s, 06/26/97 i, 07/01/97 b,
08/10/97 b, 08/13/97 i, 08/18/97 i, 08/21/97 s, 09/06/97 b,
09/07/97 b, 09/11/97 b, 05/26/98 i ?, 06/24/98 m
09049 *Pseudostrotia synochitis* (Grt.&Rob.) 05/29/97 i, 06/16/97 b, 07/03/97 b, 05/17/98 m
09051 *Lithacodia musta* (Grt.&Rob.) 06/13/97 t, 06/14/97 b, 07/25/97 b, 08/09/97 i, 07/04/98 m,
07/15/98 m, 07/20/98 m ?
09053 *Pseudostrotia carneola* (Gn.) 05/25/97 b, 06/09/97 s, 08/07/97 i
09057 *Homophoberia apicosa* (Haw.) 08/24/97 s, 08/11/98 s
09062 *Cerma cerintha* (Tr.) 06/17/97 b, 07/21/97 b

Noctuidae (continued)

09065 <i>Leuconycta diptheroides</i> (Gn.)	05/18/97 i, 07/29/97 b, 04/26/98 i
09085 <i>Tarachidia semiflava</i> (Gn.)	08/07/97 b
09095 <i>Tarachidia erastrionides</i> (Gn.)	07/26/97 b, 07/27/97 b
09127 <i>Spragueia leo</i> (Gn.)	07/20/97 b, 07/27/97 i
09169 <i>Bagisara rectifascia</i> (Grt.)	05/25/97 b, 06/01/97 i, 07/26/97 i, 05/29/98 b
09182.x <i>Panthea</i> sp. near <i>furcilla</i> (Pack.)	08/07/97 b
09184 <i>Colocasia flavicornis</i> (Sm.)	03/28/97 b (2), 03/30/97 i (2), 04/03/97 b, 08/08/97 i, 08/12/97 i, 03/30/98 m, 05/17/98 m, 08/16/98 m ?
09189 <i>Charadra deridens</i> (Gn.)	06/05/97 i, 07/13/97 b, 06/11/98 I, 08/16/98 m, 08/21/98 m
09199 <i>Acronicta rubricoma</i> Gn.	04/17/98 m, 04/18/98 m
09200 <i>Acronicta americana</i> (Harr.)	06/22/97 b, 07/13/97 s(2), 07/24/97 i, 07/26/97 b, 07/28/97 b, 06/21/98 m, 08/10/98 m
09208 <i>Acronicta betulae</i> Riley	06/15/97 s, 08/12/97 s, 08/21/97 s, 07/18/98 m
09216 <i>Acronicta albarufa</i> Grt.	08/11/98 m NEW STATE RECORD
09225 <i>Acronicta vinnula</i> (Grt.)	08/24/97 s, 05/04/98 m, 06/21/98 m, 07/26/98 s, 08/01/98 s
09227 <i>Acronicta laetifica</i> Sm.	06/16/98 m, 06/20/98 m, 07/29/98 s
09229 <i>Acronicta hasta</i> Gn.	05/25/97 b, 06/16/97 s, 07/23/97 s, 08/18/97 s, 09/06/97 b, 04/17/98 m, 04/21/98 m
09236 <i>Acronicta morula</i> Grt.&Rob.	08/17/97 s, 07/29/98 m
09237 <i>Acronicta interrupta</i> Gn.	06/14/97 i, 07/19/97 s, 05/30/98 b
09238 <i>Acronicta lobeliae</i> Gn.	05/08/97 b
09243 <i>Acronicta ovata</i> Grt.	07/13/97 s ?, 07/20/97 b, 07/25/97 b, 07/26/97 s ?, 08/14/97 s
09244 <i>Acronicta modica</i> Wlk.	05/03/97 b, 05/18/97 b, 06/06/97 i, 06/07/97 i, 06/12/97 s (2), 06/14/97 b, 06/15/97 s, 08/10/97 s, 04/21/98 m, 04/25/98 m, 05/01/98 m, 05/03/98 m, 05/04/98 m, 05/11/98 m, 05/26/98 m, 06/17/98 m, 07/26/98 s
09250x <i>Acronicta inclara</i> Sm. complex	04/26/97 i, 05/18/97 b, 05/25/97 b, 05/29/97 b, 06/09/97 s, 06/18/97 s, 07/13/97 b, 07/24/97 i, 07/28/97 b, 07/30/97 i, 09/02/97 b, 09/06/97 s, 09/11/97 s, 05/03/98 m, 05/04/98 m, 06/16/98 m, 07/13/98 m, 08/22/98 m
09251 <i>Acronicta retardata</i> (Wlk.)	07/25/97 b, 05/03/98 m
09254 <i>Acronicta afflictata</i> Grt.	08/21/97 s, 05/28/98 b, 06/24/98 m
09257 <i>Acronicta impleta</i> Wlk.	04/30/97 b, 07/20/97 b, 08/10/97 s, 09/06/97 s, 04/22/98 m, 04/30/98 m, 07/14/98 s, 08/07/98 m
09259 <i>Acronicta noctivaga</i> Grt.	05/03/97 i, 07/23/97 s, 07/29/97 s
09264 <i>Acronicta longa</i> Gn.	08/24/97 s, 04/15/98 m, 07/26/98 s
09266 <i>Acronicta lithospila</i> Grt.	08/12/97 b, 09/08/97 b, 04/30/98 m
09281 <i>Agriopodes fallax</i> (H.-S.)	06/01/97 b, 05/16/98 m
09284 <i>Agriopodes teratophora</i> (H.-S.)	07/01/97 b, 07/22/98 m
09285 <i>Polygrammate hebraeicum</i> Hbn.	04/12/97 b, 07/16/98 m
09299 <i>Eudryas unio</i> (Hbn.)	06/16/97 b
09301 <i>Eudryas grata</i> (F.)	07/01/97 b
09332 <i>Apamea vulgaris</i> (G.& R.)	06/12/97 s

Noctuidae (continued)

- 09348 *Apamea amputatrix* (Fitch) 08/12/97 b
- 09404 *Oligia modica* (Gn.) 08/22/97 i, 08/25/97 b, 09/06/97 b, 09/11/97 s, 09/29/97 s,
09/01/98 s, 09/01/98 s ?
- 09427 *Meropleon diversicolor* (Morr.) 09/26/97 i
- 09454 *Amphipoea velata* (Wlk.) 06/16/97 s, 06/18/97 b, 06/22/97 s
- 09456 *Amphipoea interoceanica* (Sm.) 07/19/97 b ?
- 09466 *Papaipema cataphracta* (Grt.) 11/06/97 i
- 09484 *Papaipema rutila* (Gn.) 09/23/97 i
- 09485 *Papaipema baptisiae* (Bird) 09/25/97 s, 09/30/98 m
- 09496 *Papaipema nebris* (Gn.) 09/15/98 m
- 09501 *Papaipema eupatorii* (Lyman) 11/09/97 i, 10/19/98 m, 10/21/98 m
- 09505 *Papaipema cerussata* (Grt.) 10/27/97 i, 10/13/98 m
- 09526c *Bellura anoa* (Dyar) 07/29/98 m
- 09545 *Euplexia benesimilis* McD. 08/24/97 s
- 09547 *Phlogophora periculosa* Gn. 09/04/97 s, 09/21/97 s, 09/22/97 s, 09/13/98 s, 10/11/98 s
- 09556 *Chytonix palliatricula* (Gn.) 05/02/97 i, 05/03/97 i, 05/25/97 i, 06/01/97 b, 06/05/97 i,
06/30/97 b, 07/06/97 i, 07/13/97 b(2), 07/23/97 b(2), 07/24/97i,
09/02/97 i, 05/02/98 m, 05/04/98 m, 07/04/98 m
- 09560 *Dypterygia rozmani* Berio 06/12/97 s, 06/26/97 i
- 09582 *Nedra ramosula* (Gn.) 03/30/97 i, 04/30/97 b, 09/11/97 s, 03/28/98 m ?
- 09619 *Phosphila miselioides* (Gn.) 06/16/97 s, 08/24/97 s, 09/07/97 s, 09/08/97 s, 06/11/98 i,
06/21/98 m ?, 06/24/98 m, 07/16/98 m
- 09631 *Callopostria mollissima* (Gn.) 06/29/97 b
- 09638 *Amphipyra pyramidoides* Gn. 11/06/96 s(3), 11/07/96 s, 07/12/97 s(2), 07/20/97 s, 08/07/97s
- 09650 *Anorthodes tarda* (Gn.) 04/26/97 i, 04/29/97 b, 04/30/97 b(3), 05/01/97 b(2), 05/03/97b,
05/05/97 b (2), 05/12/97 i, 05/19/97 i, 05/27/97 b, 05/29/97 b,
08/21/97 b, 08/26/97 i, 09/02/97 b(2), s, 09/04/97 s, 09/06/97 s,
09/07/97 b (2), s, 09/15/97 b, s, 09/29/97 s, 04/17/98 m,
04/22/98m?, 04/30/98 m, 05/05/98 i, 05/17/98 m, 08/23/98m,
08/25/98 m, 09/14/98 m, 09/23/98 s
- 09661 *Crambodes talidiformis* Gn. 04/25/98 m, 04/26/98 m
- 09662 *Balsa malana* (Fitch) 05/11/97 b, 08/07/97 i
- 09666 *Spodoptera frugiperda* (J.E.Sm.) 09/07/97s, 09/27/97s?, 07/07/98m, 09/01/98m, 09/01/98s(2)?,
09/02/98 s (3) ?, 09/10/98 m ?, 09/14/98 s, 10/13/98 s (2) ?
- 09669 *Spodoptera ornithogalli* (Gn.) 03/29/97 b, 04/07/97 i, 08/07/97 i, 08/14/97 i, 08/21/97 s,
09/08/97 b, s, 06/16/98 i, 07/15/98 m?, 07/17/98 s?, 07/26/98s
- 09678 *Elaphria versicolor* (Grt.) 05/02/97 b, 05/12/97 i, 05/19/97 i, 06/06/97 b, 07/25/97 b,
07/28/97 i, 07/22/98 m ?, 07/28/98 s ?
- 09681x *Elaphria festivooides* (Gn.) complex 05/03/97 i, 05/25/97 b, 06/14/97 b, 07/23/97 b,
04/15/98 m (2), 06/17/98 i
- 09684 *Elaphria grata* Hbn. 03/28/97 i, 04/03/97 b, 04/12/97 b, i (2), 04/26/97 i (3),
04/30/97 b, 05/03/97 b, 06/25/97 b, 08/10/97 i, 09/02/97 b,
03/28/98 m, 09/13/98 s

Noctuidae (continued)

- 09688 *Galgula partita* Gn. 03/29/97 i (2), 04/03/97 i, 08/17/97 s, 09/22/97 b, 09/26/97 i ?,
02/28/98 i, 03/01/98 i ?, 07/24/98 m ?, 08/25/98 m
- 09689 *Perigea xanthioides* Gn. 07/28/97 i, 07/13/98 m ?, 09/02/98 s
- 09690 *Platysenta videns* (Gn.) 03/29/97 b, 04/30/97 b ?, 05/18/97 b, 06/25/97 b, 07/20/97 s,
08/11/97 b, 09/27/97 b, 06/16/98 m ?, 08/28/98 m
- 09693 *Platysenta mobilis* (Wlk.) 10/12/98 s, 10/28/98 s
- 09699 *Platysenta sutor* (Gn.) 09/15/98 s ?, 09/25/98 s ?, 10/12/98 s, 10/13/98 s, 10/19/98 s?,
10/25/98 s ?
- 09720 *Ogdoconta cinereola* (Gn.) 06/18/97 b, 06/30/97 i, 07/21/97 b, 08/26/97 i, 06/14/98 i
- 09725 *Stiriodes obtusa* (H.-S.) 06/27/97 i, 07/20/97 b (2), 07/04/98 m
- 09766 *Cirrhophanus triangulifer* Grt. 09/02/97 i
- 09815 *Cosmia calami* (Harv.) 06/16/98 m, 06/21/98 m (2), 06/24/98 m
- 09886 *Lithophane patefacta* (Wlk.) 11/18/96 s, 11/19/96 s, 11/25/96 s, 10/08/97 s, 04/02/98 i,
04/08/98 i, 10/02/98 s, 10/10/98 s, 10/11/98 s, 10/12/98 s (2),
10/15/98 s (3), 10/18/98 s (2), 10/23/98 s, 10/24/98 s,
10/27/98 s (3)
- 09892 *Lithophane disposita* Morr. 10/02/98 s, 10/21/98 s(2), 10/24/98s, 10/25/98s, 10/27/98 s(3)
- 09893 *Lithophane hemina* Grt. 11/25/96 s
- 09895 *Lithophane signosa* Wlk. 11/25/96 s
- 09905 *Lithophane viridipallens* Grt. 01/05/97 s
- 09910 *Lithophane antennata* (Wlk.) 12/19/97 i (2), 03/08/98 i, 10/23/98 s
- 09915 *Lithophane grotei* Riley 11/17/96 i, s (3), 11/19/96 s, 11/20/96 i, 11/25/96 s,
01/04/97 s, 02/01/98 i (2)
- 09916 *Lithophane unimoda* (Lint.) 11/25/96 s
- 09929 *Pyreferra hesperidago* (Gn.) 02/25/98 i
- 09933 *Eupsilia vinulenta* (Grt.) 11/18/96 s (3), 11/25/96 s (2), 11/30/96 s, 12/30/96 s,
02/08/98 i (2)
- 09934 *Eupsilia cirripalea* Franc. 11/18/96 s, 04/17/98 m
- 09935 *Eupsilia tristigmata* (Grt.) 03/21/97 i (2), 03/19/98 i
- 09941 *Sericaglaea signata* (French) 01/04/97 i, s (3), 10/08/97 b, 01/05/98 i (2), 02/22/98 i,
03/28/98 i, 04/09/98 i, 10/12/98 s, 10/21/98 s
- 09942 *Xystopeplus rufago* (Hbn.) 03/19/98 i
- 09943 *Metaxaglaea inulta* (Grt.) 11/06/96 s (4), 09/27/97 s, 10/02/98 s
- 09944 *Metaxaglaea viatica* (Grt.) 01/05/98 i, 10/27/98 s
- 09945.2 *Metaxaglaea violacea* Schweitzer 11/06/96 s (2), 12/01/96 s, 02/28/98 i, 10/27/98 s
- 09946 *Epiglea decliva* (Grt.) 11/06/96 s (4), 11/18/96 s (3), 11/19/96 s
- 09950 *Chaetaglaea sericea* (Morr.) 10/10/98 s, 10/10/98 s ?, 10/15/98 s, 10/27/98 s
- 09952 *Eucirroedia pampina* (Gn.) 11/06/96 s, 11/25/96 s, 10/01/97 s, 09/26/98 m
- 09957 *Sunira bicolorago* (Gn.) 11/05/96 i, 11/06/96 s (7), 11/07/96 i, 11/17/96 s,
11/18/96 s (2), 11/19/96 i, 10/11/97 i, 10/12/98 s
- 09961 *Anathix ralla* (Grt.&Rob.) 09/15/97 s(2), 09/18/97 s, 08/30/98 m, 09/10/98 m, 09/26/98 m
- 09989a *Sutyna privata teltowa* (Sm.) 09/27/97 s, 09/29/97 b, 10/06/97 s, 09/25/98 i
- 10014 *Psaphida rolandi* (Grt.) 03/10/97 i

Noctuidae (continued)

10016 <i>Psaphida styracis</i> (Gn.)	03/28/98 m
10019 <i>Psaphida resumens</i> Wlk.	03/01/98 i, 3/04/98 i (2), 04/03/98 m ?
10021 <i>Copivaleria grotei</i> (Morr.)	03/30/97 b, 03/19/98 m
10059 <i>Homohadena badistriga</i> (Grt.)	06/19/97 i ?, 06/27/97 b ?
10065 <i>Homohadena infixa</i> (Wlk.)	06/01/97 i ?, 05/30/98 b ?, 06/24/98 m ?
10288 <i>Orthodes detracta</i> (Wlk.)	06/05/97 i, 06/09/97 s, 06/12/97 i, 06/15/97 s (2), 06/16/97 s, 07/02/97 s, 08/24/97 s, 08/25/97 s, 09/07/97 s, 05/30/98 b, 06/01/98 b?, 06/13/98 m, 06/16/98 m, 06/18/98 m(2), 06/24/98 m
10289 <i>Orthodes goodelli</i> (Grt.)	07/07/97 i, 08/21/97 s, 06/16/98 i, 06/18/98 m, 08/02/98 s, 08/11/98 s
10291 <i>Morrisonia latex</i> (Gn.)	06/26/97 i, 05/03/98 m
10304 <i>Trichordestra legitima</i> (Grt.)	09/11/97 s, 06/13/98 m, 08/20/98 m, 08/22/98 m ?
10368 <i>Lacinipolia meditata</i> (Grt.)	09/19/97 i, 09/21/97 s, 09/22/97 s (2) ?, 09/24/97 s ?, 09/26/97 i ?, 09/28/97 i ?, 09/13/98 s ?, 09/16/98 i ?, m ?, 09/20/98 m, 09/22/98 m ?, 09/25/98 m, m?
10372 <i>Lacinipolia anguina</i> (Grt.)	05/02/98 m
10397 <i>Lacinipolia renigera</i> (Steph.)	05/11/97 b, 05/16/97 b, 05/22/97 i(2), 06/01/97 i, 06/07/97 i ?, 06/18/97 b, 09/06/97 s, 09/11/97 s (4), 09/18/97 s, 09/24/97 s, 04/26/98 i, 09/12/98 s
10411 <i>Lacinipolia laudabilis</i> (Gn.)	09/02/97 b, 09/11/97 s (2), 09/02/98 s, 09/03/98 m, 09/10/98 m
10414 <i>Lacinipolia implicata</i> McD.	09/11/97 s, 09/27/97 s, 09/25/98 i
10438 <i>Pseudaletia unipuncta</i> (Haw.)	11/05/96 s, 11/18/96 s, 03/29/97 i (2), 05/03/97 i, 07/01/97 b, 07/13/97 i, 07/20/97 b, 8/18/97 i, 08/02/98 s
10445 <i>Leucania linda</i> Franc.	11/06/96 s, 06/12/97 s, 06/15/97 s, 08/21/98 m, 10/21/98 s
10456 <i>Leucania adjuta</i> (Grt.)	09/01/98 s
10461 <i>Leucania ursula</i> (Fbs.)	05/25/97 b, 06/02/97 i, 06/14/97 i ?, 06/16/97 b, i, 08/11/97 i, 08/13/97 i, 08/21/97 b, s, 09/07/97 s, 06/13/98 m, 08/07/98 m, 08/09/98 s, m, 08/10/98 s
10487 <i>Orthosia rubescens</i> (Wlk.)	03/26/97 i, 03/28/98 m
10488 <i>Orthosia garmani</i> (Grt.)	03/11/97 b, 02/25/98 i, 03/01/98 i
10495 <i>Orthosia hibisci</i> (Gn.)	03/02/97 i, 03/11/97 b, 03/27/97 i, 03/28/97 b, 03/30/97 b, 02/28/98 i (3), 03/18/98 m, 03/28/98 m
10501 <i>Crocigrapta normani</i> (Grt.)	03/31/98 m
10502 <i>Himella intractata</i> (Morr.)	04/11/97 b, 04/28/97 b
10517 <i>Egira alternans</i> (Wlk.)	04/06/97 i, 04/11/97 b (2), i, 03/30/98 m, 04/18/98 m ?
10518 <i>Achatia distincta</i> Hbn.	03/28/97 i, 05/03/97 i, 03/28/98 m
10521 <i>Morrisonia confusa</i> (Hbn.)	04/07/97 b (2), 04/26/97 b, 04/28/97 b, 04/30/97 b (2), i, 05/10/97 i, 04/08/98 i, m, 04/12/98 m, 04/14/98 m ?, 04/15/98 m, 04/26/98 m, 05/01/98 m, 05/10/98 m
10524 <i>Nephelodes minians</i> Gn.	09/18/97 s, 09/19/97 i, 09/21/97 s (2), 09/25/97 s, 09/27/97 b, s, 09/16/98 m, m ?, 09/26/98 m
10532b <i>Homorthodes lindseyi</i> (Benj.)	05/18/97 b, 09/11/97 b, 04/30/98 m, 05/11/98 m ?, 05/16/98 i?, 05/17/98 m

Noctuidae (continued)

10567 <i>Ulolonche culea</i> (Gn.)	05/08/97 i, 05/25/97 b, 04/25/98 m, 04/26/98 m, 04/30/98 m?
10585 <i>Orthodes crenulata</i> (Btlr.)	05/08/97 b, 09/11/97 s, 09/22/97 s, 09/29/97 s, 06/17/98 m
10587 <i>Orthodes cynica</i> Gn.	05/17/98 i
10627 <i>Tricholita signata</i> (Wlk.)	08/22/97 i, 08/21/98 m, 09/03/98 m
10648 <i>Agrotis gladiaria</i> Morr.	10/04/97 i, 10/13/98 s
10651 <i>Agrotis venerabilis</i> Wlk.	10/12/97 i, 10/12/98 m
10663 <i>Agrotis ipsilon</i> (Hufn.)	10/30/96 i, 11/18/96 s (2), 11/19/96 s, 07/01/97 b, 09/06/97 b
10664 <i>Agrotis subterranea</i> (F.)	06/11/98 i ?, 08/02/98 m, 10/25/98 s
10675 <i>Feltia tricola</i> (Lint.)	08/16/98 m
10676 <i>Feltia herilis</i> (Grt.)	09/02/97 b
10870 <i>Richia acclivis</i> (Morr.)	09/02/97 s
10891.1 <i>Ochropleura implecta</i> Laf.	04/30/97 b, 05/28/98 b
10903 <i>Euagrotis illapsa</i> (Wlk.)	05/29/97 i, 07/13/97 i, 07/27/97 b, 05/16/98 m, 06/02/98 b, 07/09/98 m, 08/25/98 m
10911 <i>Anicla infecta</i> (Ochs.)	08/10/97 b
10915 <i>Peridroma saucia</i> (Hbn.)	08/01/98 s, 08/02/98 s, 10/02/98 s
10942.1 <i>Xestia dolosa</i> Franc.	05/25/97 b, 07/16/97 b, 09/09/97 i, 09/22/97 s, 09/29/97 s
10944 <i>Xestia smithii</i> (Snell.)	09/12/98 m ?, s, 09/30/98 s, 10/02/98 s
10950 <i>Pseudohermonassa bicarnea</i> (Gn.)	09/01/98 s, 09/14/98 s ?
10955 <i>Agnorisma badinodis</i> (Grt.)	10/13/97 s, 10/19/97 s (2), 10/10/98 s (2), 10/14/98 m ?
10956 <i>Agnorisma bollii</i> (Grt.)	10/19/98 m
10967 <i>Xestia elimata</i> (Gn.)	10/06/97 b, 10/11/97 s
10969 <i>Xestia dilucida</i> (Morr.)	10/06/97 b?, 11/01/97 i, 09/22/98 m
10994 <i>Cerastis tenebrifera</i> (Wlk.)	03/21/97 i, 02/25/98 i, 03/28/98 m, 04/02/98 m
10998 <i>Choephora fungorum</i> Grt.&Rob.	10/04/97 i, 10/10/98 m
11006 <i>Protolampra brunneicollis</i> (Grt.)	09/15/97 b, 09/22/98 m
11029 <i>Abagrotis alternata</i> (Grt.)	10/10/98 m, 10/25/98 s
11068 <i>Heliocoverpa zea</i> (Boddie)	08/22/97 i, 09/30/97 i, 08/16/98 m, 09/03/98 m
11070 <i>Heliothis subflexus</i> Gn.	08/25/97 i
11071 <i>Heliothis virescens</i> (F.)	09/02/98 s
11072 <i>Heliothis phloxiphagus</i> G.&R.	08/09/98 m
11118 <i>Schinia obscurata</i> Stkr.	06/19/97 i
11128 <i>Schinia arcigera</i> (Gn.)	08/26/97 i, 07/22/98 m
11149 <i>Schinia trifascia</i> Hbn.	08/07/97 i

Grass Spiders of the Genus *Agelenopsis* in Virginia (Araneida: Agelenidae)

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INTRODUCTION

Six species of the Nearctic spider genus *Agelenopsis* occur in eastern North America, five of them native to Virginia. The one nonresident, *A. potteri* (Blackwall), is a transcontinental boreal species ranging from New England to Washington and California, which apparently does not extend southward through the Appalachians. The genus was revised by Chamberlin & Ivie (1941) in an adequate, well-illustrated treatment that left little to be desired except distribution maps.

The members of this genus are not uncommon elements in forest-floor biotopes as well as in open grassy fields and residential-domiciliary situations. Ongoing inventory collecting during the past decade by personnel of the Virginia Museum of Natural History (VMNH) and Virginia Division of Natural Heritage (VDNH), as well as several local naturalists, has yielded sufficient material to define both the instate geographic ranges and periods of adult activity for all five of our resident species. I take this opportunity to summarize such information for the use of anyone wishing to pursue investigations of the biology of these spiders.

MATERIALS AND METHODS

Data on the Virginia distribution of each species have been derived solely from material in VMNH, except for a few collections cited by Chamberlin & Ivie (1941). Undoubtedly, additional records can be obtained from other spider collections, but I doubt that these would significantly alter the findings presented here.

The majority of specimens examined were captured by use of the pitfall-drift fence technique. Most of these installations were serviced at two-week intervals, allowing for a reasonable degree of precision with respect to adult surface activity. Some material, particularly of

A. naevia, was collected by hand, as spiders were found on and around buildings.

Identifications were made with the Chamberlin & Ivie revision (1941) which allows recognition of adults of both sexes. Although reproductive structures provide the most definitive characters, some species can be distinguished by size (*A. naevia*) or color (*A. utahana*), as noted under the individual species accounts that follow. In developing the time intervals on the graph (Fig. 3), account was taken that the label date for pitfall material was that of the pick-up day, and generally covered the two preceding weeks. Thus, samples dated May 1, for instance, were graphed as being from the last two weeks of April. Data from the many sites operated on monthly or longer trapping intervals could not be utilized for the graph.

FAMILY AGELENIDAE

The traditional scope of this family, as expressed in the treatments by Gertsch (1940), Kaston (1948), and Roth & Brame (1972), has been substantially abridged in recent years by the relocation of many genera to other families (e.g., *Wadotes* and *Coras* to the Amaurobiidae, *Cicurina* to the Dictynidae, *Cryphoeca* to the Hahniidae, and *Cybaeus* to its own family). The remaining Nearctic elements of this more exclusive Agelenidae are basically those taxa treated by Chamberlin & Ivie in 1941: *Agelenopsis*, *Barronopsis*, *Calilena*, and *Tortolena* (plus the genera *Hololena*, *Melpomene*, *Novalena*, *Rualena*, added later).

Local species of *Agelenopsis* can be readily distinguished from other ground-dwelling spiders by the elongated posterior spinnerets alone (Fig. 1). Characters requiring use of magnification are the eight eyes in two strongly procurved rows and presence of plumose setae on the body and appendages.

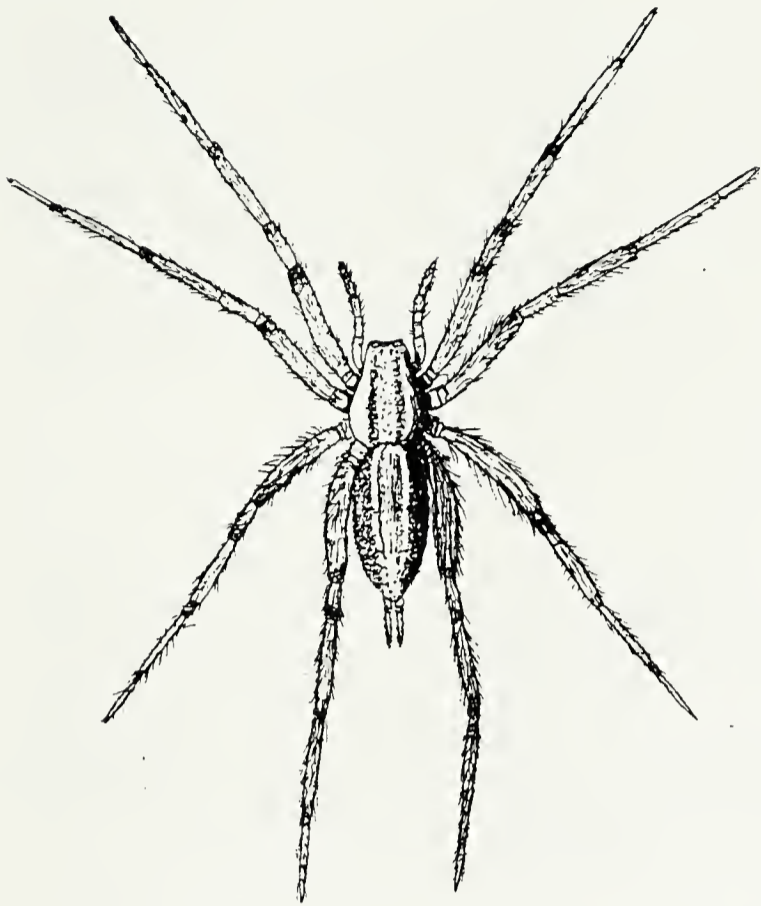


Figure 1. Generalized composite drawing of a species of *Agelenopsis* to show overall appearance and notably long spinnerets.

Females construct sheet webs, often of considerable size, in low grass and other herbage. There is always a retreat tunnel through which the spider escapes from any disturbance (Fig. 2), and attempts to capture such an animal require prior location and closure of the retreat. These webs lack sticky lines, and prey items are captured by rapid response by the spider to movements on the web. The majority of specimens taken in pitfall traps are males, suggesting greater vagility by that sex, and less involvement in web construction, as is usual for many spider taxa. Immature specimens of this genus have only rarely been caught in the Virginia pitfalls.

Agelenopsis emertoni Chamberlin & Ivie (Map 1)

Published records for this species (Chamberlin & Ivie, 1941: 503) implied a basically lowland range extending from New England to Florida, and west to Texas. Without giving specific localities, Seyler (1941) recorded *A. emertoni* also from Ohio. Muma (1945) listed Allegany, Anne Arundel, and Prince Georges counties in Maryland.

Virginia collections suggest that the species is statewide, from sea level to about 3600 ft/1160 m in the Alleghenies, and occurs in all of the five physiographic provinces. Material is at hand from the counties of Accomack, Bath, Cumberland, Dickenson, Franklin,



Figure 2. Adult male *Agelenopsis* sp. on web constructed beside a building; the curved white line is an insulated electrical wire. Note retreat tunnel directly behind the spider. Photograph by Steven M. Roble.

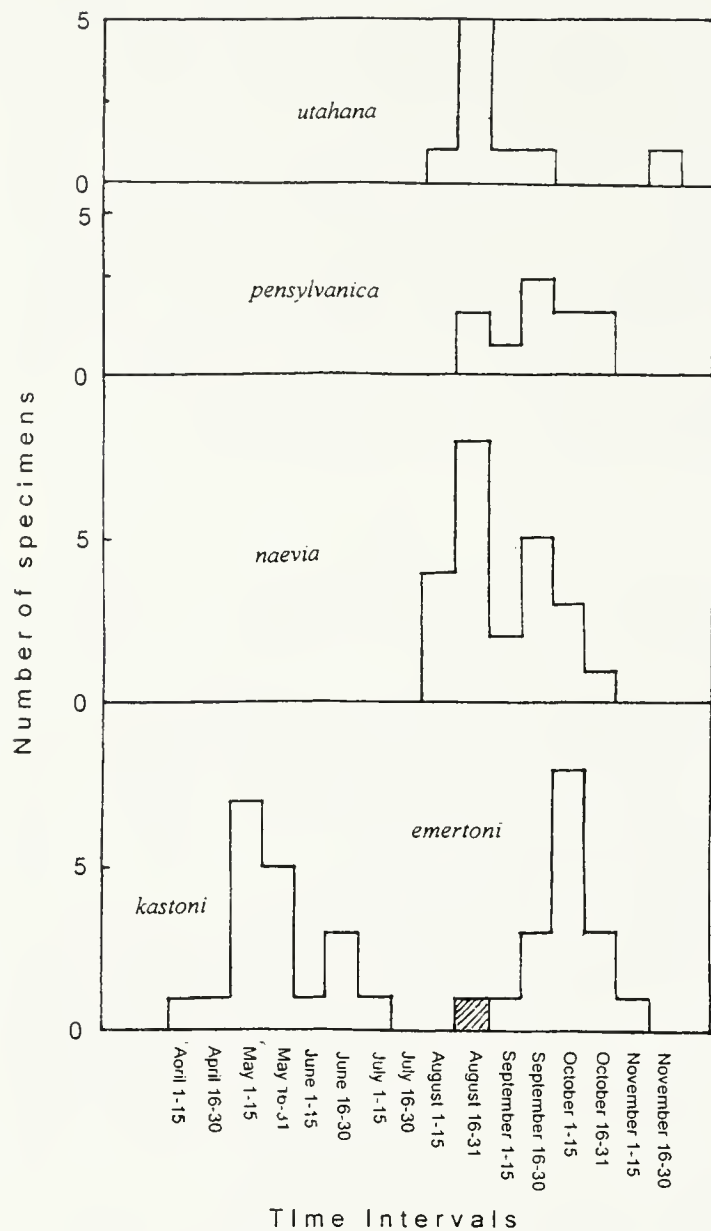


Figure 3. Seasonal surface activity of adults of the five Virginian species of *Agelenopsis*, based on samples (VMNH) taken during the years 1988-1999. The late August record for *A. emertoni* (shaded) is based on an immature male identified as this species with some confidence.

Greensville, Henry, Montgomery, Roanoke, and the City of Virginia Beach (all VMNH). Chamberlin & Ivie (1941) cited specimens from Spotsylvania and Prince George counties. Capture site data indicate that a wide variety of habitats are occupied: dune scrub, interdunal swales, grassy dunes, salt marsh, dry oak woods, pine woods, montane bog. One specimen was taken in a Malaise trap in Greensville County; three males have been found inside the VMNH building in Martinsville. It is therefore the more curious that *A. emertoni* was never taken in many of the pitfall arrays operated on a year-round basis throughout the state. In addition to being sporadically distributed, *A. emertoni* has been

captured in small series (3-5 specimens in a single trap period) only in Virginia Beach City and Cumberland County. Other samples contain typically a single male, implying a low population density. This species has the latest adult activity period of the five Virginia species, extending from early September to early November, with the peak during October 1-15. The single record for late August is of an immature male, almost certainly of this species (shaded on the graph, Fig. 3).

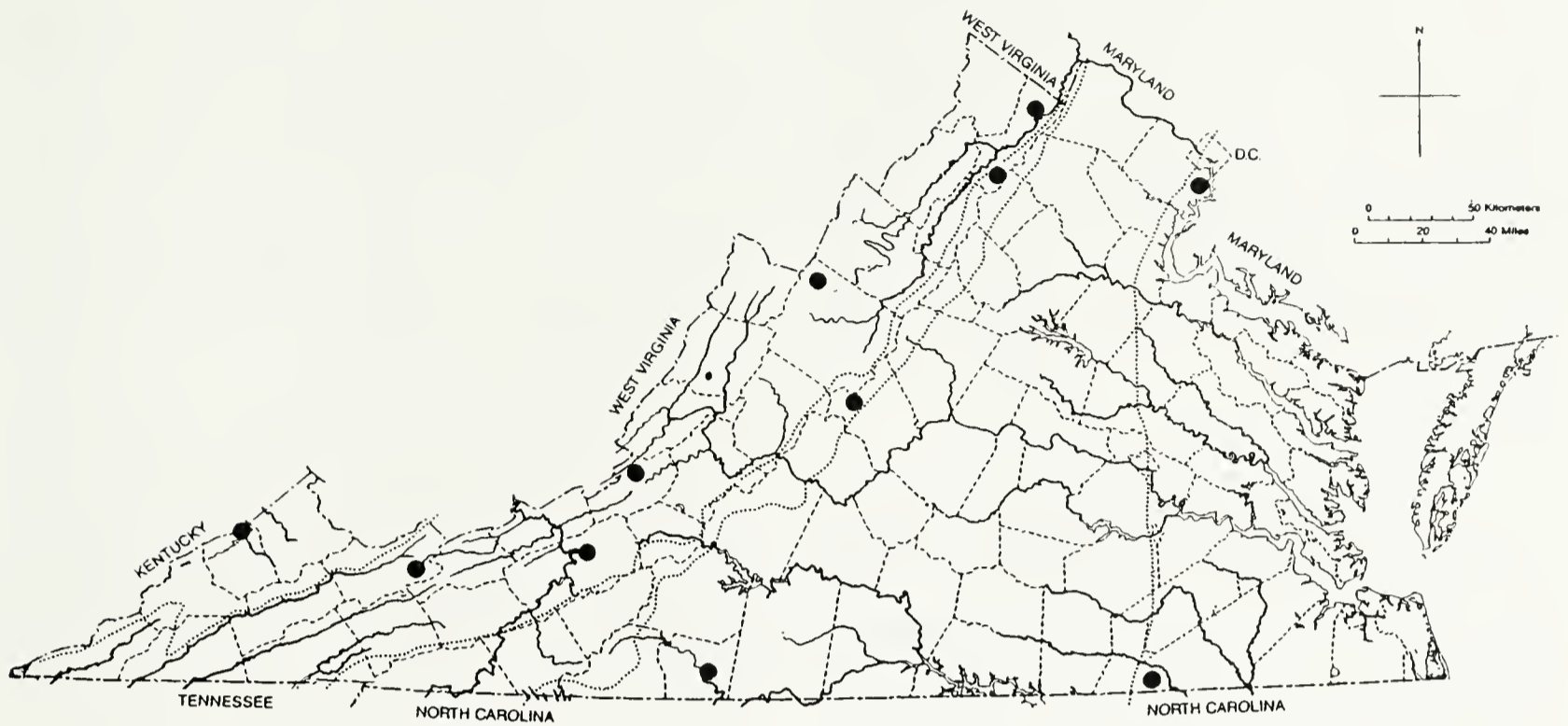
Agelenopsis kastoni Chamberlin & Ivie (Map 2)

Although this species was described sixty years ago, and is certainly abundant in eastern Virginia, remarkably little has been published about it. Kaston (1948: 290) cited three localities in Connecticut, which must be at or near the northernmost limits of the range. Muma (1945) mentioned the occurrence of *A. kastoni* in Maryland, although without having collected it personally there and providing no specific locality. Berry (1970) recorded the capture of a few specimens in the central Piedmont region of North Carolina. VMNH specimens are from Cumberland, Dinwiddie, Henrico, King George, Mecklenburg, Northampton, Prince William, and York counties, and the cities of Chesapeake and Virginia Beach (Map 2). In contrast to the similar-sized *A. emertoni*, *A. kastoni* is taken in pitfalls in far greater numbers: our largest samples contain 16, 15, 15, 14, 13, 13, 11, 9 and 7, all males. Although the impression is gained of a coastal species, three of the largest samples (15, 15, 14 specimens) are from Cumberland County, the inlandmost site for *A. kastoni* in Virginia. Perhaps the species is extending its range westward across the Piedmont?

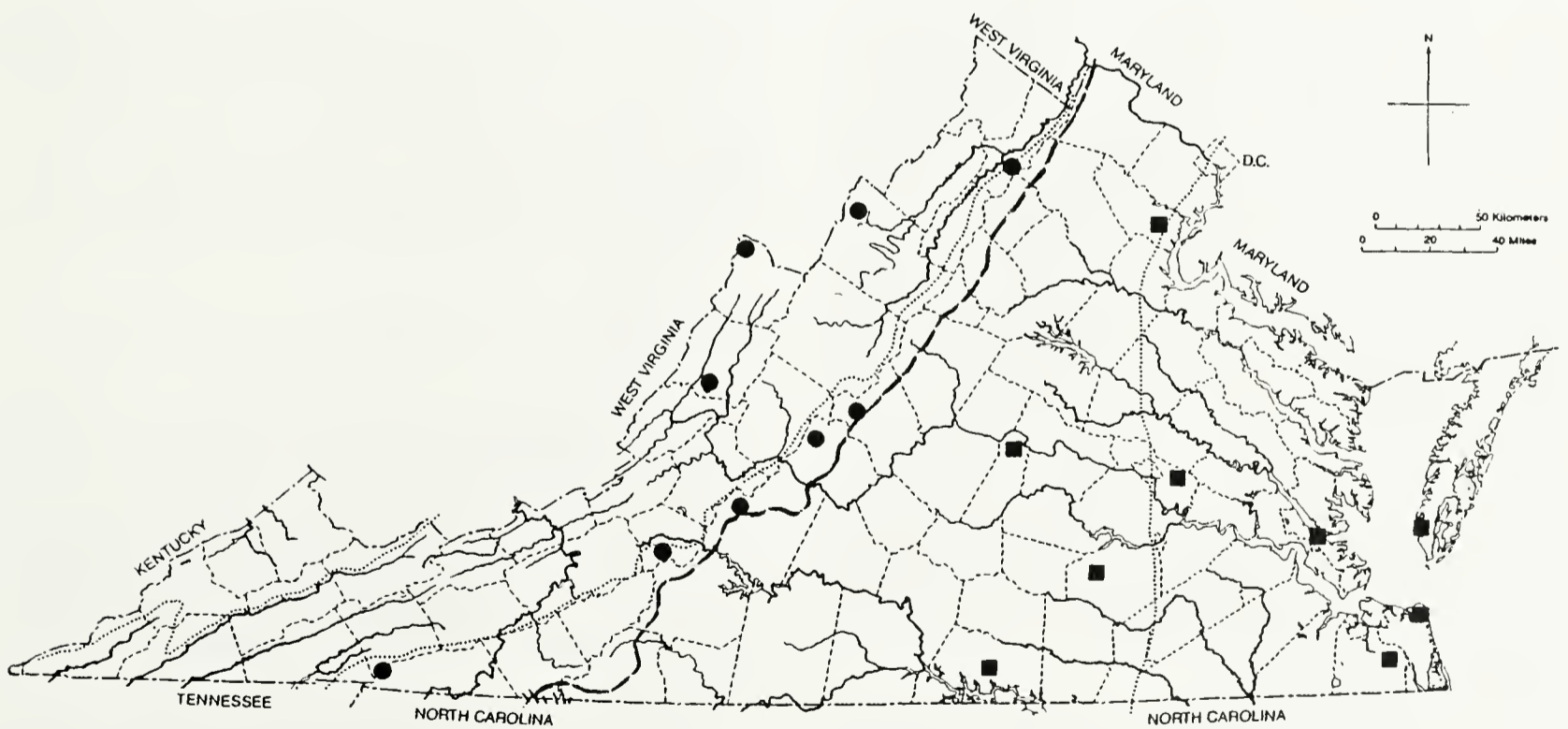
Already in 1948, Kaston observed that "This species matures early; males occurring in May and June." Virginia collections amply confirm that statement, as evident from the graphed data (Fig. 3). Here, males mature even earlier, as we have specimens from pitfalls accumulating during the first two weeks of April. Peak activity occurs in May, with a gradual decline into early July (our single male with that date could have been trapped anytime in the preceding two weeks, thus possibly late June). A gravid female was taken on 22 June 1995.

Some of the samples were taken from pitfalls which also trapped *A. emertoni* a few months later in the year. As these two species are about the same size, perhaps the seasonal displacement is a device to avoid direct resource competition in their shared niche.

The frequency of captures of this species in Virginia,



Map 1. Distributional records for *Agelenopsis emertoni* in Virginia. This species, despite the paucity of localities, is almost certainly statewide except perhaps for higher elevations.



Map 2. Distributional records for *Agelenopsis kastoni* (squares) and *A. utahana* (spots) in Virginia. The range of the latter species is a function of elevation; most localities shown are above 1000 m. The eastern edge of the Blue Ridge physiographic province is indicated by the broken line.

as opposed to the paucity of published records for it, instigated a superficial investigation into the actual range of *A. kastoni*. This, it develops, is far greater than I had imagined likely, and extends as far west as Washington County, Arkansas, and as far north inland as Knoxville, Tennessee, a fairly typical Austral distribution. Almost certainly, greater use of pitfall trapping will show that the species is as abundant throughout this range as it is in Virginia. It is therefore remarkable that *A. kastoni* was not described until 1941, and even then, from a few specimens at the extreme northern extremity of its range.

Agelenopsis naevia (Walckenaer) (Map 3)

This is the largest member of the genus in Virginia, in fact one of our largest spiders, the females attaining nearly 25 mm in length. It is also the one most frequently seen; at least the big webs are conspicuous objects in grass or low shrubs, and in the angles of outbuildings, even if the occupant is not in view. I have sometimes found adult females attracted to lights on the sides of buildings in late Fall, and females of *A. naevia* seem somewhat more liable to capture in pitfalls than their relatives.

Published records for *A. naevia* depict an extensive range in the United States east of the Great Plains. Virginia localities suggest statewide occurrence (Map 3), but none of the sites are above 3000 ft/1000 m, and we have no records for the southwestern third of the state despite pitfall trapping by both VMNH and VDNH. Perhaps this reflects inadequate sampling, as there is no *a priori* reason why *A. naevia* should not occur there. We have specimens at hand from Augusta, Bedford, Cumberland, Henry, Roanoke, and York counties and the cities of Chesapeake and Virginia Beach. Chamberlin & Ivie (1941) cited localities in Brunswick, Fairfax, Prince George, Rappahannock, and Spotsylvania counties. Most samples contained only one individual, whether caught by hand or pitfall. It is noteworthy that only single specimens are available from Seashore/First Landing State Park in Virginia Beach, and from the Fentress Naval Aviation Landing Field in nearby Chesapeake despite the extensive trapping conducted in those and numerous sites elsewhere in the two municipalities throughout 1989 and 1990.

Like most other members of the genus, *A. naevia* is adult-active in late Summer and early Fall. The earliest captures in Virginia are from the first half of August, an obvious peak is reached later that month, and a slow decline takes place until the end of October (Fig. 3).

Agelenopsis pensylvanica (Koch) (Map 4)

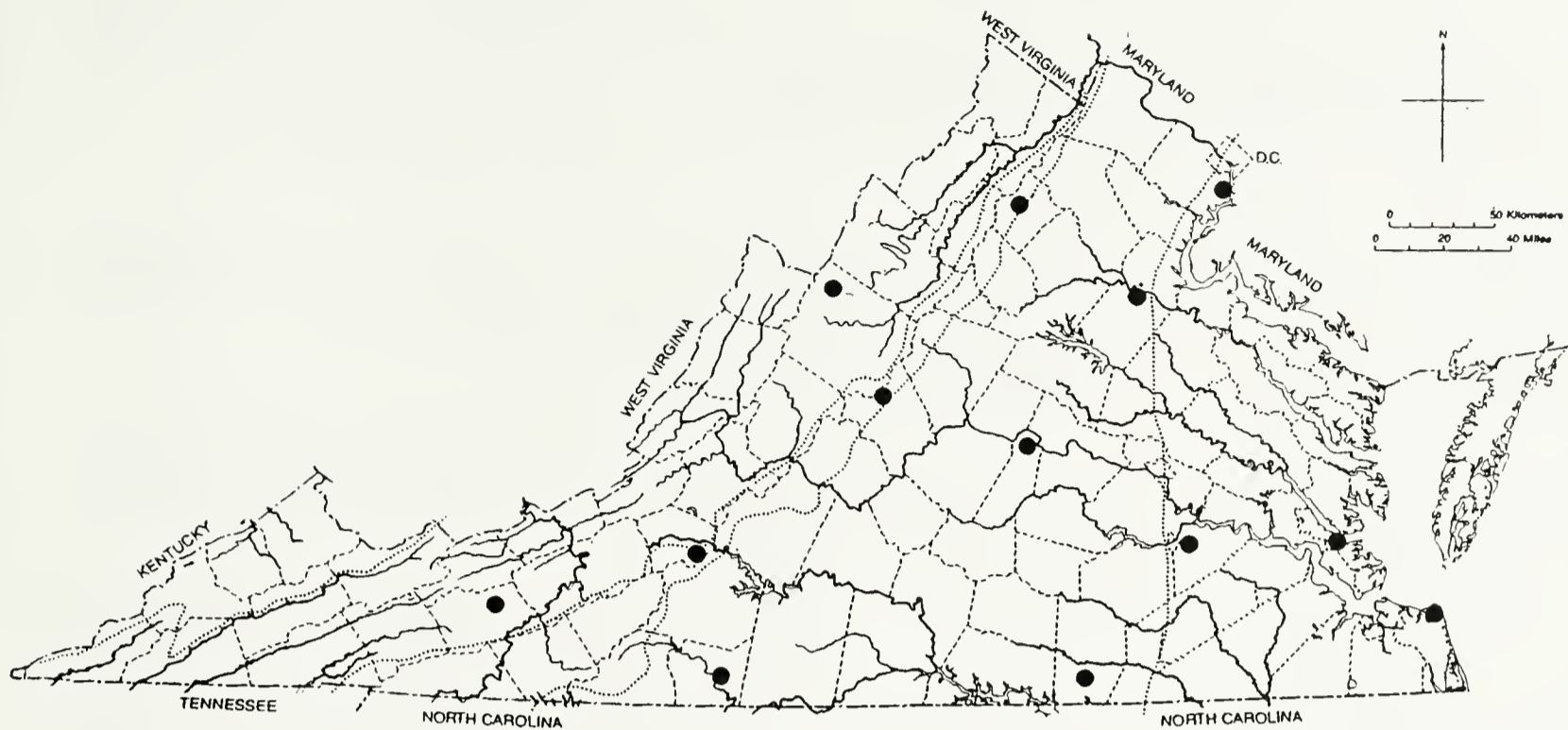
Available published data suggest that this species extends entirely across northern United States, with moderate extension southward to Virginia and Arkansas. There appear to be no records for the Southeast, and even though the Atlantic Coastal Plain has not been thoroughly surveyed for the spider fauna, present indications suggest absence of *A. pensylvanica* from that region. In Virginia, the majority of collections are from the mountains and western Piedmont. Wilton Ivie found a male at Mount Vernon, Fairfax County (on the Fall Line) in 1938, and two males entered a Malaise trap operated by VMNH beside the Meherrin River, southeast of Emporia, Greensville Co., the only actual Coastal Plain locality for the state. Considering the extent and intensity of collecting activity in eastern Virginia during the past decade, the absence of other records must be considered as conclusive. In this respect, it may be noted that Muma (1945) cited no Coastal Plain localities in Maryland.

Virginia specimens of *A. pensylvanica* in VMNH are from Augusta, Bath, Clarke, Craig, Dickenson, Greensville, Henry, Montgomery, Nelson, Tazewell, and Warren counties. About half were collected by hand, as single captures, or in pitfalls, again usually one specimen in year-long sampling intervals. The one sample of any size (10 ♂♂) came from a pitfall five miles west of Stokesville, Augusta County, during the period from mid-August to mid-September 1988. Apparently population densities are always low. In a study of old field spiders in the North Carolina Piedmont, Berry (1970) obtained only one specimen of *A. pensylvanica* in the total of nearly 20,000 spiders of 331 species.

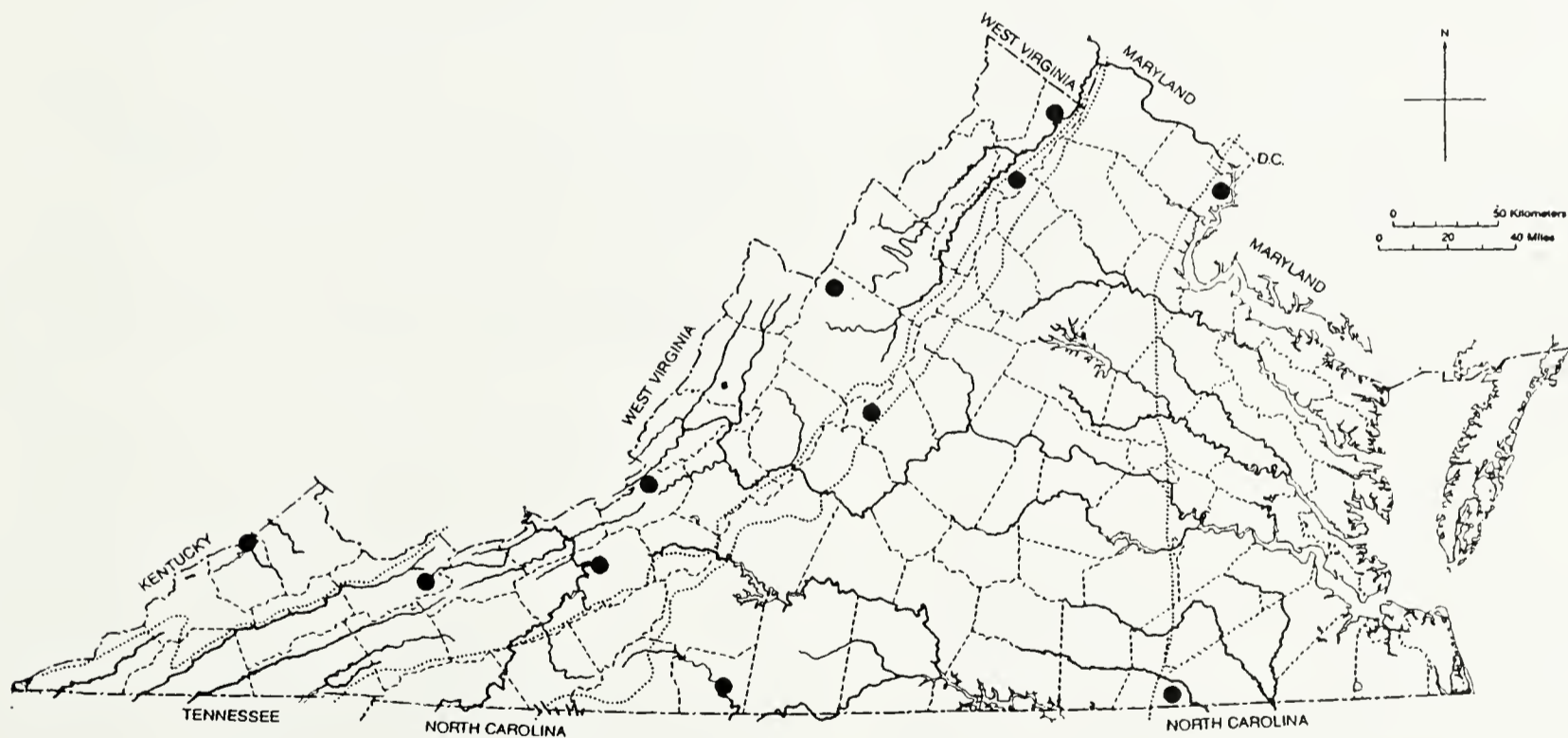
Agelenopsis utahana (Chamberlin & Ivie) (Map 2)

This small agelenid is distinctly lighter in color than its local relatives, generally a light straw yellow with darker paramedian bands on the carapace. Like *A. pensylvanica*, it is a transcontinental, subboreal species, but even more elevationally restricted. Already in 1941 Chamberlin & Ivie reported a female from Spruce Pine, North Carolina, then the only Appalachian locality south of New York.

Virginia records are from Amherst, Augusta, Bath, Bedford, Grayson, Highland, Nelson, Roanoke, Rockingham and Warren counties, all sites but two being well above 3000 ft/1000 m, in broadleaf forest. Pitfalls operated five miles west of Stokesville, Augusta County,



Map 3. Distributional records for *Agelenopsis naevia* in Virginia. Despite the lack of records for some areas, this species is probably statewide, except perhaps for the two Eastern Shore counties.



Map 4. Distributional records for *Agelenopsis pensylvanica* in Virginia. The apparent absence of the species from the Coastal Plain has been documented also for Maryland (Muma, 1945). The lack of Piedmont localities is noteworthy and may imply disjunct status for the population in, for instance, Greenville County.

at an elevation of 2200 ft/700 m, yielded 10 samples between mid-May and mid-October, with the largest number during early September. The Warren County site, four miles southeast of Front Royal, is at 1200 ft/400 m. Data from these two sites, representing monthly or longer intervals, could not be used for the graph.

At the Augusta County site, in the folded Appalachians on Devonian shale substrate, pitfalls were dispersed among three forest stages: recovering from clearcut (two years old), mature red oak forest (around 70 years), and old growth (>138 years). Captures of *A. utahana* sorted out as: two years, 8; mature forest, 9; old growth, 12, reflecting a degree of preference for established forest biotopes, although areas with no canopy were not avoided either.

On 16 August 1999, Robert S. Hogan and Michael W. Donahue found both sexes of *A. utahana* to be abundant in webs constructed in the upper leaves of milkweed (*Asclepias* sp.) plants at the top of Poor Mountain, Roanoke County.

ACKNOWLEDGMENTS

The majority of specimens examined in connection with this survey were taken in trapping programs operated by the Division of Natural Heritage, Virginia Department of Conservation and Recreation, and I am very much indebted to VDNH zoologists Christopher A. Pague, Kurt A. Buhlmann, and Steven M. Roble for depositing this material in the VMNH. Our collections have also been enriched by donations of material from personal field work by Joseph C. Mitchell, Robert S. Hogan, and Michael W. Donahue. VMNH technician Susan C. Kirby tabulated data and prepared the distribution maps. My colleagues Norman I. Platnick

(AMNH), Laura Leibensperger (MCZ), Susan Riechert (University of Tennessee), and Patricia Miller (University of Mississippi) kindly provided records for *Agelenopsis kastoni*.

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Records and Habitats of the "Rare Click Beetle," *Cerophytum pulsator* (Haldeman), in Virginia and Maryland (Coleoptera: Cerophytidae)

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The "rare click beetles" make up a small family of 10 species in the Americas and Europe (Lawrence, 1991) and are enigmatic in many ways. The single species known from the eastern United States, *Cerophytum pulsator*, has a wide range, but lives up to its common name in being infrequently found. "Pennsylvania to Illinois to North Carolina" was the distribution known to Horn (1886). Nearly a century ago, three specimens were reported from the District of Columbia (Ulke, 1902). Dury (1902) reported a specimen from Ohio, which Blatchley (1910) noted but, lacking specimens from Indiana when he listed the beetles for that state, said it "is doubtless represented." Sixty years later, Downie (1970) confirmed this, with a single record from Tippecanoe County. A record from Bay County, Florida (Peck & Thomas, 1998) extends the known range considerably southward. Several recent collections of *C. pulsator* in our area have aroused interest, but, to my knowledge, no occurrences have been published for this region since Ulke's listing. Reported here are new collection records and some associated notes on the habitat and seasonal occurrence of this seldom-collected beetle.

Little information is available on the life history of *C. pulsator*. Only the larva and habitats of the European species are described (Lawrence, 1991), and the feeding habits are apparently unknown. Adult *C. pulsator* have been "swept from foliage or taken from rotting wood or under dead bark" (White, 1983). The beetle is described and illustrated in general references on North American beetles (Arnett, 1960; White, 1983).

Material Examined and Label Data.-- The specimens

cited here are in the collections of the U.S. National Museum, Smithsonian Institution, Washington, DC; the Virginia Museum of Natural History, Martinsville, VA; and the Maryland Department of Agriculture, Annapolis, MD.

Label data are quoted verbatim except for some commas (inserted for clarity) and bracketed letters that spell out or interpret abbreviations. A forward slash "/" indicates a break between labels on the same pin.

Maryland Records.-- 1 male, "Plummer Is, Md., 4.V.[19]24, R C Shannon, on foliage [sic]"; 1 male, "MARYLAND: Pr. Geo. Co., Cheverly, 38°56'N, 76°55'W, 29 March 1998, coll. W. E. Steiner & J. M. Swearingen / At black light at ground level, mixed broken forest and residential area"; 1 male, "Col[lector]. D. Jump, 11 V 1977, Port Deposit, [Cecil County] Maryland USA"; 1 female, "USA: Maryland: Somerset Co., nr Princess Anne, ex S[outhern]. P[ine]. B[eetle]. Lindgren trap, 10 May 1989, Md. Dept. Agric."

Virginia Records.-- 1 female, "VIRGINIA: Clarke Co., U. Va. Blandy Exp. Farm, 2 mi. S. Boyce, 39°05' N, 78°10' W, 28 iv - 10 v 1993, Malaise trap, D. R. Smith"; 2 females, "VIRGINIA: Essex Co., 1 mi. S. of Dunnsville, 11 April 1991, J. Kloke & D. R. Smith, Malaise trap"; 1 female, "VIRGINIA: Fairfax Co., 4 km. SW Clifton at Bull Run, 23 April 1983, W. Steiner, A. Gerberich, E. Bishop & J. Boyd"; 1 male, "VIRGINIA: Fairfax Co., Great Falls Park, 29 March 1979, Amnon Friedberg"; 1 female, "Quinton, Va., [New Kent Co.] Under log / U. of Richmond, Va., Mch. 30, 1936, Carroll Williams, Coll. / Rec'd from J. W. Bailey, Apr. 13, 1936,

Fisher / 259"; 3 males, 1 female, "VIRGINIA: York County, 12 km NNW Williamsburg, 37°21'N, 76°44'W, 7-8 March 1992, W. E. Steiner & J. M. Swearingen."

Other Records.— 1 male, "ALAB[AMA], Blount Co., Blount Spr[ings]., 13 April 1985, light trap, T. King."

Field Notes and Discussion.-- The recent collection records offer new information on the habits and habitats of *C. pulsator*. Seasonal appearance of the beetles is limited to the generally cooler months of spring, but activity of the beetle may be limited to "warm spells" during that period. The Cheverly, MD, specimen taken at black light suggests that this species can fly (although this has never been observed), and that it does so after dark. Notes taken on this collection indicate an unusually warm spring night, with early flight records for a number of Tenebrionidae and other beetles: "Was 80° F. at dark; breeze from south. Clear but only thin crescent moon." At this site, black lights have been operated on most non-rainy and warmer nights of the year since 1992, one at ground level and the other in tree canopy (from a roof deck ca. 5 m above ground) and insects are selectively taken or observed on white vertical and drop-cloth sheets from dusk until about 2300 h. This was the only *Cerophytum* ever seen at these lights. The additional light-trap record and the capture of *C. pulsator* in the Lindgren and Malaise traps also suggest flight for both sexes as a means of dispersal.

There are several records of the beetle under wood or leaf litter and often at the bases of live trees in mature forest. Ulke (1902) reported "three specimens found under chips and stones in early spring." The Bull Run specimen (in field notes of the author) was found with *Helops* and *Tarpela* spp. (Tenebrionidae) under leaf litter on damp humus at the base of a "big old beech" on a mature forest slope. The four from the Williamsburg site were found in mixed oak-maple-loblolly pine forest, near disturbed edges at the bases of red maple (*Acer rubrum*) trees, again on damp humus but on more level ground. Two males were found after dark on 7 March: "Thunderstorm on the way at 9:30 [P.M.]; had a few minutes to check on tree trunks for beetles around the lot before storm hit; about 68°F. No tenebrionids out, but a rare catch--2 *Cerophytum* out walking on base of live red maple; one at ground level & one 15 cm off ground. Ground around this tree mostly bare except for thin sparse moss patches; not much leaf litter. Tree is about 35 cm DBH; stands near house at edge of drive and garden areas." The two additional specimens were found the following morning: "Storm over; mostly clear tree, early....70°F....at same red maple and a second adjacent

took two more *Cerophytum*--female under a small piece of bark on ground, about 30 cm from tree base; male under leaf layer at base of second tree. They click like elaterids when held." Before being preserved as specimens, the latter two beetles were kept in captivity for about 3 days with some substrates on which they were found (soil with moss, leaf litter, lichen-covered bark) and observed periodically, but no feeding or other activity was noted, other than walking over all surfaces.

The Great Falls specimen was taken by sweeping low vegetation during the day (A. Friedberg, pers. comm.) as was the one reported by Downie (1970), and both of these were in mature deciduous forest understory. The Ohio specimen (Dury, 1902) was beaten from foliage. These records and the label data on the Plummers Island specimen indicate that, while *C. pulsator* seems to be nocturnal and hides during the day, it may rest above ground as well as on it. The Malaise trap collections were also from sites of mature forest (D. R. Smith, pers. comm.). The 1924 specimen from Plummers Island was taken when the vegetation was a mixture of early successional upland and mature floodplain and swamp forest (Erwin, 1981). The beetle has now been collected in a number of ways, but its preferred microhabitat and feeding habits are still to be discovered. From the combined collection data, *C. pulsator* appears to be a vernal, flying, nocturnal beetle of mature, mostly deciduous forests. This information offers some leads to the discovery of its immature stages and an understanding of its niche, and may reveal that it is not as rare as currently believed.

ACKNOWLEDGMENTS

Richard L. Hoffman, Virginia Museum of Natural History, provided some specimen records, encouraged the making of this note, and reviewed drafts of it. Natalia J. Vandenberg, Steven M. Roble, and one anonymous reviewer also gave helpful editorial advice. Gaye L. Williams, Maryland Department of Agriculture, called my attention to other records and provided data. The assistance and information obtained from the other collectors cited in the label data are much appreciated. Margaret and Glenn Davis provided much hospitality and encouraged the collection of insects on their woodland near Williamsburg.

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Mass Mortality of Red-spotted Newts (*Notophthalmus viridescens viridescens* Rafinesque) on a Central Virginia Road

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Large numbers of amphibians and reptiles are killed annually on highways and roads in North America by vehicular traffic (Carpenter & Delzell, 1951; Dodd et al., 1989; Rosen & Lowe, 1994; Fahrig et al., 1995; Ashley & Robinson, 1996). Roads located near or adjacent to wetlands pose special problems for amphibians, especially those that move to and from terrestrial retreats to breeding sites on a seasonal basis (Palis, 1994). Road mortality in pond-breeding ambystomatid salamanders during their breeding migrations has been observed in several locations (Klemens, 1993; JCM, personal

observations). In the mountains of Virginia, red-spotted newts (*Notophthalmus viridescens viridescens*) arrive in breeding ponds in March in large breeding migrations and leave en masse in August for terrestrial hibernacula (Gill, 1978). Gill found that juveniles leave the ponds in late summer and early fall months but did not observe mass migrations. Mass migrations of juveniles have been documented in Massachusetts (Dunn, 1930; Stein, 1938; Healy, 1975), New York (Hulbert, 1969, 1970), North Carolina (Chadwick, 1944), and Ohio (Smith & Pfungsten, 1989), with the highest numbers occurring on

nights with rainfall. Such migrations of adults and juveniles in areas with roads increase the risk of mortality from vehicular traffic.

On 4 October 1991, I observed mass mortality of *Notophthalmus viridescens* on County Route 629 where it passes along a beaver-maintained wetland adjacent to Beaverdam Creek, 4.2 km NE Maidens, Goochland County, Virginia. I counted 182 dead and 4 live immature newts (efts) in a 0.25 km stretch of the hard surface road. Conditions of the specimens formed two categories, dry (older road kills) and moist (recent road kills), reflecting at least two periods of movement activity. These groups may have corresponded to two larval size classes like those observed in New York by Hulbert (1970). The moist group may have been killed during the rainfall of 2 October. The newts were counted but not measured due to time constraints. However, all sizes of eft were represented, ranging from very small ones to those that were showing green coloration, suggesting that they were near reproductive maturity. The stretch of road on which dead salamanders were found consisted of two sections, the part adjacent to the wetland without canopy and the part immediately to the east with partial canopy from the adjacent mixed hardwood and pine forest. Numbers of salamanders were approximately equal in both sections.

I visited the site again on several dates in 1992 and once in 1994 but did not find large numbers of dead eft. None was found on 17 April 1992, although one northern cricket frog (*Acris crepitans*) and one spring peeper (*Pseudacris crucifer*) were found dead in the wooded section of the road. I found six dead eft (mean SVL = 33.7 ± 3.1 mm, 30-37) on 1 September 1992, 10 dead eft (mean SVL = 37.4 ± 3.5 mm, 33-43, n = 8) on 17 September 1992, and eight (each 35 mm SVL, n = 2) on 29 November 1992. Most of the salamanders were found in the wooded section of the road. On 14 November 1994 I found 10 dead eft and one live eft on the section of the road adjacent to the beaver pond. I had originally hypothesized that mass migration in the fall should lead to mass mortality on this road. The large number found in October 1991 may have been a chance event or related to an unusually large production of cohorts that year. Road mortality impacts on this local population apparently occur at low intensities each year but high rates of mortality apparently do not appear to be a frequent event.

Road mortality was suspected by Hoffman (1992) to be the primary source of decline in frog populations in the Clifton Forge area of Alleghany County between the 1950s and early 1990s. Reptile populations in Virginia, especially snakes, suffer losses annually due to road

mortality (Mitchell, 1994 and unpublished). Roads fragment habitats and further contribute to declines in animal populations (Mader, 1984; Andrews, 1990). Because road construction and widening projects continue unabated, it is likely that vehicular traffic will continue to be a significant cause of red-spotted newt mortality and possible population decline in Virginia.

ACKNOWLEDGMENTS

I thank the students of the 1991 University of Richmond ecology class for help in counting the eft on the initial discovery and Wendy H. Mitchell for assistance on one other site visit.

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Aggregations of Red-spotted Newts (*Notophthalmus viridescens viridescens* Rafinesque) in the Shenandoah Valley of Virginia

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Aggregations of red-spotted newt adults on land following pond drying have been mentioned by several authors. Healy (1970) observed aggregations of adults in mud along the margin of two ponds in Massachusetts. Gill (1978) found large numbers of adult newts in decaying logs and in vegetation clumps at the edges of several ponds that had dried completely on Shenandoah Mountain, Virginia, in 1977 but did not provide details on numbers of individuals or sex ratios. Mitchell & Buhlmann (1999) noted that red-spotted newts had been observed under logs and rocks around a sinkhole pond

that had dried. This note provides the details of those observations.

I found two aggregations of adult red-spotted newts around the edges of a vernal pond at the Shenandoah Valley sinkhole pond complex in the George Washington National Forest, 3.5 km WSW Sherando, Augusta County, Virginia, in two consecutive years. On 16 October 1997, I found adults in a 25 m diameter pool of shallow water in Pond 11 (see Buhlmann et al., 1999, for descriptions of these ponds and pond number designations). The adjacent pond (Pond 12, connected to

Pond 11 in wet periods) contained only a small, muddy pool about 3 x 4 m in size. Adult newts were found individually under rocks in the pond basin (5 occurrences) and in combinations of 3 (2 occurrences), 4 (3), 5 (3), and 8 (1). The decaying end of one log contained an intertwined mass of 47 individuals. This aggregation contained 19 males and 28 females. Average SVL for males was 41.3 ± 2.1 mm (39-46) and for females it was 39.3 ± 1.6 mm (35-42).

On 30 October 1998, I found adults in several aggregations around the interior margins of a completely dry Pond 11. I observed an aggregation of 42 newts in and under one log, 12 of which were in a cluster in the moist soil (8 males, 4 females). A second log (25 cm diameter, 2.1 m long, 5 m from the water's edge) near the small pool remaining in Pond 12 contained 34 adults in close aggregation (24 males, 10 females). Numbers of other adults under other logs in the interior margins of these two ponds were 3, 4, 5, 6, 7, 9, 12, and 43; one individual was under a rock. These were not in tight aggregations but scattered under the logs. Measurements of newts found in the smaller cluster in Pond 11 were: male mean = 42.1 ± 1.5 mm SVL (40-43, n = 8), female mean = 40.0 ± 2.2 mm SVL (37-43, n = 4). Males in the larger cluster in Pond 12 averaged 41.1 ± 2.7 mm SVL (35-46) and females averaged 37.8 ± 2.7 mm SVL (33-43). A 45 mm SVL male in this cluster was dead. Other species found under logs with the newts were *Ambystoma opacum* (1 adult), *Acris crepitans* (2 adults), and *Rana clamitans* (1 juvenile).

Another nearby pond (Pond 13) with a small pool of water on the dates noted above contained adult newts. None was found under logs or rocks around the dry rim. Unlike Pond 11, this pond rarely dries (Buhlmann et al., 1999), and I have observed newts in the water in this pond on numerous occasions in the winter.

Aggregation behavior in red-spotted newts apparently occurs in response to pond drying and to individuals seeking moist microhabitats to avoid desiccation and death. Pond drying was considered the cause of adult emigration from breeding ponds in the mountains of North Carolina (Huheey & Stupka, 1965). Adult *Notophthalmus viridescens dorsalis* endure episodes of pond drying in the North Carolina sandhills by burrowing beneath debris in pond basins (Morin, 1983). Gill (1978) noted, however, that adults migrate annually from high elevation ponds on Shenandoah Mountain (about 75 km N of the ponds in the Shenandoah Valley) in the fall and return in the spring. This may be in response to shallow ponds freezing completely to the bottom. The only year in which he found aggregations

was 1977, the year in which ponds dried completely. The ponds in the Valley do not freeze completely and adult newts have been observed in the water in several ponds during winter months (JCM, personal observations). Perhaps aggregation occurs only when ponds dry completely, thus stimulating adults to seek moist microhabitats and the company of other newts. Aggregations may be a function of adults seeking other individuals for behavioral or physiological benefits or the use of limited refugia where survivorship is enhanced. Aggregation in the latter case may simply be the consequence of finding the few moist refugia available during the dry period. Experimental tests would reveal the roles of ecological stimuli and individual behaviors in the aggregation behavior of red-spotted newts.

ACKNOWLEDGMENTS

Scott Klinger and Dawn Kirk of the US Forest Service (George Washington and Jefferson National Forests) provided support for field work in the Shenandoah Valley sinkhole pond area. Todd Georgel assisted in the field in 1998.

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Shorter Contributions

Banisteria, Number 15, 2000

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THE RUDDY DAGGERWING (*MARPESIA PETREUS*): A NEW FACE IN VIRGINIA --The ruddy daggerwing (*Marpesia petreus*) is a common Neotropical butterfly, resident in southern Florida, the West Indies, and the mainland of Latin America from Mexico south to Brazil (Opler & Krizek, 1984; Opler, 1998). It is associated with figs and rotting fruit. Stray individuals of this species have been recorded in the western United States from Texas, Kansas, Nebraska, Colorado, and Arizona (Opler, 1998). The only records of strays in the eastern United States are from northern Florida (Opler, 1998).

On 17 July 1995, while conducting a survey for rare butterflies and dragonflies for the Virginia Division of Natural Heritage (VDNH), I was in the process of exploring a beach across from the amphibious LARC vehicle hangers on the Fort Story Military Reservation in the City of Virginia Beach. After I had passed through a narrow border of evergreen shrub just before entering the open beach, an orange butterfly flew out of a dense live oak (*Quercus virginiana*)/wax myrtle (*Myrica cerifera*) thicket. It landed on a common reed (*Phragmites australis*) stem about 25 m away. I slowly stalked the butterfly and caught it in my net. It was a ruddy daggerwing, the first known record for Virginia. The specimen was in perfect condition considering its long journey. A few days earlier, Chris Hobson, field zoologist for VDNH, observed a gulf fritillary (*Agraulis vanillae*) on this beach. I have sighted the gulf fritillary, a known migrant, many times in late summer on the Eastern Shore barrier islands.

The specimen will be donated to the National Museum of Natural History (Smithsonian Institution) via Steve Roble of VDNH.

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LYTTA POLITA (SAY), A BLISTER BEETLE NEW TO THE VIRGINIA FAUNA (COLEOPTERA: MELOIDAE) -- The blister beetle genus *Lytta* is represented by a profusion of species in western United States, but only a few, all in the subgenus *Pomphopoea*, occur in the eastern states. These are big (up to 25 mm long), soft-bodied insects usually most active in the spring months, which frequently achieve nuisance status by consuming, in enormous numbers, the foliage and flowers of many kinds of plants. The genus was revised by Selander (1960) in a treatment that included lists of museum specimens and distribution maps. Of the four eastern species, Selander had seen Virginia material of only one, *L. aenea* Say, which generally occurs statewide. *Lytta sayi* LeConte occurs further north and west, and *L. unguicularis* (LeConte) is recorded no closer to Virginia than the mountains of western North Carolina.

The fourth eastern species, *L. polita* Say, has a distinctly austral distribution ranging from North Carolina to Louisiana and south through most of Florida. With the northernmost localities at Raleigh (Selander, 1960) and Washington (Brimley, 1938), North Carolina, the presence of *L. polita* in Virginia was very probable, and this likelihood has been confirmed in the past decade by surveys of both the Virginia Museum of Natural History and Virginia Division of Natural Heritage. Four instate localities can now be documented: *Isle of Wight Co.*: Zuni Pine Barrens and Blackwater Ecologic Preserve, ca. 7 km south of Zuni (10); *Mecklenburg Co.*: Elm Hill Wildlife Management Area (1); *Northampton Co.*: Savage Neck Natural Area Preserve, 5 km N of Cape Charles (1); *City of Virginia Beach*: Seashore/First Landing State Park (26). The Elm Hill locality is on the Piedmont, almost due north of Raleigh, and implies that the range of *L. polita* in southeastern Virginia may be more extensive than now known. The Savage Neck site is on the north side of the Chesapeake estuary, and is the new northernmost locality, some 135 miles/216 km north of Washington, North Carolina.

Virginia captures reflect the known vernal activity of this and related species. Eight specimens were trapped in late March, 22 in April, and only singles in May, June, July, and August. At Seashore State Park, pitfall arrays were operated simultaneously in three biotopes, of which the "dune" site yielded 26 specimens, "mesic", four specimens, and "scrub," only one. It is noteworthy that *L. polita* is unknown from elsewhere in Virginia

Beach despite the concurrent and subsequent operation of pitfall arrays in numerous other sites within a 20 mile/32 km radius of Seashore State Park, some of them in apparently very similar "dune" habitats.

Lytta polita is easily distinguished from the three other eastern species, being the only one in which the distal antennomeres are not enlarged, the pronotal disk is glabrous, and the pro- and mesotibiae (often the metatibiae as well) are black instead of orange. The elytra have a characteristic bronzy color, often tinged with purple or green.

Acknowledgments

The Virginia Museum of Natural History is much indebted to Natural Heritage zoologists Christopher A. Pague, Kurt A. Buhlmann, and Steven M. Roble for the gift of most of the material on which this note is based.

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Banisteria, Number 15, 2000

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ADDITIONAL FIELD LONGEVITY RECORD FOR THE ALLEGHENY WOODRAT (*NEOTOMA MAGISTER*) -- Previously, I reported two field records for longevity in wild Allegheny woodrats (Mengak 1997). One male lived a minimum of 45 months between first and last captures and a female lived a minimum of 49 months between first and last captures.

As part of a continuing long-term monitoring study, live trapping has been conducted at regular intervals at several sites in Virginia from 1990 to 2000. During this study an additional woodrat has been tagged and followed through time that now extends the previously

known field longevity record for this species. Individual woodrats are live trapped in Tomahawk collapsible traps baited with one-half apple during two consecutive nights on a bi-monthly schedule, weather permitting. Captured individuals are ear-tagged for permanent identification, sexed, weighed, examined for general body condition and reproduction status, and released at the capture site.

On 14 October 1995, I caught a 230-g subadult female woodrat at my study site in Giles County, Virginia. This site consists of a cliff and associated boulders, talus and rock outcrops. There are numerous crevices, cracks, overhangs and small caves. Dominant overstory vegetation includes oak (*Quercus* spp.), hickory (*Carya* spp.), maple (*Acer* spp.), and birch (*Betula* spp.). Understory vegetation includes blueberry (*Vaccinium* spp.), seedlings of overstory trees, and greenbrier (*Smilax* spp.). Assuming a weight gain of 1.0 g per day in wild woodrats (Mengak, unpubl. data) the individual was born about April 1, 1995. She was captured an additional nine times at the Giles County site.

On 6 April 1997 she was captured and found to be hypothermic and lethargic in the trap. She could not be warmed in the field and was returned to a holding facility at Ferrum College. While in the holding facility, she was feed commercial lab chow, apples and water ad libitum. I do not have a long-term animal holding facility. Further, I was scheduled to sample at a different long-term monitoring site in May. Therefore, on 17 May 1997, she was returned to the long-term study site in Bath County, Virginia. This site is approximately 125 km NE of the Giles County capture site. She was subsequently captured 16 times at the Bath County site. Interestingly, she was caught every night of every trapping period for four years.

Her last capture was on 18 October 1999. Thus, a total of four years and four days elapsed between first and last captures (1,464 days). If we assume an additional 200 days between birth and first capture, this individual survived a total of 1,664 days or 55.5 months in the wild (including 41 days in the lab). I have evidence that juveniles gain between 0.5 and 1.25 g per day in the wild but have not attempted to separate the effects of year, site, gender or any other variable. Thus, an assumed weight gain of 1.0 g per day is a conservative estimate. This extends the known minimum longevity for a wild woodrat from the previously reported 49 and 50 months to at least 55.5 months.

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27-28.

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Miscellanea

Reports

1. President's Report

The annual business meeting of the Virginia Natural History Society was convened at Radford University on May 25, 2000, in association with the Natural History and Biodiversity Section of the Virginia Academy of Science. Attendees were sparse as in previous years, as many of our members do not attend the VAS meeting. First order of business was the election of VAS Officers for the Natural History and Biodiversity Section next year. Barbara Abraham, Hampton University, was elected as chairperson; Ralph Eckerlin, Northern Virginia Community College, was elected vice-chair; Werner Wieland, Mary Washington College, will be secretary and editor; and Michael Kosztarab, Virginia Tech, will serve as Councilor. According to our Secretary's report (Anne Lund - in absentia), the Society had a budget balance of \$6730 at the end of April and an active membership roll of 115 members. Our financial stability continues to improve but our membership list continues to fluctuate drastically, with a downward trend.

Several business items were discussed at the meeting. First, there was consensus that the VNHS membership list could be shared with the Virginia Natural History Museum who requested it in April. In return, we would request a copy of their membership list and inquire whether a copy of our recruitment flier could be placed in their next mailing to members. Recruitment of new members was discussed at length, with several ideas posed by attendees. Could we partner with other naturalist-type societies in Virginia, perhaps combining membership costs or meeting jointly to increase the attendance of members? The Nature Rally at Wintergreen each year may provide an opportunity to recruit and to participate in public education. Several of our members already participate in the nature weekend, so, it was suggested that Doug Coleman at their Nature

Center be contacted. There was general disappointment that none of the students or faculty at Radford University presented papers or attended our session. It was suggested that VNHS send letters of invitation to faculty on the host campus of VAS, encouraging submittal of a paper and/or attendance at our session. The VAS meeting in 2000 is at James Madison University, so the Board of VNHS will discuss this issue at their fall meeting.

The final topic of discussion was whether VNHS should request that the author or at least one of the co-authors of papers presented at the Natural History and Biodiversity Section of VAS be members of our society. This section of VAS was established by VNHS as our annual forum for the exchange of scientific information and to conduct our annual business meeting. To achieve the purpose intended, the attending officers felt that membership in VNHS should be requisite to participation. My recommendation was that the Secretary, upon receiving titles of papers for presentation, should respond to the author(s) with a brief explanation of the Section and encourage membership in VNHS. VAS requires that anyone presenting at this meeting be a VAS member. Most presenters in our Section are not VNHS members, and several of the authors present papers in our Section each year. Thus, our expectation of membership is not unreasonable.

On a positive note, our web page continues to expand with information on the natural history of Virginia, with stunning photos and pertinent summaries on *Banisteria*, meetings, membership opportunities, and links to other organizations in Virginia. If you haven't visited our website maintained by webmaster Dr. Ken Stein, please do so (<http://fwie.fw.vt.edu/vnhs/>). Any comments for improvements or additions should be directed to the webmaster (kstein@vt.edu).

Richard J. Neves
 President, VNHS

2. Secretary/Treasurer's Report

We have 115 members who have renewed membership for 2000. The response has been good from those who received a renewal application and a return envelope with the second 1999 issue (number 14) of *Banisteria*. We have also sent mailings to several groups of biologists and to libraries across the state in an attempt to extend our membership. **Each member receiving this issue of *Banisteria* should attempt to recruit one new member!**

Our treasury presently holds \$6,730.58 (as of May 1, 2000). The expenses for the publication and mailing of this issue of *Banisteria* will be subtracted from this amount.

Respectfully submitted,

Anne Lund
Secretary/Treasurer

3. Editor's Report

Dr. Richard Hoffman stepped down as co-editor and productions editor this spring with the publication of *Banisteria* number 14. He helped to conceptualize and produce the first 14 issues of this journal. He wrote many articles for these issues and will continue to publish within these pages. Richard will serve as an associate editor and will continue to participate. We all appreciate his service to the Virginia Natural History Society, to *Banisteria*, and to the natural history of Virginia. We hope that he will continue to be a productive writer on the natural history of the Commonwealth. Dr. Steve Roble took over as co-editor and productions editor for *Banisteria* number 15.

Banisteria number 15 will likely be published a little later than usual this year, July, due to the transition and learning time for Steve Roble and due to the slow rates of manuscript submission and reviewer return. We continue to be plagued with insufficient manuscripts and are wondering why people are not submitting their reports and theses to us. It is not a hard thing to do. Our job is to help you get manuscripts in shape for publication so that valuable natural history observations are not lost forever. So, send us your manuscripts!

Joseph C. Mitchell
Co-Editor

4. Seventh Annual Meeting of the Virginia Natural History Society

The 7th annual meeting of the VNHS was held on 25 May 2000 at Radford University. The following papers were presented in the Natural History and Biodiversity Section of the Virginia Academy of Science:

Sampling techniques for terrestrial salamanders. C. A. Haas, D. N. Harpole, S. M. Knapp, and D. G. Mackler.

Ant defensive behaviors in response to anting by songbirds. H. Revis.

Antennae of different termite castes compared using light and scanning electron microscopy. J. DiCicco, K. Carson, and D. A. Waller.

Comparison of spawning and non-spawning substrates in nests of species of *Exoglossum* and *Nocomis*. T. D. Green and E. G. Maurakis.

Karst resource inventory of the George Washington and Jefferson National Forests. T. Brown and D. Kirk.

Biodiversity of ground beetles (Carabidae) in natural and created wetlands. A. Beckman and D. A. Waller.

Ant species diversity compared in coastal versus barrier island habitats along the Eastern Shore of Virginia. D. A. Waller.

Geographic variation in the brown bullhead, *Ameiurus nebulosus*. E. D. Casey and W. Wieland.

A method for planting longleaf pine, *Pinus palustris* Miller, on highway rights-of-way. P. Sheridan.

Genetic evidence for overlapping cohorts in the semivoltine stonefly, *Peltoperla tarteri* (Plecoptera: Peltoperlidae). A. S. Schultheis and A. C. Hendricks.

Artificial cavity use by Red-cockaded Woodpeckers (*Picoides borealis*). A. N. Chadwick, J. R. Walters, and C. A. Haas.

Comparison of insect captures between wild-type and mutant green *Sarraacenia*. P. Sheridan, J. Humphrey, M. Davies, C. Simon, and N. Penick.

Fishes of the Great Dismal Swamp, 1952-1972. K. Merten and W. Wieland.

Do *Monomorium* ants pollinate *Veronica arvensis* flowers? L. Hembree and R. Bray.

The yellow pitcher plant, *Sarracenia flava* L., recovery program. P. Sheridan.

Rare plants in the classroom: Potomac Elementary School and the Toyota Tapestry Grant. P. Sheridan, R. Horman, S. Horman, S. Gilbert, A. Keeton, and M. Schmutte.

Historical relationships of river drainages in Greece. E. G. Maurakis, M.K. Pritchard, and P.S. Economidis.

The following were presented as posters:

Environmental impact statements in karst: the need for detailed field work; case study from proposed power line corridor, Skydusky Hollow area, Bland County, Virginia. W. Orndorff, J. Thompson, and T. Brown.

Adjacent land use: Does it affect bird species composition in forested riparian communities? K. M. Korth and W. J. McShea.

Evaluating the ecological and distributional status of the mole salamander, *Ambystoma talpoideum*, in Virginia. M. S. Hayslett.

Addendum

The paper in *Banisteria* 14 by S. M. Roble et al. entitled "First records of *Noctua pronuba* L., an Old World moth, in Virginia" failed to include the following record for this species: VA: Fauquier-Prince William county line, Bull Run Mountain, fire road below summit, 30 July 1998, C. S. Hobson, A. C. Chazal, and G. P. Fleming.

Submission of Manuscripts

Please follow these guidelines for manuscript submission:

Manuscripts on vertebrates, history, biography, and material for the Miscellanea section should be sent to Joe Mitchell. Manuscripts on plants, invertebrates, and book reviews should be sent to Steve Roble. Papers on other

topics can be submitted to either editor. Mitchell and Roble will serve as editors for each other's papers and an associate editor will be asked to serve as editor for those papers written jointly by the co-editors.

Instructions for Contributors

Banisteria accepts manuscripts that contribute to the public and scientific knowledge of the natural history of Virginia. This publication is intended to be an outlet for the kind of information that is useful but would not be accepted in the mainstream journals. Information found in field notebooks and files that never made it into scientific journals is especially important. The focus of *Banisteria* is classical and therefore slanted toward organismal biology. Reviews of books relevant to Virginia's natural history and biographies of naturalists influential in this field are also welcomed by the editors.

Manuscripts should be sent in duplicate to one of the Co-editors (see previous section regarding submission of manuscripts), who will in turn seek one or two reviews. Reviews of manuscripts written by a co-editor or associate editor will be handled by a different editor. Authors should retain both the original typescript and figures until final acceptance for publication. Photocopies are adequate for review purposes.

Manuscripts must be written on one side of standard size paper (21.5 x 28 cm) using double spacing throughout. Words should not be hyphenated. Manuscripts should be arranged in the following order: **title, author's name, author's address, text, acknowledgments, literature cited, tables, figure legends, figures.** Long manuscripts may follow standard sections, e.g., Materials and Methods, Results, and Discussion, although some papers may not be amenable to such division, and short manuscripts (<4-6 pages) need not have these sections. All pages should be numbered, including tables. The title should be concise but informative. It and the author's name and address should be centered at the top of the first page. The text should begin on the first page beneath the author's address. Use good judgment on arrangement of sections when other than the standard approach is necessary. Use italics or underlines for species' scientific names.

References: Use the following as a guide. Do not abbreviate journal names.

Journal article with 1 author:

Scott, D. 1986. Notes on the eastern hognose snake, *Heterodon platyrhinos* Latreille (Squamata:Colubridae), in a Virginia barrier island. *Brimleyana* 12: 51-55.

Journal with 2 authors:

Tilley, S. C., & D. W. Tinkle. 1968. A reinterpretation of the reproductive cycle and demography of the salamander *Desmognathus ochrophaeus*. *Copeia* 1968: 299-303.

Journal with 3+ authors:

Funderburg, J. B., P. Hertz, & W. M. Kerfoot. 1974. A range extension for the carpenter frog, *Rana virgatipes* Cope, in the Chesapeake Bay region. *Bulletin of the Maryland Herpetological Society* 10: 77-79.

Book:

Harris, L. D. 1984. *The Fragmented Forest*. University of Chicago Press, Chicago. 211 pp.

Chapter in a book:

Gentry, A. H. 1986. Endemism in tropical versus temperate plant communities. Pp. 153-181 *In* M. Soule (ed.), *Conservation Biology*. Sinauer Associates, Inc., Sunderland, MA.

Report:

The Nature Conservancy. 1975. *The preservation of natural diversity: A survey and recommendations*. Report to the U.S. Dept. of Interior, Washington, D.C., 189 pp. (include report series and number if present).

Tables: Each table should be typed on a separate sheet of paper. A legend for each table should follow the number and must be on the same page as the table. Ruled,

horizontal lines should be avoided except at the top and bottom of the table. Remember that **each table must fit within a space of 8.5 x 6.5 inches**, and that reduction may cause loss of detail.

Figures: Black and white line drawings are acceptable for publication. They should be no more than twice the size of final publication size, and if several are assembled as a plate, keep the ratio of height to width consistent with the rectangular shape of the page. The back of each figure should be labeled with the author's name.

Photographs: *Banisteria* will accept high contrast black and white photographs. Submit at least 5 x 7 inch photos and mount them if possible. Remember that reduction to fit column or page width will cause loss of detail.

Abbreviations: The following common abbreviations are accepted in *Banisteria*: n (sample size), no. (number), SVL (snout-vent length; define on first usage); DBH (diameter at breast height); yr (years), mo (months), wk (weeks), h (hours), min (minutes), s (seconds), P (probability), df (degrees of freedom), SD and SE (standard deviation and standard error), ns (not significant), l (liter), g (gram), mm (millimeter), m (meter), km (kilometer), and C (degrees Celsius). Do not abbreviate "male" and "female", or dates, or undefined terms.

Electronic transfer of manuscripts: Once a manuscript has been accepted for publication, one paper copy and an electronic copy on a 3.5 inch diskette should be sent to S. M. Roble. If possible, use IBM-compatible systems with Word Perfect or Microsoft Word. Please do not justify right-hand margins, and do not attempt to produce "camera-ready copy".



Muscipula Regia, f.
Lycnis viscosa flore
amplo coccineo.

