Cutworm moths (Noctuidae : Noctuinae) of South Dakota

Gerald M. Fauske
CUTWORM MOTHS (NOCTUIDAE: NOCTUINAE)
OF SOUTH DAKOTA

BY
GERALD M. FAUSKE

A thesis submitted
in partial fulfillment of the requirements for the
degree Master of Science
Major in Entomology
South Dakota State University
1982
CUTWORM MOTHS (Noctuidae: Noctuinae)

OF SOUTH DAKOTA

This thesis is approved as a creditable and indepent investigation by a candidate for a degree, Master of Science, and is acceptable for meeting the thesis requirements for this degree. Acceptance of this thesis does not imply that the conclusions reached by the candidate are necessarily the conclusions of the major department.

Burruss McDaniel
Thesis Advisor

Maurice Horton
Head, Plant Science Dept.
The author wishes to thank Dr. Burruss McDaniel for his advice and encouragement during this study.

To Dr. J. D. Lafontaine of the Canada Department of Agriculture the author is indebted both for advice and for the privilege of seeing some advance proofs from his to be published work on the Noctuinae.

Dr. Edward Balsbaugh Jr. kindly made available specimens from the North Dakota State University collection.

The author is grateful for the advice of Dr. Gary Larson on plant nomenclature and Dr. Robert J. Walstrom concerning final corrections of the manuscript.

Sincere appreciation is extended to Mrs. Irene Vick for the typing of the manuscript. Also appreciated are the excellent graphs (figures 89-115) prepared by Wes Fauske.

To fellow graduate students Roger Bohls and Paul Vassalotti the author is grateful for their encouragement and occasional "taxi service" (Roger) and light trap material (Paul).

Finally the author extends his gratitude to Joliene Christianson and Kim Kennedy for their often tedious work of setting and labeling specimens.

GMF
**TABLE OF CONTENTS**

<table>
<thead>
<tr>
<th>Section</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Introduction</td>
<td>1</td>
</tr>
<tr>
<td>Materials and methods</td>
<td>4</td>
</tr>
<tr>
<td>Literature review</td>
<td>6</td>
</tr>
<tr>
<td>Results and species descriptions</td>
<td>22</td>
</tr>
<tr>
<td>Discussion</td>
<td>109</td>
</tr>
<tr>
<td>Flight periods</td>
<td>109</td>
</tr>
<tr>
<td>Species comparisons</td>
<td>111</td>
</tr>
<tr>
<td>Taxonomy</td>
<td>113</td>
</tr>
<tr>
<td>Summary</td>
<td>116</td>
</tr>
<tr>
<td>Literature Cited</td>
<td>117</td>
</tr>
<tr>
<td>Tables</td>
<td>129</td>
</tr>
<tr>
<td>Figures</td>
<td>137</td>
</tr>
<tr>
<td>Maps</td>
<td>180</td>
</tr>
<tr>
<td>Appendices</td>
<td>190</td>
</tr>
<tr>
<td>Appendix 1. Noctuinae of six mid-western states</td>
<td>190</td>
</tr>
<tr>
<td>Appendix 2. Plant names</td>
<td>195</td>
</tr>
<tr>
<td>Appendix 3. Collection sites in South Dakota</td>
<td>200</td>
</tr>
</tbody>
</table>
Introduction

This study has four objectives: to determine the species of cutworm moths occurring in South Dakota, provide a means for their identification, bring together life history data with special reference to South Dakota, and compare South Dakota species with those of surrounding states.

Previous faunistic work dealing with cutworm moths in the state is limited to a list of names by P.C. Truman (1896, 1897) for species collected in the Volga area and scattered literature citations for specimens for other locations. Neighboring states (except Wyoming) have lists: Iowa, Jerrell and Jaques (1942); Minnesota, Knutson (1944); Montana, Cook (1930a); Nebraska, Walkden and Whelan (1942); North Dakota, Groom (1959). Both the Minnesota and Montana lists have some life history information.

For identification, three books covering the greatest number of species (Forbes 1954, Holland 1968, and Rockburne and Lafontaine 1976) cover less than 70% of South Dakota cutworm moths.

A comparison with surrounding states gives an idea of a species' range, and importance, and also serves as a check upon the results.

The Noctuidae (Owlet Moths) are the largest family of Lepidoptera, having nearly 2,700 species north of Mexico (McDunnough, 1938). Group characters are the quadrifid forewing venation, veins Sc and R fused for a short distance beyond the base of the hindwing, Sc of hindwing not swollen at base, vein 1A lost on both wings, and ocelli nearly always
present (Forbes, 1954).

The Subfamily Noctuinae (Cutworm Moths) is one of at least 21 recognized. Moths can be separated in most cases with the key below. Occasionally an array of characters are used and subfamilies will key to more than one couplet. This indicates that the true division of subfamilies at that point is in larval structures.

Key to the Subfamilies of Noctuidae

1. Hindwing venation quadrifid........................................ 2
   Hindwing venation intermediate, not definitely trifid or quadrifid 9
   Hindwing venation trifid........................................... 11

2. Eyes hairy or lashed.................................................. 3
   Eyes without hair or lashes....................................... 6

3. Eyes hairy.......................................................... Pantheinae
   Eyes lashed........................................................... 4

4. Forewing angled out at M₂, scalloped................ Scoliopteryginae
   Forewing with an even outer margin............................ 5

5. Hindwing veins M₂ and M₃ strongly divergent........ Plusiinae
   Hindwing veins M₂ and M₃ nearly parallel................... Hypeninae

6. Frons without scales on lower half, palpi reach beyond this point 7
   When frons without scaling, palpi not reaching middle........ 8

7. Ocelli usually absent, wingspan less than 25 mm........... Rivulinae
Ocelli present, wingspan usually greater than 25 mm.... Catocalinae

8. Forewing scaling rough, male with frenulum hook long. Sarrothripinae
Forewing scaling smooth, male with frenulum hook short.. Euteliinae

9. Male usually with a shovel-like process on the foreleg,
   abdomen without tufts.......................... Hermininae
   No such process, abdomen usually tufted..................... 10

10. Tympanum with hood well developed...................... Lithacodinae
    Tympanum with hood vestigial.......................... Acontiinae

11. Eyes hairy........................................... Hadeninae
    Eyes lashed......................................... 12
    Eyes without hair or lashes........................... 13

12. Mid-tibiae with at most a few weak spines............. Cucullinae
    Mid-tibiae with heavy spining........................ Ufeiinae

13. Mid-tibiae without spines................................ 14
    Mid-tibiae spined..................................... 21

14. Frons with a raised process............................ 15
    Frons at most rough and bulging......................... 17

15. Fore-tibia with at least 1 apical spine............... Stiriniinae
    Fore-tibia without spines............................. 16
16. Antennae swollen distally.......................... Agaristinae
    Antennae tapering distally.......................... Amphipyrinae

17. Corona present.................................................. 18
    Corona absent.................................................. 19

18. Corona a band of 3 or more rows of spines............ Heliothidinae
    Corona diffuse or a single row of spines............. Amphipyrinae

19. Male antennae prismatic, tarsi with 3 rows of spines. Acronictinae
    When male antennae prismatic, tarsi with 4 rows of spines....... 20

20. Clasper absent, tarsi with 4 rows of spines........... Bagisarinae
    Not with both characters.................................. Amphipyrinae

21. Corona a band of 3 rows of spines, frons rough and
    bulging..................................................... Heliothidinae
    When corona more than a single row of spines, frons
    smooth..................................................... Noctuinae

Materials and Methods

Collected specimens came from four sources. Recent captures
using a standard U.S.D.A. light trap equipped with a 15-watt General
Electric bulb F_{15} T8-B1 in Brookings County during 1980 and 1981 and in
White bulb and a method known as sugaring, applying a mixture of brown
sugar and stale beer to tree trucks, were used to collect in Minnehaha
County. The former beginning in 1972, the latter in 1976. Both were continued through 1981. The fourth source was the S.D.S.U. Insect Collection. Cutworm moths there collected by H.C. Severin, B. McDaniel, F. Andress, T. Johnson, T. Knutson, and P.C. Truman. A literature search added several records.

J.D. Lafontaine of the Canadian Department of Agriculture furnished records from the Canadian National collection and aided in the determination of specimens.

When dissection of a specimen was necessary the following procedure was used. The abdomen was removed and placed in a saturated solution of potassium hydroxide for 16 hours. After which it was washed with and placed in a 70% solution of ethyl alcohol. The ninth and tenth segments were everted by applying pressure to the abdomen anteriorly to posteriorly, removed and placed in a vial of the alcohol solution.

In making drawings the valves were centered on an etha-foam block with a few drops of water to prevent drying. Brace pins and the rough surface of the etha-foam kept the mount stationary. A dissection scope having a grid with 1/16 inch squares was used. The valves proper were drawn at a magnification of 250X, the juxtal plates at 500X. Several South Dakota species not represented in the collection were loaned or given by E.U. Balsbaugh Jr. of North Dakota State University.

In a few cases where drawings were necessary for identification and specimens were not available, but published figures were, these were used. All such are cited in the text.
Literature Review

The earliest writings dealing with South Dakota cutworm moths are descriptions by Europeans covering what happened to be holarctic species. Carl von Linnaeus (1761) in *Fauna Suecica* described *Noctua Ochropleura plecta*.

Hubner (1821) was one of the first workers in lepidopteran taxonomy. The Genera *Amathes, Eurois, Euxoa, Ochropleura*, and *Peridroma* are first used in his work: *Verziechmiss bekannter schmitterlinge*. Though Hubner created valid genera, his divisions were often intuitive based on general resemblance rather than on structural difference. Species now referred to *Euxoa* were placed by Hubner in six genera.

A treatise on some of the insect pests of New England injurious to vegetation (Harris, 1841, 1842, 1862) was the first work by an American describing cutworm moths. The dark-sided cutworm, *Agrotis Euxoa messoria*, and the striped cutworm, *Agrotis Euxoa tessellata* were described here.

Achille Guenee's *Species general des lepidopteres* (1852a, b, c) was the first work dealing with American forms to use meso-tibial spining in defining the Noctuinae.

Walker (1856a, b, 1857, 1865a, b) wrote 36 volumes of *A catalogue of the Lepidoptera, Heterocera, in the collection of the British Museum*. A great many species were described here but Walker's usage of names was not always precise. *Euxoa messoria* (Harris) was described seven times between two genera; *Euxoa tessellata* (Harris) five times between two genera. One of those genera, *Mamestra* Ochsenheimer, was at that time
long established for hairy-eyed species (Hadeninae).

Grote (1874d) published *List of the Noctuidae of North America* which placed most of the then known species of cutworm moths in the Genus *Agrotis*. Use of the spined neso-tibiae as the main character of the group led to the inclusion of unrelated forms such as *Adita chionanthi* (J.E. Smith), one of the Cucullinae. This 1874 list was superceded by numerous lists and papers culminating in the 1883 list: *An Introduction to the Study of the North American Noctuidae* (Grote, 1883). Characters defining the Genus *Euxoa* are first ranged here under the preoccupied term *Carrneades*. *Adita* species are still grouped with the cutworm moths.

Smith (1890b) published *A Revision of the Species of the Genus Agrotis* which marked the first time a single author had the majority of American species at once for study. Groupings arrived at were more natural than any preceding. As a whole, cutworm moths were separated by their spined meso-tibiae and eyes lacking hair or lashes; at the generic level by spining of the pro-tibiae, modifications of the frons, and shape of the male valves. Problems in the work arise from use of the frons and, in some cases, having only female specimens for a classification based on male structures. These two facts caused the creation of the artificial Genus *Porosagrotis* with diverse forms as *Euxoa mimallonis*, *E. satiens*.

* Originally this was to be a cooperative work by J.B. Smith, H.K. Morrison, and C.V. Riley with both pictures and descriptions. The deaths of Riley and Morrison left the text to Smith who thoroughly revised it before publication.
Agrotis vetusta and A. rileyana; and the placement of Euxoa olivia with 
Agrotis jaculifera, A. subgothica and A. herilis.

The two parts of Lepidoptera in South Dakota (Truman 1896, 1897) 
were compiled from specimens collected in the Volga area. The list has 
359 names of which 27 apply to cutworm moths representing 24 species. 
The species' authors are omitted causing confusion. Carneades insignata 
could be insignata Smith= Euxoa declarata (Walker) or insignata Walker= 
Euxoa ochrogaster (Guenee).

A revision of the North American Agrotid moths, by McDunnough 
(1928) relied almost exclusively on the male genitalia to classify 
genera. A few of the genera proposed are Loxagrotis, Euagrotis, 
Paradiarsia, Anaplectoides, and Protolampra. Most of the divisions 
and names here are still in use.

Crumb (1929) published Tobacco Cutworms which gives the life 
histories for a large number of Noctuids raised under laboratory 
conditions. This is some of the most complete data published. The 
only South Dakota records of Feltia annexa Agrotis subterranea and 
Feltia Agrotis gladiaria are here.

An Ecologically Annotated List of the Phalaenidae of Montana 
by Cook (1930a) contains flight period data and the only host plant 
records for many Euxoa species.

McDunnough (1938) published a Checklist of the Lepidoptera of 
Canada and the United States of America which differed only slightly from 
his 1928 work. A few species of Euxoa are separated under the term 
Agrotophila due to their eyes being reduced in size (an adaption to
diurnal activity). The Genus *Copablephron* is added to the cutworm moths.

Cutworms, armyworms and related species attacking cereal and forage crops in the central great plains (Walkden, 1950) includes life history data for 20 South Dakota cutworm moths. Included are drawings of larval head capsules and tarsal claws.

McDunnough (1950) revised the Genus *Euxoa* for eastern North America using characters of the corpus bursae and ovipositor lobes. Using the trait of fused ovipositor lobes he was able to associate members of the Ridingsiana group.

The *Lepidoptera* of New York and neighboring States (Forbes, 1954) relegated the Noctuinae to the Tribe Agrotini. This and the Tribe Heliothidini were classed as the Subfamily Agrotinae because of their spined meso-tibiae. Forbes made little use of genitalic characters at the genus level resulting in expanded genera: *Agrotis* also includes *Euxoa* and *Loxagrotis*; *Peridroma* embraces *Euagrotis*, *Anicla*, *Diarsia*, and *Ochropleura*; *Noctua* is used for *Anaplectoides*, *Amathes*, *Protolampra*, *Rhynchagrotis*, *Cryptocala*, *Spaelotis* and *Graphiphora*. Descriptions and keys cover about 60% of South Dakota species.

Crumb (1956) published *Larvae of the Phalaenidae* which is the largest collection of Noctuid larval descriptions. The author establishes two parallel series of Noctuid subfamilies on larval characters (corresponding roughly to couplet 1 of the subfamily key here) but is unable to develop a key to *Euxoa* larvae or to separate *Agrotis* from *Feltia* or *Abagrotis* from *Rhynchagrotis* on larval traits.

The Migration of the army cutworm (Pruess, 1967) gives evidence
that the army cutworm, *Euxoa auxiliaris* (Grote), migrates from the plains into the Rockies in late spring and back onto the plains in the fall. This clears a mystery noted by earlier workers of a species which do to the length of larval development could only have one annual generation, while moths were found in the fields during spring and fall but caged moths could only rarely oversummer in these fields (Coole, 1916).

In a five part series, Buckett (1968, 1969), revised the Genus *Abagrotis*. The key to differentiate *Abagrotis* from the related Genera *Lampra*, Protolampra, and Rhynchagrotis provides only a nebulous separation from the last.

Hardwick (1970a) revised the Genus *Euxoa*. Using curvature and armiment of the male vesica, the Subgenera *Orosagrotis*, Longivesica, *Euxoa*, Chorizagrotis, Pleonectopoda and Crassivesica are defined. The importance of this previously unused character is illustrated by the clear placement of species on other characters. Species without a frontal tubercle fall within the Pleonectopoda. The *ridingsiana* group of McDunnough falls within the *Orosagrotis*. The only South Dakota records of *Euxoa perpolita* and *E. pleuritica* are here.

Rings et al. (1974) compiled the first in a series of bibliographies of cutworm moths. The world-wide bibliography of the black cutworm was assembled using a computer information retrieval system. The original was incomplete since there was no way to access faunal lists. Two supplements have been issued.

Salkeld (1975, 1976) published scanning electron micrographs of the eggs of *Euxoa* species. The first paper dealt with the Subgenus
Euxoa, the second with the other subgenera.

Life histories of 36 Euxoa species reared under laboratory conditions were published by Hinks and Byers (1976). Information on diapause and aestivation is given. This forms a compliment to Crumb's 1929 and 1956 papers as it covers the Noctuinae these largely omitted.

A. A. Ahmadi (1978) revised the genera Agrotis and Feltia. The arrangement differs little from the McDunnough (1938) list. Subgenera within Agrotis are not defined as the author felt that the American Agrotis were mostly outliers of species groups prevalent in other parts of the world. Many species could not be distinguished on genitalic characters.

The spotted cutworm, Amathes c-nigrum, in North America was separated into two species by Franclemont (1980). Xestia Amathes dolosa and Xestia Amathes adela differ in the lengths of the male juxtal plates and in the shapes of the female ventral ostial plates.

Hudson and Lefkovitch (1980) separated the spotted cutworm moth into two species on the basis of electrophoretic techniques and a discriminate analysis of head width and wing pattern measurements. These studies were initiated when two segregates were noted in phermone traps.

Below are listed contributions to the study of Noctuinae in chronological order with special reference to South Dakota. Name entries are understood to be original descriptions when no other explanation is given. These are in their original combinations.
Linnaeus  Noctua plecta.  1761
Hufnega1  Phalaena epsilon.  1766
Linnaeus  Noctua occulta.  1767
Linnaeus  Noctua prasina, Noctua xanthographa.  1767
Fabricius  Noctua subteranea.  1787
Fabricius  Noctua subteranea.  1794
Fabricius  Noctua subteranea.  1808
Hubner  Noctua saucia.  1810
Hubner  Noctua saucia.  1810
Haworth  Agrotis subgothica.  1816
Ohssehenheimer  Agrotis infecta, Genera Agrotis and Graphiphora.  1821
Hubner  Genera Amathes, Eurois, Euxoa, Ochroplea, and Peridroma.  1840
Boisduval  Genus Spaelotis.  1841
Harris  Agrotis messoria and Agrotis tessellata.  1842
Harris  Noctua clandestina.
1852
Guenée  
Agrotis jaculifera, Agrotis obeliscoïdes, Noctua bicarnea, and Cerastis anchoceilioïdes.

1856
Walker  
Mythimna vetusta, Mythimna tripars, Charaeas detersa, Agrotis divergens, and Agrotis venerabilis.

1858
Walker  
Graphiphora illapsa.

1862
Harris  
Spaelotis clandestina (Harris) life history.

1863
Fitch  
Euxoa tessellata (Harris) Life history.

1864
Grote  
Noctua brunneicollis and Noctua alternata.

1865
Walker  
Mamestra declarata.

1868
Grote and Robinson  
Agrotis quadridentata.

1869
Riley and Thomas  
Agrotis scandens; Life histories of Euxoa messoria (Harris) and Peridroma saucia (Hubner).

Packard  
Agrotis litoralis; Agrotis epsilon (Hufnagal) Life history.
1873
Grote  Agrotis auxiliaris, Agrotis mimallonis, and Agrotis herilis.

1874
Harvey  Agrotis voluabilis.
Grote  Agrotis badinodis, Agrotis velleripennis, Noctua cupida, Agrotis normaniana, Genera Eucoptocnemis and Anicla.
Morrison  Agrotis gladiaria, Agrotis plagigera, Agrotis tenuicula, Agrotis intrita, Agrotis redimicula, and Agrotis rileyana.

1875
Grote  Agrotis pleuritica, Agrotis haruspica, and Agrotis ridingsiana.
Morrison  Agrotis infracta and Agrotis tristicula.

1876
Grote  Agrotis albipennis, Agrotis placida.
Morrison  Agrotis perpolita, Agrotis comosa, Agrotis olivia, and Agrotis orthogonia.

1877
French and Thomas  Life histories of Euxoa scandens (Riley) and Agrotis herilis Grote.

1878
Grote  Agrotis idahoensis.

1879
Grote  Agrotis basalis and Agrotis catenula.
1880
Grote  Agrotis citricolor.
Grench  Euagrotis illapsa (Walker) Life history.
Martin  Rhynchagrotis cupida (Grote) Life history.

1882
Grote  Agrotis niveilinea and Agrotis immixta.

1883
Grote  An introduction to the study of the North American Noctuidae.

1885
Saunders  Larva of Euxoa declarata (Walker).

1887
Smith  Agrotis albicosta, Agrotis tepperi, Agrotis oblongistigma, and Agrotis medialis.
Murfeldt  Larva of Rhynchagrotis alternata (Grote).

1889
Beutenmuller  Larva of Euxoa detersa (Walker).

1890
Smith  A revision of the species of the genus Agrotis; Carneades teleboa and the Genus Rhynchagrotis.

1893
Smith  List of American Noctuidae.

1894
Smith  Carneades siccata.
Dyar  Egg and larva of Anicla infecta (Ochsenheimer).
1895

Smith Carneades acornia and Carneades servitus; Noctua atricincta a synonym of Euagrotis tepperi (Smith) described from British Columbia and Volga, South Dakota.

Slingerland Larva of Agrotis vetusta (Walker).

1896

Snellen Noctua smithii.

Truman Part 1 of Lepidoptera in South Dakota.

1897

Truman Part 2 of Lepidoptera in South Dakota; only S.D. record of Anicla infecta (Ochsenheimer).

Howard Agrotis subterranea (Fabricius) Life history.

1898

Strecker Agrotis dargo.

Dyar Larvae of Euxoa divergens (Walker) and Amathes bicarnea (Guenee).

1900

Smith Carneades difformis and Carneades stigmatalis; Carneades objurgata a synonym of Euxoa tessellata (Harria) described from Volga, S.D.

1901

Beutenmuller Larvae of Anaplectoides prasina (Fabricius), Amathes smithii (Snellen), Ochropleura plecta (Linnaeus), and Eurois occulta (Linnaeus).
1902
Dyar
List and bibliographic catalogue of American Lepidoptera.

1903
Smith
Carneades tronellus; Carneades rumatana a synonym of Euxoa dargo (Strecker) described from Volga, S.D.
Noctua trumani a synonym of Amathes xanthographa (Fabricius) described from Volga, S.D.

1904
Hampson
Catalogue of the Lepidoptera, Agrotidae, in the British Museum.

1905
Smith
Euxoa bialba a synonym of Euxoa albipennis (Grote) described from Volga, S.D.

1908
Porter
Lepidoptera of Decorah, Iowa.

1910
Smith
Euxoa rabiata a synonym of Euxoa niveilinea (Grote) described from Volga, S.D. Euxoa indensa a synonym of Euxoa albipennis (Grote) described from Volga, S.D.
1914
Gibson
Larva of *Agrotis orthogonia* Morrison.

1916
Coole
Egg and larva of *Euxoa auxiliaris* (Grote).

1922
Benjamin
*Lampra barnesi*; revision of the genus *Lampra*.

1927
McDunnough
*Euxoa setonia* and *Euxoa lillooet*.

1928
McDunnough
A generic revision of the Agrotid Moths; Genera *Loxagrotis, Euagrotis, Paradiarsia, Anaplectoides*, and *Protolampra*.

1929
Crumb
Life histories of *Agrotis subgothica* Haworth, *Agrotis jaculifera* Guenee, and *Agrotis venerabilis* Walker.

1930
Phipps
Larva of *Euxoa redimicula* (Morrison) and *Amathes normaniana* (Grote).

1932
Crumb
Larva of *Rhynchagrotis barnesi* (Benjamin).

1935
Whelan
A key to the Nebraska cutworms and armyworms that attack corn; larva of *Euxoa niveilinea* (Grote).

1937
Walkden
Life history of *Amathes badinodis* (Grote).
1938

McDunnough    Checklist of Macrolepidoptera.

1942

Jerrell and Jaques List of Iowa Cutworm Moths.

Walkden and Whelan Owlet Moths (Phalaenidae) taken at light traps in Kansas and Nebraska.

1944

Knutson    Minnesota Phalaenidae; partial life history of Euxoa velleripennis (Grote).

1948

Horner    Loxagrotis albicosta (Smith) Life history.

1950

Walkden    Cutworm and armyworm moths of the great plains; Larva of Euxoa olivia (Morrison).

McDunnough    Revision of the Genus Euxoa in Eastern North America.

1954

Forbes    Lepidoptera of New York and Neighboring states.

1956

Crumb    The Larvae of the Phalaenidae; South Dakota records of Agrotis subterranea (Fabricius) and Agrotis gladiaria Morrison.

1959

Groom    Noctuidae of North Dakota.

1967

Pruess    Migration of the army cutworm.
1968
Buckett
Revision of the genus *Abagrotis*.

1969
Jacobson
*Euxoa tristicula* (Morrison) Life history.

1970
Hardwick
Revision of the genus *Euxoa*; South Dakota records of *Euxoa perpolita* (Morrison) and *Euxoa pleuritica* (Grote).

1971
Hardwick and Lefkovitch
Physical factors affecting *Euxoa* distribution.

1972
Tietz
Index to Macrolepidoptera Life histories.

1973
Hardwick
*Euxoa oberfoelli*; South Dakota records. Revision of the *declarata* group of the genus *Euxoa*; South Dakota records of *Euxoa declarata* (Walker).

1974
Rings et al
Bibliography of the Black Cutworm.

Lafontaine
Revision of the *punctigera* group of the Genus *Euxoa*; South Dakota records of *Euxoa stigmatalis* (Smith). Revision of the *redimicula* group of the genus *Euxoa*; South Dakota records of *Euxoa redimicula* (Morrison).
1975
Lafontaine  Revision of the mimallonis group of the genus Euxoa;
           South Dakota records of Euxoa mimallonis (Grote).
Rings et al  Bibliography of the dark-sided cutworm.
Salkeld    Eggs of the Subgenus Euxoa Hubner.
Byers et al Euxoa basalis (Grote) Life history.

1976
Lafontaine  Revision of the aequalis group of the genus Euxoa;
           South Dakota records of Euxoa acornis (Smith).
Rings et al  Bibliographies of the clay-backed, dusky, and
           variegated cutworms.
Salkeld    Eggs of the subgenera Chorizagrotis, Crasivesica,
           Longivesica, Orosagrotis and Pleonectopoda.
Hinks and Byers Life histories of 36 Euxoa species.
Rockburne and
Lafontaine  Cutworm moths of Ontario and Quebec.

1977
Rings and Johnson Bibliography of the Spotted Cutworm.

1978
Ahmadi  Revisions of the genera Agrotis and Feltia.

1980
Franclemont  Xestia dolosa and Xestia adela.
Hudson and
Lefkovitch  Two species of the Amathes c-nigrum complex
distinguished by isozymes of adenylate kinase and
morphological characters.
RESULTS

A total of 80 species of cutworm moths are now known from South Dakota. Of these, 34 are first published records for the state (Table 1). One new species was collected; it will be described by J.D. Lafontaine. Following is a synopsis of South Dakota Noctuinae. In the species accounts common names with an asterisk are those in Southerland et al. (1978). Expands refers to the wingspread.

Subfamily Noctuinae

Cutworm moths are distinguished from all but the Heliothidinae by trifid hindwing veination, maked eyes, and spined meso-tibiae. These two groups are separated by the subfamily key artificially. True separation is by larval morphology (Crumb, 1956) and habits (Hartwick, 1970b).

Key to the Genera of South Dakota Noctuinae

1. Corona present (figs. 2-38)...................................................... 2
   Corona absent (figs. 41-49), cucullus may be covered with spine-like hair resembling a corona (figs. 39-40)................................. 9
2. Pro-tibiae with a complete outer row of spines.................. 3
   Pro-tibiae with at most 3 spines on outer side.................. 6
3. Valve "bifuricate" with harpe and free sacculus extension (figs. 2-31); frons usually with a raised ring................. Euxoa
   Valve otherwise (figs. 32-38); frons rarely with a raised ring.............................................. 4
4. First meso-tarsal segment with at least a partial fourth row of spines........................................... 5
   With at most only a single spine representing the fourth row.................................................... Eucoptocnemis
5. Palpi shorter, reaching only \( \frac{1}{2} \) height of eye; male with antennae nearly simple.............................. Loxagrotis
   Palpi longer, to at least \( \frac{1}{2} \) height of eye; male antennae pectinate or fasiculate...................................... Agrotis
6. Pro-tibiae shorter than first tarsal joint....................... Euagrotis
   Pro-tibiae longer than first tarsal joint........................ 7
7. Corona a multiple row of spines .................................. Anicla
   Corona a single row of spines........................................ 8
8. Valve with ampula present........................................ Peridroma
   Valve with ampula absent.......................................... Ochropleura
9. Pollex present *................................................... Amathes
   Pollex absent.......................................................... 10

* Amathes tenuicula (Morrison) lacks a pollex; it will key to Graphiphora but has tufted trigonate palpi.
10. Cucullus with spine-like hair on inner face.................... 11
   No such hair...................................................... 12
11. First meso-tarsal segment with a fourth row of spines...... Eurois
   Lacking the fourth row of spines......................... Anaplectoides
12. Foretibiae with spines........................................ 13
   Foretibiae without spines.................................... 15
13. Pro-tibiae with a complete outer row of spines....... Spaelotis
   Pro-tibiae with a few apical spines........................... 14
14. Male antennae pectinate; meso-tarsi with a fourth row of
   spines........................................................ Paradiarsia
   Male antennae simple; meso-tarsi without a fourth row of
   spines........................................................ Graphiphora
15. Uncas broadened distally; abdomen without lateral
   tufts.......................................................... Protolampra
   Uncas narrow, cylindrical in cross section; abdomen
   usually with lateral tufts................................. Rhynchagrotis
Genus *Euxoa* Hubner

*Euxoa* Hubner, 1821, p. 209; type *nivens* Hubner = *decora* Schiffermuller.

_Mimetes_ Hubner, 1821, p. 210; Three species included.

Hampson, 1903, p. 153; = *Euxoa*.

_Metazyja_ Hubner, 1821, p. 223; nine species included.

Hampson, 1903, p. 153; = *Euxoa*.

_Exarnis_ Hubner, 1821, p. 225; five species included.

Hampson, 1903, p. 153; = *Euxoa*.

_Brotis_ Hubner, 1821, p. 226; two species included.

Hampson, 1903, p. 153; = *Euxoa*.

_Telmia_ Hubner, 1821, p. 227-28; three species included.

Hampson, 1903, p. 153; = *Euxoa*.

_Carneades_ Grote, 1883, p. 4; *morens* only included species.

Hampson, 1903, p. 153; = *Euxoa*.

_Paragrotis_ Pratt, in Dyar, 1902, p. 140; substitute name for *Carneades* Grote which is a synonym of *Carneades* Bates, 1869, in the Coleoptera.

The genus is represented in South Dakota by 42 species, about one-fifth of the North American forms. Without exception *Euxoa* are univoltine; usually overwintering as eggs or first instar larvae, aestivating through the summer as a prepupa, adults then flying in the autumn.
Key to South Dakota species of *Euxoa*

1. Forewings with light streaks on or along veins $M_3$ and $Cu_1$ ........ 2
   No such streaks ..................................... 8

2. Veins $M_3$ and $Cu_1$ white scaled .......................... *ridingsiana*
   Veins $M_3$ and $Cu_1$ black scaled ....................... 3

3. Orbicular oblong, about twice as long as high .................. 4
   Orbicular round or nearly so ................................ 5

4. Ordinary spots with a black outline and a white inner ring;
   tegula usually with a white scale band .................. *plagigera*
   Ordinary spots of the ground color, defined by the black
   discal cell; tegula lacking white scale band ............ *oblongistigma*

5. Prothoracic collar of ground-color with black median line .... 6
   Collar cream yellow proximally, ground-color distally, the
   two shades separated by the black median line ............ 7

6. Forewing with a yellow streak from claviform to post-medial
   line .................................................. *dargo*
   Streaks hardly lighter than ground-color .................... *niveilinea*

7. Streaks along $M_3$ and $Cu_1$ extending to terminal line .. *quadridentata*
   Streaks ending at subterminal line .......................... *olivia*

8. Forewing with subterminal area much paler than median or
   terminal areas; or costa whitish, paler than median area .... 9
   Subterminal area not paler; costa not whitish unless median
   area is also ........................................ 16
9. Cell black before and between ordinary spots................. 10
   Cell brown, hardly darker than median area.................. detersa
10. Black wedges before subterminal line......................... 11
    No such wedges.......................................... 15
11. Claviform extends out beyond orbicular..................... auxiliaris
    Claviform not extending out beyond orbicular............... 12
12. Forewing with coastal and subterminal areas concolorous.... 13
    Costa paler than subterminal area.......................... 14
13. Male hindwing with broad fuscus border...................... redimicula
    Male hindwing fuscus, base paler.......................... servita
14. Ground-color gray to red-brown; costa pale gray, white, or
    cream yellow with at most 3 black wedges before
    subterminal line.......................................... idahoensis
    Ground color coppery-brown; costa white, usually 5 black
    wedges before subterminal line............................ n. sp.
15. Male hindwing white, fuscus scaling at apex and dark
    terminal line............................................ oberfoelli
    Male hindwing with a broad fuscus border................. obeliscoides
16. Cell black or dark brown before and between ordinary spots,
    darker than ground color................................... 17
    Not as above, at most with cell darkened by passage of
    median shade............................................... 23
17. Forewing with cubitus white scaled.......................... divergens
    Not so marked............................................. 18
18. Heavy black basal dash reaching antemedial line; ground color sandy brown............................... **tristicula**
   When basal dash extends beyond basal line, ground-color light gray........................................ 19
19. Forewing brown, basal third cream-white...................... **basalis**
   Forewing shades of gray.......................................................... 20
20. Male hindwing white with fuscus border......................... 21
   Male hindwing not as above.......................................................... 22
21. Forewing without violet scaling, usually with a tuft of yellow scales at base............................. **tessellata**
   Forewing sprinkled with violet scales on upper half of subterminal area and along costa.................. **declarata**
22. Male hindwing white................................................................. **albipennis**
   Male hindwing fuscus................................................................. **lillooet**
23. Anti- and postmedial lines double and black.................. 24
   Lines absent, single, or double with only one element black... 30
24. Antimedial line strongly excurved below vein A_{2+3}, pointed outwardly and parallel to claviform............... 25
   Antimedial line with only a slight excurvation, rounded outwardly, not parallel to claviform............... 26
25. Claviform extends beyond excurvation in antemedial line for at least half its length............................... **auxiliaris**
   Claviform and excurvation of antemedial line of nearly equal length........................................... **olivia**
26. Ground-color reddish brown................................................... **infracta**
   Ground-color not reddish-brown............................................... 27
27. Median shade very broad, covering most of median area, darkening cell............................................. setonia
Median shade narrow or absent............................................. 28

28. Prothoracic collar with black center line; ground-color blue-gray to luteus gray............................................. 29
Prothoracic collar when present without dark stripe; ground-color blackish, overlaid with light brown in median area............................................. pleuritica

29. Color more blue-gray; median shade parallel to post-median line; male with yellow tuft at forewing base.............. tessellata
Color more luteus gray; median shade parallel to postmedial line; no yellow tuft............................................. messoria

30. Male antennae pectinate............................................. siccata
Male antennae serrate and fasiculate............................................. 31

31. Frons smooth; hindwing usually with a distinct subterminal line............................................. scandens
Frons with a raised ring; hindwing without subterminal line............................................. 32

32. Male hindwing when white with a dark terminal line or fuscus border; forewings dark............................................. 33
Male hindwings unmarked white; forewings usually light colored. 42

33. Antimedial line black, contrasting with ground-color............................................. 34
Antimedial line usually absent; when black, ground-color nearly as dark............................................. 36
34. Ordinary spots outlined with black; hindwing having a terminal and postmedial line........................... difformis
Ordinary spots absent or marked by a change of ground-color;
hindwing fuscus or with fuscus border........................... 35

35. Ordinary spots absent; vestiture of hair....................... comosa
Ordinary spots of a paler shade of ground-color; the vestiture of scales................................. immixta

36. Forewings black; hindwings mostly white..................... 37
When hindwings white, forewings bright red-brown.............. 38

37. Prothoracic collar present; male antennae serrate and fasiculate............................... velleripennis
Prothoracic collar absent; male antennae nearly simple.. perpolita

38. Forewings red-brown; hindwings white with dark terminal line.............................................. mimallonis
Not as above.............................................................. 39

39. Ordinary spots ringed with white.............................. 40
Ordinary spots with dark outlines or wanting................... 41

40. Male antennae weakly serrate and fasiculate; head, thorax,
and wings concolorous or wings lighter....................... auxiliaris
Male antennae heavily serrate and fasiculate; head and thorax,
bright red-brown, wings dark brown............................ intrita

41. Forewing sandy-brown, uniformly sprinkled with darker scales................................................ acornis
Forewing red-brown, dark scaling mostly along veins... stigmatalis
42. Forewing with well defined row of black terminal spots........ 43
At most with one or two spots........................................ 45
43. Orbicular a black dot; reniform a black crescent............. catenula
Ordinary spots obscure or absent.................................... 44
44. Transverse lines with some black scales; ground-color
bright lemon yellow to dingy yellow....................... citricolor
No trace of transverse lines; ground color as above or
pale gray or pale orange......................................... medialis
45. Median shade traceable; no subterminal line; wingspan
greater than 37 mm........................................... medialis
Not as above................................................................. 46
46. Ground color pale orange; subterminal line present........ teleboja
Ground color nearly white; no subterminal line........... tronella

Another 20 Euxoa species have been taken in surrounding states at
sites near enough to the South Dakota borders to be expected here
(Lafontaine, pers. com.).

Badlands of southern North Dakota and eastern Wyoming: manitobana
McDunnough, flavicollis (Smith), cicatricosa (Grote & Robinson), andra
Smith, atristrigata (Smith), nevada (Smith), pallipennis (Smith), satiens
(Smith), mitis (Smith), morens (Grote), cona (Strecker), dodi McDunnough,
spumata McDunnough, aurulenta (Smith), and atomaris (Smith). Black Hills
in eastern Wyoming: lastificans (Smith), olivalis (Grote), rufula (Smith),
campestris (Grote), and auripennis Lafontaine.
Partial Key to South Dakota Species Based on Male Reproductive Structures*

1. Vesica with a submedian twist or coil (Pleonectopoda)............. 2
   Vesica variously curved or bent, no submedian twist or coil... 4

2. Sacculus extension reaching beyond outer angle of valve. pleuritica
   Sacculus extension not reaching outer angle of valve............ 3

3. Sacculus extension twice as thick as harpe, downcurved throughout its length................................. tristicula
   Sacculus extension and harpe of about equal thickness, the former parallel to inner margin of valve............... scandens

4. Vesica 2½ to 3 times as long as aedeagus (Longivesica)....... 5
   Vesica no more than 2 times as long as aedeagus............... 6

5. Juxta strongly constricted medially, the two portions at their widest points of equal width................. messoria
   Juxta with widest point in lower half, evenly tapering upwards.............................................. divergens

6. Vesica projecting to the left shortly beyond apex of aedeagus (Orosagrotis).............................. 7
   Vesica projecting dorsally or to the right shortly beyond apex of aedeagus........................................... 8

* Couplets 1, 4, and 6 from Hardwick (1970a). Due to lack of material, only 31 of the 42 species are included.
7. Juxta as wide as high, superior excavation u-shaped.... **ridingsiana**  
Juxta higher than wide, excavation v-shaped.............. **perpolita**

8. Harpe short, spatulate; sacculus extension reaching to outer  
angle of valve, spatulate (Chorizagrotis).. .......... **auxiliaris**  
Not with both harpe and sacculus extension spatulate (Euxoa) .. 9

9. Juxta constricted medially or with a transverse thickening..... 10  
Not as above................................................................. 17

10. Harpe longer than sacculus extension or obth of equal length... 11  
Sacculus extension longer than harpe............................. 14

11. Cucullus with outer angle expanded downward (figs. 17 and 18). 12  
Cucullus with outer angle evenly rounded (figs. 15 and 19)....  13

12. Harpe and sacculus extension of equal thickness; corona  
of more than 16 spines................................................. **acornis**  
Sacculus extension thicker than harpe; corona of less  
than 16 spines....................................................... **medialis**

13. Sacculus extension spatulate..................................... **mimallonis**  
Sacculus extension pointed...................................... **stigmatalis**

14. Harpe pointed at apex............................................. 15  
Harpe slightly enlarged at apex and rounded.................... 16

15. Cucullus expanded downward at outer angle; harpe curved  
dorsally near apex*.................................................. **redimicula**  
Cucullus not expanded downward; harpe usually curved  
posteriorly.............................................................. **servita**

* Unlike most *Euxoa* species, females of these are most easily distin-  
guished. The ovipositor lobes of *redimicula* bear a flange, those of  
*servita* do not.
16. Juxta as high as wide.............................................. dargo
   Juxta higher than wide........................................... niveilinae
17. Juxta sharply widening inferiorly............................ 18
   Juxta gradually widening inferiorly or widest medially..... 23
18. Juxta with superior excavation a narrow v-shape, at least
   2/5 of juxtal height.............................................. 19
   Excavation shallower and wider................................ 20
19. Sacculus extension with a flange near base; cucullus with
   outer angle oblique (fig. 7).................................... olivia
   No flange; cucullus perpendicular (fig. 20)................... difformis
20. Harpe without setae; juxta evenly rounded inferiorly...... detersa
   Harpe minutely setose; juxta otherwise...................... 21
21. Harpe straight or curved upward................................... declarata
22. Cucullus expanded upward at apex; harpe cylindrical...... lillooet
   Cucullus not expanded upward; harpe keeled below......... albipennis
23. Juxta with excavation a deep v to about 1/2 of height...... 24
   Excavation shallower........................................... 27
24. Harpe minutely setose........................................... siccata
   Harpe without setae............................................. 25
25. Sacculus extension more than twice length of harpe........ catenula
   Sacculus extension no more than 1/4 longer than harpe...... 26
26. Cucullus with outer angle straight............................ obelisoides
   Cucullus expanded outward below apex.......................... oberfoelli
27. Juxta with lateral edges tapering to a point (Figs. 65 and 67)........ 28
Juxta with sides rounded (Figs. 59 and 63).......................... 29

28. Harpe and sacculus extension curved towards cucullus
throughout their lengths........................................... immixta
At most curved only at apices................................. tesselata

29. Juxta with superior excavation v-shaped....................... 30
Juxta with superior excavation u-shaped............... velleripennis

30. Corona of more than 15 spines................................. comosa
Corona of less than 15 spines................................. intrita

Euxoa ridingsiana (Grote)
Figs. 2 and 50; Map 1.

Synonomy
Agrotis ridingsiana Grote, 1875f, p. 305.
Carneades maines Smith, 1903c, p. 131.

Recognition: White scaling on M₃ and Cu₁, collar lacking a black central
line, and nearly simple male antennae will separate this from other
South Dakota species. E. manitobana and E. flavicollis which may occur
in the state have the coastal area pale gray or yellowish-white.

Expands 29-33 mm.

Life history: Larvae have been reared on barley and phlox (Cook, 1930a).
When raised on artificial diets under laboratory conditions (Hinks and
Byers, 1976) the species showed intense diapause as an egg. Larvae
matured in 31-40 days and aestivated as a prepupae for 7-11 days. Adults
fly primarily in August (Hardwick, 1970a).
Locations: Hill City (S.D.S.U.) and Joe Dollar Gulch (Hardwick, 1970a).


Euxoa perpolita (Morrison)

Fig. 3 (from Hardwick, 1970a); Map 1.

Synonomy

Agrotis perpolita Morrison, 1876, p. 237
Carneades exculta Smith, 1900, p. 424.
Euxoa criddlei Smith, 1908b, p. 197.

Recognition: Forewings sooty black or deep brown with trace of darker lines; hindwings whitish with fuscus borders. Prothoracic collar absent. Male antennae nearly simple. E. velleripennis and E. atomaris have similar coloration; the former with a prothoracic collar, both with male antennae strongly serrate and fasiculate.

Expands 35-40 mm.

Life history unknown. Flight period from mid-August to mid-September (Hardwick, 1970a).

Locations: Deadwood and Hill City.

Dates: IX-9, 10 (Hardwick, 1970a).

Euxoa divergens (Walker)

Figs. 4, 51, and 89; Map 1.

Synonomy

Agrotis divergens Walker, 1856b, p. 327.
Agrotis versipellis Grote, 1875c, p. 172.
Agrotis fascimacula Smith, 1891a, p. 105.

Agrotis abar Strecker, 1899, p. 5.

Carneades factoris Smith, 1900, p. 456.

Recognition: Discal cell black before and between ordinary spots; cubital vein out to reniform and radial vein out to orbicular white scaled. Prothoracic collar with a very wide black center line. Expands 32-35 mm.

Life history: Larvae have been reported on alfalfa (Cook, 1930a). Adults fly mainly in July.

Locations: Brookings, Hill City, Joe Dollar Gulch, and Spearfish.

Dates: VII-2, 3, 5, 7, 10(3), 11, 14, 15, 16(6), 20, 26(2). VIII-3.

Euxoa messoria (Harris) dark-sided cutworm, reaper dart

Figs. 5, 52, and 90; Map 1.

Synonomy

Agrotis messoria Harris, 1841, p. 324.

Agrotis spissa Guenee, 1852a, p. 261.

Mamestra inextricata Walker, 1865a, p. 658.

Mamestra indirecta Walker, 1865a, p. 659.

Mamestra displiciens Walker, 1865a, p. 660.

Mamestra expulsa Walker, 1865a, p. 661.

Agrotis ordinata Walker, 1865a, p. 691.

Agrotis reticens Walker, 1865a, p. 692.

Agrotis cochrartis Riley, 1867, p. 434.

Agrotis repentis Grote and Robinson, 1868, p. 350.

Agrotis friabilis Grote, 1875d, p. 187.

Agrotis atrifera Grote, 1878, p. 173.
Carneades territorialis Smith, 1900, p. 433.

Carneades fulda Smith, 1900, p. 437.

Carneades pindar Smith, 1900, p. 451.

Agrotis septentrionalis inordita Barnes and Benjamin, 1926, p. 303.

Recognition: Transverse lines double and black; median shade present. Ordinary spots ringed with black. Ground-color luteus gray. E. immixta has only one element of the transverse lines black. E. tessellata when the pattern is similar, ground-color is blue gray; males have a yellow tuft at the base of the forewing. E. intrita has a reddish-brown ground-color. Expands 35-40 mm.

Life history: The most recent account given by Cheng (1973) for the species in Ontario. Overwinters as an egg; larvae hatch in late April, pass through seven instars to mature by late June. Pupation is underground with moths emerging in August. Laboratory rearings (Hinks and Byers, 1976) showed diapause as an egg followed by winter hibernation. At room temperature larvae matured in 35-41 days. A long period of aestivation was spent as a prepupae.

The following host plants have been recorded by Tietz (19721) and Rings, Johnson, and Arnold (19752): silver maple1, onion1, asparagus2, sugar beet1, cabbage1, turnip1, carrot2, buckwheat1, strawberry1, sunflower1, barley2, sweet potato1, lettuce1, lillies1, lupines2, apple2, alfalfa2, tobacco1, mustard2, tomato1, millet2, kidney beans1, peas1, flax2, purslane1, primrose2, phlox2, plum2, peach1, black cherry2, rye2, pear2, radish1, currant1, potato1, spinach1, grape1, clovers1, wheat2, corn1.
Economic importance: In South Dakota there is only one vague damage report (Anonymous, 1929):

"Cutworm infestation extended over southeastern South Dakota, southwestern Minnesota, and northwestern Iowa in both garden and field crops. A lot of 150 larvae submitted for identification showed *Euxoa messoria* (Harris) to be the dominant form present."


Dates: VII-2, 10(2), 11, 12(2), 16(2), 18, 20(2), 21, 22(3), 23, 24(2), 25, 29(3).

IX-1(3), 2, 8(2), 9(3), 10(4), 12, 15(3), 16(2), 19, 26, 27.

---

**Euxoa siccata** (Smith)

Figs. 6 and 53; Map 3.

Synonomy

*Carneades siccata* Smith, 1894, p. 46.

Recognition: Only *Euxoa* species with pectinate male antennae. Forewings yellowish-gray with obscure markings; orbicular and reniform ocellate and very large. Hindwings white with light brown subterminal line. Expands 33-36 mm.

Life history unknown. Flight records for Nebraska (Walkden and Whelan, 1942) show October as the main month.

Location: Cottonwood.

Date: IX-20.
Euxoa olivia (Morrison)

Figs. 7 and 56; Map 2.

Synonomy

Agrotis olivia Morrison, 1876, p. 238.
Agrotis lacunosa Grote, 1979, p. 172.
Carneades segregata Smith, 1894, p. 47.
Carneades enteridis Smith, 1900, p. 427.
Carneades vandicus Smith, 1900, p. 453.
Euxoa anicosta Smith, 1905, p. 196.
Euxoa fieldi Dyar, 1908, p. 54.

Recognition: Ground-color varies from light brown to sooty gray; lighter forms with pale streaks along M₃ and Cu₁ and with proximal half of prothoracic collar cream-yellow. Darker forms have the antemedial line excurred as far out as orbicular below vein 2A. Species is best distinguished by flange at base of male sacculus extension. Expands 32-36 mm.

Life history: Larvae have been found on corn and strawberries during May in Nebraska (Walkden, 1950). In the laboratory, rearings showed this species to have intense dispause as an egg, overwintering in that stage; and also to undergo a long aestivation period as a prepupae (Hinks and Byers, 1976). Adults fly from early September to late October (Lafontaine, 1976b).

Locations: Brookings, Highmore, (S.D.S.U.) also in Pennington and Harding Counties (Lafontaine, pers. com.).

Date: X-12.
Euxoa dargo (Strecker)

Synonomy

Argotis dargo Strecker, 1898, p. 6.
Carneades rumatana Smith, 1903d, p. 203.

Recognition: Round orbicular and white scale-band on tegula with a gray or brown pronthoracic collar will separate this from all but the larger E. niveilinea which lacks the yellow streak from the claviform to the postmedial line. In the male, the harpe and sacculus extension are not curved inwards and the juxta is nearly round. Expands 26-32 mm.

Life history: Larvae have been reported on Russian thistle and corn. Adults fly from late August through September (Knutson, 1944).

Locations: Brookings, and in Harding County.

Dates: IX-20.

X-1.

Euxoa niveilinea (Grote) small striped cutworm

Figs. 9 and 58; Map 2.

Synonymy

Agrotis niveilinea Grote, 1882, p. 216.
Euxoa rabiata Smith, 1910, p. 255.

Recognition: Slightly larger than E. dargo; streak from claviform not paler than streaks along Cu₁, M₃, M₁, and R₅. Expands 30-35 mm.

Life history: In Nebraska larvae occur in May and June damaging corn, sweet clover, and wheat (Whelan, 1935). Adults fly in August and September (Knutson, 1944).

Locations: Reported from Volga; and in Brule, Hutchinson, and Walworth
Counties (Lafontaine, pers. com.).

**Euxoa detersa** (Walker) sandhill cutworm

Figs. 8 and 55; Map 2.

**Synonomy**

*Charaeas detersa* Walker, 1856b, p. 209.

*Agrotis pitychrous* Grote, 1873, p. 82.

*Agrotis personata* Morrison, 1876, p. 238.

*Agrotis azif* Strecker, 1898, p. 6.

**Recognition:** Better marked specimens show streak pattern of *E. dargo* and *E. niveilinea* but colors are paler. Hindwing with fuscus subterminal band; frontal tubercle smaller than in other *Euxoa* species.

Expands 30-35 mm.

**Life history:** overwintering occurs as an egg or first instar larva (Hinks and Byers, 1976). Larvae mature by the end of June with adults flying in late August and throughout September (Walkden, 1950).

The following food plants have been reported by Tietz (19721), and Rings and Johnson (19762): onions2, oats2, turnip2, sea kale1, melons2, strawberry2, sweet clover2, tobacco2, kidney beans2, peas2, rye2, black raspberry2, tomato2, potato2, saw grass1, wheat2, American cranberry1, and corn2.

**Economic importance:** The only recent damage reports in the Midwest are on corn in Nebraska (Anonymous 1967, 1971, and 1979).

**Locations:** Brookings, and in Douglas County.

**Date:** IX-20.
Euxoa quadridentata (Grote and Robinson)

Fig. 10 (from Forbes, 1954); Map 2.

Synonymy

Agrotis quadridentata Grote and Robinson, 1865, p. 491.

Carneades pugionis Smith, 1900, p. 419.

Euxoa flutea Smith, 1910, p. 255.

Recognition: Collar bi-colored; orbicular round. Forewings with streaks on $M_3$ and $Cu_1$ white rather than yellow or a paler shade of the ground color as in previous four species; reaching to the terminal line. Males have the sacculus extension as short as *E. dargo*; shorter than that of *E. niveilinea*, *E. detersa*, *E. plagigera*, and *E. oblongistigma*.

Expands 30-32 mm.

Life history: Larvae have been reported on wheat (Cook, 1930*). Adults fly from late August through September (Knutson, 1944). One South Dakota specimen is dated July.

Locations: Brookings, Cottonwood (S.D.S.U.), Volga (Truman, 1896), and in Brown, Brule, Edmunds, Harding, Hyde, and Pennington Counties (Lafontaine, pers. com.).

Dates: VII-6.

IX-9.

Euxoa plagigera (Morrison)

Map 2.

Synonymy

Agrotis plagigera Morrison, 1874, p. 163.
Recognition: A group of species which have pale streaks along veins M₃ and Cu₁, but do not have a round orbicular occur near the South Dakota borders; these and the species of couplet 4 in the key to Euxoa are separated below.

1. Orbicular v-shaped........................................... cicatricosa
   Orbicular elongate........................................... 2

2. Orbicular and reniform touching........................................... 3
   Orbicular and reniform separate........................................... 4

3. Male hindwing white........................................... anderana
   Male hindwing with fuscus border........................................... atristrigata

4. Postmedial line present, crenulate........................................... 5
   Postmedial line absent or barely tracable........................................... 6

5. Cubital vein white scaled........................................... olivalis
   Cubital vein at most with white scaling along basal third plagigera

6. Hindwings white with a dark terminal line........................................... 7
   Hindwings mostly fuscus........................................... oblongistigma

7. Male with base of prothoracic collar yellow........................................... laetificans
   Male with collar gray........................................... nevada

Expands 31-35 mm.

Life history: Laboratory rearings (Hinks and Byers, 1976) show the species to undergo an intense diapause as an egg; larvae mature in 40-50 days with a further 10 days as a prepupa. North Dakota records for this species are for July and August.

Location: Harding County (Lafontaine, pers. com.).
Euxoa oblongistigma (Smith)

Map 2.

Synonomy

Agrotis oblongistigma Smith, 1887, p. 454.
Agrotis agema Strecker, 1899, p. 5.

Recognition: See above; in the male the harpe, unlike E. plagigera, with tip minutely setose. Expands 30-32 mm.

Life history: unknown. Adults fly from July into September (Cook, 1930).

Locations: Harding and Lawrence Counties (Lafontaine, pers. com.).

Euxoa citricolor (Grote)

Map 3.

Synonomy

Agrotis citricolor Grote, 1880c, p. 154.

Recognition: See key to Euxoa. Valvae of male similar to E. immixta (Fig. 14). Expands 35 mm.

Life history: unknown. In Montana (Cook, 1930a) adults have been found in late August and September.

Location: Buffalo County (Lafontaine, pers. com.).

Euxoa tronella (Smith)

Map 3.

Synonomy

Carneades tronellus Smith, 1903a, p. 11.
Recognition: Forewings pale yellow to whitish, nearly immaculate; hindwings of male white, of female with trace of postmedial line.

Expands 32-37 mm.

Life history: unknown.

Location: Pennington County (Lafontaine, pers. com.).

Euxoa catenula (Grote)

Figs. 12 and 57; Map 3.

Synonomy

Agrotis catenula Grote, 1879, p. 44.

Carneades contagionis Smith, 1900, p. 421.

Recognition: Forewings light sandy brown, orbicular a black crescent, reniform a black dot. Females have the postmedial line indicated by black dots on veins. Hindwings of male white; of female with dark terminal line and veins. Expands 31-39 mm.

Life history: Laboratory rearings (Hinks and Byers, 1976) showed the species to undergo intense diapause (see discussion) as an egg and to have at most a brief aestivation period as a prepupae. Adults fly in September.

Larvae have been reared on loco weed, sweet clover, lupines, Russian thistle, treacle, wheat and prairie violet (Cook, 1930a).

Location: Cottonwood.

Dates: IX-8, 15(4).
Euxoa intrita (Morrison)
Figs. 13 and 59; Map 4.

Synonomy

Agrotis intrita Morrison, 1874, p. 164.
Agrotis strigilis Grote, 1876b, p. 81.
Carneades alticola Smith, 1890a, p. 51.
Carneades titubantis Smith, 1894, p. 51.

Agrotis renda Strecker, 1898, p. 6.

Recognition: Ground-color dark brown, lines obscure; ordinary spots ringed with white. Head and thorax bright red-brown. Some forms of E. auxiliaris are similarly colored but are larger and have weakly serrate and fasiculate antennae; in E. intrita male antennae are very strongly serrate and fasiculate. Expands 31-33 mm.

Life history: Under laboratory conditions the species have an intense diapause as an egg, and a long aestivation period as a prepupae (Hinks and Byers, 1976). Adults fly in August and early September.

Larvae have been found on cabbage and dandelion (Cook, 1930).

Location: Hill City.

Dates: VIII-1, 15, 19(2).

IX-3.

Euxoa infracta (Morrison)
Map 3.

Synonomy

Agrotis infracta Morrison, 1875, p. 115.
Agrotis rubefactalis Grote, 1881a, p. 154.
Recognition: Ground color yellow-gray to red-brown, lines double, black scaled, pattern as in _E. messoria_. Collar with a very broad black median line, in _E. messoria_ this line is narrow often reduced to a single row of scales.

Expands 28-35 mm.

Life history: Only recorded host plant is Kentucky Bluegrass (Tietz, 1972). In Montana the species flies in August and September (Cook, 1930).

Location: Butte County (Lafontaine, pers. com.).

_Euxoa immixta_ (Grote)

Figs. 14, 65, and 91; Map 3.

Synonomy

_Agrotis immixta_ Grote, 1881b, p. 259.

Recognition: Ground-color gray, lines double but with only one element black; ordinary spots of a slightly paler shade of gray. _E. messoria_ is similar but has a prominent median shade; _E. comosa_ lacks an orbicular, _E. cona_ has the hindwing white with a dark terminal line, hindwing of _E. immixta_ has a broad fuscus border. Expands 35-40 mm.

Life history: unknown. Adults have been collected in June, July, and early August.

Locations: Brookings, Sioux Falls, Sturgis, and in Dewey County.

Dates: VI-13, 14, 22, 24, 25.

VII-1, 4, 11(3), 12, 14(2), 16, 18, 19, 21.

VIII-8.
Note: This species is pictured by Groom (1956) and called E. dakota (Smith). South Dakota records of E. bostoniensis (Grote) are this species.

**Euxoa stigmatalis** (Smith)

Fig. 15 (from Lafontaine, 1974b).

**Synonomy**

*Carneades stigmatalis* Smith, 1900, p. 425.

*Feltia stygialis* Barnes and McDunnough, 1912, p. 8.

**Recognition:** See color key; E. morens has a subterminal line on the hindwing, E. stigmatalis has the hindwing dark brown at outer margin and paler basally. In males the short, thick, pointed sacculus extension is shared by the dissimilar E. spumata. Expands 37-40 mm.

**Life history:** unknown. Adults fly from mid-July to early September (Lafontaine, 1984b).

**Locations:** Referred to as occurring in South Dakota by Lafontaine (Pers. com.).

**Euxoa velleripennis** (Grote) fleece-winged dart

Figs. 16 and 63; Map 4.

**Synonomy**

*Agrotis velleripennis* Grote, 1874a, p. 25.

**Recognition:** Forewings sooty black with darker lines; hindwings of male white with a dark terminal line, of female fuscus (See E. perpolita). Male antennae strongly serrate and fasiculate. Expands 28-35 mm.
Life history: Caged females oviposited in the autumn, the eggs hatching before winter (Knutson, 1944). Larvae collected in May in Nebraska pupated and the adults emerged in mid-June, indicating aestivation as moths (Walkden, 1950). Adults fly in August and September.

Locations: Brookings, Sioux Falls, and Volga.

Dates: VIII-19, 22, 25.

   IX-1, 8, 19.

Euxoa acornis (Smith)

Fig. 17 (from Lafontaine 1976a); Map 4.

Snyonomy

Carneades acornia Smith, 1895, p. 333.

Agrotis alko Strecker, 1899, p. 5.

Carneades naevulvus Smith, 1900, p. 424.

Carneades megastigma Smith, 1900, p. 425.

Carneades tarmessus Smith, 1900, p. 426.

Carneades sessile Smith, 1900, p. 431.

Carneades testula Smith, 1900, p. 440.

Recognition: Forewing sandy-brown with obscure markings; hindwings pale brown with broad dark brown border. *E. morens* has white hindwings; in the male the harpe is minutely setose and 1 shorter than the sacculus extension. In *E. acornis* the harpe is smooth and of equivalent length to the sacculus extension. *E. spumata* has white hindwings with a dark terminal line; valvae similar to *E. stigmatalis* (Fig. 15). Expands 34-37 mm.
Life history: Under laboratory conditions the species showed intense diapause as an egg, and only a brief aestivation period as a prepupae (Hinks and Byers, 1976). Adults fly in the last half of August and the first half of September (Lafontaine, 1976a).

Location: Harding County (Lafontaine, 1976a).

**Euxoa medialis** (Smith)

Figs. 18, 60, and 92; Map 3.

Synonomy

*Agrotis medialis* Smith, 1887, p. 459.

*Carneades ker Villei* Smith, 1900, p. 443.

*Euxoa poncha* Smith, 1910, p. 258.

*Euxoa truva* Smith, 1910, p. 259.

Recognition: Ground-color varies from yellow to reddish to gray; hindwings white. *E. citricolor* has some black scaling along transverse lines; *E. tronella* is paler, *E. teleboa* is much smaller. In the male the sacculus extension is shorter than the harpe and curves downward posteriorly; in *E. citricolor* the sacculus extension is longer and curved towards the cucullus. Expands 36-40 mm.

Life history: unknown. Adults fly in September.

Locations: Brookings, Cottonwood.

Dates: IX-8, 12, 15(4), 23(2), 28.
Euxoa mimallonis (Grote)
Figs. 19 and 62; Map 4.

Synonomy
Agrotis mimallonis Grote, 1873, p. 98.
Agrotis gagates Grote, 1875a, p. 69.
Agrotis caenis Grote, 1879, p. 44.
Euxoa lenola Smith, 1910, p. 260.

Recognition: Reddish-brown forewings; hindwings white with a dark terminal line. Males have the harpe twice as long as the sacculus extension which is spatulate. E. mitis is similar in coloration, the hindwings are immaculate white. Expands 37-41 mm.

Life history: Laboratory studies indicate the species undergoes intense diapause as an egg and a moderate period aestivating as a prepupae (Hinks and Byers, 1976). Adults fly in August and September (Lafontaine, 1975a).

Locations: Hill City (S.D.S.U.) and in Harding County (Lafontaine, 1975a).

Date: IX-3.

Euxoa difformis (Smith)
Figs. 20 and 61; Map 4.

Synonomy
Carneades difformis Smith, 1900, p. 441.
Recognition: Lines double with only one element black; median shade broad, darkening the cell and median area. Hindwings with both a terminal and postmedial line. Darkened median area could cause specimens to key to *E. detersa* which has a subterminal line on the hindwing.

Life history: unknown.

Locations: Cottonwood (S.D.S.U.) and in Butte County (Lafontaine, pers. com.).

Date: IX-15.

**Euxoa comosa (Morrison)**

Synonomy

*Agrotis comosa* Morrison, 1876, p. 238.

*Agrotis lutulenta* Smith, 1890a, p. 50.

*Agrotis incallida* Smith, 1890a, p. 50.

*Carneades vulpina* Smith, 1895, p. 335.

*Agrotis amir* Strecker, 1898, p. 6.

*Carneades atropulveerea* Smith, 1900, p. 428.

*Carneades ontario* Smith, 1900, p. 440.

*Carneades dakota* Smith, 1900, p. 442.

*Carneades ternarius* Smith, 1900, p. 444.

*Euxoa vertitura* Smith, 1905, p. 201.

*Euxoa brunneigera masoni* Cockrell, 1905, p. 361.

*Euxoa brunneigera latebra* Benjamin, 1935, p. 201.

*Euxoa lutectincta* McDunnough, 1940, p. 195.
Euxoa altera McDunnough, 1940, p. 196.
Euxoa johnstoni McDunnough, 1946, p. 29.

**Recognition:** Ground-color gray; ordinary spots absent. Postmedial line scalloped. Hindwings mostly fuscus with a complete postmedial line. In the similar E. immixta the orbicular is tracable. The juxtal plate of E. comosa is rounded laterally; in E. immixta the juxta tapers to a point laterally. Expands 30–36 mm.

**Life history:** unknown.

**Locations:** Cited for South Dakota with map of North American distribution (Lafontaine and Byers, 1982).

Euxoa teleboa (Smith)

Map 3.

**Synonomy**

Carneades teleboa Smith, 1890b, p. 219.

**Recognition:** Ground-color pale reddish-gray; postmedial line indicated by some black scaling at veins. Median shade and reniform marked by dusky scales, orbicular absent. Hindwings unmarked white. E. medialis is much larger and lacks the dusky reniform and the subterminal line. Expands 28 mm.

**Life history:** unknown.

**Location:** Harding County (Lafontaine, pers. com.).

Euxoa tessellata (Harris) striped cutworm

Figs. 23, 67, and 93; Map 4.
Synonomy

**Agrotis tessellata** Harris, 1841, p. 324.

**Agrotis maisi** Fitch, 1856, p. 313.

**Mamestra insulsa** Walker, 1856a, p. 234.

**Agrotis perlentans** Walker, 1856a, p. 332.

**Agrotis insignata** Walker, 1856b, p. 353.

**Agrotis subsignata** Walker, 1857, p. 706.

**Agrotis illata** Walker, 1857, p. 742.

**Agrotis atropurpurea** Grote, 1877, p. 118.

**Agrotis tesselloides** Grote, 1881, p. 566.

**Agrotis finis** Smith, 1887, p. 457.

**Carneades flaviscapula** Smith, 1900, p. 422.

**Carneades objurgata** Smith, 1900, p. 448.

**Carneades cariosus** Smith, 1900, p. 449.

**Carneades nordica** Smith, 1900, p. 455.

**Carneades acutifrons** Smith, 1900, p. 458.

**Carneades laminis** Smith, 1900, p. 460.

**Carneades focinus** Smith, 1903b, p. 7.

**Recognition:** Ground-color blue-gray; transverse lines double. Discal cell before and between ordinary spots black. Hindwings whitish with broad fuscus border in males, fuscus in females. Prothoracic collar with black central stripe. Males with a yellow tuft at base of forewing.

Extremely variable, color morphs resembling *E. messoria*, *E. albipennis*, and *E. velleripennis*. In males the cucullus is expanded upward; corona of at least 25 spines. Expands 30-35 mm.
Life history: Undergoes a moderate diapause as an egg (Hinks and Byers, 1976); has been reported to overwinter as larvae in Nebraska (Walkden, 1935) and Minnesota (Knutson, 1944). At most there is a brief aestivation period as a prepupae. Adults fly from June to early August (fig. 92).

The following host plants have been reported (Tietz, 1972): boxelder, onions, celery, sugar beets, cabbage, melons, cucumbers, squash, carrots, buckwheat, lettuce, flax, apple, tobacco, parsnip, bean, smartweed, purslane, cherry, plum, peach, pear, radish, rhubarb, sorrels, tomato, potato, spinach, clovers, grape, and corn.

Locations: Brookings, DeSmet, Elk Point, Hecla, Highmore, Sioux Falls, Spearfish, Vermillion, Volga, and in Dewey and Fall River Counties.


VII-1(6), 2(2), 3(4), 4(8), 6(5), 7(18), 8(19), 9, 10(59),
11(16), 12(20), 13, 14(8), 15(11), 16(15), 17(38), 18(13),
19(2), 20(22), 21(3), 22(15), 23(19), 24(8), 25(18), 28,
29(2), 30.

VIII-1(2), 2, 8.

Euxoa declarata (Walker)
Figs. 21 and 66; Map 4.

Synonomy

Mamestra declarata Walker, 1865a, p. 663.
Agrotis decolor Morrison, 1874, p. 162.
Agrotis spectanda Smith, 1890, p. 54.
Recognition: Forewings gray; black before and between ordinary spots. Costal and subterminal areas sprinkled with violet scales. Hindwings white with narrow fuscus border. E. campestris has a darker ground-color and is smaller. Males of E. albipennis and E. illoooet have white or fuscus hindwings respectively. Expands 35-40 mm.

Life history: Overwinters as an egg. The species has a moderate period of aestivation as a prepupae (Hinks and Byers, 1976). Adults fly from late July through September (Hardwick, 1973b). North Dakota records are from the end of July through August.

Tietz (1972) lists the following host plants: loco weed, sunflowers, lupines, sweet clover, potato, and corn.

Locations: Brookings, Volga (S.D.S.U.), and in Harding County (Hardwick, 1973b).

Date: VIII-2.

Euxoa albipennis (Grote) white-winged dart

Figs. 22 and 64; Map 4.

Synonomy

Agrotis albipennis Grote, 1896b, p. 80.

Agrotis verticalis Grote, 1880b, p. 29.

Agrotis albipennis var. nigripennis Grote, 1881a, p. 159.

Carneades malis Smith, 1900, p. 450.

Euxoa bialba Smith, 1905, p. 197.

Euxoa indensa Smith, 1910, p. 263.
Recognition: Ground-color gray, basal third often paler; discal cell black before and between ordinary spots. Orbicular large, wider than the black patch between it and reniform. Hindwings of male white, of female fuscus. Head and thorax dark gray or brown, contrasting with lighter forewings. *E. pallipennis* and *E. satiens* will run to *E. albipennis* in the key to *Euxoa* species. The former with orbicular small and round, the latter with orbicular elongate. Expands 31-40 mm.

Life history: Laboratory rearings showed the species undergoes intense diapause as an egg. At room temperature larvae mature in 40-51 days and aestivate for a long period as a prepupae (Hinks and Byers, 1976). Adults fly in late August and September.

Cook (1930a) records larvae on loco weed, sunflowers, lupines, sweet clover, potatoes, and corn. This is the same list given by Tietz (1972) for *E. declarata*.

Locations: Brookings, Sioux Falls, and Volga.

Dates: VIII-29.

IX-1, 6, 9, 10, 12.

*Euxoa lillooet* McDunnough

Map 4.

Synonomy

*Euxoa lillooet* McDunnough, 1927b, p. 195.

Recognition: Ground-color gray, black before and between ordinary spots; transverse lines double and black. Hindwings fuscus. Expands 35-39 mm.
Life history: unknown. Adults were recorded from late June to mid-July by McDunnough (1927b).

Location: Spearfish.

Date: VII-5.

**Euxoa obeliscoïdes** (Guenee)

Figs. 24, 72, and 94; Map 5.

Synonomy

*Agrotis obeliscoïdes* Guenee, 1852c, p. 293.

*Agrotis sexatilis* Grote, 1873, p. 100.

Recognition: Ground-color lead gray, costa whitish; discal cell black before and between ordinary spots. Claviform extending out beyond orbicular. Transverse lines marked by slightly darker median area. Hindwings of male white with broad fuscus border, of female fuscus. See *E. oberfoelli* below. Expands 31-37 mm.

Life history: Laboratory raised specimens had an intense diapause as eggs; larvae matured in 35-46 days and a moderate, 8-17 day, period was passed in aestivation as a prepupae (Hinks and Byers, 1976). Adults fly from mid-July to early September.

Locations: Brookings and Sioux Falls.


VIII-2(4), 3(2), 4, 5, 6(2), 7, 8, 9, 10(2), 12, 16, 18, 20, 23, 24, 25(4).

IX-2, 18.
Euxoa oberfoelli Hardwick

Fig. 25; Map 5.

Synonomy

Euxoa oberfoelli Hardwick, 1973a, p. 75.

Recognition: Forewings usually darker than *E. obeliscoides*; hindwings white in males with some fuscus near apex. Color photographs comparing this species to *E. obeliscoides* see Hudson (1973). Males can be separated by the following: rounder outer margin of the cucullus, the proportionally thinner and shorter harpe and sacculus extension, and a bi-lobed sub-basal diverticulum of the vesica. In *E. obeliscoides* the diverticulum is tri-lobed (Hardwick, 1973a). Expands 31-36 mm.

Life history: Differs from that of *E. obeliscoides* in the longer period of aestivation as a prepupae (Hinks and Byers, 1976). Adults fly in late August and September.


Dates: IX-5, 6, 9, 14.

Euxoa servita (Smith)

Figs. 26 and 70; Map 5.

Synonomy

Carneades servitus Smith, 1895, p. 336.


Recognition: Ground-color gray; costa, subterminal area, and ordinary spots paler. A series of black wedges before subterminal line. Hindwings fuscus in both sexes. Males of *E. auripennis* and *E. redimicula* have
smaller black wedges making the subterminal space appear more even. Hindwings of *E. redimicula* are white with a broad fuscus border. Females of *E. servita* lack flange from ovipositor lobes present in *E. redimicula*, rod-shaped, and *E. auripennis*, ear-shaped. Expands 30-33 mm.

**Life history:** In laboratory rearings there was intense diapause during the egg stage and only a brief aestivation period as a prepupae (Hinks and Byers, 1976). Adults fly from mid-July through August (Lafontaine, 1974a).

Larvae were raised on blueberry by Phipps (1930).

**Location:** Spearfish.

**Date:** VII-22.

**Euxoa redimicula** (Morrison)

Fig. 27 (from Lafontaine, 1974a); Map 5.

**Synonomy**

*Agrotis redimicula* Morrison, 1874, p. 165.

**Recognition:** Pattern of *E. servita*, black wedges smaller. Male hindwings white with a broad fuscus border. Expands 33-35 mm.

**Life history:** unknown. Adults fly mostly from late August through September (Lafontaine, 1974a).

**Locations:** Brookings (S.D.S.U.) and in Harding, Lawrence, and Pennington Counties (Lafontaine, pers. com.).

**Dates:** VII-11, 12.
Euxoa idahoensis (Grote)

Map 5.

Synonomy

Agrotis idahoensis Grote, 1878, p. 171.

Agrotis furtivus Smith, 1890a, p. 56.

Recognition: Ground-color reddish brown to gray; costa, and ordinary spots are ringed or filled with pale gray, white, or cream yellow. Discal cell black. Three black wedges before subterminal line; terminal space darker. Hindwings light fuscus. Expands 32-38 mm.

Life history: Larvae have been raised from Russian thistle, sweet clover, and loco weed. Adults in Montana fly from June through August (Cook, 1930a).

Location: Pennington County (LaFontaine, pers. com.)

Euxoa n. sp.

Map 5.

Recognition: Similar to above; ground color coppery-brown, costa and ordinary spots white. Usually a complete row of black wedges before the subterminal line. Hindwings of female fuscus. Expands 35-40 mm.

Life history: unknown.

Locations: Dewey County (SDSU) and Pennington County (LaFontaine, pers. com.).

Dates: VII-5, 7, 9, 10.
Euxoa basalis (Grote)

Synonomy

Agrotis basalis Grote, 1879b, p. 38.

Recognition: Basal area of wings whitish to pale yellow; median area dark brown, subterminal space lighter brown. Cell darker than median area; ordinary spots ringed or filled with basal color. Hindwings brownish, darker marginally. E. rufula has less contrast between basal and median areas, hindwings are blackish. Expands 35-40 mm.

Life history: Overwinters as an egg, larvae matured in 34-52 days when raised at room temperature in the laboratory. There are most often seven instars and no aestivation as a prepupae. Adults fly from mid-July through September (Byers et al., 1975).

Locations: Cited as occurring in South Dakota (Lafontaine, pers. com.).

Euxoa auxiliaris (Grote) army cutworm*

Figs. 28, 71, 95, and 116; Map 1.

Synonomy

Agrotis auxiliaris Grote, 1873, p. 96.

Agrotis introferens Grote, 1875g, p. 423.

Agrotis auxiliaris var. agrestis Grote, 1877, p. 118.

Euxoa auxiliaris ab. tegularis Straud, 1915, p. 144.

Chorizagrotis auxiliaris form montanus Cook, 1930b, p. 149.

Recognition: Extremely variable, best distinguished by structural characters. Male antennae are weakly serrate and fasiculate; abdomen flattened, especially in female. Both sexes with pink reflex to the
hindwings which are otherwise dirty-white, darkening outwardly. Expands 35-50 mm.

**Life history:** Laboratory rearings (Hinks and Byers, 1976) showed the species overwinters as larvae which mature in 37-43 days. No aestivation as a prepupae was noted. When raised outdoors, larvae passed through seven instars and matured in from 167-194 days. The pupal stage lasted from 25-32 days (Walkden, 1950).

Pruess (1967) gives evidence that the species migrates in late spring into the Rockies and back to the plains in the fall. Light trap data showed adults to appear in numbers progressively later from east to west across Nebraska in the spring and later west to east in the fall.

Larvae have been reported on the following plants (Tietz, 1972): maples, horse radish, western wheatgrass, bent grasses, onions, celery, oats, arrow-leaved balsmroot, sugar beets, white mustard, black mustard, cabbage, turnips, shepherd's purse, larkspurs, tansy mustard, strawberry, cotton, barley, Indian paint-brush, flax, apple, alfalfa, timothy, peas, Kentucky bluegrass, wild plum, apricot, peach, radish, rhubarb, black currant, currant, black cherry, raspberry, rye, tomato, potato, dandelion, penny cress, clovers, eastern gramma grass, wheat, and corn.

**Economic importance:** There are numerous reports of damage in South Dakota:

"Infestations observed in most Tripp County wheat fields week ending March 29. Ranged from occasional larvae in some fields up to 8-10 per linear row-foot in other fields" (Anonymous, 1974).
"Larval counts of 1-2 per plant destroyed 1/3 of a field near Mitchell, in Davison County, South Dakota, during late May. This field required replanting" (Anonymous, 1971).

"Damage was noticable by late March and continued til mid-May. Larvae ranged from less than 1 to 7 per row foot. Economic numbers occurred in 11 western counties. Treatment was applied to 40,000 acres of winter wheat" (Anonymous, 1969).


Figure 116 shows locations by county for damage caused by the army cutworm in South Dakota and surrounding states (Anonymous, 1965-1980). In Minnesota damage has been reported on sugar beets, sunflowers, corn, and flax. In Montana records are on alfalfa, small grains, wheat and winter wheat. In Nebraska economic loss has occurred on alfalfa, sugar beets, wheat, and corn. In North Dakota, oats, sugar beets, sunflowers, barley, wheat and winter wheat have been damaged. Wyoming records include sugar beets, alfalfa, wheat, and corn.

Dates: V-2(3), 3(2), 5, 12, 14, 15, 16(2), 17, 18(8), 19, 24, 25(3), 26(4), 27(10), 28, 29, 30(6), 31.
VI-1(7), 2(6), 4, 6, 7(6), 9(3), 10, 11(6), 12(30), 13(3), 14(5), 15(17), 16(11), 17(3), 18(2), 20(2), 23(2), 25(6), 27(2).
VII-1, 2, 3(6), 4(2), 6(2), 7(62), 9, 10(2), 11, 12.
VIII-2.
IX-6, 8, 9(8), 10(2), 11, 15, 20, 21, 23, 29(2).
X-1.

Euxoa scandens (Riley) white cutworm
Figs. 28, 68, and 96; Map 1.

Synonomy
Agrotis scandens Riley, 1869, p. 76.
Agrotis scandens form fulminans Grote, 1896, p. 67.
Setagrotis elata Smith, 1898, p. 106.

Recognition: Frons without a raised ring. Ordinary spots faint, reniform with lower half fuscus. Forewings with row of subterminal white spots; hindwings with subterminal line. E. aurulenta lacks a frontal tubercle; ordinary spots are ocellate. Transverse lines, unlike E. scandens, are punctiform with black or white filling between line elements contrasts with darker ground-color. Expands 29-37 mm.

Life history: Laboratory studies (Hinks and Byers, 1976) show overwintering as a larva. In Nebraska larvae collected in May pupated in early June with adults emerging from late June through July (Walkden, 1950).
Larvae have been recorded on the following plants: cabbage, apple, peach, pear, white oak, radish, currant, black cherry, raspberry, willows, grape (Tietz, 1972), sweet clover (Walkden, 1950), and tomato (Knutson, 1944).

Locations: Brookings, Highmore, Hill City.

Dates: VI-20, 21, 24(2), 26, 30.

VII-1, 5(2), 7(4), 8, 10(2), 11(2), 12, 15, 20, 25.

**Euxoa tristicula** (Morrison) early cutworm

Figs. 30, 69, and 97; Map 1.

Synonomy

*Agrotis tristicula* Morrison, 1875, p. 425.

*Euxoa nesilens* Smith, 1903e, p. 192.

Recognition: Pale sandy brown, ordinary spots and costa lighter; discal cell usually black. Heavy black basal dash reaches antemedial line; prothoracic collar with wide black median stripe. Males with thick downcurved sacculus extension. Expands 36-42 mm.

Life history: Larvae overwinter; in laboratory studies at room temperature reaching maturity in 38-44 days. Aestivation as a prepupae lasts 11-43 days (Hinks and Byers, 1976). Adults fly from June through August (fig. 96).

Larvae have been found on alfalfa, flax, clovers, sugar beets, dandelions (Jacobson, 1969), Russian thistle, and winter wheat (Cook, 1930a).

Locations: Brookings, Highmore, Hill City, and Spearfish.
Dates: VI-3, 21.
VII-2, 8, 10, 12(7), 13, 17, 18(2), 20, 25(2), 26(3), 27, 29, 31.
VIII-5(2), 8, 9, 12, 15.

Euxoa pleuritica (Grote)
Fig. 31 (from Hardwick, 1970a); Map 1.

Agrotis pleuritica Grote, 1876a, p. 47.

Carneades messoria var. contracta Morrison, in Smith, 1890b, p. 170.

Recognition: Prothoracic collar usually absent. Ground-color blackish,
overlaid with brown scales in median area. Male harpe setose, \( \frac{1}{2} \) as
long as sacculus extension. Expands 34-40 mm.

Life history: Hinks and Byers (1976) found larvae to overwinter, and
prepupae to undergo a long aestivation.

Cook, (1930a) reports larvae on Russian thistle.

Locations: Volga (Hardwick, 1970a).

Dates: North Dakota specimens from late June to mid-July.

Genus Loxagrotis McDunnough

Loxagrotis McDunnough, 1928, p. 27; type Agrotis proclivis Smith.

Only one of the nine North American species occurs in South
Dakota.
**Loxagrotis albicosta** (Smith) *western bean cutworm*

Fig. 117; Map 5.

**Synonomy**

_**Agrotis albicosta** Smith, 1887, p. 454._

**Recognition:** Ground-color gray, costa white; discal cell black before and between white-ringed ordinary spots. Hindwings of male white with marginal fuscus scaling, of female fuscus. Male antennae ciliate; frons without raised ring. Expands 32-42 mm.

**Life history:** Overwinters as a partially grown larva. Pupation occurs in late June with adults flying from mid-July into August, when eggs are laid (Horner, 1948).

Larvae have been reported on corn (Anonymous, 1972) and kidney beans (Horner, 1948).

**Economic importance:** There is no record of damage in the state, however, adults have been found in numbers:

"Moth collections increased in black light traps near Oral, Fall River County, compared to 1970. From July 17-23, moths averaged 78 per night" (Anonymous, 1971).

There is a single record of larvae in the state:

"Larvae collected for the first time near Oral, Fall River County, August 12, 1971... Second and third instar larvae taken in association with corn cobs in ditch irrigated corn. In a 200-acre field on August 18, 5-8% of plants surveyed showed 1-3 second to fourth instar larvae" (Ibid.).

Figure 117 shows by county sites of economic loss caused by this species. All records occur in Nebraska on corn (Anonymous, 1965-1980).

**Locations:** Brookings, Oral, Yankton, and in Bennett, Bon Homme,
Haakon, Jackson, Lawrence, Meade, Pennington, and Tripp Counties.

Dates: VII-17, 18, 19, 21, 22, 23.

VIII-12.

Genus Agrotis Ochsenheimer

Agrotis Ochsenheimer, 1816, p. 66; type Noctua segetum Schiffermuller.

Scotia Hubner, 1821, p. 226; type Noctua cinerea Schiffermuller.

McDunnough, 1928, p. 14; = Agrotis.

Agronoma Hubner, 1821, p. 227; type Noctua vestigialis Rottenberg.

Hampson, 1903, p. 153; = Agrotis.

Georyx Hubner, 1821, p. 227; type Noctua segetum Schiffermuller.

Grote, 1896, p. 16; = Agrotis.

Feltia Walker, 1856a, p. 202; type ducens Walker, = Agrotis jaculifera Guenee

Forbes, 1954, p. 31; = Agrotis.

Porosagrotis Smith, 1890b, p. 11; type Agrotis muraenula

Grote and Robinson, = Mythimna vetusta Walker.

McDunnough, 1928, p. 13; = Agrotis.

Onychagrotis Hampson, 1903, p. 465; type Agrotis rileyana Morrison.

Forbes, 1954, p. 31; = Agrotis.

This arrangement differs from the usual in that Onychagrotis and Feltia are also included (see discussion). Eleven species, about a third of the North American forms, occur in South Dakota. Of the South Dakota species, only A. epsilon and A. subterranea have more than annual generation.
Key to the Species of Agrotis

1. Reniform with a black streak distally. .................. 2
   No such streak. ............................................. 4

2. Palpi smooth scaled beneath ..................................... \(\epsilon\)
   Palpi rough scaled beneath, appearing shaggy. .......... 3

3. Claviform black, extends out to reniform. ........... \(\varepsilon\)\(\varepsilon\)\(\varepsilon\)\(\varepsilon\)\(\varepsilon\)
   Claviform with thin black outline, extends as far out as orbicular................................. \(\epsilon\)\(\epsilon\)\(\epsilon\)\(\epsilon\)\(\epsilon\)\(\epsilon\)\(\epsilon\)\(\epsilon\)\(\epsilon\)\(\epsilon\)

4. Orbicular an open v to the costa.......................... 5
   Orbicular round, may be small or obsolete............. 7

5. Forewing with pale streaks on \(M_3\) and \(Cu_1\) .... \(\epsilon\)\(\epsilon\)\(\epsilon\)\(\epsilon\)\(\epsilon\)\(\epsilon\)\(\epsilon\)\(\epsilon\)\(\epsilon\)\(\epsilon\)\(\epsilon\)\(\epsilon\)
   No such streaks............................................. 6

6. Costal and cubital area concolorous.................. \(\epsilon\)\(\epsilon\)\(\epsilon\)\(\epsilon\)\(\epsilon\)\(\epsilon\)\(\epsilon\)\(\epsilon\)\(\epsilon\)\(\epsilon\)
   Costa darker than cubital area.......................... \(\epsilon\)\(\epsilon\)\(\epsilon\)\(\epsilon\)\(\epsilon\)\(\epsilon\)\(\epsilon\)\(\epsilon\)\(\epsilon\)\(\epsilon\)

7. Orbicular and reniform connected by a black line...... \(\epsilon\)\(\epsilon\)\(\epsilon\)\(\epsilon\)\(\epsilon\)\(\epsilon\)\(\epsilon\)\(\epsilon\)\(\epsilon\)\(\epsilon\)\(\epsilon\)\(\epsilon\)
   Ordinary spots with at most a black outline........... 8

8. Forewing with pale area below cubitus................ \(\epsilon\)\(\epsilon\)\(\epsilon\)\(\epsilon\)\(\epsilon\)\(\epsilon\)\(\epsilon\)\(\epsilon\)\(\epsilon\)\(\epsilon\)
   No such pale area.......................................... 9

9. Transverse lines mostly obsolete...................... \(\epsilon\)\(\epsilon\)\(\epsilon\)\(\epsilon\)\(\epsilon\)\(\epsilon\)\(\epsilon\)\(\epsilon\)\(\epsilon\)\(\epsilon\)
   Transverse lines double and black...................... 10

10. Pro-tibiae with blunt apical spines; no pale filling to transverse lines................................. \(\epsilon\)\(\epsilon\)\(\epsilon\)\(\epsilon\)\(\epsilon\)\(\epsilon\)\(\epsilon\)\(\epsilon\)\(\epsilon\)\(\epsilon\)
    Pro-tibiae with sharp apical spines; transverse lines pale filled...................................... \(\epsilon\)\(\epsilon\)\(\epsilon\)\(\epsilon\)\(\epsilon\)\(\epsilon\)\(\epsilon\)\(\epsilon\)\(\epsilon\)\(\epsilon\)

Agrotis ipsilon (Hufnagel) black cutworm

Figs. 33, 73, 98, and 119; Map 7.

Synonomy

Phalaena ipsilon Hufnagel, 1766, p. 416.
Noctua suffusa Schiffermüller, 1775, p. 80.
Noctua ypsilon Rottenberg, 1776, p. 111.
Agrotis telifera Harris, 1841, p. 323.

Recognition: Forewing blackish, subterminal area light brown with black wedge on outer side of reniform. Palpi beneath smooth scaled; male antennae with lower two-thirds pectinate. Expands 37-53 mm.

Life history: Laboratory rearings (Crumb, 1929) showed the life cycle to take about 60 days at room temperature; at 27°C only 35 days were required. The egg stage lasts three days, larval stage from 20-34 days, and pupal stage from 12-17 days. In South Dakota there are at least two generations, adults having been taken from early April through October.

Larvae have been reported on the following plants by Tietz (1972) and Rings et al (1974): onion, celery, asparagus, oats, sugar beets, white mustard, black mustard, cabbage, broccoli, turnips, chili pepper, rabbit-bush, chicory, orange, cucumber, squash, strawberry, Indian paint-brush, gladiolus, soybeans, cotton, morning glory, cypress vine, lettuce, flax, apple, tobacco, common mallow, guayule, kidney beans, peas, purslane, peach, radish, castor bean, sugar cane, Russian thistle, tomato, egg plant, potato, sorghum, spinach,
artichoke², clovers¹, dwarf blueberry¹, American cranberry¹, cowpeas², grape¹, and corn¹.

**Economic importance:** In South Dakota there are a few records of this damaging sorghum, flax, corn and soybeans.

"Cutworms continue to damage sorghum and corn in numerous fields in Southwestern area from Gregory County east" (Anonymous, 1969).

"Larvae active, up to 12 per row-foot on flax in Codington County" (Anonymous, 1968).

"Heavy, 1-4 per hill (average 2), in 50-acre corn field northeast of Madison, Lake County. Most plants chopped off; in many large areas not a single plant standing...Caused some damage in a 50-acre soybean field adjacent to corn in Lake County" (Anonymous, 1967).

Figure 119 shows sites of economic damage caused by this species in the seven state area (Anonymous, 1965-1980). In Nebraska corn, sorghum and small grains have been damaged; Iowa reports are for corn and soybeans. In Minnesota damage was confined to corn.

**Locations:** Brookings, Chamberlain, Elk Point, Hecla, Highmore, Letcher, Madison, Sioux Falls, Vermillion, Volga, Wessington Springs, and in Hamlin, Jones, Lyman, Stanley, and Ziebach Counties.

**Dates:** IV-20(2).


VII-2, 5, 6(2), 7, 8, 9(2), 10(2), 11(2), 12(5), 13(4), 14(3), 15(3), 16(6), 17(6), 18(5), 19(3), 20(5), 21(10), 22(9), 23(7), 24(3), 25(3), 26(10), 27(8), 28(5), 29(3), , 30(9), 31(2).
Agrotis voluabilis Harvey

Fig. 99; Map 7.

Synonomy

Agrotis voluabilis Harvey, 1874, p. 118.

Agrotis funipennis McDunnough, 1932, p. 107.

Recognition: Black wedge on outer side of reniform; collar with transverse stripe of three colors, white central stripe edged with black posteriorly and red-brown anteriorly. Male antennae fasiculate. Expands 35-40 mm.

Life history: Larval development takes about 52 days. Larvae mature by late July and aestivate till late October (McCabe, 1981). Adults fly from May to mid-July.

Larvae have been recorded on sneeze weed, evening primrose, and Vaccinium.

Locations: Brookings, Elk Point, Hecla, Highmore, Hill City, Vermillion, and Volga.


VII-11.
Agrotis venerabilis Walker dusky cutworm

Fig. 100; Map 7.

Synonymy

Agrotis venerabilis Walker, 1856b, p. 328.

Recognition: Black wedge on outer side of reniform. Claviform long, reaching to below reniform. Frons with a raised ring; male antennae with basal two thirds pectinate. Expands 35-40 mm.

Life history: Winter is passed as a larvae which matures by early June. Most of the summer is spent in aestivation. Adults fly mainly in September (Walkden, 1950).

Larvae have fed on oats, alfalfa, chickweed, white clover, tobacco, violets, and corn.

Locations: Brookings, Cottonwood, Highmore, Hill City, Sioux Falls, and Volga.

Dates: VIII-8, 10-(3), 12, 29.

IX-2(5), 3, 4(7), 5(14), 6(8), *(40), 9, 10(48), 11(21), 12(5), 13(4), 14(55), 15(37), 16(15), 17(17), 18(11), 19(7), 20(37), 21, 22(26), 23(16), 24(12), 26(10), 27(13), 28, 29.

X-1(17), 22.

Agrotis gladiaria Morrison clay-backed cutworm *

Map 6.

Synonymy

Agrotis gladiaria Morrison, 1874, p. 162.

Agrotis morrisonana Riley, 1874, p. 286.
Recognition: Claviform short, black outlined; extends to orbicular which is small and round. Subterminal line a series of white spots. Male antennae pectinate nearly to apex. Expands 30-35 mm.

Life history: The species overwinters as a partially grown larvae which (in Kansas) matures by the end of April. Summer is spent in aestivation; pupation in August with moths emerging in September (Walkden, 1950).

Larvae have been reported on summer aster, oats, strawberry, sweet potato, tobacco, kidney bean, black cherry, raspberry, curled dock, tomato, potato, goldenrod, clovers, pansies, and corn (Tietz, 1972).

Locations: Two literature citations for South Dakota: Geddes, Charles Mix County (Crumb, 1929), Stanley County (Anonymous, 1977).

Agrotis subterranea (Fabricius) granulate cutworm

Map 6.

Synonomy

Noctua subterranea Fabricius, 1794, p. 70.
Agrotis annexa Treitschke, 1825, p. 154.
Agrotis anteposita Guenee, 1852, p. 278.
Agrotis decernens Walker, 1856b, p. 333.

Recognition: Orbicular and reniform connected by a black line. Male antennae serrate; frons with a raised ring. Sexually dimorphic; males are clay-colored, females blackish with paler subterminal area and costa. Expands 32-44 mm.

Life history: Laboratory rearings (Crumb, 1929) showed the entire life cycle to take from 47 to 68 days. Egg stage lasted from 3-5 days, larval stage from 27-42 days, and pupal stage from 16-27 days. The
species does not survive the winter as far north as Nebraska (Walkden, 1950).

Larvae have been reported on the following plants (Tietz, 1972): asparagus, cabbage, broccoli, brussel sprouts, turnips, sugar beets, shepherd's purse, chili peppers, cotton, sweet potato, lettuce, pepper grass, apple, marijuana, peru, goayule, kidney beans, peas, plantains, knotweed, tomato, egg plant, potato, dandelion, clovers, eastern gramma grass, ditch bur, and corn.

**Locations:** Cited by Crumb (1929) at Geddes, Charles Mix County.

Agrotis herilis Grote

Fig. 101; Map 6.

**Synonomy**

*Agrotis herilis* Grote, 1873, p. 99.

**Recognition:** Ground-color gray with blue tinge; a pale streak above claviform. Hindwings mostly fuscus. Expands 37-40 mm.

**Life history:** Overwinters as a partially grown larva, maturing by early April (Crumb, 1956). Peak flight period is in late July and early August.

Because of confusion of this and the following two species, all host records for the three are listed under *A. jaculifera*.

**Locations:** Brookings, Sioux Falls, Spearfish, Volga.

**Dates:** VII-1, 12, 24(2), 25(2), 26, 27(2), 30(2).

VIII-1(4), 2, 3, 4(2), 6, 8, 9, 18, 21, 24(3), 29(2).

XI-11.
Agrotis subgothica (Haworth)
Fig. 102; Map 6.

Synonomy
Noctua subgothica Haworth, 1810, p. 224.
Agrotis tricosa Lintner, 1874, p. 159.

Recognition: Ground color lead gray; costa and area above claviform concolorous, or costa lighter. Hindwings dingy white with a broad fuscus border in the male, mostly fuscus in females. Expands 35-37 mm.

Life history: Overwinters as a larva, maturing by mid-May. There is a short aestivation period with pupation in July and moths flying in August and September (Knutson, 1944). In South Dakota the peak flight period is the first half of August.

See host plants under A. jaculifera.


VIII-1(9), 2(4), 3(6), 4, 5(11), 6(16), 7(2), 8(7), 9(8), 10(4), 11, 12(7), 13(7), 16(4), 18(5), 19, 20(9), 21(3), 22, 25.
IX-6(2), 9, 10(2).

Note: This is the species called jaculifera by Smith (1890b) and Forbes (1954).

Agrotis jaculifera Guenee dingy cutworm
Figs. 35, 76, and 103; Map 6.

Synonomy
Agrotis Jaculifera Guenee, 1852a, p. 262.

Feltia ducens Walker, 1856a, p. 203.

Feltia radiata Harris, in Smith 1891a, p. 58.

Recognition: Pale streaks on veins $M_3$ and $Cu_1$. Veins R and Cu white scaled to end of cell. Hindwings of male usually white with a broad fuscus border; specimens do occur with hindwings nearly all white or fuscus. Female have the hindwings with a fuscus border or all fuscus. Expands 31-37 mm.

Life history: Overwinters as a partially grown larva, maturing by late March in Kansas and Nebraska. There is a long aestivation period with pupation in early August and moths appearing in September (Walkden, 1950).

The following is a list of all food plants recorded under the names ducens, herilis, jaculifera, and subgothica by Tietz (1972), and Rings et al. (1975a2): onions, celery, cockle bur, summer aster, oats, sugar beets, cabbage, turnips, fanwart, treacle, chrysanthemums, muskmelon, cucumber, squash, strawberry, soybeans, sunflower, hollyhocks, sweet potato, lettuce, flax, apple, alfalfa, tobacco, kidney beans, peas, plantains, Kentucky bluegrass, rye, raspberry, curled dock, tomato, potato, goldenrod, chickweed, red clover, wheat, dandelion, eastern gramma grass, dwarf blueberry, Canadian blueberry, willow, and corn.

Economic importance: There are no reports of damage by this species in South Dakota. Dingy cutworms have damaged corn in Minnesota, Iowa (Anonymous, 1979), and Nebraska (Anonymous, 1980). They have also damaged...

Locations: Brookings, Cottonwood, Elk Point, Ft. Thompson, Highmore, Hill City, Sioux Falls, Spearfish, Vermillion, Volga, and in Custer, Jones, Meade, Mellette, and Turner Counties.

Dates: VII-6, 10, 12, 15, 22(2), 23(7), 25(3), 26, 27(2), 29, 30(5).

VIII-1(21), 2(11), 3(2), 5(16), 6(12), 7(4), 8(11), 9(22), 10(52),
11(4), 12(11), 13(38), 14(5), 15(2), 16(37), 17(22), 18(68),
19(11), 20(97), 21(20), 22(12), 23(19), 24(43), 25(33), 27(4),
28(4), 29(28), 30(13), 31(4).

IX-1(44), 2(29), 3(59), 4(65), 5(83), 6(86), 7(85), 8(152),
9(150), 10(145), 11(85), 12(16), 13(6), 14(7), 15(35), 16(4),
17(5), 18(14), 19(4), 20(17), 22(17), 23(7), 24(2), 26(3), 27(10),
29(2).

X-1(27), 4, *(2), 14, 22(2).

Note: This is the _subgothica_ of Smith (1890b), and Walkden (1950); the _ducens_ of Forbes (1954) and economic literature.

**Agrotis vetusta** (Walker) spotted-legged cutworm

Figs. 34 and 74; Map 7.

Synonomy

*Mythinna vetusta* Walker, 1856a, p. 78.

*Agrotis muraenula* Grote, and Robinson, 1868, p. 352.

*Porosagrotis catenuloides* Smith 1908a, p. 89.

*Porosagrotis vetusta mutata* Barnes and McDunnough, 1912, p. 1924.
Recognition: Ground-color sandy brown; lines indicated by black scales.
Hindwings immaculate white. Frons with a raised ring; male antennae fasciculate. *Euxoa catenula* is paler and has the ordinary spots black scaled; *E. scandens* has the frons smooth. Expands 35-45 mm.

Life history: Overwinters as a partially grown larva, maturing by the end of May in Nebraska. The species undergoes an aestivation period and then pupates in August. Moths appear in September (Walkden, 1950).

Larvae have been recorded on the following (Tietz, 1972):
parsley, deadly nightshade, cabbage, kale, turnip, watermelon, melon, cotton, lettuce, tobacco, kidney beans, peach, dewberry, southern dewberry, tomato, spinach, dandelion, common mullin, cowpea, and corn.

Locations: Volga, Sioux Falls.


**Agrotis orthogonia** Morrison pale western cutworm*

Fig. 118; Map 7.

Synonomy

*Agrotis orthogonia* Morrison, 1876, p. 239.

*Porosagrotis delorata* Smith, 1908a, p. 87.

*Porosagrotis orthogonia duae* Barnes and Benjamin, 1926, p. 303.

Recognition: Ground-color gray brown; lines double, black, with inter-spaces pale filled. Frons with a raised ring; male antennae pectinate. Most easily separated from *A. rileyana* by having pointed rather than blunt pro-tibial claws. Expands 30-36 mm.

Life history: Overwinters as an egg with larvae hatching in March. These
mature by early May and aestivate until August when pupation occurs. Moths fly in September. Eggs are laid in September and early October (Walkden, 1950).

Larvae have been reported on the following plants (Tietz, 1972): western wheatgrass, onion, sugar beet, white mustard, black mustard, cabbage, cheat grass, Canada thistle, carrot, sunflower, barley, wild lettuce, flax, common mallow, alfalfa, white clover, wheat, Russian thistle, rye, tomato, potato, sudan grass, dandelion, fall penny-cress, eastern gramma grass, corn and wandering jew.

Economic importance: In South Dakota the species has caused damage to winter wheat and alfalfa.

"Economic, larvae ranged 1-3 per row-foot of winter wheat near Carter, Tripp County. Controls applied to 500 acres of winter wheat near Presho, Lyman County" (Anonymous, 1970).

"Heavy localized infestations week ending May 16 severely damaged winter wheat fields in Oakton area in western, and east of Buffalo Gap, Fall River County. Infestations heaviest in wheat planted in same fields where wheat grown in 1974" (Anonymous, 1975).

Figure 118 shows by county damage reports of the pale western cutworm in this five state area (Anonymous, 1965-1980). In Montana, Nebraska, and Wyoming winter wheat and small grains have been damaged. In Nebraska and Wyoming corn has been injured; in Wyoming sugar beets have been damaged.

Dates: VII-11.
    IX-9, 12.

Note: All records are of larvae except three moths from Brookings.

Agrotis rileyana Morrison
Figs. 32, 75, and 104; Map 7.

Synonomy
Agrotis rileyana Morrison, 1874, p. 166.

Recognition: Ground-color gray-brown, darker than Agrotis orthogonia; lines rarely with both elements solid black, not pale filled. Frons with a raised ring; male antennae pectinate. Pro-tibial claws blunt.

Expands 30-35 mm.

Life history: unknown. Adults fly mostly in September indicating a life history similar to the preceding species.

Locations: Brookings, Highmore, and Hill City.

Dates: VII-23.

    VIII-1(2), 10(2), 11, 28.
    X-1(54), 8(5), 22.

Note: Compare the large number of specimens from very few locations with the preceding species.
Genus *Euoptocnemis* Grote

*Euoptocnemis* Grote, 1874d, p. 13; type *Heliophobus fimbriaris* Guenee.

One of the two North American species occurs in South Dakota.

In structure similar to the last two species of *Agrotis* but lacking the fourth row of spines on the meso-tarsi.

*Euoptocnemis tripars* (Walker)

Map 7.

Synonomy

*Mythinna tripars* Walker, 1856a, p. 78.

*Agrotis worthingtoni* Grote, 1880a, p. 91.

**Recognition**: Forewings brick-red. Orbicular a black dot; reniform yellow with a variably complete black outline. Postmedian line marked by white spots on veins distal to reniform. Hindwings white. Male antennae pectinate; frons smooth. Pro-tibiae with broad short claws heavier than in *Agrotis rileyana*. Expands 30-35 mm.

**Life history**: unknown.

**Location**: Brookings.

**Date**: X-1.

Genus *Euagrotis* McDunnough

*Euagrotis* McDunnough, 1928, p. 43; type *Noctua lubricans* Guenee.

Two of the nine North American species occur in South Dakota.

They are separated as follows:
1. Forewings brown-black; hindwings white................. illapsa

Forewings pale gray, lines black; hindwings with faint fuscus
postmedial line............................................... tepperi

Euagrotis illapsa (Walker)
Figs. 36 and 80; Map 8.

Synonomy

Graphiphora illapsa Walker, 1858, p. 744.

Recognition: Forewings dark brown-black; hindwings white. Male antennae
simple; frons smooth. The very similar E. lubricans (Walker) and
E. forbesi Franelemont have fewer than 25 spines in the corona.

Expands 30-35 mm.

Life history: The species has two annual generations with moths flying
in June and September (Forbes, 1954).

Location: Brookings.

Date: VIII-10.

Euagrotis tepperi (Smith)

Fig. 105; Map 8.

Synonomy

Agrotis tepperi Smith, 1887, p. 452.

Noctua atricincta Smith, 1895, p. 333.

Recognition: Forewings pale gray; lines black, variable, obscured by
gray scaling or prominent. Hindwings white with postmedial line and
discal spot. Prothoracic collar with black central stripe widening
dorsally. Expands 34 mm.

Life history: unknown. Moths fly in late June and in July.

Locations: Bear Butte, Brookings, Fort Pierre, Custer State Park, Milesville, Oral, and in Dewey County.

Dates: VI-25.


Genus Anicla Grote

Anicla Grote, 1874d, p. 159; type alabamae Grote = Agrotis infecta Ochsenheimer.

A single species occurs in South Dakota.

Anicla infecta (Ochsenheimer) green cutworm

Fig. 37 (from McDunnough, 1928); Map 8.

Synonomy

Agrotis infecta Ochsenheimer, 1816, p. 8.

Agrotis Incivis Guenee, 1852a, p. 274.

Anicla alabamae Grote, 1874d, p. 159.

Recognition: Pale gray-brown, subterminal and terminal areas darker.

Reniform blackish; lines double, marked only at costa and inner margin.

Hindwing white with violet sheen, apex fuscus. Frons smooth; male antennae simple. Expands 32-38 mm.

Life history: Does not overwinter in South Dakota. From 48 to 64 days were required to complete life cycle in Kansas with moths occurring in July and August (Walkden, 1950).
Larvae have been recorded on the following plants (Tietz, 1972): sugar beet, sand bur, bermuda grass, tobacco, plantains, purslane, and clovers.

Locations: Cited by Truman (1897) at Volga, S.D.

Genus *Peridroma* Hubner

*Peridroma* Hubner, 1821, p. 227; type *Noctua saucia* Hubner.

There is a single species in North America, others occur in South America.

*Peridroma saucia* (Hubner) variegated cutworm*

Figs. 38, 79, 106, and 120; Map 8.

Synonomy

*Noctua saucia* Hubner, 1808, p. 81.


*Agrotis inernis* Harris, 1841, p. 323.

*Agrotis ortonii* Packard, 1869c, p. 63.

Recognition: Ground-color varies from pale brown to very dark reddish-brown. Orbicular and costa might be light yellow. Hindwing whitish with violet sheen and fuscus border. Thorax with a central scale-crest which divides anteriorly; the scales often tipped with white. Antennae of male simple. Expands 40-55 mm.

Life history: Walkden (1950) states there are three and a partial fourth generation in Kansas with pupae overwintering in very low numbers. For eggs deposited in April the life cycle was completed in from 58 to 69 days. In South Dakota adults have been taken from May through October
with July as the peak month.

Larvae have been recorded on a great variety of plants (Tietz, 1972): balsam fir, western balsam fir, boxelder, silver maple, onion, hollyhock, service berry, common ragweed, pond apple, asparagus, sugar beet, white mustard, black mustard, cabbage, shepherd's purse, bull thistle, sneezeweed, cucumber, carrot, carnation, geraniums, honey locust, cotton, hops, lettuce, sweet pea, apple, alfalfa, sweet clover, mulberry, nasturtium, tobacco, goayule, avocado, timothy, pea, plantains, knotweed, purslane, wild plum, plum, apricot, sour cherry, bitter cherry, peach, common brake, white oak, radish, rhubarb, dwarf sumac, black currant, flowering currant, currant, black cherry, raspberry, black raspberry, curled dock, coast willow, black willow, sage, green bryar, tomato, potato, goldenrod, chickweed, eastern gramma grass, eastern hemlock, nettles, tall blueberry, dwarf blueberry, Canadian blueberry, violets, grape, ditch bur, and corn.

Economic importance: In South Dakota there is an old report of damage to alfalfa in Bennett County (Anonymous, 1956).

Figure 120 shows areas of economic damage caused by this species (Anonymous, 1965-1980). The species has damaged corn in Iowa, Nebraska, and Minnesota; alfalfa in Iowa and Nebraska; onions and tomatoes in Nebraska; and potatoes in Iowa.

Locations: Brookings, Cottonwood, Highmore, Pine Ridge, Sioux Falls, Vermillion, Volga, and in Bennett and Hughes Counties.
Dates: V-6, 11, 23, 25, 27, 30.

VI-1, 2, 3, 6(2), 8, 10, 11, 12(3), 17(3), 18(3), 19(6), 20(5), 21, 22(3), 26(4), 27(2), 28, 29, 30(4).


VIII-1(2), 2(7), 3(3), 5(7), 6(4), 8, 10, 11(2), 12, 13(3), 16(4), 17(2), 18(6), 20(4), 21, 24, 29(3), 31(2).

IX-1, 2, 3, 4(3), 5(4), 8(7), 9(3), 11, 12(2), 13, 14(5), 16(2), 18, 19, 20(7), 21, 25, 27.

X-1(2), 2, 3(2), 8(3), 10, 16(2), 22(4).

Genus Ochropleura Hubner

Ochropleura Hubner, 1821, p. 223; type Noctua plecta Linnaeus.

There is a single species in North America.

Ochropleura plecta (Linnaeus) flame-shouldered dart

Map 8.

Synonomy

Noctua plecta Linnaeus, 1761, p. 321.

Ochropleura vicaria Walker, 1856b, p. 409.

Recognition: Ground-color dark brown to gray; costa yellow from reniform to base. Cell black before and between ocellate ordinary spots.

Hindwing white with a dark terminal line. Male antennae fasiculate;
frons smooth. Expands 25-30 mm.

**Life history:** In Minnesota light trap collections indicate two broods annually (Knutson, 1944), with most adults taken in June and August.

Larvae have fed on sugar beets (Tietz, 1972).

**Locations:** Brookings and Volga.

**Date:** VII-28.

---

**Genus Eurois Hubner**

_Eurois_ Hubner, 1821, p. 217; type _Noctua occulta_ Linnaeus.

One of the five North American species occurs in South Dakota.

These are among the largest moths in the subfamily.

**Eurois occulta** (Linnaeus) great gray dart

Map 8.

**Synonymy**

Noctua occulta Linnaeus, 1767, p. 514.

**Recognition:** Ground-color gray, irrorate with white. Lines black, scalloped. Hindwings fuscus with white fringe. Expands 50-65 mm.

**Life history:** There is a single annual generation, the species overwintering as a partially grown larva. Moths fly in June.

Larvae have fed on dwarf blueberry and Canadian blueberry (Phipps, 1930).

**Locations:** Brookings and Volga.

**Date:** VI-27.
Genus *Anaplectoides* McDunnough

*Anaplectoides* McDunnough, 1928, p. 65; type *Noctua prasina* Fabricius.

A holarctic genus with one South Dakota species.

*Anaplectoides prasina* (Fabricius) green-winged dart

Map 8.

Synonomy

*Noctua prasina* Fabricius, 1787, p. 169.

*Aplecta herbacea* Guenee, 1852b, p. 73.

**Recognition:** White, heavily irrorate with black scales; large white crescent distal to reniform. Green scaling in fold and from reniform to margin. Hindwings fuscus. Expands 45-60 mm.

**Life history:** Probably overwinters as an immature larvae. Adults fly from July through September (Forbes, 1954).

Larvae have been reported on black cherry, raspberry, and blueberry (Tietz, 1976).

**Location:** Brookings.

**Dates:** VI-8.

VII-6.

Genus *Amathes* Hubner

*Amathes* Hubner, 1821, p. 222; type *Noctua baja* Schiffermuller.

*Megasema* Hubner, 1821, p. 222; type *Phalaena triangulum* Hufnегal

Hampson, 1903, p. 363; = *Amathes*.

*Lylaea* Stephens, 1829, p. 107; type *umbrosa* Hubner = *Noctua sexstrigata* Haworth.
McDunnough, 1928, p. 11; = Amathes.

Segetia Stephens, 1829, p. 153; type Noctua xanthographa Fabricius.

McDunnough, 1928, p. 12; = Amathes.

Nine of the eighteen North American species occur in South Dakota. They are separated by the keys below.

**Key to South Dakota species of Amathes**

1. White line separating frons from vertex. .......................... 2
   No such line. .......................................................... 4

2. Collar black, contrasts with pale gray thorax. ............... collaris
   At most with collar hardly darker than thorax. ............... 3

3. Post and antemedial lines marked by orange at costa....... bicarnea
   Lines white and even or represented by white spots at veins
   .............................................................. tenuicula

4. Black patch proximal to orbicular. ................................. 5
   No such patch. ......................................................... 8

5. Orbicular gray, oval, opened above and below. ............... 6
   Orbicular yellow, u-shaped, opened above only............... 7

6. Collar with at least outer half black; male antennae pectinate
   .............................................................. badinodis
   Collar with black only at base; male antennae fasciculate. normaniana

7. Color more blue-gray, lines suppressed. Forewing length:
   spring brood 19-22 mm; fall brood 18-21 mm..................... dolosa
   Color more rusty brown, lines present. Forewing length:
   spring brood 16-19 mm; fall brood 15-18 mm..................... adela
8. Ordinary spots concolorous or reniform and surrounding area obscured by a dark patch......................... smithii

Reniform with yellow center or all yellow; orbicular usually with a yellow ring................................ xanthographa

Key to Anathes based on male reproductive structures

1. Valve with pollex long, projecting obliquely inward............. 2
   Valve with pollex short, projecting downward or backward, or absent................................................................. 3

2. Harpe projects dorsally, apex rounded......................... smithii
   Harpe projects dorsally and posteriorly, apex pointed.... normani

3. Cucullus covered with spine-like hair............................. 4
   Cucullus without such hair......................................... 6

4. Harpe short, barely reaching above valve......................... 5
   Harpe long, curved posteriorly above valve............... xanthographa

5. Juxta with broadened lower portion less than \( \frac{1}{2} \) of total height. adel
   Broadened lower portion more than \( \frac{1}{2} \) total height......... dolosa

6. Harpe flattened....................................................... 7
   Harpe cylindrical................................................... 8

7. Pollex present..................................................... bicarnea
   Pollex absent..................................................... tenuicula

8. Valve narrow...................................................... collaris
   Valve broad......................................................... badinodis
Amathes dolosa (Franclemont)
Figs. 40 and 81; Map 9.

Synonomy
Xestia dolosa Franclemont, 1980, p. 579.

Recognition: Orbicular pale yellow, u-shaped. Ground color blue-gray to nearly black; females tending to be darker and larger. Expands 37-43 mm.

Life history: See under A. adela. Larvae prefer wooded areas with clearings (Franclemont, 1980).

Location: Brookings.

Dates: IX-10, 23.

Amathes adela (Franclemont) spotted cutworm
Figs. 39, 83, and 107; Map 9.

Synonomy
Xestia adela Franclemont, 1980, p. 584.

Recognition: As above, ground color often rusty brown in median area. Transverse lines usually double and black. Females tend to be larger. Expands 28-38 mm.

Life history: Larvae prefer meadows and cropland (Franclemont, 1980). This species has two generations in South Dakota with peak flights in mid-June and early September.

Larvae of this or the preceding species have been recorded on the following plants by Tietz (1972$^1$) and Rings and Johnson (1972$^2$):
maples\textsuperscript{1}, onions\textsuperscript{1}, celery\textsuperscript{1}, choke-berry\textsuperscript{1}, oats\textsuperscript{1}, sugar beets\textsuperscript{1}, cabbage\textsuperscript{1}, shepherd's purse\textsuperscript{2}, broccoli\textsuperscript{1}, turnips\textsuperscript{1}, chicory\textsuperscript{1}, Canada thistle\textsuperscript{1}, sweet fern\textsuperscript{1}, carrots\textsuperscript{1}, strawberry\textsuperscript{2}, sunflower\textsuperscript{1}, barley\textsuperscript{1}, lettuce\textsuperscript{1}, nettles\textsuperscript{1}, flax\textsuperscript{1}, apple\textsuperscript{1}, alfalfa\textsuperscript{2}, sweet clover\textsuperscript{2}, forget-me-not\textsuperscript{1}, raspberry\textsuperscript{2}, tobacco\textsuperscript{1}, kidney beans\textsuperscript{2}, peas\textsuperscript{1}, plantains\textsuperscript{1}, primroses\textsuperscript{1}, peach\textsuperscript{2}, pear\textsuperscript{1}, rhubarb\textsuperscript{1}, black currant\textsuperscript{1}, currant\textsuperscript{1}, sorrels\textsuperscript{1}, ground silt\textsuperscript{1}, tomato\textsuperscript{1}, potato\textsuperscript{1}, goldenrod\textsuperscript{1}, spirea\textsuperscript{1}, chickweed\textsuperscript{1}, dandelion\textsuperscript{1}, meadow rue\textsuperscript{1}, spearmint\textsuperscript{2}, red clover\textsuperscript{1}, eastern gramma grass\textsuperscript{1}, dwarf blueberry\textsuperscript{1}, Canadian blueberry\textsuperscript{1}, American cranberry\textsuperscript{1}, mullins\textsuperscript{1}, viburnums\textsuperscript{1}, violets\textsuperscript{1}, and corn\textsuperscript{1}.

**Economic importance:** In Minnesota this species has damaged flax and corn (Rings and Johnson, 1977).

**Locations:** Brookings, Hecla, Highmore, Oral, Sioux Falls, Spearfish, and Volga.

**Dates:** V-5, 16, 21, 25, 27, 29(2), 30.


IX-1, 2(3), 3, 4(4), 5, 6, 7(4), 8(14), 9(29), 10(12), 11(7), 12, 13, 16, 17(2), 19, 20(2), 21(2), 22(2), 23(2), 24, 26, 27, 30.

X-1, 4(2), 8.
Note: This and the preceding species in the literature appear under Amathes c-nigrum (Linnaeus), a European moth.

Amathes xanthographa (Fabricius)
Map 9.

Synonomy
Noctua xanthographa Fabricius, 1787.
Noctua trumani Smith, 1903c, p. 128.

Recognition: Ground color dull gray-brown. Orbicular with yellow outline, or all yellow; reniform with yellow center. Hindwings dirty white. Expands 30-34 mm.


Location: Cited by Smith (1903c) from Volga.

Amathes smithii (Snellen)
Fig. 108; Map 9.

Synonomy

Recognition: Ground color brown; transverse lines single, darker. Black spot on costa at inception of subterminal line. Reniform obscured by a darker brown patch. Hindwings mostly fuscus. Expands 35-40 mm.

Life history: Overwinters as a partially gown larva which matures the following spring. A month is spent in aestivation with moths flying in August and September (Forbes, 1954).
Larvae have been reported on grape (Forbes, 1954) and deadly nightshade (Tietz, 1972).

Locations: Brookings, Sioux Falls, Spearfish, and Volga.

IX-7(2).

Note: The species is closely related to the European A. baja (Schiffermuller).

**Amathes normaniana** (Grote)

Map 9.

Synonomy

*Agrotis normaniana* Grote, 1874e, p. 89.

*Agrotis obtusa* Speyer, 1875, p. 124.

Recognition: Ground color gray; lines black, usually double and pale filled. Cell black before and between ordinary spots. Black spot on costa at subterminal line. Hindwings fuscus, darker outwardly.

Expands 35-40 mm.

Life history: Overwinters as an immature larva. In Maine these matured by mid-May and pupated by mid-June (Phipps, 1930). In Minnesota moths occur in August and early September (Knutson, 1944).

Larvae feed on pin cherry, raspberry, spirea, dwarf blueberry, and Canadian blueberry.

Locations: Brookings and Volga.
Dates: VII-3, 26, 29.

VIII-1.

Note: Closely related to the European Amathes triangulum (Hufnegal).

Amathes badinodis (Grote) spotted-sided cutworm

Fig. 109; Map 9.

Synonomy

Agrotis badinodis Grote, 1874c, p. 13.

Recognition: Gray, median shade and subterminal area darker. Transverse lines black, double, even, and usually pale filled. A black spot before orbicular. Collar black on outer half. Male antennae pectinate.

Expands 30-39 mm.

Life history: The species is single brooded. In Kansas it overwinters as a partially grown larva which matures by mid-April and pupates. Pupae aestivate through the summer with adults emerging in October (Walkden, 1937). In South Dakota moths are most abundant in early September.

Larvae have been reported on summer aster, tobacco, alfalfa, sorrels, hedge mustard, chickweed, clovers, and wheat (Walkden, 1937).

Locations: Brookings and Sioux Falls.

Dates: IX-5, 7, 8(7), 9(12), 10(5), 11(3), 12, 14(4), 16, 17, 18(2), 19, 22(4), 23(3).

X-1(2).
Amathes collaris (Grote and Robinson)
Map 9.

Synonomy
Agrotis collaris Grote and Robinson, 1868, p. 348.

Recognition: Forewings pale gray; cell black before and between ordinary spots. Lines showing only white filling. Hindwings dirty white with broad fuscus borders. Collar black, contrasting with pale thorax. Expands 30-35 mm.

Life history: unknown. Minnesota records (Knutson, 1944) indicate a single generation. Moths fly in August and September.

Location: Hill City.
Date: VII-26.

Amathes tenuicula (Morrison)
Fig. 110; Map 9.

Synonomy
Agrotis tenuicula Morrison, 1874, p. 163.
Agrotis treatii Grote, 1875d, p. 186.

Recognition: Ground color dull black; cell darker before and between ordinary spots. Transverse lines usually with only pale filling showing. Hindwings of male white with light brown marginal and subterminal line; of female dirty yellow-brown. Expands 35-40 mm.

Life history: unknown. Moths fly mainly in July.

Location: Brookings.
Dates: VI-21.

VII-1(2), 3, 9, 10, 11, 20, 29.
Amathes bicarnea (Guenee) pink-spotted dart

Fig. 111; Map 9.

Synonomy

Noctua bicarnea Guenee, 1952a, p. 329.

Graphiphora plagiata Walker, 1856b, p. 400.

Recognition: Forewings dark blue-gray; cell black before and between ordinary spots. Anti- and postmedial lines marked with orange at the costa. Hindwings dirty white with fuscus borders. Expands 37-41 mm.

Life history: Probably overwinters as an immature larvae. In Maine (Phipps, 1930) mature larvae were found in late May. In South Dakota moths fly mostly in August.

Larvae feed on maples, gray birch, spirea, dandelion, and blueberry (Rockburne and Lafontaine, 1976).

Locations: Brookings, Hill City, and Sioux Falls.

Dates: VII-27, 28, 30, 31(2).

VIII-1, 4, 5, 7(2), 10, 13, 14, 16(3), 17(2), 19, 20, 21, 27(3).

Genus Rhynchagrotis Smith

Rhynchagrotis Smith, 1890b, p. 8; type Noctua cupida Grote.

Abagrotis Smith, 1890b, p. 9; type Agrotis erratica Smith.

New Synonomy*

The five South Dakota species are separated by the keys below.

* See discussion.
Key to South Dakota species of *Rhynchagrotis*

1. Second segment of palpi rough scaled, appearing shaggy; sides brown...................................................... 2
   Second segment of palpi smooth scaled giving an even triangular shape; sides black...................................................... 3

2. Subterminal line incurved as deeply between $M_1$ and $Cu_1$ as between $M_1$ and the costa; color gray to brown....................... *alternata*
   Subterminal line with a shallower curve or straight between $M_1$ and $Cu_1$; color red-brown.......................... *anchocelioides*

3. Black spot on costa at inception of subterminal line; color usually bright red-brown............................................ *cupida*
   No black spot; color gray to dull brown................................. 4

4. Dull brown, terminal area pale gray................................. *placida*
   Gray, terminal area slightly paler........................................ *barnesi*

Key to *Rhynchagrotis* based on male reproductive structures

1. Harpe projecting above valve........................................... 2
   Harpe not as above, very short or absent................................... 3

2. Terminal process of valve recurved and twisted dorsally with a backward pointing projection................................................. *anchocelioides*
   Terminal process of valve bent dorsally with squared apex........ *cupida*

3. Terminal process of valve bent dorsally.......................... *placida*
   Terminal process of valve otherwise........................................ 4

4. Terminal process of valve short and straight....................... *alternata*
   Terminal process of valve longer and twisted........................ *barnesi*
**Rhynchagrotis cupida** (Grote) brown climbing cutworm

Figs. 45, 88, and 112; Map 10.

Synonomy

*Noctua cupida* Grote, 1864, p. 525.

*Graphiphora velata* Walker, 1865a, p. 710.

*Agrotis brunneipennis* Grote, 1875d, p. 187.

**Recognition:** Ground color varies from bright orange to nearly black. Brightest and darkest specimens have the transverse lines suppressed. Ordinary spots of a darker shade of ground color or fuscus. Hindwings dull black, in fresh specimens violet sheen. Expands 31-40 mm.

**Life history:** Overwinters as a partially grown larvae. In Ohio these mature by the end of May. Pupation is in June with adults flying from mid-July till October.

Larvae have been reported on apple, peach, choke cherry, blueberry, and grape (Rings, 1972b).

**Locations:** Brookings, Sioux Falls, Volga, and in Stanley County.

**Dates:** VI-30.

VII-15, 16, 25, 26(2), 29(2).

VIII-3, 6(2), 21.

**Rhynchagrotis anchoceliodes** (Guenee)

Figs. 46 and 87; Map 10.

Synonomy

*Cerastis anchocelioides* Guenee, 1852a, p. 384.
Recognition: Red-brown, irronate with black scales; terminal space apler, subterminal space and occellate ordinary spots darker. Transverse lines pale filled. Hindwings fuscus, paler at base. Expands 35-38 mm.

Life history: unknown.

Location: Brookings,

Dates: VII-16(2).

VIII-22.

Rhynchagrotis alternata (Grote) mottled gray cutworm

Fig. 49 (From Forbes, 1954); Map 10.

Synonomy

Noctua alternata Grote, 1864, p. 526.

Recognition: Pale gray to dark brown; terminal space lighter, ordinary spots darker. Lighter specimens with transverse lines double and black, irronate with black scales. Subterminal line concave between M₁ and Cu₁.

Hindwings fuscus, lighter at base. Expands 35-40 mm.

Life history: Overwinters as a larvae which matures by the end of May. Pupation is in June with adults flying from July to October in Ohio. Eggs are not laid till September.

Larvae have been reported on cabbage, hickories, strawberry, walnuts, tomato, potato, apple, white spruce, peach, cherry, plum, and oaks (Rings, 1971).

Locations: Brookings and Volga.

Dates: VIII-5, 23.
Rhynchagrotis barnesi (Benjamin) Barnes' climbing cutworm
Figs. 48, 86, and 113; Map 10.

Synonomy

Lampra barnesi Benjamin, 1922, p. 97.
Lampra nevadensis Benjamin, 1922, p. 98.


Life history: Overwinters as a larvae which matures by June. Pupation is in June with adults flying from July into September in Ohio (Rings, 1972a).

Larvae have fed on apple, peach, cherry, cottonwood, service berry, and boxelder (Crumb, 1956).

Locations: Brookings and Sioux Falls.

Dates: VI-17, 25, 30.

VII-5, 6, 12, 19(2), 22(2), 23.


Rhynchagrotis placida (Grote)
Figs. 47 and 85; Map 10.

Synonomy

Agrotis placida Grote, 1876c, p. 305.
Agrotis minimalis Grote, 1879a, p. 45.
Recognition: Ground color dark brown, ordinary spots darker. Subterminal area pale gray. Transverse lines when present pale filled. Hindwings of male lightly infuscated, of female fuscos. In both sexes paler than the preceding four species. Expands 30–34 mm.

Life history: In Maine larvae matured by mid-May with moths emerging in mid-June (Phipps, 1930).

Larvae have been reported on hawthorn, cottonwood, apple, grape, greasewood, and dwarf blueberry (Tietz, 1972).

Locations: Brookings and Volga.

Dates: VIII-11, 16, 20, 29.

Genus Protolampra McDunnough

Protolampra McDunnough, 1928, p. 66; type Agrotis rufipectus Morrison.

One of the two North American species occurs in South Dakota.

Protolampra brunneicollis (Grote)

Figs. 44 and 82; Map 10.

Synonomy

Noctua brunneicollis Grote, 1864, p. 524.

Recognition: Thorax covered with broad spatulate scales; collar dark brown. Forewings gray; lines marked by a few black scales. Black spot at subterminal line on costa and a basal dash. Hindwings dingy white. Expands 33–38 mm.

Life history: In Tennessee the species overwinters as a larva which matures in April; adults flying in May (Crumb, 1956). South Dakota
records are in July and August.

Host plants include sweet fern, dandelion, and dwarf blueberry (Crumb, 1956).

Location: Brookings.

Dates: VII-29(2).

VIII-20.

Genus **Graphiphora** Ochsenheimer

**Graphiphora** Ochsenheimer, 1816, p. 68; type *Noctua augur* Fabricius.

**Pseudospaelotis** McDunnough, 1928, p. 49; type *Agrotis haruspica* Grote.

Crumb, 1956, p. 3; = **Graphiphora**.

A holarctic genus of which one species occurs in South Dakota.

**Graphiphora haruspica** (Grote)

Figs. 42 and 77; Map 10.

Synonomy

**Agrotis unimacula** Morrison, 1874, p. 166; preoccupied.

**Agrotis haruspica** Grote, 1875f, p. 312.

**Graphiphora augur** var. *grandis* Speyer, 1875, p. 122.

Recognition: Dull brown; ordinary spots indicated by incomplete black outlines. Lines when present, single, black, and scalloped. Hindwings fuscus. Expanse 44-50 mm.

Life history: In Washington, larvae overwintered and were mature by mid-May. Moths emerged from late May until July (Crumb, 1956). In Minnesota adults have been collected from mid-June to mid-August.
(Knutson, 1944).

Larvae have been reported on strawberry, hardback, osoberry, salmon berry, willow, and nettles (Crumb, 1956).
Locations: Brookings and Volga.
Dates: VII-3, 26, 29, 30.
VIII-1.

Genus Spaelotis Boisduval

Spaelotis Boisduval, 1840, p. 106; type Noctua ravidia Schiffermuller.
Amphitrota Warren, in Seitz 1911, p. 57; type Mamestra unicolor Walker (= Noctua clandestina Harris).
McDunnough, 1928, p. 39; = Spaelotis.
A holarctic genus with two North American species, one of which occurs in South Dakota.

Spaelotis clandestina (Harris) w-marked cutworm
Figs. 41, 84, 114; Map 10.
Synonomy
Noctua clandestina Harris, 1841, p. 448.
Mamestra unicolor Walker, 1856a, p. 233.
Mamestra nigriceps Walker, 1865a, p. 659.
Recognition: Ground color brown; transverse lines indicated by scattered black scales. Ordinary spots with incomplete black outlines. Orbicular an ellipse. Hindwings fuscus, darker in females. Thorax brown darkening to an almost black vertex. The similar S. havilae is smaller, grayer, with a light gray postmedial line. Expands 40-42 mm.
Life history: Larvae mature by early May. According to Forbes (1954) there are two generations with adults flying from May into September with a gap in July. In Minnesota (Knutson, 1944) the species is single brooded with a delayed emergence. South Dakota records indicate two broods (June and September) with the first emerging over a longer period.

Larvae have fed on the following plants (Tietz, 1972): silver maple, hollyhock, cabbage, broccoli, endive, buckwheat, pumpkin, strawberry, lettuce, apple, tobacco, kidney beans, peas, plantains, peach, black currant, currant, raspberry, clovers, eastern gramma grass, and corn.

Locations: Brookings, DeSmet, Hecla, Highmore, Hill City, Letcher, Milesville, Oral, Sioux Falls, Spearfish, and Volga.

Dates: VI-3, 5, 8(2), 10, 11, 12(3), 17(8), 18(11), 19, 20(3), 21(4), 22(2), 23(2), 24(5), 26, 27(4).

VII-2(2), 3(5), 4, 7, 10(2), 12, 14, 16(2), 23, 24(3), 25(2), 29(2), 31.

VIII-1, 2.


Genus Paradiarsia McDunnough

Paradiarsia McDunnough, 1928, p. 48; type Agrotis litoralis Packard.

There is a single North American species.
Paradiarsia litoralis (Packard)
Figs. 43, 78, and 115; Map 10.

Synonomy
Agrotis litoralis Packard, 1868, p. 36.
Pseudorthosia pectinata Grote, 1874b, p. 207.
Pachnobia ferruginoides Smith, 1890b, p. 56.

Recognition: Ground color coppery brown; lines single, even, of a darker shade. Reniform darker brown. Hindwings fuscus. Vestiture of hair; male antennae pectinate. Expands 31-35 mm.

Life history: unknown. Adults fly from early May until July.

Larvae have been recorded on dandelion, plantains, and clovers (Rockburne and Lafontaine, 1976).

Locations: Brookings, Custer State Park, Hecla, Hill City, and Strool.

Dates: V-5, 16.

VI-2, 4, 5(2), 6(2), 7, 10, 11(2), 12, 15, 16(14), 18, 19, 20(2), 23(2), 24(2), 27, 28.

VII-5(9), 7(2), 10, 11, 14, 22, 25.
DISCUSSION

Flight Periods

Figures 89-115 are histograms of relative frequency of moth activity. Relative frequency was used to facilitate interspecies comparisons.

Light trap catches can be affected by physical factors such as weather and biotic factors such as voltism, migration, diapause, and aestivation. Two histograms show double peaks; the second peak covering a single day. In Fig. 95 the second peak represents 62 specimens of *Euxoa auxiliaris* collected on July 7, 1957. In Figure 104 it consists of 54 *Agrotis rileyana* collected October 1, 1943. Both cases are attributable to weather. Other histograms which approach this pattern are Figs. 101 and 115. In each case the second peak is made up of records from more than a single day.

Effects of voltism are shown by Fig. 93; the univoltine *Euxoa tessellata*, Fig. 107 the bivoltine *Amathes adelae*, and Fig. 98 the partially trivoltine *Agrotis epsilon*. Besides the last two named species, *Spaelotis clandestina* and *Peridorma saucia* are the only others known to have more than one annual brood in South Dakota.

*Euxoa auxiliaris*, Fig. 95, has a yearly migration. Most moths leave the state by mid-July and return in September.

Aestivation as an adult is supposed to occur in *Rhynchagrotis barnesi* (Buckett, 1968), Fig. 113. In contradiction Rings (1972a) states the species has an extended flight period. Light trap catches show two flight intervals while at baited trees moths occur throughout the summer.
The influence of aestivation and diapause on flight period within the genus *Euxoa* is shown in Table 3. *E. detersa* and *E. auxiliaris* are atypical. The former either lacks diapause and overwinters as a partially grown larva or has a moderate diapause and overwinters as a fully formed larva within the egg. The latter has two flight periods due to migration. Leaving these aside, data shows that species with an intense diapause do not fly early in the season and species without diapause do not fly late in the season. This suggests that diapause is more important than aestivation in regulating flight period.

A seasonal sequence of cutworm moths is given in Table 2. Where there is a definite break species having more than one generation (and *E. auxiliaris*) are entered twice. In some cases closely similar species are seasonally different. *Agrotis voluabilis* flies in spring while *A. venerabilis* flies in the fall. *Amathes tenuicula* and *A. bicarnea* have their flight peaks a month apart. *Euxoa tessellata* flies in July while *E. albipennis* flies in September.
Species Comparisons

The economic distribution patterns of five common cutworm moths are shown in Figures 116-120. Table 4 is crop damage reports compiled over the same time period as the maps, 1965-1980. A damage report was considered to be damage by one species to one crop in one county in a given year. Because of vague host reports, grain in the table includes spring and winter wheat, oats, barley, and rye.

Both the army cutworm and the pale western cutworm are pests of cereal and forage crops and show similar distribution patterns, Figures 116 and 118. Western bean and variegated cutworms, Figures 117 and 120, feed on different crops, corn and alfalfa, but show the same type of distribution in causing damage in low areas, the South Platte River Valley or Missouri River Valley, respectively. The black cutworm damages corn mainly in Iowa, Figure 14.

The last three species of Table 4 were not mapped due to few records and the difficulty in determining larvae. Crumb (1956) was unable to derive a key for Euxoa larvae. Dingy cutworm is used in economic literature to mean either Agrotis jaculifera, A. subgothica, or A. herilis. Errors are at times made in determining well-known species. Some Minnesota damage reports of the army cutworm (Anonymous, 1975) occur in July. Pruess (1967) states that migration of army cutworm moths begins earliest in the East. Adults have left eastern South Dakota by mid-July.
A comparison of cutworm moths found in South Dakota has surrounding states (except Wyoming which has no list) is given in Appendix 1. Montana has twice the number of recorded species as the next nearest state North Dakota. A decrease in species is noted from west to east, Montana to Minnesota, and from north to south, North Dakota to Nebraska or Minnesota to Iowa. The decreases in both cases are due to the loss of *Euxoa* species. This genus is primarily western and northern having only seven species endemic to eastern North American (Hardwick and Lefkovitch, 1971).

A way to compare faunas of different areas (Johnson, 1972) is by the use of the following formula:

\[
\frac{C(100)}{n_1 + n_2 - C} = \% R
\]

Where \( C \) is the number of species common to each sample, \( n_1 \) and \( n_2 \) are samples, and \( \% R \) is percent faunal resemblance. Table 5 compares each state with South Dakota. North Dakota and Nebraska have the most similar faunas. Tables 6 and 7 break the faunas into their *Euxoa* and non-*Euxoa* components for comparison. *Euxoa* species show affinities in the plains states followed by Montana. South Dakota's non-*Euxoa* species are closest to those of Nebraska and Iowa. Between the six states faunal resemblance is only 3.2%.
Taxonomy

For consistency a few generic names have been changed. Agrotis Ochsenheimer is expanded to include Onchyagrotis Hampson and Feltia Walker. Amathes Hubner is retained over Xestia Hubner. Rhynchagrotis Smith is expanded to include Abagrotis Smith. A classification should have two goals: to express natural relationships between taxa; to aid, at the least not hinder, species identification.

Onchyagrotis was described for Agrotis rileyana Morrison by Hampson on the basis of enlarged pro-tibial claws. Within the Noctuidae greater differences in pro-tibial spinning exist within genera. In the Hiliothidinae (Hardwich 1970b) Schinia thoreai Grote and Robinson has the pro-tibial claws enlarged so as to form a plate (fossorial row) while in S. cumatilis Grote the claws are narrow. In the Noctuinae Anaplectoides pressus (Grote) has pro-tibial spines while A. prasina (Fabricius) does not (McDunnough, 1928). In the genus, Agrotis epsilon and A. orthogonia are as similar as O. rileyana is to A. orthogonia in pro-tibial claws. In the male the valves of A. orthogonia and O. rileyana are extremely similar.

Feltia Walker was defined with ducens Walker (= jaculifera Guenee) as type. McDunnough (1928) listed the shaggy palpi and fasciculate male antennae as external characters; the longer harpe, expanded cucullus, and a cornutus on the vesica as genitalic characters. In terms of external structure the outline given by Forbes (1954) shows that Feltia* is not a natural arrangement:
1. Clasper with a single process.
   A. Wings ample.
      1. Front with traces of a raised ring.
         a. Male antennae broadly pectinate.
            gladiaria.
         b. Male antennae biserrate to bifasiculate.
            herilis*, subgothica*, jaculifera*.
      2. Front nearly flat, rough.
         a. Male antennae subpectinate, heavily bristled.
            geniculata*.
         b. Male antennae narrowly fasiculate and serrate.
            mollis.
   B. Wings narrow with more oblique outer margin.
      1. Front with a raised ring.
         a. Male antennae narrowly pectinate, simple, apex.
            rileyana, orthogonia, patula, venerabilis.
         b. Male antennae serrate.
            subterranea*, malefida.
         c. Male antennae simple, fasiculate.
            vetusta.
      2. Front rough and rounded out, no ring.
         a. Male antennae broadly pectinate to apex.
            manifesta.
         b. Male antennae simple, fasiculate.
            volubilis.
      3. Front rough, only a little bulging.
         a. Male antennae narrowly pectinate, simple apex.
            epsilon.

In internal structure, *Euxoa* species may have cornuti
(Crassiveesica); long or short harpe, mimallonis or auxiliaris; cucullus
may be expanded, olivia, or not, dargo. In both harpe length and
expansion of the cucullus, *F. jaculifera* is the extreme case with *F.
subgothica* and *F. herilis* having these characters less pronounced.

*Amathes* Hubner, 1821, is retained for the species *dolosa* through
bicarnea. *Xestia* Hubner has not been defined in terms of the American
fauna except by Franclemont(1980) when *adela* and *dolosa* were assigned
to it. The type of *Xestia* is *Noctua c-nigrum* Linnaeus, a European
species nearly identical to *adela*. The type of *Amathes* is *Noctua baja*
Schiffermuller, similar to smithii Snellen. All of the above named species are closer to each other structurally than to badinodis or bicaernea. If the change is simply priority then Xestia Hubner, 1816, should be used.

Abagrotis Smith was separated from Rhynchagrotis Smith by Smith (1890b) by having fasiculate male antennae. McDunnough (1928) separated the two by the harpe being short or absent (Abagrotis) or long, projecting above the valve (Rhynchagrotis): female abdomen with heavy lateral tufts (Rhynchagrotis) or with slight tufts (Abagrotis). In terms of South Dakota species abdominal tufting is heaviest in R. anchocelioides and R. cupida, somewhat lighter in A. alternata, much lighter in A. barnesi, and nearly absent in A. placida. No species has fasiculate antennae in the male. Palpi of cupida, barnesi, and placida have a smooth triangular tuft of scales and are black laterally. Palpi of anchocelioides and alternata are rough scaled and shaggy; sides are of the ground color. For harpe length as a generic distinction see under Agrotis. The use of two generic terms for closely related species obscures their association.
Summary

Eighty species of cutworm moths are known to occur in South Dakota. Of these, 34 are the first published records for the state. One as yet unnamed species was collected. Light trap data show that four species: *Agrotis ipsilon*, *Peridroma saucia*, *Amathes adela*, and *Spaelotis clandestina* have more than a single generation in the state. Within South Dakota only five species have been reported as causing damage: *Euxoa auxiliaris*, *E. messoria*, *Agrotis ipsilon*, *A. orthogonia*, and *Peridroma saucia*. The cutworm moth fauna of South Dakota is closest to that of the other plains states: *Euxoa* species showing more affinities to the northwest, non-*Euxoa* species showing more affinities to the southeast. Generic name changes were made for the sake of consistancy: *Onychagrotis* and *Feltia* species added to *Agrotis*, *Amathes* retained over *Xestia*, and *Abagrotis* included under *Rynchagrotis*. 

Anonymus. 1929. Insect pest survey Bull. 9.


Fitch, Asa. 1856. Second report on the noxious and beneficial and other insects of New York State.

____ 1863. Nineth report on the noxious and beneficial and other insects of New York State.


1879b. ———— 38-9.

1880a. ———— 2: 91.


1883a. ———— 15: 3-13.


1852b. Vol. 2.

1852c. Vol. 5.


Harris, T. W. 1841. A Treatise on some of the insect pests of New England which are injurious to vegetation. Cambridge.


1809.

1810.

Part 2.

Part 3.


1903e. New Noctuidae for 1903-No. 5. J. N.Y. Entomol. Soc. 11: 188-93.


1899. Suppl. 2.


1897. Suppl. 8: 27-29.


1856b. Part 10.

1857. Part 11.

1865a. Parts 32 and 33.

1865b. Suppl. 3.

Table 1. Cutworm moths of South Dakota.

<table>
<thead>
<tr>
<th>Light trap collections</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Euxoa messoria</strong></td>
</tr>
<tr>
<td>&quot; siccata&quot;</td>
</tr>
<tr>
<td>&quot; quadridentata&quot;</td>
</tr>
<tr>
<td>&quot; catenula&quot;</td>
</tr>
<tr>
<td>&quot; immixa&quot;</td>
</tr>
<tr>
<td>&quot; medialis&quot;</td>
</tr>
<tr>
<td>&quot; diffinis&quot;</td>
</tr>
<tr>
<td>&quot; datera&quot;</td>
</tr>
<tr>
<td>&quot; albipennis&quot;</td>
</tr>
<tr>
<td>&quot; tessellata&quot;</td>
</tr>
<tr>
<td>&quot; obeliscoides&quot;</td>
</tr>
<tr>
<td>&quot; n. sp.&quot;</td>
</tr>
<tr>
<td>&quot; auxiliaria&quot;</td>
</tr>
<tr>
<td><strong>Graphiphora haruspica</strong></td>
</tr>
<tr>
<td><strong>Spaelotis clandestina</strong></td>
</tr>
<tr>
<td>&quot; placida&quot;</td>
</tr>
<tr>
<td>&quot; barnesi&quot;</td>
</tr>
<tr>
<td><strong>Paradiarsia litoralis</strong></td>
</tr>
</tbody>
</table>

South Dakota State University Collection

| **Euxoa ridingsiana** |
| " divergens" |
| " niveolina" |
| " dargo" |
| " olivia" |
| " intrita" |
| " mimallonis" |
| " velleripennis" |
| " declarata" |
| " llilcoet" |
| " redimicula" |
| " servita" |

| **Euxoa scandens** |
| " tristicula" |
| **Agrotis voluabilis** |
| **Eucoptocnemis tripala** |
| **Ochroneura plecta** |
| **Eurois occulta** |
| **Amaethes normaniana** |
| " collaris" |
| **Anaplectoides prasina** |
| **Rhynchagrotis anchocelioides** |
| " alternata" |
| **Protolampra brunnecollis** |

Literature citations

| **Euxoa perpolita** |
| " acornis" |
| " stigmatalis" |
| " oberfoelli" |
| " pleuritica" |

| **Agrotis gladiaria** |
| " subterranea" |
| **Anicla infecta** |
| **Amaethes xanthographa** |

continued
Canadian National Collection

<table>
<thead>
<tr>
<th>Euxoa</th>
<th>plagiger</th>
<th>r</th>
<th>Euxoa</th>
<th>oblongistigma</th>
<th>r</th>
</tr>
</thead>
<tbody>
<tr>
<td>citricolor</td>
<td>r</td>
<td></td>
<td>tronella</td>
<td>r</td>
<td></td>
</tr>
<tr>
<td>infracta</td>
<td>r</td>
<td></td>
<td>setonia</td>
<td>r</td>
<td></td>
</tr>
<tr>
<td>comosa</td>
<td>r</td>
<td></td>
<td>teleboa</td>
<td>r</td>
<td></td>
</tr>
<tr>
<td>idahoensis</td>
<td>r</td>
<td></td>
<td>basalis</td>
<td>r</td>
<td></td>
</tr>
</tbody>
</table>

r First published record for South Dakota.
b Collected at bait.
Table 2. Seasonal sequence of cutworm moths.

<table>
<thead>
<tr>
<th>species</th>
<th>median date</th>
<th>number of specimens</th>
</tr>
</thead>
<tbody>
<tr>
<td><em>Agrotis volubilis</em></td>
<td>VI-2</td>
<td>49</td>
</tr>
<tr>
<td><em>Euxoa auxiliaris</em></td>
<td>VI-15</td>
<td>241</td>
</tr>
<tr>
<td><em>Paradiarsia litoralis</em></td>
<td>VI-16</td>
<td>54</td>
</tr>
<tr>
<td><em>Amathes adela</em></td>
<td>VI-16</td>
<td>66</td>
</tr>
<tr>
<td><em>Spaelotis clandestina</em></td>
<td>VI-22</td>
<td>76</td>
</tr>
<tr>
<td><em>Amathes tenuicula</em></td>
<td>VII-3</td>
<td>9</td>
</tr>
<tr>
<td><em>Euxoa scandens</em></td>
<td>VII-7</td>
<td>22</td>
</tr>
<tr>
<td><em>Euagrotis tepperi</em></td>
<td>VII-10</td>
<td>10</td>
</tr>
<tr>
<td><em>Euxoa immixta</em></td>
<td>VII-11</td>
<td>18</td>
</tr>
<tr>
<td><em>Rhynchagrotis barnesi</em></td>
<td>VII-12</td>
<td>11</td>
</tr>
<tr>
<td><em>Euxoa tessellata</em></td>
<td>VII-12</td>
<td>363</td>
</tr>
<tr>
<td><em>Euxoa divergens</em></td>
<td>VII-15</td>
<td>20</td>
</tr>
<tr>
<td><em>Euxoa tristicula</em></td>
<td>VII-18</td>
<td>31</td>
</tr>
<tr>
<td><em>Loxagrotis albicosta</em></td>
<td>VII-21</td>
<td>7</td>
</tr>
<tr>
<td><em>Peridroma saucia</em></td>
<td>VII-24</td>
<td>303</td>
</tr>
<tr>
<td><em>Agrotis ipsilon</em></td>
<td>VII-24</td>
<td>340</td>
</tr>
<tr>
<td><em>Rhynchagrotis cupida</em></td>
<td>VII-26</td>
<td>12</td>
</tr>
<tr>
<td><em>Graphiphora haruspica</em></td>
<td>VII-29</td>
<td>5</td>
</tr>
<tr>
<td><em>Agrotis herilis</em></td>
<td>VIII-1</td>
<td>30</td>
</tr>
<tr>
<td><em>Euxoa obeliscoides</em></td>
<td>VIII-6</td>
<td>36</td>
</tr>
<tr>
<td><em>Agrotis subgothica</em></td>
<td>VIII-6</td>
<td>143</td>
</tr>
<tr>
<td><em>Amathes bicarnea</em></td>
<td>VIII-13</td>
<td>24</td>
</tr>
<tr>
<td><em>Euxoa intrita</em></td>
<td>VIII-19</td>
<td>5</td>
</tr>
<tr>
<td><em>Amathes smithii</em></td>
<td>VIII-20</td>
<td>22</td>
</tr>
<tr>
<td><em>Euxoa velleripennis</em></td>
<td>VIII-25</td>
<td>5</td>
</tr>
<tr>
<td><em>Euxoa messoria</em></td>
<td>IX-1</td>
<td>45</td>
</tr>
<tr>
<td><em>Agrotis jaculifera</em></td>
<td>IX-5</td>
<td>1805</td>
</tr>
<tr>
<td><em>Euxoa albipennis</em></td>
<td>IX-6</td>
<td>6</td>
</tr>
<tr>
<td><em>Amathes adela</em></td>
<td>IX-8</td>
<td>147</td>
</tr>
<tr>
<td><em>Euxoa auxiliaris</em></td>
<td>IX-9</td>
<td>21</td>
</tr>
<tr>
<td><em>Amathes badinodis</em></td>
<td>IX-10</td>
<td>45</td>
</tr>
<tr>
<td><em>Rhynchagrotis barnesi</em></td>
<td>IX-11</td>
<td>17</td>
</tr>
<tr>
<td><em>Spaelotis clandestina</em></td>
<td>IX-11</td>
<td>41</td>
</tr>
<tr>
<td><em>Euxoa medialis</em></td>
<td>IX-15</td>
<td>9</td>
</tr>
<tr>
<td><em>Agrotis venerabilis</em></td>
<td>IX-15</td>
<td>437</td>
</tr>
<tr>
<td><em>Agrotis rileyana</em></td>
<td>IX-20</td>
<td>132</td>
</tr>
</tbody>
</table>
Table 3. Relationship of diapause and aestivation to flight period.

<table>
<thead>
<tr>
<th>Euxoa species</th>
<th>diapause</th>
<th>aestivation</th>
<th>flight season</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>n. m. l.</td>
<td>n. m. l.</td>
<td>e. m. l.</td>
</tr>
<tr>
<td>ridingiana</td>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>messoria</td>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>olivia</td>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>plagigera</td>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>niveillinea</td>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>catenula</td>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>detersa</td>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>intrita</td>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>acornis</td>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>mimallonis</td>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>tessellata</td>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>declarata</td>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>albipennis</td>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>obeliscoides</td>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>oberfoelli</td>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>servita</td>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>basalis</td>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>auxiliaris</td>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>scandens</td>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>tristicula</td>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>pleuritica</td>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
</tbody>
</table>

Diapause: none- overwintering as a partially grown larva, moderate- overwintering as a fully formed larva within the egg or a first instar larva, intense- overwintering as an egg.
Aestivation: none, moderate, or long.
Flight season: early- mostly in July or earlier, middle- mostly in August, late- in September or later.

Diapause and aestivation data from Hinks and Byers (1976). Flight data from S.D.S.U. Insect Collection, Byers et al. (1975), Cook (1930a), Hardwick (1970a, 1973a, b), Knutson (1944), Lafontaine (1974a, b, 1975, 1976a, b), and Walkden and Whelan (1942).
Table 4. Crop damage reports for South Dakota and surrounding states from 1965 through 1980.

<table>
<thead>
<tr>
<th>species</th>
<th>a.</th>
<th>b.</th>
<th>c.</th>
<th>f.</th>
<th>g.</th>
<th>sg.</th>
<th>sy.</th>
<th>sf.</th>
<th>o.</th>
<th>total</th>
</tr>
</thead>
<tbody>
<tr>
<td>black cutworm</td>
<td>185</td>
<td>1</td>
<td>3</td>
<td>8</td>
<td>2</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>199</td>
</tr>
<tr>
<td>army cutworm</td>
<td>59</td>
<td>11</td>
<td>8</td>
<td>3</td>
<td>104</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>194</td>
</tr>
<tr>
<td>pale western cutworm</td>
<td>11</td>
<td>2</td>
<td>6</td>
<td>-</td>
<td>45</td>
<td>-</td>
<td></td>
<td></td>
<td></td>
<td>64</td>
</tr>
<tr>
<td>variegated cutworm</td>
<td>39</td>
<td>-</td>
<td>10</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td></td>
<td>3</td>
<td>52</td>
</tr>
<tr>
<td>western bean cutworm</td>
<td>-</td>
<td>-</td>
<td>28</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td></td>
<td>28</td>
</tr>
<tr>
<td>dingy cutworm</td>
<td>-</td>
<td>3</td>
<td>22</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td></td>
<td>25</td>
</tr>
<tr>
<td>dark-sided cutworm</td>
<td>-</td>
<td>-</td>
<td>21</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td></td>
<td>21</td>
</tr>
<tr>
<td>sandhill cutworm</td>
<td>-</td>
<td>-</td>
<td>3</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td></td>
<td>3</td>
</tr>
<tr>
<td>total</td>
<td>109</td>
<td>16</td>
<td>283</td>
<td>4</td>
<td>152</td>
<td>8</td>
<td>2</td>
<td>9</td>
<td>3</td>
<td>586</td>
</tr>
</tbody>
</table>

Crop: a. alfalfa, b. sugar beets, c. corn, f. flax, g. grains, sg. sorghum, sy. soybeans, sf. sunflower, o. others- onions, potatoes, and tomatoes.
Table 5. Numerical comparison of Noctuinae species of six mid-western states.

<table>
<thead>
<tr>
<th>State</th>
<th>n</th>
<th>C</th>
<th>R</th>
</tr>
</thead>
<tbody>
<tr>
<td>Montana</td>
<td>164</td>
<td>51</td>
<td>26.42</td>
</tr>
<tr>
<td>North Dakota</td>
<td>81</td>
<td>58</td>
<td>56.31</td>
</tr>
<tr>
<td>South Dakota</td>
<td>80</td>
<td>80</td>
<td>100.00</td>
</tr>
<tr>
<td>Nebraska</td>
<td>65</td>
<td>47</td>
<td>47.95</td>
</tr>
<tr>
<td>Minnesota</td>
<td>49</td>
<td>30</td>
<td>30.30</td>
</tr>
<tr>
<td>Iowa</td>
<td>38</td>
<td>30</td>
<td>34.09</td>
</tr>
</tbody>
</table>

n. number of species in a given state.
C. number of species common to both the given state and South Dakota.
R. % faunal resemblance between the given state and South Dakota.
Table 6. Numerical comparison of *Euxoa* species of six mid-western states.

<table>
<thead>
<tr>
<th>State</th>
<th>n</th>
<th>C</th>
<th>R</th>
</tr>
</thead>
<tbody>
<tr>
<td>Montana</td>
<td>93</td>
<td>38</td>
<td>39.17</td>
</tr>
<tr>
<td>North Dakota</td>
<td>52</td>
<td>32</td>
<td>51.61</td>
</tr>
<tr>
<td>South Dakota</td>
<td>42</td>
<td>42</td>
<td>100.00</td>
</tr>
<tr>
<td>Nebraska</td>
<td>35</td>
<td>25</td>
<td>48.07</td>
</tr>
<tr>
<td>Minnesota</td>
<td>17</td>
<td>16</td>
<td>37.20</td>
</tr>
<tr>
<td>Iowa</td>
<td>9</td>
<td>8</td>
<td>18.60</td>
</tr>
</tbody>
</table>

n. number of species in a given state.
C. number of species common to both the given state and South Dakota.
R. % faunal resemblance between the given state and South Dakota.
Table 7. Numerical comparison of non-*Euxoa* Noctuinae of six mid-western states.

<table>
<thead>
<tr>
<th>State</th>
<th>n</th>
<th>C</th>
<th>R</th>
</tr>
</thead>
<tbody>
<tr>
<td>Montana</td>
<td>71</td>
<td>13</td>
<td>13.54</td>
</tr>
<tr>
<td>North Dakota</td>
<td>29</td>
<td>26</td>
<td>63.43</td>
</tr>
<tr>
<td>South Dakota</td>
<td>38</td>
<td>38</td>
<td>100.00</td>
</tr>
<tr>
<td>Nebraska</td>
<td>30</td>
<td>22</td>
<td>43.43</td>
</tr>
<tr>
<td>Minnesota</td>
<td>32</td>
<td>14</td>
<td>25.00</td>
</tr>
<tr>
<td>Iowa</td>
<td>29</td>
<td>22</td>
<td>46.88</td>
</tr>
</tbody>
</table>

n. number of species in a given state  
C. number of species common to both the given state and South Dakota.  
R. % faunal resemblance between the given state and South Dakota.
Figure 1. Pattern and venation of a cutworm moth. A. anal vein; Ad. apical dash; Am. antemedial line; Bd. basal dash; Bl. basal line; C. costal vein; Cl. claviform spot; Co. collar; Cu. cubital vein; Dc. discal lumule; F. fringe; M. medial vein; Ms. median shade; Or. orbicular spot; Pm. postmedial line; R. radial vein; Re. reniform spot (Re and Or are the ordinary spots); Sc. subcostal vein; Sr. subreniform spot; St. subterminal line; T. tegula; Td. tornal dash; Tl. terminal line.
Figures 41-46. Right inner face of valves of cutworm moths. 41. Spaelotis clandestina; 42. Graphiphora haruspica; 43. Paradiarsia litoralis; 44. Protolampra brunneicollis; 45. Rhynchagrotis cupida; 46. R. anchocelioides.
Fig. 89. Flight period of *Euxoa divergens*.
Fig. 90. Flight period of *Euxoa messoria*.
Fig. 91. Flight period of *Euxoa immixta*.
% of total catch

Fig. 92. Flight period of *Euxoa medialis*. 
Fig. 93. Flight period of *Euxoa tessellata*. 
Fig. 94. Flight period of *Zuxoa obeliscoïdes*.
Fig. 95. Flight period of *Euxoa auxiliaris*.
Fig. 96. Flight period of *Euxoa scandens*.
Fig. 97. Flight period of *Euxoa tristicula*.
Fig. 98. Flight period of *Agrotis ipsilon*.
% of total catch

Fig. 99. Flight period of *Agrotis voluabilis*. 
Fig. 100. Flight period of *Agrotis venerabilis*.
Fig. 101. Flight period of *Agrotis herilis*. 

% of total catch

<table>
<thead>
<tr>
<th></th>
<th></th>
<th>V</th>
<th>VI</th>
<th>VII</th>
<th>VIII</th>
<th>IX</th>
<th>X</th>
</tr>
</thead>
<tbody>
<tr>
<td>months</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

160
Fig. 102. Flight period of *Agrotis subgothica*.
Fig. 103. Flight period of *Agrotis jaculifera*.
Fig. 104. Flight period of *Agrotis rilevana*. 

% of total catch

months

Fig. 104. Flight period of *Agrotis rilevana*. 

IV V VI VII VIII IX X
% of total catch

Fig. 105. Flight period of Euagrotis tepperi.
Fig. 106. Flight period of *Peridroma saucia*. 
Fig. 107. Flight period of *Amathes adela*.
Fig. 108. Flight period of *Amathes smithii*.
Fig. 109. Flight period of *Amathes badinodis*. 

% of total catch

months

IV V VI VII VIII IX X
Fig. 110. Flight period of *Amathes tenuicula*. 
Fig. 111. Flight period of *Amathes bicarnea*.
Fig. 112. Flight period of *Rhynchagrotis cupida*.
Fig. 113. Flight period of *Rhynchagrotis barnesi*.
Fig. 114. Flight period of *Spaelotis clandestina*. 

% of total catch

IV V VI VII VIII IX X

months
Fig. 115. Flight period of *Paradiarsia litoralis*. 
Figure 116. Economic damage reports for the army cutworm, *Euxoa auxiliaris*, from 1965 to 1980 by county.
Figure 117. Economic damage reports for the western bean cutworm, *Loxagrotis albicosta*, from 1965 to 1980 by county.
Figure 118. Economic damage reports for the pale western cutworm, *Agrotis orthogonia*, from 1965 to 1980.
Figure 119. Economic damage reports for the black cutworm, *Agrotis ipsilon*, from 1965 to 1980 by county.
Figure 120. Economic damage reports for the variegated cutworm, *Peridroma saucia*, from 1965 to 1980 by county.
Appendix 1

Comparison of Noctuinae species for six mid-western states.

<table>
<thead>
<tr>
<th>species</th>
<th>State</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Euxoa taura Sm.</strong></td>
<td></td>
</tr>
<tr>
<td>* cooki McD.</td>
<td>x</td>
</tr>
<tr>
<td>&quot; perolivalis (Sm.)</td>
<td>x</td>
</tr>
<tr>
<td>&quot; ridingsiana (Grt.)</td>
<td>x x x</td>
</tr>
<tr>
<td>&quot; aberrans McD.</td>
<td>x</td>
</tr>
<tr>
<td>&quot; manitobana (McD.)</td>
<td>x</td>
</tr>
<tr>
<td>&quot; flavicollis (Sm.)</td>
<td>x x</td>
</tr>
<tr>
<td>&quot; perpolita (Morr.)</td>
<td>x x x x x x x</td>
</tr>
<tr>
<td>&quot; messoria (Har.)</td>
<td>x x x x x x x</td>
</tr>
<tr>
<td>&quot; divergens (Walk.)</td>
<td>x x x x x x x</td>
</tr>
<tr>
<td>&quot; siccata (Sm.)</td>
<td>x x</td>
</tr>
<tr>
<td>&quot; olivia (Morr.)</td>
<td>x x x x</td>
</tr>
<tr>
<td>&quot; septemtrionalis (Walk.)</td>
<td>x</td>
</tr>
<tr>
<td>&quot; brevipennis (Sm.)</td>
<td>x</td>
</tr>
<tr>
<td>&quot; cicatricosa (Grt. &amp; Rob.)</td>
<td>x x x</td>
</tr>
<tr>
<td>&quot; cineriopalida (Sm.)</td>
<td>x</td>
</tr>
<tr>
<td>&quot; detera (Walk.)</td>
<td>x x x x x x x</td>
</tr>
<tr>
<td>&quot; dargo (Stkr.)</td>
<td>x x x x x x</td>
</tr>
<tr>
<td>&quot; niveilinea (Grt.)</td>
<td>x x x x x x</td>
</tr>
<tr>
<td>&quot; quadridentata (Grt. &amp; Rob.)</td>
<td>x x x x x x</td>
</tr>
<tr>
<td>&quot; laetificans (Sm.)</td>
<td>x</td>
</tr>
<tr>
<td>&quot; andra Sm.</td>
<td>x</td>
</tr>
<tr>
<td>&quot; atristrigata (Sm.)</td>
<td>x x x</td>
</tr>
<tr>
<td>&quot; nevada (Sm.)</td>
<td>x</td>
</tr>
<tr>
<td>&quot; plagigera (Morr.)</td>
<td>x x x</td>
</tr>
<tr>
<td>&quot; olivalis (Grt.)</td>
<td>x</td>
</tr>
<tr>
<td>&quot; oblongistigma (Sm.)</td>
<td>x x x</td>
</tr>
<tr>
<td>&quot; ducalis (Sm.)</td>
<td>x</td>
</tr>
<tr>
<td>&quot; citricolor (Grt.)</td>
<td>x x x</td>
</tr>
<tr>
<td>&quot; tronella (Sm.)</td>
<td>x x x</td>
</tr>
<tr>
<td>&quot; catenula (Grt.)</td>
<td>x x x</td>
</tr>
<tr>
<td>&quot; pallipennis (Sm.)</td>
<td>x x x</td>
</tr>
<tr>
<td>&quot; sathiens (Sm.)</td>
<td>x</td>
</tr>
<tr>
<td>&quot; misturata (Sm.)</td>
<td>x</td>
</tr>
<tr>
<td>&quot; mitis (Sm.)</td>
<td>x</td>
</tr>
<tr>
<td>&quot; morens (Grt.)</td>
<td>x</td>
</tr>
<tr>
<td>&quot; cona (Stkr.)</td>
<td>x x x</td>
</tr>
<tr>
<td>&quot; intrita (Morr.)</td>
<td>x x x</td>
</tr>
<tr>
<td>&quot; dodi McD.</td>
<td>x</td>
</tr>
<tr>
<td>&quot; infracta (Morr.)</td>
<td>x x x</td>
</tr>
<tr>
<td>&quot; sponsa (Sm.)</td>
<td>x</td>
</tr>
<tr>
<td>species</td>
<td>State</td>
</tr>
<tr>
<td>-------------------------------</td>
<td>-----------</td>
</tr>
<tr>
<td>Euxoa immixa (Grt.)</td>
<td>x xx x</td>
</tr>
<tr>
<td>&quot; perfusca (Grt.)</td>
<td>x</td>
</tr>
<tr>
<td>&quot; excogita (Sm.)</td>
<td>x</td>
</tr>
<tr>
<td>&quot; punctigera (walk.)</td>
<td>x</td>
</tr>
<tr>
<td>&quot; stigmatalis (Sm.)</td>
<td>x</td>
</tr>
<tr>
<td>&quot; spumata McD.</td>
<td>x x</td>
</tr>
<tr>
<td>&quot; velleripennis (Grt.)</td>
<td>x x x x x</td>
</tr>
<tr>
<td>&quot; acornis (Sm.)</td>
<td>x x x</td>
</tr>
<tr>
<td>&quot; choris (Harv.)</td>
<td>x</td>
</tr>
<tr>
<td>&quot; nostra (Sm.)</td>
<td>x</td>
</tr>
<tr>
<td>&quot; pluralis (Grt.)</td>
<td>x</td>
</tr>
<tr>
<td>&quot; medialis (Sm.)</td>
<td>x x</td>
</tr>
<tr>
<td>&quot; mimallonis (Grt.)</td>
<td>x x x x x</td>
</tr>
<tr>
<td>&quot; intermontana Laf.</td>
<td>x</td>
</tr>
<tr>
<td>&quot; difformis (Sm.)</td>
<td>x x</td>
</tr>
<tr>
<td>&quot; terrena (Sm.)</td>
<td>x</td>
</tr>
<tr>
<td>&quot; antica Laf.</td>
<td></td>
</tr>
<tr>
<td>&quot; scholastica McD</td>
<td></td>
</tr>
<tr>
<td>&quot; atropulveria (Sm.)</td>
<td>x</td>
</tr>
<tr>
<td>&quot; setonia McD</td>
<td></td>
</tr>
<tr>
<td>&quot; comosa (Worr.)</td>
<td>x x x x x</td>
</tr>
<tr>
<td>&quot; vulpina (Sm.)</td>
<td>x</td>
</tr>
<tr>
<td>&quot; pedalis (Sm.)</td>
<td>x</td>
</tr>
<tr>
<td>&quot; teleboa (Sm.)</td>
<td>x x x</td>
</tr>
<tr>
<td>&quot; rectinicincta (Sm.)</td>
<td>x</td>
</tr>
<tr>
<td>&quot; murdocki (Sm.)</td>
<td>x</td>
</tr>
<tr>
<td>&quot; knoxvillea McD</td>
<td>x</td>
</tr>
<tr>
<td>&quot; tessellata (Harv.)</td>
<td>x x x x x</td>
</tr>
<tr>
<td>&quot; remota (Sm.)</td>
<td></td>
</tr>
<tr>
<td>&quot; lillooet McD.</td>
<td>x x</td>
</tr>
<tr>
<td>&quot; declarata (Walk.)</td>
<td>x x x</td>
</tr>
<tr>
<td>&quot; campestris (Grt.)</td>
<td>x x</td>
</tr>
<tr>
<td>&quot; albipennis (Grt.)</td>
<td>x x x x x</td>
</tr>
<tr>
<td>&quot; rockburnei Hard.</td>
<td>x</td>
</tr>
<tr>
<td>&quot; munis (Grt.)</td>
<td>x</td>
</tr>
<tr>
<td>&quot; rena (Sm.)</td>
<td>x</td>
</tr>
<tr>
<td>&quot; obeliscoidea (Gn.)</td>
<td>x x x x x</td>
</tr>
<tr>
<td>&quot; oberfoelll Hard.</td>
<td>x x x x x</td>
</tr>
<tr>
<td>&quot; redimicula (Worr.)</td>
<td>x x x x x</td>
</tr>
<tr>
<td>&quot; servita (Sm.)</td>
<td>x x x</td>
</tr>
<tr>
<td>&quot; auripennis Laf.</td>
<td>x x</td>
</tr>
<tr>
<td>&quot; idahoensis (Grt.)</td>
<td>x x</td>
</tr>
<tr>
<td>&quot; n sp.</td>
<td>x x x</td>
</tr>
<tr>
<td>&quot; clause McD.</td>
<td>x</td>
</tr>
<tr>
<td>&quot; basalis (Grt.)</td>
<td>x x x</td>
</tr>
<tr>
<td>species</td>
<td>State</td>
</tr>
<tr>
<td>--------------------------</td>
<td>-------</td>
</tr>
<tr>
<td>Euxoa ochrogaster (Gn.)</td>
<td></td>
</tr>
<tr>
<td>&quot; drewseni (Straud.)</td>
<td>x</td>
</tr>
<tr>
<td>&quot; auxiliaris (Grt.)</td>
<td>x</td>
</tr>
<tr>
<td>&quot; extranea (Sm.)</td>
<td></td>
</tr>
<tr>
<td>&quot; scandens (Ril.)</td>
<td>x</td>
</tr>
<tr>
<td>&quot; aurulenta (Sm.)</td>
<td>x</td>
</tr>
<tr>
<td>&quot; lewisi (Grt.)</td>
<td></td>
</tr>
<tr>
<td>&quot; tristicula (Morr.)</td>
<td>x</td>
</tr>
<tr>
<td>&quot; atomaris (Sm.)</td>
<td>x</td>
</tr>
<tr>
<td>&quot; pleuritica (Grt.)</td>
<td>x</td>
</tr>
<tr>
<td>&quot; pestula (Sm.)</td>
<td></td>
</tr>
<tr>
<td>&quot; simona McD.</td>
<td></td>
</tr>
<tr>
<td>&quot; brocha (Morr.)</td>
<td></td>
</tr>
<tr>
<td>Protexarnis balanitis (Grt.)</td>
<td>x</td>
</tr>
<tr>
<td>Loxagrotis albicosta (Sm.)</td>
<td></td>
</tr>
<tr>
<td>&quot; apicalis (Grt.)</td>
<td>x</td>
</tr>
<tr>
<td>Pseudorthosia variabilis Grt.</td>
<td>x</td>
</tr>
<tr>
<td>Richia chortalis (Harv.)</td>
<td></td>
</tr>
<tr>
<td>&quot; parentalis Grt.</td>
<td></td>
</tr>
<tr>
<td>Eucoptocnemis tripars (Walk.)</td>
<td>x</td>
</tr>
<tr>
<td>Copablephron grandis (Stkr.)</td>
<td>x</td>
</tr>
<tr>
<td>&quot; longipennis (Grt.)</td>
<td></td>
</tr>
<tr>
<td>&quot; alba Harv.</td>
<td></td>
</tr>
<tr>
<td>Agrotis rileyana Morr.</td>
<td>x</td>
</tr>
<tr>
<td>&quot; orthogonia Morr.</td>
<td>x</td>
</tr>
<tr>
<td>&quot; vetusta (Walk.)</td>
<td>x</td>
</tr>
<tr>
<td>&quot; malefida Gn.</td>
<td>x</td>
</tr>
<tr>
<td>&quot; epsilon (Huf.)</td>
<td>x</td>
</tr>
<tr>
<td>&quot; subterranea (F.)</td>
<td>x</td>
</tr>
<tr>
<td>&quot; daudalus Sm.</td>
<td>x</td>
</tr>
<tr>
<td>&quot; vancouverensis Grt.</td>
<td></td>
</tr>
<tr>
<td>&quot; venerabilis Walk.</td>
<td>x</td>
</tr>
<tr>
<td>&quot; volubilis Harv.</td>
<td>x</td>
</tr>
<tr>
<td>&quot; gladiaria Morr.</td>
<td>x</td>
</tr>
<tr>
<td>&quot; subpallida (McD.)</td>
<td>x</td>
</tr>
<tr>
<td>&quot; jaculifera (Gn.)</td>
<td>x</td>
</tr>
<tr>
<td>&quot; hudsoni (Sm.)</td>
<td>x</td>
</tr>
<tr>
<td>&quot; subgothica (Haw.)</td>
<td>x</td>
</tr>
<tr>
<td>&quot; herilia Grt.</td>
<td>x</td>
</tr>
<tr>
<td>&quot; geniculata Grt. &amp; Rob.</td>
<td>x</td>
</tr>
<tr>
<td>Actebia fennica (Tau.)</td>
<td>x</td>
</tr>
<tr>
<td>Protogygia lagenis (Grt.)</td>
<td>x</td>
</tr>
<tr>
<td>Spaelotis clandestina (Har.)</td>
<td>x</td>
</tr>
<tr>
<td>&quot; havilae (Grt.)</td>
<td>x</td>
</tr>
<tr>
<td>Choephora fungorum Grt. &amp; Rob.</td>
<td>x</td>
</tr>
<tr>
<td>Species</td>
<td>State Mt. ND. SD. Nb. Mn. Ia.</td>
</tr>
<tr>
<td>---------</td>
<td>-----------------------------</td>
</tr>
<tr>
<td>Eurois occulta (L.)</td>
<td>x x x</td>
</tr>
<tr>
<td>&quot; astricta Morr.</td>
<td>x</td>
</tr>
<tr>
<td>&quot; nigra (Sm.)</td>
<td></td>
</tr>
<tr>
<td>Ochropleura plecta (L.)</td>
<td>x x x x x</td>
</tr>
<tr>
<td>Anicla infecta (Och.)</td>
<td>x x x</td>
</tr>
<tr>
<td>Euaegrotis exuberans (Sm.)</td>
<td>x</td>
</tr>
<tr>
<td>&quot; illapsa (Walk.)</td>
<td>x</td>
</tr>
<tr>
<td>&quot; tepperi (Sm.)</td>
<td>x x</td>
</tr>
<tr>
<td>Hemieuxoa rudens (Harv.)</td>
<td>x</td>
</tr>
<tr>
<td>Metaeaeis salicarum (Walk.)</td>
<td>x</td>
</tr>
<tr>
<td>Cerastis tenebifera (Walk.)</td>
<td>x</td>
</tr>
<tr>
<td>Peridroma saucia (Hub.)</td>
<td>x x x x x</td>
</tr>
<tr>
<td>Paradiarsia litoralis (Pack.)</td>
<td>x x x x</td>
</tr>
<tr>
<td>Graphiopheora haruspica (Grt.)</td>
<td>x x x</td>
</tr>
<tr>
<td>Rhyacia quadrangula (Zett.)</td>
<td>x x</td>
</tr>
<tr>
<td>Chersotis juncta (Grt.)</td>
<td>x</td>
</tr>
<tr>
<td>Diarsia rubrifera (Grt.)</td>
<td>x</td>
</tr>
<tr>
<td>&quot; rosaria (Grt.)</td>
<td>x</td>
</tr>
<tr>
<td>&quot; calgary (Sm.)</td>
<td>x</td>
</tr>
<tr>
<td>Amathes adela (Francl.)</td>
<td>x x x x x x</td>
</tr>
<tr>
<td>&quot; dolosa (Francl.)</td>
<td>x x x x</td>
</tr>
<tr>
<td>&quot; smithii (Snel.)</td>
<td>x x x x</td>
</tr>
<tr>
<td>&quot; normaniana (Grt.)</td>
<td>x x x</td>
</tr>
<tr>
<td>&quot; oblata (Morr.)</td>
<td>x</td>
</tr>
<tr>
<td>&quot; substrigata (Sm.)</td>
<td>x</td>
</tr>
<tr>
<td>&quot; collaria (Grt. &amp; Rob.)</td>
<td>x x x</td>
</tr>
<tr>
<td>&quot; badinodis (Grt.)</td>
<td>x x x x x</td>
</tr>
<tr>
<td>&quot; xanthographa (F.)</td>
<td>x</td>
</tr>
<tr>
<td>&quot; bicarnea (Gn.)</td>
<td>x x x x</td>
</tr>
<tr>
<td>&quot; tenuicula (Morr.)</td>
<td>x x x x x</td>
</tr>
<tr>
<td>Anomogyna infinitis (Grt.)</td>
<td>x</td>
</tr>
<tr>
<td>Setagrotis planifrons Sm.</td>
<td>x</td>
</tr>
<tr>
<td>&quot; radiatus Sm.</td>
<td>x</td>
</tr>
<tr>
<td>&quot; atrifrons (Grt.)</td>
<td>x</td>
</tr>
<tr>
<td>&quot; piscipellis (Grt.)</td>
<td>x</td>
</tr>
<tr>
<td>Anaplectoides pressus (Grt.)</td>
<td>x x</td>
</tr>
<tr>
<td>&quot; prasina (Schiff.)</td>
<td>x x</td>
</tr>
<tr>
<td>Protolampra rufifpectus (Morr.)</td>
<td>x</td>
</tr>
<tr>
<td>&quot; brunneicolis (Grt.)</td>
<td>x x x x x</td>
</tr>
<tr>
<td>Cryptocanula acadiensis (Beth.)</td>
<td>x x</td>
</tr>
<tr>
<td>Eueretagrotis aignoides (Gn.)</td>
<td>x x x x</td>
</tr>
<tr>
<td>&quot; perattenta (Grt.)</td>
<td>x</td>
</tr>
<tr>
<td>Hemigraphiphora plebeia (Sm.)</td>
<td>x</td>
</tr>
<tr>
<td>Pronoctua pyrophiloides (Harv.)</td>
<td>x</td>
</tr>
<tr>
<td>species</td>
<td>State</td>
</tr>
<tr>
<td>------------------</td>
<td>--------------------</td>
</tr>
<tr>
<td>Rhynchagrotis</td>
<td></td>
</tr>
<tr>
<td>cupida (Grt.)</td>
<td>x x x x x x x</td>
</tr>
<tr>
<td>anchocelioides (Gn.)</td>
<td>x x</td>
</tr>
<tr>
<td>exertistigma (Morr.)</td>
<td>x</td>
</tr>
<tr>
<td>insularis (Grt.)</td>
<td>x</td>
</tr>
<tr>
<td>erratica (Sm.)</td>
<td>x</td>
</tr>
<tr>
<td>vittifrons (Grt.)</td>
<td>x</td>
</tr>
<tr>
<td>trigona Sm.</td>
<td>x</td>
</tr>
<tr>
<td>mirabilis (Grt.)</td>
<td>x</td>
</tr>
<tr>
<td>nefascia Sm.</td>
<td>x</td>
</tr>
<tr>
<td>barnesi (Benj.)</td>
<td>x x x x x</td>
</tr>
<tr>
<td>alternata (Grt.)</td>
<td>x x x x x</td>
</tr>
<tr>
<td>variata (Grt.)</td>
<td>x</td>
</tr>
<tr>
<td>scopeops Dyar</td>
<td>x</td>
</tr>
<tr>
<td>nanalis (Grt.)</td>
<td>x</td>
</tr>
<tr>
<td>duanca Sm.</td>
<td>x</td>
</tr>
<tr>
<td>placida (Grt.)</td>
<td>x x x x x</td>
</tr>
<tr>
<td>dodi (McD.)</td>
<td>x</td>
</tr>
</tbody>
</table>

totals 164 81 80 65 49 38
## Appendix 2

### Plant names

<table>
<thead>
<tr>
<th>Alfalfa</th>
<th>Medicago sativa L.</th>
</tr>
</thead>
<tbody>
<tr>
<td>American cranberry</td>
<td>Vaccinium macrocarpon Ait.</td>
</tr>
<tr>
<td>Apple</td>
<td>Malus pumila P. Mill.</td>
</tr>
<tr>
<td>Apricot</td>
<td>Prunus armeniaca L.</td>
</tr>
<tr>
<td>Arrow-leaved balsamroot</td>
<td>Balsamorrhiza sagittata Nutt. (Pursh)</td>
</tr>
<tr>
<td>Artichoke</td>
<td>Stachys floridana Shutt. L.</td>
</tr>
<tr>
<td>Asparagus</td>
<td>Asparagus officinalis L.</td>
</tr>
<tr>
<td>Avocado</td>
<td>Persea americana Mill.</td>
</tr>
<tr>
<td>Balsam fir</td>
<td>Abies balsamea (L.) P. Mill.</td>
</tr>
<tr>
<td>Barley</td>
<td>Hordeum vulgare L.</td>
</tr>
<tr>
<td>Beans</td>
<td>Phasolus vulgaris L.</td>
</tr>
<tr>
<td>Bermuda grass</td>
<td>Digitaria sanguinalis (L.) Scop.</td>
</tr>
<tr>
<td>Bent grass</td>
<td>Agrostis spp.</td>
</tr>
<tr>
<td>Bitter cherry</td>
<td>Prunus emarginata (Dougl.) Walp.</td>
</tr>
<tr>
<td>Black currant</td>
<td>Ribes nigrum L.</td>
</tr>
<tr>
<td>Black mustard</td>
<td>Brassica nigra (L.) W.D.J. Koch</td>
</tr>
<tr>
<td>Black raspberry</td>
<td>Rubus occidentalis L.</td>
</tr>
<tr>
<td>Black willow</td>
<td>Salix nigra L.</td>
</tr>
<tr>
<td>Blueberry</td>
<td>Vaccinium sp.</td>
</tr>
<tr>
<td>Boxelder</td>
<td>Acer negundo L.</td>
</tr>
<tr>
<td>Broccoli</td>
<td>Brassica oleracea var. botrytis</td>
</tr>
<tr>
<td>Brussels sprouts</td>
<td>Brassica oleracea var. gemmifera</td>
</tr>
<tr>
<td>Buckwheat</td>
<td>Fagopyrum esculentum Moench</td>
</tr>
<tr>
<td>Bull thistle</td>
<td>Cirsium vulgare (Savi) Tenore</td>
</tr>
<tr>
<td>Cabbage</td>
<td>Brassica oleracea L.</td>
</tr>
<tr>
<td>Canada thistle</td>
<td>Cirsium arvense (L.) Scop.</td>
</tr>
<tr>
<td>Canadian blueberry</td>
<td>Vaccinium myrtillus L. Michx.</td>
</tr>
<tr>
<td>Carnation</td>
<td>Dianthus carvophyllus L.</td>
</tr>
<tr>
<td>Carrot</td>
<td>Daucus carota L.</td>
</tr>
<tr>
<td>Castor bean</td>
<td>Ricinus communis L.</td>
</tr>
<tr>
<td>Celery</td>
<td>Apium graveolens L.</td>
</tr>
<tr>
<td>Cheat grass</td>
<td>Bromus tectorum L.</td>
</tr>
<tr>
<td>Cherry</td>
<td>Prunus serotina Ehrh.</td>
</tr>
<tr>
<td>Chickweed</td>
<td>Stellaria media (L.) Vill.</td>
</tr>
<tr>
<td>Chicory</td>
<td>Cichorium intybus L.</td>
</tr>
<tr>
<td>Chili pepper</td>
<td>Capsicum annuum L.</td>
</tr>
<tr>
<td>Choke berry</td>
<td>Aronia melanocarpa (Michx.) Ell.</td>
</tr>
<tr>
<td>Choke cherry</td>
<td>Prunus virginiana L.</td>
</tr>
<tr>
<td>Chrysanthemums</td>
<td>Chrysanthemum sp.</td>
</tr>
<tr>
<td>Clovers</td>
<td>Trifolium spp.</td>
</tr>
<tr>
<td>Coast willow</td>
<td>Salix hookeriana Barratt</td>
</tr>
<tr>
<td>Cockle bur</td>
<td>Arctium lappa L.</td>
</tr>
<tr>
<td>Common Name</td>
<td>Scientific Name</td>
</tr>
<tr>
<td>-----------------------------</td>
<td>---------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Common brake</td>
<td>Pteridium aquilinum (L.) Kuhn</td>
</tr>
<tr>
<td>Common mallow</td>
<td>Lactuca rotundifolia L.</td>
</tr>
<tr>
<td>Common ragweed</td>
<td>Ambrosia artemisiifolia L.</td>
</tr>
<tr>
<td>Corn</td>
<td>Zea mays L.</td>
</tr>
<tr>
<td>Cotton</td>
<td>Gossypium thurberi Todaro</td>
</tr>
<tr>
<td>Cottonwood</td>
<td>Populus deltoides Bartr.</td>
</tr>
<tr>
<td>Cowpea</td>
<td>Vigna unguiculata (L.) Walp.</td>
</tr>
<tr>
<td>Cucumber</td>
<td>Cucumis sativis L.</td>
</tr>
<tr>
<td>Curled dock</td>
<td>Rumex crispus L.</td>
</tr>
<tr>
<td>Currant</td>
<td>Ribes rubrum L.</td>
</tr>
<tr>
<td>Cypress vine</td>
<td>Ipomoea coccinea L.</td>
</tr>
<tr>
<td>Dandelion</td>
<td>Taraxacum officinale Weber</td>
</tr>
<tr>
<td>Deadly nightshade</td>
<td>Atropa belladonna L.</td>
</tr>
<tr>
<td>Dewberry</td>
<td>Rubus trivalis Lichx.</td>
</tr>
<tr>
<td>Ditch bur</td>
<td>Xanthium strumarium L.</td>
</tr>
<tr>
<td>Dock</td>
<td>Rumex sp.</td>
</tr>
<tr>
<td>Dwarf blueberry</td>
<td>Vaccinium cespitosum Michx.</td>
</tr>
<tr>
<td>Dwarf sumac</td>
<td>Rhus copallina L.</td>
</tr>
<tr>
<td>Eastern gramna grass</td>
<td>Tripsacum dactyloides (L.) L.</td>
</tr>
<tr>
<td>Eastern hemlock</td>
<td>Tsuga canadensis (L.) Carr.</td>
</tr>
<tr>
<td>Eggplant</td>
<td>Solanum melongena L.</td>
</tr>
<tr>
<td>Endive</td>
<td>Cichorium endivia L.</td>
</tr>
<tr>
<td>Evening primrose</td>
<td>Oenothera biennis L.</td>
</tr>
<tr>
<td>Fanwort</td>
<td>Cabomba caroliniana Gray</td>
</tr>
<tr>
<td>Field penny-cress</td>
<td>Thlaspi arvense L.</td>
</tr>
<tr>
<td>Flax</td>
<td>Linum usitatissimum L.</td>
</tr>
<tr>
<td>Flowering currant</td>
<td>Ribes sanguineum Pursh</td>
</tr>
<tr>
<td>Forget-me-not</td>
<td>Lyosotis sp.</td>
</tr>
<tr>
<td>Geranium</td>
<td>Geranium sp.</td>
</tr>
<tr>
<td>Gladiolus</td>
<td>Gladiolus sp.</td>
</tr>
<tr>
<td>Goldenrod</td>
<td>Solidago sp.</td>
</tr>
<tr>
<td>Grape</td>
<td>Vitis vinifera L.</td>
</tr>
<tr>
<td>Gray birch</td>
<td>Betula populifolia Marsh.</td>
</tr>
<tr>
<td>Greasewood</td>
<td>Sacrobatus vermiculatus (Hook.) Torr.</td>
</tr>
<tr>
<td>Guayule</td>
<td>Parthenium argentatum Gray</td>
</tr>
<tr>
<td>Hardhack</td>
<td>Spiraea tomentosa L.</td>
</tr>
<tr>
<td>Hawthorn</td>
<td>Crataegus sp.</td>
</tr>
<tr>
<td>Hedge mustard</td>
<td>Sisymbrium officinale (L.) Scop.</td>
</tr>
<tr>
<td>Hickory</td>
<td>Carva sp.</td>
</tr>
<tr>
<td>Hollyhock</td>
<td>Alcea rosea L.</td>
</tr>
<tr>
<td>Honey locust</td>
<td>Gleditsia triacanthos L.</td>
</tr>
<tr>
<td>Hops</td>
<td>Humulus lupulus L.</td>
</tr>
<tr>
<td>Horse radish</td>
<td>Armoracea rusticana (Lam.) Gaertin.</td>
</tr>
<tr>
<td>Common Name</td>
<td>Scientific Name</td>
</tr>
<tr>
<td>------------------</td>
<td>---------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Indian paint-brush</td>
<td><em>Geum triflorum</em> Pursh</td>
</tr>
<tr>
<td>kale</td>
<td><em>Brassica oleracea</em> var. <em>viridis</em></td>
</tr>
<tr>
<td>Kentucky blue grass</td>
<td><em>Poa pratensis</em> L.</td>
</tr>
<tr>
<td>knotweed</td>
<td><em>Polygonum aviculare</em> L.</td>
</tr>
<tr>
<td>larkspur</td>
<td><em>Delphinium</em> sp.</td>
</tr>
<tr>
<td>lettuce</td>
<td><em>Lactuca sativa</em> L.</td>
</tr>
<tr>
<td>lilies</td>
<td><em>Lilium</em> sp.</td>
</tr>
<tr>
<td>loco weed</td>
<td><em>Astragalus mollissimus</em> Torr.</td>
</tr>
<tr>
<td>lupine</td>
<td><em>Lupinus</em> sp.</td>
</tr>
<tr>
<td>maples</td>
<td><em>Acer</em> spp.</td>
</tr>
<tr>
<td>marijuana</td>
<td><em>Cannabis sativa</em> L.</td>
</tr>
<tr>
<td>meadow rue</td>
<td><em>Thalictrum pubescens</em> Pursh</td>
</tr>
<tr>
<td>melon</td>
<td><em>Cucumis melo</em> L.</td>
</tr>
<tr>
<td>millet</td>
<td><em>Panicum miliaceum</em> L.</td>
</tr>
<tr>
<td>morning glory</td>
<td><em>Ipomoea purpurea</em> (L.) Roth</td>
</tr>
<tr>
<td>mulberry</td>
<td><em>Morus</em> spp.</td>
</tr>
<tr>
<td>mullens</td>
<td><em>Verbascum</em> spp.</td>
</tr>
<tr>
<td>mustards</td>
<td><em>Sisymbrium</em> spp.</td>
</tr>
<tr>
<td>mustard</td>
<td><em>Nasturtium</em> spp.</td>
</tr>
<tr>
<td>nettle</td>
<td><em>Urtica</em> spp.</td>
</tr>
<tr>
<td>oaks</td>
<td><em>Quercus</em> spp.</td>
</tr>
<tr>
<td>oats</td>
<td><em>Avena sativa</em> L.</td>
</tr>
<tr>
<td>onion</td>
<td><em>Allium cepa</em> L.</td>
</tr>
<tr>
<td>orange</td>
<td><em>Citrus sinensis</em> (L.) Osbeck</td>
</tr>
<tr>
<td>osoberry</td>
<td><em>Oleomeria cerasiformis</em> (Torr. &amp; Gray)</td>
</tr>
<tr>
<td>pansy</td>
<td><em>Viola tricolor</em> L.</td>
</tr>
<tr>
<td>parsley</td>
<td><em>Petroselinum crispum</em> (P. - Kill.) Nyman</td>
</tr>
<tr>
<td>parsnip</td>
<td><em>Pastinaca sativa</em> L.</td>
</tr>
<tr>
<td>peach</td>
<td><em>Prunus persica</em> (L.) Batsch</td>
</tr>
<tr>
<td>pear</td>
<td><em>Pyrus communis</em> L.</td>
</tr>
<tr>
<td>pepper grass</td>
<td><em>Lenidium virginicum</em> L.</td>
</tr>
<tr>
<td>peru</td>
<td><em>Nicandra physalodes</em> (L.) Gaertin.</td>
</tr>
<tr>
<td>phlox</td>
<td><em>Phlox</em> sp.</td>
</tr>
<tr>
<td>pin cherry</td>
<td><em>Prunus pennsylvanica</em> L.</td>
</tr>
<tr>
<td>plantains</td>
<td><em>Plantago</em> spp.</td>
</tr>
<tr>
<td>plum</td>
<td><em>Prunus domestica</em> L.</td>
</tr>
<tr>
<td>pond apple</td>
<td><em>Annona glabra</em> L.</td>
</tr>
<tr>
<td>potato</td>
<td><em>Solanum tuberosum</em> L.</td>
</tr>
<tr>
<td>prairie violet</td>
<td><em>Viola pedatifida</em> G. Don</td>
</tr>
<tr>
<td>primrose</td>
<td><em>Primula</em> sp.</td>
</tr>
<tr>
<td>pumpkin</td>
<td><em>Cucurbita pepo</em> L.</td>
</tr>
<tr>
<td>purslane</td>
<td><em>Portulaca oleracea</em> L.</td>
</tr>
<tr>
<td>Common Name</td>
<td>Scientific Name</td>
</tr>
<tr>
<td>------------------</td>
<td>------------------------------------------------------</td>
</tr>
<tr>
<td>rabbitbush</td>
<td>Chrysothamnus spp.</td>
</tr>
<tr>
<td>radish</td>
<td>Raphanus sativus L.</td>
</tr>
<tr>
<td>raspberry</td>
<td>Rubus idaeus var. strigosus (Michx.) Focke</td>
</tr>
<tr>
<td>red clover</td>
<td>Trifolium pratense L.</td>
</tr>
<tr>
<td>rhubarb</td>
<td>Rheum raponticum L.</td>
</tr>
<tr>
<td>Russian thistle</td>
<td>Salsola iberica Tausch</td>
</tr>
<tr>
<td>rye</td>
<td>Secale cereale L.</td>
</tr>
<tr>
<td>sage</td>
<td>Salvia officinalis L.</td>
</tr>
<tr>
<td>salmon berry</td>
<td>Rubus parviflorus Nutt.</td>
</tr>
<tr>
<td>sand bur</td>
<td>Chenchrus incertus W. A. Curtis</td>
</tr>
<tr>
<td>saw grass</td>
<td>Spartina patens (Ait.) Muhl.</td>
</tr>
<tr>
<td>sea kale</td>
<td>Cakile edulenta (Bigelov) Hook.</td>
</tr>
<tr>
<td>service berry</td>
<td>Amelonchier pallide Greene</td>
</tr>
<tr>
<td>sheperd's purse</td>
<td>Capsella bursa-pastoris (L.) Medic.</td>
</tr>
<tr>
<td>silver maple</td>
<td>Acer saccharinum Marsh.</td>
</tr>
<tr>
<td>smartweed</td>
<td>Polygonum spp.</td>
</tr>
<tr>
<td>sneezeweed</td>
<td>Conyza canadensis (L.) Cronq.</td>
</tr>
<tr>
<td>sorghum</td>
<td>Sorghum bicolor (L.) Moench</td>
</tr>
<tr>
<td>sorrels</td>
<td>Rumex spp.</td>
</tr>
<tr>
<td>sour cherry</td>
<td>Prunus cerasus L.</td>
</tr>
<tr>
<td>southern dewberry</td>
<td>Rubus enslenii Tratt.</td>
</tr>
<tr>
<td>soybean</td>
<td>Glycine max (L.) Merr.</td>
</tr>
<tr>
<td>spearmint</td>
<td>Mentha spicata L.</td>
</tr>
<tr>
<td>spiraea</td>
<td>Spiraea latifolia (Ait.) Borkh.</td>
</tr>
<tr>
<td>spinach</td>
<td>Spinacea oleracea L.</td>
</tr>
<tr>
<td>squash</td>
<td>Cucurbita maxima Duschiesme</td>
</tr>
<tr>
<td>strawberry</td>
<td>Fragaria chiloensis (L.) Duschesme</td>
</tr>
<tr>
<td>sugar beet</td>
<td>Beta vulgaris L.</td>
</tr>
<tr>
<td>sugar cane</td>
<td>Saccharum officinarum L.</td>
</tr>
<tr>
<td>summer aster</td>
<td>Aster ericoides L.</td>
</tr>
<tr>
<td>sunflowers</td>
<td>Helianthus spp.</td>
</tr>
<tr>
<td>sweet clover</td>
<td>Melilotus alba Medic.</td>
</tr>
<tr>
<td>sweet fern</td>
<td>Comptonia peregrina (L.) Coult.</td>
</tr>
<tr>
<td>sweet pea</td>
<td>Lathyrus odoratus L.</td>
</tr>
<tr>
<td>sweet potato</td>
<td>Ipomoea batatas (L.) Lam.</td>
</tr>
<tr>
<td>tall blueberry</td>
<td>Vaccinium corymbosum L.</td>
</tr>
<tr>
<td>tansey mustard</td>
<td>Descurainia richardsonii (Sweet) D.F. Schulz</td>
</tr>
<tr>
<td>timothy</td>
<td>Phleum pratense L.</td>
</tr>
<tr>
<td>tobacco</td>
<td>Nicotiana tabacum L.</td>
</tr>
<tr>
<td>treacle</td>
<td>Conringia orientalis (L.) Dumott.</td>
</tr>
<tr>
<td>tomato</td>
<td>Lycopersicon esculentum P. Mill.</td>
</tr>
<tr>
<td>turnip</td>
<td>Brassica rapa L.</td>
</tr>
<tr>
<td>vibernums</td>
<td>Vibernum spp.</td>
</tr>
<tr>
<td>violets</td>
<td>Viola spp.</td>
</tr>
<tr>
<td>Plant Type</td>
<td>Scientific Name</td>
</tr>
<tr>
<td>-------------------</td>
<td>----------------------------------------------</td>
</tr>
<tr>
<td>walnuts</td>
<td><strong>Juglans spp.</strong></td>
</tr>
<tr>
<td>wandering Jew</td>
<td><strong>Zea pendula Schnizl.</strong></td>
</tr>
<tr>
<td>watermelon</td>
<td><strong>Citrullus lanatus (Thumb.) Matsumura &amp; Nakai</strong></td>
</tr>
<tr>
<td>western balsam fir</td>
<td><strong>Abies grandis (Dougl.) Lindl.</strong></td>
</tr>
<tr>
<td>western wheatgrass</td>
<td><strong>Agropyron smithii Rydb.</strong></td>
</tr>
<tr>
<td>wheat</td>
<td><strong>Tritium aestivum L.</strong></td>
</tr>
<tr>
<td>white mustard</td>
<td><strong>Sisymbrium altissimum L.</strong></td>
</tr>
<tr>
<td>white oak</td>
<td><strong>Quercus alba L.</strong></td>
</tr>
<tr>
<td>white spruce</td>
<td><strong>Picea engelmannii Parry</strong></td>
</tr>
<tr>
<td>wild lettuce</td>
<td><strong>Lactuca biennis (Moench) Fern.</strong></td>
</tr>
<tr>
<td>wild plum</td>
<td><strong>Prunus americana Marsh.</strong></td>
</tr>
<tr>
<td>willows</td>
<td><strong>Salix spp.</strong></td>
</tr>
</tbody>
</table>
Appendix 3
Collection sites in South Dakota

<table>
<thead>
<tr>
<th>Location</th>
<th>County</th>
<th>Location</th>
<th>County</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alexandria</td>
<td>Hanson</td>
<td>Oral</td>
<td>Fall River</td>
</tr>
<tr>
<td>Badlands National</td>
<td>Pennington</td>
<td>Philip</td>
<td>Haakon</td>
</tr>
<tr>
<td>Monument</td>
<td>Meade</td>
<td>Pine Ridge</td>
<td>Shannon</td>
</tr>
<tr>
<td>Bear Butte</td>
<td>Butte</td>
<td>Fresho</td>
<td>Lyman</td>
</tr>
<tr>
<td>Belle Fourche</td>
<td>Haakon</td>
<td>Rockerville</td>
<td>Pennington</td>
</tr>
<tr>
<td>Billsburg</td>
<td>Brookings</td>
<td>Spearfish</td>
<td>Minnehaha</td>
</tr>
<tr>
<td>Brookings</td>
<td>Custer</td>
<td>Spearfish Canyon</td>
<td>Lawrence</td>
</tr>
<tr>
<td>Buffalo Gap</td>
<td>Jones</td>
<td>Stanford</td>
<td>Jackson</td>
</tr>
<tr>
<td>Capa</td>
<td>Tripp</td>
<td>Strool</td>
<td>Perkins</td>
</tr>
<tr>
<td>Carter</td>
<td>Brule</td>
<td>Sturgis</td>
<td>Meade</td>
</tr>
<tr>
<td>Chamberlain</td>
<td>Jackson</td>
<td>Vermillion</td>
<td>Clay</td>
</tr>
<tr>
<td>Cottonwood</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Custer State Park</td>
<td>Custer</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Deadwood</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>De Smet</td>
<td>Lawrence</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dupree</td>
<td>Kingsbury</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Elk Point</td>
<td>Ziebach</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Enning</td>
<td>Union</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fort Pierre</td>
<td>Stanley</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fort Thompson</td>
<td>Buffalo</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Gayville</td>
<td>Yankton</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Geddes</td>
<td>Charles Mix</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Gregory</td>
<td>Gregory</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hamil</td>
<td>Tripp</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hayes</td>
<td>Stanley</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hecla</td>
<td>Brown</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Highmore</td>
<td>Hyde</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hill City</td>
<td>Pennington</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Huron</td>
<td>Beadle</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ideal</td>
<td>Tripp</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Interior</td>
<td>Jackson</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Joe Dollar Gulch</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Kennebec</td>
<td>Lawrence</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Letcher</td>
<td>Lyman</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ludlow</td>
<td>Sanborn</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Madison</td>
<td>Harding</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Midland</td>
<td>Lake</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Milesville</td>
<td>Haakon</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mitchell</td>
<td>Davison</td>
<td></td>
<td></td>
</tr>
<tr>
<td>New Underwood</td>
<td>Pennington</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Celrichs</td>
<td>Fall River</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Okaton</td>
<td>Jones</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>