CONTENTS

A Melanic *Pieris rapae* from Michigan (Lepidoptera: Pieridae)
Julian P. Donahue and M. C. Nielsen ............................. 111

A New Family of Cavernicolous Millipedes with the Description of a
New Genus and Species from Idaho (Diplopoda: Chordeumida: Chordeu-
midea)
John S. Buckett and Michael R. Gardner .......................... 117

The 'Michigan List' .................................................. 126

*Aniulus paludicolens*, n. sp. (Julida: Paraiulidae), a Bog-dwelling Milli-
ped
Nell B. Causey ......................................................... 127

New Records of Acrolophidae (Lepidoptera) from Kentucky
Julian P. Donahue ....................................................... 130

Arthur J. Yates (1882-1961) and his collection of Lepidoptera
Roland L. Fischer ....................................................... 131

Notes on the Ecology of *Xyloryctes jamaicensis* (Coleoptera: Scarabaei-
dae) in Southern Ontario
Karl Stephan ............................................................. 133

January Collecting in Central Michigan
Ronald S. Wilkinson ................................................... 135

Réaumur's Insect Collecting Net of 1736
Ronald S. Wilkinson ................................................... 137

A Method of Collecting *Catocala minuta* (Lepidoptera: Noctuidae) and
related species
Joseph Muller .......................................................... 140

Reviews of Recent Literature ......................................... 141

COVER PHOTO

*Xyloryctes jamaicensis* (Drury) ♂ (Coleoptera: Scarabaeidae), col-
lected near Wheatley, Ontario, 12 July 1962, by Karl Stephan. Photo-
graph made on Plus-X Pan film with a 2-1/4 x 3-1/4 Crown Graphic,
courtesy of Jeffrey Jackson. See article on page 133.

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A MELANIC PIERIS RAPAE FROM MICHIGAN
(LEPIDOPTERA: PIERIDAE)

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The Arthur J. Yates collection of Michigan Lepidoptera, recently donated to Michigan State University (see Fischer, 1967), contained a striking melanic male cabbage butterfly [*Pieris rapae* (Linnaeus)] (Figs. 1, 2) now incorporated into the MSU series. Yates collected the specimen on 29 May 1934 in Roseville, Macomb County, near the western shore of Lake St. Clair in southeastern Michigan. An examination of the androconia and genitalia, using the characters described by Chang (1963), assured proper identification of the specimen.

Although we have found no record of a similar *rapae* taken in North America, there are some named European forms of various species of *Pieris* that resemble our specimen.

DESCRIPTION

Generally, the upperside of the specimen is uniformly smoky gray-brown, while most of the veins and marginal fringes are yellowish-gray. The underside is lighter than the upperside, with the apex of the forewing and the outer third of both wings washed with yellow. Two spots are located on the underside of the forewing, as in typical specimens.

The detailed description below includes some characters visible only under magnification.

UPPERSIDE (Fig. 1), including basal two-thirds of the veins, uniformly and entirely smoky gray-brown except for the yellowish-gray marginal fringe on both wings. Distal third of all veins yellowish-gray, except at apex of the forewing, where the veins abruptly become concolorous with the ground color. This apical darkening is the only suggestion of the black apex of typical specimens. Uniform, diffuse, obscure speckling on both wings.

FOREWING UNDERSIDE (Fig. 2) lighter than upperside. Apex distinctly washed with yellow. Two faint dark spots parallel to outer margin, near the discal cell, in Median 3 and Cubitus 2 cells, as in typical specimens; anterior spot larger and more conspicuous. Broadly pale yellowish-gray from the spots to the outer margin. Costa narrowly pale.

HINDWING UNDERSIDE (Fig. 2) is broadly smoky gray-brown basally (concolorous with the upperside), this dark area diffusing into
a broad, dull yellowish area that extends to the outer margin from the end of the discal cell and from a point about midway on the anal margin. Costa bright yellow from a point above the end of the precostal vein to a point about two-thirds the length of the subcostal vein (best seen under magnification).

Figures 1 and 2. Dorsal and ventral views, respectively, of the melanic *Pieris rapae*. Photos by Julian P. Donahue.
ANTENNAE dorsally dark brown, tipped with yellow; ventrally gray, annulated with brown.

PALPI with mixed brown and blackish hairlike scales.

EYE dark brown, mottled with black. (Eye color possibly influenced by non-genetic factors, i.e., changes occurring since the death of the specimen.) Hairs on dorsal and anterior periphery black; hairs on ventral periphery concolorous with the palpi.

PROBOSCIS basally yellow, becoming black distally.

THORAX above black, with dark brown hairlike scales; ventrally gray-scaled, clothed with dense light brown scales.

LEG (only one remains on the specimen) tan, becoming yellow on the tarsus. Two yellowish tibial spurs, each with a sharp black tip.

ABDOMEN above dark brown, becoming blackish anteriorly, with appressed dark brown hairlike scales; ventrally heavily clothed with gray-brown scales on first few segments, this scaling becoming more gray posteriorly. Vestiture on margin of valvae dull yellow.

The scales on the wings of the melanic specimen differ from those of typical specimens in that the scales are relatively narrow with a great variety of lobes and teeth on the distal end, while some are almost entire. The scales are arranged in irregular rows and have upturned lateral edges. In contrast, scales of normal specimens are broader and more uniform, usually have two to four teeth, and are arranged in more regular rows.

DISCUSSION

An amazing variety of "forms" and "aberrations" have been described in the genus *Pieris*, especially in the Palearctic Region. Lempke (1934), for example, discussed no less than 68 named races, forms, aberrations, and generations of *Pieris rapae* alone. Although our search in the European literature has not been exhaustive, several descriptions and illustrations from this chaotic collection of names have been found which bear a strong resemblance to the Michigan specimen.

One of the first of these dark forms to be described was *P. brassicae* form "obscurata" Oberthür (1886), based on a female from Paris. The specimen was described as being dark gray on both the upper- and undersides, except that the costa of each left wing is more broadly whitened on the underside than on the upperside.

Gillmer (1905) described and illustrated *P. napi* aberration "fumigata," also based on a female. The following description, which indicates a striking similarity between Gillmer's specimen and ours, has been translated from the German:

"*Pieris napi* Linn. ♀ (fig. 4). A beautiful evenly colored smoky gray species, formed both above and below in the same manner. The fringes and the anterior margin of the forewings (especially visible beneath) appear faintly pale yellow, the veins on the under side also have this pale yellow color on their outer half, while the basal half is black; the veins on the upper side are entirely black = aberration *fumigata* Gillmer."
In 1908 Verity (1905-1911, p. 150) described and figured (pl. xxxii, fig. 50) aberration "nigrans," assigning it to *P. napi*, but Lempke and Oberthür (Lempke, 1934) were convinced that the specimen was a form of *P. rapae*. The following original description of "nigrans" Verity is translated from the French:

"I propose this name for a melanotic form represented in the Oberthür collection by a ♂, of the summer generation, collected in Silesia, whose wings are both above and below a uniform gray, making the dark pattern on the upperside and the veins on the underside scarcely visible."

Further on in the text, in a supplement, Verity (1905-1911, p. 332) stated that his "nigrans" was perhaps identical to Gillmer's "fumigata." Bollow (1932) apparently agreed, for he made "nigrans" Verity a synonym of "fumigata" Gillmer. But, since Lempke (1934) assigned "nigrans" to *P. vapae*, the question remaining is: should the supposedly synonymous "fumigata" also be placed in *P. vapae*? Only a detailed examination of the specimen in question can solve the puzzle.

Lempke (1934) also mentioned a male specimen collected at Naarden, Netherlands, which he assigned to "nigrans" Verity.

Stauder (1913) described and figured (pl. 1, fig. 13) a melanic female *Pieris rapae*, calling it aberration "brunneoflavida." The following original description is translated from the German:

"The upper- and undersides are not the sulfur yellow or canary color of *flavescens* Röber, but the color of bright copper, which gives the insect a very remarkable appearance.

"Likewise the head, thorax, and the body, as well as the antennae, are copper colored; the apical mark is greatly reduced as in *leucotera* or *metra*, vague and intermingled with brown.

"Similarly the median area of the underside of the forewing is filled with brownish-yellow.

"The brown of the upperside closely approaches that of an aberrant ♂ described and figured by Wagner (Jahresbericht des Wiener Ent. Ver., Volume XIV, 1903, p. 43-44, pl. I), and is similar to the color of the veins on the underside of the hindwing."

Stauder's specimen, illustrated by a photograph of the upperside, differs considerably from the Michigan specimen in that the black apex is clearly and sharply delimited from the background color, as are two spots on the forewing and one spot on the apex of the hindwing.

Finally, we draw attention to a melanic female aberration of the African *Pieris thysa*, originally described as subspecies *rimala* of *P. larima* by Suffert (1904).

Perhaps because of the extreme rarity of melanic specimens, nothing is known about the cause of melanism in *Pieris*. Two possibilities exist: some environmental factor may have a gross effect on one of the early stages of the insect, or the melanism is the expression of a rare genotype. Dr. H.B.D. Kettlewell of the Genetics Laboratory, Department of Zoology, University Museum, Oxford, who has undertaken distinguished research on industrial melanism in the Lepidoptera, has
examined photographs of the Michigan specimen and offered these comments on it (personal communication, 28 Nov. 1963):

"In the first place it can be definitely stated that the melanic form of this butterfly is in no way connected with normal Industrial Melanism. It is almost certainly inherited as a rare recessive and not as a dominant as is the case with nearly all industrial melanic species. The advantages conferred by blackness on a moth which spends its day at rest and motionless are quite different from those of a butterfly flying in the sunlight. I would think that this black *rapae* is at a considerable disadvantage physiologically, and it is difficult to see what visual advantage it would acquire from blackness. I think most of us are agreed that the colour 'white' is a warning colour suggesting distastefulness. By this means the white butterflies are largely freed from attacks by bird predators. This butterfly of yours, therefore, has given up such an advantage (if there is one). It would have been most interesting to have bred from this insect, and to have ascertained the true state of its genetics."

We are not, of course, naming this specimen, since "forms" and "aberrations" have no taxonomic validity. There is already a surfeit of such names to clutter the literature, and the only value of these names is to assist in locating descriptions of particularly interesting forms.

Although we found no references to similar forms having been collected in North America, there is still a chance that other specimens have not been reported. We would appreciate learning of any other captures of melanic *Pieris*.

ACKNOWLEDGMENTS

We wish to thank Dr. Roland L. Fischer, Curator of the Entomology Museum, Michigan State University, where the melanic specimen is deposited, for his assistance in the study of this insect and for his translations of German descriptions. Our thanks also to John H. Newman, who provided us with additional background information, and to Dr. H.B.D. Kettlewell for his interesting observations on the melanic specimen.

LITERATURE CITED


FORTHCOMING PUBLICATIONS

One of the rarer nineteenth-century entomological publications is the first volume (1840-42) of The Entomologist. This key journal, founded by Edward Newman and still 'going strong' today, is of course found in most larger libraries, but Vol. 1 is usually missing. There was a long hiatus before the publication of Vol. 2 in 1864-65; after that date the journal appeared regularly, but Vol. 1 was already rare enough in 1865 to elicit Newman's comment that whoever needed it must "wait in vain; it reposes in peace on the shelves of the British Museum, the Universities, and the learned societies, but has long since disappeared from the bookseller's counter."

Librarians need no longer "wait in vain" to complete their series, and collectors who could never hope to own the original can have a substitute. A reprint is scheduled for publication late in March by Wm. Dawson & Sons, Ltd. and E. W. Classey, Ltd. The price will be £9.5.0. sterling (U.S. $25.90).

Also of interest to American entomologists is the announcement that E. W. Classey Ltd. will continue to reprint The Genitalia of the British Lepidoptera by F. N. Pierce, J. W. Metcalfe and B. P. Beirne. The work is fundamental to genitalic study, and treats numerous genera that have North American species. The volumes for the Tortricidae and the female Noctuidae have already appeared; those for the male Noctuidae, the Geometridae, the Rhopalocera and larger moths are scheduled for 1967 at prices ranging from £3.10.0 to £6.0.0. sterling per volume.
A NEW FAMILY OF CAVERNICOLOUS MILLIPEDES WITH THE DESCRIPTION OF A NEW GENUS AND SPECIES FROM IDAHO (DIPLOPODA: CHORDEUMIDA: CHORDEUMIDEA)

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The Chordeumidea is accumulating species names faster than any other group of North American Diplopoda. About one-half its species, 47, have been described since 1950. This recent growth has occurred because the small size, localized populations, and, frequently, cave habitus of these millipedes have obstructed thorough collection in the past. These factors have only recently been overcome by comprehensive collecting. As a result of this rapid growth and the many artificial groupings which result from it, much organization of the higher classification remains to be done. Hoffman (1961) emphasizes that cooperation between workers, more thorough descriptions, more accurate illustrations, and revisions are necessary if a proper classification is to be attained.

Described herein is a new cave form unique among the known North American Chordeumidea. Related to Cleidogonidae, Conotylidae, and Bactropidae, it is distinguished from these families by having the ninth legs reduced and unsegmented. This species represents the type of a new family, which we name after the state in which it was collected.

IDAGONIDAE, NEW FAMILY

Diagnosis: Resembles Conotylidae in having 30 segments, slender body, long slender antennae, head entirely exposed from collum, undivided mentum of gnathochilarium, numerous pigmented ocelli, body with moderately developed setigerous tubercles, coxa of tenth leg with eversible pouch. Differs from Conotylidae in having the ninth legs reduced to small, unsegmented, sclerotized arms closely associated with the peltogonopods.

While this paper was awaiting publication, Loomis (1966) published descriptions of two new North American Chordeumoid families, and an addendum to the key of Chamberlin and Hoffman (1958). When the present paper was returned for corrections, we felt this important addition should also be included in a revised key.

KEY TO THE CHORDEUMOIDEA OF NORTH AMERICA

(Modified from Chamberlin and Hoffman, 1958, with addendum from Loomis, 1966.)

1. Body composed of 20 or 26 segments . . . . . . . . . . . . . . . . . . . . 2
Body composed of 28, 30, or 32 segments . . . . . . . . . . . . . . . . . . . . 3
2. Segments 20; tergites not produced laterally into paranota (lateral carinae of authors) ................................................................. Ergethidae
   Segments 26; tergites with numerous short dorsal crests and prominent paranota ......................................................... Branneriidae

3. Telopodite of ninth leg pair of males thickened, often clavate, the second joint often forming a distinct angle with the coxa, the latter with a conspicuous inner process .............................................. 4
   Ninth leg pair of males never clavately thickened as described above, and not forming a distinct angle with the coxa, which has no inner process .......................................................... 6

4. Gnathochilarium with mentum undivided, no promentum set off
   ................................................................. 5
   Gnathochilarium with distinct mentum and promentum
   ........................................................................ Caseydidae

5. Coxae of legs 10 and 11 possess gland opening; peltogonopods coalesced, coxal region large and distinctly divided from telopodite; paragonopods with 3 to 5 segments, with or without a terminal claw
   ........................................................................ Trichopetalidae
   Coxae of legs 11 lack gland opening; peltogonopods not coalesced, with coxa and telopodite not distinctly separated; paragonopods consist of 3 segments, lacking a terminal claw ...... Conotylidae

6. Last tergite prolonged into a projection which surpasses the anal valves ................................................................. Urochordeumidae
   Last tergite not thus prolonged ......................................................... 7

7. Dorsum densely short-setose in addition to macrosetae and other sculpturing; segment 1 enlarged, much wider than head, anterior margin transverse and triarcuate; outer macroseta of each side well within lateral limits; last segment short and broadly rounded throughout behind ............................................................ Rhiscosomididae
   Dorsum never short-setose; segment 1 not wider than head, usually much narrower, anterior margin rounded or rounded-angular; outermost macroseta at lateral limit; last segment with sides oblique and nearly straight, apex truncate ......................................................... 8

Figures 1-3, facing page, *Idagona westcotti*. Fig. 1, male paratype, gonopods and coxae of tenth legs, *in situ*, ventral view. A - antero-mesal coxal lobe; C - basal region of coxa; G - paragonopod; L - lateral lobe of coxa; T - telopodite of peltogonopod; Fig. 2, male paratype, anterior view of gonopods illustrating relative positions of sclerites. I - intersternal bar; P - plate; Fig. 3, male paratype, left lateral view of gonopods. B - basal region (coxopodite) of peltogonopod; G - paragonopod; P - plate and intersternal bar; S - sternum of paragonopod; ST - sternum of peltogonopod; T - telopodite of peltogonopod.
8. Gnathochilarium with mentum undivided, no promentum set off .................. 9
Gnathochilarium with distinct mentum and promentum .................. 10

9. Ninth male legs conspicuous, five segmented and with a small claw; length 9 mm; setigerous tubercles obsolete .................. Bactropidae
Ninth male legs (paragonopods) inconspicuous, unsegmented, and without a claw; length 14 mm; setigerous tubercles moderately developed .................. Idagonidae

10. Size large, at least 14 mm long; body without strongly projecting paranota .................. Cleidogonidae
Size smaller, body 8 mm or less, with prominent paranota .............

11. Metazonites with dense scattering of thin, short, longitudinal carinae; macrosetae small; paranota thick, following contour of dorsum, and evident to last two or three segments; ninth male legs three jointed .................. Tingupidae
Metazonites densely granular on keeled segments, smooth on others; macrosetae large; paranota strongly projecting, almost horizontal, thin, and terminating on segment 23 or 24; ninth legs six jointed .................. Apterouridae

**IDAGONA BUCKETT AND GARDNER, NEW GENUS**

*Diagnosis:* Body with 30 segments, light brown; pigmented ocelli well developed (14 - 17 per patch); antennae very long, slender, reaching caudad to seventh segment; gnathochilarium with mentum undivided, promentum not set off; setigerous tubercles moderately developed on small shoulder-like prominence in medial body segments; peltogonopods large, simple, arched caudad and fitting tightly against coxae of tenth legs; paragonopods small, closely appressed to peltogonopods; coxae of tenth and eleventh legs swollen, an eversible pouch present in each coxa of tenth legs.

*Type species:* *Idagona westcotti* Buckett and Gardner, new species.

**IDAGONA WESTCOTTI, NEW SPECIES**

*Holotype male:* Body cream to light brown; length 14 mm. Head with vertex prominent, nearly smooth, glossy, sparsely hirsute; frons more densely hirsute; epicranial suture distinguishable; head much wider than

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Fig. 4, female allotype, tergite of medial body segment, posterior view; Fig. 5, tenth leg of male paratype; Fig. 6, third leg of male paratype.
collum; mandibular cheeks laterally protruding far beyond eyes; anterior margin of labrum concave with three well-defined teeth; labral setae six on each side; eyes pigmented, placed in triangular patch with four transverse rows of 6, 5, 3, and 2 ocelli respectively; antennae reaching caudad to seventh segment; approximate ratios of antennal segments as follows, beginning with first: 1, 4, 8, 5, 7, 3, 5, 2; gnathochilarium with promentum apparently absent (as in Fig. 7), stipes and lingual lamellae each with two sense cones.

First and second legs of equal length; third legs 1.3 times length of preceding legs; fourth segment of third legs swollen, nearly 1.5 times as thick as equivalent segment on other legs, and produced into a cylindrical, mesally directed process (as in Fig. 6); fourth through seventh legs slightly larger than third legs, but not modified; ninth legs, herein referred to as paragonopods, greatly reduced and closely associated with peltogonopods; tenth legs each with distal portion of coxa produced into rounded, caudally directed lobe; ventral margin of lobe ventrally exceeding second joint, which arises laterad; also, tenth coxae each with a short, truncate anteroventral lobe situated anteromesad to and exceeded ventrally by large caudally directed lobe; anteroventral lobe with eversible pouch; remainder of tenth legs of same proportions as following legs, but about 15% smaller; coxae of eleventh legs swollen, but no gland openings apparent; remaining legs normal.

Collum nearly smooth, anterior margin rounded, posterior margin straight, caudolateral corners appearing rounded from dorsal view; median carina weakly represented on collum, extending strongly along succeeding segments, terminating on penultimate body segment; setigerous tubercles of collum weak, more prominent on succeeding segments (as in Fig. 4), diminishing on last eight segments; lateral two pairs of tubercles on each tergite of first seven postgenital segments raised on shoulder-like prominences (as in Fig. 4); posterolateral pair of setae largest of the six dorsal setae, reaching a length of 0.6 mm; anal segment truncate, much wider than long, yet slightly longer than preceding segment; anal lips weakly developed, lined with four pairs of setae; anal tergite with anterior margin mesally possessing a single pair of setae, lateral margins possessing two pairs of setae; one pair of spinnerets present on posterolateral corners of anal tergite.

Gonopods simple, constructed of a large peltogonopod and a small, slender paragonopod, each consisting of a single branch; in situ, peltogonopod proceeding ventrally, curving caudad at about three-fifths its length, entire peltogonopod fitting tightly against coxae of tenth legs (as in Fig. 1); basal portion of peltogonopod stout, distally broadening into a lamina with anterior surface convex, posterior surface

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Fig 7, female allotype, gnathochilarium, ventral view; Fig. 8, female allotype, posterior aspect of cyphopods; setae omitted from left side and projecting arms omitted on right side.
slightly concave; peltogonopod narrowing distally of caudal curve to blunt, rounded apex, but with a small mesocaudal conical terminal process; paragonopod laminate, broadly joined to horizontal sternal bar; paragonopod proceeding cephalad between bases of peltogonopods, curving ventrolaterally around anterior face of peltogonopod of same side of body, terminating laterad of base of peltogonopod; paragonopod with basal end triangular: a broad horizontal base joined to sternum, a mesal vertical wall, and an oblique wall adjoining the other two; paragonopods evenly narrowing distad from triangular base to single vertical lamina, and eventually to pointed apex. A sclerotized intersternal bar extending between sterna of peltogonopods and dorsally of paragonopods; bar with a single median attachment on sternum of peltogonopod; posteriorly, bar forks and makes two attachments to sternum of paragonopod. A thin plate extends between intersternal bar and sternum of peltogonopod on each side of intersternal bar, with broad attachments both on sternum and anterior half of intersternal bar (cephalad of fork); plate arched, convex ventrally and possessing a ventrally directed tubercle; tubercles each possessing from 1 to 3 setae.

**Allotype female:** As in male, only lacking secondary sex characters such as modified third and tenth legs and glandular pouches. Cyphopods each consisting of two subequal lobes and a pair of curved arm-like projections (Fig. 8).

**Specimens examined:** Holotype male, allotype female, 3 male paratypes, 2 female paratypes, and 3 fragments of undeterminable sex, collected deep in Crystal Falls Cave, 20 mi. northeast of Dubois, Clark County, Idaho, 16 July 1965 (R. L. Westcott). One additional female specimen from Boy Scout Cave, Craters of the Moon National Monument, Butte County, 18 August 1965 (R. L. Westcott).

**Type deposition:** Holotype deposited in the Type Collection, Department of Entomology, University of California, Davis, California; one male paratype sent to H. F. Loomis, Miami, Florida; allotype retained in the authors' private collection; remainder of paratypes divided between University of Idaho, Moscow, Idaho, and the authors' private collection.

**Discussion:** The gonopods of *Idagona* are distinctive in several respects. The paragonopods are completely unsegmented, there being even no observable division between coxa and telopodite. Also, the extreme reduction of the paragonopods exhibits a reversal of the size relationship of the two gonopods in related groups.

The female cyphopods may be distinctive for the species, but no conclusions can be reached at this time, due to inadequate material and scarcity of illustrations of cyphopods in the literature.

The gonopods of a paratype were cleared in 15% NaOH and were stained with lignin pink; the sclerites were loosened in order to ascertain the relationships of the various parts. The coxopodite of the peltogonopod basally curves laterally around the end of the sternum, but does not fuse with it; however, the telopodite of the paragonopod does
appear to fuse with the posterior sternum. The lateral edges of the posterior sternum fit against the basal region of the peltogonopods, but do not coalesce with them. The attachment of the thin sclerotized plate on the anterior sternum is more mesad than the attachment of the peltogonopod on the sternum. There appears to be only a membranous connection between the plate and the peltogonopod. The intersternal arm is the only sclerotized connection between the two sets of gonopods, the telopodites not being united. The intersternal arm is probably of sternal origin, but the plates are of dubious origin.

The approximate placement of Idagonidae is determinable by somatic characters. Its size, slender body, long slender antennae, number of segments, number of eyes, and moderate setigerous tubercles place it in the Chordeumidea near the families Cleidogonidae and Conotylidae, from which it is superficially indistinguishable.

In order to distinguish between members of this Conotyloid complex, workers have relied on genitalic characters, especially the ninth legs, or peltogonopods of the male, modified from the ninth leg. The configuration of these structures apparently manifests generic and familial ties within this group. In the Conotylidae the general form of the telopodite of leg nine consists of two or more thickened, elongate segments. In Cleidogonidae and Bactropidae, the ninth legs tend to be reduced but not distally thickened. In these families the generic classification has been based largely on the segmentation of the ninth legs, as illustrated by Hoffman's (1950) key to the Cleidogonidae.

However useful the ninth legs have been in elucidating familial and generic affinities within the complex, they give no clue as to the position of the apparently distant Idagonidae. Nevertheless, the closest ally to Idagonidae may be inferred from other characters. The absence of a promontum in the gnathochilarium is an important somatic character and relates it to Conotylidae, Bactropidae, and Trichopetalidae. Bactropidae differs from Idagonidae in its diminutive size and relatively clavate antennae. However, more must be known about the family Bactropidae before accurate relationships can be determined. Trichopetalidae differs from Idagonidae in possessing more complicated and coalesced peltogonopods, coxal openings on leg 11, and in being distributed only in the eastern and southern part of North America. Conotylidae resembles Idagonidae in the larger size, elongate antennae, lack of gland openings on coxa of leg 11, relatively simple and non-coalesced peltogonopods, and in possessing a distribution overlapping the type locality of Idagona. Conotylidae, therefore, seems to be the most closely related family to Idagonidae.

Also collected in Crystal Falls Cave was a single immature male specimen of the family Conotylidae, which can be easily distinguished by the characters in the key, as well as its possessing only 5 unpigmented eyes.

ACKNOWLEDGMENTS

We wish to express our appreciation to Mr. R. L. Hoffman and to Mr. H. F. Loomis for their notes on gonopod morphology and their opinions
on the relationships of Idagonidae to other families within the Chordeumidea. We would like to acknowledge the ardent collector for whom we take great pleasure in naming the species herein described as new, Mr. Richard L. Westcott, University of Idaho, Moscow, Idaho. Without the extensive survey work conducted by personnel at the Department of Entomology at the University of Idaho in collecting arthropods, this work would not have been possible.

LITERATURE CITED AND REFERENCES


THE ‘MICHIGAN LIST’

The List of Michigan Insects and Related Arthropods, envisioned and initiated by the late Robert Dreisbach, will begin publication later this year. The list, edited by Roland L. Fischer and Ronald S. Wilkinson with the assistance of John H. Newman, Mogens C. Nielsen and Henry K. Townes, is being compiled by leading authorities. It will reflect the latest phylogenetic concepts of classification.

Fascicles, each comprising an order or other major taxon, will appear as they are ready. Authors will include an introduction to each taxon, furnishing such information as biology, ecology and general distribution in Michigan. Individual species listings will be accompanied by county distribution, earliest and latest date of adult capture, larval food when known, and other pertinent data.

Publication costs will be financed by the Dow Chemical Company of Midland, Michigan. Society members and subscribers entitled to receive The Michigan Entomologist will also receive the List of Michigan Insects free of charge, and others may obtain it upon payment of a nominal handling charge to be announced with each fascicle.

R.S.W.
ANIULUS PALUDICOLENS, N. SP. (JULIDA: PARAIULIDAE),
A BOG-DWELLING MILLIPED

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Almost without exception, millipeds require a continuously moist substratum, yet they do not tolerate flooding. Other ecological factors that limit their distribution are subtle and difficult to recognize. *Aniulus paludicolens*, n. sp., is unique in that all collections are from *Sphagnum* bogs in the vicinity of the Great Lakes. It is best known from Byron Bog, in southern Ontario. This bog has the following vegetation zones: a, a central bog based on a mat of *Sphagnum* moss and covered almost entirely by leatherleaf; b, a low wooded region, damp or flooded, with hardwood trees and shrubs at its outer limits and black spruce and larch at its inner limits; and c, wooded slopes occupied by deciduous trees and shrubs. *A. paludicolens* occurs only in zones b and c, and in greatest numbers in the former. Other millipeds in the bog include *A. bollmani* Causey, which was collected only in zone c (Judd, 1965).

These two species represent the most northern distribution of the genus, of which there are many species in the southern states and Texas. The species most closely related to *A. paludicolens* is *A. paitus* Chamberlin, which occurs in disjunct polytypic populations in the mountain valleys of Arizona, Colorado, and New Mexico.

**ANIULUS PALUDICOLENS, NEW SPECIES**

*Figures 1-6*

*Diagnosis:* Nearest to *A. paitus*, differing in the bog habitat and in details of the sexual characters. *Male* characterized by the large sternum of legpair 10, the deeply recessed gonopods, and by details of the gonopods. *Female* characterized by the rounded metapleurites of segment 3 and by the large, triangular caudal thickening on the synoperculum of the moderately short vulvar apparatus.

*Male holotype:* Width 2 mm. 49 segments, with the last 3 legless. Dorsum is red-brown; black dorsal line and lateral spots are indistinct; under magnification the usual mottled pattern is visible; venter and legs are light brown. Apical margin of anal tergite is obtusely angular when viewed from above, extending not quite as far back as anal valves do. Mandibular cheek (Fig. 1) is moderately thick, as is usual in the genus. Sternum of legpair 10 (Fig. 2) is the largest in the genus; its broadly rounded anterior margin crowds the small gonopods into the anterior part of the gonopodal cavity; its posterior margin is unusual in that it is a thick, rounded, transverse ridge that projects much farther below the body surface than the gonopods do.
Figs. 1-6. *Aniulus paludicolens*, n. sp. Fig. 1, left mandibular cheek, male; Fig. 2, sternum of legpair 10, male; Fig. 3, left anterior gonopod, lateral view; Fig. 4, left posterior gonopod, lateral view; Fig. 5, apical region of telopodite of left posterior gonopod, mesial view; Fig. 6, vulvar apparatus, caudal view. Drawings are from toptotypical paratypes.
From a lateral view of the gonopods, all 4 branches are visible, but none is as conspicuous as the sternum of legpair 10. From a ventral view, the broad telopodites of the posterior gonopods are directed mesiad and are contiguous at the apex, and their slender coxites, which are directed mesiocaudad, intersect in the midline and extend back to the sternum of legpair 10; the small, inconspicuous coxites of the anterior gonopods are directed mesiad behind their telopodites; the sternum of legpair 10 fills more than the posterior half of the gonopodal cavity. Caudal surface of syncoxa of anterior gonopods is thick, vertical, and not visible from ventral view. In lateral view (Fig. 3), coxite of anterior gonopods is asymmetrical, lanceolate, with the broad surface ectad and the apical margin, on which there are 3 minute teeth, bent mesiad; its telopodite is more slender than in most congeners. The narrow, attenuated S-shaped coxite of the posterior gonopods (Fig. 4) arises ectad of its telopodite, which is broader, shorter, and unusual in that the apical region is bent mesiad, expanded, and part of the margin is concave; it lacks serrations and a scabrous area.

**Female allotype:** Width 2.2 mm. 49 segments, with the last 3 legless.

Metapleurites of segment 3 are large, rounded and almost contiguous in the midline. From a lateral view, vulvar apparatus is slightly visible below segments 2 and 3. From a ventral view, vulvar apparatus is largely covered by third pleurites. The dissected vulvar apparatus is flattened on both anterior and posterior surfaces and its ventral and ectal margins are broadly rounded; on the anterior surface, legpair 2 does not extend to the ventral margin of the synoperculum; on the posterior surface (Fig. 6), ratio of length and width of synoperculum is about 1/2; vulvae are partly covered by synoperculum, and inner valves are wider than outer valves.

**Variations of 19 known specimens:** Width 1.9 to 2.2 mm, 45 to 49 segments, of which 12 have 2 legless caudal segments and 7 have 3. Apex of coxite of anterior gonopods has either 2 or 3 minute serrations. Ventral margin of synoperculum of vulvar apparatus is either almost straight or sinuous, and inner valves are either contiguous or slightly separated above synoperculum.

**Type locality and specimens:** Michigan. Livingston County: Dollar Tamarack Swamp, Edwin S. George Reserve, 4 May 1961, holotype ♂, allotype ♀, Walter Suter.


**Deposition of specimens:** Male holotype, female allotype and paratypes of each sex from the Ontario collection are in the U.S. National Museum. The remaining paratypes are in my collection.

**LITERATURE CITED**

NEW RECORDS OF ACROLOPHIDAE (LEPIDOPTERA) FROM KENTUCKY

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A recent collection of Kentucky moths submitted for identification contained 28 specimens of *Acrolophus*, or burrowing webworms. Rudolph A. Scheibner collected the moths in 1966 in Lexington, Fayette Co., and Paintsville, Johnson Co., Kentucky. The specimens are deposited in the insect collections of the University of Kentucky and Michigan State University.

The five females in the series, all from Lexington (three collected on 19 June and two collected on 5 July), were not identified. The 23 males, identified according to Hasbrouck (1964), represent four species. Only one of them, *A. popeanellus*, has previously been recorded from Kentucky.

ACCOUNT OF SPECIES

*Acrolophus plumifrontellus* (Clemens), four specimens; three from Lexington, 19 June, and one from Paintsville, 21 June. Recorded from Tennessee, Illinois, Indiana, Ohio, and West Virginia by Hasbrouck (1964). This is one of the commonest and most widespread acrolophids.

*Acrolophus mortipennellus* (Grote), one specimen from Lexington, 5 June. This dirty-white, widely distributed and locally common species has been recorded from Tennessee, Indiana, Illinois, Ohio, and Virginia (Hasbrouck, 1964).

*Acrolophus popeanellus* (Clemens), 14 specimens from Lexington, nine collected on 17 July and five collected on 29 July. This species, the most common and widely distributed member of the genus in the eastern United States, has been recorded from Harrodsburg, Mercer Co., Kentucky by Hasbrouck (1964).

*Acrolophus arcanellus* (Clemens), four specimens from Lexington, two collected on 19 June, one collected on 5 July, and one collected on 17 July. This is another widespread species, which Hasbrouck (1964) recorded from Tennessee, Illinois, Indiana, Ohio, and North Carolina, but not from Kentucky.

LITERATURE CITED

The fine collection of Michigan Lepidoptera assembled by the late Arthur J. Yates has recently been donated by his wife, Mrs. Ethel K. Yates, to the Entomology Museum of Michigan State University.

Arthur Yates was born in the county of Kent, England on 30 July 1882, and was educated there in the standard school system. He attended evening sessions so that he could join his father in the construction business, and subsequently followed that trade for the remainder of his life. Yates was recognized as a craftsman of the highest caliber in his specialty, the installation of fire brick in smelting furnaces.

His interest in entomology began in England when his schoolmaster, an accomplished amateur, invited him to join a collecting foray. Yates was instructed in the art of preparing his catches for the cabinet, and soon derived great pleasure from collecting English Lepidoptera. By
1912 Yates had assembled an extensive collection which, unfortunately, was too large to accompany him when he emigrated to the United States in 1913.

Some time after arriving in America he once again resumed the pursuit of his youthful hobby. About 1939 he met another Michigan collector, John H. Newman, who was then living in Detroit. Together they formed an association that lasted until 1945 when Newman moved to South Lyon, a small farming community in Washtenaw County. During these six years they practiced many methods of collecting Lepidoptera; working at light-sheets, "sugaring" and searching for cocoons in winter. They were an inseparable collecting team, their complete enthusiasm bridging the gap in their ages. Numerous records were added to the list of Michigan Lepidoptera through their joint efforts.

Yates was a charter member of the Detroit Entomological Society, and took a keen interest in all of its functions. He read occasional papers describing his collecting methods and field experiences; these efforts were always enthusiastically received. His collecting activities were not restricted to the Detroit area, for his specialized trade necessitated frequent travel to other parts of Michigan. He regularly visited the northern counties of the state to seek relief from hay fever, and was thus able to add measurably to his collection.

Aside from being an expert craftsman, Yates was an accomplished gardener. His extensive yard was the kind pictured in magazines—the sort that many of us strive to emulate but never, despite our concerted effort, are able to duplicate. In the mid-1940s, his Roseville home was surrounded by open fields and scattered woodlands; all these evidences of nature have now been replaced by factories, homes and superhighways to serve the heavily industrialized area of metropolitan Detroit. His collection is thus extremely valuable, for the ecosystem has changed so extensively that many of his records can never be duplicated.

In December 1958 Yates lost his only son, John, and never completely recovered from the tragedy. In July 1959 he suffered a stroke, which seriously curtailed his usual activities. He passed away at his Roseville home on 1 June 1961, at the age of 78.

The Arthur Yates collection contains approximately 3500 specimens of Lepidoptera and includes many single state records, as well as species known in Michigan from a few specimens only. Among these are *Xylophanes tersa* (Linnaeus), *Ecpantheria deflorata* (Fabricius) and *Hyparpax aurora* (Abbot & Smith). Of special interest is a melanic specimen of *Pieris rapae* (Linnaeus), described elsewhere in this issue (Donahue and Nielsen, 1967). The collection is in a fine state of preservation, indicative of the care that it has received over the past years. Most of the labels are written in a familiar English script, reflecting Yates' early schooling.

Mrs. Yates is to be commended for her generous gift of this most significant collection to Michigan State University and for thus making the results of Arthur J. Yates' efforts available to science.

**LITERATURE CITED**

NOTES ON THE ECOLOGY OF XYLORYCTES JAMAICENSIS
(COLEOPTERA: SCARABAEIDAE) IN SOUTHERN ONTARIO
(see cover photo)

Karl Stephan

R. R. 5, Tilbury, Ontario

The comprehensive survey of literature on the biology of the Scarabaeidae by Ritcher (1958) indicates that the ecology of many large groups is known from a study of very few species. Such is the case with the rhinoceros beetles in the subfamily Dynastinae. From 1960 to 1965 I had many opportunities to observe the rhinoceros beetle Xyloryctes jamaicensis (Drury) in a woodlot near Wheatley, Ontario, on the north shore of Lake Erie. My notes, although fragmentary, suggest areas of further research.

The Wheatley woodlot, now part of a provincial park, has a bluish clayey soil, interspersed with many elevated areas and ridges of fine sand. Low spots often hold surface water in spring and early summer, causing the well-drained sandy areas to stand out like islands. Low-growing plants are scarce in the deciduous forest; white ash (Fraxinus americana L.) is common in the lower areas and is frequently found in sandy soil close to the clay.

While digging at the base of one of these latter trees in late July, 1960 I found an adult X. jamaicensis. The next day, digging around the living but partially decayed ash, I exposed 12 males, 5 females and several larvae in an early instar. All the specimens were taken at a depth of 6"-10" in a hard-packed mixture of sand and clay. Scars were evident on the main roots near the base of the tree, and signs of recent feeding were found.

Early instar larvae were collected in close proximity to other trees, always white ash. Yet later, when sifting leaf litter some distance from any growth of ash, many large, late instar larvae were found. These were at the level where the loose litter met older matted leaves. The larvae had fed extensively on various leaves, and frass was found in quantity. Similar larvae were observed in most heavy accumulations of leaves in the area, always on sandy ground and elevated above the water table.

I attempted to rear 25 larvae by placing them in a 10-gallon aquarium containing 2"-3" of sand covered with 3" of leaf litter, which was replaced as consumed. The sand and leaf litter were both obtained at the collection site. The aquarium was placed in a partially heated garage, where the temperature in winter seldom drops below freezing.

Pupation began in late October, at which time no more larvae could be found in the field. After four larvae had constructed egg-shaped unlined cavities in the soil, it was noticed that the remaining larvae were developing dark, scabrous patches, and had started to shrink as if dehydrated. Close examination showed that the larvae were infested.
with large numbers of small, pale brown mites; unfortunately these were not identified. All these larvae died and only those already below ground escaped.

Adult emergence took place in May, probably due to the warm temperature of the garage; in the field adults are not seen until late July or early August. Data could not be obtained on length of adult life in the field, but I suspect that death occurs shortly after mating and deposition of ova, as I have never found live adults after late August.

Digging in 1961 and subsequent years confirmed the impression that sandy soil is a preferred habitat; also, young larvae were never found except near the roots of white ash. In other woodlots near Tilbury where both white ash and leaf litter were plentiful but the soil was not sandy, adults or larvae were not found. A large woodlot in Maidstone Township, Essex County, Ontario, yielded a few specimens but these were only found in a few sandy spots in the otherwise clayey soil.

I have not collected *X. jamnicensis* at light in Ontario, but was able to take a series by this method near Portal, Arizona in 1964 and 1966. [The species has been collected at light in Grand Traverse Co., Mich.-Ed.] The specimens were considerably larger than my Ontario captures. Vincent Roth, director of the Southwestern Research Station, Portal, has informed me that, to his knowledge, larvae have not been collected in the vicinity, but adults have been taken at light in the relatively treeless desert as well as at higher altitudes where various species of trees are found.

*X. jamnicensis* would seem to be fairly common in southwestern Ontario under the conditions described. Small larvae migrate from their original habitat at the roots of white ash, to complete their growth in leaf litter on well drained, sandy soil. The larvae are within easy reach of predators, yet appear to produce no protective liquids or offensive odors; perhaps a complete absence of odor protects them. Ritcher (1958) points out that length of life cycles among the Scarabaeidae varies with the climate, being longest in more temperate regions. In this area a two year cycle is most likely for *X. jamnicensis*, but definite proof is not yet available.

ACKNOWLEDGMENT

I should like to thank Dr. R.C. Graves, Department of Biology, Bowling Green State University, Bowling Green, Ohio, for his kind help in the course of this study.

LITERATURE CITED

To the uninitiated reader, searching for adult insects in mid-winter might seem a fruitless task at best. Yet as the List of Michigan Insects and Related Arthropods takes shape, "off-season" collecting records are urgently needed by the compilers. Many species of insects thrive when we might wish to stay indoors; the Collembola are good examples, as are the species of Chionea (Diptera: Tipulidae), a genus of wingless crane-flies. We should like to know much more about the distribution of many hardy winter insects, and only increased collecting will enable this.

Winter thaws have been turned to good use by several Michigan entomologists. An interesting paper by Newman (1945) shows what lepidopterists can do. 'Sugaring' trees and collecting at 'blacklight' are useful measures when winter temperatures rise; a recent example will illustrate the productivity of these methods.

Abnormally high temperatures during the fourth week of January, 1967, caused a marked increase in insect activity. On the 23rd the thermometer soared to 58°F, in East Lansing, and two lepidopterists, Julian P. Donahue and the author, decided to try the results of light and sugar. By evening the mercury had dropped to 48°F, but Noctuidae (Lepidoptera) were seen in flight as we approached our collecting site near Rose Lake, Shiawassee County (T5N, R1E, Sec. 20). Bait was applied and 12 noctuids were taken. These proved to be Eupsilia morrisoni (Grote), 19, and Eupsilia vinulenta (Grote), 6♂ and 5♀. The BLB tube was not as productive, as it attracted only two noctuids, a♂ Pyreterra hesperidagro (Guenée) and a♀ E. vinulenta. Except for two Microlepidoptera, neither of which were captured, no other insects of any order were observed. Activity dropped sharply about an hour and a half after nightfall, and when the temperature reached 40°F we ceased our efforts. Several noctuids were seen on the wing as we left the area.

On 24 January the temperature increased steadily during the day, and had reached the middle fifties at dusk, when we applied our bait at the same locality. Noctuidae were found to be more numerous than on the previous night. Species taken at bait were: Eupsilia sidus (Guenée), 1♂; Eupsilia trisignata (Grote), 3♀; Eupsilia vinulenta (Grote), 7♂ and 7♀. Eupsilia morrisoni was extremely common at bait, and several were captured on twigs far from the sugar. 11♂♀ and 14♀♀ were taken to increase our series, and others were purposely startled to observe their reaction. Invariably they dropped directly from the bait into the dead leaves and litter beneath, where their color harmonized perfectly. These moths made no further attempt to escape, and could be bottled easily or even picked up with the fingers. One♂ Lithophane bethivei Grote & Robin-
son was taken on a twig, an undetermined immature phalangid was found on a tree, and two undetermined spiders were taken in similar situations.

Light was also more productive on 24 January, although it did not compare with bait. A BLB tube was used again, and it attracted a $\sigma E. \text{vinulenta}$ and a $\sigma E. \text{sidus}$, as well as an unexpected surprise. About 9:00 P.M., despite a stiff cool 15-20mph breeze, the noctuid $\text{Homoglaea hircina}$ Morrison began to fly, and four $\sigma\sigma$ were captured at light in quick succession. An undetermined trichocerid (Diptera) and an olethreutid (Lepidoptera) were also taken at the BLB tube.

Collecting in the same locality, Mogens C. Nielsen had similar success. His unsexed Lepidoptera included 12 $E. \text{morrisoni}$, 2 $E. \text{trisignata}$ and 3 $E. \text{vinulenta}$, all at bait; he also benefited from the flight of $H. \text{hircina}$, taking 6 at BL after 9:00 P.M. No one took $H. \text{hircina}$ at sugar, although a late survey of the baited trees was made. The temperature had risen slightly and had passed 60° when we all ended our efforts at 10:00 P.M.

The results are at least indicative of what can be done if the collector can overcome the queer sensation of searching for moths on trees surrounded by drifted snow, or waiting at a light-sheet while Sirius shines high over the foggy forest path.

LITERATURE CITED

Réaumur's Insect Collecting Net of 1736

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In several recent papers (Wilkinson, 1966a, 1966b, 1966c, 1967), I have discussed the interesting origins of modern collecting nets. Actual illustrations of nets are very rarely found in entomological literature before the 1750s, and we are extremely lucky to have in Réaumur's classic Mémoires pour servir à l'histoire des insectes (Paris, 1734-42), a very early depiction of one of the ancestors of our present bag-net, with an explanation of its construction.

René Antoine Ferchault de Réaumur (1683-1757) is probably best known for his thermometer, still used in some countries. A prominent member of the Académie des Sciences, Réaumur distinguished himself in many fields of endeavor. His Mémoires contain the results of original research on such topics as the community life of social insects and the development of parasitic Hymenoptera. A follower of Swammerdam, Réaumur studied the immature stages of many species of insects and made a significant contribution to our knowledge of the nature of metamorphosis.

Each of the six volumes of the Mémoires contains an engraved vignette, placed after the preliminaries as a headpiece to the main body of the volume. Our illustration from Réaumur (Fig. 1) appears in t. 2 (1736) and shows a group of collectors using a curious variant of the bag-net. Réaumur gives careful instructions for assembling his net in the preface to the volume (pp. xlv-xlvi). An iron wire is bent into a hoop with a diameter of 13-14 pouces (approximately 33-35.5 cm.),

Figure 1. Réaumur's vignette of the insect collectors from t. 2 (1736) of Mémoires pour servir à l'histoire des insectes.
and the ends of the wire are bent outward and bound together so that the hoop can be attached to a cane or stick, either by tying the bound ends securely to the end of the stick "a volonte," or by the safer method of drilling the stick and pressing in the wires.

Thus far Réaumur's directions could apply equally to the construction of a simple modern amateur's net, but he means to improve upon the already well-known bag-net design. According to Réaumur, a wide ribbon of cloth is folded over the hoop and stitched (Fig. 2, A); then a loose circular piece of yézeau or fine netting (Fig. 2, B) is sewn to the ribbon. In the center of this piece is an aperture through which the hand can be passed freely ("asséz grande pour laisser passer la main librement"). To the circumference of the aperture is stitched a cylinder of gauze (Fig. 2, C), open at the other end but fitted with a ribbon so that it can be drawn tightly shut and secured.

Réaumur explains the necessity for adding the gauze cylinder. If an insect is captured by covering it with the net, the creature might escape if the wire frame were lifted to admit the hand. The difficulty is solved by entering the net from the other end of the bag; "on prend à loisir & doucement le papillon; ainsi on conserve ses ailes avec toute leur fleur." Some experienced collectors, says Réaumur, are able to take insects on the wing; the net is brought quickly to the ground once the quarry is inside. The procedure of handling the net

Figure 2. A, the hoop with its stitched cover; B, the loose circular piece of net; C, the net cylinder with ribbon, here untied. Drawing courtesy of Julian P. Donahue.
is well illustrated in Fig. 1, and one of the collectors may be seen removing a butterfly from the bag.

A transcription of Réaumur's statement is easily made, but interpretation is not as simple. Knowledge of the European Lepidoptera had reached such a level in the late seventeenth century that nets must have been widely used by collectors, but the first evidence of such use does not appear until the end of the century (Wilkinson, 1966a). The first net used was apparently the bag-net, derived from the design used by fishermen. The earliest English statement found to date indicates that the pioneer lepidopterist James Petiver (ca. 1663-1718) was using a bag-net or later variant in the early eighteenth century, but we know that the cumbersome clap-net somehow gained popular approval in England (Wilkinson, 1966a, 1966b). However, this piece of fowler's apparatus did not replace earlier designs on the Continent. French, Dutch and German collectors used the bag-net, but evidently did not discover at once that if a deep net were used on the ring, an insect could be trapped inside quite easily by doubling the ring over the net as we do today. Réaumur's instructions, as well as scattered illustrations from the mid-eighteenth century, indicate that in this period many bag-nets were so shallow that proper capture could not be effected unless the wire frame of the net was held securely against the ground.

As the century wore on, Continental collectors chose to lengthen their net bags and pinch or pin trapped insects through the gauze rather than adopt Réaumur's elaborate cylinder tied with ribbon. By the third quarter of the century, French nets were fitted with bags two feet or more in depth, affixed directly to the hoop. The Réaumur net fell into disuse, becoming one of many discarded experiments in the pragmatic development of our modern collecting equipment.

[As this issue goes to press I have received photographs from my kind friend Dr. W. S. Bristowe, Whatlington, Battle, Surrey, England, of a much earlier style of Continental net. The illustrations, which show collectors in action, are from a Flemish MS. of 'The Romance of Alexander,' dated 1339-1344. They will be published by Dr. Bristowe in a forthcoming issue of The Entomologist's Gazette -- RSW.]

LITERATURE CITED

A METHOD OF COLLECTING CATOCALA MINUTA (LEPIDOPTERA: NOCTUIDAE) AND RELATED SPECIES

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During the last twelve years I have 'sugared' extensively in areas where large honey locusts (*Gleditsia triacanthos* L.) are abundant. Although the various forms of *Catocala innubens* Guenee and *Stenoloma lunilinea* (Grote) have appeared in my bait traps, *Catocala minuta* Edwards has been absent. [*C. minuta* is taken on *Gleditsia* in southern Michigan by using a mixture of molasses, brown sugar, beer and rum--Ed.] There is, however, a method of collecting the pupae of *C. minuta* that I have employed with excellent results.

Obtain a quantity of clean rags or burlap bags. Clear the bases of the honey locust trees; all climbing vines and nearby weeds should be removed. Moisten the bags and place them around the base of each tree in close proximity to the trunk. The cloth should be folded two or three times or crumpled, as if the surface is too smooth, the larvae will cross over and pupate farther away. Normally, a mature larva would leave the tree and spin a loose cocoon in the leaf litter and debris surrounding the tree, but with the base of each tree surrounded with bags, the larva will have no need to look farther for a suitable place to pupate. It will spin inside or under the bag.

The bags should be positioned about 1 June. In New Jersey, pupae will be obtained from this date to about 1 July. [Adult *minuta* have been taken as early as 27 June in southern Michigan--Ed.] Larvae will usually die if disturbed when spinning, so it is best to wait until late in June before the bags are searched for pupae. I have collected the pupae of *C. minuta*, *C. innubens* and *S. lunilinea* by this method, as well as other species that have fed on nearby plants. In the season of 1966 I fitted 10 *Gleditsia* in two locations with burlap bags, and obtained 30 pupae of *C. minuta*, a species I had sought for many years without luck.

I have not yet tried the method on other species of trees, but it may be generally useful for the *Catocala*; even the larval of *Apantesis* spp. (Lepidoptera: Arctiidae) may be trapped with bags flattened on the ground and weighted. Once I substituted newspapers, usually a successful medium for the pupation of *Catocala*, but upon later investigation I found the material shredded, perhaps by mice, rats or other mammals. There were no pupae. Under the circumstances, rags or burlap bags would seem to be the safer material.

Presumably, many of Vladimir Vladimirovich Nabokov's readers do not know that he is a distinguished entomologist; one can search through the majority of his numerous novels, short stories, translations and critical works without discovering the fact. On the other hand, there may be an entomologist somewhere who does not know that Nabokov of the Lycaenidae is also the author of Lolita, Pnin and Nabokov's Dozen. To those in both categories, and to those who already know how successfully Nabokov has bridged the Two Cultures, we recommend Speak, Memory.

This enlarged and revised version of Nabokov's autobiography has a rather complicated past. Many of its chapters appeared in first form in such magazines as The New Yorker -- where, as example, the sixth was printed as "Butterflies" in 1948. The first version of the autobiography was published in the United States as Conclusive Evidence (1951); its success may be measured by the fact that it was translated into five languages. The early form of Chapter 6 has already become a minor classic of its kind, and was included in Patrick Matthews' anthology The Pursuit of Moths and Butterflies (1957).

Now there is additional material, woven into the captivating story of Nabokov's childhood in Czarist Russia, his education at Cambridge, and the European exile when the Russian novels were written. Only a hint is given of his later work with the Lepidoptera, as the time-span does not extend beyond the author's emigration to America in 1940. Yet there are evocative passages in which Nabokov recalls his early entomological experiences on the great estate near St. Petersburg. We wait with him at deep-throated flowers and net Sphingidae as they feed during the June twilight, and follow him as he sugars for Catocala adultera in the cool northern autumn.

There are triumphs and moments of adversity. In a disused store-room, the youthful Nabokov discovers a host of rare entomological books; surely the ownership of Maria Sibylla Merian's superb color-plate work on Surinam insects, Esper's Die Schmetterlinge and Boisdruval's Icones historiques de Lépidoptères Nouveaux would incline anyone toward the collecting of Lepidoptera! We share Nabokov's distress as the Swiss governess, entering his room to read aloud a passage from Rousseau denouncing zoology in favor of botany, sits decisively on a cabinet drawer containing a rare series of Pieris brassicae aberrations including a gynandromorph, then 'consoles' him by suggesting that the broken specimens were only "papillons de potager".

Vladimir Nabokov has hunted butterflies "in various climes and disguises: as a pretty boy in knickerbockers and sailor cap; as a lanky cosmopolitan expatriate in flannel bags and beret; as a fat hatless old man in shorts," and few writers in English have his power to evoke
the spirit and color of the chase. *Speak, Memory* will surely find its place among those books turned to in desperation on long winter evenings when all that can remind us of happy past seasons are the long rows of specimens, and reminiscences that such authors as Nabokov provide.

R.S.W.

**BRIEF NOTICES**


Contributions to this year's volume are: The entomologist J.C. Fabricius; Temperature effects on embryonic development in insects; Gut absorption; Food selection by grasshoppers; Bionomics and ecology of predaceous Coccinellidae; Fungal-insect mutualism in trees and timber; Systemic insecticides in trees; Insects and the problem of austral disjunctive distribution; The evolution and past dispersal of the Trichoptera; Evaluation of forest insect infestations (by Fred B. Knight, Department of Forestry, University of Michigan); Mode of action of insecticide synergists; Consequences of insecticide use on nontarget organisms; A critical review of *Bacillus thuringiensis* var. *thuringiensis* Berliner and other crystalliferous bacteria; Allergic responses to insects; Trans-stadial and transovarial development of disease agents in arthropods; Ticks in relation to human diseases caused by *Rickettsia* species; Recent fundamental work on tsetse flies; Recent advances in bee communication and orientation; The evolution and genetics of insect behaviour; and Acoustical communication in arthropods (by Richard D. Alexander, Department of Zoology, University of Michigan).

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This interesting little work contains ideas for the maintenance and study of a great variety of animals, from amoeba to opossum. Entomologists will want to read the chapters about grasshoppers, crickets and termites. There is a useful appendix, listing sources for the purchase of general biological supplies, animals and specialized equipment.

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This, the latest volume of a useful series initiated in 1963, contains the following papers: Image formation and sensory transmission in the compound eye; Amino acid and protein metabolism in insect development; Metabolic control mechanisms in insects; The control of polymorphism in aphids; The regulation of breathing in insects. The well chosen type face and pleasing format might well serve as models for other publishers to emulate.
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INFORMATION FOR AUTHORS

Papers dealing with any aspect of entomology will be considered for publication in The Michigan Entomologist. We solicit subjects of particular interest to amateur and professional entomologists in the North Central States and Canada, as well as general papers and revisions directed to a larger audience while retaining an interest to readers in our geographical area. Books will be reviewed with this larger audience in mind. Notes on collecting methods and new techniques are welcomed, as are subjects in the history and bibliography of entomology.

Manuscripts are submitted to one or more qualified referees and are judged on scholarly merit as well as clarity of presentation. Articles of 10 or more printed pages may be published in the course of several issues unless the extra pages are subsidized at cost. Especially meritorious papers of at least 28 pages may be published as single issues if subsidized.

Illustrations are encouraged and will be printed without charge. Photographs should be glossy and 8" x 10" in size while drawings, charts, graphs, and maps may be of any size, allowing for reduction. Contributors should follow the recommendations of the Style Manual for Biological Journals, available at $3.00 per copy from the American Institute of Biological Sciences, 3900 Wisconsin Avenue, N.W., Washington, D.C. 20016. A pedantic style should be avoided, for scientific accuracy and lucid, interesting prose can exist together.

Manuscripts must be typed, double-spaced, with wide margins on white 8 1/2" x 11" or equivalent foreign size paper. Proofs will be submitted to authors, and must be returned within one week of receipt. Titles should be concise, identifying the order and family discussed. The author of each species mentioned must be given fully at least once in the text. A common name for each species or group should be given at least once when such a name exists. The format of references should follow that used in recent issues. While every care will be taken of authors' manuscripts, neither the Editor nor the Michigan Entomological Society will accept responsibility for accidental loss or damage.

Each author or co-author will receive 25 gratis separates of his paper; authors of notes will receive 10 separates. Additional separates may be ordered at cost upon acceptance of manuscript.

All manuscripts for The Michigan Entomologist should be sent to the Editor, Ronald S. Wilkinson, The Library, Michigan State University, East Lansing, Michigan 48823, USA. Other correspondence should be directed to the Executive Secretary (see inside front cover).