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

Specimen Records:

Catocala innubens Guenee (9 specimens): Brooking—VIII-28-76, 6; Sioux Falls—
VII-12-78, 6; VIII-3-78, 6; VIII-5-78, 6; VIII-5-78, 6; VII-29-79, 6; VII-9-79, 6; VIII-
12-79, 6; Volga—VII-7-1896, 2 ♀ ♂.

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


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

Catocala illia (Cramer) (5 specimens): Brookings—VII-29-69, ♀; Sioux Falls—VIII-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, ♀; VII-5-78, ♀; Volga—reported rare (Truman, 1897), no specimens.

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


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


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


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

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


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

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


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.

<table>
<thead>
<tr>
<th>Species</th>
<th>Collecting procedure</th>
<th>Light Male</th>
<th>Light Female</th>
<th>Bait Male</th>
<th>Bait Female</th>
<th>Resting site Male</th>
<th>Resting site Female</th>
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<td>3</td>
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<td><em>ilia</em></td>
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<td>1</td>
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<td>7</td>
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<td><strong>Totals</strong></td>
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<td>73</td>
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<tr>
<td><strong>Totals (male &amp; female)</strong></td>
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<td>18</td>
<td>161</td>
<td>5</td>
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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 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* Strecke 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
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. illia, C. amestris, C. cerogama, C. coccinata, C. clintonii and C. amica were not collected, while C. insolabilis and C. paaleogama 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.

**ACKNOWLEDGMENTS**

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**LITERATURE CITED**


