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Matthew J. Petersen

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To the Graduate Council:

I am submitting herewith a thesis written by Matthew J. Petersen entitled "Crane flies (Tipulomorpha; Diptera) collected during the All-Taxa Biodiversity Inventory of Great Smoky Mountains National Park, Tennessee and North Carolina : an ecological study." I have examined the final electronic copy of this thesis for form and content and recommend that it be accepted in partial fulfillment of the requirements for the degree of Master of Science, with a major in Entomology and Plant Pathology.

Earnest C. Bernard, Major Professor

We have read this thesis and recommend its acceptance:

Accepted for the Council:
Carolyn R. Hodges

Vice Provost and Dean of the Graduate School

(Original signatures are on file with official student records.)

To the Graduate Council:

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Ernest C Bernard

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Acceptance for the Council:

Vice Provost and Dean of
Graduate Studies

Crane Flies (Tipulomorpha; Diptera) Collected During the All-Taxa Biodiversity Inventory of Great Smoky Mountains National Park, Tennessee and North Carolina: An Ecological Study

A Thesis Presented for the
Master of Science Degree
The University of Tennessee, Knoxville

Matthew J. Petersen
August 2003

ABSTRACT

Collections were made in association with the All-Taxa Biodiversity Inventory (ATBI) occurring in Great Smoky Mountains National Park (GRSM) was conducted between October 2000 and October 2002 in an attempt to define the crane fly (Tipulomorpha, Diptera) assemblages found there. The objectives of this research were: 1) to define the crane fly assemblages of GRSM, 2) estimate the numbers of species likely to be found in GRSM, and 3) determine spatial and temporal distributions for species encountered. Over 9,000 specimens were collected from 22 Malaise trap located at 11 ATBI plot locations, representing 177 species from 57 genera and 5 families. Richness estimators indicated that an additional 20-80 species likely would be found using these collecting techniques, although up to 500 total species may be possible for GRSM. A high degree of faunal turnover was observed between traps. Distinct assemblages of crane flies occurred in different vegetation communities. Major differences were found between high-elevation coniferous forest sites and deciduous forests at all elevations. Open areas with no canopy had depauperate crane fly assemblages comprised mostly of transient species occurring in low numbers. Variation in elevation gradient affected the distributional patterns of many species. Numerous species were collected in only the upper or lower elevations. Those collected only in upper elevations typically had northern North American ranges or are known only from the Tennessee-North Carolina area. Species collected only at lower elevations had an increased likelihood of having southern ranges. The overall crane fly assemblage of GRSM is largely comprised of species with more northern distributions and species with broad geographic distributions.

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CHAPTER I

Introduction

TIPULOMORPHA

Crane flies are placed in the superfamily Tipulomorpha, which is comprised of four families: Cylindrotomidae, Tipulidae, Limoniidae, and Pedicidae. Two additional families, Ptychopteridae (phantom crane flies) and Trichoceridae (winter crane flies), are commonly referred to as crane flies though differ taxonomically from members of Tipulomorpha. Worldwide, there are more than 15,000 described species (Oosterbroek 2002; Byers 1996), about 1,600 species (Oosterbroek 2002; Borror et al. 1989) are known from the Nearctic region. Crane flies exhibit complete metamorphosis, with the longest period spent in the larval stage, which may last from a few weeks to over a year depending on the species. Habitats in which crane flies can be found are very diverse, though most larvae and adults have a preference for moist environments (Alexander 1967) and are prone to desiccation in arid environments. Crane flies are of little economic importance except for a few pest species (Pritchard 1983; Alexander 1920), however many species serve an important ecological role in the breakdown of leaf litter and stream detritus as well as acting as an important food source for various mammals, birds, amphibians, fish, and other invertebrates (Alexander 1920).

Eggs

Female crane flies can lay between 45 and 2000 eggs during oviposition, depending on species (Alexander 1920). These eggs are generally spindle-shaped, ranging in length from around 1 mm in species of *Tipula spp.* to less than 0.5 mm in small species (Alexander 1920). The eggs of Tipulidae are black, usually with a smooth

chorion and a hygroscopic filament (Pritchard 1983). Eggs of Limoniidae and Cylindrotomidae are generally lighter, often white, with a sculptured chorion, and lack a hygroscopic filament (Pritchard 1983).

Larvae

Crane fly larvae occupy the same habitat where oviposition by the adult female occurred (Alexander 1920). All larvae go through four instars before pupation. Larval habitat for individual species may be highly specific and diversification of larval habitats is extensive. It is difficult to produce generalities of larval habitat at the family level, though Limoniidae are known to be restricted to wetter habitats than Tipulidae (Pritchard 1983). The larval stage of crane flies can be grouped into three categories (aquatic, semi-aquatic, and terrestrial) with each category equally represented by one-third of all crane fly larvae (Gelhaus 2002). Aquatic species can range from intertidal species to those inhabiting freshwater streams, ponds, and lakes. Semi-aquatic species are represented by those that inhabit saturated earth and muck, seeps, and those found along stream, pond, or lake margins. Terrestrial species occupy a variety of niches, including within the leaves of plants (*Dicranomyia sp.*), decaying (*Elephantomyia spp.*) and nearly solid (*Tanyptera spp.*) wood, fungi (*Ula spp.*), and in dry soil (*Nephrotoma spp.*) (Alexander 1920).

Tipulid larvae exhibit great diversity in feeding preferences, but most are herbivorous and feed on algae, mosses, liverworts, or decomposing plant material (Pritchard 1983). Species feeding on living plant material and considered injurious to the point of economic importance can be found in *Tipula spp.* and *Nephrotoma spp.*, which feed on plant and grass roots, and Cylindrotomidae, which feed on higher plants and mosses (Pritchard 1983). Pedicidae and most Hexatominae (Limoniidae) are

predaceous, feeding on small soft-bodied organisms such as *Tubifex* worms and small dipteran larvae. Those species that ingest decomposing plant material make up an important part of the decomposition cycle in both aquatic and terrestrial systems (Pritchard 1983).

Pupae

Crane fly larvae pupate in the skin of the last larval stage and generally pupate in the same habitat inhabited by the larvae. Exceptions occur in some aquatic species that migrate to the terrestrial margins of the aquatic environment to order to pupate (Alexander 1920). Pupal duration seems fairly uniform, averaging about five to six days to eclosion, although all other stages of life history in crane flies may be quite varied (Alexander 1920).

Adults

Adult crane flies are recognized from other flies by characteristic wing venation having two anal veins reaching the wing margin, presence of a V-shaped mesonotal suture, deciduous legs, and absence of ocelli (Pritchard 1983). The emergence of adult flies may be spread over two to six months or a whole population may emerge during a period of two weeks or less (Pritchard 1983). Factors that regulate adult emergence are unknown, but it is thought that photoperiod, temperature and moisture all play roles. Adults show a tendency to remain in close proximity to certain habitat types. This association between adult flies and habitat may be due to a number of variables including relative humidity (Merritt 1981; Barnes 1925; Rogers 1933; Freeman 1968), air movement and insolation (Merritt 1981; Rogers 1933), pheromones (Freeman 1968), topography and geography (Young 1978), and plant community borders (Freeman 1968).

Feeding, with very few exceptions, does not occur in the adult stage, although a few are known to ingest nectar and water (Pritchard 1983).

ECOLOGICAL WORK ON NORTH AMERICAN CRANE FLIES

Field studies involving North American crane flies and their distributions have largely consisted of strict inventory of specific areas or regions, resulting in the creation of species lists for specific areas. The publications of J. S. Rogers, G. W. Byers and C. P. Alexander have greatly increased our understanding of North American crane fly assemblages. Most notably, the regional works of Alexander (1967; 1942; 1920; 1919) have resulted in valuable detailed distributional data and taxonomic keys. These manuals still stand as defining works on the biology, distribution, and composition of the crane flies of North America.

In addition to documenting the assemblages of crane flies in specific regions of North America, some authors have furthered our knowledge of crane fly ecology and distribution. These works seek to both document assemblages and determine why differences occur in assemblages from different locations.

Young (1978) investigated the assemblages of crane flies from two woodlots in eastern Kansas. Crane flies of eastern Kansas are largely comprised of species that occur in the eastern part of the continent. Comparisons of Kansas crane fly emergence patterns to emergence patterns of the same species in Michigan (Rogers 1942) showed that the Kansas populations generally emerged earlier in the spring, and several Kansas species had two generations per year, compared to only one generation in Michigan. Faunal turnover between the two sites showed low complimentarity (40%), indicating a

homogenous species composition. Differences in topography and forest disturbance history appeared to influence the differences between the two crane fly assemblages.

Merritt and Lawson (1981) determined the assemblages of crane flies that inhabited three woodland floodplains, differing in size and vegetation diversity, in southwestern Michigan by emergence trapping and collection of larvae. Limiting factors in the distributions of larval crane flies were soil moisture and organic content. An increase in organic material helps to trap moisture in the soil and create wetter soil conditions that reduce the risk of desiccation for larvae. The requirements of larval stage appeared to be the determining stage in species distribution for most of the species. Factors limiting the adult fly to specific habitats were not investigated, but the authors agreed with Service (1973) that crane flies are poor fliers, and that restriction of adults to specific habitats appears to be determined by factors influencing evaporation rate (relative humidity), air movement, and isolation (Rogers 1933).

GREAT SMOKY MOUNTAINS NATIONAL PARK

Great Smoky Mountains National Park (GRSM) in eastern Tennessee and western North Carolina provides a large area of diverse habitats and a gradient in elevation and covers 211,000 hectares (521,000 acres). Nearly 20% of the Park's total area, about 40,000 hectares (100,000 acres), is made up of uncut old growth forest (Houk 1993), representing one of the largest sections of contiguous old growth forest in the eastern United States. Annual precipitation averages about 127 cm at lower elevations and up to 210 cm at upper elevations. Recent surveys of the vegetation composition of GRSM by the United States Geological Survey (1999) have identified 42 alliances and 68 associations, and more species of vascular plants have been recorded in GRSM than in

any other National Park (Boetsch et al. 1998). The elevation of GRSM ranges from under 500 meters at Cades Cove to 2,025 meters at Clingmans Dome, the second-highest point east of the Mississippi River, and includes 16 peaks over 1,830 meters. The preservation of the resources and organisms found in GRSM is a priority as signified by its designation as an International Biosphere Reserve and World Heritage site. Dangers to the biota of GRSM exist, through invasion by exotic species such as the balsam (Allen and Kupfer 2001) and hemlock wooly adelgids, air pollution (Neufeld 2000; Chappelka 1999), acid deposition (Flum 1995), and possible habitat alteration due to global climate change. It is important to document species assemblages to identify changes that may be caused due to potential threats.

CURRENT RESEARCH

This investigation into the assemblage of crane flies of eastern Tennessee and western North Carolina was conducted in association with the All Taxa Biodiversity Inventory (ATBI) being conducted in GRSM. The ATBI has the goal of inventorying the estimated 100,000 species of living organisms in Great Smoky Mountains National Park while developing species checklists, distribution maps, databases, and natural history profiles for all species encountered through traditional and structured sampling protocols (White and Morse 2000). Intensive arthropod sampling was begun in October 2000 as part of a pilot project to determine best sampling techniques and the most efficient methods for conducting a structured sampling protocol. Eleven previously established biodiversity reference plots sampled, each representing a different vegetation community common to GRSM.

The goals of this crane fly research were to document all species of crane flies found during sampling, assess the completeness of sampling by use of species collection curves and species richness indicators, and investigate the distributional patterns shown by these species.

The chapters that follow are publications derived from this research. Chapter 1 documents the phenology of crane flies found during this investigation; Chapter 2 describes the two new species and significant range extensions that were discovered during sampling; and Chapter 3 discusses the completeness of sampling, with estimates of the actual number of species of GRSM, and the distributions and assemblages in collected crane flies.

CHAPTER II

Phenology of Adult Crane Flies (Tipulomorpha, Diptera) Collected During the All Taxa Biodiversity Inventory of Great Smoky Mountains National Park

INTRODUCTION

Sampling in association with the All Taxa Biodiversity Inventory (ATBI) was conducted to evaluate the efficiency of long-term structured sampling in order to document all species of cane flies (Tipulomorpha, Diptera) in Great Smoky Mountains National Park (GRSM). There are some 15,000 species of crane flies worldwide (Oosterbroek 2002; Byers 1996), with about 1,600 species known from the Nearctic region (Oosterbroek 2002; Borror et al. 1989). The species that are commonly referred to as crane flies constitute four families under the European system of nomenclature: Cylindrotomidae, Limoniidae, Pediciidae, and Tipulidae. American specialists treat these families as subfamilies within Tipulidae (Limoniinae, Pediciinae, Tipulinae, and Cylindrotominae). Arguments for each arrangement are provided by Stary (1992) and Byers (1992). For the purposes of this publication, the European system of nomenclature was followed. Information on differences in nomenclature can be found in the world catalog prepared by Oosterbroek (2002). Species of the closely related families Ptychopteridae (phantom crane flies) and Trichoceridae (winter crane flies) were also investigated during this study.

The assemblages of the crane flies (Tipulomorpha, Diptera) from Great Smoky Mountains National Park (GRSM) in eastern Tennessee and western North Carolina are known primarily from collections made by Alexander (1940, 1941), supplemented by the works of Rogers (1930) on the crane flies of the nearby Cumberland Plateau in Tennessee

and Brimley (1938) on the insects of North Carolina. GRSM was still in early stages of recovery following its establishment in 1934 during the time of Alexander's sampling. Much of GRSM's 211,000 hectares (521,000 acres) still showed the effects of the logging and settlement that were widespread during the early 20th century (MacKenzie and White 1998; Pyle 1988). Large tracts of land remained intact and today represent some of the largest areas of old growth forest remaining in the eastern United States. The forests of GRSM now cover about 95% of the Park's total area (Houk 1993). A diverse array of vegetational communities are found here, including 68 vegetation associations comprised of 48 forests, 2 woodlands, 6 shrublands, 10 herbaceous vegetation types, and 2 sparsely vegetated types (USGS 1999).

A species list for GRSM consisting of 186 species was compiled from records of Alexander, collections published in other papers, and additional collections made by Park staff and visiting researchers (Hynes 1996). It was hypothesized by the author that large gaps in sampling in both the early spring and late fall along with the successional changes that have occurred in GRSM since previous sampling have left the actual current crane fly assemblage unknown. This research was carried out using continuously operating fixed-plot sampling to collect specimens from a wide variety of vegetation communities to document the actual current crane fly assemblages of GRSM and accumulate natural history information for all species collected.

The goals of this crane fly research were to document all species of crane flies found during sampling, assess the completeness of sampling by use of species collection curves and species richness indicators, and investigate the distributional patterns shown by these species. This chapter addresses: 1) descriptions of research plots used, 2) the

crane flies found during this research, 3) the winter fauna of GRSM, and 4) patterns of temporal and spatial distributions observed.

METHODS AND MATERIALS

Sampling was conducted in Great Smoky Mountains National Park (GRSM) (Fig. 1) located in Tennessee and North Carolina, between October 2000 and October 2002 by means of 22 Townes-style Malaise traps (Townes 1972) located on 11 1-ha ATBI reference plots. Each plot contained two Malaise traps placed at different ends of the research plots in locations that represented differences in the vegetation composition of the plot, in obvious flight corridors, or in areas adjacent to specific microhabitats. Each of the plots used in this inventory was chosen to represent distinct vegetative communities in GRSM (see Plot Descriptions section below).

Malaise trap specimens were collected into 70%-90% ethanol. Malaise traps were operated year-round with collected material retrieved approximately every two weeks by research staff, GRSM park staff, and numerous volunteers. Occasionally, heavy snows, dangerous travel conditions, or trap destruction by wildlife or high winds prevented bi-weekly collections from being made. Collection dates in this report are given as start date–end date of the trap collecting period. Collected materials were taken to laboratories at GRSM Twin Creeks Natural Resource Center or University of Tennessee, where crane flies were separated from other arthropods. Flies were sorted and preserved in 95% ethanol. Specimens were identified to species level with the use of available taxonomic keys (Alexander 1919, 1920, 1940 1941, 1942; Byers 1961, 1983; Oosterbroek 1984; Tangelder 1983; Young 1987). When needed for the purpose of identification, male genitalic features were cleared by immersing removed genitalia in a warm 5% sodium

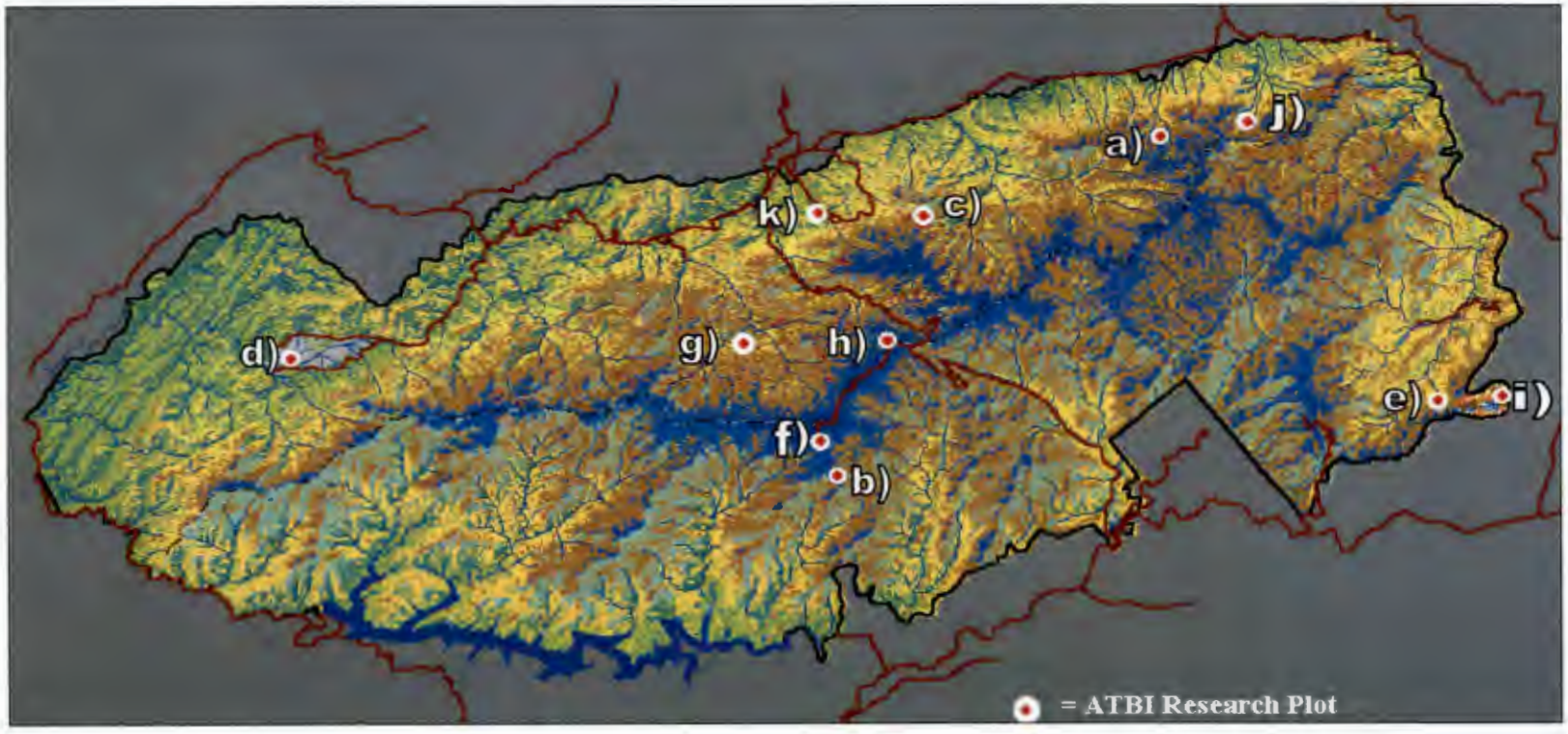


Fig 1. Great Smoky Mountains National Park; a) Albright Grove, b) Andrew Bald, c) Brushy Mountain, d) Cades Cove, e) Cataloochee, f) Clingmans Dome, g) Goshen Prong, h) Indian Gap, i) Purchase Knob, j) Snakeden Ridge, and k) Twin Creeks.

hydroxide solution for five minutes. Morphological terminology used is based on Alexander and Byers (1981).

Collected crane fly specimens were used to plot spatial and temporal distributional patterns. Plots were grouped into low (<1000 m), mid (1000-1500 m), and high (>1500 m) elevation groups. Species represented during sampling by more than six specimens per plot were classified as common to that plot.

PLOT DESCRIPTIONS

Descriptions of the 11 plots are based on the vegetation analysis provided by the USGS National Park Service vegetation-mapping program (USGS 1999) with additional information on trap placement provided by observations made by the authors and research staff. Malaise traps were designated MT01 through MT22. A summary of research plots used can be found in Table 1.

Albright Grove (MT17, MT18)

Albright Grove (35.7333 W – 83.28056 N) is located in the northeastern area of GRSM and is situated in one of the largest tracts of remaining old growth forest on the east coast of the United States. The forest is in the *Tsuga Canadensis* Engelm – *Halesia tetraptera* Ellis – (*Magnolia fraseri* Walt – *Fagus grandifolia* Ehrh*) / Rhododendron maximum* L. */ Dryopteris intermedia* (Willdenow) alliance with a Southern Appalachian Acid Cove forest (silverbell type) community type. This community type is found in the central to northeastern areas of GRSM at middle elevations, commonly on moderately steep slopes and in coves with western to northeastern aspects. The two Malaise traps at this location, MT 17 and MT18, are located in similar habitats, differing in that MT18 is

Table 1. ATBI Study Plots within the Great Smoky Mountains National Park. ATBI research plots listed with trap numbers, locality, elevation, vegetation community, and disturbance history.

Site	Malaise Trap	Locality	Elevation (m)	Vegetation
Albright Grove	MT17-MT18	TN: Cocke Co	1034	Southern Appalachian Acid Cove Forest (Silverbell Type)
Andrews Bald	MT11-MT12	NC: Swaine Co	1757	Grassy Bald (Southern Grass Type)
Brushy Mountain	MT13-MT14	TN: Seviet Co	1467	Southern Appalachian Laurel Bald
Cades Cove	MT03-MT04	TN: Blount Co	457	Old Agricultural Grassy Field
Cataloochee	MT09-MT10	NC: Haywood Co	1382	High Elevation Red Oak Forest (Deciduous Shrub Type)
Clingmans Dome	MT15-MT16	TN: Sevier Co	1944	Red Spruce-Fraser Fir Forest (Deciduous Shrub Type)
Goshen Prong	MT21-MT22	TN: Sevier Co	895	Southern Appalachian Cove Forest (Rich Montane Type)
Indian Gap	MT05-MT06	TN: Sevier Co	1672	Southern Appalachian Beech Gap
Purchase Knob	MT07-MT08	NC: Haywood Co	1529	Southern Appalachian Northern Hardwood Forest
Snakeden Ridge	MT19-MT20	TN: Cocke Co	993	Southern Appalachian Acid Cove Forest (Silverbell Type)
Twin Creeks	MT01-MT02	TN: Sevier Co	594	Early Successional Appalachian Hardwood Forest

slightly higher in elevation (~ 20 m) due to its position on a northeast-facing slope and MT17.

Andrews Bald (MT11, MT12)

Andrews Bald (35.53889 W – 83.49417 N) is characteristic of a Southern Appalachian Grassy Bald, *Danthonia compressa* Austin herbaceous vegetation alliance. This community occurs on moderate to high elevation (greater than 1,350 meters or 4,500 feet) peaks, often on south- to southwest-facing domes, ridgetops, and gentle slopes and saddles in the Southern Appalachian Mountains. Balds are characterized by native and introduced graminoid species and scattered woody plants and shrubs such as *Rhododendron* spp. and *Vaccinium* spp. The surrounding forest is a mixture of red spruce (*Picea rubra* Sarg.) and Fraser fir (*Abies fraseri* (Pursh)). Grassy balds are relatively common throughout the southern Appalachian Mountains, though their origins are unknown. This habitat is characterized by strong winds, high rainfall, shallow rocky soils, and extreme shifts in temperature and moisture levels. Surrounding forest has encroached into the open grassy area, causing a reduction in the bald's size. MT11 was located in the open grassy field, while MT12 was placed in an area of surrounding spruce-fir forest encroachment, close to a naturally occurring high elevation seep. The seep is spring-fed and dominated by patches of forbs, sedges, and peatmoss.

Brushy Mountain (MT13, MT14)

Southern Appalachian Laurel Balds such as Brushy Mountain (35.67667 W – 83.43083 N) are scattered throughout GRSM and the southern Appalachian Mountains. This community type occurs along ridges and steep rocky slopes at mid-elevations (1219-1524 m) in the southern Blue Ridge. This community results from secondary succession

following logging, fire, windfall, or landslide, and is naturally maintained through these same processes. Brushy Mountain MT13 was located on the north face of the peak in a tight thicket of *Rhododendron cawawbiense* Michaux, which completely encapsulates the collecting apparatus. Malaise trap 14 was on the south face of Brushy Mountain in a much more open area where *Rhododendron* sp. was sparse, not covering the Malaise trap, and largely replaced by low-lying sand myrtle, *Leiophyllum buxifolium* (Bergius), mountain laurel, *Kalmia latifolia* L., and low-lying *Rhododendron catawbiense*. Permanent running water is not found near this plot, though the trail leading to Brushy Mountain is an ephemeral stream channel. The exposed side of Brushy Mountain is much drier than the enclosed area of *Rhododendron* sp., as seen from the relative humidity differences between the two areas.

Cades Cove (MT03, MT04)

This large open field in the western end of GRSM (35.59251 W – 83.84376 N) was originally cleared for agricultural use by early settlers, but now is an abandoned agricultural field dominated by *Fescue* spp. with sparse native grasses, woody shrubs, and trees. Surrounding forest is Cove Hardwood. The National Park Service now maintains this area as open grassland with periodic burning. The ATBI plot is located in a lowland area that is subject to inundation in the spring by adjacent Abrams Creek caused from large amounts of runoff form the surrounding mountains. Spring water levels were left a watermark on traps indicating a depth of nearly 1m. Cades Cove experiences large swings in temperature due to its lack of canopy and the basin shape of the cove, into which cooler air flows at night from the surrounding higher elevations. The Malaise traps were in similar habitats, varying only in MT03 being more centered in

the open field and the closer proximity of MT04 to Abrams Creek. A prescribed burn of the cove in spring 2002 caused traps to be removed from March 3 – May 9.

Cataloochee (MT09, MT10)

This area of GRSM (35.58639 W – 83.08167 N) was once dominated by large American chestnut, *Castanea dentate* (Marsh.), until its demise in the early 20th century due to chestnut blight. The remains of these large chestnuts can be seen as stumps and logs that still litter the forest floor. The community type is now High-Elevation Red Oak Forest (deciduous type) in the *Quercus rubra* forest alliance. Red oak dominates the canopy, while the subcanopy is comprised of *Acer rubrum* L., *Ilex montana* (Torr. And Grey) and *Hamamelis virginiana* L.. Though the forest alliance is classified as high elevation for red oak forest, for the overall elevation gradient of GRSM this plot constitutes the upper end of the mid-elevations (1219-1524 m). Trap MT09 was located on a gentle north-facing slope and MT10 was placed nearly 80 m east of MT09 at the crest of a steep rising slope.

Clingmans Dome (MT15, MT16)

Clingmans Dome (35.56028 W – 83.49528 N) is the highest point in Tennessee and the second highest point east of the Mississippi river. This high-elevation plot is a representative of the southern Appalachian fir forest (deciduous type), which is dominated by Fraser fir (*Abies fraseri*) and red spruce (*Picea rubens*). Though fir trees still exist at this plot, they now are represented by small, young trees due to the death of larger trees by the exotic balsam woolly adelgid (*Adelges piceae* (Ratzeburg). Scattered throughout the forest are the standing and fallen remains of older fir trees. The elevation of this plot (1,944 m) strongly affects temperature, which can differ by as much as 7 ^{o} C

from that of lower elevations. The cooler air at this elevation cools the warm, moist air that rises from lower elevations, resulting in frequent fog and precipitation. Clingmans Dome is designated as a temperate coniferous rainforest. Little permanent running water is found here, though many ephemeral channels exist and the ground is largely saturated. Both Malaise traps were located in similar habitat, differing only in that MT16 was in an area of more open canopy than MT15.

Goshen Prong (MT21, MT22)

Before formation of GRSM, the Goshen Prong (35.61056 W – 83.54278 N) area was heavily deforested due to logging and settlement. The regrown forest in the large cove in which this plot is located now represents a rich montane Southern Appalachian Cove Forest, *Liriodendron tulipifera* L. – *Tilia americana* var. *heterophylla* (Vent.) – *Aesculus flava* Ait. – *Acer saccharum* L. forest alliance. Both Malaise traps were located within a large cove area on the north face of a moderate-gradient slope, with MT21 slightly farther up the slope than MT22

Indian Gap (MT05, MT06)

One of the least common forest communities in GRSM is the high-elevation Southern Appalachian Beech Gap Community in the *Betula alleghaniensis* Britton– *Fagus grandifolia – Aesculus flava* forest alliance found at Indian Gap (35.61083 W – 83.44361 N). These stands are dominated by American beech (*Fagus grandifolia*) and are limited to areas over 1,370 m in elevation. Beech gaps typically occur on northerly facing, steep slopes and on the north and northeast side of gaps. High levels of rainfall and low temperatures due to high elevation are typical of this community. Strong winds and ice storms periodically damage these forests, creating canopy gaps and contributing

to its stunted appearance. This community commonly occurs as small patches surrounded by other forest types. Threats to this forest community include beech bark disease and rooting by invasive European wild boar (*Sus scrofa* Linnaeus). Both traps were located on a steep south-facing slope, one on either side (MT05 above, MT06 below) of the Appalachian Trail, which bisects this plot, and is located within a hog exclosure fence that surrounds the entire research plot.

Purchase Knob (MT07, MT08)

The forest community here, Northern Hardwood, is similar to that of forests in the northeastern United States. The forest canopy is comprised of Yellow birch (*Betula alleghaniensis*), American beech (*Fagus grandifolia*), and Yellow buckeye (*Aesculus flava*). Both Malaise traps were found in like habitat, located on a moderately steep north-facing slope (35.59194 W – 83.06028 N). No seeps or springs were in close proximity to either trap, and the nearest source of water is an ephemeral stream located more than 100 m from either trap.

Snakeden Ridge (MT19, MT20)

Snakeden Ridge (35.74333 W – 83.22000 N) shares much in common with Albright Grove plot. Both are classified as Southern Appalachian Cove Forest (Silverbell type) and have been relatively undisturbed by settlement or logging. Snakeden Ridge differs from Albright Grove in being much more dominated by mature hemlocks. Additionally, topography of this plot is different, as it is located on a moderately steep talus slope. Malaise trap 19 was located at the base of the talus slope while MT20 was placed on a small level area on the slope. Though no water, standing or running, was in

close proximity to either trap, the relative humidity at this plot was high in comparison to other plots used in this survey.

Twin Creeks (MT01, MT02)

The Twin Creeks plot (35.68500 W – 83.49900 N) was an area of heavy settlement before the formation of GRSM. The forest community is in a state of early to middle succession, and is classified as Early Successional Appalachian Hardwood forest, *Liriodendron tulipifera* forest alliance. This community type is found at elevations below 914 m on areas of low slopes in areas that had been impacted by heavy settlement, farming, or logging. Forest canopy is dominated by *Liriodendron tulipifera* and *Acer rubrum* with understory vegetation variable in composition, but often comprised of various vining species. The plot surface ranges from thin soil with the presence of many large boulders to rich thick soil. This plot is unique in that its placement is between two branches of LeConte Creek the runs through the research plot, so that the two Malaise traps were in much closer proximity to flowing water than those in than at any other plot.

RESULTS AND DISCUSSION

Sampling from October 2000-October 2002 resulted in the collection of 9,319 crane fly specimens representing 177 species in 57 genera and 6 families (Table 2). Tables and Figures are placed together in Appendix III. Sixty-four species were recorded from GRSM for the first time, including two species new to science. Prior to the start of ATBI sampling, 185 species of crane flies were known from GRSM (Hynes 1996). The current sampling recollected 113 previously collected species, but did not collect 72 species previously reported (Table 3). Trap running days were similar between traps.

Table 2. Crane fly species documented during sampling between October 2000 and October 2002.

Family	Species
Cylindrotomidae	
	Liogma nodicornis (Osten Sacken)
Limoniidae	
	Antocha (Antocha) opalizens Osten Sacken
	Antocha (Antocha) saxicola Osten Sacken
	Atarba (Atarba) picticornis Osten Sacken
	Austrolimnophila (Austrolimnophila) toxoneura (Osten Sacken)
	Cheilotrichia (Empeda) stigmatica Osten Sacken
	Chionea (Chionea) scita Walker
	Chionea (Chionea) valga Harris
	Chionea (Chionea) wilsoni Byers
	Cladura flavoferriugenia Osten Sacken
	Dactylolabis (Dactylolabis) cubitalis (Osten Sacken)
	Dactylolabis (Dactylolabis) hudsonica Alexander
	Dactylolabis (Dactylolabis) montana Alexander
	Dicranomyia (Dicranomyia) adirondacensis Alexander
	Dicranomyia (Dicranomyia) brevivena Osten Sacken
	Dicranomyia (Dicranomyia) distans Osten Sacken
	Dicranomyia (Dicranomyia) distendens Lundstrom
	Dicranomyia (Dicranomyia) divisa (Alexander)
	Dicranomyia (Dicranomyia) gladiator Osten Sacken
	Dicranomyia (Dicranomyia) immodesta Osten Sacken
	Dicranomyia (Erostrata) globithorax Osten Sacken
	Dicranomyia (Glochina) liberta Osten Sacken
	Dicranomyia (Melanolimonia) spinifera Alexander
	Dicranomyia (Numantia) fusca (Meigen)
	Dicranoptycha acanthophallus Alexander
	Dicranoptycha elsa Alexander
	Dicranoptycha germana Osten Sacken
	Dicranoptycha septemtrionis Alexander
	Discobola annulata (Linnaeus)
	Discobola nigroclavata (Alexander)
	Elephantomyia (Elephantomyia) westwoodi Osten Sacken

Table 2. Continued.

Family	Species
	Eloeophila johnsoni (Alexander)
	Eloeophila solstitalis (Alexander)
	Epiphragma (Epiphragma) fasciapenne (Say)
	Epiphragma (Epiphragma) solatrix (Osten Sacken)
	Erioptera (Mesocyphona) caliptera Say
	Eugnophomyia luctuosa (Osten Sacken)
	Euphylidorea albipes (Leonard)
	Euphylidorea lutea (Doane)
	Euphylidorea niveitarsis (Osten Sacken)
	Geranomyia diversa Osten Sacken
	Geranomyia rostrata (Say)
	Gnophomyia tristissima Osten Sacken
	Gonomyia (Gonomyia) bidentata Alexander
	Gonomyia (Lipophleps) manca Osten Sacken
	Hexatoma (Eriocera) albitarsis (Osten Sacken)
	Hexatoma (Eriocera) aurata (Doane)
	Hexatoma (Eriocera) brachycera (Osten Sacken)
	Hexatoma (Eriocera) brevioricornis Alexander
	Limnophila (Arctolimnophila) subcostata (Alexander)
	Limnophila (Dicranophragma) fuscavoria Osten Sacken
	Limnophila (Idiolimnophila) emmelina Alexander
	Limnophila (Lasiomastix) macrocera (Say)
	Limnophila (Lasiomastix) tenuicornis Osten Sacken
	Limonia indigena (Osten Sacken)
	Limonia macateei (Alexander)
	Limonia maculicosta (Coquillett)
	Limonia parietina (Osten Sacken)
	Limonia tristigma (Osten Sacken)
	Lipsothrix sylva (Alexander)
	Metalimnobia (Metalimnobia) cinctipes (Say)
	Metalimnobia (Metalimnobia) fallax (Johnson)
	Metalimnobia (Metalimnobia) immatura (Osten Sacken)
	Metalimnobia (Metalimnobia) triocellata (Osten Sacken)
	Molophilus (Molophilus) fultonensis Alexander
	Molophilus (Molophilus) hirthipennis (Osten Sacken)
	Molophilus (Molophilus) perflaveolus Alexander

Table 2. Continued.

Family	Species
	Neocladura delicatula (Alexander)
	Neolimnophila appalachicola Alexander
	Neolimonia rara (Osten Sacken)
	Ormosia (Oreophila) parviala Petersen and Gelhaus
	Ormosia (Ormosia) bilineata Dietz
	Ormosia (Ormosia) carolinensis Alexander
	Ormosia (Ormosia) harrisoniana Alexander
	Ormosia (Ormosia) holotrichia (Osten Sacken)
	Ormosia (Ormosia) hubbelli Alexander
	Ormosia (Ormosia) lilliana Alexander
	Ormosia (Ormosia) monticola (Osten Sacken)
	Ormosia (Ormosia) romanovichiana Alexander
	Ormosia (Ormosia) tennesseensis Alexander
	Ormosia (Ormosia) townesi Alexander
	Ormosia (Paraormosia) nigripila (Osten Sacken)
	Ormosia (Paraormosia) palpalis Dietz
	Ormosia (Paraormosia) pygmae (Alexander)
	Pilaria tenuipes (Say)
	Prionolabis munda (Osten Sacken)
	Prionolabis politissima (Alexander)
	Prionolabis rudimentis (Alexander)
	Prionolabis rufibasis (Osten Sacken)
	Prionolabis terebrans (Alexander)
	Prionolabis walleyi (Osten Sacken)
	Prolimnophila areolata (Osten Sacken)
	Pseudolimnophila (Pseudolimnophila) australina Alexander
	Pseudolimnophila (Pseudolimnophila) contempta (Osten Sacken)
	Pseudolimnophila (Pseudolimnophila) inornata (Osten Sacken)
	Pseudolimnophila (Pseudolimnophila) luteipennis (Osten Sacken)
	Pseudolimnophila (Pseudolimnophila) noveboracensis (Alexander)
	Rhabdomastix (Sacandaga) flava (Alexander)
	Rhipidia (Rhipidia) bryanti Johnson
	Rhipidia (Rhipidia) domestica Osten Sacken
	Rhipidia (Rhipidia) fidelis Osten Sacken
	Rhipidia (Rhipidia) maculata Meigen
	Rhipidia (Rhipidia) shannoni Alexander
	Scleroprota apicalis (Alexander)
	Shannonomyia lenta Alexander

Table 2. Continued.

Famly	Species
	Symplecta (Symplecta) cana (Walker)
	Trimicra pilipes (Fabricius)
	Ulomorpha pilosella (Osten Sacken)
	Ulomorpha rogersella Alexander
Pedicidae	
	Dicranota (Paradicranota) eucera Alexander
	Dicranota (Rhaphidolabina) flaveola (Osten Sacken)
	Pedicia (Pedicia) albivitta Walker
	Pedicia (Pedicia) margarita Alexander
	Tricyphona (Pentacyphona) autumnalis Alexander
	Tricyphona (Pentacyphona) huffae (Alexander)
	Tricyphona (Tricyphona) auripennis (Osten Sacken)
	Tricyphona (Tricyphona) gigantea (Alexander)
	Tticyphona (Tricyphona) katahdin Alexander
	Tricyphona (Tricyphona) inconstans (Osten Sacken)
	Tricyphona (Tricyphona) vernalis (Osten Sacken)
	Ula (Ula) elegans Osten Sacken
	Ula (Ula) paupera Osten Sacken
Ptychopteridae	
	Ptychoptera rutocincta Meigen
Tipulidae	
	Brachypremma dispellens (Walker)
	Ctenophora (Ctenophora) apicata Osten Sacken
	Ctenophora (Ctenophora) nubecula Osten Sacken
	Dolichopeza (Dolichopeza) americana Needham
	Dolichopeza (Oropeza) johnsonella (Alexander)
	Dolichopeza (Oropeza) obscura (Johnson)
	Dolichopeza (Oropeza) subalbipes (Johnson)
	Leptotarsus (Longurio) minimus (Alexander)
	Nephrotoma cingulata (Dietz)
	Nephrotoma eucera (Loew)

Table 2. Continued.

Family	Species
	Nephrotoma gnata (Dietz)
	Nephrotoma macrocera (Say)
	Nephrotoma subalterna Oosterbroek
	Nephrotoma virescens (Loew)
	Tanyptera (Tanyptera) dorsalis (Walker)
	Tipula (Lindnerina) illinoiensis Alexander
	Tipula (Lindnerina) senega Alexander
	Tipula (Lunatipula) apicalis Loew
	Tipula (Lunatipula) atreia Petersen and Gelhaus
	Tipula (Lunatipula) duplex Walker
	Tipula (Lunatipula) flavibasis Alexander
	Tipula (Lunatipula) fuliginosa (Say)
	Tipula (Lunatipula) monticola Alexander
	Tipula (Lunatipula) submaculata Loew
	Tipula (Nobilotipula) collaris Say
	Tipula (Nobilotipula) nobilis (Loew)
	Tipula (Pterelachisus) angulata Loew
	Tipula (Pterelachisus) coleana Alexander
	Tipula (Pterelachisus) entomophthorae Alexander
	Tipula (Pterelachisus) penobscot Alexander
	Tipula (Pterelachisus) trivitatta Say
	Tipula (Savtshenkia) fragilis Loew
	Tipula (Savrshenkia) ignobilis Loew
	Tipula (Schummelia) friendi Alexander
	Tipula (Schummelia) hermannia Alexander
	Tipula (Schummelia) stenorhabda Alexander
	Tipula (Trichotipula) algonquin Alexander
	Tipula (Trichotipula) oropezoides Johnson
	Tipula (Trichotipula) stonei Alexander
	Tipula (Trichotipula) unimaculata (Loew)
	Tipula (Triplicitipula) integra Alexander
	Tipula (Triplicitipula) triplex Walker
	Tipula (Triplicitipula) umbrosa Loew
	Tipula (Vestiplex) loniventris Loew
	Tipula (Yamatotipula) aprilina Alexander
	Tipula (Yamatotipula) furca Walker
	Tipula (Yamatotipula) iroquois Alexander

Table 2. Continued.

Family	Species
	Tipula (Yamatotipula) tephrocephala Loew
	Tipula (Yamatotipula) tricolor Fabricius
Trichoceridae	
	Trichocera bimaculata Walker
	Trichocera brevicornis Alexander
	Trichocera fattigiana Alexander
	Trichocera garretti Alexander
	Trichocera heimalis (De Greer)

Table 3. Species previously documented to occur in GRSM but not collected during sampling.

Family	Species
Limoniidae	
	Antocha (Antocha) biarmata Alexander
	Dactylolabis cubitalis (Osten Sacken)
	Dicranomyia (Caenoglochina) apicata subapicata (Alexander)
	Dicranomyia (Dicranomyia) humidicola (Osten Sacken)
	Dicranomyia (Dicranomyia) stulta (Osten Sacken)
	Dicranota (Eudicranota) catawbiensis Alexander
	Dicranota (Plectromyia) confusa (Alexander)
	Dicranota (Rhaphidolabis) hickmanae Alexander
	Dicranota (Rhaphidolabis) persimilis (Alexander)
	Dicrantoa (Rhaphidolabis) rubescens (Alexander)
	Eloeophila aprilina Osten Sacken
	Eloeophila brecifurca (Alexander)
	Eloeophila seticellula (Alexander)
	Erioptera (Erioptera) megophthalma Alexander
	Erioptera (Erioptera) septemtrionalis Alexander
	Erioptera (Erioptera) vespertina Osten Sacken
	Erioptera (Hoplolabis) armata Osten Sacken
	Erioptera (Mesocyphona) needhami Alexander
	Erioptera (Mesocyphona) parva Osten Sacken
	Euphylidorea cherokeensis (Alexander)
	Geranomyia diversa (Osten Sacken)
	Gonempeda nyctops (Alexnader)
	Gonomyia (Gonomyia) subcinerea Osten Sacken
	Gonomyia (Lipophleps) sulphurella Osten Sacken
	Helius (Helius) flavipes (Macquart)
	Hexatoma (Eriocera) cinerea (Alexander)
	Hexatoma (Eriocera) fuliginosa (Osten Sacken)
	Hexatoma (Eriocera) tristis (Alexander)
	Limnophila (Arctolimnophila) subcostata (Alexander)
	Limnophila (Dicranophragma) angustula Alexander
	Molophilus cramptoni Alexander
	Molophilus pubipennis (Osten Sacken)
	Ormosia (Ormosia) adirondacensis Alexander
	Ormosia (Ormosia) arcuata (Doane)

Table 3. Continued.

Family and Species
Ormosia (Ormosia) harrisoniana Alexander
Ormosia (Ormosia) serridens Alexander
Oxydiscus (Oxydiscus) americanus (Alexander)
Oxydiscus (Oxydiscus) minutes (Alexander)
Oxydiscus (Oxydiscus) pleuralis (Dietz)
Rhabdomastix hansoni Alexander
Rhabdomastix bracyneura Alexander
Rhabdomastix margarita Alexander
Scleroprocta innocens (Osten Sacken)
Tasiocera (Dasymolophilus) ursina (Osten Sacken)
Teucholabis immaculata Alexnader
Pedicidae
Tricyphona calcar (Osten Sacken)
Ptychopteridae
Bittacomorpha clavipes Fabricius
Bittacomorpha jonesi (Johnson)
Tipulidae
Dolichopeza (Oropeza) carolus Alexander
Dolichopeza (Oropeza) sessilis Alexander
Dolichopeza (Oropeza) subvenosa Alexander
Dolichopeza (Oropeza) tridenticulata Alexander
Dolichopeza (Oropeza) walleyi (Alexander)
Leptotarsus (Longurio) testaceus Loew
Nephrotoma calinota (Dietz)
Nephrotoma ferruginea (Fabricius)
Nephrotoma incurva (Loew)
Nephrotoma tenuis (Loew)
Tipula (Arctotipula) williamsiana Alexander
Tipula (Lunatipula) abdominalis (Say)
Tipula (Lunatipula) mallachi Alexander
Tipula (Lunatipula) translucida Doane
Tipula (Lunatipula) tuscarora Alexander

Table 3. Continued.

Family and Species
Tipula (Lunatipula) valida Alexander
Tipula (Platytipula) cunctans Say
Tipula (Pterelachisus) margarita Alexander
Tipula (Yamatotipula) brevifurcata Alexander
Tipula (Yamatotipula) calopteroides Alexander
Tipula (Yamatotipula) catawbiana Alexander
Tipula (Yamatotipula) cayuga Alexander
Tipula (Yamatotipula) nephophila Alexander
Tipula (Yamatotipula) noveboracensis Alexander

The distributions shown in Appendix I help to distinguish seasonal and temporal behavior patters exhibited by adult crane flies of GRSM. Previous sampling for crane flies in GRSM was largely conducted between May-September. The year-round sampling conducted in the current study revealed the presence of numerous species that had previously been unknown due to this gap in sampling. The late fall/winter/early spring fauna is includes 3 species of the apterous genus *Chionea* and 5 species of the winter crane fly genus *Trichocera*. Although not specifically limited to higher elevations, all species of *Chionea* spp. found during this inventory had higher numbers and more species at high elevation plots then at lower elevation plots. Surprisingly, all species of *Chionea* were collected by Malaise trap, despite their apterous condition. Additional specimens also were hand-collected from the foliage of small fir trees at Clingmans Dome by the author, indicating an apparent tendency for *Chionea* spp. to climb. Of the 5 species of *Trichocera*, the most widespread and common species was *Trichocera brevicornis* Alexander, which was found at all plots except Cades Cove. *Trichocera hiemalis* (De Greer), also was found at all locations, but not as commonly as *T. brevicornis*. *Trichocera fattigiana* Alexander, was collected only at the Cades Cove grassland plot.

Numerous species showed a preference in their spatial and temporal distributions. Eight species occurred only at high elevations (>1500 m) and were represented by more than 6 collected specimens: *Dicranomyia (Dicranomyia) adirondacensis* Alexander, *Dicranomyia (Dicranomyia) distendens* Lundstrom, *Limonia tristigma* (Osten Sacken), *Neolimnophila appalachicola* Alexander, *Ormosia (Ormosia) lilliana* Alexander, *Ormosia (Ormosia) monticola* (Osten Sacken), *Tricyphona (Pentacyphona) huffae*

(Alexander), and *Leptotarsus (Longurio) minimus* (Alexander). *Ormosia lilliana* and *T. huffae* are known only from Tennessee and North Carolina, and were collected previously only from upper elevations (Hynes 1996; Alexander 1941). Thus, it is likely that these species are limited to higher elevations in GRSM. *Neolimnophila appalachicola* has a similar pattern of being collected much more frequently at upper elevations, but Alexander (1941) collected three females at a mid-elevation of 1067 m. The remaining species all have distributions that are more typically northern, their presence in GRSM representing the southern end of their range. These species are likely to be more common at higher elevations in the southern Appalachians where temperatures are more similar to those in the rest of their northern range. Several other species also were collected only at higher elevations, but in lower numbers (< 6 specimens): *Dactylolabis (Dactylolabis) montana* Alexander, *Euphylidorea lutea* (Doane), *Geranomyia diversa* Osten Sacken, *Hexatoma (Eriocera) brevioricornis* Alexander, *Limnophila (Arctolimnophila) subcostata* (Alexander), *Limnophila (Lasiomastix) macrocera* (Say), *Ormosia (Ormosia) bilineata* Dietz, *Ormosia (Ormosia) harrisoniana* Alexander, *Ormosia (Ormosia) nigripila* (Osten Sacken), *Ormosia (Ormosia) pygmae* (Alexander), *Prionolabis rudimentis* (Alexander), *Dicranota (Rhaphidolabina) flaveloa* (Osten Sacken), *Tricyphona (Tricyphona) auripennis* (Osten Sacken), *Tricyphona (Tricyphona) autumnalis* Alexander, *Dolichopeza (Orepeza) johnsonella* (Alexander), *Dolichopeza (Orepeza) obscura* (Johnson), *Tipula (Pterelachisus) penobscot* Alexander, *Tipula (Schummelia) stenorhabda* Alexander, *Tipula (Trichotipula) oropezoides* Johnson, and *Tipula (Yamatotipula) iroquois* Alexander.

Only three species represented by more than six specimens were collected only from low elevation (<1000 m): *Tipula (Schummelia) hermannia*, *Tipula (Lunatipula) flavibasis* Alexander, and *Trichocera garretti.* All of these species have extensive Nearctic ranges and it is doubtful that they would be limited to only the lower elevations of GRSM. Many other species were collected only at low elevations, but were represented by fewer than six specimens: *Antocha (Antocha) opalizens* Osten Sacken, *Antocha (Antocha) saxicola* Osten Sacken, *Dicranoptycha elsa* Alexander, *Eloeophila johnsoni* (Alexander), *Eloeophila solstitalis* (Osten Sacken), *Erioptera (Mesocyphona) caloptera* Say, *Eugnophomyia luctuosa* (Osten Sacken), *Geranomyia rostrata* (Say), *Gonomyia (Gonomyia) bidentata* Alexander, *Hexatoma (Eriocera) aurata* (Doane), *Limnophila (Lasiomastix) tenuicornis* Osten Sacken, *Molophilus (Molophilus) perflaveolus* Alexander, *Ormosia (Paraormosia) palpalis* Dietz, *Prionolabis terebrans* (Alexander), *Pseudolimnophila (Pseudolimnophila) luteipennis* (Osten Sacken), *Pseudolimnophila (Pseudolimnophila) noveboracensis* (Alexander), *Rhipidia (Rhipidia) bryanti* Johnson, *Scheroprota apicalis* (Alexander), *Trimicra pilipes* (Fabricius), *Dicranota (Raradicranota) eucera* Alexander, *Tricyphona (Tricyphona) katahdin* Alexander, *Tricyphona (Tricyphona) vernalis* (Osten Sacken), *Ptychoptera rutocincta* Meigen, *Brachypremna dispellens* (Walker), *Ctenophora (Ctenophora) nubecula* Osten Sacken, *Dolichopeza (Oropeza) subalbipes* (Johnson), *Nephrotoma eucera* (Loew), *Nephrotoma gnata* (Dietz), *Nephrotoma macrocera* (Say), *Nephrotoma subalterna* Oosterbroek, *Tipula (Lunatipula) atreia* Petersen and Gelhaus, *Tipula (Lunatipula) fuliginosa* (Say), *Tipula (Triplicitipula) umbrosa* Loew, *Tipula (Yamatotipula) furca* Walker, and *Tipula (Yamatotipula) tricolor* Fabricius.

Among species collected throughout the elevation gradient, several emerged earlier in the spring at lower elevations than at higher elevations: *Atarba (Atarba) picticornis* Osten Sacken, *Epiphragma (Epiphragma) fasciepennis* (Say), *Euphylidorea albipes* (Leonard), *Limnophila (Dicranomyia) fuscovaria* Osten Sacken, *Limnophila (Idiolimnophila) emmellina* Alexander, *Prionolabis munda* (Osten Sacken), *Prionolabis politissima* (Alexander), *Prionolabis rufibasis* (Osten Sacken), *Prionolabis walleyi* (Osten Sacken), *Pseudolimnophila (Pseudolimnophila) australina* Alexander, *Pseudolimnophila (Pseudolimnophila) contempta* (Osten Sacken), *Tanyptera dorsalis* (Walker), *Tipula (Lunatipula) duplex* Walker, *Tipula (Pterelachisus) trivittata* Say, and *Tipula (Vestiplex) longiventris* Loew. Several fall species emerged earlier at high elevations: *Chionea (Chionea) valga* Harris, *Cladura flavoferruginea* Osten Sacken, *Limonia paratiena* (Osten Sacken), and *Trichocera brevicornis*. For these species, it appears that suitable larval habitat occurs at both high and low elevations. However, seasonal conditions between the zones differ, thus altering the emergence patterns of the adult flies.

The appearance of two emergence periods indicates either the presence of two separate broods or a single brood undergoing two generations per year (Rogers 1942). For many species there are distinct patterns with two nodes of emergence, one in the spring and one in the fall, that represent two generations per year. Bivoltine species include the following: *Dicranomyia (Dicranomyia) divisa* (Alexander), *Dicranomyia (Dicranomyia) liberta* Osten Sacken, *Dicranomyia (Numantia) fusca* (Meigen), *Erioptera (Mesocyphona) caloptera*, *Eugnophomyia luctuosa*, *Gnophomyia tristissima* Osten

Sacken, *Limonia indigena* (Osten Sacken), *Molophilus (Molophilus) fultonensis* Alexander, *Molophilus (Molophilus) hirthipennis* (Osten Sacken), *Neolimnophila appalachicola*, *Neolimonia rara* (Osten Sacken), *Ormosia (Ormosia) romanovichiana* Alexander, *Rhipidia (Rhipidia) domestica* Osten Sacken, *Rhipidia (Rhipidia) fidelis* Osten Sacken, *Rhipidia (Rhipidia) maculata* Meigen, *Rhipidia (Rhipidia) shannoni* Alexander, *Symplecta cana* (Walker), *Ula (Ula) paupera* Osten Sacken, and *Leptotarsus (Longurio) minimus*. Two of these species, *Limonia indigena* and *M. fultonensis* have two nodes of strong emergence, one in spring and one in fall, at lower elevations, but one continuous emergence at higher elevations. This pattern is similar to those found with species common to both Kansas (Young 1978) and Michigan (Merritt 1981; Rogers 1942) where species with both a spring and fall emergence in Kansas had only one emergence in Michigan.

Molophilus fultonensis and *M. hirthipennis* both occur at the high elevation bog on Andrews Bald (MT11). The emergence patterns of these two closely related species over two years shows that there is a distinct separation in their emergence. Both species were collected in large numbers from this habitat. *Molophilus hirthipennis* emerges earlier in the year, followed by the start of *M. fultonensis* emergence. There is little overlap in the occurrence of the adults of these two species. The separation in emergence of these two species due to resource partitioning is unlikely since the adults of these species do not feed and the closeness of emergence of these species would not allow for much additional growth in the larvae of *M. fultonensis*. More likely this pattern is a technique to avoid interspecific copulation by the adults of two crane fly species (Freeman 1968).

Species with emergence patterns such as *Metalimnobia (Metalimnobia) immature* (Osten Sacken), that have staggered emergences with individuals collected throughout the year, are likely due to differences in development time by individuals at different locations. For these species it is difficult to discern the true number of generations or broods present. This continual emergence is indicative of species that have their adult emergence less dependent on seasonal timing and may be more dependent on viability of larval habitat and food availability.

The crane fly fauna enumerated in this study is at least partially stratified due to meteorological differences resulting from the elevation gradient. For many species, the degree to which these patterns are exhibited is still unclear and collection of further specimens is needed. The GRSM crane fly fauna is strongly influenced by the presence of species that reach their southern limits in GRSM. Comparison of species distributions by geographic range (Oosterboek 2002) shows that most of the species found during this sampling exhibit this pattern (Table 4). Species that have widespread distributions, typically from Canada to Florida and westward to Kansas, were collected nearly as frequently. Species that radiate from a southern distribution comprised a much smaller proportion of the total species encountered. When the elevation gradient is considered, species known from only the higher elevations (> 1500 m) are represented by far more species with northern and widespread distributions and a larger percentage of species known only from the Tennessee-North Carolina area. Species found only at low elevations (>1000 m) had the majority of species with widespread distributions, an increase in species with southern distributions, and a decrease in locally known species.

Table 4. Range distributions of species collected at differing elevations in GRSM. Distributions for each species was determined to be either widespread (ranging from Florida to Canada and considerably westward), Northern (appearance in TN/NC is southernmost extent of their range which extends to at least Canada), Southern (range radiates from the southern US and typically extends into the tropics), or TN/NC (species is known only from the Tennessee/North Carolina area). Information is listed for all species collected, those found only at upper elevations (>1500 m) and those from only lower elevations (< 1000 m) and is shown as percentages with actual numbers in parenthesis.

Range	All Species	Upper Elevations			Lower Elevations		
		> 6 specimens	< 6 specimens	Together	> 6 specimens	< 6 specimens	Together
Widespread	41% (73)	30% (3)	40% (8)	37% (11)	100% (3)	43 % (15)	47% (18)
Northern	40% (71)	30% (3)	45% (9)	40% (12)	0% (0)	25 % (9)	24% (9)
Southern	21% (21)	10% (1)	0% (0)	3% (1)	0% (0)	29 % (10)	26% (10)
TN/ NC	7% (13)	30% (3)	15% (3)	20% (6)	0% (0)	3 % (1)	3% (1)

From these data it appears that crane fly assemblages in GRSM are largely comprised of species that have widespread distributions. High-elevation species assemblages are comprised of a greater percentage of northern species or species known only from the mountainous areas of Tennessee and North Carolina. Species typical of lower elevations are more frequently of widespread or southern distribution.

CHAPTER III

New Species and Records of Crane Flies (Tipulomorpha, Diptera) from Great Smoky Mountains National Park, Tennessee and North Carolina, U. S. A.

This chapter is a paper by the same name that was submitted for publication in Transactions of the American Entomological Society in 2003 by Matthew Petersen, Jon Gelhaus, and Ernest Bernard:

Petersen, M. J., J. K. Gelhaus, and E. C. Bernard. New Species and Records of Crane Flies (Tipulomorpha, Diptera) from Great Smoky Mountains National Park, Tennessee and North Carolina, U.S.A.. Transactions of the American Entomological Society. (in review).

My contribution to this paper includes (1) discovery and preliminary identification of specimens, (2) writing the description of the two new species discovered, (3) identifying the species showing significant range extensions, (4) writing discussions for each range extension, (5) finding and reviewing the literature used to compare these species, (6) taking the images used in this publication, and (7) a majority of the writing.

INTRODUCTION

Created in 1934, Great Smoky Mountains National Park (GRSM) is located in Tennessee and North Carolina and covers over 521,000 acres. This is one of the largest national parks on the east coast and represents one of the largest tracts of forest, including most of the remaining old growth forest remaining, on the east coast. In 1996, an All Taxa Biodiversity Inventory (ATBI) was begun in GRSM with the goal of identifying all life from within its boundries. An intensive arthropod sampling pilot project was begun in October at 11 plot locations. The goal of this project is to evaluate sampling protocol for large-scale arthropod sampling and evaluate collection effectiveness of these techniques. Collection plot locations were chose to coincide with existing ATBI research plots. These plots were chosen to represent both areas that are common (cove hardwood

forest and spruce/fir forest) and unique to (grassy bald) the southern Appalachian Mountain region of Tennessee and North Carolina.

Knowledge of the crane fly (Tipulomorpha, Diptera) fauna of GRSM is based primarily on two papers by C.P. Alexander (1940, 1941). Sampling by Alexander was conducted from June through September in 1939-1940 at selected locations in GRSM. During the time of Alexander's sampling, GRSM was still in an early stage of succession. Much of its area still showed the effects of the logging and settlement that was prevalent in this area during the early 20th century (Pyle, 1988). Since this time, the forests have become reestablished and now cover about 95% of the Parks total area. While the reports of Alexander greatly increased our understanding of the crane fly fauna of the region, changes in the forest composition and sampling gaps in the early spring and late fall have left the actual current crane fly community of GRSM incompletely determined. With our current sampling, we seek to fill in seasonal sampling gaps and collect crane flies in habitats that have not been sampled previously.

Currently, one year of data from this sampling has been analyzed, resulting in over 7,000 crane fly specimen identifications, representing 48 genera and 155 species. Among these taxa, 66 species are new records for GRSM with two representing species new to science, and nine representing significant extensions to species distributions. This paper contains descriptions of two new species, *Ormosia* (*Oreophila*) *parviala* Petersen and Gelhaus n. sp. and *Tipula* (*Lunatipula*) *atreia* Petersen and Gelhaus n. sp., and discussions of significant range extensions for nine species.

METHODS AND MATERIALS

Sampling was conducted between October 2000 and October 2001 by use of 22 Malaise/flight intercept traps, 121 pitfall traps, and 22 Lindgren funnel canopy traps located at 11 ATBI reference plots located throughout GRSM. Each plot location contained two Malaise traps, ten pit-fall traps, and two Lindgren funnel canopy traps. Malaise trap specimens were collected into 70% ethanol and pit-fall and Lindgren funnel traps were collected into ethylene glycol. Traps were run year-round with removal of collected material occurring every two weeks. Collection dates for this publication are given as start date–end date of collecting period. Collected material was then taken to the lab where crane flies were removed and identified to species level. Sorted flies were preserved in 70% ethanol. Male genitalic features were studied by immersing removed genetalia in a warm sodium hydroxide solution for five minutes. Digital images used in this publication were taken both at the Academy of Natural Sciences, Philadelphia, PA, and at the University of Tennessee, Knoxville, TN. Images taken at the Academy of Natural Sciences were captured by a JVC-3CCD video camera attached to a Leica Leitz DMRB compound microscope and a Wild MZ6 stereomicroscopethe. All images used in this publication were compiled using the Syncroscopy Auto-Montage© imaging system.

Description of morphological terminology is based on McAlpine et al. (1981).

ORMOSIA (OREOPHILA) PARVIALA

Type Specimens

HOLOTYPE, male: North Carolina: Swain Co., Clingmans Dome, Great Smoky Mountains National Park (GRSM), 35.56028 N -83.49528 W, elevation 1,944 m, 24 May 2000-6 June 2000, collected with Malaise trap (in alcohol). Holotype deposited in the

Academy of Natural Sciences, Philadelphia, PA. PARATYPE: North Carolina: Swain Co., (7 males, 3 females (in alcohol)). 4 ♂♂, North Carolina: Swain Co., Clingmans Dome, GRSM, 10 May 2001-24 May 2001, collected by Malaise trap; 1 ♂, North Carolina: Swain Co., Clingmans Dome, GRSM, 24 May 2001-6 June 2001; 1 ♂, 1 female, 10 May 2001-24 May 2001, collected with Malaise trap; 1 ♂, North Carolina: Swain Co., Andrews Bald, GRSM, 35.53889 N -83.49417 W, elevation 1757 m, 24 Apr 2001-10 May 2001, collected by Malaise trap; 2 ♀♀, Tennessee: Sevier Co., Goshen Prong, GRSM, 35.61056 N -83.61056 W, elevation 895 m, 28 Mar 2001-9 Apr 2001, collected in pitfall trap. Paratypes are deposited in the Academy of Natural Sciences, Philadelphia, PA, USA; Smithsonian Institution, Washington D. C., USA; University of Tennessee Entomology Museum, Knoxville, TN, USA; Great Smoky Mountains National Park Museum, Gatlinburg, TN, USA.

Diagnosis

Small species; Overall coloration of thorax yellowish brown, with prescutum coloration ranging from three distinct dark brown stripes to a broad dorsal darkening; halters pale, stem slightly darker; male wing (Fig. 2) slightly suffused with brown, brown macrotrichia present in all cells, *Sc* poorly indicated and intersecting *C* at about origin of *Rs*, cell M_2 open by atrophy of *m*; female wing (Fig. 2) reduced in size and venation; male hypopygium (Fig 2) with ventral gonostyle a simple rod, narrowing to a blackened tip; dorsal gonostyle a simple pale yellow rod.

MALE (N = 8). From specimens in alcohol. *Body Length*—2.8-3.8 mm; wing length 4.1- 4.7 mm. Body yellowish brown unless otherwise noted. *Head*—Dorsally with a wide brown stripe running from anterior margin to rostrum, broadest at

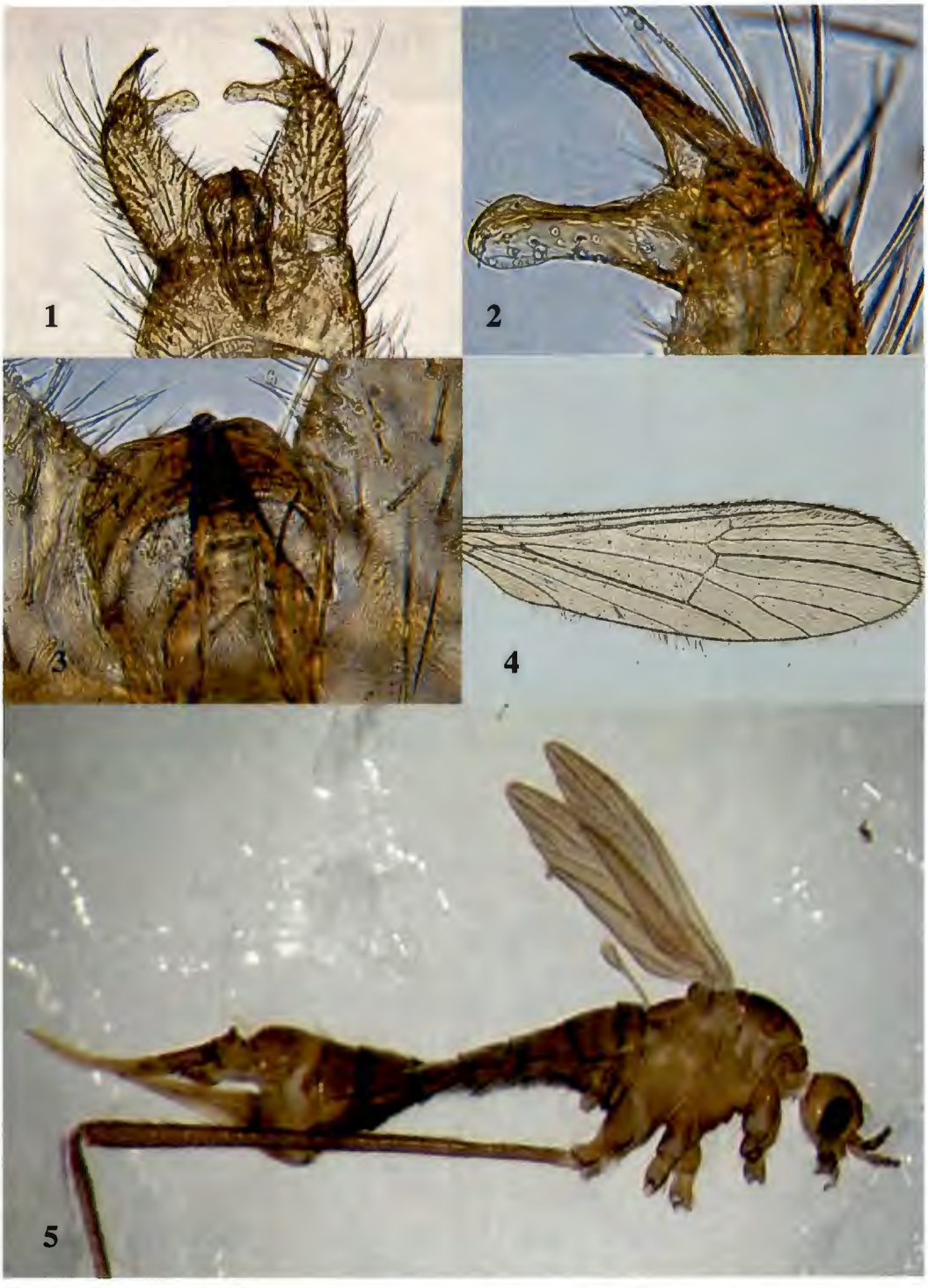


Figure 2. *Ormosia* (*Oreophila*) *parviala*, new species; (1) male, hypopygium dorsal view, (2) male, inner and outer gonostyle, (3) male, adeagus and fused gonopophyses, (4) male, wing, (5) female, lateral view showing reduced wing.

mid-length. Rostrum yellow, very short. Palpi and antennae brown. *Antenna*—0.7-1.0 mm long, apparently 15-segmented (last 2 flagellomeres fused), scape longer than wide, slightly lighter in color than remaining antenna. Pedicel pear shaped. Verticils exceeding the length of their respective segment, each flagellomere oval in shape. *Thorax*—Prescutum brown dorsally, rarely with three brown stripes and lateral brown spot. Tuberculate pits black. Scutum darkening to brown anteriorly. Membranous areas yellowish white. *Halteres*—0.7-0.9 mm long, base and knob white with stem slightly darkened. Legs with femur tips slightly darkened, tarsi dark brown. *Wing*—Slightly suffused with light brown, otherwise unpatterned, stigma absent. Macrotrichia present in all cells, brown in color. Microtrichia of veins black. *Venation*—Veins pale brown, vein *Sc* exceedingly pale. Veins R_4 and *Cu* darker brown. *Sc* intersecting *C* at about the origin of *Rs*. R_2 entering at or slightly beyond fork of R_3+R_4. Anal veins divergent. Cell M_1 open by atrophy of *m*, *CuA* entering *M* at or slightly beyond fork of *M*. *Abdomen*—Intersegmental regions pale. *Male Hypopygium*—Simple in construction. Rotated 180°. Ninth tergite with posterior margin slightly rounded. Ventral gonostylus having a "thorn-like" appearance, a short slightly curved spine, darkened beyond base, surface of darkened area with microscopic denticles. Dorsal gonostylus longer than ventral gonostylus, appearing as a pale yellow rod, constricted slightly medially, when viewed posteriorly having a slight curve, apex rounded; short, scattered setae found throughout. Gonapophyses seen as an unbroken sclerotized plate, shallowly excavated medially forming two weak lateral lobes. Gonapophyses overlain with simple stout aedeagus, narrowing to a darkened rounded blunt tip; internal base extended anteriorly as sinuous rods, enclosing a rounded sperm pump.

FEMALE (N = 3). As in male except: *Body length*—4.2 mm; wing length—1.5 mm. *Wing*—More strongly suffused with brown than in male. *Venation*—Poorly indicated (Fig. 2). *Thorax*—General coloration yellowish brown throughout, lateral spots absent. *Antenna*—Damaged, missing flagellum. *Abdomen*—Dark Brown. Ovipositor elongate, with cerci curved upward. Lighter in color that remainder of abdomen.

Etymology

O. (*O.*) *parviala* was named using the Latin prefix parv-, meaning small, and the Latin word ala, meaning wing. This "small wing" refers to the wing of the female, which is much reduced in size.

Discussion

The subgenus *Oreophila* contains 16 species, 7 Oriental and 9 Nearctic. Except for the present species, the 8 other Nearctic species are western in distribution, with most occurring in the Pacific Northwest of the U. S. and Canada. *Ormosia* (*O.*) *parviala* n. sp. belongs to what Alexander called the *flaveola* group (*O.* (*O.*) *absoroka* Alexander, *O.* (*O.*) *flaveola* Coquillett, *O.* (*O.*) *sequoiarum* Alexander). This group includes members that have the hypopygium with a short ventral gonostyle, with narrowing apex and roughened with microscopic denticles; dorsal gonostyle a pale rod of nearly the same length as ventral gonostyle; aedeagus stout, narrowing to a darkened blunt tip; phallosome an unbroken oval sclerotized plate, simple in construction. *Ormosia* (*O.*) *parviala* n. sp. most closely resembles *O. absaroka* Alexander in appearance of the hypopygium, but differs in presence of small rounded lobes of the gonopophyes and smaller overall body size (< 4 mm). *O. flaveola* differs from *O. parviala* in darker coloration of its legs and more suffused wings. *O. parviala* differs from *O. sequoiarum*

in the lobed phallosome, having a yellowish brown coloration (uniform black coloration in *sequoiarum*), wings with uniform trichation of all wing cells, and 9t of simple construction. The male of *Ormosia parviala* will key to the subgenus *Oreophila* in Alexander and Byers (1981) in which it is the only Eastern species. The species will key to the *Ormosia nigripila* group (couplet 12) in Alexander 1942 but differs from the two species keyed there in the structure of the thorn-shaped ventral gonostylus.

The female of *O. (O.) parviala* can be readily distinguished from all other species of *Oreophila* by its greatly reduced wings, which would seem to render it flightless. This is the second brachypterous crane fly described from the upper elevations of GRSM; the first being *Prionolabis rudimentus* Alexander, described in 1940. A reproductive advantage has been observed in species with reduced flight muscles due to wing reduction (Roff et al 2002). Byers (1983) notes that in the apterous crane fly genus *Chionea*, reduced flight musculature in the female resulted in increased space in the thorax for egg production. Of the three females collected, the preserving agent dissolved the wing musculature of the two female specimens that still contained eggs and it was not possible to determine whether a reduction in flight muscle had actually occurred. It has not been determined whether the musculature in the third female had been reduced or not. Byers (1969) offers further notes on wing reduction in crane flies.

Distribution

North Carolina and Tennessee in Great Smoky Mountains National Park, U. S. A.

Habitat

Ormosia (Oreophila) parviala has been identified from three high-elevation (>1,750 m) sites in GRSM (two at Clingmans Dome and one at Andrews Bald) and one

low-elevation site (Goshen Prong). Vegetation of Clingmans Dome is dominated Fraser fir, *Abies fraseri*, and Red spruce, *Picea rubens*. Andrews Bald is a cleared mountaintop that is dominated by native and introduced grass species. The Goshen Prong forest is representative of a secondary growth deciduous cove hardwood forest. This forest type is most common below 1,400 m in the many coves and valleys of GRSM. The presence of adults at three distinct habitats makes the association between species and habitat difficult to determine and is more likely that this species will be found across forest types at the mid to upper elevations of GRSM (865-1,944 m). Larval habitat for this species is unknown, but based on knowledge of larval habitats for other species of *Ormosia* (Byers, 1996), the larva of *O. parviala* is likely to live in moist earth.

TIPULA (LUNATIPULA) ATREIA

Type Specimen

HOLOTYPE, male, Tennessee: Blount Co., Great Smoky Mountain National Park (GRSM), Cades Cove old field, 35.59251 N -83.84376 W, elevation 457 m, 9 Apr-23 April 2001, collected by Malaise trap (in alcohol). Holotype deposited at the Academy of Natural Sciences, Philadelphia, U.S.A.

Diagnosis

Small *Lunatipula* species. Wing pale yellow; costal and subcostal fields suffused with brown; stigma faintly indicated, otherwise wing unmarked. Posterior margin of male tergite 9 expanded into two large lateral lobes, forming a wide V-shaped notch, separated by a small pale thin medial lobe that is approximately one quarter the length of the latter two. Eighth sternite slightly excavated medially, with two short rounded lobes each equipped with a single stout elongate seta. Appendages of the ninth sternite covered

with long, pale, straight setae. Outer gonostyle a pale greatly reduced lobe. Outer basal lobe excavated laterally with large and small spines along apex.

MALE (N=1). From specimen in alcohol. *Body Length*—11.5 mm; wing length 11.7 mm. *Head*—Uniformly brown, rostrum light brown, nasus present; palpi brown (terminal segment absent). *Antenna*—3.5 mm, just attaining wing origin when bent back, pedicel and scape yellowish brown, flagellum brown, flagellomeres weakly bicolorous with bases enlarged and darker in color than remaining portion of segment, first flagellomere lighter in color than otheres, terminal flagellomere small. *Thorax*—Prescutum yellowish brown with three broad, dark brown stripes, median stripe bisected by thin brown line, median line not extending posteriorly beyond transverse suture, lateral pair continued as broader stripe along scutum; pleural region yellowish brown with pale membranous areas, ventral half of katepisternum and meron dark brown. *Halteres*—Yellowish brown, sparse black setae present at base of knob. *Wings* (Fig. 3)—Overall pale yellow in color; costal and subcostal fields suffused with brown; stigma faintly indicated but clearly present, preceded by small white area extending to cell *m2*; remainder of wing unmarked; *Sc* longer than *m-cu*; cell *m1* longer than its petiole. *Legs*—Yellow, paler near base of femor and darkening slightly distally; tibia brown. *Abdomen*—Overall yellowish brown; tergites 3-6 vaguely marked medially with a wide brown stripe, widening to cover the posterior edge on tergite 6; tergites 7 and 8 uniformly brown; sternites pale yellow in color; sternites 5-7 marked along the posterior edge by pale brown. *Male genitalia* (Figs. 3)—Male hypopygium with tergite 9 yellowish brown in color, trilobed, lateral margins expanded into two large lateral lobes, broad at base and narrowing to slender, rounded apex, medial margin of lobe sinuous; median lobe a short

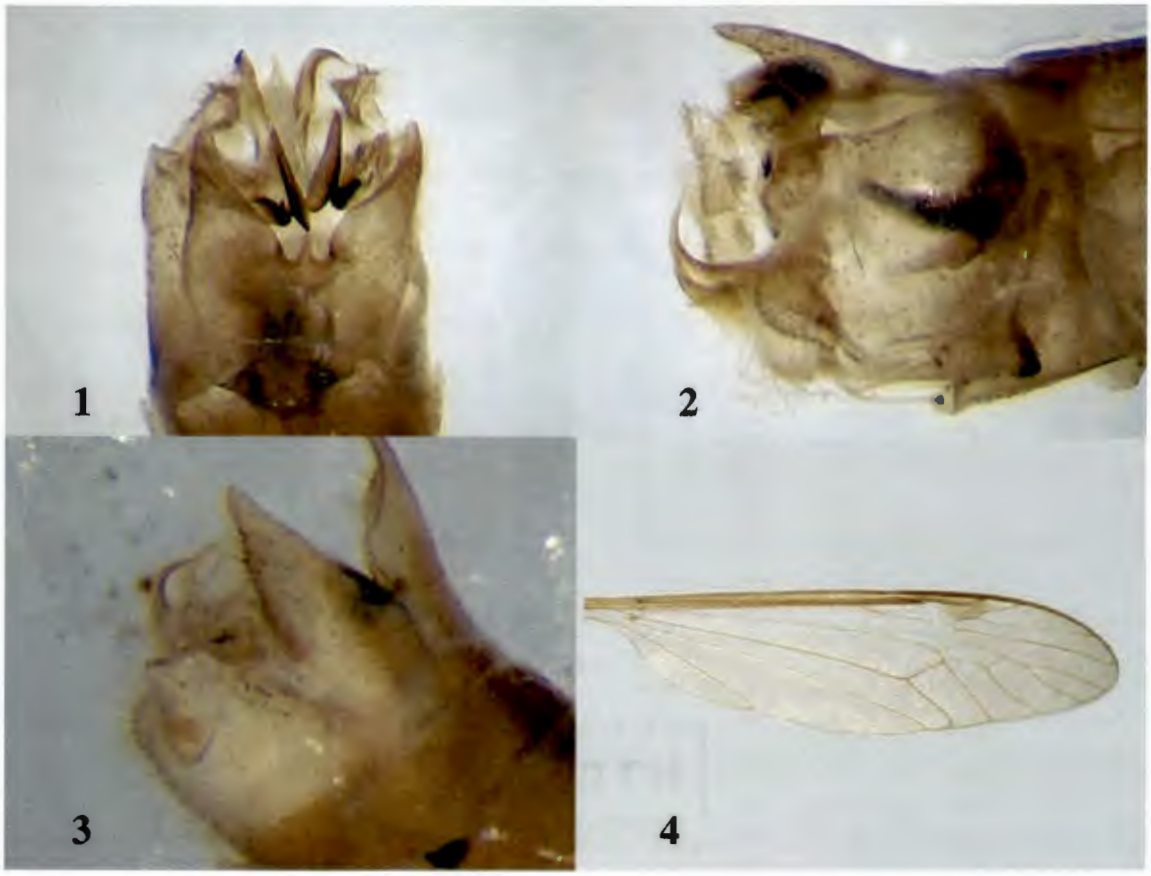


Figure 3. *Tipula (Lunatipula) atreia*, new species; (1) male, hypopygium, dorsal view, (2) male, hypopygium, lateral view, (3) male, hypopygium, lateral view showing reduced outer gonostyle, (4) male, wing.

spine, one quarter the length of lateral lobes, separated from lobes by narrow U-shaped emarginations (Fig. 3). Posterior margin of sternite 8 slightly excavated, with two short rounded lateral lobes; each lobe equipped with a single stout elongate seta that is slightly curved medially, surrounded by sparse fine yellow setae. Appendage of the ninth sternite swollen, narrowing ventrally, covered with long straight yellow setae. Inner gonostyle composed of both upper and lower beaks and outer basal lobe; upper beak appearing as a large laterally compressed oval; distal edge slightly expanded to a rounded tip, the proximal end bearing a set of small sensory pegs. Lower beak a rounded lobe, bearing serrations along its darkened apex, along lateral surface a line of strong dark setae extending to mid-length. Outer basal lobe deeply excavated laterally with crenulated apical margin, with a large and small spine along apex. Outer gonostyle a small pale lobe; bearing sparse pale setae. Aedeagus with each lateral lobe a strongly recurved spine (Fig. 3), their apex strongly attenuate.

FEMALE. Unknown.

Etymology

The name *atreia* refers to Atreus of Greek mythology. Atreus, king of Mycenae, has his ancestry is in the line of Tantalus, being the son of Pelops and brother to Thyestes. Just as *Tipula atreia* goes through its transition from larvae to adult stage, Atreus similarly goes through a metamorphosis between two distinct stages, from a relatively harmless youth stage into a very different vengeful and destructive adult stage. The struggle between Atreus and his brother Thyestes was a widely used theme for many early Greek dramaticists. Possibly one of the most complete works featuring Atreus is *Thyestes* by playwright, orator, and philosopher Locius Annaeus Seneca. The suggestion

of this name and information on Atrues came from Jon Darnielle. Additional background was obtained through Tarrant (1985).

Discussion

Tipula (*Lunatipula*) *atreia* most closely resembles *Tipula* (*Lunatipula*) *triton* Alexander in general appearance. Similarities can be seen in the appearance of the trilobed 9th tergite and the minute outer gonostyle in the two species. After examination of the type specimen of *T. triton* by JKG, it is clear that Alexander mistakenly referred to the outer basal lobe of *triton* as the outer gonostyle, an understandable confusion as the outer gonostyle is unusually reduced (Fig. 3). This present species can be separated from *triton* based on the following characteristics: ninth tergite (Fig. 3) of *T. atreia* has the medial lobe greatly reduced when compared to the lobe of *T. triton* (Alexander 1942, fig. 32M); the two lobes of the adeagus on *T. atreia* are much more slender (Fig. 3) than the stouter lobes of *T. triton*; the apex of the outer basal lobe of *T. triton* is an elongate slender tip, while the outer basal lobe of *T. atreia* is stouter and crenulate with 2 acute points; the setae of the appendage of the ninth sternite differ between the two in that those of *T. atreia* are long, straight and yellow, where those of *T. triton* are darker, denser and have a crinkled appearance.

Tipula atreia will key to *T. triton* in the key of Alexander (1942); note that the key in couplet 21 refers to the outer basal lobe mistakenly as the "outer dististyle."

Disribution

Tennessee in Great Smoky Mountains National Park, U. S. A.

Habitat

Tipula (*Lunatipula*) *atreia* has been collected from one location from the western end of Cades Cove in GRSM. This location is an open grassland cove that is surrounded by forest. The area of grassland where the specimen was collected is subject to early season inundation, but throughout the rest of the year is dominated by various native and introduced grasses. Surrounding forest is deciduous cove hardwood.

RANGE EXTENSIONS

While over 50 new records have been discovered for GRSM during the current sampling, the eight species listed below not only represent new records for the states of North Carolina and Tennessee, but also extend the known range of the species a significant distance. Listed below each species name is a discussion of the range of the species, the previous range of the species (Catalogue of the Crane flies of the World, Oosterbroek, pers. comm.), and the location information for collections made in GRSM.

Of these species with significant range extensions, most were previously known only from northeastern North America. The occurrence of four species, *Ctenophora (Ctenophora) apicata*, *Limonia maculicosta*, *Tipula (Lunatipula) monticola*, and *Tricyphona (Pentacyphona) autumnalis*, only at sites above 1000 m gives the indication that these species may be limited to higher elevations in the southern Appalachians. The remaining species were found at elevations ranging from 594-1944 m and are more likely to represent continuous ranges from the north.

The addition of *Antocha (Antocha) obtusa* was from prior sampling ATBI sampling conducted in 1999.

Antocha (*Antocha*) *obtusa* Alexander

The distribution of this species shows an northern range from New York to Michigan with a large extension south to Kansas. The larval stage of this species is aquatic and adults were collected along two larger rivers in GRSM.

Previously known distribution: Canada (Quebec), USA (Michigan, New York, south to Kansas).

Tennessee: Blount Co, Little River, 1.2 km south of Townsend, GRSM; 2 ♂♂, 9 June 1999; CR & KA Parker. Collected by blacklight. Tennessee: Sevier Co., Greenbrier Cove, Middle Prong Little River, GRSM; 2 ♂♂, 11 June 1999; CR & KA Parker. Collected by blacklight.

Ctenophora (*Ctenophora*) *apicata* Osten Sacken

This species is known from the northeastern United States and eastern Canada. Its occurrence in GRSM extends its range by nearly 1000 km. *Ctenophora apicata* was rarely encountered, with only 3 specimens collected from two locations, Purchase Knob, a northern hardwood forest, and Albright Grove, an old growth montane cove hardwood forest.

Previously known distribution: Canada (Ontario, Quebec, and Ontario), USA (Minnesota, Maine, south to New York and Connecticut).

North Carolina: Haywood Co., Purchase Knob, GRSM, 35.59194 N -83.06028 W; 1 male, 1 female, 19 July 2001-2 Aug 2001. Tennessee: Cocke Co., Albright Grove, GRSM, 35.73333 N -83.28056 W; 1 ♀, 1 Aug 2001-14 Aug 2001.

Discobola nigroclavata (Alexander)

This species was described by Alexander (1942) from one female specimen from New York, one female from Massachusetts, and one male from Maine. This marks the first documented collection of this species since the original description. While not found in large numbers, this species was found widely at many locations and all elevations throughout GRSM

Previously known distribution: USA (Maine, south to New York and Massachusetts).

North Carolina: Haywood Co., Cataloochee, GRSM, 35.58639 N -83.08167 W; 1 ♀, 2 Aug 2001-20 Aug 2001; 2 ♀♀, 20 Aug 2001-11 Sept 2001. North Carolina: Haywood Co., Purchase Knob, GRSM, 35.59194 N -83.06028 W; 2 ♀♀, 20 Aug 2001-11 Sept 2001; 1 ♀, 2 Aug 2001-20 Aug 2001. North Carolina: Swain Co., Clingmans Dome, GRSM, 35.56028 N -83.49528 W; 2 ♂♂ 4 ♀♀, 31 Jul 2001-16 Aug 2001. Tennessee: Cocke Co., Snakeden Ridge, GRSM, 35..74333 N -83.22000 W; 1 ♀, 10 Sept 2001-24 Sept 2001; 1 ♀, 1 Aug 2001-14 Aug 2001; 1 ♀, 14 Aug 2001-10 Sept 2001. Tennessee: Sevier Co., Indian Gap, GRSM, 35.61083 N -83° .44361 W; 1 ♂ 1 ♀, 3 Sept 2001-26 Sept 2001. Tennessee: Sevier Co., Twin Creeks, GRSM, 35.68500 N -83.49900 W; 1♂ 1 ♀, 8 Oct 2001-15 Oct 2001.

Limnophila (Idiolimnophola) emmelina Alexander

This species was previously known from as far south as Virginia; the records here mark a small southern extension.

Previously known distribution: Canada (Ontario), USA (Massachusetts south to Virginia).

North Carolina: Haywood Co., Purchase Knob, GRSM, 35.59194 N -83.06028 W; 4 ♂♂, 23 Apr 2001-15 May 2001; 1 ♂, 15 May 2001-8 Jun 2001. Tennessee: Sevier Co., Goshen Prong, GRSM, 35.61056 N -83.54278 W; 2 ♂♂, 9 Apr 2001-27 Apr 2001; 3 ♂♂ 6 ♀♀, 27 Apr-8 May 2001. Tennessee: Sevier Co., Twin Creeks, GRSM, 35.68500 N -83.49900 W; 1 ♂, 11 Apr 2001-26 Apr 2001.

Limonia maculicosta (Coquillett)

This Holarctic species was previously known from as far south as Virginia. This species occurs at the mid to upper elevations of GRSM.

Previously known distribution: Canada, USA (Alaska to Vermont, south to California and Virginia); Belgium, Finland, Sweden; Russia: FE (Kamchatka); Japan (Honshu).

North Carolina: Swain Co., Andrews Bald, GRSM, 35.53889 N -83.49417 W; 1 ♂, 6 Jun 2001-22 Jun 2001; 1 female, 10 May 2001-24 May 2001. North Carolina: Swain Co., Clingmans Dome, GRSM, 35.56028 N -83.49528 W; 2 ♂♂, 24 May 2001-6 Jun 2001; 1 ♂ 1 ♀, 6 Jun 2001-25 Jun 2001; 25 Jun 2001-16 Aug 2001. Tennessee: Cocke Co., Snakeden Ridge, GRSM, 35.74333 N -83.22000 W; 1 ♂ 1 ♀, 25 Apr 2001-9 May 2001; 1 ♂, 16 July 2001-1 Aug 2001.

Tipula (*Lindnerina*) *illinoiensis* (Alexander)

This species was one of the most common species of *Tipula* found during this sampling, and was found across a range of forest types and elevations. Surprisingly, it had not previously been recorded any closer than Pennsylvania and Illinois. The fact that this species is little known from the southern Appalachians is likely due to its early emergence date (late April-early June).

Previously known distribution: Canada (Manitoba, Ontario, and Quebec), USA (Minnesota, Illinois, Pennsylvania, and New Hampshire); Russia: FE (Magadan obl.); Korea.

North Carolina. Haywood Co., Purchase Knob, GRSM, 35.59154 N –83.06028 W; 5 ♂♂ 1 ♀, 15 May 2001-8 Jun 2001. Tennessee: Sevier Co., Goshen Prong, GRSM, 35.61056 N -83.54278 W; 2 ♂♂ 1 ♀, 27 Apr 2001-8 May 2001; 4 males, 8 May 2001-21 May 2001. Tennessee: Sevier Co., Indian Gap, GRSM, 35.61083 N 83.44361 W; 2 ♀♀, 10 May 2001-28 May 2001. Tennessee: Sevier Co., Twin Creeks, GRSM, 35.68500 N -83.49000 W; 4 ♂♂, 26 Apr 2001-15 May 2001.

Tipula (*Lunatipula*) *flavibasis* Alexander

Since its original description from Kansas in 1918, this species has only been documented twice, from Kansas (Young, 1978) and western Pennsylvania (Young and Gelhaus 2000). Collection of *T. flavibasis* in GRSM mark an extension of its range 1100 km east from Kansas and 600 km south from Pennsylvania.

Previously known distribution: USA (Kansas and Pennsylvania).

North Carolina: Haywood Co., Purchase Knob, GRSM, 35.59194 N -83.06028 W; 1 ♂ 1 ♀, 2 Aug 2001-20 Aug 2001. Tennessee: Sevier Co., Goshen Prong, GRSM, 35.61056 N -83.54278 W; 4 ♂♂ 3 ♀♀, 27 Aug 2001-17 Sep 2001. Tennessee: Sevier Co., Twin Creeks, GRSM, 35.68500 N -83.49000 W; 7 ♂♂ 30 Jul 2001-13 Aug 2001; 4 ♂♂ 3 ♀♀, 13 Aug-27 Aug 2001; 1 male, 27 Aug 2001-10 Sep 2001.

Tipula (*Lunatipula*) *monticola* Alexander

This species was found from two locations in GRSM, one upper and one mid elevation (the emergence of the two adults collected corresponds with collection dates recorded from Pennsylvania, where this species has been widely collected).

Previously known distribution: Canada (Ontario to Quebec), USA (Maine south to Pennsylvania).

North Carolina: Haywood Co., Cataloochee, GRSM, 35.58639 N -8308167 W; 1 ♂, 15 May 2002-8 Jun 2002. North Carolina: Swain Co., Andrews Bald, GRSM, 35.53889 N -83.49417 W; 1 ♂, 6 Jun 2001-22 Jun 20001.

Tricyphona (*Pentacyphona*) *autumnalis* (Alexander)

The record of this species in GRSM marks a range extension of about 600 km from its southernmost previously known distribution in Pennsylvania. The finding of this species at only the high elevation site seems to indicate that it may be restricted to the upper elevations of the southern Appalachian Mountains.

Previously known distribution: Canada (Ontario to New Brunswick), USA (Wisconsin and Pennsylvania).

North Carolina: Swain Co., Clingmans Dome, GRSM, 35.56028 N -83.49528 W; 1 ♂, 16 Aug 2001-29 Aug 2001.

CHAPTER IV

Assessment of Crane Fly (Tipulomorpha; Diptera) Assemblages Collected During the All-Taxa Biodiversity Inventory of Great Smoky Mountains National Park

INTRODUCTION

Assemblages of crane flies (Diptera: Tipulomorpha) found in Great Smoky Mountains National Park (GRSM) were studied in association with the All Taxa Biodiversity Inventory (ATBI), a goal of which is to identify all forms of life that occur in the boundaries of GRSM (Sharkey 2001). The ATBI has brought together scientists, universities, and numerous public and private organizations in the name of science to identify all living organisms in GRSM, gather associated natural history information, and to educated and train both new taxonomists and the general public (White and Morse 2000). Intensive structured arthropod sampling was begun in October 2000 as part of a pilot project to determine best sampling techniques and the most efficient methods for conducting a structured arthropod sampling protocol.

At 211,000 hectares (521,000 acres), GRSM in eastern Tennessee and western North Carolina provides a rugged terrain with diverse habitats and large range in elevation. Nearly 20% of the Park's total area, about 40,000 hectares (100,000 acres), is composed of uncut old growth forest (Houk 1993) representing one of the largest sections of contiguous old growth forest in the eastern United States. The Park receives abundant precipitation, averaging about 127 cm at lower elevations and up to 210 cm at upper elevations; sections of the Park are classified as temperate rain forest. Recent surveys into the vegetation composition of GRSM by the United States Geological Survey (1999) have identified 42 alliances and 68 associations, and more species of vascular plants have

been recorded here than in any other National Park (Boetsch et. al. 1998). The elevation of GRSM ranges from under 500 meters to 1,944 meters at Clingmans Dome, the second highest point east of the Mississippi River, and includes 16 peaks over 1,830 meters (6,000 ft).

Knowledge of the crane flies of GRSM (Alexander 1940; 1941) has largely been based on strict inventories with little ecological data gathered on the seasonality or distributions of species. Tipulomorpha is a diverse group of insects with over 15,000 species worldwide (Oosterbroek 2002; Byers 1996) and over 1,600 in the Nearctic region (Oosterbroek 2002; Borror et al. 1989). Many crane flies are found in areas without substantial moisture and can even occur in semiarid environments (Gelhaus 1994), though they are generally associated with humid environments. The range of larval habitats from fully aquatic (mainly in streams), to semi-aquatic (stream edge, wet mosses, algal mats, aquatic vegetation) to purely terrestrial (soils, leaf litter, rotting wood) (Gelhaus 2002) indicates that these taxa might form unique assemblages in different vegetation communities throughout large forest ecosystems such as GRSM. Identification of faunal assemblages in different vegetation communities is important in terms of assigning conservation status to particular habitats. While a National Park would seem to already have a high level of protection, stressors occur that could degrade habitat and alter the sustainability of the species found there. Dangers to the biota of GRSM exist through invasion by exotic species, such as the balsam (Allen and Kupfer 2001) and hemlock wooly adelgids, air pollution (Neufeld 2000; Chappelka 1999), and acid deposition (Flum 1995). It is important to document species assemblages in order to identify change that may be caused due to potential threats.

Hynes (1996) examined the collections of Alexander (1940,1941) and others that have investigated crane flies in GRSM, and compiled a listing of crane flies consisting of 186 species. This species list gives insight into the relationships among assemblages of crane flies found in different locations in the Park, but does not allow for extrapolation to their similarities and differences in species abundance because knowledge of prior sampling intensity is unknown. Prior sampling does not allow estimations of the true number of species in GRSM to be made. Estimations typically are addressed through the use of species accumulation curves and species richness estimators (Carlton and Robison 1998; Coddington et al 1998; Longino et al. 2002; Petersen and Meier 2003; Petersen et al. 2003; Sorensen et al. 2002; Toti et al. 2000). No single richness estimator operates best with all sets of data, therefore continued investigation into their use is important to further our understanding of their usefulness with different taxonomic groups and sampling procedures. The use of fixed-plot, continuously running traps in many vegetation types can allow for the extrapolation of estimated species numbers at many points, an estimate of the total number of species for the Park, and determination of relationships among the assemblages of crane flies found in different habitats. Work done on the crane flies will provide detailed information on the characteristics of the collecting process, determine the degree of completeness after two years of collecting, determine the theoretical length of time needed to capture the entire crane fly fauna of GRSM, and provide a base-line estimate for the effort and time needed to collect other insect taxa.

METHODS AND MATERIALS

Sampling was conducted between October 2000 and October 2002 by use of 22 Townes-style Malaise traps (Townes 1972) at 11 ATBI biodiversity reference plots located throughout Great Smoky Mountains National Park (GRSM). Each of the 11 plots used in this inventory was chosen to represent a different vegetative community found in GRSM. A more detailed analysis of plot vegetation dynamics can be found in Chapter 1. Two Malaise traps were placed at each plot within areas of either likely specimen encounter (e.g., obvious flight corridors), adjacent to unique microhabitats, or in areas where traps could be successfully erected. An electrified fence was placed around each Malaise trap in an attempt to exclude large mammals such as black bears, wild boars, and deer. Wiring used in the fencing was thin and did not hinder the collection of specimens.

Malaise trap specimens were collected into 70%-90% ethanol. Traps were run year-round from October 2000 through October 2002, with removal of collected material occurring approximately every two weeks. Collection dates for trap operation for each trap are given as start date–end date. Collected material was then taken to laboratories at GRSM Twin Creeks Resource Center or at the University of Tennessee, where collected crane flies were separated from other arthropods. Flies were sorted and preserved in 95% ethanol. Specimens were identified to species level with the use of available taxonomic keys (Alexander 1919, 1920, 1940 1941, 1942; Byers 1961, 1983; Oosterbroek 1984; Tangelder 1983; Young 1987). When needed for the purpose of identification, male genitalic features were cleared by immersing removed genitalia in a warm 5 % sodium hydroxide solution for five minutes. Morphological terminology used is based on Alexander and Byers (1981).

Data Analysis

Complimentarity, a measurement of species turnover between compared samples, was calculated according to the formulation provided in Colwell and Coddington (1996):

$$C_{jk} = U_{jk} \ / \ S_{jk}$$

Sj is the number of species found at site j and Sk is the number of species found at site k and Vjk is the number of species common to both sites:

$$S_{jk} = S_j + S_k - V_{jk}$$

and Ujk is the number of species unique to either site:

$$U_{jk} = S_j + S_k - 2V_{jk}$$

Similarity between traps was measured based on species numbers and abundances using a modified Morisita index (Wolda 1981). A cluster analysis was conducted on the collection information for each trap at all plots. Before analysis was performed, the data was log(e) transformed to reduce weight given to species collected in excessive numbers. Cluster analyses were displayed as simplified dendrograms using the unweighted pair group average (UPGMA) clustering method. Similarities and cluster analysis were determined and performed with the MVSP statistical package (Kovach Computing Systems, Anglesey, Wales 1999). Species collection curves were created for each Malaise trap; each plot with the combined data from both traps; and for all traps combined by plotting the number of species collected at each site against specimens collected (Willott 2001). The data from each location were entered into the EstimateS statistical package version 5 (Colwell 1997) and randomized 50 times to compensate for the large peaks in collected specimens due to the high degree of seasonality in adult

emergence. The following richness estimators were calculated with EstimateS: abundance coverage (ACE), incidence coverage (ICE), Chao 1, Chao 2, jackknife 1, jackknife 2, bootstrap 1 and bootstrap 2. Regressions were conducted in order to obtain an equation for each species collections curve using SigmaPlot 8.0 (SPSS Inc., Chicago, IL). This equation was then used to determine time of additional sampling needed for the species collection curve to reach an asymtope.

RESULTS

Two years of collection in Great Smoky Mountains National Park resulted in 9,319 identified collected crane flies, representing 177 species from 57 genera and 6 families. Specimens and species numbers were highly variable among traps, ranging from 35 to 1,677 specimens and 19 to 68 species per trap (Table 5). Limoniidae comprised the largest percentage of the catch (61%) followed by Tipulidae (28%), Pediciidae (7%), Trichoceridae (3%), Cylindrotomidae (0.5%), and Ptychopteridae (0.5%). Species with known larval states were distributed in equal proportions: aquatic (18%), semi-aquatic (16%), and terrestrial (25%). Of the two major families collected, a greater number of limoniid singletons (19) were collected than tipulid singletons (11), but the tipulid singletons comprised a larger percentage of total species (30%) than did limoniids singletons (11%). More specimens were collected during the first year (2000-2001; 5,805) of sampling than during the second year (2001-2002; 3,514). More days of trap operation were used in the first year (7867 trap days) than the second (7415 trap days), with more specimens per trap day shown in the first year (0.74 specimens per trap day) than the second (0.47 specimens per trap day) (Table 5).

Table 5. Assessment of trap composition from all Malaise traps. Singletons refer to those species that were represented by a single specimen and doubletons refer to species represented by two specimens.

Location	Malaise Trap	Species	Specimens Collected	Singletons	Singletons (%)	Doubletons	Doubletons (%)	Trap Days	Species/ Trap Day
Twin Creeks	01	68	641	23	34	11	16	731	0.093
Twin Creeks	02	57	612	16	28	10	17	746	0.076
Cades Cove	03	25	74	14	56	4	16	668	0.047
Cades Cove	04	27	91	16	59	3	11	683	0.040
Indian Gap	05	38	483	11	29	8	21	663	0.057
Indian Gap	06	33	358	11	33	7	21	529	0.062
Purchase Knob	07	34	239	12	35	2	6	745	0.046
Purchase Knob	08	45	334	23	51	5	11	745	0.060
Cataloochee	09	27	302	10	37	5	18	714	0.038
Cataloochee	10	26	99	9	35	6	23	743	0.035
Andrews Bald	11	30	145	15	51	6	20	703	0.043
Andrews Bald	12	61	1,677	15	24	12	19	742	0.084
Brushy Mountain	13	31	243	10	32	7	22	739	0.042
Brushy Mountain	14	19	35	12	63	3	15	698	0.027
Clingmans Dome	15	39	263	14	36	10	26	744	0.052
Clingmans Dome	16	46	448	14	30	6	13	744	0.063
Albright Grove	17	34	368	10	29	2	6	746	0.046
Albright Grove	18	50	484	20	40	3	6	724	0.069
Snakeden Ridge	19	52	984	15	29	2	4	717	0.073
Snakeden Ridge	20	39	291	15	38	2	5	745	0.052
Goshen Prong	21	43	556	15	35	8	19	677	0.064
Goshen Prong	22	37	589	7	19	4	11	680	0.054
All Traps	-	177	9,319	38	21	16	9	15,626	0.011

The overall species accumulation curve for all traps combined did not reach an asymptote (Fig. 4). Total richness was estimated at between 183 and 262 and averaged 228 species. These estimates indicated that this two-year sampling was from 68% - 89% complete, averaging 75%, with 2 to11 times (4-22 years) more sampling needed to collect all species. Individual traps varied in the degree of calculated completeness (Table 6), but neither individual traps nor combined plot locations had species accumulation curves that reached an asymptote (Figs. 4). All traps and plots, with the exception of those at Cades Cove, were shown to have collected at least 50% of the species estimated to occur there. Four times more sampling (8 years) will be needed to reach the average richness estimate of 228 species. Final numbers show that new species were being added at an interval of one new species every 52 collected individuals.

High species turnover occurred among all traps, with an average complimentarity value of 68% and a range of 46% to 95% (Fig. 5). With the exception of the two traps located at Andrews Bald (MT11, MT12), which showed 79% complimentarity to each other, all other Malaise traps showed lowest complimentarity values when they were compared to the second Malaise trap at that plot location. The two traps at Cades Cove grassland (MT03, MT04) had the highest degree of complimentarity when compared to traps from other plots, averaging 87% and 90% respectively. High levels of complimentarity (>75% average against other traps) also were seen at Andrews Bald (MT12; 79%), Brushy Mountain (MT14; 75%), and Clingmans Dome (MT15; 77%, MT16; 75%).

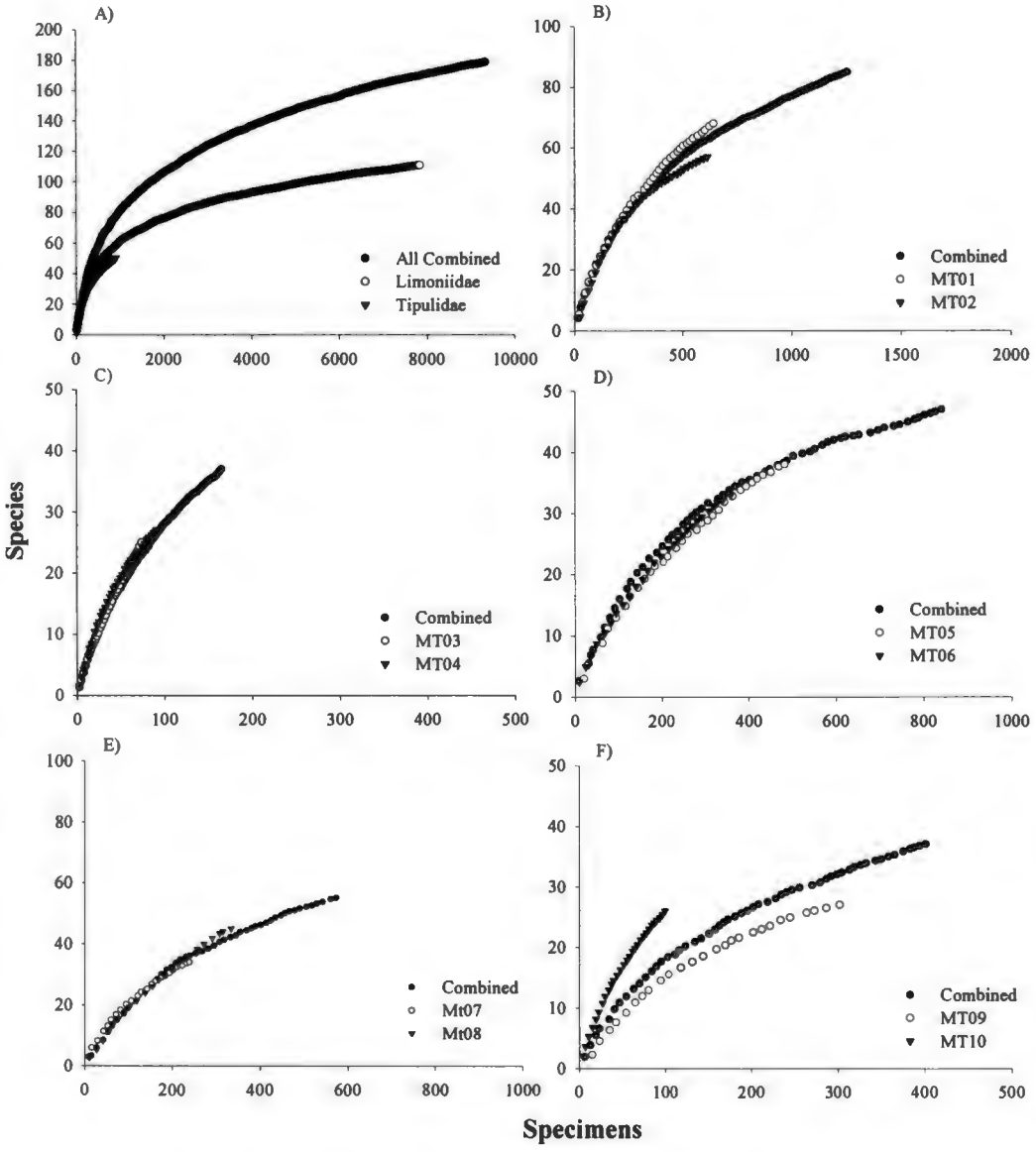


Figure 4. Species accumulation curves. A) All traps; Limoniidae, Tipulidae; B) Twin Creeks; C) Cades Cove; D) Indian Gap; E) Purchase Knob; F) Cataloochee. Plots in Figs. 1B-F are presented as specimens collected in each Malaise trap and for traps at each plot combined.

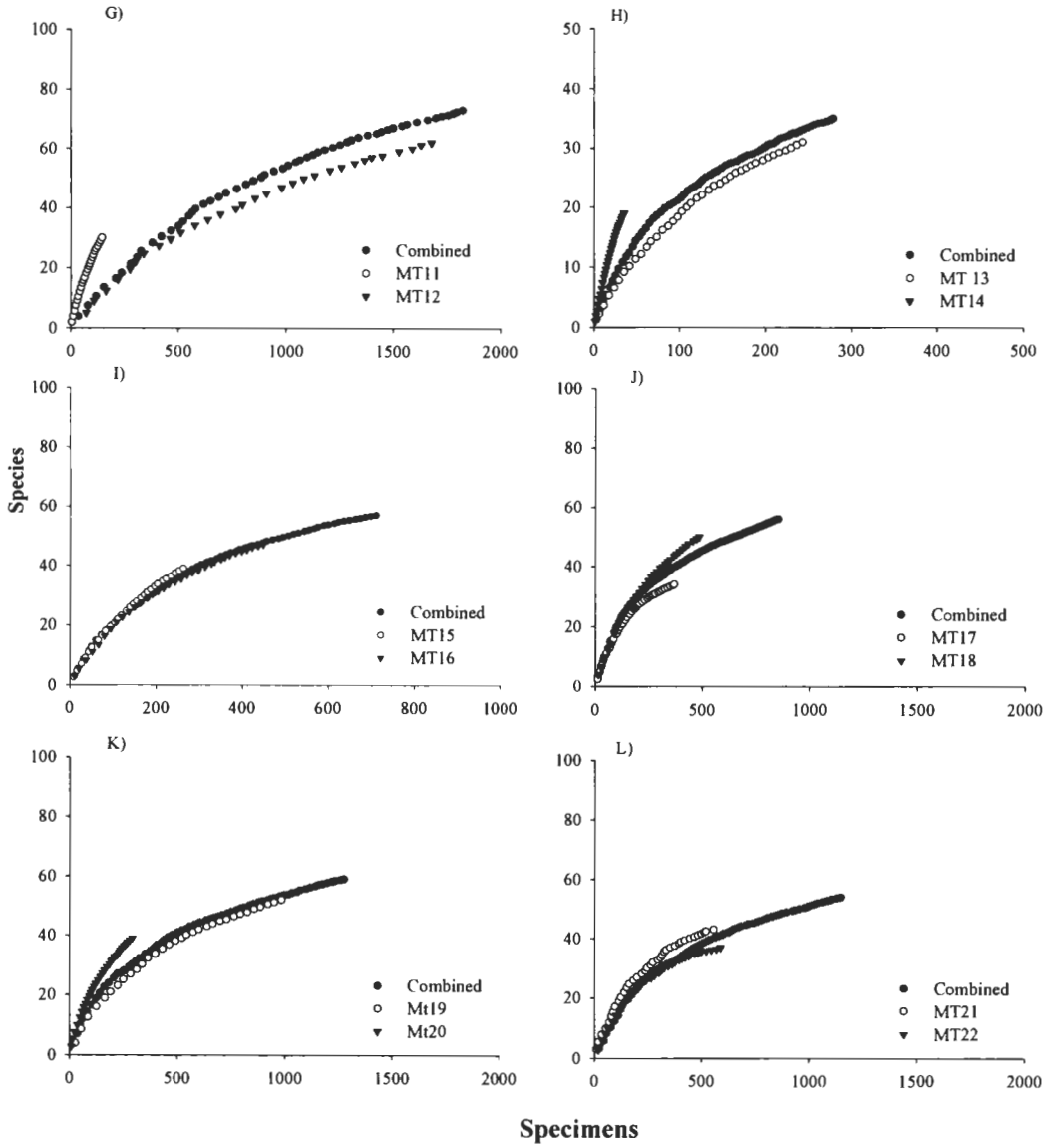


Figure 4. Continued. G) Andrews Bald; H) Brushy Mountain; I) Clingmans Dome; J) Albright Grove; K) Snakeden Ridge; L) Goshen Prong. Plots in Figs 2 G-L are presented as specimens collected in each Malaise trap and for traps at each plot combined.

Table 6. Species richness indicators. Shown for each malaise trap, combined malaise traps for each plot, and all traps combined.

Plot	Trap	ACE	ICE	Chao 1	Chao 2	Jack 1	Jack 2	Bootstrap	Completeness (%)
Twin Creeks	MT01+MT02	111	121	108	112	116	130	99	65-86
	MT01	94	105	91	97	97	112	81	61-84
	MT02	75	74	69	72	76	83	66	69-86
Cades Cove	MT03+MT04	74	68	77	58	55	66	45	48-82
	MT03	51	99	47	77	43	58	32	25-78
	MT04	57	58	64	50	42	53	37	42-73
Indian Gap	MT05+MT06	55	63	54	67	65	75	55	62-87
	MT05	45	63	45	62	56	67	46	56-84
	MT06	46	56	41	62	50	62	40	53-83
Purchase Knob	MT07+MT08	100	93	152	142	82	105	66	36-83
	MT07	45	48	63	43	47	51	41	54-83
	MT08	88	111	94	132	75	97	57	30-79
Cataloochee	MT09+MT10	57	61	47	52	54	63	44	59-84
	MT09	37	43	35	38	40	46	33	57-81
	MT10	32	46	32	39	40	46	32	57-81
Andrews Bald	MT11+MT11	94	108	91	104	104	121	87	60-84
	MT11	53	50	45	45	47	56	38	54-79
	MT12	75	92	70	83	88	99	74	63-89
Brushy Mountain	MT13+MT14	48	53	45	58	51	62	42	56-83
	MT13	40	48	38	48	46	54	37	57-86
	MT14	40	33	40	32	31	37	24	48-79
Clingmans Dome	MT15+MT16	64	76	61	71	77	84	66	68-93
	MT15	55	66	47	58	59	70	48	56-83
	MT16	59	69	60	68	68	80	56	59-84
Albright Grove	MT17+MT18	86	80	98	107	78	97	65	52-86
	MT17	44	39	50	42	44	49	39	68-87
	MT18	77	80	98	73	72	85	60	51-83
Snakeden Ridge	MT19+MT20	76	77	87	74	79	87	68	68-87
	MT19	65	83	87	87	75	91	62	57-84
	MT20	58	67	75	74	59	74	47	52-83
Goshen Prong	MT21+MT22	76	78	85	83	76	90	63	60-86
	MT21	61	62	54	60	61	71	51	60-84
	MT22	41	42	41	41	47	46	42	78-90
All Traps	-	210	231	220	242	230	262	201	68-89

	MT01	MT02	MT03	MT04	MT05	MT06	MT07	MT08	MT09	MT10	MT11	MT12	MT13	MT14	MT15	MT16	MT17	MT18	MT19	MT20	MT21
MT22	0.6	0.618	0.852	0.877	0.585	0.511	0.521	0.586	0.578	0.63	0.688	0.747	0.667	0.783	0.729	0.727	0.489	0.619	0.631	0.593	0.519
MT21	0.558	0.649	0.867	0.906	0.65	0.593	0.6	0.603	0.654	0.592	0.722	0.75	0.655	0.735	0.809	0.714	0.519	0.591	0.662	0.677	
MT20	0.679	0.685	0.836	0.881	0.672	0.56	0.673	0.708	0.755	0.725	0.774	0.722	0.727	0.816	0.778	0.697	0.54	0.609	0.458		
MT19	0.605	0.718	0.884	0.903	0.657	0.629	0.59	0.653	0.726	0.721	0.762	0.643	0.703	0.776	0.75	0.68	0.542	0.563			
MT18	0.628	0.61	0.881	0.915	0.625	0.639	0.623	0.623	0.695	0.643	0.754	0.698	0.65	0.789	0.778	0.756	0.5				
MT17	0.603	0.621	0.82	0.87	0.588	0.477	0.553	0.661	0.614	0.605	0.667	0.72	0.587	0.738	0.737	0.694					
MT16	0.763	0.805	0.925	0.943	0.651	0.571	0.773	0.835	0.787	0.763	0.696	0.654	0.742	0.8	0.482						
MT15	0.795	0.841	0.914	0.917	0.712	0.709	0.78	0.831	0.818	0.815	0.72	0.649	0.745	0.837							
MT14	0.792	0.813	0.872	0.905	0.761	0.732	0.767	0.815	0.757	0.75	0.816	0.754	0.571								
MT13	0.731	0.725	0.833	0.863	0.673	0.609	0.7	0.774	0.682	0.674	0.761	0.726									
MT12	0.738	0.822	0.899	0.915	0.701	0.699	0.753	0.741	0.781	0.795	0.795										
MT11	0.763	0.723	0.867	0.896	0.694	0.689	0.776	0.732	0.707	0.667											
MT10	0.712	0.639	0.891	0.918	0.694	0.628	0.636	0.685	0.568												
MT09	0.733	0.623	0.87	0.941	0.7	0.605	0.548	0.615													
MT08	0.639	0.622	0.906	0.925	0.703	0.742	0.564														
MT07	0.658	0.662	0.887	0.948	0.691	0.66															
MT06	0.671	0.696	0.84	0.909	0.489																
MT05	0.641	0.603	0.895	0.917																	
MT04	0.855	0.849	0.595																		
MT03	0.852	0.812																			
MT02	0.529																				

Figure 5. Complimentarity between all Malaise traps. Shown based of species lists collected between October 2000-October 2002 for each malaise trap. A value of 1.00 indicates complete distinctness between the two traps and a value of 0 indicates identical species lists for the two traps.

Crane fly assemblages at the Malaise traps from each plot showed higher similarity to each other than to traps from other plots, with the exception of the two traps at Andrews Bald (MT11, MT12). At a level of 0.50 similarity, four groupings occurred in the cluster analysis: two traps at Cades Cove (MT03, MT04), two traps at Brushy Mountain (MT13, MT14), three high-elevation traps from Clingmans Dome and Andrews Bald (MT15, MT16, MT12), and a large grouping containing the remaining traps (Fig. 6).

DISCUSSION

Completeness of Sampling

The different richness estimators offered a wide range of species number estimates, demonstrating the lack of consistency between indicators. No single species richness estimator consistently provided a high estimate, but the bootstrap estimator did consistently offer a lower estimate than others. After one year of sampling the range of richness estimators for all traps combined was between 170 and 182 species with an observed richness of 156 species. After a second year of sampling, the observed richness reached 177 species with richness estimators continuing to provide estimates of between 20-30 species greater than the observed richness remaining to be collected, with no estimator attaining an asymptote. This indicates that richness estimators are not adequately estimating the potential species richness with small sample sizes. Further collection and investigation into efficiency of each estimator will need to be done to evaluate their usefulness in estimating species richness.

Most of the plots showed similar accumulation curves for both traps. Large differences between traps were observed at Cataloochee, Andrews Bald, Brushy

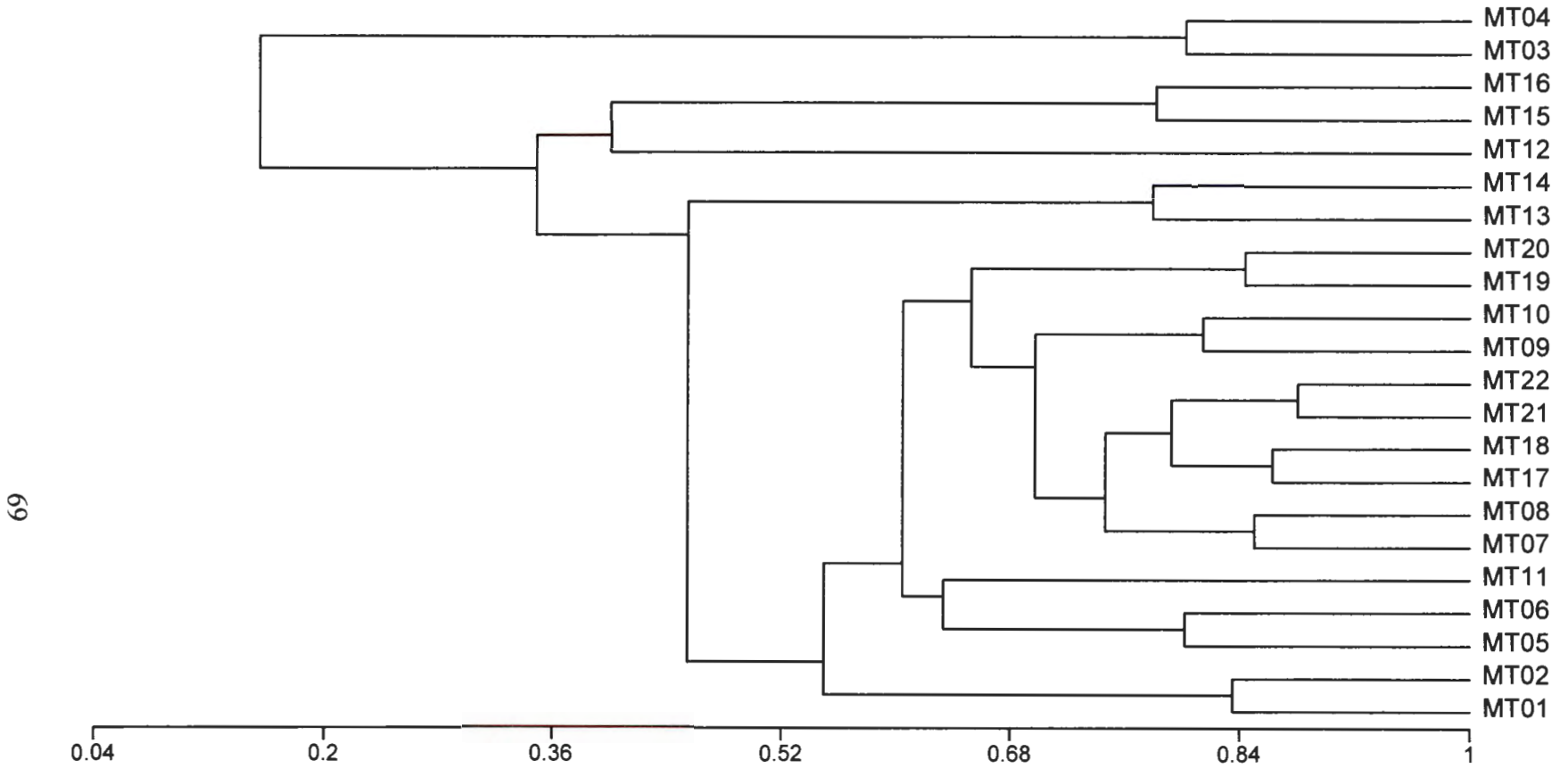


Fig. 6. Cluster analysis for all Malaise traps used during sampling. Collection data was log(e) transformed and clustered with the Modified Morisita's Similarity Index.

Mountain, and Snakeden Ridge. The steep slopes of collection curves for these traps along with the number of singletons offer insights into the collecting dynamics of these traps and allow for correlations between crane fly assemblages and trap placement. Differences between species collection curves of the traps at these locations can largely be explained in two ways: location in exposed areas and difference in topography between the two traps.

Andrews Bald and Brushy Mountain plots differ in vegetation community structure, though they possess similarities in trap placement and shape of species collection curves. Both plots have one exposed trap without plant canopy and one more sheltered trap under a plant canopy. A steep collection curve is often indicative of a sample having a large proportion of singletons, species represented by a single collected individual, and doubletons, species represented by two collected individuals (Colwell & Coddington 1994). Both traps in exposed areas showed a steep collection curve and samples dominated by a high percentage of singleton species, while traps under a plant canopy had more gradually sloping species collection curves with lower percentages of singleton species. Species represented by singletons often are considered rare species by other authors (Summerville 2001; Novtny and Bassett 2000), but it is possible that singletons at these two traps are transients or locally uncommon species rather than rare species. These two traps are located in pathways of strong winds that likely carry individuals into these habitats, offer poor larval habitat, and haveextremes in temperature and humidity. The marked increase in percentage of singletons at these two traps, which otherwise have depauperate faunas, indicates that they are transient rather than rare species. The occurrence of high numbers of singletons at the Cades Cove plot, which is

similar to Andrews Bald (MT11) and Brushy Mountain (MT14) in exposure and lacking a plant canopy, suggests that assemblages of crane flies in open areas are most likely to have low species richness, to be collected in low numbers, and to have a higher occurrence of singleton species. Exposed traps averaged 57% singletons while those under a plant canopy averaged 33%, indicating a marked increase in the occurrence of infrequently collected species in these habitats. In these exposed habitats, the presence of singletons likely represents transient species, though not all singletons are necessarily transient species.

The differences between accumulation curves for traps at Cataloochee and Snakeden Ridge may be explained by the placement of traps of differing topographies at each location. Differences in topography can alter drainage patterns and moisture retention and have been shown to affect larval habitats (Young 1978). The placement of MT20 on a steep talus slope at Snakeden Ridge may explain the decreased number of specimens and species collected relative to the other trap (MT19) at this plot because of differences in crane fly assemblages due to topography; however a decrease in malaise trap efficiency because of placement cannot be ruled out. A similar change in species accumulation because of topography is evident in trap placement at Cataloochee; the placement of MT10 at the crest of a steeply sloped hilltop may have decreased the number of specimens collected, even though number of species collected was similar to the other trap at this location (MT09).

Larval State

Species for which the larval habitats are known were collected in approximately the same one-third terrestrial, one-third aquatic, and one-third semi-aquatic proportions of

all species for which the larval habitat is known, except for a slightly greater number of terrestrial species (Fig. 7). The larval habitats of species new to GRSM are disproportionately terrestrial (Fig. 9). Those species that are known to occur in GRSM but not collected in this study are mostly aquatic and semi-aquatic species (Fig. 8). These results indicate that the current sampling was biased towards collecting terrestrial species and against aquatic and semi-aquatic species, as suggested by plot placement.

Spatial distributions

More sampling needs to be done to reveal the complete assemblage at each plot. The similarity in the ranges of completeness for traps and plots indicates consistency in completeness of sampling at each plot and indicates that further analysis of crane fly distributions and assemblages can be made.

Requirements of the larval stages of crane flies limit their dispersal into new habitats (Merritt 1981; Young 1978; Freeman 1968; Alexander 1942; Rogers 1933). The processes that limit adult fly distributions and hold them to a specific habitat are not known. Many variables have been suggested, including relative humidity (Merritt 1981; Barnes 1925; Rogers 1933; Freeman 1968); air movement and insulation (Merritt 1981; Rogers 1933); pheromones (Freeman 1968); topography and geography (Young 1978); and plant community borders (Freeman 1968). For flying insects with weak flight potential, such as crane flies (Merritt 1981; Service 1973), it would be beneficial not to stray from the vicinity of suitable oviposition and larval development sites. The current findings lend indirect evidence that indeed humidity levels act to affect the dispersal patterns of adult flies. Exposed plots (Andrews Bald (MT11), Cades Cove (MT03, MT04), and Brushy Mountain (MT14)), which would show low humidity with high

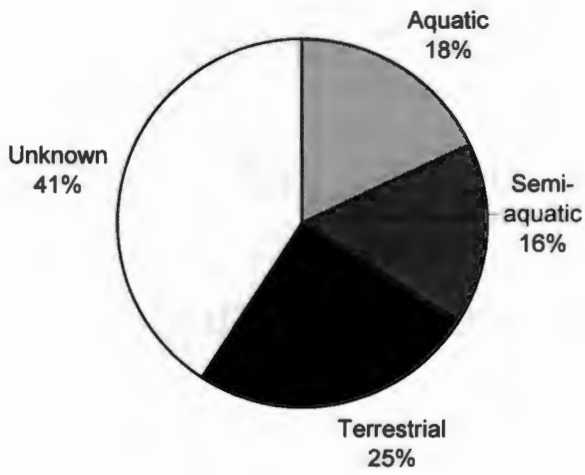


Fig 7. Larval habitats of crane flies collected during sampling in Great Smoky Mountains National Park between October 2000-October 2002.

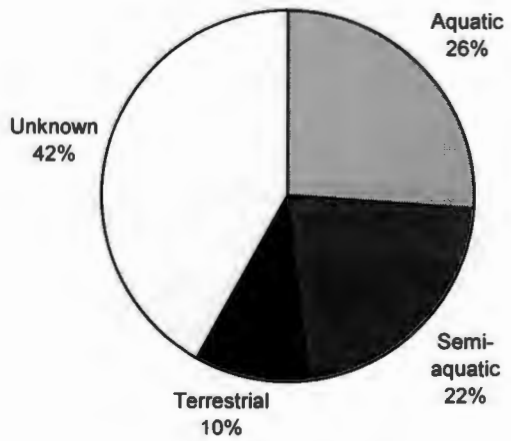


Fig 8. Larval habitats of crane flies recorded from Great Smoky Mountains National Park but not collected during sampling between October 2000-October 2002.

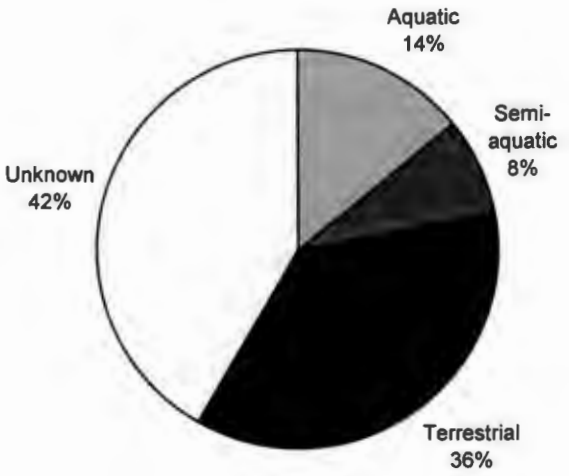


Fig 9. Larval habitats of crane flies new to Great Smoky Mountains National Park.

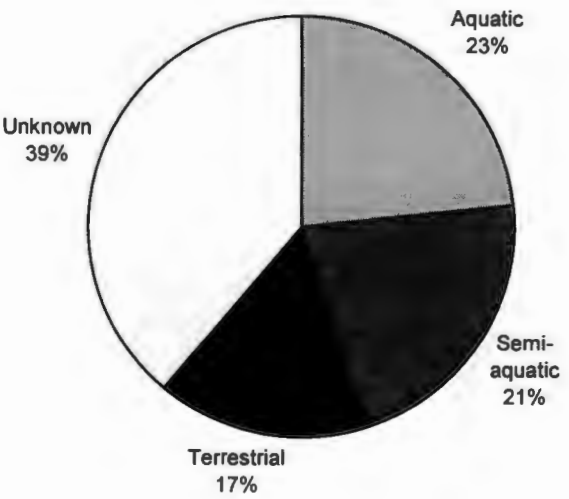


Fig 10. Larval stages of crane flies previously reported from Great Smoky Mountains National Park (Hynes 1996).

swings in temperature due to increased solar radiation, have a limited crane fly fauna dominated by transient species represented in low numbers. It is still unclear if this is a mechanism operating to limit distributions between different forest habitats, but is seems to limit the number of species known to inhabit non-forested habitat.

Numerous authors have indicated the tendency of adult crane flies to form different species assemblages according to habitat type (Merritt 1981; Young 1978; Freeman 1968; Coulson 1958; Rogers 1942; 1933; Barnes 1925). Cluster analysis and complimentarity measures both show that there are distinct adult crane fly assemblages found at different locations in GRSM. At a level of 0.50 similarity, the plots that showed distinctness in crane fly assemblages can be divided into four divisions: Cades Cove plot (MT03, MT04), high elevation coniferous plots (MT15, MT16, MT12), Brushy Mountain plot (MT13, MT14), and a large division containing the remaining traps (Fig 13).

Cades Cove had high levels of complimentarity and low similarity in the cluster analysis when compared to all other traps. The distinctness of this assemblage can be explained by the unique low-elevation pastoral nature of Cades Cove. Cades Cove was one of two grassland areas surveyed, the other being the high-elevation Andrews Bald site (MT11). Complimentarity between MT11 and both Cades Cove traps was 87% and 90%, respectively. Far too many variables exist to come to any definite conclusion as to why these assemblages are so different, though it is likely that a combination of difference in disturbance history, temperature, elevation, and differences in surrounding forest type all contribute.

The separation of the Brushy Mountain plot from other plots is likely due to a limited resident fauna enriched with transient species flying or being blown in from other

locations. Brushy Mountain trap MT14 which was on a south-facing slope, exposed to sunlight, high temperatures, low relative humidity, and strong upslope airflow had 19 species, with 12 species appearing as singletons, from 35 specimens. The remaining 7 species taken at this plot also were all collected in the second trap (MT13), which is located on the summit of Brushy Mountain in a habitat of thick *Rhododendron* sp., and are likely more closely associated with this habitat than with the exposed MT14. Soil with low organic matter and moisture create limited larval habitat. The poor larval habitat along with the presence of strong upslope winds indicate that the resident fauna associated with MT14 is likely even less rich than is reported here, and is almost wholly comprised of transient species. Trap MT13 was more similar to traps found at low and mid-elevations due to its location in a shaded pure stand of *Rhododendron* sp. The thick cover keeps temperatures lower and retains more moisture then the exposed area represented by MT14. Less fluctuation in temperature and humidity in the areas of thick *Rhododendron* sp. stands on Brushy Mountain likely promote a more stable species assemblage than the more exposed areas.

The high-elevation traps at Clingmans Dome and Andrews Bald did not show strong similarity (40%), but levels of complimentarity were also low between MT12 on Andrews Bald and the two traps at Clingmans Dome, and indicates similar crane fly assemblages between these traps. The grouping of these plots from all others results from numerous factors. Andrews Bald is considered an open grassy field, with MT12 located on the edge of the grassland within the encroaching forest, which is successional spruce-fir forest, similar to the forest type found at the Clingmans Dome plot. These traps are characterized by moist, humid environments, cooler temperatures, high-

elevation locations, and soil organic material comprised of large inputs of coniferous leaf material. The differences between the two plots can be attributed to the location of Andrews Bald MT12 in close proximity to a high elevation seep, which was responsible for the presence of species that exploit this specialized larval habitat. The striking difference between the two traps at Andrews Bald (MT11, MT12) demonstrates that two closely located traps (< 100 m) can result in very different species assemblages.

The remaining plots along with MT11 from Andrews Bald show varying levels of similarity to each other, but cluster together at greater than 50% similarity. High complimentarity values between plots do indicate that distinct assemblages occur between habitats, though the causes for these differences are unknown. The clustering of Andrews Bald MT11 and the traps at Indian Gap (MT05, MT06), the only other high-elevation traps, indicate that elevation may be an important variable acting to define crane fly assemblages.

Differences in crane fly assemblages between open and closed canopy environments are greater than those among different vegetation communities with a plant canopy cover. Major differences were observed in the amount of solar radiation received between these two habitats. The increased amount of solar radiation received in areas without canopy cover results in higher temperatures, lower relative humidity, and lowered water retention of the soil. These variables affect larval habitats and thus the assemblage of resident crane flies that can be found there. The adverse conditions found in exposed areas limit the dispersal of adult flies into these habitats. Instead, the assemblages of crane flies found in exposed sites are largely composed of species adapted to arid environments, such as *Nephrotoma* spp., or transients, those that are not

directly associated with this type of environment. Exposed environments result in a distinct faunal assemblage comprised of a mixture of species that may resemble assemblages from adjacent habitat, as seen at Brushy Mountain, or that are very different from assemblages from adjacent habitats, as seen at Andrews Bald.

Within the contiguous forest environment, adult flies have more freedom of dispersal without risk of desiccation. The plant canopy acts to reduce direct solar radiation, creating more consistency in temperature and relative humidity. Increased homogeneity is found in assemblages within forest communities with canopy cover, although measurable faunal turnover between forest vegetation communities do exist. Differences in crane fly assemblages within forested environments is likely due to differences in topography, disturbance history, vegetation community, elevation, and presence of specific microhabitats such as springs and seeps.

LIST OF REFERENCES

List of References

Alexander, C. P. 1919. The crane-flies of New York. Part I. Distribution and taxonomy of the adult flies. Cornell Univ. Agric. Exp. Stn. Mem. 25: 766-993.

Alexander, C. P. 1920. Crane-flies of New York. Part II. Biology and phylogeny. Ithaca, N.Y., Cornell University.

Alexander, C. P. 1940. Records and descriptions of North American crane-flies (Diptera). Part I. Tipulomorpha of the Great Smoky Mountains National Park, Tennessee. Amer. Midl. Nat. 24: 602-644.

Alexander, C. P. 1941. Records and descriptions of North American crane-flies (Diptera). Part II. Tipulomorpha of mountainous western North Carolina. Amer. Midl. Nat. 26: 281-319.

Alexander, C. P. 1942. Family Tipulidae. Bull. Conn. State Geol. Nat. Hist. Surv. 64: 196-509.

Alexander, C. P. and G. W. Byers. 1981. Tipulidae. Pp. 153-190, in J. F. McAlpine et al., (eds.). Manual of Nearctic Diptera. Vol. 1. Agriculture Canada Research Branch Monograph 27.

Allen, T. R. and J. A. Kupfer. 2001. Spectral response and spatial pattern of Fraser fir mortality and regeneration, Great Smoky Mountains, USA. Plant Ecol. 156 (1): 59-74.

Barnes, H. F. 1925. The ecological distribution of adult crane flies in Carnarvonshire. J. Ecol. 13: 138-148.

Boetsch, J., D. Defoe, R. Dellinger, K. Langdon, and J. Rock. 1998. Vascular plants of the Great Smoky Mountains. A checklist for the vascular plants of Great Smoky Mountains National Park. Great Smoky Mountains Natural History Association.

Borror, D. J., C. A. Triplehorn, and N. F. Johnson. 1989. An introduction to the study of insects, 6th ed. Saunders College Publishing, Philadelphia, U.S.A. 875 p.

Brimley, C. S. 1938. Tipulidae. *In* The Insects of North Carolina. North Carolina Dept. Agr., Div. Ent. 314-320.

Byers, G W. 1961. The Crane Fly Genus *Dolichopeza* in North America. Univ. Kansas Sci. Bull. 42 (6): 665-924.

Byers, G W. 1969. Evolution of wing reduction in crane flies (Diptera: Tipulidae). Evolution 23: 346-354.

Byers, G W. 1983. The Crane Fly Genus *Chionea* in North America. Univ. Kansas Sci. Bull. 52 (6): 59-195.

Byers, G W. 1992. Crane flies - three families or one?. Proceedings of the First International Symposium on Tipulomorpha. Acta zool. cracov. 35 (1): 37-41.

Byers, G W. 1996. Tipulidae, pp. 549-570. *In* R. W. Merritt and K. W. Cummins (eds.), An introduction to the aquatic insects of North America, 3rd ed. Kendall/Hunt Publishing Company, Dubuque, Iowa.

Carlton, C.E. and H.W. Robinson. 1998. Diversity of litter-dwelling beetles in the Ouachita Highlands of Arkansas, USA (Insecta: Coleoptera). Biodiv. and Conser. 7 (12) 1589-1605.

Chappelka, A., G. Somers, and J. Renfro. 1999. Visible ozone injury on forest trees in Great Smoky Mountains National Park, USA. Water, Air, and Plant Pollut.116 (1-2): 255-260.

Coddington, J. A., L. H. Young, and F. A. Coyle. 1998. Estimating spider species richness in a southern Appalachian cove hardwood forest. Jour. of Arach. 24 (2): 111-128.

Colwell, R. K. and J. A. Coddington. 1994. Estimating terrestrial biodiversity through extrapolation. Phil. Trans.of the Roy. Soc.of Lon. 345: 101-118.

Colwell, R. K. 1997. EstimateS: Statistical estimation of species richness and shared species from samples. Version 6. User's Guide and application published at: http://viceroy.eeb.uconn.edu/estimates.

Coulson, J. C. 1959. Observations on the Tipulidae (Diptera) of the Moor House Reserve, Westmorland. Trans. Royal Ent. Soc. Lon. 111: 157-174.

Flum, T. and S. C. Nodvin. 1995. Factors affecting streamwater chemistry in the Great Smoky Mountians, USA. Water, Air, and Soil Pollut. 85 (3): 1707-1712.

Freeman, B. E. 1968. Studies on the ecology of adult Tipulidae (Diptera) in southern England. J. Anim. Ecol. 37: 339-362.

Gelhaus, J. K. 1994. Systematics and biogeography of the *Tipula (Lunatipula) tergata* species group (Diptera: Tipulidae), a desert inhabiting crane fly group in western North America. Abstracts, 3rd Internat. Congr. Dipterology, Guelph: 72-73.

Gelhaus, J. K. 2002. Manual for the identification of aquatic crane fly larvae for Northwest North America. Northwest Biological Assessment Workgroup's Taxonomic Workshop on Diptera, Ellensburg, WA, U. S. A., 147 p.

Houk, R. 1993. A natural history guide. Great Smoky Mountains National Park. Houghton Mifflin Co., New York.

Hynes, C. D. 1996. Tipulomorpha of the Great Smoky Mountains National Park. (unpublished report).

Knizeski Jr., H. M. and S. J. Sullivan. 1984. Temporal distribution of crane flies (Diptera: Tipulidae) in a southern New York woodland. Can. Ent. 16: 1137-1144.

Kovach Computing Systems. 1999. Multi-Variant Statistical Program (MVSP) ver.3.11c. www.kovcamp.com.

Longino J. T., J. Coddington, and R. K. Colwell. 2002. The ant fauna of a tropical rain forest: Estimating species richness three different ways. Ecol. 83 (3): 689-702.

MacKenzie, M. D. and P. S. White. 1998. Vegetation of Great Smoky Mountains National Park, 1935-1938. Castanea 63 (3) 323-336.

Merritt, R. W. and D. L. Lawson. 1981. Adult emergence patterns and species distribution and abundance of tipulidae in three woodland floodplains. Environ. Ent. 10: 915-921.

Moreno, C. A. and G. Halffter. 2001. On the measure of sampling effort used in species accumulation curves. J. Applies Ecol. 38: 487-490.

Neufeld, H. S., E. H. Lee, J. R. Renfro, and W. D. Hacker. 2000. Seedling insensitivity to ozone for three conifer species native to Great Smoky Mountains National Park. Envir. Poll.108 (2): 141-151.

Novotny, V. and Y. Basset. 2000. Rare species in communities of tropical insect herbivores: pondering the mystery of singletons. Oikos 89: 564-572.

Oosterbroek, P. 2002. Catalogue of the crane flies of the world. Database version, Zoological Museum, University of Amsterdam (18,079 records) (distributed by the author).

Oosterbroek, P. 1984. A revision of the crane Fly genus *Nephrotoma* Meigen, 1803, in North America (Diptera, Tipulidae). Part II: The non-*Dorsalis* species-groups. Beaufortia 34 (5): 117-180.

Petersen, F. T. and R. Meier. 2003. Testing species-richness estimation methods on single-sample collection data using the Danish Diptera. Biodiv. and Conser. 12 (4): 667-686.

Petersen, F. T., R. Meier, and M. Nykjaer. 2003. Testing species richness estimation methods using museum label data on the Danish Asilidae. Biodiv. and Conser. 12 (4): 687-701.

Pritchard, G. 1983. Biology of Tipulidae. Ann. Rev. Ent. 28: 1-22.

Pyle, C. 1988. The type and extent of anthropogenic vegetation disturbance in the Great Smoky Mountains before National Park Service acquisition. Castanea 53 (3): 183-196.

Roff, D. A., S. Mostowy, and D. J. Rairbairn. 2002. The evolution of trade-offs: Testing predictions on response to selection and environmental variation. Evol. 56 (1): 84-95.

Rogers, J. S. 1930. The summer crane-fly fauna of the Cumberland Plateau in Tennessee. Mich Univ. Mus. Zool. Occas. Pap. 215: 1-50.

Rogers, J. S. 1933. The ecological distribution of the crane flies of northern Florida. Ecol. Monogr. 3: 1-74.

Rogers, J. S. 1942. The crane flies (Tipulidae) of the George Reserve, Michigan. Univ. Mich. Misc. Publ. Mus. Zool. 53: 1-128.

Service, M. W. 1973. Spatial and temporal distribution of aerial populations of woodland tipulids (Diptera). J. Anim. Ecol. 42: 295-303.

Sharkey, M. J. 2001. The all taxa biological inventory of the Great Smoky Mountains National Park. Florida Ent. 84 (4): 556-564.

Sorensen, L. L., J. A. Coddington, and N. Scharff. 2002. Inventorying and estimating subcanopy spider diversity using semiquantitative sampling methods in an Afromontane forest. Envir. Ent. 31 (2): 319-330.

SPSS Inc. 2001. SigmaPlot version 8.02. http://www.spssscience.com/sigmaplot.

Stary, J. 1992. Phylogeny and classification of Tipulomorpha, with special emphasis on the family Limoniidae. Acta zool. cracov. 35 (1): 11-36.

Summerville, K. S., E. H. Metzler, and T. O. Crist. 2001. Diversity of lepidoptera in ohio forests at local and regional scales: How heterogeneous is the fauna?. Ann. Ent. Soc. Amer. 94 (1): 583-591.

Tangelder, I. R. M. 1983. A Revision of the Crane Fly Genus *Nephrotoma* Meigen, 1803, in North America (Diptera, Tipulidae). Part I: The *Dorsalis* Species-Group. Beaufortia 33 (8): 111-205.

Tarrant, R. J. 1985. Seneca's *Thyestes*. American Philological Association Textbook Series, Number 11. Scholars Press, Atlanta, GA.

Toti, D. S., F. A. Coyle, and J. A. Miller. 2000. A structured inventory of Appalachian grass bald and heath bald spider assemblages and a test of species richness estimator performance. Jour. of Arach. 28 (3): 329-345.

Townes, H. 1972. A lightweight Maliaise trap. Entomol. News 18: 239-247.

United States Geological Survey. 1999. USGS-NPS Vegetation Mapping Program: Vegetation Sampling and Classification of Great Smoky Mountains National Park. Accessed 26 February 2003. http://biology.usgs.gov/npsveg/grsm/methods.html.

Willott, S. J. 2001. Species accumulation curves and the measure of sampling effort. J. Applied Ecol. 38: 484-486.

Wolda, H. 1981. Similarity indices, sample size and diversity. Oecologia 50: 296-302.

Young, C. W. 1978. Comparison of the crane flies (Diptera: Tipulidae) of two woodlands in eastern Kansas, with a key to adult crane flies of eastern Kansas. Univ. Kans. Sci. Bull. 51: 407-440.

Young, C. W. 1987. A Revision of the crane fly genus *Dicranoptycha* in North America. Univ. Kansas Sci. Bull. 53 (5): 215-274.

Young, C. W., and J. K. Gelhaus. 2000. Crane flies of Pennsylvania: preliminary checklist and database development with emphasis on aquatic apecies. Report submitted to The Wild Resource Conservation Fund (Harrisburg, PA) and PA Fish & Boat Commission (Bellefonte, PA).

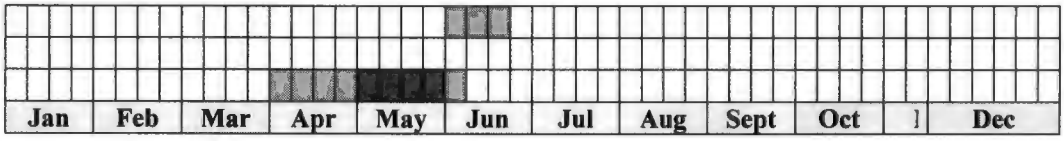
APPENDICIES

Appendix I. Phenology of adult crane flies in Great Smoky Mountains National Park Oct 2000 – Oct 2002.

The seasonal patterns are shown for adult crane flies collected in Malaise traps from October 2000 through October 2002. Species-specific diagrams were created by assigning the number of specimens collected to the entire time frame in which a trap was in operation. Specific collection information for each species can be found in Appendix II. Phenology diagrams have been separated into three elevation categories, low (0-500 m), medium (500-1500 m), and high (>1500 m). Sites were grouped according to elevation category and collection numbers from each elevation category were combined to form graphs. Numbers of specimens (n) collected were similarly divided into three categories and are represented by the following color divisions: = 1-5 specimens, = 6-15 specimens, and = >15 specimens.

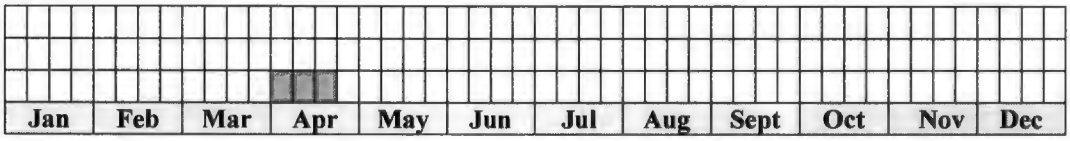
Cylindrotomidae

Liogma nodicornis (Osten Sacken) (n=13)

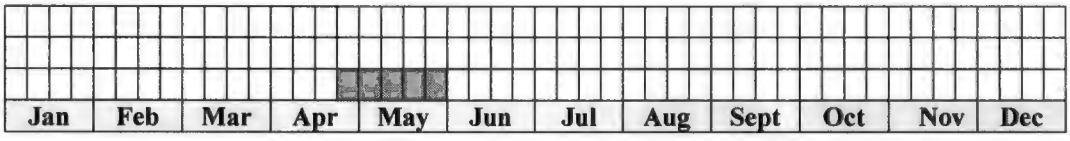


Limoniidae

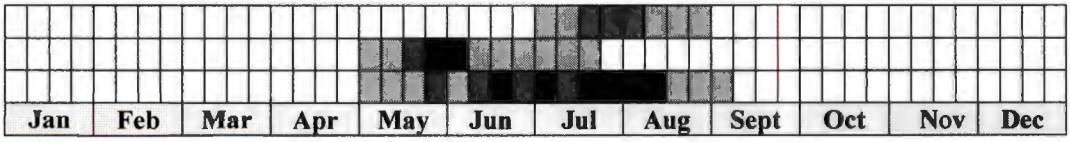
Antocha (Antocha) opalizens Osten Sacken (n=1)



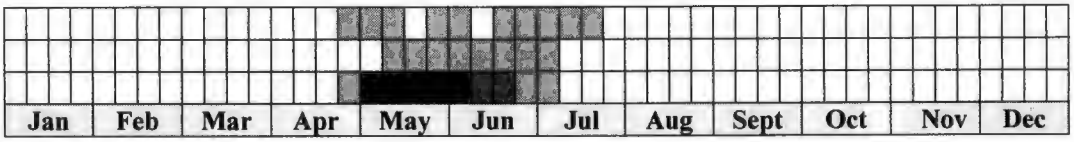
Antocha (Antocha) saxicola Osten Sacken (n=2)



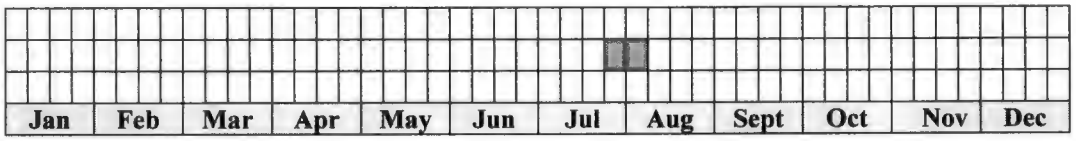
Atarba (Atarba) picticornis Osten Sacken (n=141)



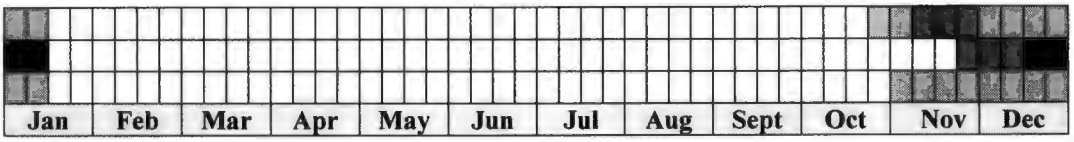
Austrolimnophila (Austrolimnophila) toxoneura (Osten Sacken) (n=115)



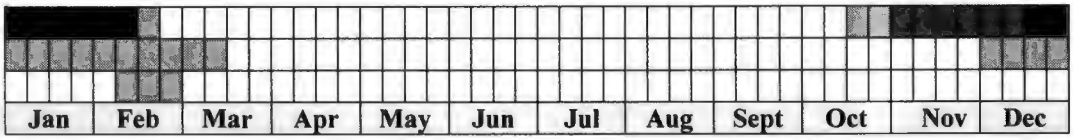
Cheilotrichia (Empeda) stigmatica Osten Sacken (n=1)



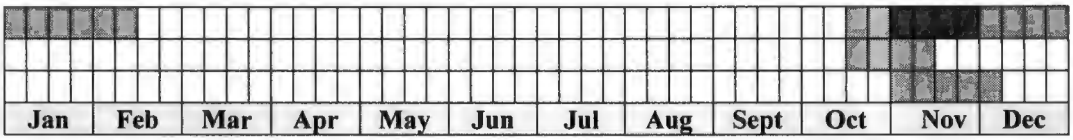
Chionea (Chionea) scita Walker (n=52)



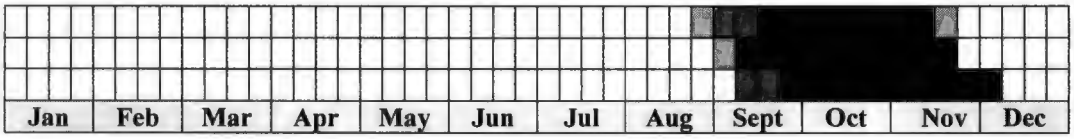
Chionea (Chionea) valga Harris (n=49)



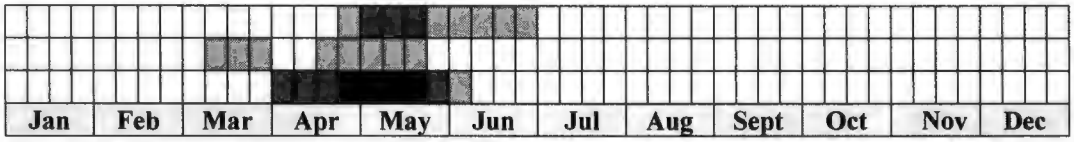
Chionea (Chionea) wilsoni Byers (n=19)



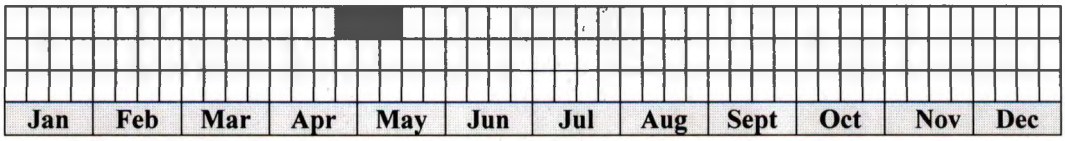
Cladura flavoferriugenia Osten Sacken (n=1484)



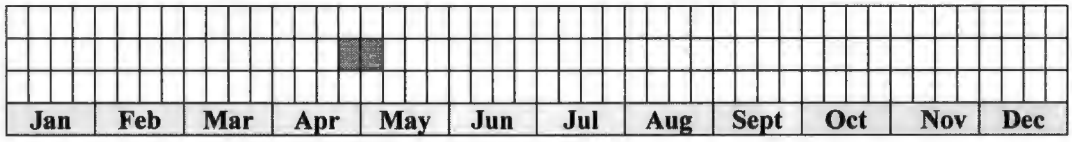
Dactylolabis (Dactylolabis) hudsonica Alexander (n=155)



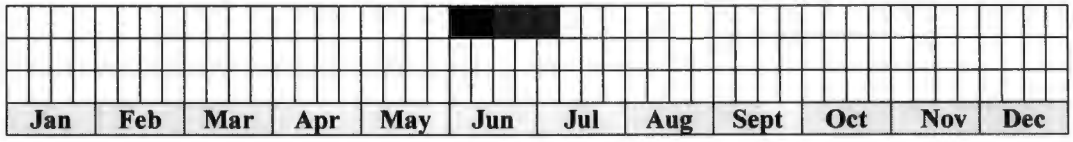
Dactylolabis (Dactylolabis) montana Alexander (n=1)



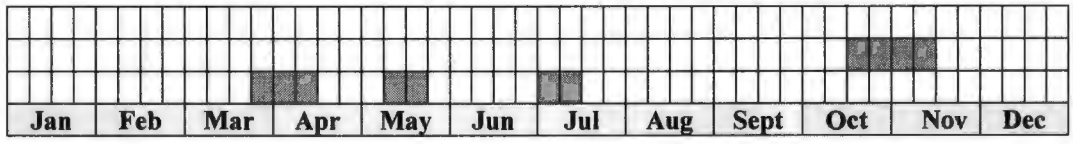
Dactylolabis (Dactylolabis) pemetica Alexander (n=1)



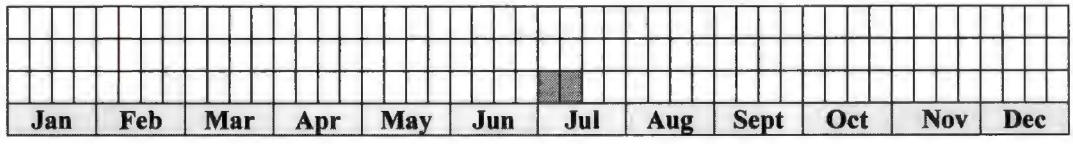
Dicranomyia (Dicranomyia) adirondacensis Alexander (n=35)



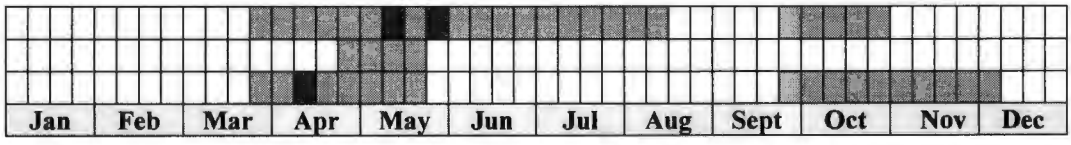
Dicranomyia (Dicranomyia) brevivena Osten Sacken (n=6)



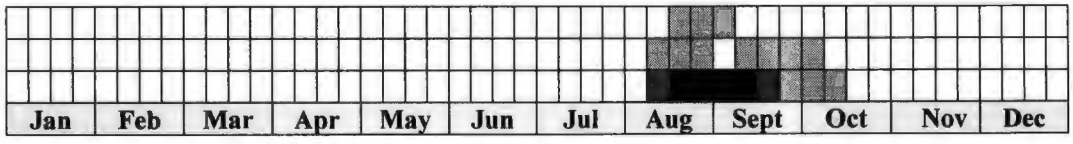
Dicranomyia (Dicranomyia) distans Osten Sacken (n=1)



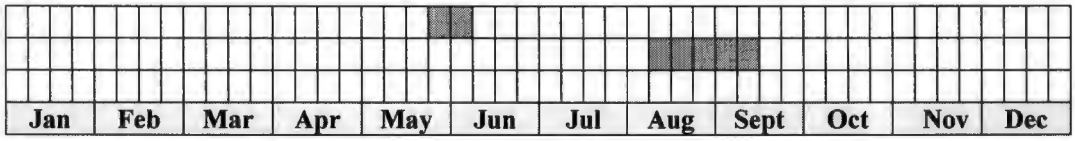
Dicranomyia (Dicranomyia) divisa (Alexander) (n=36)



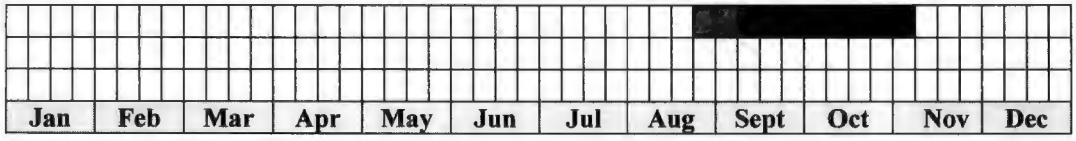
Dicranomyia (Dicranomyia) gladiator Osten Sacken (n=40)



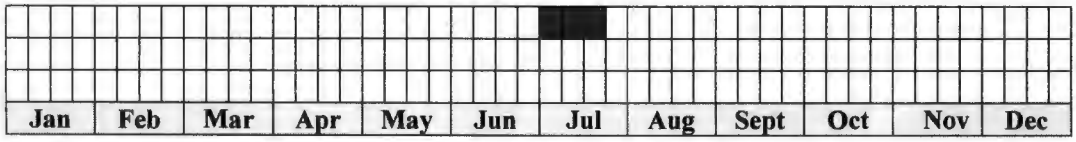
Dicranomyia (Dicranomyia) immodesta Osten Sacken (n=4)



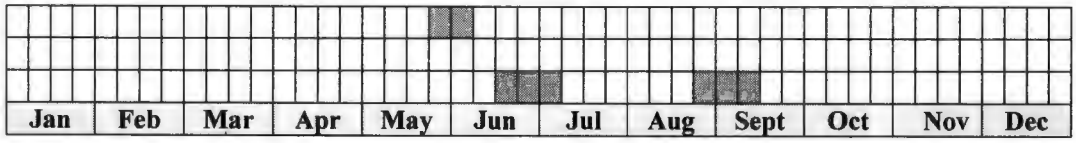
Dicranomyia (Melanolimonia) spinifera Alexander (n=143)



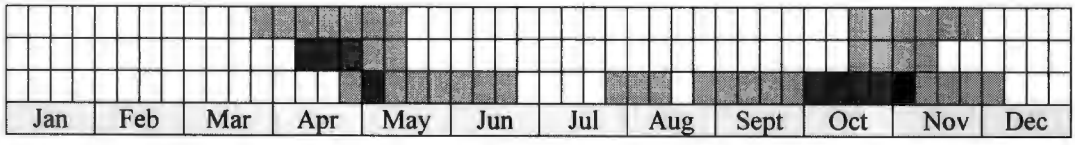
Dicranomyia (Dicranomyia) distendens Lundstrom (n=14)



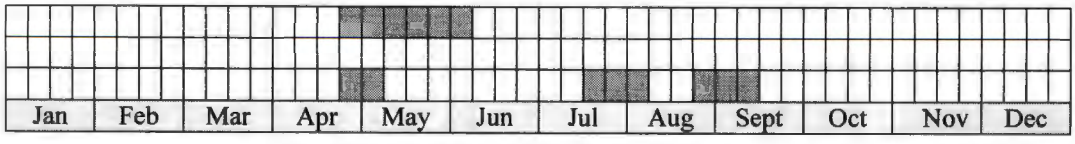
Dicranomyia (Erostrata) globithorax Osten Sacken (n=4)



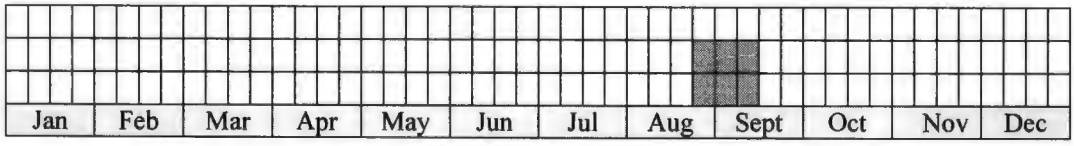
Dicranomyia (Dicranomyia) liberta Osten Sacken (n=61)



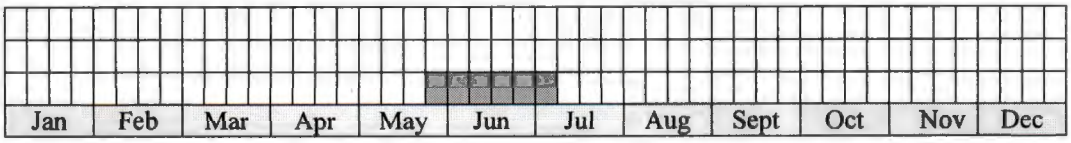
Dicranomyia (Numantia) fusca (Meigen) (n=6)



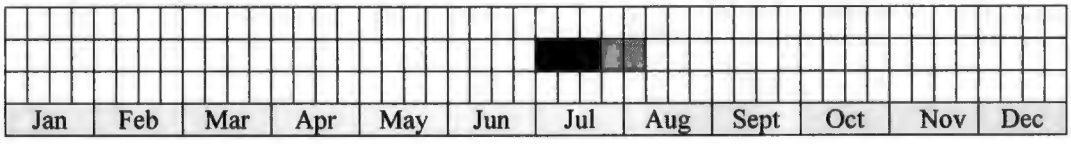
Dicranoptycha acanthophallus Alexander (n=2)



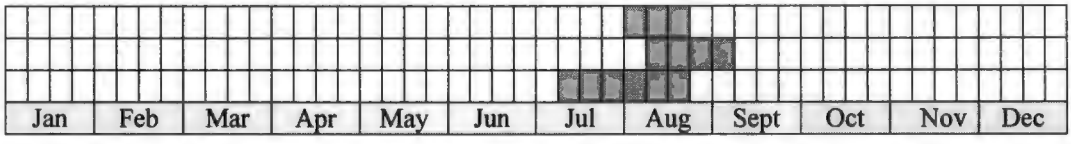
Dicranoptycha elsa Alexander (n=2)



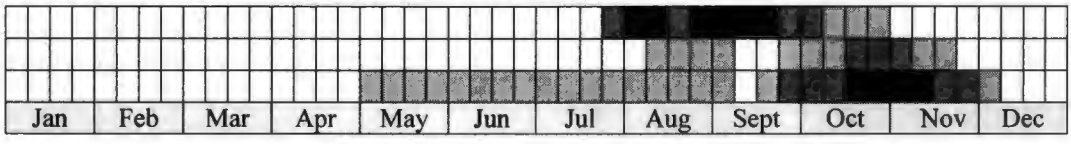
Dicranoptycha germana Osten Sacken (n=23)



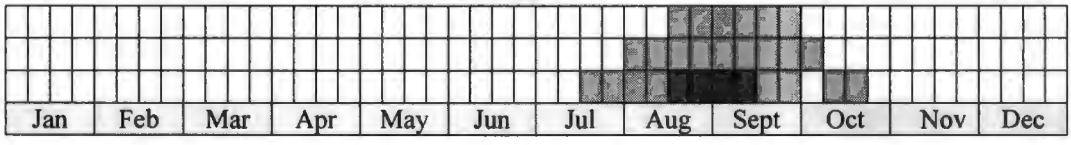
Dicranoptycha septemtrionis Alexander (n=19)



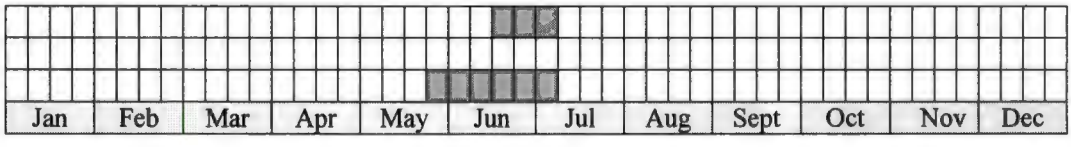
Discobola annulata (Linnaeus) (n=152)



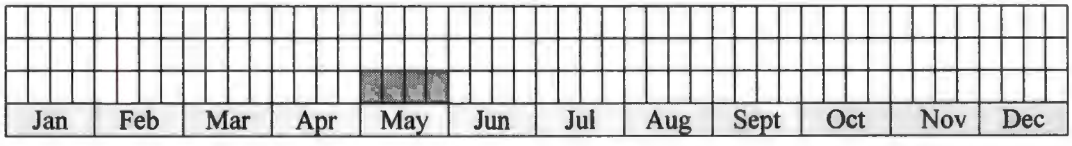
Discobola nigroclavata (Alexander) (n=21)



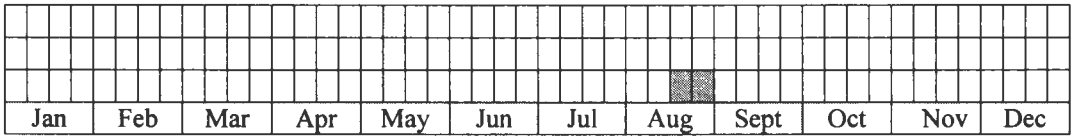
Elephantomyia (Elephantomyia) westwoodi Osten Sacken (n=4)



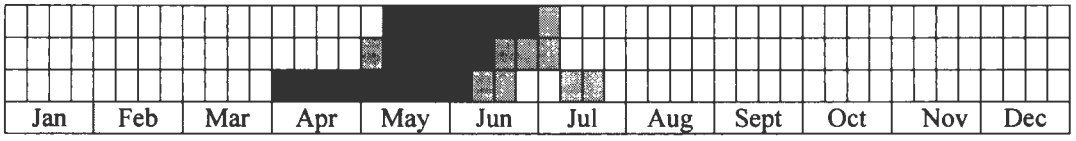
Eloeophila johnsoni (Alexander) (n=1)



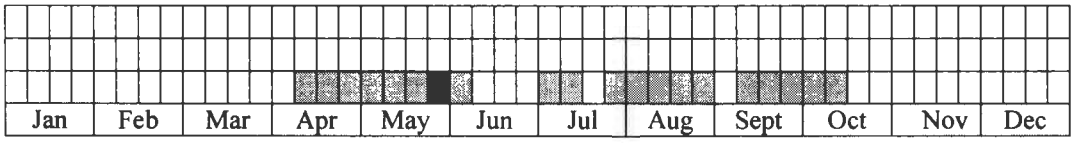
Eloeophila solstitialis (Alexander) (n=1)



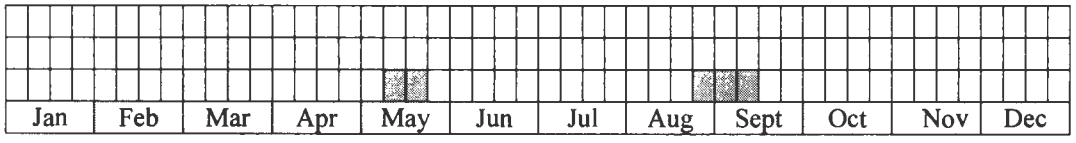
Epiphragma (Epiphragma) fasciapenne (Say) (n=236)



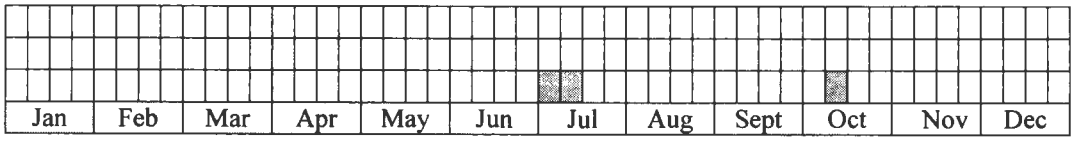
Epiphragma (Epiphragma) solatrix (Osten Sacken) (n=14)



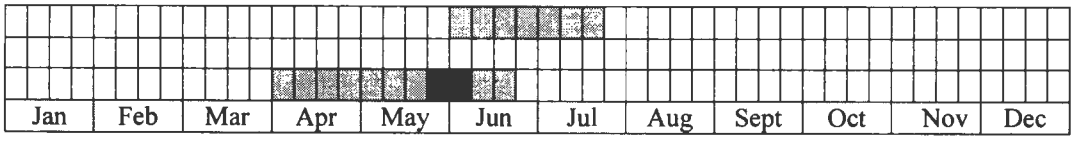
Erioptera (Mesocyphona) caloptera Say (n=4)



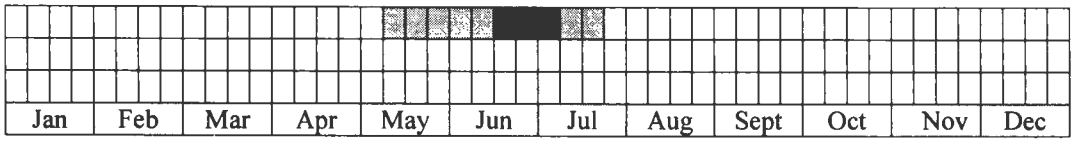
Eugnophomyia luctuosa (Osten Sacken) (n=2)



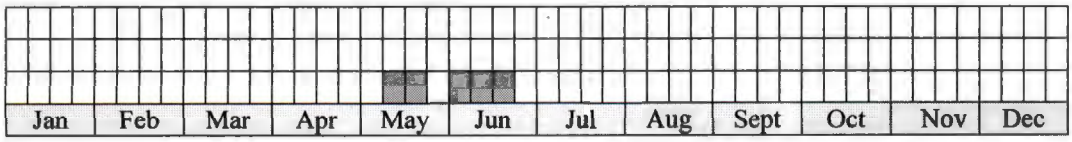
Euphylidorea albipes (Leonard) (n=16)



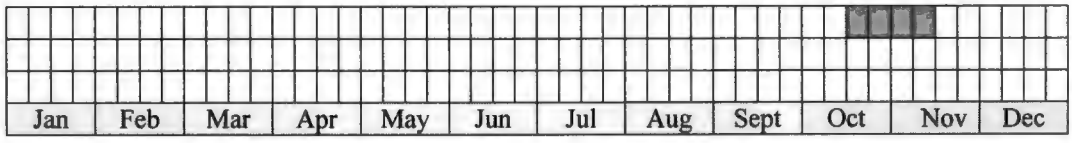
Euphylidorea lutea (Doane) (n=9)



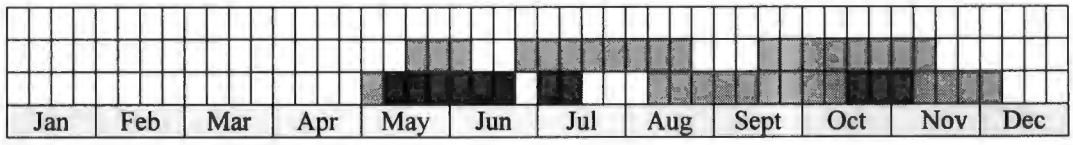
Geranomyia rostrata (Say) (n=3)



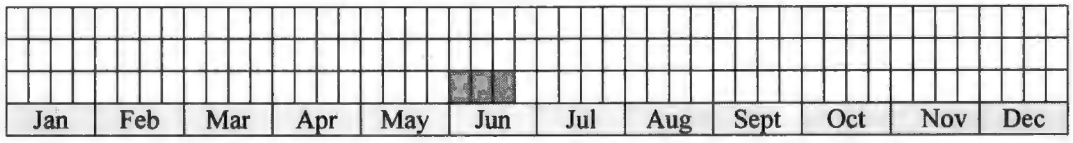
Geranomyia diversa Osten Sacken (n=1)



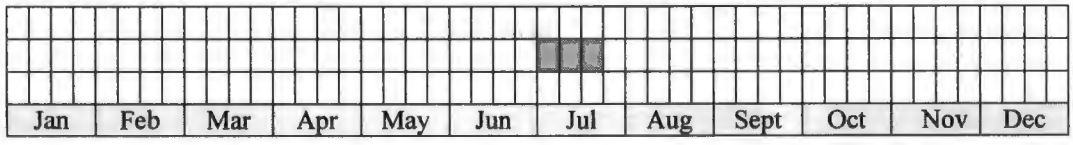
Gnophomyia tristissima Osten Sacken (n=38)



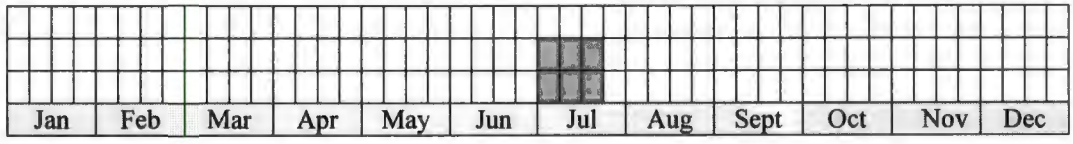
Gonomyia (Gonomyia) bidentata Alexander (n=1)



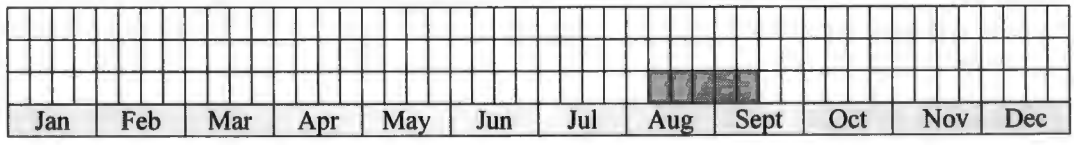
Gonomyia (Lipophleps) manca Osten Sacken (n=1)



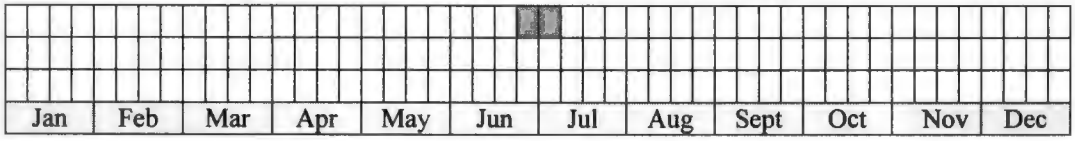
Hexatoma (Eriocera) albitarsis (Osten Sacken) (n=4)



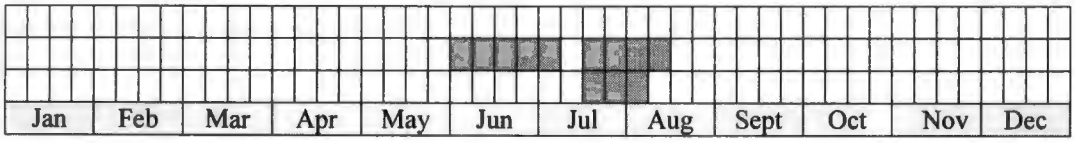
Hexatoma (Eriocera) aurata (Doane) (n=3)



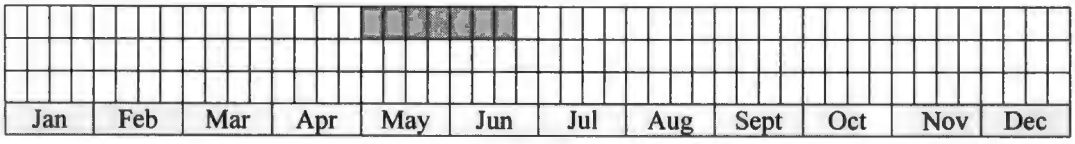
Hexatoma (Eriocera) brachycera (Osten Sacken) (n=2)



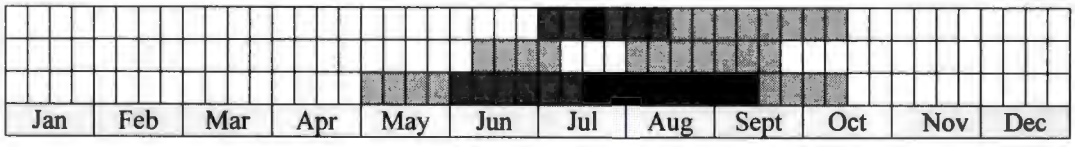
Hexatoma (Eriocera) brevioricornis Alexander (n=46)



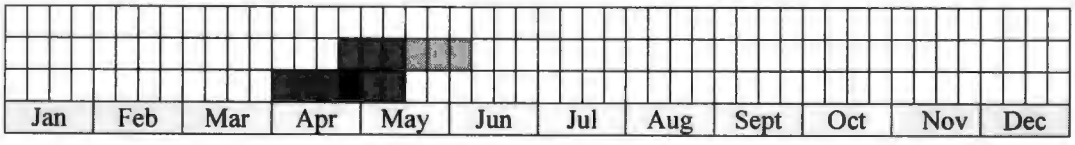
Limnophila (Arctolimnophila) subcostata (Alexander) (n=4)



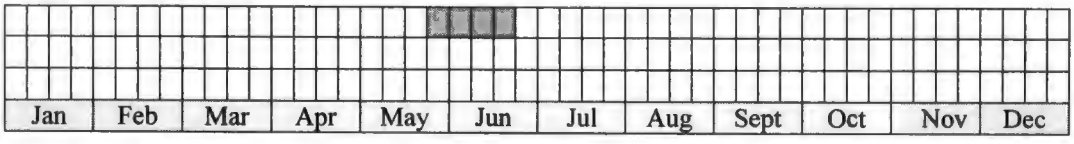
Limnophila (Dicranophragma) fuscavoria Osten Sacken (n=419)



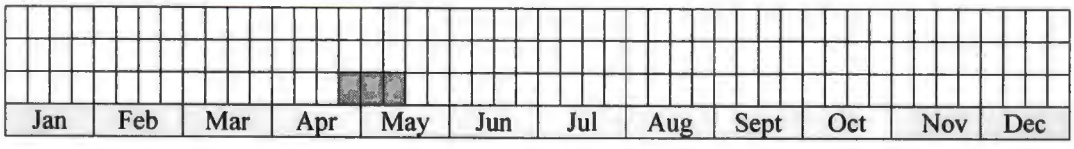
Limnophila (Idiolimnophila) emmellina Alexander (n=28)



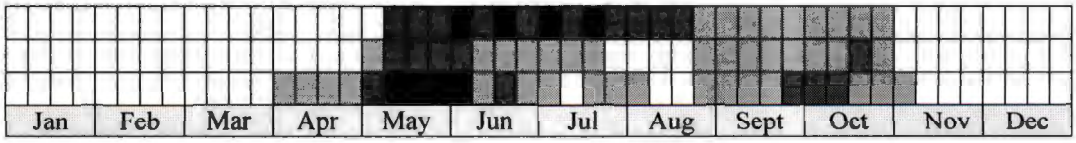
Limnophila (Lasiomastix) macrocera (Say) (n=6)



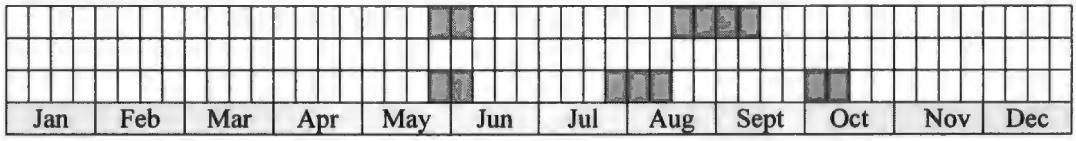
Limnophila (Lasiomastix) tenuicornis Osten Sacken (n=1)



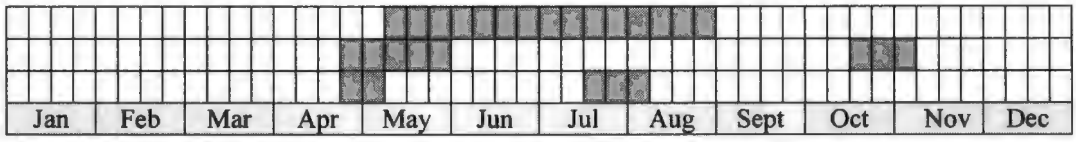
Limonia indigena (Osten Sacken) (n=152)



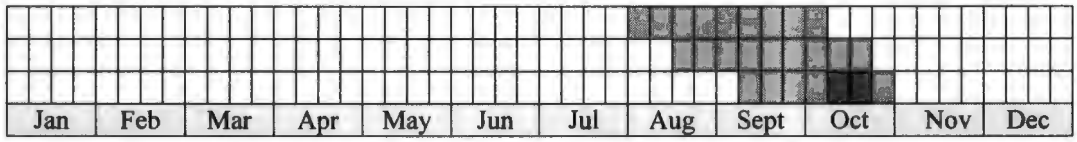
Limonia macateei (Alexander) (n=7)



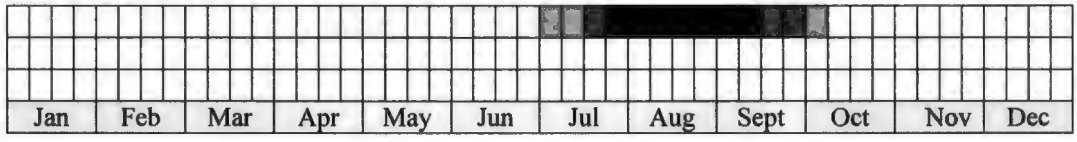
Limonia maculicosta (Coquillett) (n=19)



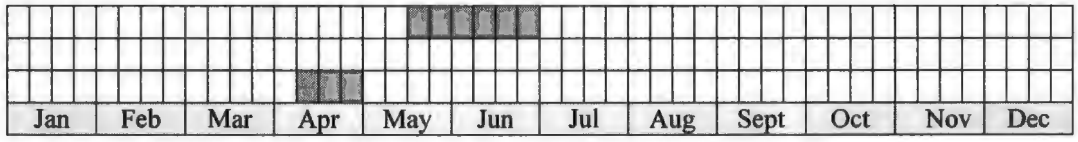
Limonia parietina (Osten Sacken) (n=13)



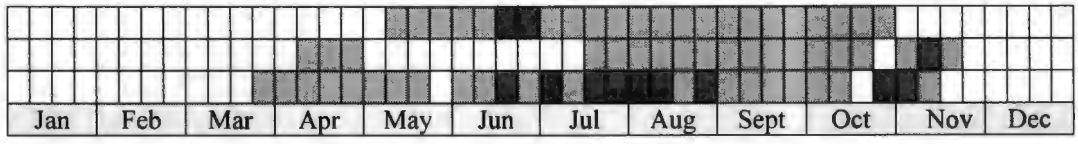
Limonia tristigma (Osten Sacken) (n=108)



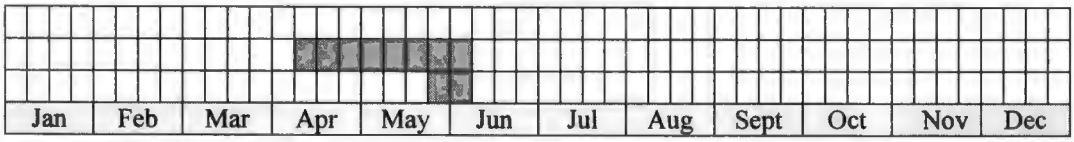
Lipsothrix sylva (Alexander) (n=6)



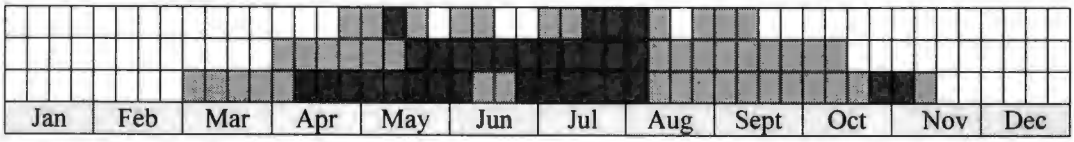
Metalimnobia (Metalimnobia) cinctipes (Say) (n=82)



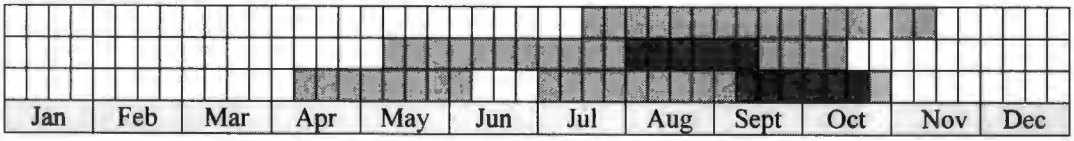
Metalimnobia (Metalimnobia) fallax (Johnson) (n=5)



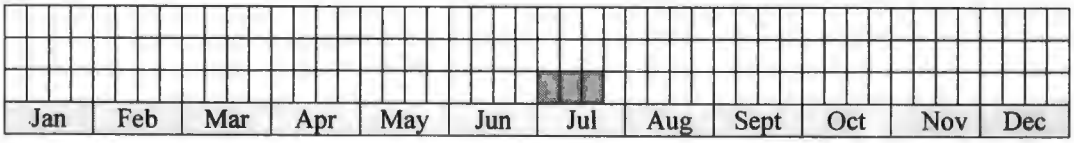
Metalimnobia (Metalimnobia) immatura (Osten Sacken) (n=113)



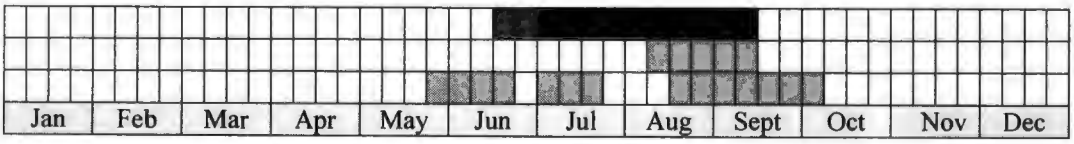
Metalimnobia (Metalimnobia) triocellata (Osten Sacken) (n=70)



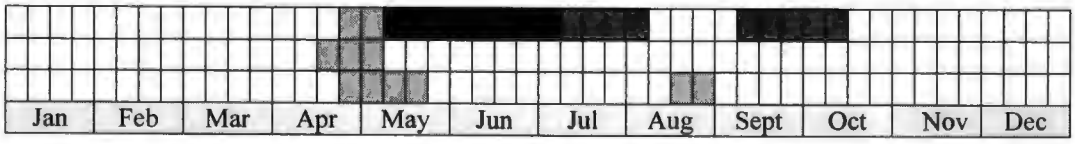
Molophilus (Molophilus) perflaveolus Alexander (n=3)



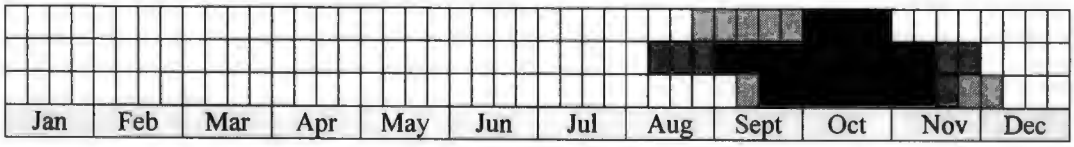
Molophilus (Molophilus) fultonensis Alexander (n=363)



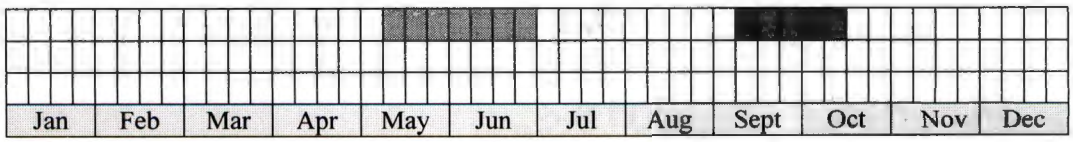
Molophilus (Molophilus) hirthipennis (Osten Sacken) (n=787)



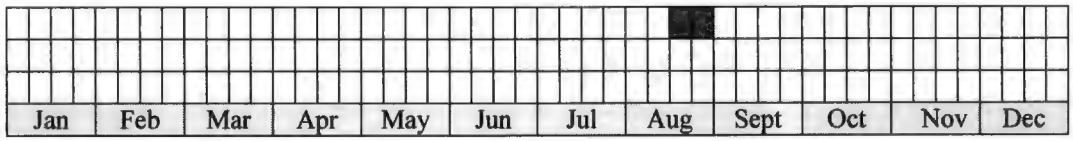
Neocladura delicatula (Alexander) (n=1251)



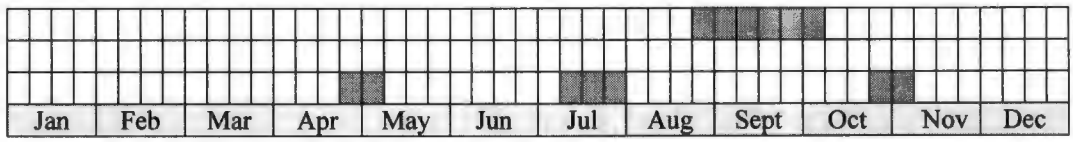
Neolimnophila appalachicola Alexander (n=15)



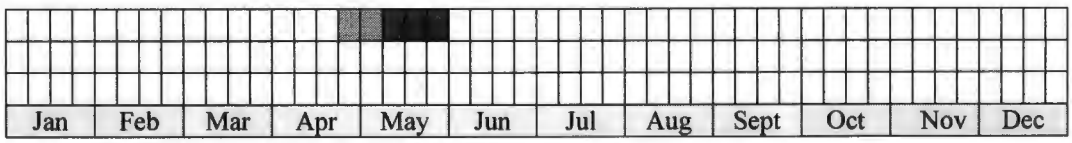
Neolimnophila ultima Alexander (n=7)



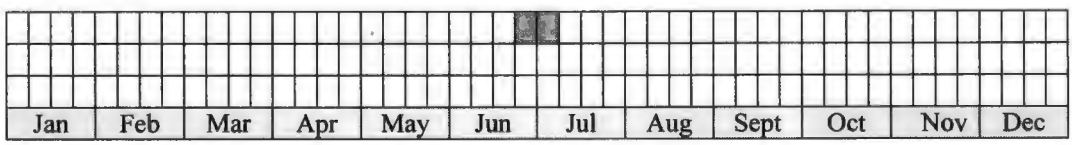
Neolimonia rara (Osten Sacken) (n=5)



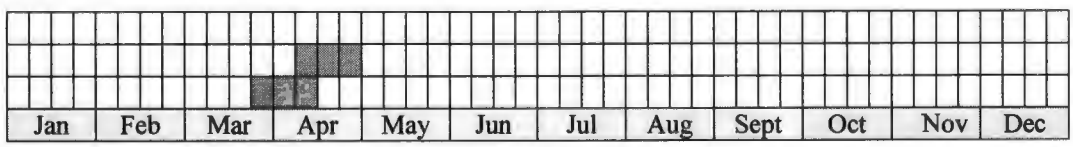
Ormosia (Oreophila) parviala Petersen and Gelhaus (n=8)



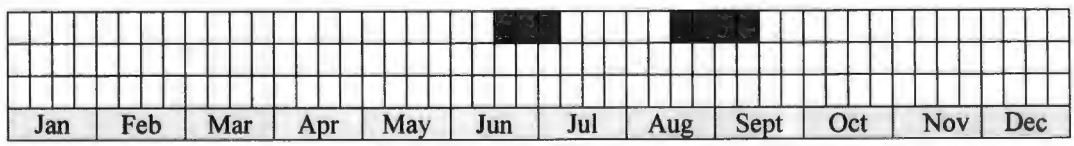
Ormosia (Ormosia) bilineata Dietz (n=2)



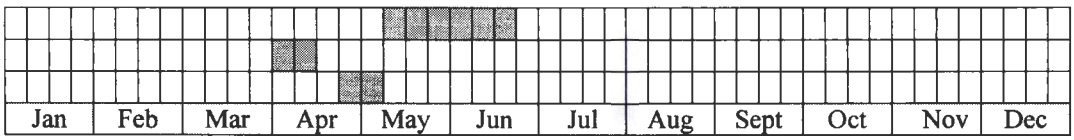
Ormosia (Ormosia) carolinensis Alexander (n=2)



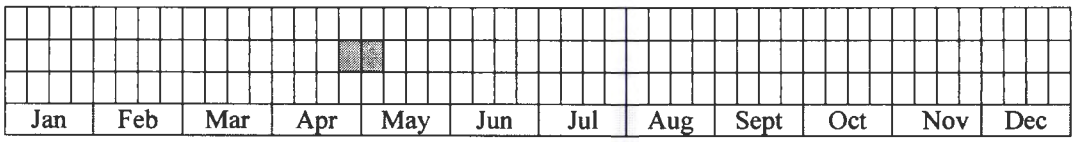
Ormosia (Ormosia) harrisoniana Alexander (n=35)



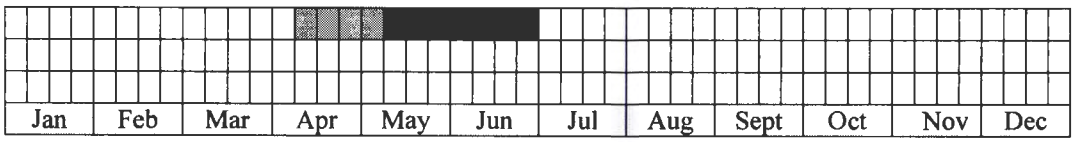
Ormosia (Ormosia) holotrichia (Osten Sacken) (n=7)



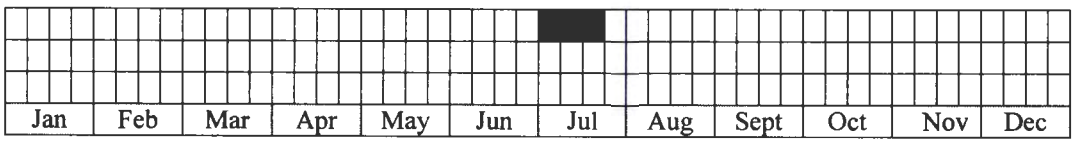
Ormosia (Ormosia) hubbelli Alexander (n=1)



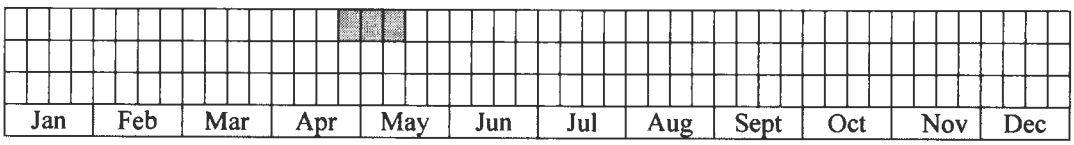
Ormosia (Ormosia) lilliana Alexander (n=86)



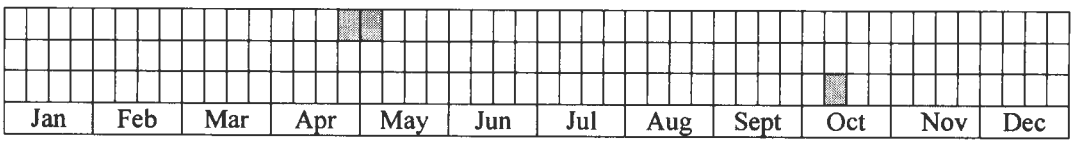
Ormosia (Ormosia) monticola (Osten Sacken) (n=33)



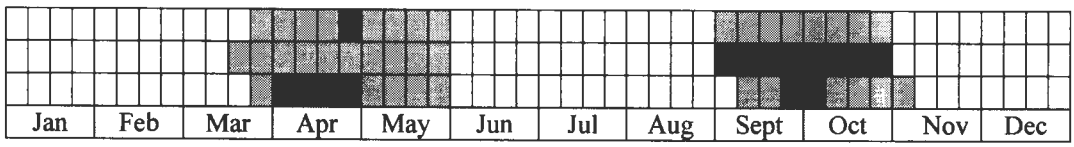
Ormosia (Ormosia) nigripila (Osten Sacken) (n=1)



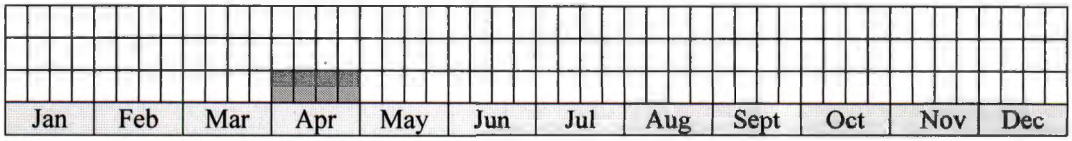
Ormosia (Ormosia) pygmae (Alexander) (n=4)



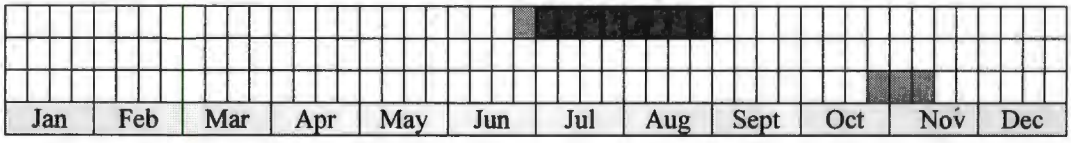
Ormosia (Ormosia) romanovichiana Alexander (n=65)



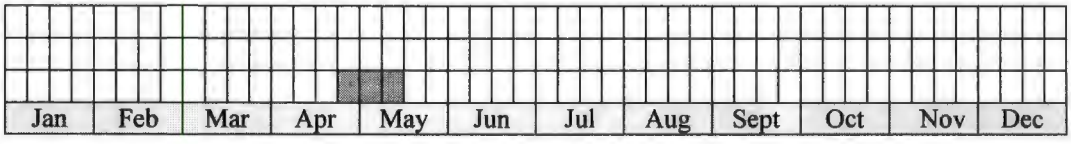
Ormosia (Ormosia) tennesseensis Alexander (n=1)



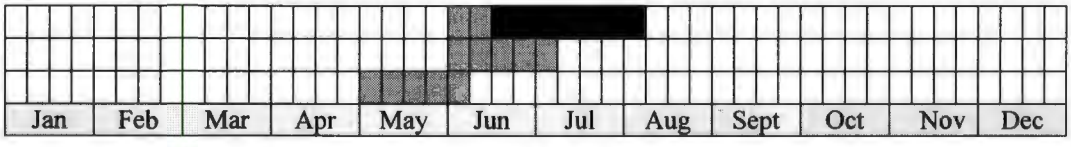
Ormosia (Ormosia) townesi Alexander (n=20)



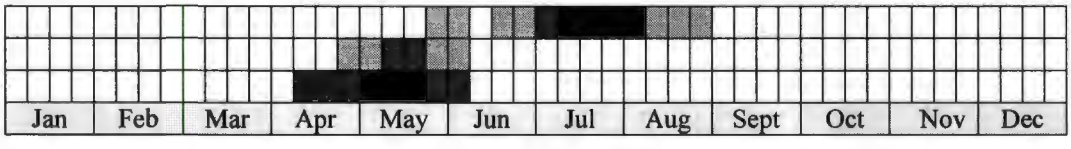
Ormosia (Paraormosia) palpalis Dietz (n=4)



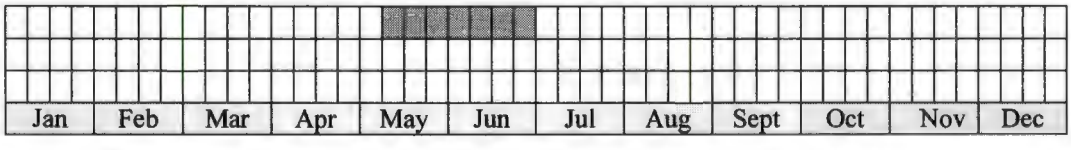
Prionolabis munda (Osten Sacken) (n=79)



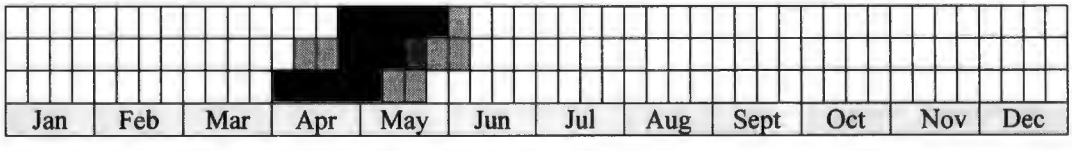
Prionolabis politissima (Alexander) (n=105)



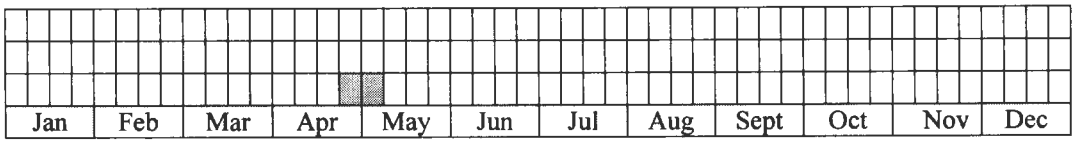
Prionolabis rudimentis (Alexander) (n=4)



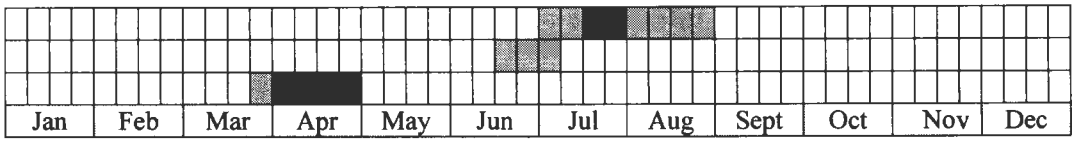
Prionolabis rufibasis (Osten Sacken) (n=332)



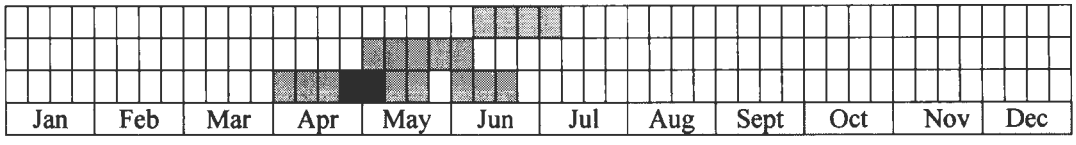
Prionolabis terebrans (Alexander) (n=4)



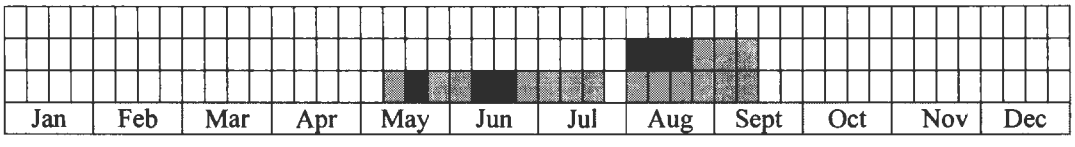
Prionolabis walleyi (Osten Sacken) (n=59)



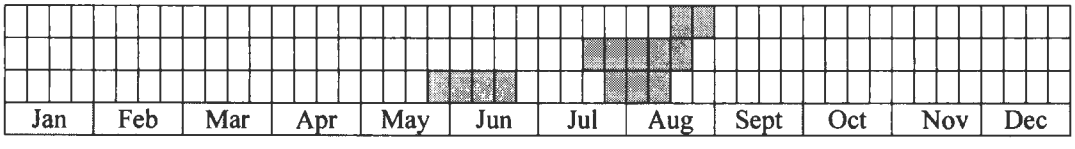
Prolimnophila areolata (Osten Sacken) (n=23)



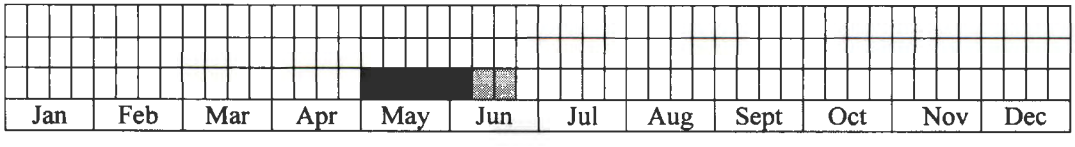
Pseudolimnophila (Pseudolimnophila) australina Alexander (n=44)



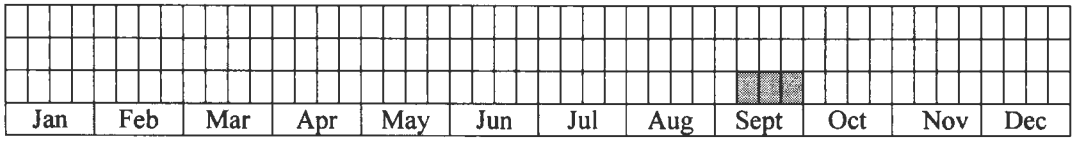
Pseudolimnophila (Pseudolimnophila) contempta (Osten Sacken) (n=15)



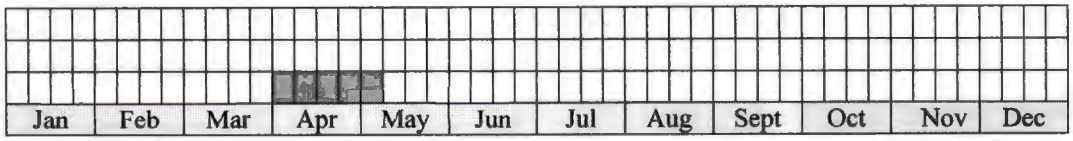
Pseudolimnophila (Pseudolimnophila) inornata (Osten Sacken) (n=12)



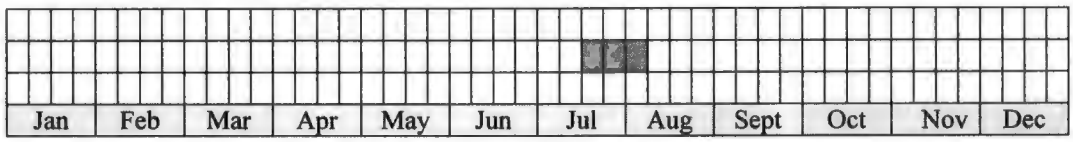
Pseudolimnophila (Pseudolimnophila) luteipennis (Osten Sacken) (n=1)



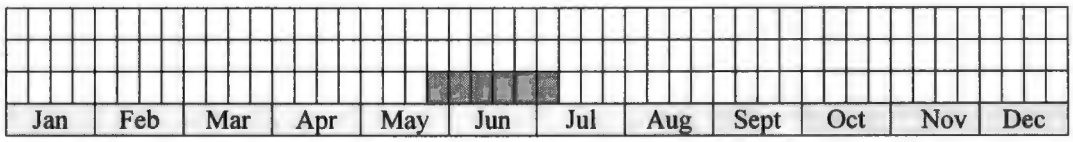
Pseudolimnophila (Pseudolimnophils) noveboracensis (Alexander) (n=2)



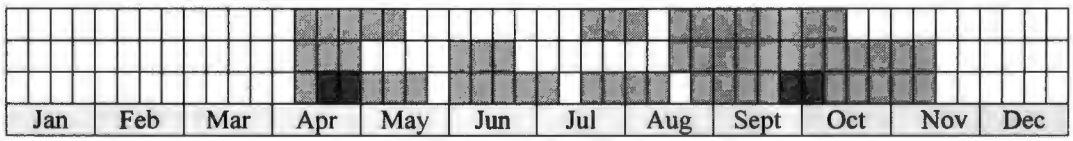
Rhabdomastix (Sacandaga) flava (Alexander) (n=1)



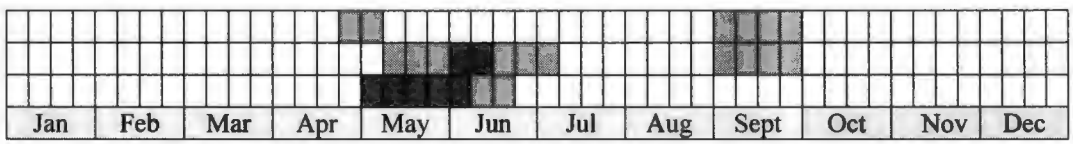
Rhipidia (Rhipidia) bryanti Johnson (n=2)



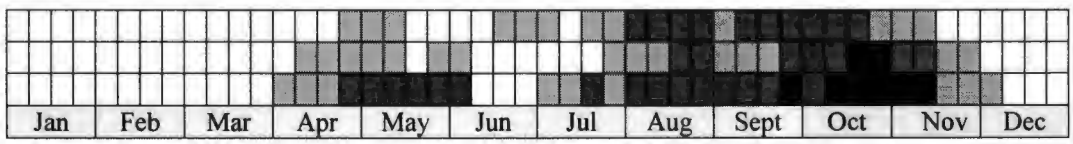
Rhipidia (Rhipidia) domestica Osten Sacken (n=62)



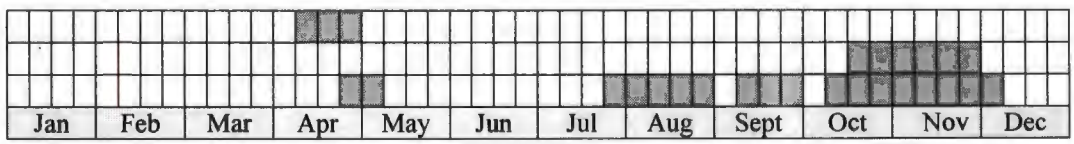
Rhipidia (Rhipidia) fidelis Osten Sacken (n=30)



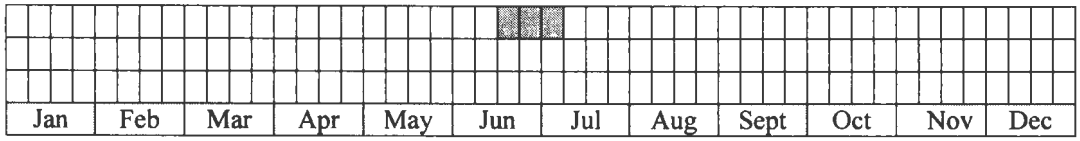
Rhipidia (Rhipidia) maculata Meigen (n=371)



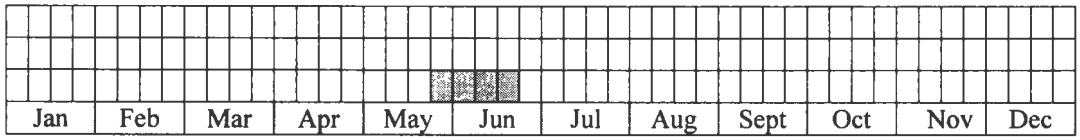
Rhipidia (Rhipidia) shannoni Alexander (n=14)



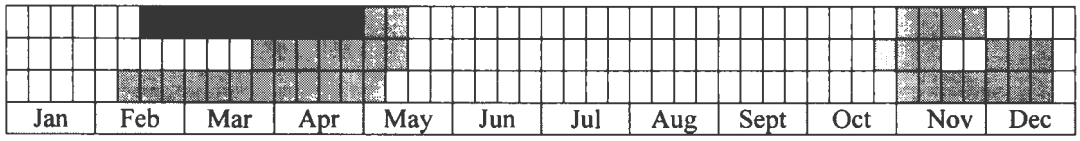
Shannonomyia lenta (Osten Sacken) (n=1)



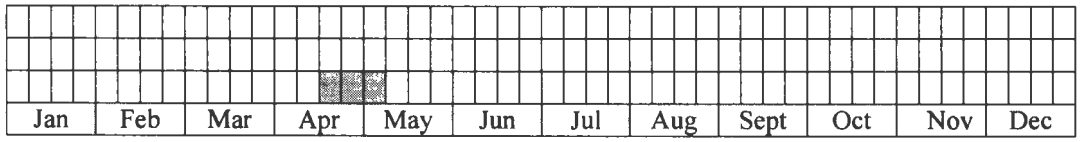
Scleroprota apicalis (Alexander) (n=1)



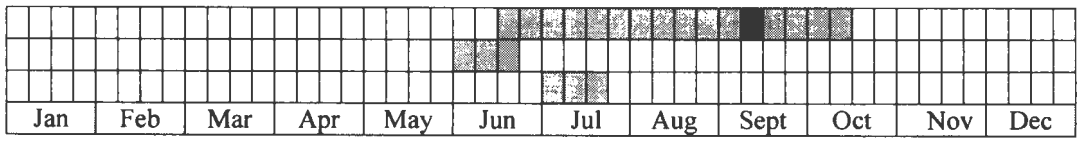
Symplecta cana Walker (n=71)



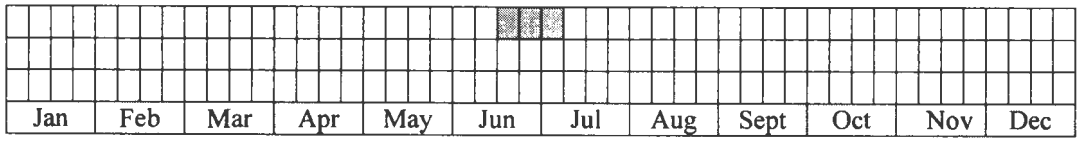
Trimicra pilipes (Fabricius) (n=1)



Ulamorpha pilosella (Osten Sacken) (n=17)

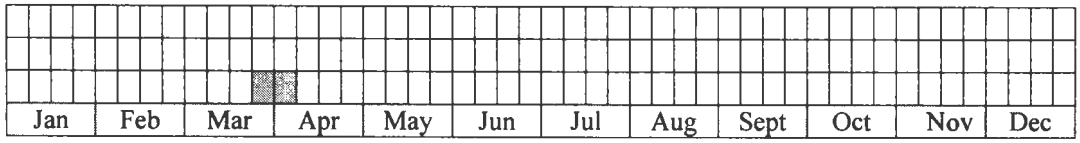


Ulomorpha rogersella Alexander (n=3)

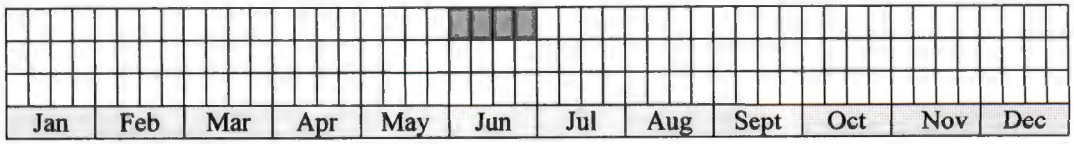


Pediciidae

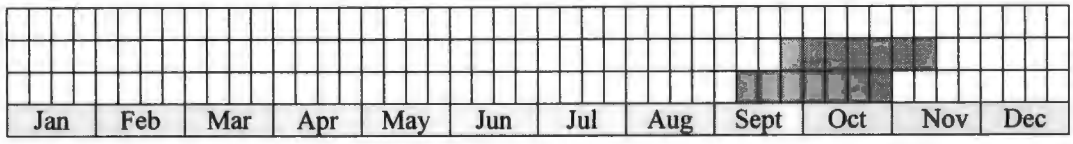
Dicranota (Paradicranota) eucera Alexander (n=1)



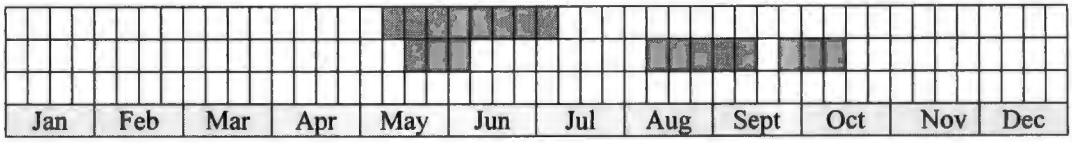
Dicranota (Rhaphidolabina) flaveloa (Osten Saken) (n=1)



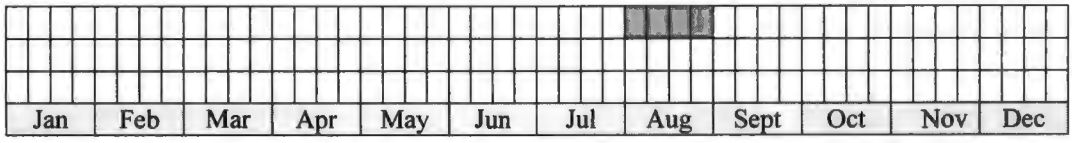
Pedicia (Pedicia) albivitta Walker (n=7)



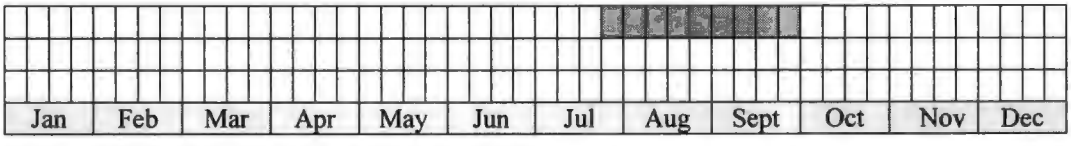
Pedicia (Pedicia) margarita Alexander (n=6)



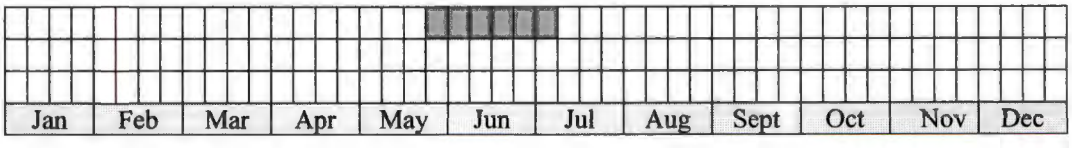
Tricyphona (Pentacyphona) autumnalis Alexander (n=3)



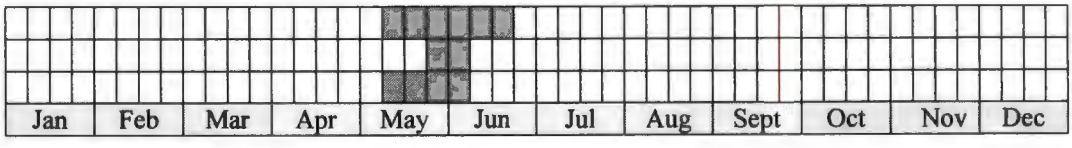
Tricyphona (Pentacyphona) huffae (Alexander) (n=9)



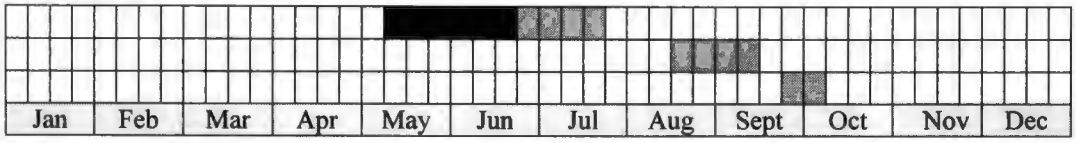
Tricyphona (Tricyphona) auripennis (Osten Sacken) (n=4)



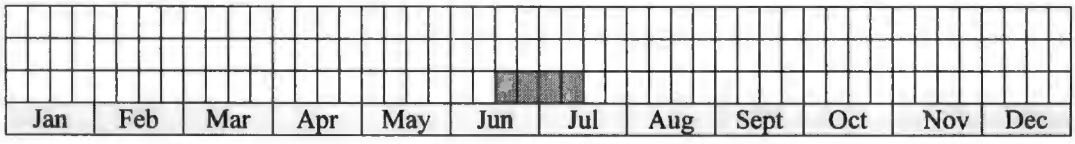
Tricyphona (Tricyphona) gigantean (Alexander) (n=5)



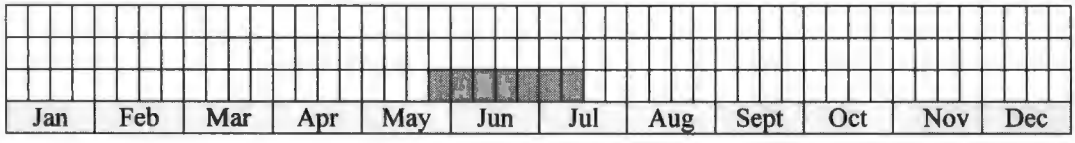
Tricyphona (Tricyphona) inconstans (Osten Sacken) (n=48)



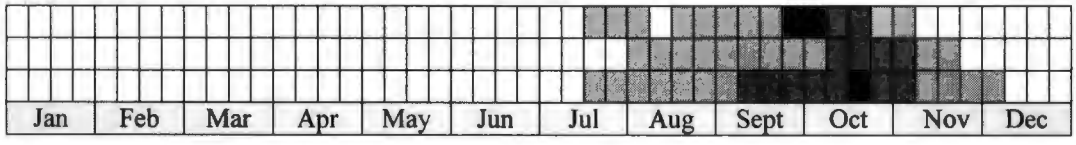
Tricyphona (Tricyphona) katahdin Alexander (n=1)



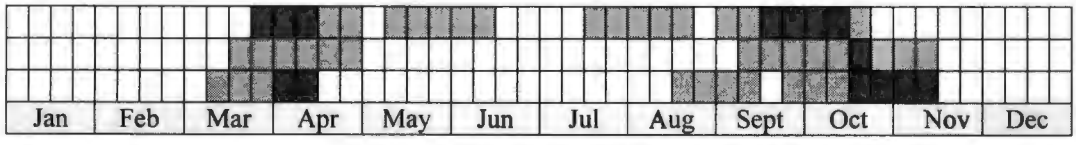
Tricyphona (Tricyphona) vernalis (Osten Sacken) (n=3)



Ula (Ula) elegans Osten Sacken (n=70)

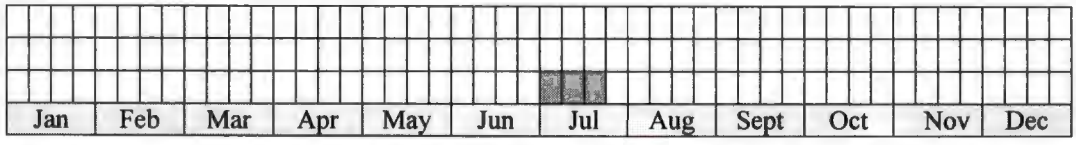


Ula (Ula) paupera Osten Sacken (n=64)



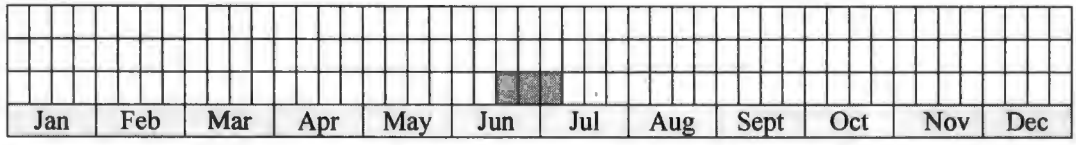
Ptychopteridae

Ptychoptera rutocincta Meigen (n=1)

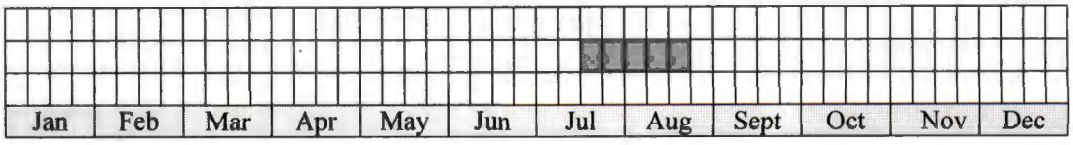


Tipulidae

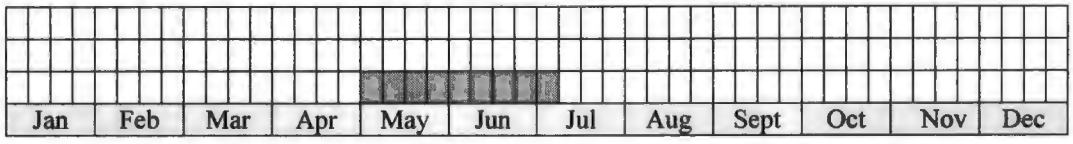
Brachypremna dispellens (Walker) (n=1)



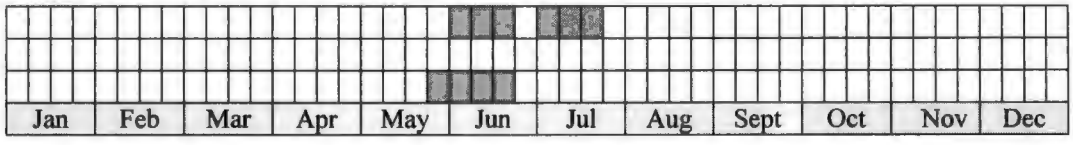
Ctenophora (Ctenophora) apicata Osten Sacken (n=4)



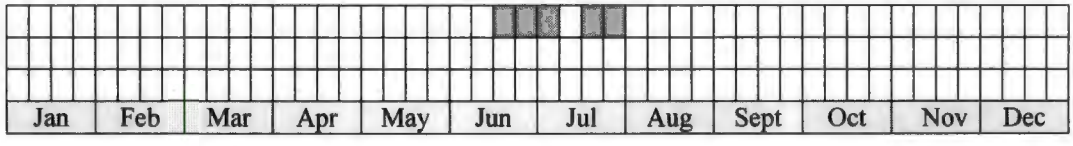
Ctenophora (Ctenophora) nubecula Osten Sacken (n=1)



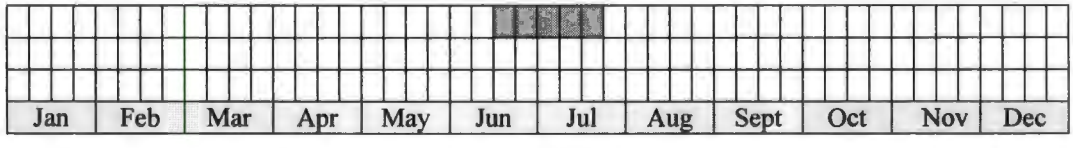
Dolichopeza (Dolichopeza) americana Needham (n=4)



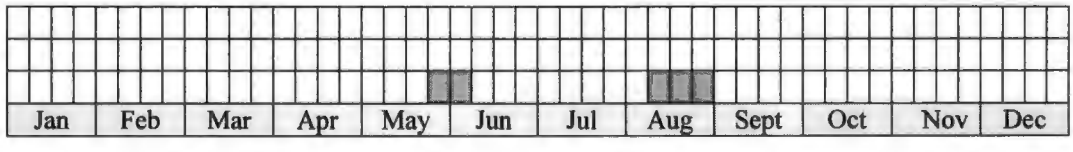
Dolichopeza (Oropeza) johnsonella (Alexander) (n=2)



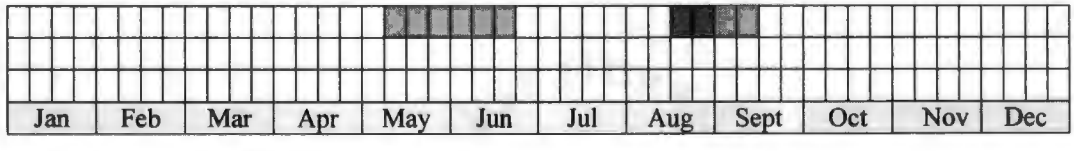
Dolichopeza (Oropeza) obscura (Johnson) (n=2)



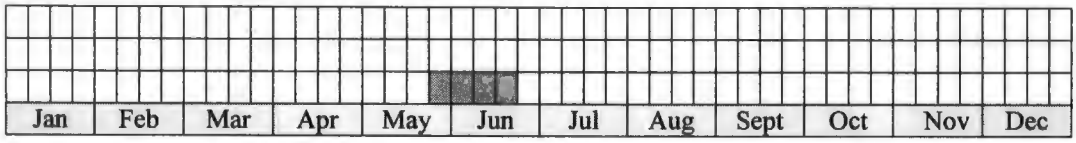
Dolichopeza (Oropeza) subalbipes (Johnson) (n=2)



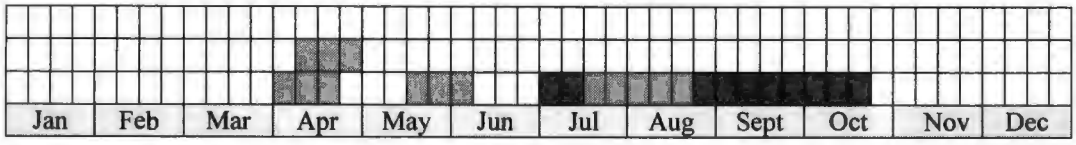
Leptotarsus (Longurio) minimus (Alexander) (n=9)



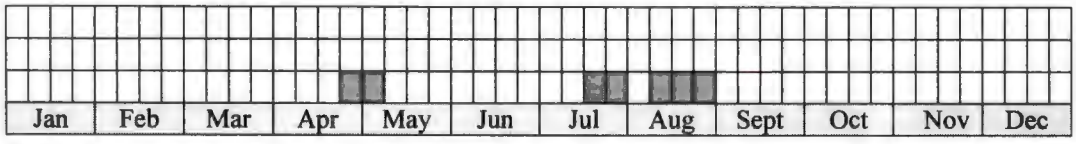
Nephrotoma eucera (Loew) (n=1)



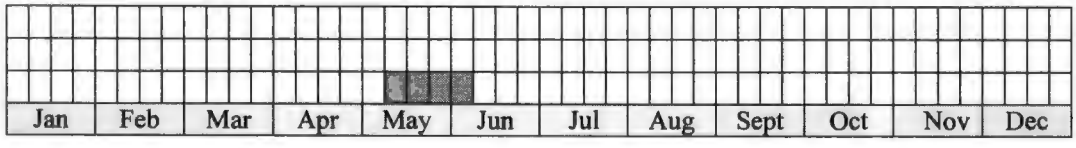
Nephrotoma cingulata (Dietz) (n=54)



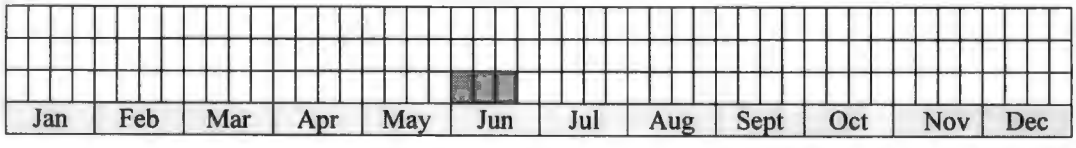
Nephrotoma gnata (Dietz) (n=4)



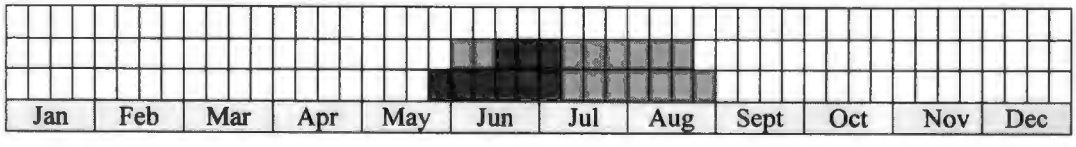
Nephrotoma macrocera (Say) (n=2)



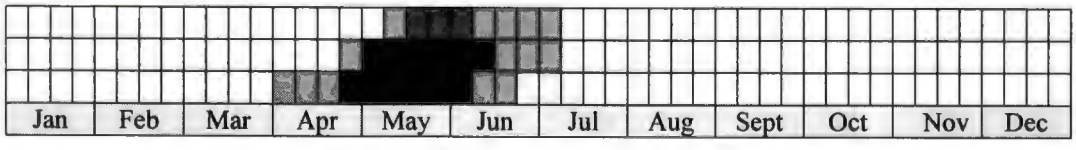
Nephrotoma subalterna Oosterbroek (n=1)



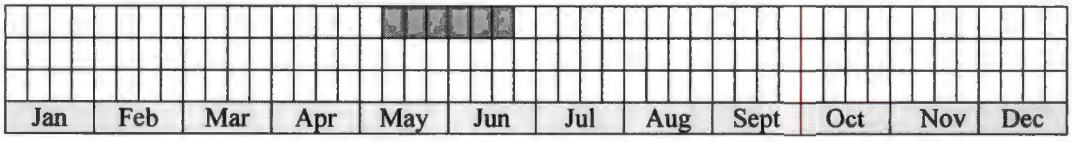
Nephrotoma virescens (Loew) (n=49)



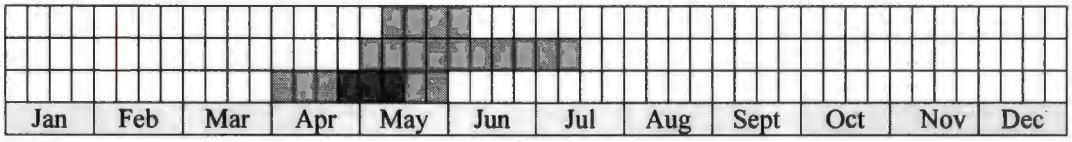
Tanyptera (Tanyptera) dorsalis (Walker) (n=425)



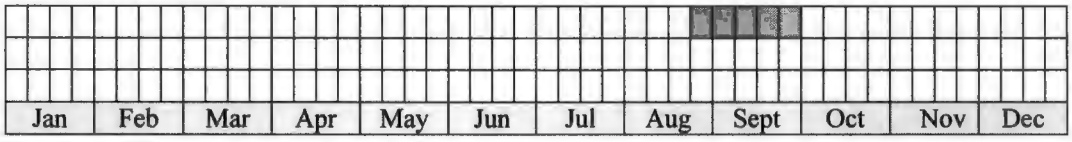
Tipula (Pterelachisus) penobscot Alexander (n=1)



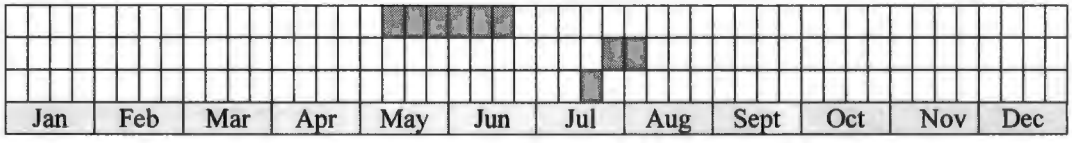
Tipula (Pterelachisus) trivitatta Say (n=28)



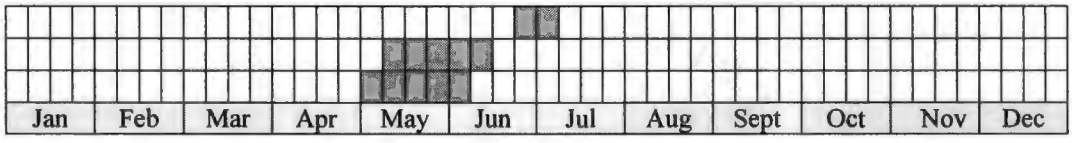
Tipula (Savtshenkia) fragilis Loew (n=1)



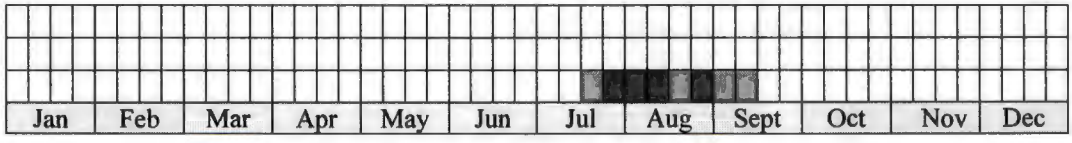
Tipula (Savtshenkia) ignobilis Loew (n=8)



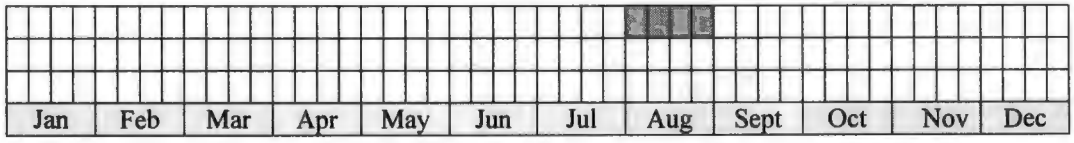
Tipula (Schummelia) friendi Alexander (n=6)



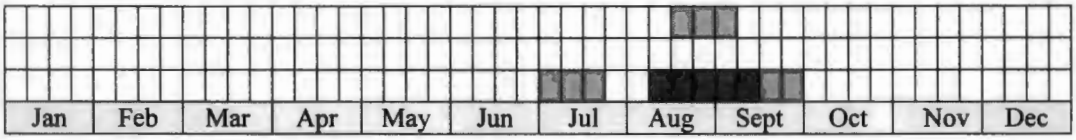
Tipula (Schummelia) hermannia Alexander (n=14)



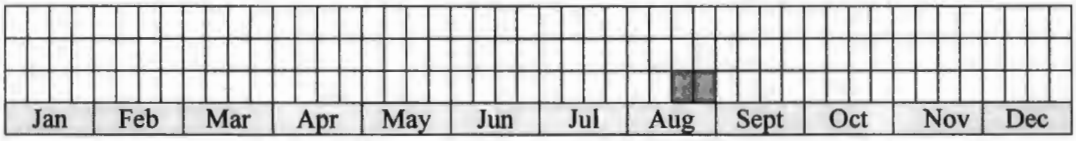
Tipula (Schummelia) stenorhabda Alexander (n=1)



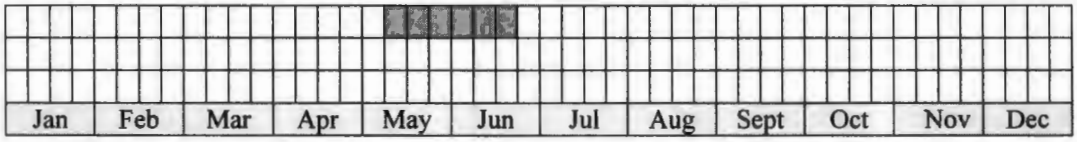
Tipula (Schummelia) stonei Alexander (n=26)



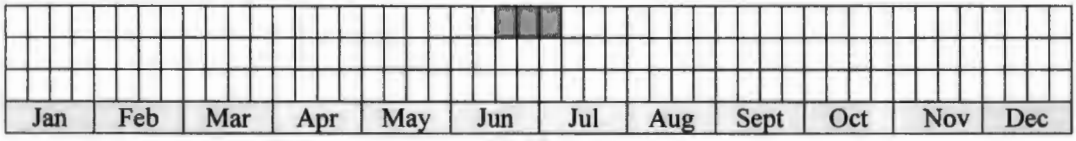
Tipula (Trichotipula) algonquin Alexander (n=3)



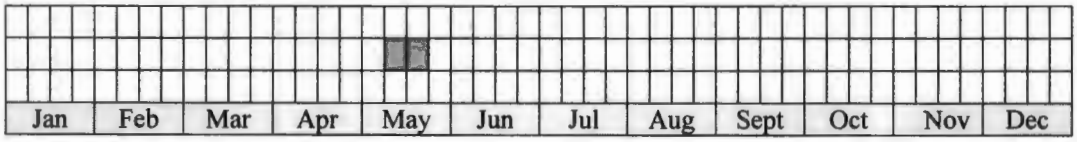
Tipula (Trichotipula) oropezoides Johnson (n=5)



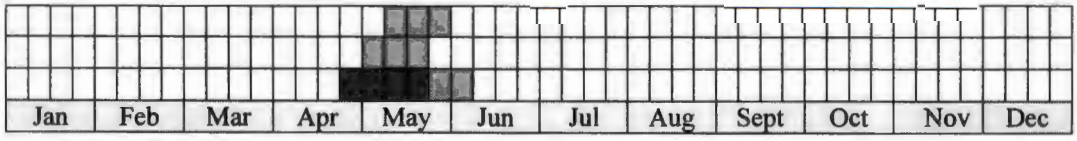
Tipula (Trichotipula) unimaculata (Loew) (n=1)



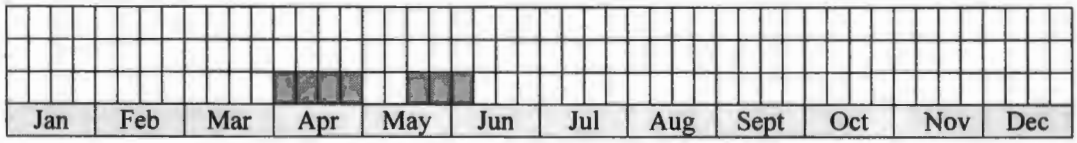
Tipula (Triplicitipula) integra Alexander (n=1)



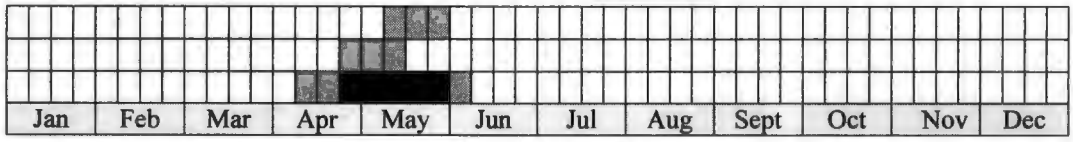
Tipula (Triplicitipula) triplex Walker (n=13)



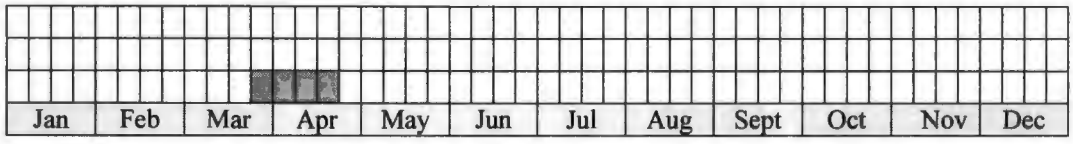
Tipula (Triplicitipula) umbrosa Loew (n=4)



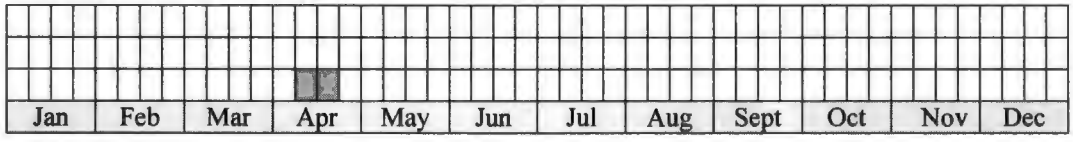
Tipula (Vestiplex) longiventris Loew (n=50)



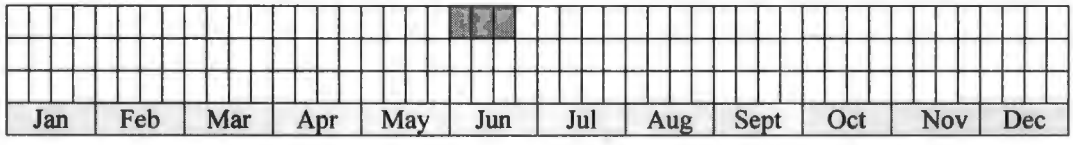
Tipula (Yamatotipula) aprilina Alexander (n=2)



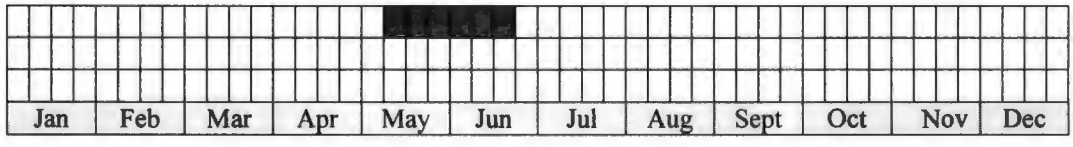
Tipula (Yamatotipula) furca Walker (n=1)



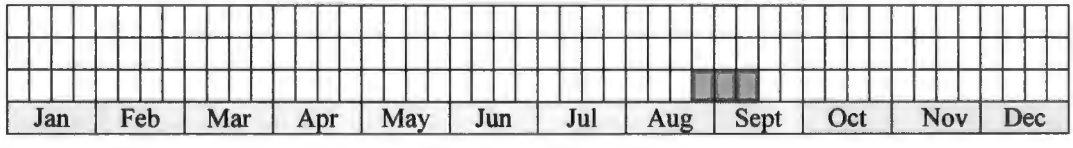
Tipula (Yamatotipula) iroquois Alexander (n=1)



Tipula (Yamatotipula) tephrocephala Loew (n=10)

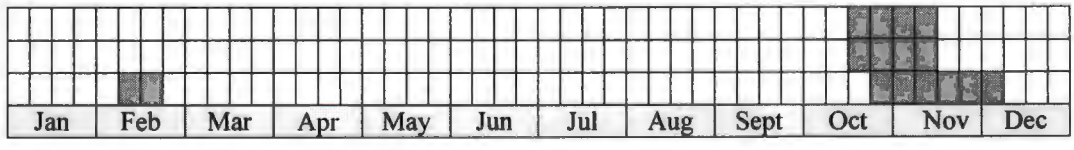


Tipula (Yamatotipula) tricolor Fabricius (n=1)

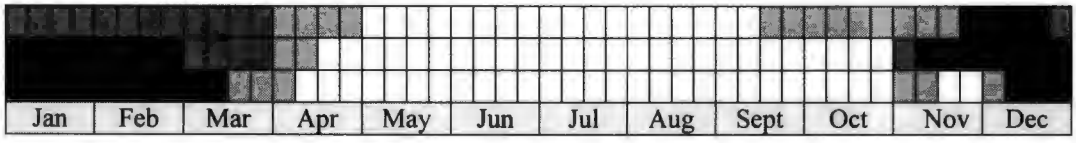


Trichoceridae

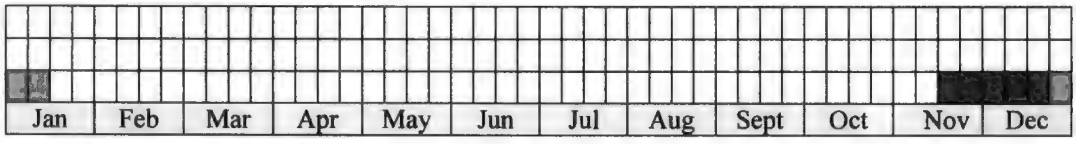
Trichocera bimaculata Walker (n=13)



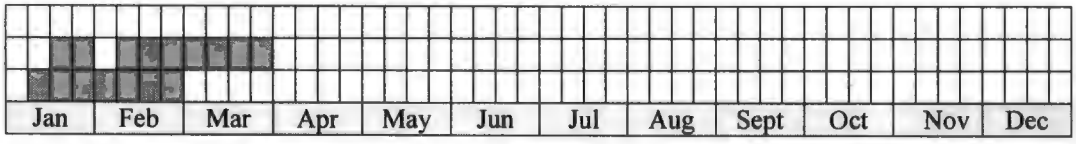
Trichocera brevicornis Alexander (n=413)



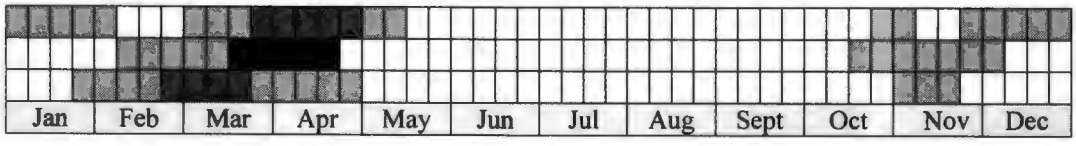
Trichocera fattigiana Alexander (n=18)



Trichocera garretti Alexander (n=9)



Trichocera heimalis (De Greer) (n=63)



Appendix II: Complete Data for Species Collected at Malaise traps from October 2000 – October 2002. The species collected during sampling are listed according to family. Collection data is listed by total specimens collected during the duration of the project followed by plot designation and trap number. Specimens where a species level of identification was not determined are not included. Collection dates are given by start date – end date of the collection period.

Cylindrotomidae

Liogma nodicornis (Osten Sacken) (n= 13)

Twin Creeks MT01: 1 ♀, 06 May-30 May 2002. **Cades Cove MT03:** 1 ♂, 08 May-21 May 2001. **Cades Cove MT04:** 1 ♀, 08 May-21 May 2001. **Andrews Bald MT12:** 1 ♂, 06 Jun-22 Jun 2001. **Snakeden Ridge MT19:** 1 ♀, 25 Apr-09 May 2001; 2 ♂♂, 06 Apr-06 May 2002; 3 ♀♀, 06 May-05 Jun 2002. **Snakeden Ridge MT20:** 1 ♀, 09 May-22 May 2001; 1 ♂ 1 ♀, 06 May-05 Jun 2002.

Limoniidae

Antocha (Antocha) opalizens Osten Sacken (n= 1)

Cades Cove MT04: 1 ♂, 09 Apr-23 Apr 2001.

Antocha (Antocha) saxicola Osten Sacken (n= 2)

Twin Creeks MT01: 1 ♂, 06 May-30 May 2002. **Cades Cove MT03:** 1 ♂, 26 Apr-09 May 2002

Atarba (Atarba) picticornis Osten Sacken (n= 141)

Twin Creeks MT01: 2 ♀♀, 16 July-30 July 2001; 1 ♂, 06 May-30 May 2002; 3 ♀♀, 30 May-21 Jun 2002. **Twin Creeks MT02:** 2 ♀♀, 21 Jun-06 Jul 2001; 4 ♀♀, 06 Jul-16 Jul 2001; 1 ♀, 16 Jul-30 Jul 2001; 1 ♀, 06 May-30 May 2002; 1 ♀, 30 May-21 Jun 2002; 2 ♀♀, 16 Jul-31 Jul 2002; 1 ♀, 31 Jul-15 Aug 2002. **Cades Cove MT03:** 1 ♀, 12 Aug-26 Aug 2002. **Cades Cove MT04:** 2 ♀♀, 17 Jul-02 Aug 2002. **Indian Gap MT05:** 1 ♀, 01 Aug-30 Aug 2002. **Indian Gap MT06:** 1 ♂ 6 ♀♀, 17 Jul-02 Aug 2001. **Purchase Knob MT07:** 1 ♀, 19 Jul-02 Aug 2001; 3 ♀♀, 02 Aug-20 Aug 2001; 1 ♀, 30 Jul-20 Aug 2002. **Purchase Knob MT08:** 4 ♀♀, 05 Jul-19 Jul 2001; 2 ♀♀, 19 Jul-02 Aug 2001; 3 ♀♀, 17 Jul-30 Jul 2002. **Brushy Mountain MT13:** 1 ♂, 03 Jun-18 Jun 2002; 1 ♀, 30 Jun-16 Jul 2002. **Albright Grove MT17:** 1 ♂ 3 ♀♀, 08 Jun-19 Jun 2001; 2 ♂♂ 2 ♀♀, 19 Jun-06 Jul 2001; 2 ♀♀, 01 Aug-14 Aug 2001; 1 ♂, 05 Jul-20 Jul 2002. **Albright Grove MT18:** 1 ♀, 08 Jun-19 Jun 2001; 2 ♀♀ 8♂ ♂, 19 Jun-06 Jul 2001; 1 ♀, 12 May-15 Jun 2002; 1 ♂ 5 ♀♀, 15 Jun-05 Jul 2002; 1 ♀, 05 Jul-20 Jul 2002; 2 ♀♀, 20 Jul-01 Aug 2002. **Snakeden Ridge MT19:** 3 ♂♂ 3 ♀♀, 02 Jul-16 Jul 2001; 1 ♂ 6 ♀♀, 16 Jul-01 Aug 2001; 7 ♂♂, 01 Aug-14 Aug 2001; 1 ♀, 14 Aug-10 Sep 2001; 1 ♀, 06 May-05 Jun 2002; 1 ♂ 2 ♀♀, 05 Jun-21 Jun 2002; 1 ♀, 21 Jun-17 Jul 2002; 2 ♀♀, 17 Jul-01 Aug 2002; 1 ♀, 01 Aug 14 Aug 2002. **Snakeden Ridge MT20:** 1 ♂ 3 ♀♀, 19 Jun-02 Jul 2001; 2 ♀♀, 02 Jul-16 Jul 2001; 2 ♀♀, 16 Jul-01 Aug 2001; 2 ♀♀, 01 Aug-14 Aug 2001; 2 ♀♀, 05 Jun-21 Jun 2002; 4 ♀♀, 02 Jul-01 Aug 2002. **Goshen Prong MT21:** 1 ♂, 02 Jul-17 Jul 2001; 4 ♀♀, 17 Jul-13 Aug 2001; 2 ♀♀, 13 Aug-27 Aug 2001; 1 ♀, 09 Jul-17 Jul 2002; 3 ♀♀, 17 Jul-05 Aug 2002. **Goshen Prong MT22:** 2 ♀♀, 02 Jul-17 Jul 2001; 1 ♂, 17 Jul-30 Jul 2001; 1 ♂ 1 ♀, 09 Jul-17 Jul 2002; 2 ♀♀, 17 Jul-05 Aug 2002; 1 ♀, 05 Aug-19 Aug 2002.

Austrolimnophila (Austrolimnophila) toxoneura (Osten Sacken) (n= 115)

Twin Creeks MT01: 3 ♂♂, 15 May-23 May 2001; 1 ♂1 ♀, 25 Apr-06 May 2002; 9 ♂♂ 6 ♀♀, 06 May-30 May 2002. **Twin Creeks MT02:** 1 ♂ 2 ♀♀, 26 Apr-15 May 2001; 2 ♂♂ 6 ♀♀, 23

May-05 Jun 2001; 5 ♂♂ 13 ♀♀, 06 May-30 May 2002. **Indian Gap MT05:** 1 ♀, 10 May-28 May 2001; 1 ♂ 1 ♀, 28 May-07 Jun 2001; 2 ♂♂ 4 ♀♀, 21 Jun-05 Jul 2001; 3 ♂ 9 ♀♀, 05 Jul-21 Jul 2001. **Indian Gap MT06:** 1 ♂, 28 May-07 Jun 2001; 3 ♀♀, 21 Jun-05 Jul 2001; 2 ♀♀, 05 Jul-17 Jul 2001. **Purchase Knob MT08:** 1 ♀, 05 Jul-19 Jul 2001. **Andrews Bald MT11:** 1 ♀, 27 Apr-10 May 2002. **Albright Grove MT17:** 1 ♀, 08 Jun-19 Jun 2001; 1 ♀, 19 Jun-06 Jun 2001; 1 ♂, 12 May-15 Jun 2002. **Albright Grove MT18:** 1 ♀, 22 May-08 Jun 2001. **Albright Grove MT18:** 1 ♀, 22 May-08 Jun 2001; 1 ♂ 3 ♀♀, 12 May-15 Jun 2002. **Snakeden Ridge MT19:** 2 ♂♂ 1 ♀, 05 Jun-21 Jun 2002. **Snakeden Ridge MT20:** 3 ♀♀, 22 May-04 Jun 2001; 4 ♀♀, 04 Jun-19 Jun 2001; 1 ♀, 16 Jun-02 Jul 2001; 1 ♂ 4 ♀♀, 06 May-05 Jun 2002. **Goshen Prong MT21:** 5 ♀♀, 09 May-23 May 2002. **Goshen Prong MT22:** 1 ♂ 2 ♀♀, 21 May-07 Jun 2001; 1 ♂ 3 ♀♀, 09 May-23 May 2002.

Cheilotrichia (Empeda) stigmatica Osten Sacken (n= 1)

Purchase Knob MT08: 1 ♀, 19 Jul-02 Aug 2001.

Chionea (Chionea) scita Walker (n= 52)

Twin Creeks MT01: 1 ♂, 12 Dec 2000–16 Jan 2001; 1 ♂, 05 Nov-05 Dec 2001; 1 ♂, 05 Dec-17 Dec 2001. **Indian Gap MT05:** 1 ♀, 10 Nov-29 Nov 2000; 1 ♀, 24 Nov-18 Dec 2001. **Indian Gap MT06:** 1 ♂ 1 ♀, 14 Dec 2000-17 Jan 2001; 1 ♀, 24 Oct-08 Nov 2001; 1 ♀, 24 Nov-18 Dec 2001. **Andrews Bald MT12:** 2 ♂♂ 2 ♀♀, 13 Nov-29 Nov 2000; 1 ♀, 24 Oct-08 Nov 2001. **Brushy Mountain MT13:** 2 ♂♂ 5 ♀♀, 27 Nov-12 Dec 2000; 3 ♂♂ 8 ♀♀, 12 Dec 2000-16 Jan 2001; 1 ♂, 07 Dec-19 Dec 2001; 4 ♂♂ 2 ♀♀, 19 Dec 2001-15 Jan 2002. **Brushy Mountain MT14:** 1 ♀, 27 Nov-12 Dec 2000; 2 ♂♂ 2 ♀♀, 12 Dec 2000-16 Jan 2001; 1 ♂, 07 Dec-19 Dec 2001. **Clingmans Dome MT16:** 1 ♂, 18 Oct-13 Nov 2000; 2 ♂♂ 1 ♀, 13 Nov-29 Nov 2000; 1 ♀, 24 Oct-08 Nov 2001. **Snakeden Ridge MT19:** 1 ♂ 13 Dec 2000-17 Jan 2001. **Goshen Prong MT21:** 1 ♂, 18 Dec 2001-17 Jan 2002.

Chionea (Chionea) valga Harris (n= 49)

Indian Gap MT05: 1 ♀, 10 Nov-29 Nov 2000. **Indian Gap MT06:** 1 ♂, 14 Dec 2000-17 Jan 2001. **Andrews Bald MT12:** 1 ♀, 29 Nov-14 Dec 2000; 2 ♂♂ 2 ♀♀, 08 Nov-24 Nov 2001; 4 ♂♂ 2 ♀♀, 24 Nov-18 Dec 2001; 1 ♀, 18 Dec 2001-16 Feb 2002. **Brushy Mountain MT13:** 1 ♂ 1 ♀, 12 Dec 2000-16 Jan 2001; 2 ♀♀, 16 Jan-29 Jan 2001; 1 ♀, 07 Dec-19 Dec 2001; 2 ♀♀, 15 Jan-15 Feb 2002; 1 ♂♂ 1 ♀, 23 Feb-13 Mar 2002. **Brushy Mountain MT14:** 1 ♀, 16 Jan-29 Jan 2001. **Clingmans Dome MT15:** 1 ♂, 18 Oct-13 Nov 2000; 1 ♀, 01 Feb-20 Feb 2001; 1 ♀, 24 Nov-18 Dec 2001; 2 ♀♀, 18 Dec 2001-16 Feb 2002. **Clingmans Dome MT16:** 1 ♀, 18 Oct-13 Nov 2000; 1 ♂ 1 ♀, 13 Nov-29 Nov 2000; 1 ♂, 24 Nov-18 Dec 2001; 2 ♂♂ 13 ♀♀, 18 Dec-16 Feb. **Snakeden Ridge MT20:** 1 ♂, 13 Feb-28 Feb 2002.

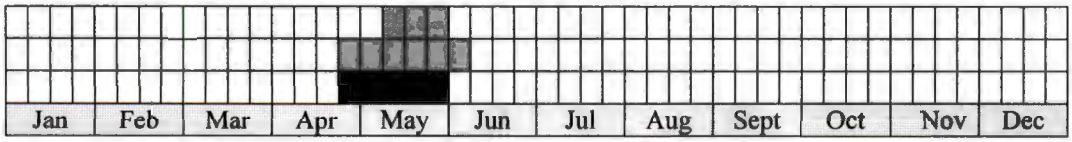
Chionea (Chionea) wilsoni Byers (n= 19)

Indian Gap MT05: 1 ♂, 24 Oct-08 Nov 2001; 1 ♂, 08 Nov-24 Nov 2001; 1 ♂, 18 Dec 2001-18 Feb 2002. **Indian Gap MT06:** 1 ♂, 08 Nov-24 Nov 2001. **Cataloochee MT09:** 1 ♂, 19 Oct-15 Nov 2000. **Andrews Bald MT11:** 1 ♂, 20 Oct-13 Nov 2000; 1 ♂, 29 Nov-14 Dec 2000; 1 ♂, 08 Nov-24 Nov 2001. **Andrews Bald MT12:** 1 ♂, 20 Oct-13 Nov 2000; 1 ♂, 24 Nov-18 Dec 2001. **Clingmans Dome MT16:** 2 ♂♂, 13 Nov-29 Nov 2000; 1 ♀, 29 Nov-14 Dec 2000; 1 ♂, 08 Nov-24 Nov 2001. **Goshen Prong MT22:** 2 ♂♂, 05 Nov-12 Nov 2001; 3 ♂, 12 Nov-05 Dec 2001.

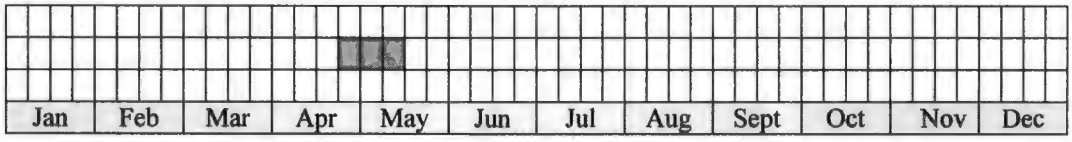
Cladura flavoferriugenia Osten Sacken (n= 1484)

Twin Creeks MT02: 1 ♂1 ♀, 24 Oct-06 Nov 2000; 1 ♂ 1 ♀, 15 Oct-05 Nov 2001; 1 ♂ 2 ♀♀, 05 Nov-05 Dec 2001; 1 ♀, 30 Sep-05 Nov 2002. **Indian Gap MT05:** 1 ♂ 10 ♀♀, 18 Oct-10 Nov 2000; 64 ♂♂ 112 ♀♀, 26 Sep-24 Oct 2001; 2 ♂♂ 2 ♀♀, 24 Oct-08 Nov 2001; 1 ♂, 08 Nov-24 Nov 2001; 2 ♂♂ 1 ♀, 30 Aug-17 Sep 2002; 26 ♂♂ 33 ♀♀, 17 Sep-02 Oct 2002; 5 ♂♂ 23 ♀♀, 02 Oct-18 Oct 2002. **Indian Gap MT06:** 3 ♀♀, 18 Oct-10 Nov 2000; 23 ♂♂, 16 ♀♀, 03 Sep-26 Sep 2001; 39 ♂♂, 45 ♀♀, 26 Sep-24 Oct 2001; 1 ♂ 6 ♀♀, 24 Oct-08 Nov 2001. **Purchase Knob MT07:** 8 ♂♂ 18 ♀♀, 10 Oct-19 Oct 2001; 2 ♂♂ 5 ♀♀, 19 Oct-26 Oct 2001; 10 ♀♀, 26 Oct-21

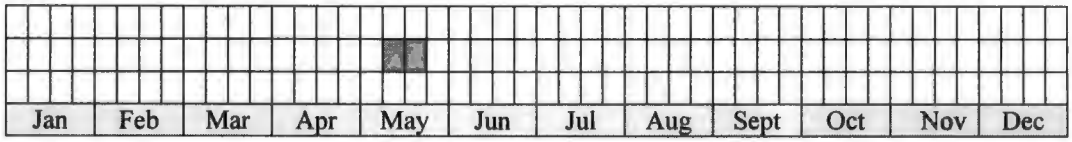
Tipula (Linderina) illinoiensis Alexander (n=65)



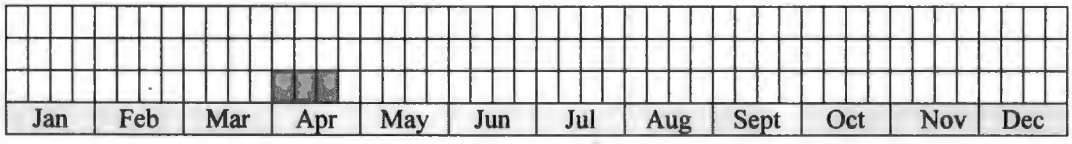
Tipula (Linderina) senega Alexander (n=5)



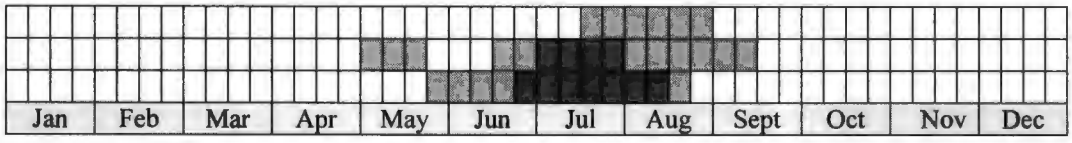
Tipula (Lunatipula) apicalis Loew (n=2)



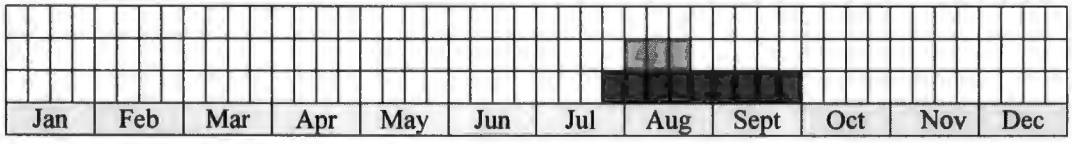
Tipula (Lunatipula) atreia Petersen and Gelhaus (n=1)



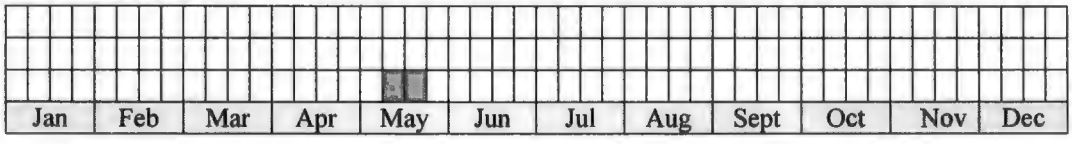
Tipula (Lunatipula) duplex Walker (n=53)



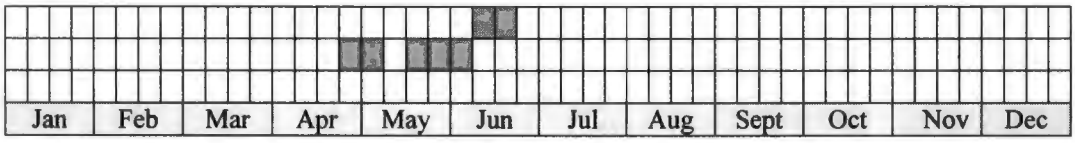
Tipula (Lunatipula) flavibasis Alexander (n=24)



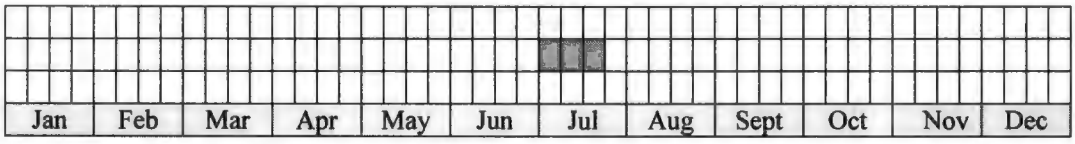
Tipula (Lunatipula) fuliginosa (Say) (n=2)



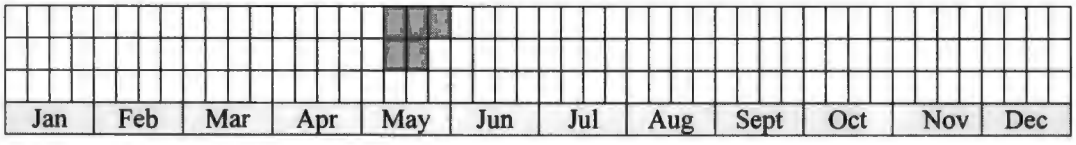
Tipula (Lunatipula) monticola Alexander (n=3)



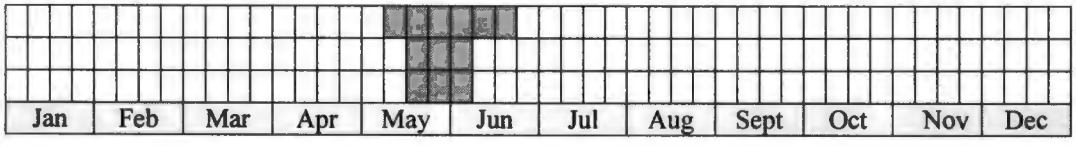
Tipula (Lunatipula) submaculata Loew (n=1)



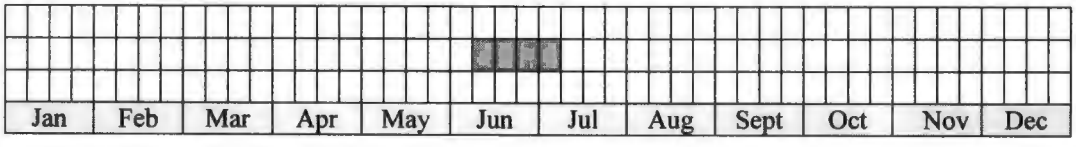
Tipula (Nobilotipula) collaris Say (n=2)



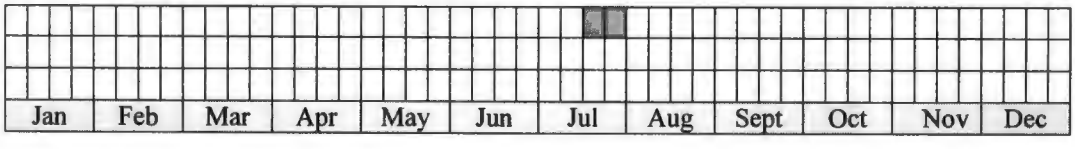
Tipula (Nobilotipula) nobilis (Loew) (n=3)



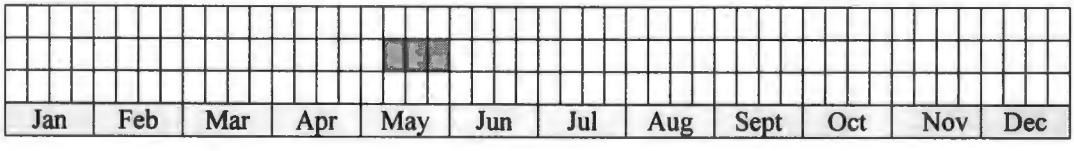
Tipula (Pterelachisus) angulata Loew (n=1)



Tipula (Pterelachisus) coleana Alexander (n=3)



Tipula (Pterelachisus) entomophthorae Alexander (n=2)



Nov 2001; 1 ♂ 3 ♀♀, 04 Sep-02 Oct 2002; 1 ♀, 17 Oct-09 Nov 2002. **Purchase Knob MT08:** 3 ♂♂ 11 ♀♀, 11 Sep-10 Oct 2001; 1 ♂ 1 ♀, 10 Oct-19 Oct 2001; 1 ♂ 15 ♀♀, 19 Oct-26 Oct 2001; 2 ♂♂ 6 ♀♀, 26 Oct-21 Nov 2001; 6 ♀♀, Sep-02 Oct 2002. **Cataloochee MT09:** 16 ♂♂ 30 ♀♀, 19 Oct-15 Nov 2000; 9 ♂♂ 23 ♀♀, 10 Oct-18 Oct 2001; 7 ♂♂ 6 ♀♀, 18 Oct-26 Oct 2001; 5 ♂♂ 25 ♀♀, 26 Oct-21 Nov 2001. **Cataloochee MT10:** 1 ♂ 10 ♀♀, 19 Oct-15 Nov 2000; 2 ♀♀, 11 Sep-10 Oct 2001; 4 ♀♀, 10 Oct-18 Oct 2001; 1 ♂ 5 ♀♀, 18 Oct-26 Oct 2001; 1 ♂ 5 ♀♀, 26 Oct-21 Nov 2001; 2 ♂♂ 1 ♀, 02 Oct-17 Oct 2002. **Andrews Bald MT11:** 10 ♀♀, 20 Oct-13 Nov 2000; 4 ♀♀, 09 Oct-24 Oct 2001; 5 ♀♀, 11 Sep-11 Oct 2002. **Andrews Bald MT12:** 11 ♀♀, 20 Oct-13 Nov 2000; 1 ♂ 2 ♀♀, 26 Sep-09 Oct 2001; 1 ♂ 12 ♀♀, 09 Oct-24 Oct 2001; 1 ♂ 2 ♀♀, 11 Oct-21 Oct 2002. **Brushy Mountain MT13:** 1 ♀, 23 Oct-06 Nov 2000; 1 ♀, 04 Sep-28 Sep 2001; 3 ♀♀, 13 Oct-27 Oct 2001. **Clingmans Dome MT15:** 1 ♂, 26 Sep-09 Oct 2001; 1 ♀, 09 Oct-24 Oct 2001. **Clingmans Dome MT16:** 1 ♀, 12 Sep-02 Oct 2002. **Albright Grove MT17:** 5 ♂♂ 57 ♀♀, 16 Oct-14 Nov 2000; 1 ♂ 10 ♀♀, 27 Sep-16 Oct 2001; 2 ♂♂ 34 ♀♀, 16 Oct-06 Nov 2001; 1 ♂ 7 ♀♀, 06 Nov-19 Nov 2001; 2 ♀♀, 13 Sep-02 Oct 2002; 1 ♂ 9 ♀♀, 04 Oct-22 Oct 2002. **Albright Grove MT18:** 1 ♀, 10 Sep-27 Sep 2001; 10 ♂♂ 30 ♀♀, 27 Sep-16 Oct 2001; 10 ♂♂ 36 ♀♀, 16 Oct-06 Nov 2001; 2 ♀♀, 06 Nov-19 Nov 2001; 5 ♀♀, 13 Sep-04 Oct 2002; 1 ♂ 4 ♀♀, 04 Oct-22 Oct 2002. **Snakeden Ridge MT19:** 3 ♂♂ 24 ♀♀, 17 Oct-07 Nov 2000; 1 ♀, 07 Nov-01 Dec 2000; 5 ♀♀, 10 Sep-16 Oct 2001; 3 ♂♂ 30 ♀♀, 16 Oct-06 Nov 2001; 1 ♂ 5 ♀♀, 06 Nov-19 Nov 2001. **Snakeden Ridge MT20:** 8 ♀♀, 17 Oct-07 Nov 2000; 2 ♀♀, 27 Sep-16 Oct 2001. **Goshen Prong MT21:** 1 ♂ 100 ♀♀, 25 Oct-10 Nov 2000; 1 ♀, 17 Sep-22 Oct 2001; 6 ♂♂ 70 ♀♀, 05 Nov-12 Nov 2001; 3 ♂♂ 36 ♀♀, 12 Nov-05 Dec 2001; 4 ♂♂ 19 ♀♀, 04 Oct-15 Oct 2002. **Goshen Prong MT22:** 24 ♂♂ 53 ♀♀, 25 Oct-10 Nov 2000; 15 ♀♀, 17 Sep-22 Oct 2001; 13 ♂♂ 68 ♀♀, 22 Oct-05 Nov 2001; 4 ♂♂ 42 ♀♀, 05 Nov-12 Nov 2001; 4 ♂♂ 30 ♀♀, 12 Nov-05 Dec 2001.

Dactylolabis (Dactylolabis) hudsonica Alexander (n= 155)

Twin Creeks MT01: 22 ♂♂ 7 ♀♀, 26 Apr–15 May 2001; 4 ♂♂ 2 ♀♀, 15 May–23 May 2001; 1 ♂, 08 Apr-25 Apr 2002; 17 ♂♂ 5 ♀♀, 25 Apr-06 May 2002; 1 ♂, 06 May-30 May 2002. **Twin Creeks MT02:** 3 ♂♂ 2 ♀♀, 11 Apr-26 Apr 2001; 21 ♂♂ 15 ♀♀, 26 Apr-15 May 2001; 5 ♂♂ 3 ♀♀, 15 May-23 May 2001; 2 ♂♂, 08 Apr-25 Apr 2002; 9 ♂♂ 7 ♀♀, 25 Apr-06 May 2002. **Andrews Bald MT11:** 1 ♂, 06 Jun-22 Jun 2001. **Clingmans Dome MT16:** 1 ♂, 06 Jun-25 Jun 2001. **Albright Grove MT17:** 1 ♂ 2 ♀♀, 25 Apr-09 May 2001; 3 ♂♂ 2 ♀♀, 09 May-22 May 2001; 1 ♂ 1 ♀, 10 May-19 Jun 2002; 1 ♀, 14 Mar-29 Mar 2002; 1 ♂, 20 Apr-06 May 2002. **Albright Grove MT18:** 1 ♂, 09 May-22 May 2001. **Snakeden Ridge MT19:** 1 ♂, 25 Apr-09 May 2001; 1 ♂, 09 May-22 May 2001; 2 ♂♂ 4 ♀♀, 06 Apr-06 May 2002. **Snakeden Ridge MT20:** 1 ♂, 09 May-22 May 2001; 2 ♂ 1 ♀, 06 May-05 Jun 2002. **Goshen Prong MT21:** 1 ♂, 27 Apr-08 May 2001; 1 ♂, 08 May-21 May 2001.

Dactylolabis (Dactylolabis) montana Alexander (n= 1)

Andrews Bald MT12: 1 ♂, 27 Apr-10 May 2002.

Dactylolabis (Dactylolabis) pemetica Alexander (n= 1)

Purchase Knob MT08: 1 ♂, 26 Apr-08 May 2002.

Dicranomyia (Dicranomyia) adirondacensis Alexander (n= 35)

Andrews Bald MT12: 9 ♂♂ 15 ♀♀, 06 Jun-22 Jun 2001; 1 ♂ 1 ♀, 22 Jun-03 Jun 2001; 3 ♂♂ 6 ♀♀, 19 Jun-03 Jul 2002.

Dicranomyia (Dicranomyia) brevivena Osten Sacken (n= 6)

Twin Creeks MT02: 1 ♂, 12 Oct-24 Oct 2000; 1 ♀, 27 Mar-11 Apr 2001; 2 ♂♂ 1 ♀, 06 Jul-16 Jul 2001. **Cataloochee MT09:** 1 ♂, 19 Oct-15 Nov 2000.

Dicranomyia (Dicranomyia) distans Osten Sacken (n= 1)

Twin Creeks MT01: 1 ♀, 06 Jul–16 Jul 2001

Dicranomyia (Dicranomyia) divisa (Alexander) (n= 36)

Twin Creeks MT01: 1 ♀, 27 Mar–11 Apr 2001; 1 ♂, 26 Apr–15 May 2001; 1 ♂, 05 Nov-05 Dec 2001. **Twin Creeks MT02:** 1 ♂, 12 Oct-24 Oct 2000. **Cades Cove MT03:** 2 ♂♂ 1 ♀, 09 Apr-23 Apr 2001. **Cades Cove MT04:** 1 ♀, 23 Apr-08 May 2001; 1 ♀, 08 May-21 May 2001. **Indian Gap MT05:** 1 ♀, 29 Mar-27 Apr 2001; 2 ♂♂ 1 ♀, 10 May-28 May 2001; 1 ♀, 28 May-07 Jun 2001; 1 ♀, 21 Jun-17 Jul 2001. **Indian Gap MT06:** 1 ♂, 26 Sep-24 Oct 2001. **Cataloochee MT09:** 1 ♂ 1 ♀, 23 Apr-15 May 2001. **Andrews Bald MT11:** 1 ♂ 1 ♀, 10 May-24 May 2001; 1 ♀, 06 Jun-22 Jun 2001. **Andrews Bald MT12:** 1 ♂, 24 Apr-10 May 2001; 2 ♀♀, 24 May-06 Jun 2001; 1 ♀, 22 Jun-03 Jul 2001; 1 ♀, 31 Jul-16 Aug 2001. **Brushy Mountain MT13:** 1 ♂ 1 ♀, 14 May-23 May 2001. **Albright Grove MT17:** 1 ♀, 09 May-22 May 2001. **Snakeden Ridge MT19:** 1 ♀, 03 Apr-25 Apr 2001; 1 ♂ 16 Oct-06 Nov 2001. **Snakeden Ridge MT20:** 1 ♀, 27 Sep-16 Oct 2001. **Goshen Prong MT22:** 1 ♂ 2 ♀♀, 22 Oct-05 Nov 2001; 1 ♀, 11 Apr-25 Apr 2002.

Dicranomyia (Dicranomyia) gladiator Osten Sacken (n= 40)

Indian Gap MT06: 1 ♂, 16 Aug-03 Sep 2001. **Albright Grove MT17:** 1 ♂, 13 Sep-04 Oct 2002. **Albright Grove MT18:** 1 ♂ 2 ♀♀, 14 Aug-24 Aug 2002; 1 ♀, 13 Sep-04 Oct 2002. **Snakeden Ridge MT19:** 7 ♂♂ 10 ♀♀, 14 Aug-10 Sep 2001; 2 ♂♂ 4 ♀♀, 10 Sep-27 Sep 2001; 1 ♂ 2 ♀♀, 27 Sep-16 Oct 2001; 3 ♂♂ 1 ♀, 13 Aug-30 Aug 2002; 1 ♂, 30 Aug-13 Sep 2002. **Snakeden Ridge MT20:** 1 ♂ 2 ♀♀, 14 Aug-10 Sep 2001.

Dicranomyia (Dicranomyia) immodesta Osten Sacken (n= 4)

Andrews Bald MT12: 2 ♂♂ 1 ♀, 24 May-06 Jun 2001. **Albright Grove MT18:** 1 ♀, 14 Aug-10 Sep 2001.

Dicranomyia (Dicranomyia) distendens Lundstrom (n= 14)

Andrews Bald MT12: 2 ♂♂ 12 ♀♀, 03 Jul-18 Jul 2002.

Dicranomyia (Erostrata) globithroax Osten Sacken (n= 4)

Twin Creeks MT01: 1 ♂, 26 Aug-10 Sep 2002. **Indian Gap MT06:** 1 ♂, 16 Aug-03 Sep 2001. **Clingmans Dome MT16:** 1 ♂, 24 May-06 Jun 2001. **Goshen Prong MT21:** 1 ♂, 20 Jun-09 Jul 2002.

Dicranomyia (Glochina) liberta Osten Sacken (n= 61)

Twin Creeks MT01: 1 ♂, 12 Oct 2000–24 Oct 2000; 1 ♀ 24 Oct 2000–6 Nov 2001; 1 ♂ 1 ♀, 05 Nov-05 Dec 2001; 1 ♂, 25 Apr-06 May 2002; 1 ♂, 30 Sep-05 Nov 2002. **Twin Creeks MT02:** 1 ♂, 24 Oct-06 Nov 2000; 1 ♂, 08 Oct-15 Oct 2001; 4 ♂♂ 4 ♀♀, 15 Oct-05 Nov 2001; 1 ♂ 1 ♀, 25 Apr-06 May 2002; 1 ♂, 30 May- 21 Jun 2002. **Cades Cove MT03:** 1 ♂, 09 May-03 Jun 2002; 1 ♂, 03 Jun-17 Jun 2002; 3 ♂♂, 26 Aug-23 Sep 2002; 2 ♀♀, 23 Sep-07 Oct 2002; 1 ♂, 07 Oct-21 Oct 2002. **Cades Cove MT04:** 1 ♀ 1 ♂, 19 Oct-07 Nov 2000; 1 ♂ 1 ♀, 30 Jul-16 Aug 2001; 2 ♀♀, 26 Apr-09 May 2002; 1 ♂, 23 Sep-07 Oct 2002. **Indian Gap MT05:** 1 ♂ 1 ♀, 29 Mar-27 Apr 2001. **Indian Gap MT06:** 1 ♂, 08 Nov-24 Nov 2001. **Cataloochee MT09:** 1 ♂, 19 Oct-15 Nov 2000; 1 ♂, 16 Apr-26 Apr 2002. **Andrews Bald MT11:** 1 ♂, 20 Oct-13 Nov 2001; 1 ♂, 24 Apr-10 May 2001. **Brushy Mountain MT13:** 3 ♂♂, 11 Apr-30 Apr 2002; 1 ♂, 30 Apr-12 May 2002. **Brushy Mountain MT14:** 1 ♂, 11 Apr-30 Apr 2002; 2 ♂♂, 30 Apr-12 May 2002. **Clingmans Dome MT15:** 1 ♂, 14 Apr-27 Apr 2002. **Clingmans Dome MT16:** 1 ♀, 27 Apr-10 May 2002. **Albright Grove MT17:** 1 ♂, 14 Apr-29 Apr 2002. **Goshen Prong MT21:** 1 ♂, 05 Nov-12 Nov 2001.

Dicranomyia (Melanolimonia) spinifera Alexander (n= 143)

Andrews Bald MT12: 13 ♂♂ 5 ♀♀, 26 Sep-09 Oct 2001; 3 ♂♂ 6 ♀♀, 09 Oct-24 Oct 2001; 1 ♂, 19 Aug-11 Sep 2002; 69 ♂♂ 32 ♀♀, 11 Sep-11 Oct 2002; 2 ♂♂ 6 ♀♀, 11 Oct-21 Oct 2002.

Clingmans Dome MT15: 1 ♂1 ♀, 29 Aug-26 Sep 2001. **Clingmans Dome MT16:** 1 ♂ 3 ♀♀, 12 Sep-02 Oct 2002.

Dicranomyia (Numantia) fusca (Meigen) (n= 6)

Brushy Mountain MT13: 1 ♂, 30 Apr-12 May 2002. **Albright Grove MT17:** 1 ♂, 09 May-22 May 2001. **Albright Grove MT18:** 1 ♀, 22 May-08 Jun 2001. **Snakeden Ridge MT19:** 1 ♀, 16 Jul-01 Aug 2001; 1 ♀, 30 Aug-13 Sep 2002. **Goshen Prong MT21:** 1 ♀, 27 Apr-08 May 2001.

Dicranoptycha acanthophallus Alexander (n= 2)

Twin Creeks MT02: 1 ♀, 27 Aug-10 Sep 2001. **Purchase Knob MT07:** 1 ♀, 20 Aug-11 Sep 2001.

Dicranoptycha elsa Alexander (n= 2)

Twin Creeks MT02: 1 ♂, 30 May-21 Jun 2002; 1 ♂, 21 Jun-02 Jul 2002.

Dicranoptycha germana Osten Sacken (n= 23)

Purchase Knob MT07: 2 ♂♂ 10 ♀♀, 05 Jul-19 Jul 2001; 2 ♀, 19 Jul-02 Aug 2001. **Purchase Knob MT08:** 8 ♀♀, 05 Jul-19 Jul 2001. **Cataloochee MT09:** 1 ♀, 05 Jul-19 Jul.

Dicranoptycha septemtrionis Alexander (n= 19)

Twin Creeks MT02: 1 ♂ 1 ♀, 30 Jul-15 Aug 2002. **Purchase Knob MT08:** 1 ♂ 2 ♀♀, 02 Aug-20 Aug 2001; 8 ♀♀, 20 Aug-11 Sep 2001; 1 ♀, 30 Jul-20 Aug 2002. **Albright Grove MT18:** 1 ♂, 14 Aug-10 Sep 2001; 1 ♂, 14 Aug-24 Aug 2002. **Goshen Prong MT21:** 1 ♂, 09 Jul-17 Jul 2002. **Goshen Prong MT22:** 1 ♂ 1 ♀, 05 Aug-19 Aug 2002.

Discobola annulata (Linnaeus) (n= 152)

Twin Creeks MT01: 1 ♂, 12 Oct–24 Oct 2000; 4 ♂♂ 7 ♀♀, 24 Oct–6 Nov 2000; 1 ♂, 6 Nov–27 Nov 2000; 1 ♀, 27 Sept–8 Oct 2001; 2 ♂♂ 4 ♀♀, 8 Oct–15 Oct 2001; 1 ♂, 05 Nov-05 Dec 2001. **Twin Creeks MT02:** 2 ♀♀, 12 Oct-24 Oct 2000; 3 ♂♂ 1 ♀, 24 Oct-06 Nov 2000; 1 ♀, 27 Sep-08 Oct 2001; 1 ♂, 08 Oct-15 Oct 2001; 8 ♂♂ 1 ♀, 15 Oct-05 Nov 2001; 1 ♀, 31 Jul-15 Aug 2002. **Cades Cove MT03:** 1 ♀, 07 Nov-28 Nov 2000. **Indian Gap MT05:** 1 ♂ 2 ♀♀, 02 Aug-16 Aug 2001; 1 ♂, 16 Aug-03 Sep 2001. **Indian Gap MT06:** 1 ♀, 16 Aug-03 Sep 2001; 1 ♂, 26 Sep-24 Oct 2001. **Cataloochee MT09:** 1 ♂, 18 Oct-26 Oct 2002. **Purchase Knob MT07:** 1 ♂, 19 Oct-26 Oct 2001. **Cataloochee MT10:** 1 ♀, 02 Oct-17 Oct 2002. **Andrews Bald MT12:** 2 ♀♀, 19 Aug-11 Sep 2002. **Clingmans Dome MT15:** 3 ♂♂ 2 ♀♀, 31 Jul-16 Aug 2001; 1 ♂ 2 ♀♀, 16 Aug-29 Aug 2001; 10 ♂♂ 21 ♀♀, 29 Aug-26 Sep 2001; 2 ♂♂, 26 Sep-09 Oct 2001; 2 ♀♀, 30 Aug-12 Sep 2002. **Clingmans Dome MT16:** 2 ♂♂ 4 ♀♀, 31 Jul-16 Aug 2001; 1 ♂ 1 ♀, 16 Aug-29 Aug 2001; 1 ♂ 2 ♀♀, 01 Aug-30 Aug 2002; 2 ♂♂ 4 ♀♀, 12 Sep-02 Oct 2002. **Albright Grove MT17:** 2 ♂♂, 16 Oct-14 Nov 2000; 1 ♂ 3 ♀♀, 16 Oct-06 Nov 2001; 1 ♀, 06 Nov-19 Nov 2002. **Albright Grove MT18:** 2 ♀♀, 14 Aug-10 Sep 2001; 1 ♂, 27 Sep-16 Oct 2001. **Snakeden Ridge MT19:** 1 ♂, 17 Oct-07 Nov 2000; 1 ♂ 1 ♀, 16 Jul-01 Aug 2001; 1 ♂ 1 ♀, 27 Sep-16 Oct 2001; 1 ♂, 06 May-05 Jun 2002. **Snakeden Ridge MT20:** 1 ♂, 19 Jun-02 Jul 2001; 1 ♂, 14 Aug-10 Sep 2001; 1 ♀, 27 Sep-16 Oct 2001; 1 ♀, 06 Nov-19 Nov 2001. **Goshen Prong MT21:** 1 ♀, 12 Nov-05 Dec 2001; 1 ♀, 07 Jun-20 Jun 2002; 1 ♂, 09 Jul-17 Jul 2002; 1 ♂, 04 Oct-15 Oct 2002. **Goshen Prong MT22:** 4 ♂♂ 5 ♀♀, 25 Oct-10 Nov 2001; 1 ♀, 17 Sep-22 Oct 2001; 3 ♂♂ 4 ♀♀, 22 Oct-05 Nov 2001; 2 ♂♂ 1 ♀, 12 Nov-05 Dec 2001.

Discobola nigroclavata (Alexander) (n= 21)

Twin Creeks MT02: 1 ♀, 08 Oct-15 Oct 2001. **Indian Gap MT05:** 1 ♀, 03 Sep-26 Sep 2001. **Indian Gap MT06:** 1 ♀, 16 Aug-03 Sep 2001; 1 ♀, 06 Sep-26 Sep 2001. **Purchase Knob MT07:** 1 ♀, 02 Aug-20 Aug 2001; 1 ♀, 20 Aug-11 Sep 2001. **Purchase Knob MT08:** 1 ♀, 20 Aug-11 Sep 2001. **Cataloochee MT09:** 1 ♀, 02 Aug-20 Aug 2001; 2 ♀♀, 20 Aug-11 Sep 2001. **Cataloochee MT10:** 2 ♀♀, 11 Sep-10 Oct 2001. **Albright Grove MT18:** 1 ♀, 20 Jul-01 Aug

2002; 2 ♀♀, 24 Aug-13 Sep 2002. **Snakeden Ridge MT19:** 1 ♀, 01 Aug-14 Aug 2001; 4 ♀♀, 14 Aug-10 Sep 2001. **Snakeden Ridge MT20:** 1 ♀, 10 Sep-27 Sep 2001.

Elephantomyia (Elephantomyia) westwoodi Osten Sacken (n= 4)

Twin Creeks MT01: 1 ♀, 30 May-21 Jun 2002. **Twin Creeks MT02:** 1 ♀, 21 Jun-06 Jul 2001. **Indian Gap MT05:** 1 ♂, 19 Jun-03 Jul 2002. **Indian Gap MT06:** 1 ♂, 21 Jun-05 Jul 2001.

Eloeophila johnsoni (Alexander) (n= 1)

Twin Creeks MT02: 1 ♀, 06 May-30 May 2002.

Eloeophila solstitialis (Alexander) (n= 1)

Twin Creeks MT01: 1 ♂, 15 Aug-26 Aug 2000.

Epiphragma (Epiphragma) fasciapenne (Say) (n= 236)

Twin Creeks MT01: 3 ♂♂, 26 Apr-15 May 2001; 1 ♀, 23 May-05 Jun 2001; 2 ♀♀, 08 Apr-25 Apr 2002; 1 ♂ 5 ♀♀, 25 Apr-06 May 2002; 4 ♂♂ 6 ♀♀, 06 May-30 May 2002. **Twin Creeks MT02:** 1 ♀, 15 May-23 May 2001; 3 ♀♀, 23 May-05 Jun 2001; 1 ♀, 08 Apr-25 Apr 2002; 2 ♀♀, 25 Apr-06 May 2002; 4 ♀♀, 06 May-30 May 2002. **Indian Gap MT05:** 2 ♂♂ 1 ♀, 10 May-28 May 2001; 5 ♂♂ 1 ♀, 28 May-07 Jun 2001; 2 ♀♀, 07 Jun-21 Jun 2001; 1 ♂ 1 ♀, 21 Jun-05 Jul 2001. **Indian Gap MT06:** 1 ♂, 10 May-28 May 2001. **Purchase Knob MT07:** 2 ♂♂, 23 Apr-15 May 2001; 4 ♀♀, 15 May-08 Jun 2001. **Purchase Knob MT08:** 2 ♂♂ 4 ♀♀, 15 May-08 Jun 2001; 1 ♂, 26 Apr-08 May 2002. **Cataloochee MT09:** 1 ♂, 15 May-08 Jun 2001; 1 ♂, 08 May-04 Jun 2002. **Andrews Bald MT12:** 1 ♀, 24 May-06 Jun 2001; 2 ♂♂ 1 ♀, 06 Jun-22 Jun 2001; 4 ♀♀, 10 May-19 Jun 2002. **Brushy Mountain MT13:** 2 ♂♂, 23 May-05 Jun 2001; 1 ♀, 12 May-03 Jun 2002. **Brushy Mountain MT14:** 1 ♀, 23 May-05 Jun 2001; 1 ♂, 12 May-24 May 2002. **Clingmans Dome MT15:** 1 ♂ 4 ♀♀, 06 Jun-25 Jun 2001; 3 ♂♂ 1 ♀, 10 May-19 Jun 2002. **Clingmans Dome MT16:** 3 ♂♂ 1 ♀, 06 Jun-25 Jun 2001; 2 ♂♂ 1 ♀, 10 May-19 Jun 2002. **Albright Grove MT17:** 3 ♂♂ 7 ♀♀, 09 May-22 May 2001; 1 ♀, 08 Jun-19 Jun 2001; 1 ♀, 06 May-12 May 2002; 9 ♀♀, 12 May-15 Jun 2002; 1 ♀, 15 Jun-05 Jul 2002. **Albright Grove MT18:** 5 ♂♂ 8 ♀♀, 09 May-22 May 2001; 8 ♀♀, 22 May-08 Jun 2001; 4 ♀♀, 06 May-12 May 2002; 7 ♂♂ 5 ♀♀, 12 May-15 Jun 2002. **Snakeden Ridge MT19:** 3 ♂♂ 5 ♀♀, 09 May-22 May 2001; 9 ♂♂ 11 ♀♀, 06 Apr-06 May 2002; 3 ♂♂ 25 ♀♀, 06 May-05 Jun 2002. **Snakeden Ridge MT20:** 1 ♂, 25 Apr-09 May 2001; 3 ♂♂ 2 ♀♀, 09 May-22 May 2001; 2 ♀♀, 22 May-04 Jun 2001; 1 ♂ 1 ♀, 06 Apr-06 May 2002; 1 ♂ 9 ♀♀, 06 May-05 Jun 2002. **Goshen Prong MT21:** 1 ♀, 27 Apr-08 May 2001; 1 ♂ 5 ♀♀, 08 May-21 May 2001; 7 ♀♀, 21 May-07 Jun 2001; 1 ♀, 07 Jul-18 Jul 2001; 1 ♀, 25 Apr-09 May 2002; 7 ♀♀, 09 May-23 May 2002; 1 ♂, 23 May-07 Jun 2002. **Goshen Prong MT22:** 1 ♂ 2 ♀♀, 27 Apr-08 May 2001; 4 ♀♀, 08 May-21 May 2001; 2 ♀♀, 21 May-07 Jun 2001; 1 ♀, 07 Jun-18 Jun 2001; 1 ♀, 25 Apr-09 May 2002.

Epiphragma (Epiphragma) solatrix (Osten Sacken) (n= 14)

Twin Creeks MT01: 1 ♀, 23 May-5 Jun 2001; 2 ♂♂, 06 Jul-16 Jul 2001; 1 ♀, 13 Aug-27 Aug 2001; 1 ♀, 10 Sep-27 Sep 2001; 1 ♀, 27 Sep-15 Oct 2001; 1 ♂, 08 Apr-25 Apr 2002; 1 ♂ 2 ♀♀, 06 May-30 May 2002. **Twin Creeks MT02:** 1 ♂, 15 May-23 May 2001; 1 ♂, 06 May-30 May 2002. **Cades Cove MT03:** 1 ♀, 26 Apr-06 May 2002. **Cades Cove MT04:** 1 ♀, 29 Jul-12 Aug 2002.

Erioptera (Mesocyphona) caloptera Say (n= 4)

Cades Cove MT03: 2 ♀♀, 08 May-21 May 2001. **Cades Cove MT04:** 1 ♀, 08 May-21 May 2001; 1 ♀, 27 Aug-10 Sep 2001.

Eugnophomyia luctuosa (Osten Sacken) (n= 2)

Twin Creeks MT01: 1 ♀, 06 Jul-16 Jul 2001; 1 ♀, 08 Oct-15-Oct 2001.

Euphylidorea albipes (Leonard) (n= 16)

Andrews Bald MT12: 1 ♂, 03 Jul-18 Jul 2002; 1 ♂, 19 Jun-03 Jul 2002. **Clingmans Dome MT16:** 1 ♀, 06 Jun-25 Jun 2001; 1 ♂, 25 Jun-03 Jul 2001. **Snakeden Ridge MT19:** 2 ♂♂, 09 May-22 May 2001. **Snakeden Ridge MT20:** 5 ♂♂ 3 ♀♀, 22 May-04 Jun 2001; 1 ♀, 04 Jun-19 Jun 2001; 1 ♀, 06 Apr-06 May 2002.

Euphylidorea lutea (Doane) (n= 9)

Andrews Bald MT11: 1 ♂, 24 May-06 Jun 2001; 1 ♂, 10 May-19 Jun 2002. **Clingmans Dome MT15:** 3 ♂♂, 19 Jun-18 Jul 2002. **Clingmans Dome MT16:** 2 ♂♂, 25 Jun-03 Jul 2001; 1 ♂ 1 ♀, 19 Jun-18 Jul 2002.

Euphylidorea niveitarsis (Osten Sacken) (n= 33)

Andrews Bald MT12: 5 ♀♀, 19 Aug-11 Sep 2002. **Clingmans Dome MT15:** 1 ♂, 10 May-19 Jun 2002. **Clingmans Dome MT16:** 1 ♀, 10 May-19 Jun 2002. **Snakeden Ridge MT19:** 1 ♀, 25 Apr-09 May 2001; 3 ♂♂ 9 ♀♀, 06 May-05 Jun 2002. **Snakeden Ridge MT20:** 2 ♂♂ 1 ♀, 09 May-22 May 2001; 1 ♂ 9 ♀♀, 06 May-05 Jun 2002.

Geranomyia rostrata (Say) (n= 3)

Cades Cove MT03: 1 ♀, 08 May-21 May 2001. **Cades Cove MT04:** 1 ♀, 08 May-21 May 2001; 1 ♂, 03 Jun-17 Jun 2002.

Geranomyia diversa Osten Sacken (n= 1)

Andrews Bald MT12: 1 ♀, 20 Oct-13 Nov 2000.

Gnophomyia tristissima Osten Sacken (n= 58)

Twin Creeks MT01: 1♀, 12 Oct-24 Oct 2000; 4 ♀♀, 24 Oct-06 Nov 2000; 3 ♂♂ 3 ♀♀, 06 Jul-16 Jul 2001; 1 ♀, 13 Aug-27Aug 2001; 1 ♂, 27 Aug-10 Sep 2001; 1 ♂, 27 Sep-08 Oct 2001; 1 ♂, 08 Oct-15 Oct 2001; 1 ♂ 1 ♀, 05 Nov-05 Dec 2001; 1 ♀, 06 May-30 May 2002; 2 ♂♂ 1 ♀, 30 May-21 Jun 2002; 1 ♂, 15 Aug-26 Aug 2002; 1 ♂, 30 Sep-05 Nov 2001. **Twin Creeks MT02:** 1 ♀, 12 Oct-24 Oct 2000; 1 ♀, 06 Jul-16 Jul 2001; 1 ♂, 15 Oct-05 Nov 2001; 2 ♂ 1 ♀, 06 May-30 May 2002; 3 ♀♀, 30 May-21 Jun 2001; 1 ♀, 15 Aug-26 Aug 2002. **Purchase Knob MT07:** 1 ♀, 15 May-08 Jun 2001; 1 ♀, 05 Jul-19 Jul 2001; 1 ♀, 19 Jul-02 Aug 2001; 1 ♂ 1 ♀, 05 Aug-20 Aug 2001; 1 ♂, 19 Oct-26 Oct 2001; 1 ♀, 26 Oct-21 Nov 2001; 2 ♀♀, 30 Jul-20 Aug 2002; 1 ♂, 04 Sep-04 Oct 2002. **Purchase Knob MT08:** 1 ♂ 2 ♀♀, 05 Jul-19 Jul 2001; 1 ♀, 19 Jul-02 Aug 2001; 1 ♀, 18 Jun-03 Jul 2002; 1 ♀, 30 Jul-20 Aug 2002; 1 ♂ 2 ♀♀, 04 Sep-02 Oct 2002. **Cataloochee MT09:** 1 ♀, 18 Oct-26 Oct 2001. **Snakeden Ridge MT19:** 2 ♀♀, 09 May-22 May 2001; 1 ♀, 05 Jun-21 Jun 2002; 1 ♂, 30 Aug-13 Sep 2002. **Goshen Prong MT22:** 1 ♀, 17 Sep-22 Oct 2001.

Gonomyia (Gonomyia) bidentata Alexander (n= 1)

Cades Cove MT04: 1 ♀, 03 Jun-17 Jun 2002.

Gonomyia (Lipophleps) manca Osten Sacken (n= 1)

Purchase Knob MT07: 1 ♀, 05 Jul-19 Jul 2001.

Hexatoma (Eriocera) albitarsis (Osten Sacken) (n= 4)

Twin Creeks MT01: 2 ♂♂ 1 ♀, 06 Jul-16 Jul 2001. **Albright Grove MT18:** 1 ♀, 05 Jul-20 Jul 2002.

Hexatoma (Eriocera) aurata (Doane) (n= 3)

Twin Creeks MT02: 1 ♀, 15 Aug-26 Aug 2002; 1 ♂, 26 Aug-10 Sep 2002. **Goshen Prong MT22:** 1 ♀, 13 Aug-27 Aug 2001.

Hexatoma (Eriocera) brachycera (Osten Sacken) (n= 2)

Andrews Bald MT12: 2 ♂♂, 22 Jun-03 Jul 2001.

Hexatoma (Eriocera) brevioricornis Alexander (n= 46)

Cades Cove MT04: 1 ♀, 15 Jul-26 Jul 2002. **Purchase Knob MT08:** 1 ♀, 19 Jul-2 Aug 2001. **Andrews Bald MT12:** 1 ♂, 06 Jun-22 Jun 2001; 3 ♂♂, 22 Jun-03 Jul 2001; 1 ♂ 5 ♀♀, 17 Jul-31 Jul 2001; 3 ♂♂ 15 ♀♀, 03 Jul-18 Jul 2002; 14 ♀♀, 18 Jul-07 Aug 2002. **Albright Grove MT18:** 1 ♀, 01 Aug-14 Aug 2001. **Snakeden Ridge MT19:** 1 ♂, 16 Jul-01 Aug 2001.

Limnophila (Arctolimnophila) subcostata (Alexander) (n= 4)

Clingmans Dome MT16: 3 ♂♂ 1 ♀, 10 May-19 Jun 2002.

Limnophila (Dicranophragma) fuscavoria Osten Sacken (n= 419)

Twin Creeks MT01: 1 ♂ 2 ♀♀, 06 May-30 May 2002. **Purchase Knob MT07:** 1 ♂ 5 ♀♀, 19 Jul-02 Aug 2001; 1 ♀, 02 Aug-20 Aug 2001. **Purchase Knob MT08:** 1 ♀, 05 Jul-19 Jul 2001. **Andrews Bald MT12:** 1 ♂, 17 Jul-31 Jul 2001; 6 ♀♀, 31 Jul-16 Aug 2001; 1 ♀, 16 Aug-29 Aug 2001; 1 ♂ 8 ♀♀, 03 Jul-18 Jul 2002; 1 ♀, 18 Jul-07 Aug 2002; 1 ♂ 2 ♀♀, 19 Aug-11 Sep 2002; 3 ♂♂, 16 Jun-03 Jul 2002; 1 ♀, 11 Sep-11 Oct 2002. **Albright Grove MT17:** 1 ♀, 08 Jun-21 Jun 2001; 2 ♀♀, 10 Sep-27 Sep 2001; 1 ♀, 01 Aug-14 Aug 2002; 1 ♀, 14 Aug-24 Aug 2002. **Albright Grove MT18:** 1 ♀, 01 Aug-14 Aug 2001; 3 ♀♀, 14 Aug-10 Sep 2001; 1 ♂ 1 ♀, 15 Jun-05 Jul 2002; 1 ♂, 14 Aug-24 Aug 2002. **Snakeden Ridge MT19:** 1 ♂ 3 ♀♀, 02 Jul-16 Jul 2001; 2 ♂♂ 7 ♀♀, 16 Jul-01 Aug 2001; 5 ♂♂ 12 ♀♀, 01 Aug-14 Aug 2001; 16 ♂♂ 115 ♀♀, 14 Aug-10 Sep 2001; 2 ♀♀, 10 Sep-27 Sep 2001; 3 ♂♂ 5 ♀♀, 05 Jun-21 Jun 2002; 15 ♂♂ 24 ♀♀, 01 Aug-13 Aug 2002; 8 ♂♂ 23 ♀♀, 13 Aug-30 Aug 2002; 3 ♂♂ 23 ♀♀, 30 Aug-13 Sep 2002. **Snakeden Ridge MT20:** 1 ♂, 19 Jun-02 Jul 2001; 2 ♀♀, 02 Jul-16 Jul 2001; 1 ♂ 1 ♀, 16 Jul-01 Aug 2001; 3 ♀♀, 01 Aug-14 Aug 2001; 3 ♂♂ 29 ♀♀, 14 Aug-10 Sep 2001; 1 ♀, 10 Sep-27 Sep 2001; 1 ♀, 27 Sep-16 Oct 2001; 2 ♀♀, 05 Jun-21 Jun 2002; 1 ♂ 1 ♀, 21 Jun-02 Jul 20002; 1 ♂ 4 ♀♀, 02 Jul-01 Aug 2002; 3 ♂♂ 9 ♀♀, 01 Aug-13 Aug 2002; 4 ♀♀; 13 Aug-30 Aug 2002; 1 ♀, 30 Aug-30 Sep 2002.

Limnophila (Idiolimnophila) emmelina Alexander (n= 28)

Twin Creeks MT01: 1 ♂, 11 Apr-26 Apr 2001; 1 ♂, 25 Apr-06 May 2002. **Purchase Knob MT07:** 4 ♂, 23 Apr-15 May 2001; 1 ♂, 15 May-08 Jun 2001. **Purchase Knob MT08:** 3 ♂, 26 Apr-08 May 2002. **Goshen Prong MT21:** 2 ♂, 09 Apr-27 Apr 2001; 2 ♂ 5 ♀♀, 27 Apr-08 May 2001; 1 ♂, 11 Apr-25 Apr 2002. **Goshen Prong MT22:** 4 ♂♂ 2 ♀♀, 09 Apr-27 Apr 2001; 2 ♂, 11 Apr-25 Apr 2002.

Limnophila (Lasiomastix) macrocera (Say) (n= 6)

Andrews Bald MT12: 3 ♂♂, 24 May-06 Jun 2001; 2 ♂♂ 1 ♀, 06 Jun-22 Jun 2001.

Limnophila (Lasiomastix) tenuicornis Osten Sacken (n= 1)

Twin Creeks MT01: 1 ♂, 26 Apr-15 May 2001.

Limonia indigena (Osten Sacken) (n= 152)

Twin Creeks MT01: 1 ♀, 12 Oct-24 Oct 2000; 2 ♀♀, 15 May-23 May 2001; 1 ♀, 21 Jun-06 Jul 2001; 2 ♀♀, 10 Sep-27 Sep 2001; 1 ♀, 27 Sep-08 Oct 2001; 1 ♀, 25 Apr-06 May 2002; 1 ♂, 26 Aug-10 Sep 2002; 1 ♂ 2 ♀♀, 30 Sep-05 Nov 2002. **Twin Creeks MT02:** 1 ♂, 12 Oct-24 Oct 2000; 1 ♂ 1 ♀, 06 May-30 May 2002. **Indian Gap MT05:** 1 ♂ 1 ♀, 10 May-28 May 2001; 1 ♂, 07 Jun-21 Jun 2001; 1 ♂ 2 ♀♀, 21 Jun-05 Jul 2001; 2 ♀, 17 Jul-02 Aug 2001; 1 ♂ 1 ♀, 02 Aug-16 Aug 2001; 1 ♂, 16 Aug-03 Sep 2001; 1 ♀, 26 Sep-24 Oct 2001; 2 ♂♂, 19 jun-03 Jul 2002; 2 ♀♀, 03 Jul-18 Jul 2002;. **Indian Gap MT06:** 1 ♂, 1 ♀, 28 May-07 Jun 2001; 3 ♀♀, 07 Jun-21 Jun 2001; 1 ♂, 3 ♀♀, 21 Jun-05 Jul 2001; 1 ♂, 1 ♀, 05 Jul-17 Jul 2001; 3 ♀♀, 17 Jul-03 Aug 2001; 1 ♂, 2 ♀♀, 03 Aug-17 Aug 2001; 1 ♀, 17 Aug-03 Sep 2001. **Purchase Knob MT07:** 2 ♂♂ 1♀, 15 May-08 Jun 2001; 1 ♀, 10 Oct-19 Oct 2001. **Purchase Knob MT08:** 1 ♀, 11 Sep-10

Oct 2001. **Cataloochee MT09:** 1 ♀, 15 May-08 Jun 2001; 1 ♀, 05 Jul-19 Jul 2001; 1 ♀, 10 Oct-18 Oct 2001; 2 ♀♀, 08 May-04 Jun 2002. **Cataloochee MT10:** 1 ♀, 08 Jun-05 Jul 2001; 1 ♀, 20 Aug-11 Sep 2001; 1 ♀, 11 Sep-10 Oct 2001; 1 ♀, 10 Oct-20 Oct 2001; 1 ♂, 02 Oct-17 Oct 2002. **Andrews Bald MT11:** 1 ♀, 06 Jun-22 Jun 2001; 1 ♂, 19 Jun-03 Jul 2002. **Andrews Bald MT12:** 1 ♂, 09 Oct-24 Oct 2001; 1 ♀, 16 Jun-03 Jul 2002; 1 ♂, 03 Jul-18 Jul 2002. **Clingmans Dome MT15:** 2 ♂♂ 2 ♀♀, 06 Jun-25 Jun 2001; 2 ♂♂ 1 ♀, 25 Jun-03 Jul 2001; 3 ♂♂ 2 ♀♀, 17 Jul-31 Jul 2001; 1 ♀, 31 Jul-16 Aug 2001; 1 ♂ 4 ♀♀, 10 May-18 Jun 2002; 1 ♀, 01 Aug-30 Aug 2002. **Clingmans Dome MT16:** 1 ♂ 2 ♀♀, 03 Jul-17 Jul 2001; 1 ♀, 17 Jul-31 Jul 2001; 2 ♀♀, 10 May-19 Jun 2002; 1 ♂ 2 ♀♀, 19 Jun-18 Jul 2002; 1 ♀ 18 Jul-01 Aug 2002. **Albright Grove MT17:** 1 ♀, 09 May-22 May 2001; 1 ♂, 27 Sep-16 Oct 2001; 1 ♀, 06 May-12 May 2002; 1 ♂ 2 ♀♀, 12 May-15 Jun 2002. **Albright Grove MT18:** 1♂ 2 ♀♀, 09 May-22 May 2001; 3 ♀♀, 22 May-08 Jun 2001; 2 ♀♀, 27 Sep-16 Oct 2001; 1 ♀, 12 May-15 Jun 2002; 1 ♀, 05 Jul-20 Jul 2002. **Snakeden Ridge MT19:** 1 ♂ 2 ♀♀, 09 May-22 May 2001; 2 ♀♀, 16 Jul-01 Aug 2001; 1 ♂ 1 ♀, 27 Sep-16 Oct 2001; 1 ♀, 06 Apr-06 May 2002; 6 ♂♂ 10 ♀♀, 09 May-05 Jun 2002; 2 ♀♀, 05 Jun-21 Jun 2002; 1 ♀, 21 Jun-02 Jul 2002; 1 ♀, 17 Jul-01 Aug 2002. **Snakeden Ridge MT20:** 1 ♀, 22 May-04 Jun 2001; 2 ♀♀, 04 Jun-19 Jun 2001; 1 ♂, 19 Jun-02 Jul 2001. **Goshen Prong MT21:** 1 ♀, 09 Apr-27 Apr 2001; 1 ♀, 08 May-21 May 2001; 1 ♂, 25 Apr-09 May 2002. **Goshen Prong MT22:** 1 ♂, 27 Apr-08 May 2001; 1 ♂, 25 Apr-09 May 2002; 1 ♀, 07 Jun-20 Jun 2002.

Limonia macateei (Alexander) (n= 7)

Purchase Knob MT07: 1 ♂, 20 Aug-11 Sep 2001. **Clingmans Dome MT16:** 1♀, 24 May-06 Jun 2001. **Snakeden Ridge MT19:** 1 ♂, 01 Aug-13 Aug 2002. **Snakeden Ridge MT20:** 1 ♀, 22 May-04 Jun 2001. **Goshen Prong MT21:** 2 ♀♀, 30 Jul-13 Aug 2001; 1 ♀, 04 Oct-15 Oct 2002.

Limonia maculicosta (Coquillett) (n= 19)

Andrews Bald MT12: 1 ♀, 10 May-24 May 2001; 1 ♂, 06 Jun-22 Jun 2001. **Brushy Mountain MT13:** 1 ♂, 30 Apr-12 May 2002; 1 ♂, 30 Jun-16 Jul 2002. **Brushy Mountain MT14:** 1 ♀, 12 May-24 May 2002. **Clingmans Dome MT15:** 1 ♂, 31 Jul-16 Aug 2001. **Clingmans Dome MT16:** 2 ♂♂, 24 May-06 Jun 2001; 1 ♂ 1 ♀, 06 Jun-25 Jun 2001; 1 ♀, 17 Jul-31 Jul 2001; 1 ♀, 19 Jun-18 Jul 2002; 1 ♀, 18 Jul-01 Aug 2002; 2 ♀♀, 01 Aug-30 Aug 2002. **Albright Grove MT18:** 1 ♀, 16 Oct-06 Nov 2001. **Snakeden Ridge MT19:** 1 ♂ 1 ♀, 25 Apr-09 May 2001; 1 ♀, 16 Jul-01 Aug 2001.

Limonia parietina (Osten Sacken) (n= 13)

Twin Creeks MT01: 1 ♂, 08 Oct-15 Oct 2001. **Twin Creeks MT02:** 1 ♀, 12 Oct-24 Oct 2000. **Indian Gap MT05:** 1 ♀, 03 Sep-26 Sep 2001; 1 ♀, 01 Aug-30 Aug 2002; 1 ♂, 17 Sep-02 Oct 2002. **Purchase Knob MT08:** 1 ♀, 11 Sep-10 Oct 2001. **Cataloochee MT10:** 1 ♀, 20 Aug-04 Sep 2002. **Albright Grove MT18:** 1 ♂ 27 Sep-16 Oct 2001. **Snakeden Ridge MT19:** 1 ♀, 10 Sep-27 Sep 2001; 3 ♂♂ 1 ♀, 27 Sep-16 Oct 2001.

Limonia tristigma (Osten Sacken) (n= 108)

Indian Gap MT05: 1 ♂, 02 Aug-16 Aug 2001; 1 ♀, 03 Jul-18 Jul 2002. **Andrews Bald MT11:** 1 ♀, 07 Aug-11 Sep 2002. **Andrews Bald MT12:** 2 ♀♀, 17 Jul-31 Jul 2001; 1 ♀, 31 Jul-16 Aug 2001; 1 ♂, 16 Aug-29 Aug 2001. **Clingmans Dome MT15:** 1 ♂ 3 ♀♀, 31 Jul-16 Aug 2001; 1 ♀, 16 Aug-29 Aug 2001; 6 ♂♂ 5 ♀♀, 29 Aug-29 Sep 2001; 1 ♂1 ♀, 18 Jul-01 Aug 2002; 7 ♀♀, 01 Aug-30 Aug 2002. **Clingmans Dome MT16:** 5 ♂♂ 17 ♀♀, 31 Jul-16 Aug 2001; 1 ♂ 6 ♀♀, 16 Aug-29 Aug 2001; 6 ♀♀, 18 Jul-01 Aug 2002; 17 ♂♂ 12 ♀♀, 01 Aug-30 Aug 2002; 9 ♂♂ 2 ♀♀, 30 Aug-12 Sep 2002; 1 ♂, 12 Sep-02 Oct 2002.

Lipsothrix sylva (Alexander) (n= 6)

Twin Creeks MT01: 1 ♂, 11 Apr-26 Apr 2001. **Purchase Knob MT07:** 1 ♂, 15 May-08 Jun 2001. **Andrews Bald MT12:** 1 ♂, 10 May-24 May 2001; 1 ♂, 06 Jun-22 Jun 2001. **Clingmans Dome MT15:** 2 ♀♀, 06 Jun-25 Jun 2001.

Metalimnobia (Metalimnobia) cinctipes (Say) (n= 82)

Twin Creeks MT01: 1 ♂, 21 Jun-06 Jul 2001; 1 ♂ 1 ♀, 06 Jul-16 Jul 2001; 1 ♀, 16 Jul-30 Jul 2001; 3 ♂♂ 2 ♀♀, 30 Jul-13 Aug 2001; 2 ♂♂, 13 Aug-27 Aug 2001; 1 ♂ 1 ♀, 27 Aug-10 Sep 2001; 2 ♀♀, 10 Sep-27 Sep 2001; 1 ♂, 06 Jul-31 Jul 2002; 1 ♀, 30 Jul-15 Aug 2002. **Twin Creeks MT02:** 4 ♂♂ 2 ♀♀, 24 Oct-06 Nov 2000; 1 ♂ 2 ♀♀, 21 Jun-06 Jul 2001; 1 ♀, 06 Jul-16 Jul 2001; 2 ♀♀, 16 Jul-30 Jul 2001; 2 ♂♂, 30 Jul-13 Aug 2001; 1 ♀, 08 Oct-15 Oct 2001; 1 ♀, 21 Jun-02 Jul 2002; 1 ♀, 15 Aug-26 Aug 2002. **Cades Cove MT04:** 1 ♀, 27 Aug-10 Sep 2001. **Indian Gap MT05:** 1 ♂, 10 May-28 May 2001. **Purchase Knob MT07:** 1 ♀, 02 Aug-20 Aug 2001; 1 ♂ 1 ♀, 20 Aug-11 Sep 2001. **Purchase Knob MT08:** 1 ♂, 19 Jul-02 Aug 2001; 1 ♀, 02 Aug-20 Aug 2001; 1 ♀, 11 Sep-10 Oct 2001. **Cataloochee MT10:** 1 ♀, 17 Jul-20 Aug 2002. **Andrews Bald MT11:** 1 ♂, 16 Aug-29 Aug 2001. **Andrews Bald MT12:** 1 ♀, 17 Jul-31 Jul 2001; 2 ♀♀, 09 Oct-24 Oct 2001. **Brushy Mountain MT13:** 1 ♂, 21 Jul-05 Aug 2001. **Brushy Mountain MT14:** 1 ♀, 11 Apr-30 Apr 2002. **Clingmans Dome MT15:** 1 ♀, 06 Jun-25 Jun 2001; 1 ♀, 31 Jul-16 Aug 2001. **Clingmans Dome MT16:** 2 ♂♂ 2 ♀♀, 06 Jun-25 Jun 2001; 1 ♂ 19 Jun-18 Jul 2002. **Albright Grove MT17:** 1 ♂, 21 Jul-01 Aug 2001; 2 ♀♀, 10 Oct-16 Oct 2001; 1 ♀, 06 Nov-19 Nov 2001. **Albright Grove MT18:** 1 ♂, 10 Sep-27 Sep 2001; 1 ♀, 27 Sep-16 Oct 2001; 1 ♂, 06 May-12 May 2002; 1 ♂, 20 Jul-01 Aug 2002. **Snakeden Ridge MT19:** 1 ♀, 09 May-22 May 2001; 1 ♂, 02 Jul-16 Jul 2001; 1 ♀, 01 Aug-14 Aug 2001; 1 ♂, 14 Aug-10 Sep 2001; 1 ♀, 06 Apr-06 May 2002; 1 ♂, 05 Jun-21 Jun 2002. **Goshen Prong MT21:** 1 ♀, 27 Apr-08 May 2001; 1 ♂, 08 May-21 May 2001; 1 ♀, 17 Jul-30 Jul 2001; 2 ♀♀, 17 Jul-05 Aug 2002. **Goshen Prong MT22:** 3 ♀♀, 25 Oct-10 Nov 2000; 1 ♀, 28 Mar-08 Apr 2001; 1 ♀, 30 Jul-13 Aug 2001; 1 ♀, 27 Aug-17 Sep 2001; 1 ♀, 07 Jun-20 Jun 2002.

Metalimnobia (Metalimnobia) fallax (Johnson) (n= 5)

Twin Creeks MT02: 1 ♂, 23 May-05 Jun 2001. **Purchase Knob MT08:** 1 ♂, 23 Apr-15 May 2001. **Cataloochee MT09:** 1 ♀, 10 Apr-26 Apr 2002. **Cataloochee MT10:** 1 ♀, 15 May-08 Jun 2001. **Albright Grove MT18:** 1 ♀, 22 May-08 Jun 2001.

Metalimnobia (Metalimnobia) immatura (Osten Sacken) (n= 113)

Twin Creeks MT01: 1 ♀, 12 Oct-24 Oct 2000; 2 ♀♀, 21 Jun-6 Jul 2001; 1 ♂ 4 ♀, 16 Jul-30 Jul 2001; 1 ♀, 27 Aug-10 Sep 2001; 1 ♀, 08 Apr-25 Apr 2002; 2 ♂, 06 May-30 May 2002; 1 ♂, 10 Sep-30 Sep 2002; 1 ♀, 30 Sep-05 Nov 2002. **Twin Creeks MT02:** 4 ♂♂, 24 Oct-06 Nov 2001; 1 ♀, 21 Jun-06 Jul 2001; 1 ♂, 06 Jul-16 Jul 2001; 1 ♂, 16 Jul-30 Jul 2001; 1 ♂, 30 Jul-13 Aug 2001; 1 ♀, 08 Oct-15 Oct 2001; 3 ♂♂ 1 ♀, 08 Apr-25 Apr 2002; 1 ♂ 2 ♀♀, 06 May-30 May 2002. **Cades Cove MT03:** 1 ♀, 23 Sep-07 Oct 2002. **Indian Gap MT06:** 1 ♀, 10 May-28 May 2001; 1 ♂, 28 May-07 Jun 2001; 1 ♂, 05 Jul-17 Jun 2001. **Purchase Knob MT07:** 1 ♂, 23 Apr-15 May 2001; 2 ♂♂, 15 May-08 Jun 2001; 1 ♀, 05 Jul-19 Jul 2001; 3 ♂♂ 2 ♀♀, 19 Jul-02 Aug 2001. **Purchase Knob MT08:** 2 ♀♀, 15 May-08 Jun 2001; 1 ♂, 05 Jul-19 Jul 2001; 1 ♀, 20 Aug-11 Sep 2001. **Cataloochee MT09:** 1 ♀, 15 May-08 Jun 2001; 1 ♀, 05 Jul-19 Jul 2001; 1 ♀, 02 Aug-20 Aug 2001. **Cataloochee MT10:** 1 ♀, 15 May-08 Jun 2001; 1 ♀, 11 Sep-10 Oct 2001; 1 ♂, 18 Jun-03 Jul 2002; 2 ♀♀, 17 Jul-20 Aug 2002. **Andrews Bald MT12:** 1 ♂, 27 Apr-10 May 2002; 1 ♂, 18 Jul-07 Aug 2002. **Brushy Mountain MT13:** 1 ♂, 21 Jun-05 Jul 2001; 1 ♀, 21 Jul-05 Aug 2001; 1 ♂, 03 Jun-18 Jun 2002. **Brushy Mountain MT14:** 1 ♂ 2 ♀♀, 23 May-05 Jun 2001; 1 ♀, 30 Jun-16 Jul 2002. **Albright Grove MT17:** 1 ♀, 21 Jul-01 Aug 2001; 1 ♀, 16 Oct-06 Oct 2002; 1 ♀, 12 May-15 Jun 2002. **Albright Grove MT18:** 1 ♂, 25 Apr-09 May 2001; 1 ♂ 2 ♀, 22 May-09 May 2001; 1 ♂, 09 Jun-19 Jun 2001; 1 ♂ 1 ♀, 19 Jun-06 Jul 2001; 1 ♂, 14 Aug-10 Sep 2001. **Albright Grove MT18:** 1 ♂, 10 Sep-27 Sep 2001; 1 ♀, 14 Apr-29 Apr 2002; 1 ♀, 29 Apr-12 May 2002; 1 ♂, 12 May-15 Jun 2002; 1 ♀, 15 Jun-05 Jul 2002; 1 ♀, 01 Aug-14 Aug 2002. **Snakeden Ridge MT19:** 3 ♂♂ 1 ♀, 02 Jul-16 Jul 2001; 2 ♂♂ 3 ♀♀, 16 Jul-01 Aug 2001; 1 ♀, 14 Aug-10

Sep 2001; 1 ♀, 06 Apr-06 May 2002; 1 ♀, 05 Jun-21 Jun 2002; 1 ♂ 1 ♀, 21 Jun-01 Aug 2001; 1 ♂, 01 Aug-13 Aug 2002. **Snakeden Ridge MT20:** 2 ♂♂, 22 May-04 Jun 2001; 1 ♀, 19 Jun-02 Jul 2001; 1 ♂, 02 Jul-16 Jul 2001; 1 ♀, 16 Jul- 01 Aug 2001. **Goshen Prong MT21:** 1 ♂, 09 Apr-27 Apr 2001; 1 ♂, 21 May-07 Jun 2001; 1 ♂ 1 ♀, 18 Jun-02 Jul 2001; 1 ♂, 17 Jul-30 Jul 2001; 1 ♂, 25 Apr-09 May 2002; 1 ♂, 23 May-07 Jun 2002;. **Goshen Prong MT22:** 1 ♂ 1 ♀, 25 Oct-10 Nov 2000; 1 ♂ 2 ♀♀, 27 Apr-08 May 2001; 1 ♀, 21 May-07 Jun 2001; 1 ♂, 13 Aug-27 Aug 2001; 1 ♂ 1 ♀, 17 Sep-22 Oct 2001; 1 ♀, 22 Oct-05 Nov 2001; 1 ♀, 07 Mar-11 Apr 2002; 1 ♂, 25 Apr-09 May 2002.

Metalimnobia (Metalimnobia) triocellata (Osten Sacken) (n= 70)

Twin Creeks MT01: 1 ♀, 13 Aug-27 Aug 2001; 1 ♂, 10 Sep-27 Sep 2001; 2 ♂♂, 27 Sep-8 Oct 2001; 1 ♂, 8 Oct-15 Oct 2001; 1 ♀, 16 Jul-31 Jul 2002. **Twin Creeks MT02:** 1 ♀, 12 Oct-24 Oct 2000; 1 ♂, 13 Aug-23 Aug 2001; 1 ♂ 1 ♀, 08 Oct-15 Oct 2001; 1 ♂, 15 Aug-26 Aug 2002. **Indian Gap MT05:** 1 ♀, 03 Sep-26 Sep 2001. **Indian Gap MT06:** 2 ♀♀, 03 Sep-26 Sep 2001. **Purchase Knob MT07:** 3 ♀♀, 19 Jul-02 Aug 2001; 1 ♂ 1 ♀, 02 Aug-20 Aug 2001; 1 ♂, 03 Jul-17 Jul 2002. **Purchase Knob MT08:** 1 ♀, 02 Aug-20 Aug 2001; 2 ♂♂ 1 ♀, 20 Aug-11 Sep 2001. **Cataloochee MT09:** 2 ♀♀, 05 Jul-19 Jul 2001; 2 ♂♂ 3 ♀♀, 02 Aug-20 Aug 2001; 1 ♂ 6 ♀♀, 20 Aug-11 Sep 2001; 2 ♀♀, 30 Jul-20 Aug 2002. **Cataloochee MT10:** 1 ♂ 1 ♀, 8 Jun-05 Jul 2001; 1 ♀, 11 Sep-10 Oct 2001. **Andrews Bald MT11:** 1 ♂, 29 Aug-26 Sep 2001. **Clingmans Dome MT16:** 1 ♀, 18 Oct-13 Nov 2000. **Albright Grove MT17:** 1 ♂, 12 May-15 Jun 2002. **Albright Grove MT18:** 2 ♂♂ 1 ♀, 14 Aug-10 Sep 2001; 1 ♀, 12 May-15 Jun 2002; 1 ♂, 15 Jun-05 Jul 2002; 1 ♂, 24 Aug-13 Sep 2002. **Snakeden Ridge MT19:** 2 ♂♂, 02 Jul-16 Jul 2001; 1 ♂ 1 ♀, 14 Aug-10 Sep 2001; 2 ♂♂ 2 ♀♀, 10 Sep-27 Sep 2001; 1 ♂, 06 May-05 Jun 2002; 1 ♀, 17 Jul-01 Aug 2002; 1 ♀, 30 Aug-13 Sep 2002. **Goshen Prong MT21:** 1 ♂, 09 Apr-27 Apr 2001; 1 ♂, 17 Jul-05 Aug 2002. **Goshen Prong MT22:** 1 ♂ 2 ♀♀, 17 Sep-22 Oct 2001; 1 ♂, 09 Jul-17 Jul 2002; 1 ♀, 17 Jul-05 Aug 2002.

Molophilus (Molophilus) perflaveolus Alexander (n= 3)

Cades Cove MT03: 1 ♂ 2 ♀♀, 03 Jul-17 Jul 2002.

Molophilus (Molophilus) fultonensis Alexander (n= 363)

Twin Creeks MT01: 1 ♂, 27 Aug-10 Sep 2001; 1 ♂, 27 Sep-08 Oct 2001; 1 ♂ 1 ♀, 30 May-21 Jun 2002; 1 ♂, 15 Aug-10 Sep 2002. **Twin Creeks MT02:** 1 ♂ 1 ♀, 26 Aug-10 Sep 2002. **Purchase Knob MT08:** 1 ♂, 20 Aug-11 Sep 2001. **Andrews Bald MT12:** 1 ♂ 3 ♀♀, 22 Jun-03 Jul 2001; 7 ♂♂ 6 ♀♀, 17 Jul-31 Jul 2001; 34 ♂♂ 50 ♀♀, 31 Jul-16 Aug 2001; 20 ♂♂ 72 ♀♀, 16 Aug-29 Aug 2001; 5 ♂♂ 12 ♀♀, 16 Jun-03 Jul 2002; 15 ♂♂ 26 ♀♀, 03 Jul-18 Jul 2002; 2 ♂♂ 4 ♀♀, 18 Jul-07 Aug 2002; 50 ♂♂ 50 ♀♀, 19 Aug-11 Sep 2002. **Clingmans Dome MT15:** 4 ♂♂ 1 ♀, 19 Jun-18 Jul 2002. **Snakeden Ridge MT19:** 1 ♂ 2 ♀♀, 14 Aug-10 Sep 2001. **Snakeden Ridge MT20:** 1 ♂ 2 ♀♀, 02 Jul-16 Jul 2001.

Molophilus (Molophilus) hirthipennis (Osten Sacken) (n= 787)

Twin Creeks MT01: 1 ♂, 25 Apr-06 May 2002; 1 ♀, 15 Aug-26 Aug 2002. **Purchase Knob MT08:** 1 ♂, 26 Apr-08 May 2002. **Andrews Bald MT12:** 211 ♂♂ 244 ♀♀, 24 May-06 Jun 2001; 112 ♂ 120 ♀♀, 06 Jun-22 Jun 2001; 2 ♂♂ 10 ♀♀, 22 Jun-06 Jul 2001; 18 ♂♂ 11 ♀♀, 10 May-19 Jun 2002; 6 ♂♂ 2 ♀♀, 19 Jul-07 Aug 2002; 1 ♂ 7 ♀♀, 11 Sep-11 Oct 2002. **Clingmans Dome MT15:** 8 ♂♂ 10 ♀♀, 06 Jun-25 Jun 2001; 2 ♂♂ 1 ♀, 25 Jun-05 Jul 2001; 4 ♂♂ 3 ♀♀, 10 May-19 Jun 2002; 1 ♂, 19 Jun-18 Jul 2002. **Clingmans Dome MT16:** 3 ♂♂ 3 ♀♀, 19 Jun-18 Jul 2002. **Snakeden Ridge MT19:** 4 ♂♂ 1 ♀, 09 May-22 May 2001.

Neocladura delicatula (Alexander) (n= 1251)

Twin Creeks MT01: 13 ♂♂ 43 ♀♀, 12 Oct-24 Oct 2000; 21 ♀♀, 24 Oct-06 Nov 2000; 7 ♀♀, 08 Oct-15 Oct 2001. **Twin Creeks MT02:** 31 ♂♂ 75 ♀♀, 12 Oct-24 Oct 2000; 27 ♀♀, 24 Oct-06 Nov 2000; 2 ♀♀, 06 Nov-27 Nov 2000; 17 ♀♀, 08 Oct-15 Oct 2001; 74 ♀♀, 15 Oct-05 Nov 2001; 7 ♂♂ 9 ♀♀, 30 Sep-05 Nov 2002. **Cades Cove MT03:** 1 ♀, 07 Oct-21 Oct 2002. **Indian**

Gap MT06: 1 ♀, 26 Sep-24 Oct 2001. **Purchase Knob MT07:** 1 ♂ 39 ♀♀, 10 Oct-19 Oct 2001; 2 ♀♀, 26 Oct-21 Nov 2001; 7 ♂♂ 6 ♀♀, 04 Sep-04 Oct 2002. **Purchase Knob MT08:** 40 ♂♂ 40 ♀♀, 11 Sep-10 Oct 2001; 47 ♀♀, 10 Oct-19 Oct 2001. **Cataloochee MT09:** 1 ♂ 23 ♀♀, 19 Oct-15 Nov 2000; 1 ♂ 24 ♀♀, 10 Oct-18 Oct 2001; 7 ♀♀, 18 Oct-26 Oct 2001; 5 ♀♀, 26 Oct-21 Nov 2001; 8 ♂♂ 8 ♀♀, 04 Sep-02 Oct 2002. **Cataloochee MT10:** 1 ♀, 19 Oct-15 Nov 2000; 1 ♂, 11 Sep-10 Oct 2001; 1 ♂ 11 ♀♀, 10 Oct-26 Oct 2001. **Andrews Bald MT11:** 2 ♀♀, 09 Oct-24 Oct 2001. **Andrews Bald MT12:** 1 ♀, 26 Sep-09 Oct 2001; 17 ♀♀, 09 Oct-24 Oct 2001; 2 ♂♂ 2 ♀♀, 11 Sep-11 Oct 2002. **Brushy Mountain MT13:** 12 ♀♀, 23 Oct-06 Nov 2000; 2 ♀♀, 06 Nov-27 Nov 2000; 12 ♂♂ 4 ♀♀, 04 Sep-28 Sep 2001; 1 ♂ 3 ♀♀, 13 Oct-27 Oct 2001; 8 ♂♂ 5 ♀♀, 17 Aug-03 Oct 2002; 6 ♂♂ 27 ♀♀, 03 Oct-16 Oct 2002. **Brushy Mountain MT14:** 1 ♀, 23 Oct-06 Nov 2001; 1 ♀, 04 Sep-28 Sep 2001. **Clingmans Dome MT16:** 1 ♀, 30 Aug-12 Sep 2002. **Albright Grove MT17:** 4 ♂♂ 26 ♀♀, 16 Oct-14 Nov 2000; 4 ♂♂, 10 Sep-27 Sep 2001; 16 ♀♀, 27 Sep-16 Oct 2001; 1 ♀, 16 Oct-06 Nov 2001; 1 ♂, 13 Sep-04 Oct 2002; 1 ♂ 3 ♀♀, 04 Oct-22 Oct 2002. **Albright Grove MT18:** 1 ♂ 20 ♀♀, 27 Sep-16 Oct 2001; 2 ♀♀, 16 Oct-06 Nov 2001; 1 ♀, 06 Nov-19 Nov 2001; 1 ♂ 13 ♀♀, 04 Oct-22 Oct 2002. **Snakeden Ridge MT19:** 100 ♀♀, 17 Oct-07 Nov 2000; 1 ♀, 07 Nov-01 Dec 2000; 2 ♂♂ 1 ♀, 10 Sep-27 Sep 2001; 1 ♂ 3 ♀♀, 27 Sep-16 Oct 2001; 2 ♂♂ 61 ♀♀, 16 Oct-06 Nov 2001. **Snakeden Ridge MT20:** 3 ♂♂ 1 ♀, 17 Oct-07 Nov 2000; 44 ♀♀, 27 Sep-16 Oct 2001; 4 ♀♀, 06 Nov-19 Nov 2001. **Goshen Prong MT21:** 91 ♀♀, 25 Oct-10 Nov 2001; 2 ♀♀, 04 Oct-15 Oct 2002. **Goshen Prong MT22:** 27 ♀♀, 25 Oct-10 Nov 2000; 18 ♂♂ 70 ♀♀, 17 Sep-22 Oct 2001; 1 ♂ 19 ♀♀, 22 Oct-05 Nov 2001.

Neolimnophila appalachicola Alexander (n= 15)

Andrews Bald MT12: 6 ♂♂ 6 ♀♀, 11 Sep-11 Oct 2002. **Clingmans Dome MT15:** 2 ♂♂, 06 Jun-25 Jun 2001; 1 ♂, 10 May-19 Jun 2002.

Neolimonia rara (Osten Sacken) (n= 5)

Twin Creeks MT01: 1 ♂, 25 Apr-06 May 2002. **Twin Creeks MT02:** 1 ♀, 24 Oct-06 Nov 2000. **Cades Cove MT04:** 1 ♀, 16 Jul-30 Jul 2001. **Goshen Prong MT22:** 1 ♂, 25 Apr-09 May 2002. **Clingmans Dome MT15:** 1 ♂, 16 Sep-26 Sep 2001.

Ormosia (Oreophila) parviala Petersen and Gelhaus (n= 8)

Andrews Bald MT11: 1 ♂, 24 Apr-10 May 2001. **Clingmans Dome MT15:** 1 ♂ 1 ♀, 10 May-24 May 2001. **Clingmans Dome MT16:** 4 ♂, 10 May-24 May 2001; 1 ♂, 27 Apr-10 May 2002.

Ormosia (Ormosia) bilineata Dietz (n= 2)

Clingmans Dome MT16: 1 ♂ 1 ♀, 25 Jun-03 Jul 2001.

Ormosia (Ormosia) carolinensis Alexander (n= 2)

Twin Creeks MT02: 1 ♀, 27 Mar-11 Apr 2001. **Cataloochee MT10:** 1 ♂, 10 Apr-23 Apr 2001.

Ormosia (Ormosia) harrisoniana Alexander (n= 35)

Andrews Bald MT12: 5 ♂♂ 17 ♀♀, 16 Jun-03 Jul 2002; 5 ♂♂ 8 ♀♀, 19 Aug-11 Sep 2002.

Ormosia (Ormosia) holotrichia (Osten Sacken) (n= 7)

Clingmans Dome MT15: 2 ♂♂, 10 May-19 Jun 2002. **Albright Grove MT18:** 1 ♂ 1 ♀, 01 Apr-14 Apr 2002. **Snakeden Ridge MT19:** 1 ♂, 03 Apr-25 Apr 2001. **Snakeden Ridge MT20:** 1 ♂ 1 ♀, 25 Apr-09 May 2001.

Ormosia (Ormosia) hubbelli Alexander (n= 1)

Purchase Knob MT08: 1 ♂, 26 Apr-08 May 2002.

Ormosia (Ormosia) lilliana Alexander (n= 86)

Indian Gap MT05: 2 ♂♂ 2 ♀♀, 10 May-28 May 2001. **Indian Gap MT06:** 5 ♂♂, 10 May-28 May 2001. **Andrews Bald MT12:** 1 ♂, 14 Apr-27 Apr 2002. **Clingmans Dome MT15:** 3 ♂♂ 1

♀, 10 May-24 May 2001; 2 ♂♂ 4 ♀♀, 24 May-06 Jun 2001; 1 ♂ 7 ♀♀, 06 Jun-25 Jun 2001; 1 ♂, 27 Apr-10 May 2002; 4 ♂♂ 1 ♀, 10 May-19 Jun 2002. **Clingmans Dome MT16:** 3 ♂♂ 3 ♀♀, 10 May-24 May 2001; 20 ♂♂ 18 ♀♀, 24 May-06 Jun 2001; 1 ♂ 5 ♀♀, 06 Jun-25 Jun 2001; 2 ♂♂, 27 Apr-10 May 2002.

Ormosia (Ormosia) monticola (Osten Sacken) (n= 33)

Andrews Bald MT12: 3 ♂♂ 30 ♀♀, 03 Jul-18 Jul 2002.

Ormosia (Paraormosia) nigripila (Osten Sacken) (n= 1)

Brushy Mountain MT13: 1 ♀, 26 Apr-14 May 2001

Ormosia (Paraormosia) pygmae (Alexander) (n= 4)

Twin Creeks MT01: 2 ♂♂, 08 Oct-15 Oct 2001. **Purchase Knob MT08:** 2 ♂♂, 26 Apr-08 May 2002.

Ormosia (Ormosia) romanovichiana Alexander (n= 65)

Twin Creeks MT01: 2 ♂♂, 27 Sep-08 Oct 2001; 1 ♀, 26 Mar-08 Apr 2002. **Twin Creeks MT02:** 1 ♀, 27 Sep-08 Oct 2001; 1 ♂, 08 Apr-25 Apr 2002. **Indian Gap MT05:** 1 ♀, 29 Mar-27 Apr 2001; 1 ♂, 10 May-28 May 2001. **Indian Gap MT06:** 1 ♂, 03 Sep-26 Sep 2001; 1 ♀, 14 Apr-27 Apr 2002. **Purchase Knob MT07:** 1 ♂, 23 Apr-15 May 2001. **Purchase Knob MT08:** 1 ♂, 23 Apr-15 May 2001; 1 ♂, 11 Sep-10 Oct 2001; 1 ♀, 26 Apr-08 May 2002. **Cataloochee MT09:** 1 ♂ 1 ♀, 23 Apr-15 May 2001. **Andrews Bald MT12:** 2 ♀♀, 09 Oct-24 Oct 2001; 1 ♀, 14 Apr-27 Apr 2002. **Brushy Mountain MT13:** 1 ♂, 14 May-23 May 2001. **Clingmans Dome MT15:** 1 ♀, 24 Apr-10 May 2001. **Clingmans Dome MT16:** 1 ♀, 09 Oct-24 Oct 2001. **Albright Grove MT17:** 2 ♀♀, 15 Mar-25 Apr 2001; 1 ♂, 25 Apr-09 May 2001; 1 ♂, 10 Sep-27 Sep 2001; 2 ♀♀, 27 Sep-16 Oct 2001; 1 ♀, 01 Apr-14 Apr 2002; 1 ♀, 13 Sep-04 Oct 2002. **Albright Grove MT18:** 1 ♀, 15 Mar-15 Apr 2001; 1 ♂, 14 Aug-10 Sep 2001; 2 ♂♂ 9 ♀♀, 10 Sep-27 Sep 2001; 1 ♂ 5 ♀♀, 27 Sep-16 Oct 2001. **Snakeden Ridge MT19:** 1 ♂ 1 ♀, 03 Apr-25 Apr 2001; 2 ♂♂ 2 ♀♀, 10 Sep-27 Sep 2001; 2 ♂♂, 16 Oct-06 Nov 2001; 1 ♀, 06 Apr-06 May 2002. **Snakeden Ridge MT20:** 1 ♂ 1 ♀, 03 Apr-25 Apr 2001; 1 ♂, 10 Sep-27 Sep 2001; 2 ♂♂ 1 ♀, 27 Sep-16 Oct 2001; 1 ♂, 06 Apr-06 May 2002. **Goshen Prong MT22:** 1 ♀, 08 May-21 May 2001.

Ormosia (Ormosia) tennesseensis Alexander (n= 1)

Snakeden Ridge MT19: 1 ♂, 03 Apr-25 Apr 2001.

Ormosia (Ormosia) townesi Alexander (n= 20)

Indian Gap MT06: 1 ♂ 2 ♀♀, 17 Jul-02 Aug 2001. **Clingmans Dome MT15:** 1 ♀, 17 Jul-31 Jul 2001; 1 ♂, 01 Aug-30 Aug 2002. **Clingmans Dome MT16:** 1 ♂, 25 Jun-03 Jul 2001; 2 ♂♂ 3 ♀♀, 03 Jul-17 Jul 2001; 1 ♂ 1 ♀, 17 Jul-31 Jul 2001; 1 ♂ 1 ♀, 31 Jul-16 Aug 2001; 1 ♂ 3 ♀♀, 01 Aug-30 Aug 2002. **Goshen Prong MT22:** 1 ♂, 25 Oct-10 Nov 2000.

Ormosia (Paraormosia) palpalis Dietz (n= 4)

Snakeden Ridge MT20: 4 ♀♀, 25 Apr-09 May 2001.

Pilaria tenuipes (Say) (n= 1)

Cades Cove MT04: 1 ♂, 08 May-21 May 2002.

Prionolabis munda (Osten Sacken) (n= 79)

Indian Gap MT05: 1 ♂, 21 Jun-05 Jul 2001. **Indian Gap MT06:** 5 ♂♂ 2 ♀♀, 21 Jun-05 Jul 2001. **Andrews Bald MT12:** 1 ♂, 06 Jun-22 Jun 2001; 1 ♂, 22 Jun-03 Jul 2001. **Brushy Mountain MT13:** 1 ♂, 05 Jun-21 Jun 2001. **Clingmans Dome MT15:** 1 ♂, 19 Jun-18 Jul 2002. **Clingmans Dome MT16:** 4 ♂♂ 1 ♀, 03 Jul-17 Jul 2001; 16 ♂♂, 17 Jul-31 Jul 2001; 1 ♂, 31 Jul-16 Aug 2001; 18 ♂♂ 7 ♀♀, 19 Jun-18 Jul 2002; 13 ♂♂ 4 ♀♀, 18 Jul-01 Aug 2002; 1 ♂, 01 Aug-

30 Aug 2002. **Albright Grove MT18:** 1 ♂, 15 Jun-05 Jul 2002. **Snakeden Ridge MT19:** 1 ♂, 06 May-05 Jun 2002.

Prionolabis politissima (Alexander) (n= 105)

Twin Creeks MT01: 5 ♂♂, 11 Apr-26 Apr 2001; 3 ♂♂ 2 ♀♀, 26 Apr-15 May 2001. **Indian Gap MT05:** 3 ♂♂, 21 Jun-05 Jul 2001; 3 ♂♂ 2 ♀♀, 05 Jul-17 Jul 2001; 5 ♂♂ 2 ♀♀, 17 Jul-02 Aug 2001; 1 ♂ 1 ♀, 19 Jun-03 Jul 2002; 3 ♂♂, 03 Jul-18 Jul 2002. **Indian Gap MT06:** 1 ♂, 28 May-07 Jun 2001; 10 ♂♂, 05 Jul-17 Jul 2001; 12 ♂♂ 1 ♀, 17 Jul-02 Aug 2001. **Andrews Bald MT12:** 1 ♂, 03 Jul-19 Jul 2002. **Clingmans Dome MT15:** 2 ♂♂ 1 ♀, 18 Jul-01 Aug 2002; 1 ♂, 01 Aug-30 Aug 2002. **Clingmans Dome MT16:** 4 ♂♂, 18 Jul-01 Aug 2002; 1 ♂ 2 ♀♀, 01 Aug-30 Aug 2002. **Albright Grove MT17:** 2 ♂♂ 4 ♀♀, 09 May-22 May 2001; 1 ♂, 22 May-06 Jun 2001; 1 ♂, 29 Apr-06 May 2002; 1 ♂, 06 May-12 May 2002; 1 ♂, 12 May-15 Jun 2002. **Albright Grove MT18:** 1 ♂, 22 May-08 Jun 2001. **Snakeden Ridge MT19:** 3 ♂♂ 4 ♀♀, 09 May-22 May 2001; 7 ♂♂ 4 ♀♀, 06 May-05 Jun 2002. **Snakeden Ridge MT20:** 2 ♂♂ 1 ♀, 09 May-22 May 2001; 2 ♂♂ 2 ♀♀, 06 May-05 Jun 2002. **Goshen Prong MT22:** 1 ♂ 2 ♀♀, 08 May-21 May 2001.

Prionolabis rudimentis (Alexander) (n= 4)

Clingmans Dome MT15: 1 ♂, 06 Jun-25 Jun 2001. **Clingmans Dome MT16:** 3 ♂♂, 10 May-19 Jun 2002.

Prionolabis rufibasis (Osten Sacken) (n= 332)

Twin Creeks MT01: 2 ♂♂ 1 ♀, 25 Apr-06 May 2002. **Twin Creeks MT02:** 2 ♀♀, 08 Apr-25 Apr 2002. **Indian Gap MT05:** 1 ♂, 27 Apr-10 May 2001; 19 ♂♂ 3 ♀♀, 10 May-28 May 2001; 1 ♂ 1 ♀, 28 May-07 Jun 2001. **Indian Gap MT06:** 9 ♂♂ 1 ♀, 10 May-28 May 2001. **Purchase Knob MT07:** 5 ♂♂ 1 ♀, 23 Apr-15 May 2001; 1 ♂, 10 Apr-26 Apr 2002. **Purchase Knob MT08:** 1 ♂ 2 ♀♀, 23 Apr-15 May 2001; 1 ♂, 15 May-08 Jun 2001; 2 ♂♂, 10 Apr-26 Apr 2002; 2 ♂♂ 4 ♀♀, 26 Apr-08 May 2002. **Cataloochee MT09:** 20 ♂♂ 8 ♀♀, 23 Apr-15 May 2001; 3 ♀♀, 15 May-08 Jun 2001; 2 ♂♂, 10 Apr-26 Apr 2002; 5 ♂♂ 2 ♀♀, 26 Apr-08 May 2002; 1 ♂, 08 May-04 Jun 2002. **Cataloochee MT10:** 1 ♂ 2 ♀♀, 23 Apr-15 May 2001; 1 ♂ 1 ♀, 26 Apr-08 May 2002. **Andrews Bald MT11:** 3 ♂♂ 1 ♀, 10 May-24 May 2001; 7 ♂♂ 4 ♀♀, 24 May-06 Jun 2001; 4 ♂♂ 4 ♀♀, 27 Apr-10 May 2002; 7 ♂♂ 11 ♀♀, 10 May-19 Jun 2002. **Andrews Bald MT12:** 1 ♂, 24 May-06 Jun 2001. **Clingmans Dome MT15:** 2 ♂♂, 24 May-06 Jun 2001; 16 ♂♂ 4 ♀♀, 06 Jun-25 Jun 2001; 6 ♂♂ 2 ♀♀, 17 Jul-31 Jul 2001; 14 ♂♂ 3 ♀♀, 10 May-19 Jun 2002. **Clingmans Dome MT16:** 3 ♂♂ 1 ♀, 24 May-06 Jun 2001; 13 ♂♂ 1 ♀, 06 Jun-25 Jun 2001; 16 ♂♂ 7 ♀♀, 10 May-19 Jun 2002; 2 ♂♂ 1 ♀, 19 Jun-18 Jul 2002. **Albright Grove MT17:** 5 ♂♂, 25 Apr-09 May 2001; 4 ♂♂ 5 ♀♀, 14 Apr-29 Apr 2002; 1 ♂, 29 Apr-06 May 2002. **Albright Grove MT18:** 7 ♂♂ 3 ♀♀, 25 Apr-09 May 2001; 1 ♂ 7 ♀♀, 09 May-22 May 2001; 1 ♂, 14 Apr-29 Apr 2002; 2 ♂♂, 29 Apr-12 May 2002. **Snakeden Ridge MT19:** 1 ♂ 1 ♀, 25 Apr-09 May 2001; 2 ♂♂ 2 ♀♀, 06 Apr-06 May 2002. **Snakeden Ridge MT20:** 2 ♂♂ 1 ♀, 06 Apr-06 May 2002. **Goshen Prong MT21:** 3 ♂♂ 2 ♀♀, 09 Apr-27 Apr 2001; 3 ♂♂ 6 ♀♀, 27 Apr-08 May 2001; 1 ♂ 1 ♀, 08 May-21 May 2001; 4 ♂♂ 1 ♀, 11 Apr-25 Apr 2002. **Goshen Prong MT22:** 11 ♂♂ 4 ♀♀, 09 Apr-27 Apr 2001; 5 ♂♂ 6 ♀♀, 27 Apr-08 May 2001; 1 ♂, 25 Apr-09 May 2002.

Prionolabis terebrans (Alexander) (n= 4)

Goshen Prong MT21: 1 ♂ 3 ♀♀, 25 Apr-09 May 2002.

Prionolabis walleyi (Osten Sacken) (n= 59)

Twin Creeks MT01: 5 ♂♂, 11 Apr-26 Apr 2001; 1 ♂, 26 Mar-08 Apr 2002; 5 ♂♂ 2 ♀♀, 08 Apr-25 Apr 2002. **Twin Creeks MT02:** 1 ♂, 27 Mar-11 Apr 2001; 3 ♂♂ 1 ♀, 11 Apr-26 Apr 2001; 4 ♂♂, 08 Apr-25 Apr 2002. **Clingmans Dome MT16:** 2 ♂♂ 3 ♀♀, 03 Jul-17 Jul 2001; 14 ♂♂ 12 ♀♀, 17 Jul-31 Jul 2001; 2 ♂♂ 1 ♀, 31 Jul-16 Aug 2001; 1 ♂ 01 Aug-30 Aug 2002. . **Snakeden Ridge MT20:** 1 ♂, 05 Jun-21 Jun 2002. **Albright Grove MT18:** 1 ♂, 19 Jun-06 Jul 2001.

Prolimnophila areolata (Osten Sacken) (n= 23)

Twin Creeks MT01: 1 ♂, 26 Apr-15 May 2001; 2 ♂♂, 25 Apr-06 May 2002. **Twin Creeks MT02:** 1 ♂, 08 Apr-25 Apr 2002; 2 ♂♂, 25 Apr-06 May 2002; **Indian Gap MT05:** 3 ♂♂ 1♀, 07 Jun-21 Jun 2001. **Indian Gap MT06:** 1 ♀, 07 Jun-21 Jun 2001; 1 ♂, 21 Jun-05 Jul 2001. **Albright Grove MT17:** 1 ♂, 09 May-22 May 2001; 1 ♂, 22 May-06 Jun 2001. **Albright Grove MT18:** 2 ♂♂ 1 ♀, 25 May-08 Jun 2001; 1 ♀, 06 May-12 May 2002. **Snakeden Ridge MT20:** 1 ♂, 04 Jun-19 Jun 2001. **Goshen Prong MT21:** 1 ♂, 27 Apr-08 May 2001. **Goshen Prong MT22:** 1 ♂, 09 Apr-27 Apr 2001; 1 ♂, 11 Apr-25 Apr 2002; 1 ♂, 09 May-23 May 2002.

Pseudolimnophila (Pseudolimnophila) australina Alexander (n= 44)

Twin Creeks MT01: 1 ♂, 26 Aug-10 Sep 2002. **Purchase Knob MT07:** 1 ♂ 1 ♀, 02 Aug-20 Aug 2001; 5 ♀♀, 20 Aug-11 Sep 2001; 1 ♂, 30 Jul-20 Aug 2002. **Purchase Knob MT08:** 4 ♂♂, 02 Aug-20 Aug 2001; 1 ♂, 30 Jul-20 Aug 2002. **Snakeden Ridge MT19:** 3 ♀♀, 04 Jul-16 Jul 2001; 1 ♀, 14 Aug-10 Sep 2001; 1 ♂, 01 Aug-13 Aug 2002. **Snakeden Ridge MT20:** 1 ♀, 14 Aug-10 Sep 2001. **Goshen Prong MT21:** 1 ♂ 2 ♀♀, 21 May-07 Jun 2001; 1 ♂ 3 ♀♀, 07 Jun-18 Jun 2001; 2 ♀♀, 18 Jun-02 Jul 2001. **Goshen Prong MT22:** 3 ♀♀, 08 May-21 May 2001; 2 ♀♀, 21 May-07 Jun 2001; 7 ♀♀, 07 Jun-18 Jun 2001; 2 ♀♀, 18 Jun-02 Jul 2001.

Pseudolimnophila (Pseudolimnophila) contempta (Osten Sacken) (n= 15)

Twin Creeks MT01: 1 ♂, 31 Jul-15 Aug 2002. **Twin Creeks MT02:** 1 ♂ 4 ♀♀, 30 May-21 Jun 2002; 2 ♂♂, 31 Jul-15 Aug 2002. **Purchase Knob MT07:** 2 ♂♂, 19 Jul-02 Aug 2001; 2 ♂♂, 17 Jul-20 Aug 2002; 1 ♂, 20 Aug-04 Sep 2002. **Purchase Knob MT08:** 1 ♀, 20 Aug-11 Sep 2001. **Andrews Bald MT11:** 1 ♀, 16 Aug-29 Aug 2001.

Pseudolimnophila (Pseudolimnophila) inornata (Osten Sacken) (n= 12)

Twin Creeks MT02: 1 ♂, 30 May-21 Jun 2002. **Snakeden Ridge MT19:** 5 ♂♂ 6 ♀♀, 06 May-05 Jun 2002.

Pseudolimnophila (Pseudolimnophila) luteipennis (Osten Sacken) (n= 1)

Cades Cove MT04: 1 ♀, 10 Sep-26 Sep 2001.

Pseudolimnophila (Pseudolimnophila) noveboracensis (Alexander) (n= 2)

Cades Cove MT04: 1 ♀, 23 Apr-08 May 2001. **Snakeden Ridge MT20:** 1 ♂, 06 Apr-06 May 2002.

Rhabdomastix (Sacandaga) flava (Alexander) (n= 1)

Brushy Mountain MT14: 1 ♂, 21 Jul-05 Aug 2001.

Rhipidia (Rhipidia) bryanti Johnson (n= 2)

Twin Creeks MT02: 1 ♀, 30 May-21 Jun 2002; 1 ♀, 21 Jun-02 Jul 2002.

Rhipidia (Rhipidia) domestica Osten Sacken (n= 62)

Twin Creeks MT01: 2 ♂♂ 4 ♀♀, 27 Sep-08 Oct 2001; 1 ♂, 30 Sep-05 Nov 2002. **Twin Creeks MT02:** 1 ♂, 12 Oct-24 Oct 2000; 1 ♂ 1 ♀, 27 Sep-08 Oct 2001; 1 ♀, 08 Oct-15 Oct 2001; 1 ♂ 1 ♀, 15 Oct-05 Nov 2002. **Cades Cove MT03:** 1 ♀, 18 Jun-02 Jul 2001; 1 ♀, 21 Oct-05 Nov 2001; 1 ♀, 26 Apr-09 May 2002; 1 ♂, 03 Jun-15 Jun 2002; 2 ♂♂, 15 Jul-29 Jul 2002; 1 ♀, 29 Jul-12 Aug 2002. **Cades Cove MT04:** 2 ♀♀, 03 Jun-17 Jun 2002; 2 ♀♀, 29 Jul-12 Aug 2002; 1 ♂ 2 ♀♀, 07 Oct-21 Oct 2002. **Purchase Knob MT07:** 1 ♀, 20 Aug-11 Sep 2001; 1 ♀, 20 Aug-04 Sep 2002. **Andrews Bald MT12:** 2 ♂♂ 2 ♀♀, 11 Apr-27 Apr 2002; 1 ♀, 27 Apr-10 May 2002; 1 ♀, 18 Jul-07 Aug 2002; 1 ♀, 11 Sep-11 Oct 2002. **Brushy Mountain MT13:** 2 ♂♂ 1 ♀, 03 Jun-18 Jun 2002; 1 ♀, 17 Aug-13 Sep 2002. **Brushy Mountain MT14:** 1 ♂ 1 ♀, 11 Apr-30 Apr 2002; 1 ♂, 03 Jun –18 Jun 2002; 1 ♀, 13 Sep-03 Oct 2002. **Clingmans Dome MT15:** 1 ♀, 27 Apr-10 May 2002. **Albright Grove MT17:** 1 ♀, 18 Oct-14 Nov 2000. **Albright Grove MT18:** 3 ♂♂ 1 ♀, 27 Sep-16 Oct 2001; 1 ♂, 14 Apr-29 Apr 2002. **Goshen Prong MT21:** 1 ♀, 25 Oct-10

Nov 2000; 1 ♂, 27 Aug-17 Sep 2001; 2 ♀♀, 11 Apr-25 Apr 2002; 1 ♂ 1 ♀, 25 Apr-09 May 2002. **Goshen Prong MT22:** 1 ♂ 2 ♀♀, 11 Apr-25 Apr 2002; 1 ♂, 09 May-23 May 2002.

Rhipidia (Rhipidia) fidelis Osten Sacken (n= 30)

Twin Creeks MT02: 1 ♀, 06 May-30 May 2002; 2 ♀♀, 30 May-21 Jun 2002. **Indian Gap MT05:** 2 ♀♀, 03 Sep-26 Sep 2001. **Purchase Knob MT08:** 1 ♀, 15 May-08 Jun 2001. **Cataloochee MT10:** 1 ♀, 18 Jun-03 Jul 2002. **Andrews Bald MT11:** 1 ♀, 27 Apr-10 May 2002. **Brushy Mountain MT13:** 1 ♀, 05 Jun-21 Jun 2001; 4 ♀♀, 04 Sep-28 Sep 2001; 2 ♀♀, 30 Jun-16 Jul 2002. **Brushy Mountain MT14:** 1 ♂, 05 Jun-21 Jun 2001. **Albright Grove MT18:** 2 ♀♀, 22 May-08 Jun 2001; 1 ♀, 08 Jun-19 Jun 2001; 1 ♂ 1 ♀, 12 May-15 Jun 2002. **Snakeden Ridge MT19:** 2 ♂♂ 2 ♀♀, 06 May-05 Jun 2002. **Snakeden Ridge MT20:** 1 ♀, 04 Jun-19 Jun 2001. **Goshen Prong MT21:** 2 ♀♀, 21 May-07 Jun 2001. **Goshen Prong MT22:** 1 ♀, 08 May-21 May 2001; 1 ♀, 21 May-07 Jun 2001.

Rhipidia (Rhipidia) maculata Meigen (n= 371)

Twin Creeks MT01: 2 ♀♀, 24 Oct-06 Nov 2000; 2 ♂♂, 13 Aug-27 Aug 2001; 1 ♀, 10 Sep-27 Sep 2001; 2 ♀♀, 27 Sep-08 Oct 2001; 6 ♂♂ 2 ♀♀, 08 Oct-15 Oct 2001; 1 ♂, 05 Nov-05 Dec 2001; 1 ♀, 25 Apr-06 May 2002; 1 ♀, 26 Aug-10 Sep 2002; 2 ♀♀, 10 Sep-30 Sep 2002; 1 ♂, 30 Sep-05 Nov 2002. **Twin Creeks MT02:** 1 ♂, 12 Oct-24 Oct 2000; 1 ♂, 24 Oct-06 Nov 2000; 1 ♀, 15 May-23 May 2001; 1 ♀, 23 May-05 Jun 2001; 1 ♀, 06 Jul-16 Jul 2001; 1 ♀, 27 Aug-10 Sep 2001; 6 ♂♂, 08 Oct-15 Oct 2001; 3 ♂♂ 4 ♀♀, 15 Oct-05 Nov 2001; 1 ♂ 1 ♀, 08 Apr-25 Apr 2002; 1 ♂, 06 May-30 May 2002; 1 ♂, 15 Aug-26 Aug 2002. **Cades Cove MT03:** 1 ♀, 02 Jul-16 Jul 2001; 2 ♀♀, 26 Apr-09 May 2002. **Indian Gap MT05:** 1 ♀, 17 Jul-02 Aug 2001; 1 ♀, 19 Jun-03 Jul 2002; 1 ♂ 3 ♀♀, 17 Aug-30 Aug 2002; 1 ♂, 17 Sep-02 Oct 2002. **Indian Gap MT06:** 1 ♀, 16 Aug-03 Sep 2001; 1 ♂ 3 ♀♀, 26 Sep-24 Oct 2001. **Purchase Knob MT07:** 2 ♂ 1 ♀, 30Jul-20 Aug 2002. **Purchase Knob MT08:** 2 ♀♀, 02 Aug-20 Aug 2001. **Cataloochee MT09:** 2 ♂♂ 2 ♀♀, 19 Oct-15 Nov 2001; 1 ♀, 02 Aug-20 Aug 2001; 2 ♀♀, 20 Aug-11 Sep 2001; 1 ♂, 02 Oct-20 Oct 2001; 1 ♂, 26 Oct-21 Nov 2001. **Cataloochee MT10:** 1 ♀, 11 Sep-10 Oct 2001; 3 ♀♀, 10 Oct-26 Oct 2001; 1 ♀, 26 Oct-21 Nov 2001. **Andrews Bald MT11:** 1 ♀, 20 Oct-13 Nov 2000; 1 ♂, 07 Aug-11 Sep 2002. **Andrews Bald MT12:** 2 ♂♂, 09 Oct-24 Oct 2001; 1 ♀, 19 Aug-11 Sep 2002; 1 ♂ 3 ♀♀, 11 Sep-11 Oct 2002. **Brushy Mountain MT13:** 1 ♀, 21 Aug-04 Sep 2001; 1 ♂ 2 ♀♀, 04 Sep-28 Sep 2001; 2 ♂♂ 2 ♀♀, 13 Oct-27 Oct 2001; 1 ♂, 10 Nov-25 Nov 2001; 2 ♀♀, 30 Jun-16 Jul 2002; 1 ♂ 1 ♀ 13 Sep-03 Oct 2002. **Brushy Mountain MT14:** 1 ♂, 23 Oct-06 Nov 2000; 1 ♂, 17 Aug-13 Sep 2002. **Clingmans Dome MT15:** 1 ♀, 27 Apr-10 May 2002. **Clingmans Dome MT16:** 1 ♀, 17 Jul-31 Jul 2001; 1 ♂ 1 ♀, 09 Oct-24 Oct 2001; 1 ♂ 1 ♀, 19 Jun-18 Jul 2002; 1 ♀, 01 Aug-30 Aug 2002. **Albright Grove MT17:** 3 ♂♂ 2 ♀♀, 18 Oct-14 Nov 2000; 1 ♂, 21 Jul-01 Aug 2001; 1 ♀, 01 Aug-14 Aug 2001; 2 ♂♂, 27 Sep-16 Oct 2001; 1 ♀, 14 Apr-29 Apr 2002; 2 ♀♀, 29 Apr-12 May 2002. **Albright Grove MT18:** 1 ♂ 1 ♀, 25 Apr-09 May 2001; 1 ♀, 22 May-08 Jun 2001; 1 ♀, 01 Aug-14 Aug 2001; 2 ♀♀, 14 Aug-10 Sep 2001; 5 ♂♂ 2 ♀♀, 27 Sep-16 Oct 2001; 3 ♂♂, 16 Oct-06 Nov 2001; 1 ♀, 06 May-12 May 2002; 1 ♂ 2 ♀♀, 14 Aug-24 Aug 2002; 1 ♀, 13 Sep-04 Oct 2002. **Snakeden Ridge MT19:** 2 ♂♂, 17 Oct-07 Nov 2000; 1 ♂ 1 ♀, 07 Nov-01 Dec 2000; 1 ♂ 1 ♀, 25 Apr-09 May 2001; 1 ♂ 3 ♀♀, 16 Jul-01 Aug 2001; 1 ♂ 3 ♀♀, 01 Aug-14 Aug 2001; 1 ♀, 14 Aug-10 Sep 2001; 1 ♀, 27 Sep-16 Oct 2001; 2 ♂♂ 1 ♀, 16 Oct-06 Nov 2001; 2 ♀♀, 06 Apr-06 May 2002; 3 ♀♀, 06 May-05 Jun 2002; 1 ♂, 01 Aug-13 Aug 2002; 1 ♂, 13 Aug-30 Aug 2002. **Snakeden Ridge MT20:** 2 ♂♂, 02 Jul-16 Jul 2001; 1 ♂, 01 Aug-14 Aug 2001; 1 ♂ 1 ♀, 14 Aug-10 Sep 2001; 2 ♂♂ 1 ♀, 10 Sep-27 Sep 2001; 2 ♂♂, 27 Sep-16 Oct 2001; 1 ♂, 06 May-05 Jun 2002; 1 ♂, 02 Jul-01 Aug 2002. **Goshen Prong MT21:** 10 ♂♂ 3 ♀♀, 25 Oct-10 Nov 2000; 1 ♀, 09 Apr-27 Apr 2001; 1 ♂, 27 Aug-17 Sep 2001; 2 ♂♂ 2 ♀♀, 17 Sep-22 Oct 2001; 1 ♀, 25 Apr-09 May 2002; 1 ♀, 09 May-23 May 2002; 1 ♂, 23 May-07 Jun 2002; 2 ♀, 19 Aug-10 Sep 2002; 2 ♂♂, 04 Oct-15 Oct 2002. **Goshen Prong MT22:** 19 ♂♂ 4 ♀♀, 25 Oct-10 Nov 2000; 1 ♀, 27 Aug-17 Sep 2001; 1 ♀, 17 Sep-22 Oct 2001; 3 ♂♂ 1 ♀, 22 Oct-05 Nov 2001; 1 ♀, 25 Apr-09 May 2002.

Rhipidia (Rhipidia) shannoni Alexander (n= 14)

Twin Creeks MT01: 1 ♀, 24 Oct-06 Nov 2000; 1 ♀, 10 Sep-27 Sep 2001; 1 ♂, 05 Nov-05 Dec 2001. **Twin Creeks MT02:** 1 ♀, 30 Jul-13 Aug 2001; 1 ♀, 13 Aug-27 Aug 2001; 1 ♀, 15 Oct-05 Nov 2001. **Cades Cove MT04:** 1 ♀, 23 Apr-08 May 2001; 2 ♂♂, 12 Aug-26 Aug 2002; 1 ♀, 26 Aug-23 Sep 2002. **Andrews Bald MT11:** 1 ♀, 14 Apr-27 Apr 2002. **Brushy Mountain MT13:** 1 ♀, 06 Nov-27 Nov 2000. **Albright Grove MT17:** 1 ♀, 18 Oct-14 Nov 2000. **Albright Grove MT18:** 1 ♂, 16 Oct-06 Nov 2001.

Scleroprota apicalis (Alexander) (n= 1)

Twin Creeks MT02: 1 ♀, 30 May-21 Jun 2001.

Shannonomyia lenta Alexander (n= 1)

Purchase Knob MT08: 1 ♂, 18 Jun-03 Jul 2002.

Symplecta (Symplecta) cana Walker (n= 71)

Twin Creeks MT01: 1 ♀, 12 Mar-27 Mar 2001. **Twin Creeks MT02:** 1 ♂, 27 Nov-12 Dec 2000; 1 ♂, 12 Feb-27 Feb 2001. **Cades Cove MT03:** 1 ♀, 14 Feb-26 Feb 2001; 1 ♀, 26 Feb-13 Mar 2001; 1 ♀, 13 Mar-28 Mar 2001; 1 ♂ 1 ♀, 28 Mar-09 Apr 2001; 1 ♀, 08 May-21 May 2001. **Cades Cove MT04:** 1 ♀, 07 Nov-28 Nov 2000; 2 ♀♀, 14 Feb-26 Feb 2001; 1 ♂ 1 ♀, 26 Feb-13 Mar 2001; 1 ♀, 23 Apr-08 May 2001. **Indian Gap MT05:** 3 ♂♂ 2 ♀♀, 20 Feb-16 Mar 2001; 4 ♂♂ 1 ♀, 29 Mar-27 Apr 2001; 2 ♀♀, 15 Mar-28 Mar 2002. **Indian Gap MT06:** 3 ♂♂, 20 Feb-16 Mar 2001; 1 ♀, 15 Mar-28 Mar 2002; 2 ♂♂ 1 ♀, 28 Mar-14 Apr 2002; 1 ♂, 14 Apr-27 Apr 2002. **Purchase Knob MT08:** 1 ♀, 26 Mar-10 Apr 2001. **Cataloochee MT09:** 1 ♀, 23 Apr-15 May 2001. **Cataloochee MT10:** 1 ♀, 10 Apr-26 Apr 2002. **Andrews Bald MT11:** 1 ♀, 01 Feb-16 Mar 2001; 1 ♂, 24 Apr-10 May 2001; 1 ♀, 28 Mar-14 Apr 2002. **Andrews Bald MT12:** 4 ♀♀, 16 Mar-24 Apr 2001; 1 ♂, 24 Apr-10 May 2001. **Brushy Mountain MT13:** 1 ♂, 11 Apr-26 Apr 2001; 1 ♂, 27 Oct-10 Nov 2001; 1 ♂, 07 Dec-19 Dec 2001. **Clingmans Dome MT15:** 1 ♂ 1 ♀, 29 Mar-24 Apr 2001; 1 ♀, 24 Apr-10 May 2001; 1 ♀, 08 Nov-24 Nov 2001. **Clingmans Dome MT16:** 2 ♂♂ 1 ♀, 29 Mar-24 Apr 2001; 1 ♂ 2 ♀, 24 May-06 Jun 2001; 1 ♀, 15 Mar-28 Mar 2002; 1 ♀, 14 Apr-24 Apr 2002. **Albright Grove MT17:** 1 ♀, 15 Mar-25 Apr 2001; 1 ♂, 25 Apr-09 May 2001; 2 ♀♀, 16 Oct-06 Nov 2001. **Snakeden Ridge MT20:** 1 ♀, 03 Apr-25 Apr 2001. **Goshen Prong MT21:** 1 ♂, 10 Nov-28 Nov 2000; 1 ♂, 05 Dec-18 Dec 2001. **Goshen Prong MT22:** 1 ♂, 10 Nov-28 Nov 2000; 1 ♂, 12 Nov-05 Dec 2001.

Trimicra pilipes (Fabricius) (n= 1)

Cades Cove MT04: 1 ♂, 23 Apr-08 May 2001.

Ulomorpha pilosella (Osten Sacken) (n= 17)

Twin Creeks MT01: 1 ♀, 06 Jul-16 Jul 2001. **Indian Gap MT05:** 1 ♂, 07 Jun-21 Jun 2001. **Andrews Bald MT12:** 1 ♂, 06 Jun-22 Jun 2001; 1 ♂, 17 Jul-31 Jul 2001; 2 ♀♀, 31 Jul-16 Aug 2001; 1 ♀, 16 Aug-29 Aug 2001; 2 ♀♀, 16 Jun-03 Jul 2002; 2 ♂♂, 19 Aug-11 Sep 2002; 4 ♀♀, 11 Sep-11 Oct 2002. **Brushy Mountain MT14:** 1 ♂, 03 Jun-18 Jun 2002. **Snakeden Ridge MT19:** 1 ♀, 04 Jul-16 Jul 2001.

Ulomorpha rogersella Alexander (n= 3)

Andrews Bald MT12: 1 ♂ 2 ♀♀, 16 Jun-03 Jul 2002.

Pedicidae

Dicranota (Paradicranota) eucera Alexander (n= 1)

Cades Cove MT03: 1 ♀, 28 Mar-08 Apr 2001.

Dicranota (Rhaphidolabina) flaveola (Osten Sacken) (n= 1)

Clingmans Dome MT15: 1 ♂, 06 Jun-25 Jun 2001.

Pedicia (Pedicia) albivitta Walker (n=7)

Twin Creeks MT01: 1 ♂, 08 Oct-15 Oct 2001; 2 ♂♂ 1 ♀, 10 Sep-30 Sep 2002. **Albright Grove MT17:** 1 ♀, 18 Oct-14 Nov 2000. **Snakeden Ridge MT19:** 1 ♂, 27 Sep-16 Oct 2001. **Goshen Prong MT21:** 1 ♀, 27 Aug-17 Sep 2001.

Pedicia (Pedicia) margarita Alexander (n= 6)

Indian Gap MT05: 1 ♀, 19 Jun-03 Jul 2002. **Purchase Knob MT08:** 1 ♀, 20 Aug-11 Sep 2001. **Andrews Bald MT12:** 1 ♂, 10 May-19 Jun 2002. **Albright Grove MT18:** 1 ♀, 27 Sep-16 Oct 2001. **Goshen Prong MT21:** 1 ♀, 21 May-07 Jun 2001; 1 ♂, 13 Aug-27 Aug 2001.

Tricyphona (Pentacyphona) autumnalis Alexander (n= 3)

Clingmans Dome MT16: 1 ♂, 16 Aug-26 Aug 2001; 2 ♂♂, 01 Aug-30 Aug 2002.

Tricyphona (Pentacyphona) huffae (Alexander) (n= 9)

Andrews Bald MT11: 1 ♀, 29 Aug-26 Sep 2001. **Andrews Bald MT12:** 2 ♀♀, 16 Aug-29 Aug 2001. **Clingmans Dome MT15:** 1 ♂, 31 Jul-16 Aug 2001; 2 ♀♀, 16 Aug-29 Aug 2001. **Clingmans Dome MT16:** 2 ♀♀, 31 Jul-16 Aug 2001; 1 ♀, 16 Aug-29 Aug 2001.

Tricyphona (Tricyphona) auripennis (Osten Sacken) (n= 4)

Clingmans Dome MT15: 1 ♀, 06 Jun-25 Jun 2001; 1 ♂, 25 Jun-03 Jul 2001. **Clingmans Dome MT16:** 1 ♀, 24 May-06 Jun 2001; 1 ♂, 06 Jun-25 Jun 2001.

Tricyphona (Tricyphona) gigantea (Alexander) (n= 5)

Andrews Bald MT12: 1 ♂, 06 Jun-22 Jun 2001; 1 ♂, 10 May-19 Jun 2002. **Albright Grove MT18:** 1 ♂, 22 May-08 Jun 2001. **Goshen Prong MT21:** 1 ♂, 21 May-07 Jun 2001; 1 ♂, 09 May-23 May 2002.

Tricyphona (Tricyphona) inconstans (Osten Sacken) (n= 48)

Twin Creeks MT01: 1 ♀, 27 Sep-08 Oct 2001. **Purchase Knob MT08:** 1 ♀, 20 Aug-11 Sep 2001. **Andrews Bald MT11:** 1 ♂, 10 May-24 May 2001. **Andrews Bald MT12:** 1 ♂, 10 May-24 May 2001; 2 ♂♂, 24 May-06 Jun 2001; 1 ♂ 2 ♀♀, 06 Jun-22 Jun 2001; 2 ♂♂ 1 ♀, 22 Jun-03 Jul 2001; 14 ♂♂ 15 ♀♀, 10 May-19 Jun 2002; 3 ♀♀, 03 Jul-18 Jul 2002; 2 ♀♀, 19 Aug-11 Sep 2002. **Clingmans Dome MT15:** 1 ♂, 06 Jun-25 Jun 2001; 1 ♂, 25 Jun-03 Jul 2001.

Tricyphona (Tricyphona) katahdin Alexander (n= 1)

Goshen Prong MT21: 1 ♂, 20 Jun-09 Jul 2002.

Tricyphona (Tricyphona) vernalis (Osten Sacken) (n= 3)

Twin Creeks MT01: 1 ♂, 21 Jun-06 Jul 2001. **Twin Creeks MT02:** 1 ♀, 30 May-21 Jun 2002. **Goshen Prong MT21:** 1 ♂, 20 Jun-09 Jul 2002.

Ula (Ula) elegans Osten Sacken (n= 70)

Twin Creeks MT01: 1 ♂, 08 Oct-15 Oct 2001. **Twin Creeks MT02:** 1 ♀, 15 Oct-05 Nov 2001; 1 ♀, 31 Jul-15 Aug 2002. **Indian Gap MT06:** 1 ♀, 17 Jul-02 Aug 2001; 1 ♂, 16 Aug-03 Sep2001; 4 ♂♂ 11 ♀♀, 26 Sep-24 Oct 2001. **Purchase Knob MT07:** 1 ♀, 19 Jul-02 Aug 2001; 1 ♀, 30 Jul-20 Aug 2002. **Purchase Knob MT08:** 1 ♀, 20 Aug-11 Sep 2001; 2 ♀♀, 11 Sep-10 Oct 2001. **Cataloochee MT09:** 1 ♀, 02 Aug-20 Aug 2001; 1 ♀, 26 Oct-21 Nov 2001. **Cataloochee MT10:** 2 ♀♀, 11 Sep-10 Oct 2001; 1 ♀, 10 Oct-26 Oct 2001. **Andrews Bald MT11:** 1 ♀, 16 Aug-29 Aug 2001. **Andrews Bald MT12:** 1 ♀, 24 Oct-08 Nov 2001. **Brushy Mountain MT13:** 1 ♀, 13 Oct-27 Oct. **Brushy Mountain MT14:** 1 ♀, 04 Sep-28 Sep 2001. **Albright Grove MT17:** 1 ♂ 3 ♀♀, 16 Oct-14 Nov 2000; 1 ♀, 14 Aug-13 Sep 2002. **Albright Grove MT18:** 1 ♀, 14 Aug-10 Sep 2001; 2 ♀♀, 10 Sep-27 Sep 2001; 1 ♀, 16 Oct-06 Nov 2001. **Snakeden Ridge MT19:** 1 ♀, 17 Oct-07 Nov 2000; 2 ♀♀, 16 Jul-01 Aug 2001; 4 ♀♀, 10 Sep-27 Sep 2001; 2 ♂♂ 5

♀♀, 16 Oct-06 Nov 2001. **Snakeden Ridge MT20:** 1 ♀, 10 Sep-27 Sep 2001. **Goshen Prong MT21:** 1 ♀, 17 Sep-22 Oct 2001; 1 ♀, 19 Aug-10 Sep 2002. **Goshen Prong MT22:** 1 ♂ 4 ♀♀, 17 Sep-22 Oct 2001; 1 ♀, 22 Oct-05 Nov 2001; 1 ♂, 12 Nov-05 Dec 2001; 2 ♂♂, 01 Apr-11 Apr 2002.

Ula (Ula) paupera Osten Sacken (n= 64)

Twin Creeks MT01: 1 ♀, 12 Mar-27 Mar 2001. **Twin Creeks MT02:** 1 ♀, 12 Oct-24 Oct 2000; 1 ♀ 2 ♂, 08 Oct-15 Oct 2001. **Indian Gap MT05:** 3 ♀♀, 26 Sep-24 Oct 2001. **Indian Gap MT06:** 1 ♂ 2 ♀♀, 03 Sep-26 Sep 2001; 5 ♂♂ 1 ♀, 28 Mar-14 Apr 2002; 2 ♂♂, 14 Apr-27 Apr 2002. **Purchase Knob MT07:** 1 ♂, 10 Oct-19 Oct 2001; 1 ♂, 30 Jul-20 Aug 2002. **Cataloochee MT10:** 1 ♀, 11 Sep-10 Oct 2001; 1 ♂, 10 Oct-18 Oct 2001. **Andrews Bald MT12:** 4 ♂♂, 26 Sep-09 Oct 2001. **Brushy Mountain MT13:** 1 ♀, 11 Apr-30 Apr 2002. **Clingmans Dome MT15:** 1 ♀, 18 Jul-01 Aug 2002. **Clingmans Dome MT16:** 1 ♂, 10 May-19 Jun 2002. **Albright Grove MT17:** 1 ♂ 2 ♀♀, 18 Oct-14 Nov 2000; 1 ♀, 15 Mar-25 Apr 2001; 1 ♂, 16 Oct-06 Nov 2001; 1 ♂, 29 Mar-14 Apr 2002. **Albright Grove MT18:** 3 ♂♂, 27 Sep-16 Oct 2001; 1 ♂ 2 ♀♀, 29 Mar-14 Apr 2002. **Snakeden Ridge MT19:** 2 ♀, 17 Oct-07 Nov 2000; 1 ♂, 14 Aug-10 Sep 2001; 1 ♂, 16 Oct-06 Nov 2001. **Snakeden Ridge MT20:** 1 ♂ 1 ♀, 17 Oct-07 Nov 2000; 1 ♂, 10 Sep-27 Sep 2001; 3 ♀♀, 27 Sep-16 Oct 2001. **Goshen Prong MT21:** 1 ♀, 27 Aug-17 Sep 2001. **Goshen Prong MT22:** 1 ♂ 1 ♀, 25 Oct-10 Nov 2000; 1 ♂, 13 Mar-28 Mar 2001; 2 ♂♂, 28 Mar-09 Apr 2001; 1 ♀, 22 Oct-05 Nov 2001; 5 ♂♂ 1 ♀, 01 Apr-11 Apr 2002.

Ptychopteridae

Ptychoptera rutocincta Meigen (n= 1)

Snakeden Ridge MT19: 1 ♀, 02 Jul-17 Jul 2002.

Tipulidae

Brachypremna dispellens (Walker) (n= 1)

Twin Creeks MT02: 1 ♀, 21 Jun-02 Jul 2002.

Ctenophora (Ctenophora) apicata Osten Sacken (n= 5)

Purchase Knob MT07: 1 ♂ 1 ♀, 19 Jul-02 Aug 2001; 1 ♀, 30 Jul-20 Aug 2002. **Albright Grove MT18:** 1 ♀, 01 Aug-14 Aug 2001. **Albright Grove MT18:** 1 ♀, 01 Aug-14 Aug 2001.

Ctenophora (Ctenophora) nubecula Osten Sacken (n= 1)

Snakeden Ridge: 1 ♂ 1 ♀, 06 May-05 Jun 2002. **Goshen Prong MT22:** 1 ♀, 18 Jun-02 Jul 2001.

Dolichopeza (Dolichopeza) americana Needham (n= 4)

Twin Creeks MT02: 1 ♂, 30 May-21 Jun 2002. **Indian Gap MT05:** 1 ♂, 07 Jun-21 Jun 2001. **Clingmans Dome MT16:** 1 ♂ 1 ♀, 03 Jul-17 Jul 2001.

Dolichopeza (Oropeza) johnsonella (Alexander) (n= 2)

Indian Gap MT06: 1 ♂, 21 Jun-05 Jul 2001. **Clingmans Dome MT16:** 1 ♂, 17 Jul-31 Jul 2001.

Dolichopeza (Oropeza) obscura (Johnson) (n= 2)

Clingmans Dome MT15: 1 ♂, 19 Jun-18 Jul 2002. **Clingmans Dome MT16:** 1 ♂, 25 Jun-03 Jul 2001.

Dolichopeza (Oropeza) subalbipes (Johnson) (n= 2)

Twin Creeks MT02: 1 ♀, 13 Aug-27 Aug 2001. **Twin Creeks MT02:** 1 ♀, 23 May-05 Jun 2001.

Leptotarsus (Longurio) minimus (Alexander) (n= 9)

Andrews Bald MT12: 1 ♂, 06 Jun-22 Jun 2001; 3 ♂♂, 16 Aug-29 Aug 2001; 1 ♂ 1 ♀, 10 May-19 Jun 2002; 3 ♂♂, 19 Aug-11 Sep 2002.

Nephrotoma eucera (Loew) (n= 1)

Twin Creeks MT01: 1 ♂, 30 May-21 Jun 2002.

Nephrotoma cingulata (Dietz) (n= 54)

Twin Creeks MT01: 1 ♂, 08 Apr-25 Apr 2002. **Twin Creeks MT02:** 1 ♂ 2 ♀♀, 08 Apr-25 Apr 2002. **Cades Cove MT03:** 1 ♀, 08 May-21 May 2001; 4 ♂♂, 26 Apr-09 May 2002; 4 ♂♂, 04 Jul-15 Jul 2002; 2 ♂♂, 15 Jul-29 Jul 2002; 3 ♂♂, 29 Jul-12 Aug 2002; 1 ♂, 12 Aug-26 Aug 2002; 2 ♂♂, 26 Aug-23 Sep 2002; 2 ♂♂, 23 Sep-07 Oct 2002; 1 ♂, 23 Sep-21 Oct 2002. **Cades Cove MT04:** 1 ♂, 16 Jul-30 Jul 2001; 1 ♂ 1 ♀, 08 Oct-21 Oct 2001; 7 ♂♂, 26 Apr-09 May 2002; 1 ♂, 09 May-03 Jun 2002; 1 ♂ 1 ♀, 01 Jul-15 Jul 2002; 1 ♀, 29 Jul-12 Aug 2002; 4 ♂♂ 1 ♀, 26 Aug-23 Sep 2002; 5 ♂♂, 23 Sep-07 Oct 2002; 3 ♂♂ 1 ♀, 07 Oct-23 Oct 2002. **Albright Grove MT18:** 1 ♂, 14 Apr-29 Apr 2002. **Snakeden Ridge MT20:** 1 ♂, 02 Jul-01 Aug 2002.

Nephrotoma gnata (Dietz) (n= 4)

Twin Creeks MT01: 1 ♂, 13 Aug-27 Aug 2001. **Cades Cove MT04:** 2 ♀, 23 Apr-08 May 2001; 1 ♀, 16 Jul-30 Jul 2001.

Nephrotoma macrocera (Say) (n= 2)

Cades Cove MT03: 2 ♂♂, 09 May-03 Jun 2002.

Nephrotoma subalterna Oosterbroek (n= 1)

Cades Cove MT03: 1 ♂, 04 Jun-18 Jun 2001.

Nephrotoma virescens (Loew) (n= 49)

Twin Creeks MT01: 1 ♀, 21 Jun-06 Jul 2001; 1 ♀, 16 Jul-30 Jul 2001; 1 ♀, 13 Aug-27 2001; 1 ♂, 30 May-21 Jun 2002; 3 ♀♀, 16 Jul-31 Jul 2002. **Twin Creeks MT02:** 4 ♂♂, 23 May-05 Jun 2001; 1 ♀ 3 ♂, 05 Jun-21 Jun 2001; 1 ♂ 2 ♀♀, 21 Jun-06 Jul 2001; 1 ♂, 06 Jun-16 Jun 2001; 2 ♀♀, 16 Jun-30 Jun 2001; 3 ♂♂ 2 ♀♀, 30 May-21 Jun 2002; 4 ♂♂ 2 ♀♀, 21 Jun-02 Jul 2002. **Cataloochee MT09:** 2 ♀♀, 02 Aug-20 Aug 2001. **Cataloochee MT10:** 3 ♀♀, 08 Jun-05 Jul 2001. **Brushy Mountain MT13:** 1 ♂, 21 Jun-05 Jul 2001. **Albright Grove MT18:** 1 ♂ 5 ♀♀, 15 Jun-05 Jul 2002; 4 ♀♀, 05 Jul-20 Jul 2002. **Goshen Prong MT21:** 1 ♂, 13 Aug-27 Aug 2001.

Tanyptera (Tanyptera) dorsalis (Walker) (n= 425)

Twin Creeks MT01: 30 ♂♂ 5 ♀♀, 26 Apr-15 May 2001; 13 ♂♂ 5 ♀♀, 15 May-23 May 2001; 1 ♂, 23 May-05 Jun 2001; 41 ♂♂ 3 ♀♀, 25 Apr-06 May 2002; 31 ♂♂ 6 ♀♀, 06 May-30 May 2002. **Twin Creeks MT02:** 11 ♂♂ 2 ♀♀, 26 Apr-15 May 2001; 3 ♀♀, 15 May-23 May 2001; 13 ♂♂ 2 ♀♀, 25 Apr-06 May 2002; 13 ♂♂ 2 ♀♀, 06 May-30 May 2002. **Indian Gap MT05:** 3 ♀♀, 10 May-28 May 2001; 2 ♂♂ 2 ♀♀, 28 May-07 Jun 2001. **Indian Gap MT06:** 2 ♀♀, 28 May-07 Jun 2001. **Purchase Knob MT07:** 12 ♂♂ 6 ♀♀, 15 May-08 Jun 2001. **Purchase Knob MT08:** 13 ♂♂ 4 ♀♀, 15 May-08 Jun 2001; 1 ♂, 26 Apr-08 May 2002. **Cataloochee MT09:** 2 ♂♂, 15 May-08 Jun 2001; 3 ♂♂, 08 May-04 Jun 2002. **Cataloochee MT10:** 2 ♂♂ 4 ♀♀, 15 May-08 Jun 2001; 2 ♀♀, 08 Jun-05 Jul 2001. **Andrews Bald MT12:** 1 ♀, 06 Jun-22 Jun 2001; 1 ♂, 22 Jun-03 Jul 2001. **Brushy Mountain MT13:** 1 ♀, 23 May-05 Jun 2001; 1 ♀, 05 Jun-21 Jun 2001; 1 ♀ , 12 May-03 Jun 2002. **Brushy Mountain MT14:** 5 ♂♂ 2 ♀♀, 21 May-05 Jun 2001. **Clingmans Dome MT16:** 1 ♂ 1 ♀, 10 May-19 Jun 2002. **Albright Grove MT17:** 6 ♂♂ 5 ♀♀, 09 May-22 May 2001; 1 ♂ 6 ♀♀, 12 May-15 Jun 2002. **Albright Grove MT18:** 10 ♂♂ 13 ♀♀, 09 May-22 May 2001; 1 ♂ 6 ♀♀, 22 May-08 Jun 2001; 1 ♂ 1 ♀, 06 May-12 May 2002; 1 ♂ 7 ♀♀, 12 May-15 Jun 2002. **Snakeden Ridge MT19:** 14 ♂♂ 8 ♀♀, 09 May-22 May 2001; 1 ♂ 2 ♀♀, 06 Apr-06 May 2002; 9 ♂♂ 6 ♀♀, 06 May-05 Jun 2002; 1 ♀, 05 Jun-21 Jun 2002. **Snakeden Ridge MT20:** 4 ♂♂ 5 ♀♀, 09 May-22 May 2001; 2 ♀♀, 22 May-04 Jun 2001; 1 ♂ 1 ♀, 06 May-05 Jun

2002; 1 ♂, 05 Jun 21 Jun 2002. **Goshen Prong MT21:** 10 ♂♂ 2 ♀♀, 08 May-21 May 2001; 6 ♂♂ 4 ♀♀, 21 May-07 Jun 2001; 2 ♂♂, 25 Apr-09 May 2002; 2 ♂♂ 1 ♀, 09 May-23 May 2002. **Goshen Prong MT22:** 1 ♂, 27 Apr-08 May 2001; 11 ♂♂ 3 ♀♀, 08 May-21 May 2001; 5 ♂♂ 4 ♀♀, 21 May-07 Jun 2001; 5 ♂♂ 3 ♀♀, 25 Apr-09 May 2002; 3 ♂♂, 09 May-23 May 2002.

Tipula (Linderina) illinoiensis Alexander (n= 65)

Twin Creeks MT01: 2 ♂♂, 26 Apr-15 May 2001; 3 ♂♂, 1 ♀, 25 Apr-06 May 2002. **Twin Creeks MT02:** 2 ♂♂, 26 Apr-15 May 2001; 2 ♂♂, 25 Apr-06 May 2002; 1 ♂ 2 ♀♀, 06 May-30 May 2002. **Indian Gap MT05:** 2 ♀♀, 10 May-28 May 2001. **Purchase Knob MT07:** 1 ♂, 23 Apr-15 May 2001; 3 ♂♂, 15 May-08 Jun 2001. **Purchase Knob MT08:** 2 ♂♂ 1 ♀, 15 May-08 Jun 2001. **Cataloochee MT09:** 1 ♂, 15 May-08 Jun 2001. **Goshen Prong MT21:** 1 ♂, 27 Apr-08 May 2001; 4 ♂♂, 08 May-21 May 2001; 10 ♂♂ 1 ♀, 25 Apr-09 May 2002. **Goshen Prong MT22:** 2 ♂♂, 08 May-21 May 2001; 13 ♂♂ 2 ♀♀, 09 May-23 May 2002.

Tipula (Linderina) senega Alexander (n= 5)

Purchase Knob MT08: 1 ♂, 26 Apr-08 May 2002. **Albright Grove MT17:** 1 ♂, 29 Apr-06 May 2002; 1 ♂ 1 ♀, 06 May-12 May 2002. **Albright Grove MT18:** 1 ♂, 06 May-12 May 2002.

Tipula (Lunatipula) apicalis Loew (n= 2)

Albright Grove MT18: 1 ♂ 1 ♀, 09 May-22 May 2001.

Tipula (Lunatipula) atreia Petersen and Gelhaus (n= 1)

Cades Cove MT03: 1 ♂, 09 Apr-23 Apr 2001.

Tipula (Lunatipula) duplex Walker (n= 53)

Twin Creeks MT01: 1 ♂, 16 Jul-31 Jul 2002. **Twin Creeks MT02:** 1 ♂, 05 Jun-21 Jun 2001; 5 ♂♂, 21 Jun-06 Jul 2001; 1 ♂, 06 Jul-16 Jul 2001; 3 ♂♂ 1 ♀, 16 Jul-30 Jul 2001; 2 ♂♂, 30 Jul-13 Aug 2001; 3 ♂♂, 30 May-21 Jun 2002. **Indian Gap MT05:** 1 ♂, 17 Jul-02 Aug 2001; 1 ♂, 18 Jul-01 Aug 2002; 1 ♂, 01 Aug-30 Aug 2002. **Purchase Knob MT07:** 1 ♂, 02 Aug-20 Aug 2001. **Purchase Knob MT08:** 1 ♂ 1 ♀, 19 Jul-02 Aug 2001. **Cataloochee MT09:** 1 ♂ 1 ♀, 02 Aug-20 Aug 2001; 1 ♀, 20 Aug-11 Sep 2001. **Cataloochee MT10:** 1 ♂, 20 Aug-11 Sep 2001; 1 ♂ 1 ♀, 17 Jul-20 Aug 2002. **Albright Grove MT17:** 1 ♂, 19 Jun-06 Jul 2001. **Albright Grove MT18:** 1 ♂, 09 May-22 May 2001; 1 ♂ 1 ♀, 15 Jun-05 Jul 2002; 5 ♂♂ 1 ♀, 05 Jul-20 Jul 2002. **Goshen Prong MT21:** 1 ♂, 02 Jul-17 Jul 2001; 1 ♀, 17 Jul-30 Jul 2001; 3 ♂♂, 30 Jul-13 Aug 2001; 1 ♂, 20 Jun-09 Jul 2002. **Goshen Prong MT22:** 2 ♂♂ 2 ♀♀, 02 Jul-17 Jul 2001; 2 ♂♂ 1 ♀, 17 Jul-30 Jul 2001; 1 ♀, 30 Jul-13 Aug 2001.

Tipula (Lunatipula) flavibasis Alexander (n= 24)

Twin Creeks MT02: 7 ♂♂, 30 Jul-13 Aug 2001; 4 ♂♂ 3 ♀♀, 13 Aug-27 Aug 2001; 1 ♂, 27 Aug-10 Sep 2001. **Purchase Knob MT08:** 1 ♂ 1 ♀, 02 Aug-20 Aug 2001. **Goshen Prong MT21:** 4 ♂♂ 3 ♀♀, 27 Aug-17 Sep 2001.

Tipula (Lunatipula) fuliginosa (Say) (n= 2)

Goshen Prong MT22: 1 ♂ 1 ♀, 08 May-21 May 2001.

Tipula (Lunatipula) monticola Alexander (n= 3)

Purchase Knob MT08: 1 ♂, 26 Apr-08 May 2002. **Cataloochee MT09:** 1 ♂, 15 May-08 Jun 2001. **Andrews Bald MT12:** 1 ♂, 06 Jun-22 Jun 2001.

Tipula (Lunatipula) submaculata Loew (n= 1)

Albright Grove MT18: 1 ♂, 05 Jul-20 Jul 2002.

Tipula (Nobilotipula) collaris Say (n= 2)

Andrews Bald MT12: 1 ♀, 10 May-24 May 2001. **Albright Grove MT18:** 1 ♂, 09 May-22 May 2001.

Tipula (Nobilotipula) nobilis (Loew) (n= 3)

Andrews Bald MT12: 1 ♂, 10 May-19 Jun 2002. **Purchase Knob MT08:** 1 ♂, 15 May-08 Jun 2001. **Goshen Prong MT21:** 1 ♂, 21 May-07 Jun 2001.

Tipula (Pterelachisus) angulata Loew (n=1)

Cataloochee MT10: 1 ♂, 08 Jun-05 Jul 2001.

Tipula (Pterelachisus) coleana Alexander (n= 3)

Clingmans Dome MT15: 1 ♂ 1 ♀, 17 Jul-31 Jul 2001. **Clingmans Dome MT16:** 1 ♀, 17 Jul-31 Jul 2001.

Tipula (Pterelachisus) entomophthorae Alexander (n= 2)

Brushy Mountain MT14: 1 ♂ 1 ♀, 12 May-24 May 2002.

Tipula (Pterelachisus) penobscot Alexander (n= 1)

Andrews Bald MT12: 1 ♂, 10 May-19 Jun 2002.

Tipula (Pterelachisus) trivitatta Say (n= 28)

Twin Creeks MT01: 1 ♂, 26 Apr-15 May 2001; 1 ♂1 ♀, 25 Apr-06 May 2002; 1 ♂ 1 ♀, 06 May-30 May 2002. **Twin Creeks MT02:** 1 ♂ 1 ♀, 26 Apr-15 May 2001; 2 ♂♂, 15 May-23 May 2001; 3 ♂♂ 1 ♀, 08 Apr-25 Apr 2002; 2 ♂♂, 25 Apr-06 May 2002. **Indian Gap MT05:** 2 ♂♂, 10 May-28 May 2001. **Purchase Knob MT07:** 1 ♂, 15 May-08 Jun 2001. **Andrews Bald MT12:** 1 ♂, 24 May-06 Jun 2001. **Brushy Mountain MT14:** 1 ♂, 30 Jun-16 Jul 2002. **Albright Grove MT17:** 1 ♂, 08 Jun-19 Jun 2001. **Albright Grove MT18:** 1 ♂ 1 ♀, 09 May-22 May 2001; 1 ♂ 1 ♀, 22 May-08 Jun 2001. **Snakeden Ridge MT19:** 1 ♂, 09 May-22 May 2001.

Tipula (Savtshenkia) fragilis Loew (n= 1)

Clingmans Dome MT15: 1 ♂, 29 Aug-26 Sep 2001.

Tipula (Savtshenkia) ignobilis Loew (n= 8)

Andrews Bald MT12: 1 ♂ 4 ♀♀, 10 May-19 Jun 2002. **Brushy Mountain MT13:** 1 ♂ 1 ♀, 21 Jul-05 Aug 2001. **Brushy Mountain MT14:** 1 ♂, 21 Jul-05 Aug 2001.

Tipula (Schummelia) friendi Alexander (n= 6)

Clingmans Dome MT16: 1 ♂, 25 Jun-03 Jul 2001. **Albright Grove MT17:** 1 ♂, 12 May-15 Jun 2002. **Snakeden Ridge MT19:** 3 ♂♂, 06 May-05 Jun 2002. **Snakeden Ridge MT20:** 1 ♂, 06 May-05 Jun 2002.

Tipula (Schummelia) hermannia Alexander (n= 14)

Twin Creeks MT01: 2 ♂♂, 31 Jul-15 Aug 2002; 1 ♂, 26 Aug-10 Sep 2002. **Snakeden Ridge MT19:** 1 ♂ 2 ♀♀, 16 Jul-14 Aug 2001; 1 ♂ 2 ♀♀, 14 Aug-10 Sep 2001; 1 ♂ 1 ♀, 17 Jul-01 Aug 2002; 1 ♂, 30 Aug-13 Sep 2002. **Snakeden Ridge MT20:** 1 ♂ 1 ♀, 02 Jul-01 Aug 2002.

Tipula (Schummelia) stenorhabda Alexander (n= 1)

Indian Gap MT05: 1 ♂, 01 Aug-30 Aug 2002.

Tipula (Schummelia) stonei Alexander (n= 26)

Twin Creeks MT01: 1 ♂ 2 ♀♀, 13 Aug-27 Aug 2001; 1 ♂ 6 ♀♀, 27 Aug-10 Sep 2001; 1 ♂ 1 ♀, 27 Sep-08 Aug 2002; 1 ♂ 2 ♀♀, 15 Aug-26 Aug 2002; 1 ♂ 1 ♀, 10 Sep-30 Sep 2002. **Twin**

Creeks MT02: 1 ♂, 06 Jul-16 Jul 2001; 1 ♂ 2 ♀♀, 13 Aug-27 Aug 2001; 4 ♀♀, 27 Aug-10 Sep 2001.**Indian Gap MT05:** 1 ♂, 16 Aug-03 Sep 2001.

Tipula (Trichotipula) algonquin Alexander (n= 3)
Twin Creeks MT02: 1 ♂ 2 ♀♀, 15 Aug-26 Aug 2002.

Tipula (Trichotipula) oropezoides Johnson (n= 5)
Andrews Bald MT12: 1 ♂, 10 May-24 May 2001; 2 ♂♂, 24 May-06 Jun 2001; 1 ♂ 1 ♀, 10 May-19 Jun 2002.

Tipula (Trichotipula) unimaculata (n= 1)
Purchase Knob MT07: 1 ♂, 30 Jul-20 Aug 2002.

Tipula (Triplicitipula) integra Alexander (n= 1)
Brushy Mountain MT13: 1 ♂, 14 May-23 May 2001.

Tipula (Triplicitipula) triplex Walker (n= 13)
Twin Creeks MT02: 1 ♂, 26 Apr-15 May 2001. **Cades Cove MT03:** 3 ♂♂, 26 Apr-09 May 2002. **Cades Cove MT04:** 1 ♂ 1 ♀, 08 May-21 May 2001; 1 ♂ 1 ♀, 26 Apr-09 May 2002; 3 ♂♂, 09 May-03 Jun 2002. **Andrews Bald MT11:** 1 ♂, 10 May-24 May 2001. **Albright Grove MT18:** 1 ♂, 09 May-22 May 2001.

Tipula (Triplicitipula) umbrosa Loew (n= 4)
Cades Cove MT03: 1 ♂1 ♀, 21 May-04 Jun 2001. **Cades Cove MT04:** 1 ♂, 21 May-04 Jun 2001. **Snakeden Ridge MT19:** 1 ♂, 03 Apr-25 Apr 2001.

Tipula (Vestiplex) longiventris Loew (n= 50)
Twin Creeks MT01: 2 ♂♂ 1 ♀, 26 Apr-15 May 2001; 4 ♂♂ 6 ♀♀, 15 May-23 May 2001; 1 ♀, 23 May-05 Jun 2001; 1 ♂, 08 Apr-25 Apr 2002; 3 ♂♂ 1 ♀, 25 Apr-06 May 2002; 1 ♂, 06 May-30 May 2002. **Twin Creeks MT02:** 6 ♂♂ 2 ♀♀, 26 Apr-15 May 2001; 3 ♂♂ 1 ♀, 15 May-23 May 2001; 1 ♂, 23 May-05 Jun 2001; 4 ♂♂ 1 ♀, 25 Apr-06 May 2002; 3 ♂♂ 3 ♀♀, 06 May-30 May 2002. **Indian Gap MT05:** 2 ♂♂ 1 ♀, 10 May-28 May 2001. **Brushy Mountain MT13:** 2 ♂♂, 30 Apr-12 May 2002. **Albright Grove MT18:** 1 ♂, 06 May-12 May 2002.

Tipula (Yamatotipula) aprilina Alexander (n= 2)
Cades Cove MT03: 1 ♂, 09 Apr-23 Apr 2001. **Cades Cove MT04:** 1 ♂, 28 Mar-09 Apr 2001.

Tipula (Yamatotipula) furca Walker (n= 1)
Cades Cove MT03: 1 ♂, 09 Apr-23 Apr 2001.

Tipula (Yamatotipula) iroquois Alexander (n= 1)
Andrews Bald MT11: 1 ♀, 06 Jun-22 Jun 2001.

Tipula (Yamatotipula) tephrocephala Loew (n= 10)
Andrews Bald MT12: 2 ♂♂ 8 ♀♀, 10 May-19 Jun 2002.

Tipula (Yamatotipula) tricolor Fabricius (n= 1)
Cades Cove MT04: 1 ♂, 27 Aug-10 Sep 2001.

Trichoceridae

Trichocera bimaculata Walker (n= 13)
Twin Creeks MT01: 2 ♂ 2 ♀♀, 05 Nov-05 Dec 2001. **Cades Cove MT04:** 1 ♂, 14 Feb-26 Feb 2001. **Indian Gap MT06:** 1 ♂, 18 Oct-10 Nov 2000. **Cataloochee MT10:** 2 ♂♂ 1 ♀, 19 Oct-15

Nov 2000. **Andrews Bald MT12:** 1 ♂, 20 Oct-13 Nov 2000. **Brushy Mountain MT14:** 1 ♂, 23 Oct-06 Nov 2000. **Clingmans Dome MT16:** 1 ♂, 18 Oct-13 Nov 2000. **Goshen Prong MT21:** 1 ♂, 25 Oct-10 Nov 2000.

Trichocera brevicornis Alexander (n= 413)

Twin Creeks MT01: 1 ♂, 16 Jan-29 Jan 2001; 5 ♂♂, 29 Jan-12 Feb 2001. **Twin Creeks MT02:** 1 ♂, 16 Jan-29 Jan 2001; 1 ♂, 12 Feb-27 Feb 2001. **Indian Gap MT05:** 1 ♀, 18 Oct-10 Nov 2000; 3 ♂♂, 17 Jan-01 Feb 2001; 8 ♂♂, 20 Feb-16 Mar 2001; 5 ♂♂, 16 Mar-29 Mar 2001; 1 ♂, 28 Mar-14 Apr 2002. **Indian Gap MT06:** 1 ♂, 24 Oct-08 Nov 2001; 12 ♂♂ 7 ♀♀, 24 Nov-18 Dec 2001; 1 ♂, 28 Mar-14 Apr 2002. **Purchase Knob MT07:** 1 ♂, 17 Oct-30 Nov 2000; 1 ♂, 01 Mar-26 Mar 2001. **Purchase Knob MT08:** 2 ♂♂, 13 Feb-01 Mar 2001. **Cataloochee MT09:** 2 ♂♂, 15 Nov-30 Nov 2000; 9 ♂♂, 15 Dec 2000-18 Jan 2001; 8 ♂♂, 18 Jan-13 Feb 2001; 6 ♂♂, 13 Feb-01 Mar 2001; 4 ♂♂, 01 Mar-26 Mar 2001; 4 ♂♂, 21 Dec 2001-15 Jan 2002; 1 ♂ 4 ♀♀ 31 Jan-14 Feb 2002; 1 ♂ 1 ♀, 27 Mar-10 Apr 2002. **Cataloochee MT10:** 1 ♂, 15 Dec 2000-18 Jan 2001; 1 ♂, 13 Feb-01 Mar 2001; 1 ♂, 01 Mar-26 Mar 2001; 1 ♂, 20 Dec 2001-15 Jan 2002; 1 ♂, 15 Jan-28 Jan 2002; 1 ♂, 07 Mar-27 Mar 2002. **Andrews Bald MT11:** 1 ♂, 20 Oct-13 Nov 2000; 6 ♂, 14 Dec2000-01 Feb 2001. **Andrews Bald MT12:** 2 ♂♂, 20 Oct-13 Nov 2000; 2 ♂♂, 29 Nov-14 Dec 2000; 1 ♂, 24 Oct-08 Nov 2001; 2 ♂♂, 11 Sep-11 Oct 2002. **Brushy Mountain MT13:** 14 ♂♂, 06 Nov-27 Nov 2000; 4 ♂♂, 27 Nov-12 Dec 2000; 4 ♂♂, 12 Dec 2000-16 Jan 2001; 3 ♂♂, 16 Jan-29 Jan 2001; 4 ♂♂, 29 Jan-14 Feb 2001; 4 ♂♂, 12 Feb-27 Feb 2001; 5 ♂♂, 27 Feb-12 Mar 2001; 2 ♂♂, 27 Mar-11 Apr 2001; 2 ♂♂ 2 ♀♀, 10 Nov-25 Nov 2001; 2 ♂♂ 2 ♀♀, 25 Nov-19 Dec 2001; 3 ♂♂ 2 ♀♀, 15 Jan-15 Feb 2002; 2 ♂♂, 15 Feb-13 Mar 2002; 1 ♂ 1 ♀, 27 Mar-11 Apr 2002. **Brushy Mountain MT14:** 5 ♂♂, 27 Nov-12 Dec 2000; 3 ♂♂, 12 Feb-27 Feb 2001. **Clingmans Dome MT15:** 1 ♂, 20 Feb-29 Mar 2001. **Clingmans Dome MT16:** 1 ♂, 29 Nov-14 Dec 2000; 1 ♂, 29 Mar-24 Apr 2001; 1 ♂, 15 Mar-28 Mar 2002; 1 ♂ 1 ♀, 14 Apr-27 Apr 2002. **Albright Grove MT17:** 3 ♂♂, 01 Dec-13 Dec 2000; 2 ♂♂, 13 Dec 2000- 19 Jan 2001; 1 ♂, 19 Jan-30 Jan 2001; 8 ♂♂, 30 Jan-16 Feb 2001; 3 ♂♂, 16 Feb-02 Mar 2001; 2 ♂♂ 02 Mar-15 Mar 2001. **Albright Grove MT18:** 18 ♂♂, 13 Dec 2000-19 Jan 2001; 3 ♂♂, 19 Jan-30 Jan 2001; 13 ♂♂, 30 Jan-18 Feb 2001; 7 ♂♂, 18 Feb-02 Mar 2001; 6 ♂♂, 02 Mar-15 Mar 2001; 3 ♂♂, 15 Mar-25 Apr 2001; 1 ♂ 1 ♀, 02 Jan-21 Jan 2002; 2 ♂♂ 2 ♀♀, 21 Jan-09 Feb 2002. **Snakeden Ridge MT19:** 4 ♂♂, 01 Dec-13 Dec 2000; 22 ♂♂, 13 Dec 2000-17 Jan 2001; 13 ♂♂, 17 Jan-30 Jan 2001; 21 ♂♂, 30 Jan-16 Feb 2001; 20 ♂♂, 16 Feb-05 Mar 2001; 1 ♂, 05 Mar-15 Mar 2001; 3 ♂♂, 15 Mar-03 Apr 2001; 8 ♂♂ 3 ♀♀, 05 Jan-16 Jan 2002; 14 ♂♂ 22 ♀♀, 16 Jan-13 Feb 2002; 1 ♂ 1 ♀, 28 Feb-09 Mar 2002. **Snakeden Ridge MT20:** 1 ♂, 13 Dec 2000-17 Jan 2001; 2 ♂♂, 16 Jan-13 Feb 2002; 1 ♂, 13 Feb-28 Feb 2002. **Goshen Prong MT21:** 1 ♂, 05 Nov-12 Nov 2001; 1 ♂, 17 Jan-10 Feb 2002. **Goshen Prong MT22:** 6 ♂♂ 2 ♀♀, 25 Dec 2000-15 Jan 2001; 1 ♂, 15 Jan-31 Jan 2001; 6 ♂♂ 2 ♀, 31 Jan-14 Feb 2001; 2 ♂♂, 05 Nov-12 Nov 2001.

Trichocera fattigiana Alexander (n= 18)

Cades Cove MT03: 1 ♂, 28 Nov-11 Dec 2000; 2 ♂♂ 8 ♀♀, 19 Nov-03 Dec 2001. **Cades Cove MT04:** 1 ♂, 11 Dec 2000-15 Jan 2001; 1 ♂ 5 ♀♀, 03 Dec-17 Dec 2001.

Trichocera garretti Alexander (n= 9)

Twin Creeks MT01: 1 ♂, 29 Jan-12 Feb 2001; 1 ♂, 12 Feb-27 Feb 2001. **Twin Creeks MT02:** 1 ♂, 12 Feb-27 Feb 2001. **Cataloochee MT09:** 1 ♂, 13 Feb-01 Mar 2001; 1 ♂, 14 Feb-07 Mar 2002; 1 ♂, 07 Mar-27 Mar 2002. **Cataloochee MT10:** 2 ♂♂, 15 Jan-28 Jan 2002. **Goshen Prong MT21:** 1 ♂, 12 Jan-10 Feb 2002.

Trichocera heimalis (De Greer) (n= 63)

Twin Creeks MT01: 1 ♂, 29 Jan-12 Feb 2001. **Cades Cove MT04:** 1 ♂ 4 ♀♀, 05 Nov-19 Nov 2001. **Indian Gap MT05:** 1 ♂, 24 Oct-08 Nov 2001. **Indian Gap MT06:** 2 ♂♂, 28 Mar-14 Apr 2002. **Purchase Knob MT07:** 1 ♂, 01 Mar-26 Mar 2001. **Cataloochee MT09:** 1 ♂, 14 Feb-07 Mar 2002. **Cataloochee MT10:** 1 ♂, 27 Mar-10 Apr 2002. **Andrews Bald MT11:** 1 ♂ 1 ♀, 29 Nov-14 Dec 2000; 1 ♀, 14 Dec 2000-01 Feb 2001. **Andrews Bald MT12:** 1 ♂, 16 Mar-24 Apr

2001. **Brushy Mountain MT13:** 1 ♂, 12 Mar-27 Mar 2001; 1 ♂, 27 Mar-11 Apr 2002. **Clingmans Dome MT15:** 2 ♂♂, 24 Apr-10 May 2001; 2 ♂♂ 1 ♀, 14 Apr-27 Apr 2002. **Clingmans Dome MT16:** 2 ♂♂, 29 Mar-24 Apr 2001. **Albright Grove MT17:** 1 ♂ 2 ♀♀, 18 Oct-14 Nov 2000; 1 ♂, 14 Nov-01 Dec 2000; 8 ♂♂, 15 Mar-25 Apr 2001; 1 ♂, 29 Mar-14 Apr 2002. **Albright Grove MT18:** 6 ♂♂, 15 Mar-25 Apr 2001; 1 ♂, 28 Frb-14 Mar 2002; 1 ♂ 2 ♀♀, 29 Mar-14 Apr 2002. **Snakeden Ridge MT19:** 2 ♂♂, 16 Feb-05 Mar 2001; 1 ♂, 15 Mar-03 Apr 2001; 4 ♂♂, 03 Apr-25 Apr 2001. **Goshen Prong MT21:** 1 ♂, 26 Feb-13 Mar 2001; 1 ♂, 13 Mar-28 Mar 2001. **Goshen Prong MT22:** 3 ♂♂, 26 Feb-13 Mar 2001; 3 ♂♂, 13 Mar-28 Mar 20

VITA

Matthew J. Petersen was born in Jefferson City, IA on Friday, June 13, 1975. He grew up in Charles City, Iowa where he attended and graduated from Charles City Community High School in 1994. In the fall of 1994 he enrolled at Iowa State University in Ames, IA and in 1998 received a bachelor's degree in Animal Ecology with an emphasis in Fisheries. After two years working for the Iowa Department of Natural Resources, Illinois Natural History Survey and the National Park Service, Matt entered into graduate school in the department of Entomology and Plant Pathology at the University of Tennessee, Knoxville. He graduated in the summer of 2003 with a Master of Science degree in Entomology and a minor in Ecology and Evolutionary Biology.

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