

THE GENUS *CATOCALA* SCHRANK COLLECTED FROM
FOUR EASTERN SOUTH DAKOTA COUNTIES
(NOCTUIDAE: CATOCALINAE)

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ABSTRACT. Twenty-eight species of underwing moths were collected from eastern South Dakota by the use of light traps and a technique for collecting *Catocala* moths known as sugaring. Included are data on flight period, time of collection and a key to the species.

The members of the genus *Catocala* Schrank are commonly called underwing moths. The genus is mostly temperate in distribution and according to Forbes (1954) contains about 200 species. Sargent (1976) listed 71 species east of the Mississippi River and McDunnough (1938) listed 104 North American species.

This paper treats 28 species of underwing moths, collected from four eastern South Dakota counties: Clay, Minnehaha, Lake and Brookings. Included are data on flight period, collecting methods, time of collection, and a key to species.

METHODS AND MATERIALS

Collecting included the use of light traps (black-light and standard 200 watt light bulb) and the use of a technique for collecting moths known as "sugaring" (a mixture of brown sugar and beer applied to trees). Two types of specimens have been used in this study: museum specimens deposited in the South Dakota State University collection, which contains the Truman collection from Volga, and specimens collected by the use of light traps and bait (sugaring) for the years 1976 through 1979 in Minnehaha Co. and 1979 in Brookings Co. Collecting in Minnehaha was by the use of white light and bait within the city of Sioux Falls, South Dakota. In Brookings Co. specimens were collected from five different light trap sites using a fluorescent black light, 15 watt General Electric bulb, F₁₅T8-BL. Three traps were placed in the city of Brookings; one trap a mile south of Volga; one trap east of Aurora.

Key to Eastern South Dakota *Catocala* Moths

- | | |
|--|--------------------|
| 1. Foretibiae spined | 2 |
| Foretibiae not spined | 7 |
| 2. Ventral forewing with postmedial band orange | 4 |
| Ventral forewing with postmedial band not orange | 3 |
| 3. Hindwing black | <i>insolabilis</i> |
| Hindwing orange | <i>innubens</i> |

4. Expanse less than 70 mm	5
Expanse greater than 70 mm	6
5. Below with thorax and base of wings whitish, above strongly mottled, both sexes with a basal dash	<i>palaeogama</i>
Underside not as above, forewing with more even coloring, only female has basal dash	<i>habilis</i>
6. Forewing mottled brown with some gray, subreniform usually closed	<i>piatrix</i>
Forewing mottled gray with some brown, subreniform usually opened	<i>neogama</i>
7. Hind tibiae spined	8
Hind tibiae not spined	21
8. Hindwing red or pink	10
Hindwing orange	18
Hindwing black with light band	9
9. Band orange	<i>cerogana</i>
Band white	<i>relicta</i>
10. Ventral forewing with postmedial band having red scaling	11
Postmedial band white	12
11. Postmedial band red; expanse less than 70 mm	<i>coccinata</i>
Postmedial band not solid red; expanse greater than 70 mm	<i>ilia</i>
12. Hindwing pink	13
Hindwing red	15
13. Forewing black with darker lines, dusted with yellow-green scales	<i>cara</i>
Forewing lighter gray, no yellow-green scales	14
14. Hindwing with fringe invaded with black scales at veins; basal dash usually present; expanse greater than 70 mm	<i>amatrix</i>
Fringe white; basal dash absent; expanse less than 70 mm	<i>concumbens</i>
15. Forewing with apical, basal and tornal dashes	<i>parta</i>
Not with all three dashes	16
16. Forewing without white	<i>luciana</i>
Forewing with at least white subterminal line	17
17. Forewing with brown scaling near antemedial and postmedial lines ..	<i>arizonae</i>
Forewing with gray or blue scales in these areas	<i>meskei</i>
18. Reniform black	19
Reniform gray, surrounded by black	20
19. Reniform a triangle; black antemedial line widening to middle of wing	<i>whitneyi</i>
Reniform drop-shaped; antemedial line not widening	<i>nuptialis</i>
20. Reniform surrounded by a black V whose ends touch the costa ..	<i>abbreviatella</i>
Reniform with two concentric black rings	<i>amestris</i>
21. Hindwing red	<i>ultromia</i>
Hindwing orange	22
22. Inner band of hindwing looped back to the base	23
Inner band of hindwing ends at anal angle	25
Inner band of hindwing absent	<i>amica</i>
23. Light streak from costa to subreniform	24
Forewing uniform blue-gray, brown scaling at tornal angle	<i>grynea</i>
24. Forewing mottled gray; ante- and postmedial lines well separated at inner margin	<i>mira</i>
Forewing mottled brown; antemedial and postmedial lines very close or touching	<i>blandula</i>
25. Forewing gray; basal and tornal dashes present	<i>clintonii</i>
Forewing brown; subterminal lines white at costa	<i>minuta</i>

Specimen Records:

Catocala innubens Guenee (9 specimens): Brookings—VIII-28-76, ♂; Sioux Falls—VII-12-78, ♀; VIII-3-78, ♀; VIII-5-78, ♀; VIII-5-78, ♀; VII-29-79, ♂; VII-9-79, ♂; VIII-12-79, ♂; Volga—VII-7-1896, 2 ♀♀.

Catocala piatrix Grote (2 specimens): Brookings—VII-23-57, ♂; Vermillion—VII-16-46, ♂.

Catocala habilis Grote (2 specimens): Volga—VII-12-1896, ♂; VII-14-1896, ♂.

Catocala insolabilis Guenee (3 specimens): Sioux Falls—VII-24-79, 2 ♀♀; VII-26-79, ♂.

Catocala palaeogama Guenee (2 specimens): Sioux Falls—VII-15-79, ♀; VII-20-79, ♂.

Catocala neogama (Abbot and Smith) (9 specimens): Sioux Falls—VIII-13-77, ♀; VII-23-78, ♀; VII-3-78, 2 ♂♂, ♀; VIII-5-78, 2 ♂♂; VII-22-79, ♀; VIII-31-79, ♂.

Catocala ilia (Cramer) (5 specimens): Brookings—VII-29-69, ♀; Sioux Falls—VII-8-78, 2 ♀♀; VII-9-78, ♂; VII-12-78, ♀; Volga—reported as common (Truman, 1896), no specimens.

Catocala cerogama Guenee (3 specimens): Sioux Falls—VII-26-77, ♀; VII-25-78, ♂; VIII-5-78, ♀; Volga—reported rare (Truman, 1897), no specimens.

Catocala relictia Walker (no specimens): Volga—reported as very rare (Truman, 1897).

Catocala parta Guenee (71 specimens): Brookings—VII-20-70, ♀; VIII-9-70, ♂; Sioux Falls—VI-23-77, ♀; VI-23-78, ♀; VII-6-78, ♂; VII-8-78, ♂, 2 ♀♀; VII-9-78, 2 ♀♀; VII-12-78, ♂; VIII-3-78, ♀; VII-14-79, ♀; VII-15-79, ♂; VII-16-79, ♂; VII-18-79, 3 ♂♂, ♀; VII-19-79, 6 ♂♂, 4 ♀♀; VII-20-79, 7 ♂♂, 3 ♀♀; VII-22-79, 4 ♂♂, 4 ♀♀ FE; VII-24-79, 6 ♂♂, ♀; VII-27-79, ♂, ♀; VII-28-79, 2 ♂♂, 2 ♀♀; VII-29-79, ♀; VII-30-79, ♂; VIII-2-79, ♂; VIII-9-79, ♀; VIII-21-79, ♀; Volga—3 ♂♂, 3 ♀♀, no dates.

Catocala meskei Grote (13 specimens): Brookings—VIII-3-22, ♂; VII-9-66, ♀; VIII-1-66, ♀; VII-23-70, ♂; Sioux Falls—VII-9-76, ♀; VII-4-77, ♂; VII-29-78, ♀; VIII-6-79, ♂, ♀; VIII-15-79, ♂; VIII-19-79, ♂, ♀; VIII-21-79, ♂.

Catocala arizonae Grote (*stretchii* of authors) (no specimens): Volga—listed as rare (Truman, 1897).

Catocala luciana Hy. Edwards (26 specimens): Brookings—VIII-12-?, ♀; VII-24-14, ♂; VII-26-19, ♂; VIII-15-27, ♂; VIII-10-43, ♂; IX-13-57, ♂; VIII-19-70, ♂; IX-3-79, ♀; Chester—VII-12-23, ♂; VI-28-29, ♂; VII-27-29, ♂; VII-29-29, ♂; VIII-2-29, ♂; Sioux Falls—VII-20-77, ♂; VII-25-78, ♂; VIII-3-78, ♂, 2 ♀♀; VIII-16-78, ♂; VIII-12-79, ♂; VIII-20-79, ♂; IX-1-79, ♂; Volga—4 ♂♂, no dates.

Catocala concumbens Walker (2 specimens): Brookings—VII-6-66, ♂; Volga—♂, no date.

Catocala amatrix (Hübner) (5 specimens): Brookings—IX-6-79, ♀; Sioux Falls—VIII-20-78, ♀; VIII-6-79, ♂; VIII-18-79, ♂; VIII-21-79, ♀; 1 sight record VIII-28-78.

Catocala cara Guenee (4 specimens): Sioux Falls—VIII-3-78, ♂; VIII-17-79, ♂; 1 sight record IX-26-79; Volga—2 ♀♀, no dates.

Catocala abbreviatella Grote (2 specimens): Brookings—VI-25-77, ♂, ♀; Volga—recorded as rare (Truman, 1897), no specimens.

Catocala nuptialis Walker (4 specimens): Sioux Falls—VIII-3-78, ♂; VIII-16-79, ♂; VIII-29-79, ♀; IX-26-79, ♀.

Catocala whitneyi French (21 specimens): Brookings—VIII-8-21, ♂; VIII-2-48, ♀; VII-29-43, ♀; VII-27-43, ♀; VII-17-44, ♂; VII-12-66, ♀; VII-15-66, ♀; VII-19-66, ♀; VI-?-67, 2 ♂♂; VII-26-68, ♂; VII-24-68, ♂; VII-29-68, ♂; 2 ♂♂, no dates; Volga—2 ♂♂, 4 ♀♀, no dates.

Catocala amestris Strecker (1 specimen): Sioux Falls—VII-12-78, ♀.

Catocala coccinata Grote (1 specimen): Sioux Falls—VII-9-78, ♀.

Catocala ultromia (Hübner) (20 specimens): Brookings—VII-21-79, ♂; VII-27-22, ♂; VII-30-38, ♀; VII-19-43, ♂; VII-25-43, ♂; VIII-2-43, ♀; VII-20-44, ♀; VII-12-48, ♂; VIII-6-65, ♂; VII-26-66, ♂; VIII-23-68, ♂; Sioux Falls—VIII-3-78, ♀; VIII-5-78, ♂; VIII-3-79, ♂, ♀; VIII-12-79, ♀; VIII-18-79, ♀; Volga—♂, 2 ♀♀, no dates.

Catocala blundula Hulst (1 specimen): Brookings—VII-16-66, ♂.

Catocala mira Grote (21 specimens): Sioux Falls—VI-30-77, ♀; VII-9-78, ♂; VII-11-78, 2 ♀♀; VII-12-78, ♂, ♀; VII-14-79, ♂; VII-15-79, 2 ♂♂; VII-16-79, ♂; VII-19-79, ♂; VII-23-79, ♂; VII-24-79, 2 ♀♀; VII-26-79, 3 ♂♂, ♀; VII-28-79, ♀; VII-30-79, ♂, ♀.

Catocala grynea (Cramer) (34 specimens): Brookings—VIII-12-42, ♂; VII-25-43, 3 ♂♂; VII-27-43, ♂; VIII-2-43, 2 ♂♂; VIII-10-43, ♂; VII-20-44, ♂; VIII-8-44, 2 ♂♂; IX-

TABLE 1. Comparison of three collecting methods used for *Catocala* in Sioux Falls from 1976-1979.

Species	Collecting procedure					
	Light		Bait		Resting site	
	Male	Female	Male	Female	Male	Female
<i>innubens</i>			3	3		
<i>insolabilis</i>			1	2		
<i>palaeogama</i>			1	1		
<i>neogama</i>			5	4		
<i>ilia</i>			1	3		
<i>cerogama</i>		1	1	1		
<i>parta</i>		1	35	26	1	
<i>meskei</i>			5	2		1
<i>luciana</i>	1		5	2	1	
<i>cara</i>			2			
<i>amatrux</i>			2	2		
<i>nuptialis</i>	1	2	1			
<i>amestris</i>				1		
<i>coccinata</i>				1		
<i>ultromia</i>		1	2	3		
<i>mira</i>	2	1	10	7		
<i>grynea</i>	1	1	9	7	1	1
<i>clintonii</i>			1			
<i>minuta</i>	4	1	4	7		
<i>amica</i>				1		
Totals	9	9	88	73	3	2
Totals (male & female)	18		161		5	

14-44, ♂; VII-30-68, ♂; VIII-6-68, ♂; Sioux Falls—VII-7-77, 2 ♀♀; VIII-2-77, ♂; VII-4-78, ♂; VII-11-78, ♀; VII-12-78, 2 ♂♂, ♀; VII-22-79, 2 ♂♂; VII-24-79, ♀; VII-27-79, ♂; VII-28-79, ♀; VII-30-79, ♂; VIII-3-79, ♂; VIII-4-79, ♂, ♀; VIII-20-79, ♀; VIII-21-79, ♂; IX-5-79, ♀; Volga—reported as common (Truman, 1896), no specimens.

Catocala clintonii Grote (1 specimen): Sioux Falls—VII-12-78, ♂; Volga—reported as rare (Truman, 1897), no specimens.

Catocala minuta W. H. Edwards (16 specimens): Sioux Falls—VII-3-76, 2 ♂♂; VII-8-78, ♂, ♀; VII-9-78, ♂, ♀; VII-12-78, ♂, 4 ♀♀; VII-15-79, ♂; VII-23-79, ♂; VII-24-79, ♀; VII-30-79, ♀; VIII-5-79, ♂.

Catocala amica (Hübner) (2 specimens): Brookings—VII-26-79, ♂; Sioux Falls—VIII-3-78, ♀.

In the S.D.S.U. collection is a specimen of *G. aholibah* Strecker with the label "South Dakota" in Truman's handwriting. This is probably a Californian specimen. Truman is known to have placed South Dakota labels on some Californian material.

DISCUSSION

In comparing the collecting methods used in this study, by far the most successful was the use of bait. A total of 161 specimens were collected at bait representing 88 males and 73 females (Table 1). This contrasts with only 18 specimens collected at light and five at resting sites. Only *C. nuptialis* and *C. minuta* had greater than 25% of specimens collected at light. Of the 63 *C. parta* collected, only two were

TABLE 2. Flight periods of *Catocala* in eastern South Dakota and southern New England.

Species	Flight period	
	Eastern South Dakota	Southern New England
<i>innubens</i>	VII-7 to VIII-28	VII-31 to IX-20
<i>neogama</i>	VII-22 to VIII-31	VII-19 to X-14
<i>parta</i>	VI-23 to VIII-21	VII-29 to X-14
<i>luciana</i>	VII-23 to IX-1	—
<i>meskei</i>	VII-4 to VIII-21	—
<i>whitneyi</i>	VI-? to VIII-8	—
<i>ultronia</i>	VII-12 to VIII-18	VII-11 to IX-28
<i>mira</i>	VI-30 to VII-30	VII-22 to VIII-28
<i>grynea</i>	VII-4 to IX-14	VII-12 to IX-8
<i>minuta</i>	VII-3 to VIII-5	—

not at bait. The data show that no collecting method was more effective for one sex than another.

It is interesting to note the differences in species and numbers of specimens in one locality for the years 1978 and 1979. In 1978, 58 specimens and 18 species were collected. In 1979, 116 specimens and 14 species were collected. During the two years, collecting was in the same place (Sioux Falls, S.D.), using the same procedures, and collecting in the same time frame (2030 to 0200 hours). In 1979 *C. ilia*, *C. amestris*, *C. cerogama*, *C. coccinata*, *C. clintonii* and *C. amica* were not collected, while *C. insolabilis* and *C. palaeogama* were not seen in 1978. Of the 20 species 12 (60%) are common to both samples and eight (40%) are found in only one sample.

The unpredictability of bait has been well documented (Sargent, 1976). This was evident in our study in 1979. *Catocala* were found on every day in July when collecting was done, except on the 7th, and on all but five days in August (1, 7, 8, 10, 11). This contrasts with high *Catocala* counts for other dates (July 19, 20, 22, 24).

Differences in flight periods between *Catocala* of eastern South Dakota and southern New England have been found (Table 2). The New England data are from Sargent (1976). *C. innubens* records begin three weeks later in New England than in South Dakota. *C. parta* records for South Dakota begin a month before their New England counterparts. *C. mira* flies three weeks earlier in S.D. (there are no *C. erataegi* records and only one *C. blandula* record for S.D.).

The flight period of *C. grynea* begins earlier and ends later in South Dakota. This is interesting as New England records are based on many more specimens. *C. grynea* collected from Sioux Falls present an interesting pattern with regard to specimen conditions and dates.

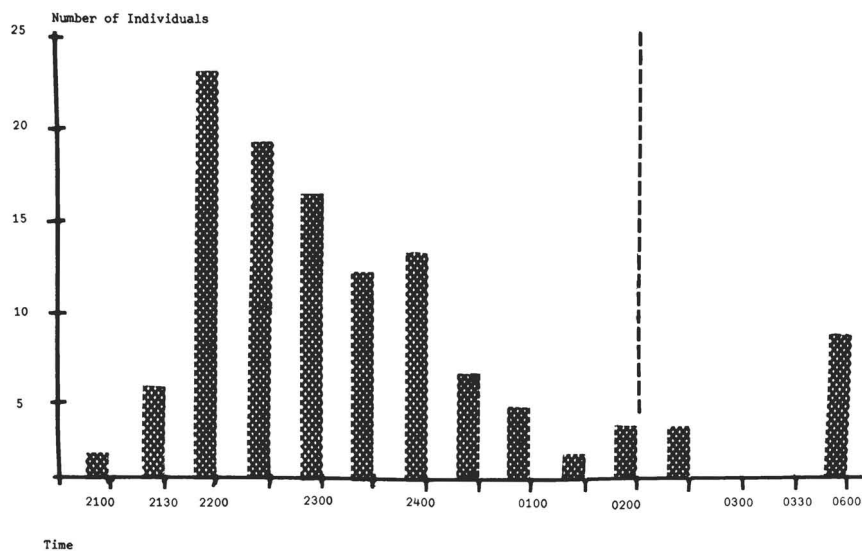


FIG. 1. Flight times versus numbers of *Catocala* for Sioux Falls, 1979.

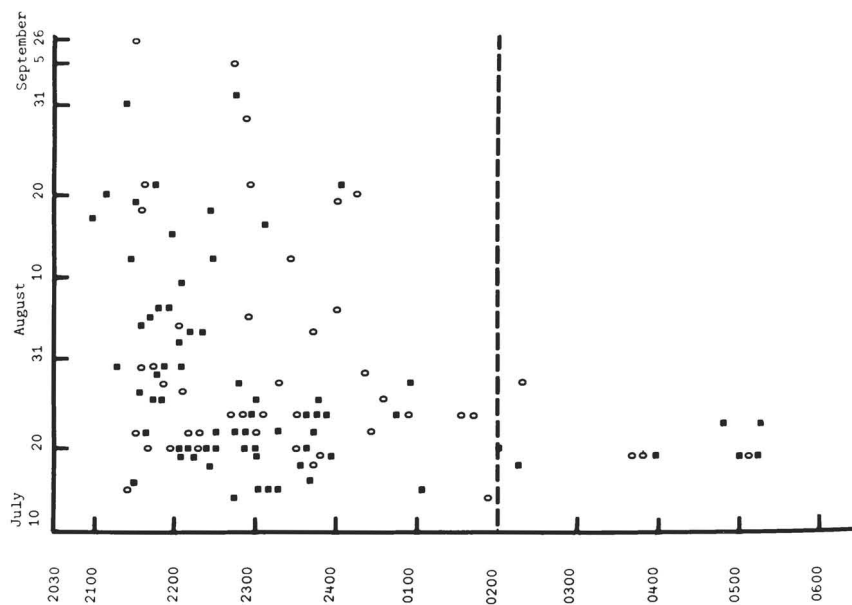


FIG. 2. Flight times broken down by sex for *Catocala* in Sioux Falls, 1979—filled squares represent males; open circles represent females.

Specimens collected from 22 July to 4 August range from perfectly fresh ones to weathered individuals by 4 August. Specimens collected on 20, 21 August and 5 September are again perfect. However, 1978 data do not show such a pattern. More information is needed to determine whether there is a partial second brood or delayed emergence of *C. grynea* in eastern South Dakota.

The greatest period of *Catocala* activity in Sioux Falls was between 2130 and 2400 hours (Fig. 1). The light and baited trees were checked twice weekly for periods after 0200 hours, and one night a week collecting was continued until dawn. Both light and bait were checked continuously from 2100 to 0200 hours.

Comparing *Catocala* flight periods and sex ratios reveals interesting patterns (Fig. 2). It was seen that the majority of males were active before 2400 hours, while females tended to show a more even flight pattern. As the season progressed flight times tended to start and end sooner. Before 31 July there were 11 records between 2400 and 0200 hours. After 31 July there were only three records, and after the 31st no records after 0200 hours.

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LITERATURE CITED

- FORBES, W. T. M. 1954. Lepidoptera of New York and Neighboring States. III. Noctuidae. Cornell Univ. Ag. Expt. Sta., Mem. 329. 433 pp.
- MCDUNNOUGH, J. 1938. Checklist of the Lepidoptera of Canada and the United States of America. Part I. Macrolepidoptera. Mem. So. Calif. Acad. Sci. Vol. 1. 275 pp.
- SARGENT, T. D. 1976. Legion of Night. The Underwing Moths. Univ. of Mass. Press, Amherst. 222 pp.
- SMITH, JOHN B. 1891. List of Lepidoptera of Boreal America. Am. Ent. Soc., Philadelphia. 124 pp.
- TRUMAN, P. C. 1896. Lepidoptera in South Dakota. Ent. News 7: 298-299.
- 1897. Lepidoptera in South Dakota. Ent. News 8: 27-29.