

## GENERAL NOTES

CATOCALA (NOCTUIDAE) SPECIES TAKEN IN CLAY COUNTY,  
TENNESSEE

While collecting Lepidoptera in southwestern Michigan and on seven collecting trips of one or two annually to Clay Co., Tennessee from 1970–1976, I became aware of the large *Catocala* fauna of the latter area as compared to Michigan where many of the same species are rare or absent. Subsequently I made a special effort to collect this genus in Tennessee during 1975–1976. The majority of records listed below were made during this period.

## MATERIALS AND METHODS

Collecting was conducted from 20 June–22 August within a two-mile radius of Celina in north-central Tennessee. The general countryside, being a part of the Cumberland Mountains, is hilly and heavily forested. Common trees here include White and Black Oak (*Quercus alba* L. & *Q. ellipsoidalis* Hill), Mockernut and Shag-bark Hickory (*Carya tomentosa* Nutt. & *C. ovata* Mill.), Honey Locust (*Gleditsia triacanthos* L.), Black Walnut (*Juglans nigra* L.), American Beech (*Fagus grandifolia* Ehrhart), Tulip Poplar (*Liriodendron tulipifera* L.), Black Maple (*Acer nigrum* F. Michaux), and White Ash (*Fraxinus americana* L.). The forested collecting areas generally consisted of about 25% hickory, 35% oak, 20% beech and maple, and 20% miscellaneous species. Most night collecting was done during a new moon phase with night temperatures averaging 60°–70°F.

Four basic collecting methods were used for collecting *Catocala*: bait, ultraviolet and mercury vapor light, tapping trees, and a 150-watt incandescent light. Baiting was done along a path in an oak-hickory woods. The bait, consisting of beer, sugar, molasses, and fermented fruit, was applied to about 40 trees at dusk and checked periodically until about 0200 hours. A single 15-watt unfiltered fluorescent black-light tube set up in front of a sheet hung alongside the place of residence and a 150-watt incandescent porch light were checked at regular intervals throughout every night. In 1976 a 175-watt mercury vapor lamp was used along with the other light sources. Tapping trees with a wood mop handle to flush resting moths during the daytime was done primarily in the same oak-hickory woods that baiting was done. Data was recorded in a field notebook as soon as possible on species behavior and numbers.

The *Catocala* species and forms were determined by referring to the works of Barnes & McDunnough (1918, Mem. Amer. Mus. Nat. Hist. 3(1), 47 p., 21 pl.) and Sargent (1976, Legion of night. Univ. Mass. Press, Amherst, 215 p., 8 pl.), as well as examining *Catocala* collections of M. C. Nielsen and Michigan State University at East Lansing. The lone *C. gracilis* specimen, although worn, was determined by the presence of the short basal forewing dash often used in separating *gracilis* from the very similar *C. sordida*.

All specimens collected have been deposited in my personal collection in Kalamazoo, Michigan, given to Mike Larkin also of Kalamazoo, or donated to Western Michigan University.

## RESULTS AND DISCUSSION

As of August 1976 the *Catocala* species total for Clay Co., Tennessee is 41. A list of the species arranged according to McDunnough (1938, Mem. So. Calif. Acad. Sci., Vol. 1. 275 p.) that includes earliest and latest dates taken and other capture data is shown in Table 1. The dates given in Table 1 coincide only with my collecting trips and should not be construed as conclusive. Many of the species have longer flight periods than shown. However, species whose condition and/or numbers that

TABLE 1. *Catocala* collected in Clay Co., Tennessee at bait (B), ultraviolet and mercury vapor lights (UV & MV), tapping trees (T), and 150-watt incandescent light (IN). Tree species tapped are Shagbark Hickory (SH), Mockernut Hickory (MH), Black Oak (BO), White Oak (WO), and Black Maple (BM).

Species	Earliest & latest collecting dates	Method of capture				Tapping results Tree species					Total number of specimens
		B	UV & MV	T	IN	SH	MH	BO	WO	BM	
<i>C. innubens</i> Gn. incl. " <i>scintillans</i> " G. & R.	4 July-7 Aug.	13	9	10	-	1	4	3	-	2	32
<i>C. piatrix</i> Grt.	5 July-5 Aug.	5	1	-	-	-	-	-	-	-	6
<i>C. epione</i> Dru.	21 June-6 Aug.	9	31	2	2	1	1	-	-	-	44
<i>C. habilis</i> Grt.	31 July-6 Aug.	-	2	13	-	12	-	-	1	-	15
<i>C. serena</i> Edw.	11 July-6 Aug.	-	4	5	-	5	-	-	-	-	9
<i>C. robinsoni</i> Grt.	6 Aug.	-	-	1	-	1	-	-	-	-	1
<i>C. judith</i> Stkr.	25 June-6 Aug.	1	8	15	-	15	-	-	-	-	24
<i>C. flebilis</i> Grt.	5 July-6 Aug.	9	8	22	-	5	14	2	-	1	39
<i>C. angusi</i> Grt. incl. " <i>lucetta</i> " Hy. Edw.	31 July-6 Aug.	6	4	12	-	12	-	-	-	-	22
<i>C. obscura</i> Stkr.	4 July-6 Aug.	45	3	28	-	25	2	1	-	-	76
<i>C. residua</i> Grt.	4 July-6 Aug.	42	1	7	-	7	-	-	-	-	50
<i>C. sappho</i> Stkr.	4 Aug.-6 Aug.	-	2	1	-	1	-	-	-	-	3
<i>C. resecta</i> Grt. incl. subspecies <i>luctuosa</i> Hlst.	5 July-6 Aug.	36	6	21	-	14	1	-	6	-	63
<i>C. ulalume</i> Stkr.	31 July-4 Aug.	-	1	1	-	-	-	-	-	1	2
<i>C. dejecta</i> Stkr.	24 June-4 Aug.	3	16	4	-	4	-	-	-	-	23
<i>C. insolabilis</i> Gn.	4 July-3 Aug.	6	5	5	-	5	-	-	-	-	16
<i>C. vidua</i> A. & S.	1 Aug.-6 Aug.	16	-	12	-	7	-	-	5	-	28
<i>C. maestosa</i> Hlst.	2 Aug.-3 Aug.	-	-	2	-	-	-	-	2	-	2
<i>C. lacrymosa</i> Gn. incl. " <i>evelina</i> " Fr. & " <i>zelica</i> " Fr.	16 July-5 Aug.	8	2	5	-	1	-	3	-	1	15

TABLE I. (Continued)

Species	Earliest & latest collecting dates	Method of capture				Tapping results Tree species					Total number of specimens
		B	UV & MV	T	IN	SH	MH	BO	WO	BM	
<i>C. palaeogama</i> Gn. incl. "phalanga" Grt. & "annida" Fager	5 July-6 Aug.	5	9	10	-	2	2	3	-	3	24
<i>C. nebulosa</i> Edw.	5 July-6 Aug.	3	6	2	-	-	-	2	-	-	11
<i>C. subnata</i> Edw.	5 July-5 Aug.	1	5	4	-	2	-	-	2	-	10
<i>C. neogama</i> A. & S.	5 July-6 Aug.	10	9	5	-	5	-	-	-	-	24
<i>C. ilia</i> Cram. incl. "conspicua" Worth.	20 June-6 Aug.	128	47	3	1	-	-	3	-	-	179
<i>C. cerogama</i> Gn.	4 July-6 Aug.	11	-	-	-	-	-	-	-	-	11
<i>C. relictata</i> Wlk.	22 Aug.	-	1	-	-	-	-	-	-	-	1
<i>C. cara</i> Gn. incl. subspecies											
<i>carrisima</i> Hlst.	2 Aug.-6 Aug.	7	-	-	-	-	-	-	-	-	7
<i>C. amatrix</i> Hbn.	4 Aug.	1	-	-	-	-	-	-	-	-	1
<i>C. illecta</i> Wlk.	24 June-28 June	-	8	-	-	-	-	-	-	-	8
<i>C. gracilis</i> Edw.	12 July	-	-	-	1	-	-	-	-	-	1
<i>C. andromedae</i> Gn.	23 June-15 July	-	16	1	1	1	-	-	-	-	18
<i>C. coccinata</i> Grt.	23 June-27 June	-	7	-	-	-	-	-	-	-	7
<i>C. miranda</i> Hy. Edw.	26 June	-	1	-	-	-	-	-	-	-	1
<i>C. ultronia</i> Hbn. incl. "celia" Hy. Edw.	23 June-3 Aug.	10	18	2	1	2	-	-	-	-	31
<i>C. grynea</i> Cram.	23 June-17 July	-	4	-	-	-	-	-	-	-	4
<i>C. clintoni</i> Grt.	23 June-28 June	1	2	-	-	-	-	-	-	-	3
<i>C. similis</i> Edw.	26 June	-	1	-	-	-	-	-	-	-	1
<i>C. minuta</i> Edw. incl. "mellitula" Hlst.	23 June-27 June	-	5	-	1	-	-	-	-	-	6
<i>C. micronympha</i> Gn. incl. "hero" Hy. Edw. & "gisela" Meyer	22 June-16 July	2	38	5	2	-	-	1	4	-	47

TABLE 1. (Continued)

Species	Earliest & latest collecting dates	Method of capture				Tapping results Tree species					Total number of specimens
		B	UV & MV	T	IN	SH	MH	BO	WO	BM	
<i>C. connubialis</i> Gn. incl. " <i>cordelia</i> " Hy. Edw.	23 June-27 June	-	5	-	1	-	-	-	-	-	6
<i>C. amica</i> Hbn. incl. " <i>curvifascia</i> " Brow.	26 June-2 Aug.	-	9	23	-	-	1	10	12	-	32
Total number of specimens	20 June-22 Aug.	378	294	221	10	129	25	27	32	8	903
Numbers broken to percentages (%)		42	33	24	1	58	11	12	15	4	

appeared to be affected by the restrictive collecting dates are subsequently discussed. Although additional coverage of Clay Co. will undoubtedly add more species and behavior data, certain interesting conclusions can be drawn from Table 1.

The 5 July collecting date for *C. piatrix* is very early for Tennessee, as this species peak flight is normally early to mid August. This could account for the small number taken of a fairly common species. The *C. robinsoni* male taken on 6 August is likewise a very early date for the species. I have seen fresh *robinsoni* in the M. C. Nielsen Collection from Missouri with mid-September dates. The 2 males of *C. sappho*, and to a lesser extent a female, captured in early August were very worn, suggesting a mid-July flight period in Tennessee. Specimens of *C. ulalume* and *C. maestosa* were fresh, indicating their capture dates probably fall within the species main flight period. The late June dates recorded for *C. clintoni* are quite advanced. All specimens were worn and this species is generally considered to be the earliest *Catocala* on the wing. Eggs were secured from one female. The flight period of the smaller species begins about 20 June in Tennessee as nearly all specimens taken at that time were fresh. In cases where the small number of species taken prohibited an accurate determination of the flight period, Forbes (1954, Cornell Univ. Agric. Expt. Stat., Mem. 329. 433p.), Sargent (1976), and various *Catocala* collections were consulted to arrive at more accurate flight times.

More specimens were taken at bait than by other methods because of large numbers of a few species, e.g., *C. obscura*, *resecta*, *vidua*, *cerogama*, *illia*, and *cara*. These same species are also found commonly at bait in Michigan. Baiting success was greatest right after dusk and became progressively worse into the night. *C. angusi* was the only species recorded as a consistent late night feeder, never appearing till a few hours after dusk. Dry, warm, still nights were more productive than heavy, humid nights, such as after a rain. I believe high humidity may dilute the scent of the bait. Moon phase did not appear as a factor in baiting success.

Light attracted a wider variety of species than any other method with small *Catocala* being especially susceptible. The most productive night of collecting at bait and light occurred when a distant electrical storm was brewing.

Shagbark Hickory produced more *Catocala* than all other species of trees tapped. Hickories composed only about 25% of the total tree species, but yielded 70% of the underwings. Tapping was best during hot, dry afternoons. If any electrical discharge was in the air, such as an oncoming storm, the results were phenomenal. I have scared as many as 10-12 moths off Shagbarks about 0.67 m in diameter. During cool days, moths might rest higher in trees using more exposed positions for thermoregulation, which could account for the very poor results during those times. I have flushed *Catocala* from under shale outcroppings in woods. I could not make any positive identifications, but the species (about 5) were all large with yellow hindwings, perhaps being *C. nebulosa*. This species is reported to select unusual resting places (Sargent, 1976).

In addition to the results recorded in Table 1, other interesting *Catocala* observations were made. *C. obscura* and *residua* intergrade very closely in Clay Co. The two species ranged from very distinct to almost totally indistinguishable. This observation for this area agrees with that made by Sargent (1976). *C. obscura* alone exhibits much individual variation. Some specimens are large (70 mm), with greenish tinged, dark, well maculated forewings that are marked with a black dash extending from slightly below the apex to the outermost point of the pm line. Specimens at the other extreme are small (62 mm) with light, uniform dusky brown primaries that have very little maculation. These variations, with little blending, are found in both sexes. All *C. obscura* from Michigan are of the latter description. Clay Co. lies within the range of *C. resecta luctuosa*, and appears to be a blend zone with many intergrades between the nominate form and the subspecies taken here. Both nominate *C. cara* and *C. c. carissima* were very distinct with no intergradation. I found this interesting, but because of the small sample size, I hesitate to speculate

further on this observation. The single specimen of the typical *C. relicta* was a positively identified sight record. Sargent (1976) mentions Kentucky as the southern limit of this species, however Mather (pers. comm.) informed me of a single record from Mississippi. All *C. illecta* (males) were captured between 0300 and 0400 hours and could suggest that this is an active late night species. The lone capture of *C. miranda* was made at 0400 hours. This species' rarity might be due in part to its being a late flyer. Sargent (1976) gives some Atlantic Coast states, with Pennsylvania, as the range of *C. miranda*, but besides this specimen, I have found another one from Tennessee in the Michigan State University collection at East Lansing, Michigan.

The only regional list of *Catocala* I could find for any area close to Clay Co. was from Mather (pers. comm.) for Mississippi. Mather did not include *habilis*, *judith*, *flebilis*, *subnata*, *cerogama*, *miranda*, or *coccinata*. Species with only one or two records include *serena*, *obscura*, *residua*, *sappho*, *palaeogama*, *relicta*, *gracilis*, *clintoni*, and *minuta*. According to the *Catocala* ranges given by Sargent (1976) and assessment of local foodplants, the following might be expected to occur in Clay Co., but have not been recorded: *C. consors* A. & S., *agrippina* Stkr., *marmorata* Edw., *junctura* Wlk., *sordida* Grt., *crataegi* Saund., *mira* Grt., *titania* Dodge, and *dulciola* Grt.

The diversity of *Catocala* species encountered in Clay Co. is remarkable for only two years of fairly concentrated collecting. I would greatly appreciate hearing from anyone who has collected this genus in the Tennessee or Kentucky area.

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#### APPARENT LONG-DISTANCE DISPERSAL BY *PIERIS OCCIDENTALIS* (PIERIDAE)

Colonizing ability and the turnover rate of local populations of animals depend to a considerable degree on vagility. Records of "stray" butterflies are common in the literature, although it is rarely possible to deduce the manner of dispersal or even a minimum distance traveled. Altitudinal displacements sometimes offer good opportunities of this sort (Shapiro, 1973, J. Res. Lep. 12: 231-235; 1974, Ibid. 13: 157-161). The western white (*Pieris occidentalis* Reakirt) and the checkered white (*P. protodice* Boisduval & LeConte) are a pair of sibling species which generally replace each other, occurring at high and low altitudes respectively through most of western North America. Both are believed to be colonizing species, with vigorously dispersing adults (Shapiro, 1975, Amer. Midl. Nat. 93: 424-433). *P. protodice* seems unable to overwinter in Donner Pass (Placer/Nevada cos., California) at 7000 feet, but regularly colonizes the area in summer. Records of downslope dispersal by *P. occidentalis*, which is not known to breed in the Sierra below 6000 feet, are much rarer. On 13 August 1975 a worn female was taken at 5000 feet in the South Yuba River Canyon, Nevada Co., and I considered this a noteworthy "low elevation" record for California (Shapiro, unpublished).

On 17 October 1976 I was collecting a sample of *P. protodice* at Rancho Cordova, Sacramento Co., California, elevation 65 feet, when I noticed a dark female vigorously rejecting a courting male. I collected the two, and was astonished to find that the