# JOURNAL OF

# THE LEPIDOPTERISTS, SOCIETY

Volume 19

1965

Number 1

# LARVAL FOOD PLANTS AND DISTRIBUTION NOTES FOR TWENTY-FOUR TEXAS HESPERIIDAE

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This is the fifth in a series of papers recording larval food plants for Texan butterflies and skippers. In this paper, 62 plant species representing 8 families are given for the following 24 hesperiids. Arrangement for the skippers follows dos Passos (1964):

## HESPERIINAE

Calpodes ethlius (Stoll), Amblyscirtes vialis (Edwards), Polites vibex praeceps (Scudder), Hesperia viridis (Edwards), Copæodes aurantiaca (Hewitson).

## PYRGINAE

Pholisora catullus (Fabricius), Celotes nessus (Edwards), Heliopetes laviana (Hewitson), Heliopetes macaira (Reakirt), Pyrgus communis communis (Grote), Erynnis baptisiæ (Forbes), Erynnis horatius (Scudder & Burgess), Gesta gesta invisus (Butler & Druce), Achlyodes thraso tamenund (Edwards), Systasea pulverulenta (R. Felder), Staphylus mazans mazans (Reakirt), Cogia hippalus outis (Skinner), Thorybes bathyllus (Smith), Thorybes pylades (Scudder) and "form" albosuffusa H. A. Freeman, Achalarus lyciades (Geyer), Achalarus toxeus (Plötz), Urbanus proteus (Linnaeus), Chioides catillus albofasciatus (Hewitson), Epargyreus clarus clarus (Cramer).

Each of these species is treated separately in the order given. Also, a chart of larval food plants, arranged alphabetically by plant family and genus, summrizes these data.

<sup>&</sup>lt;sup>1</sup> Acknowledgment is made to the Rob and Bessie Welder Wildlife Foundation for providing a portion of the publication costs.

Calpodes ethlius (Stoll). The brazilian skipper is probably more common and widespread in Texas than present records indicate. It seems to be closely associated with its larval food plants, cannas. In the lower Rio Grande Valley, Freeman (1951) has collected *C. ethlius* from April to December. In more northern parts of its range, the flight period is from March to October, indicating a more prolonged larval or pupal diapause.

The present known distribution of this skipper in Texas is limited to eight counties: Bexar, May–Oct.; Cameron, Apr.–Dec.; Dallas, June– Oct.; Fayette, May; Hidalgo, Apr.–Dec.; San Patricio, Oct.–Nov.; Tarrant, Sept.; and Travis, Sept. The writer has reared larvae through which were collected on *Canna indica* L., but the food plant has never been grown in the laboratory garden; therefore, a careful study of its life history has not been made.

Bexar Co.: 16 June 1956. Six larvae, collected on C. indica, pupated from 28 June to 11 July. Adults emerged from 6 to 18 July.

Fayette Co.: 26 May 1956. At a cafe in Schulenburg where cannas were grown as ornamentals, numerous larvae were present in their rolled leaf nests.

Tarrant Co.: 22 September 1962. Attention was called to numerous larvae on cannas growing in a yard in Fort Worth. One pupa, in its rolled leaf shelter, was taken. A male emerged 23 September.

Amblyscirtes vialis (Edwards). The roadside skipper's distribution in Texas is not well defined. It appears to be more or less confined to the north-central and northeastern portions of the State. The species has been collected from the first week in April to June. Additional rearing is necessary to determine the number of broods in Texas.

Brown Co.: 9 April 1964. At Lake Brownwood State Park, a female was collected and kept for eggs. It was confined with *Stenotaphrum secundatum* (Walt.) Kuntze and *Cynodon dactylon* (L.) Pers. More than 50 eggs were deposited by 20 April when the female died. Eggs were deposited on both grasses; they started hatching 18 April. Newly hatched larvae were offered S. secundatum which they sampled but then refused, and many died. They were then offered C. dactylon on which they matured. Pupation occurred: 18 May (2), 19 May (2), 20 May (5), 21 May (2), 22 May (1), 23 May (1), 24 May (1), 26 May (1), 27 May (1), and 30 May (1). Six & and 59 9, emerged: 27 May (1&, 19), 29 May (2&), 31 May (1&, 29 9), 4 June (19), 5 June (1&), and 9 June (1&).

When fully mature, larvae seek the ground to pupate. Larvae cut circular disks from a paper table napkin on the bottom of the container, and fashioned nests in which to pupate. Immature stages were preserved and live pupae furnished Dr. C. L. Remington for chromosome studies.

Five other Texas counties in which the writer collected A. *vialis* in 1964 are: Cherokee, 4 Apr.; Harrison, 5 & 6 Apr., eggs obtained from one female but all first instar larvae perished on S. *secundatum*; Smith, 4 Apr.; Tarrant, 8 & 9 Apr.; Titus, 6 Apr.

Polites vibex præceps (Scudder). The whirlabout has been recorded

as a constant flyer in extreme southern Texas by Freeman (1951). While an occasional specimen may be collected throughout the year in certain localities, its principal flight is from April to October. During this period considerable overlapping of broods occurs. *P. præceps* is well adapted to metropolitan living where it oviposits on bermuda, *Cynodon dactylon* Pers.; St. Augustine, *Stenotaphrum secundatum* Kuntze; and doubtless other local grasses. Additional fieldwork is necessary to establish its exact range over the State and the blend zone with *Polites vibex brettoides* (Edwards). It would seem to have a larval or pupal diapause; additional rearing will determine this.

Bexar Co.: 30 July 1963. A female was collected in the laboratory garden in San Antonio, where the species is well established, and kept for eggs. During the next five days, 90 eggs were deposited on S. secundatum, after which the female was released. Eggs started hatching 3 August. Larvae were reared through on S. secundatum, pupating: 1 Sept. (1), 6 Sept. (5), 7 Sept. (12), 9 Sept. (10), 12 Sept. (1), and 14 Sept. (4). Fifteen  $\delta \delta$  and  $139 \varphi$  emerged: 11 Sept. (1 $\delta$ ), 15 Sept. (3 $\delta \delta$ , 1 $\varphi$ ), 16 Sept. (4 $\delta \delta$ , 5 $\varphi \varphi$ ), 17 Sept. (4 $\delta \delta$ , 2 $\varphi \varphi$ ), 18 Sept. (1 $\delta$ ), 25 Sept. (1 $\delta$ ), 20 Sept. (1 $\delta$ , 1 $\varphi$ ), 22 Sept. (1 $\delta$ ), 23 Sept. (1 $\varphi$ ), and 25 Sept. (1 $\varphi$ ). Immatures were preserved. At a sidewalk cafe in San Antonio, on 30 Sept. 1963 a female was observed to deposit 15 ova in about 10 minutes, one at a time, on C. dactylon.

Cameron Co.: 18 October 1963. At Brownsville, a female was collected and kept alive for eggs. It received only modest care in the improvised field laboratory, and after depositing five eggs it perished. Eggs hatched 26 October. Two first instar larvae were accidentally lost. The remaining three, reared through on S. secundatum, pupated 14 & 17 December and 8 January. Adults, emerged: 8 Jan. (19), 11 Jan. (19), and 31 Jan. (19). A most interesting discovery was that these females did not have the usual blurred markings on the HW beneath; instead, the marks were sharp and well defined.

The writer has collected *P. præceps* in four other Texas counties: Comal, 27 July 1963; Hidalgo, 31 Mar. 1960, 17 Oct. 1963; Kimble, 20 July 1963; San Patricio, 14 & 15 Sept., 13 & 20 Oct. 1963; and Zavala, 18 Aug. 1963.

Hesperia viridis (Edwards). The green skipper's range in Texas appears to be from the Edwards Plateau northward. Too few records have been published for the State to give much of an idea as to its exact distribution. Present field data would indicate two distinct flights: April–June and August–October. Reared adults have emerged in January and February, but this may not occur in nature. There is some indication that viridis may feed all winter on a grass such as Bouteloua gracilis Lag. and pupate in spring, emerging in April or May, depending on climatic conditions. May is by far the best time to collect viridis in the southern part of its range.

Bexar Co.: 6 October 1963. Near the intersection of Babcock Road and F.M. 1604, NW of San Antonio, 13 adults were collected on wild flowers along the road. Two females collected 6 October were kept alive for eggs. They were caged over *Stenotaphrum secundatum* Kuntze. The following day several ova were deposited

on the grass and two on the container. By 8 October, 14 ova had been deposited, more than half of them on the container. One female died 8 Oct., the other was then offered *Cynodon dactylon* (L.) Pers. Eighteen eggs were deposited the following day, all on the grass. First instar larvae were offered *S. secundatum* which they accepted reluctantly. Numerous larvae died by mid-December. The survivors were then offered *C. dactylon*. Only two larvae died following the transfer. Still later, larvae were offered *Lolium perenne* L., which they accepted. Five larvae were reared through, pupating 1, 11, 21, & 28 January and 1 February 1964. Adults, emerged: 28 Jan. (13), 5 Feb. (19), 12 Feb. (13), 22 Feb. (19), and 28 Feb. (19).

This is believed to be the first Bexar County record for H. viridis. On 9 October, Roy W. Quillin collected one specimen at Helotes, a few miles west of this spot, and on 10 & 11 October, Dr. J. W. Tilden collected 35 specimens near the first mentioned spot.

The writer has collected *viridis* in only two other Texas counties: Blanco, 3 May 1963; Comal, 11 May 1958, 15 & 22 May 1960, and 21 May 1962. Freeman (1951) and MacNeill (1964) have recorded it from several other Texas counties.

*Copæodes aurantiaca* (Hewitson). The orange skipperling, common at times, may be found in all major botanical areas of Texas. It has been collected from February to November. *C. aurantiaca* is most often seen around patches of Bermuda grass, *Cynodon dactylon* Pers., its only known larval food plant. Since the food plant is a perennial, dying back with the first hard freeze, a pupal diapause is indicated.

Bexar Co.: 30 June 1956. A female collected in the laboratory garden at San Antonio deposited numerous eggs on *C. dactylon* the same day. Ova started hatching 4 July. Fifty-six larvae were inventoried 15 July. Larvae pupated: 19 July (8), 20 July (2), 21 July (2), 23 July (5), 24 July (3), 26 July (1), 28 July (8), 1 Aug. (5), 6 Aug. (1), and 7 Aug. (1). In addition to immatures which were preserved, 16 &  $\delta$  and 13  $\circ$   $\circ$  emerged: 24 July (1 $\delta$ ), 25 July (3 $\delta$ , 3, 26 July (2 $\delta$ , 1 $\circ$ ), 27 July (2 $\delta$ , 1 $\circ$ ), 28 July (1 $\delta$ , 1 $\circ$ ), 29 July (1 $\delta$ , 1 $\circ$ ), 30 July (2 $\delta$  $\delta$ , 1 $\circ$ ), 31 July (1 $\delta$ , 1 $\circ$ ), 1 Aug. (1 $\delta$ ), 2 Aug. (2 $\circ$   $\circ$ ), 3 Aug. (2 $\circ$   $\circ$ ), 6 Aug. (1 $\circ$ ), 7 Aug. (2 $\delta$ , 3, 1 $\circ$ ), 8 Aug. (1 $\circ$ ), and 10 Aug. (1 $\circ$ ).

Another female, collected in the laboratory garden 13 September 1958, deposited a quantity of ova on *C. dactylon*. Eggs started hatching 18 September. The first larva pupated 11 October. Adults emerged in due course but emergence dates were not recorded.

Pholisora catullus (Fabricius). The common sooty-wing ranges over the entire state of Texas. In certain sections, it has been collected each month of the year. Its principal flight, however, is from March to November. During this time July and November are the least likely months to find it on the wing. This species has a larval diapause which results in adults mostly in March. Immatures have been collected in nature on Amaranthus caudatus L., A. spinosus L., A. retroflexus L., Chenopodium album L., C. ambrosioides L., and C. berlandieri Moq.

Bexar Co.: 27 August 1956. In a city alley near the laboratory, 13 larvae, two of which were parasitized, were found on A. spinosus. Larvae pupated from 26 Aug.

to 5 Sept. Six  $\delta \delta$  and  $5 \circ \circ$ , emerged: 2 Sept.  $(1 \circ)$ , 4 Sept.  $(1 \circ)$ , 5 Sept.  $(1 \delta)$ , 6 Sept.  $(1 \circ)$ , 7 Sept.  $(2 \delta \delta)$ , 8 Sept.  $(1 \delta, 1 \circ)$ , 10 Sept.  $(1 \circ)$ , and 11 Sept.  $(2 \delta \delta)$ . At another location just north of San Antonio, seven larvae were found 11 November 1956 on *A. retroflexus*. Three of these proved to be parasitized. Two larvae remained in diapause until 22 April 1957 after which they perished, probably due to dehydration. One male emerged 3 February and another male on 11 February 1957; pupation dates unobserved. In the laboratory garden 18 May 1958, numerous larvae were observed on *A. spinosus*. Several were collected and pupation occurred 25 May. Emergence dates were not recorded. A female taken 30 August 1958 deposited 23 eggs on *A. spinosus* under laboratory conditions; all ova were preserved.

A few miles south of San Antonio, a female was collected 23 April 1960 while flying around C. *album*. Examination of the plant disclosed one larva which later died of parasitism. The captive female deposited numerous ova on C. *album*, and these later hatched. Due to improper care, most of the larvae were lost to fungus. All other larvae and pupae were preserved.

Cameron Co.: 21 April 1962. At the Laguna Atascosa National Wildlife Refuge, four larvae were collected on *C. ambrosioides*. Larvae matured in due course with adults emerging: 3 May  $(1 \,_{\sigma}, 1 \,_{\varphi})$ , 7 May  $(1 \,_{\varphi})$ , and 13 May  $(1 \,_{\varphi})$ . At another location in the county, about 16 miles SE of Brownsville, seven larvae were collected 19 October 1963 on *A. caudatus*. Three of these entered diaspause; the remaining four pupated in due course. One pupa died. Adults emerged: 6 Nov.  $(1 \,_{\sigma})$ , 7 Nov.  $(1 \,_{\varphi})$ , and 2 Dec.  $(1 \,_{\sigma})$ . The three larvae in diapause had not pupated 15 February 1964 when this paper was prepared.

Guadalupe Co.: 7 July 1962. At a roadside park on U. S. Highway 90, three miles E of Kingsbury, one larva was collected on *A. retroflexus* which produced a male 20 July.

Live Oak Co.: 10 September 1960. On Texas Highway 9 about eight miles NW of Mathis, one larva was found on *C. berlandieri* which produced a female 2 October.

San Patricio Co.: 21 August 1960. At Lake Corpus Christi State Park, one larva collected on *C. berlandieri* pupated 22 August and a male emerged 30 August. At the Welder Wildlife Refuge, one larva was found 5 July 1963 on *C. berlandieri*; it pupated 13 July and a male emerged 20 July. Again, near Mathis, one larva was collected 15 September 1963 on *A. hybridus*; it pupated 16 September and a female emerged 24 September.

Val Verde Co.: 1 May 1961. At Lake Walk, two larvae were collected on *C. berlandieri* which produced one male and one female 17 May. At a roadside park on U. S. Highway 277 south of Del Rio near the county line, two larvae were found 17 August 1963 on *A. hybridus*. Larvae pupated 21 & 23 August. Adults emerged: 27 Aug.  $(1 \ c)$  and 29 Aug.  $(1 \ c)$ .

Zavala Co.: 18 August 1963. At Batesville, three larvae were collected on A. hybridus. One larva which was thought to be ready to pupate, escaped when left exposed overnight. The other two pupated 23 & 29 August. Adults emerged: 28 Aug.  $(1 \, \wp)$  and 4 Sept.  $(1 \, \varsigma)$ .

Larval habits of this species are quite interesting. The first instar larva folds over a small portion of the leaf as a shelter. It leaves the shelter to feed. Upon returning home, the larva rests with its anal end near the open door. It now leisurely digests the consumed forage and ejects frass some distance from the shelter.

Celotes nessus (Edwards). The streaky skipper flies from March to November in Texas. Earliest and latest dates on which *C. nessus* has been taken by the writer are 9 March and 12 November. Reared specimens have emerged as late as 25 November. Kendall (1959) gave *Abutilon incanum* (Link) Sweet as a larval food plant for *nessus*. As a result of additional research four more species of malvaceous plants are now reported: *Althaea rosea* L., *Sida filipes* Gray, *Sphaeralcea lobata* (Woot.) Kearney (*det.* Dr. B. H. Warnock, Sul Ross State College), and *Wissadula amplissima* (L.) R. E. Fries.

Bexar Co.: 9 May 1963. Examination of S. *filipes*, which had been planted in the laboratory garden a year earlier, disclosed three larvae of *nessus* feeding on it. They were taken into the laboratory and reared to maturity on this plant. The first larva pupated 31 May. Adults emerged: 8 June (13), 14 June (13), and 11 July (19).

Blanco Co.: 3 May 1963. On U. S. Highway 281 at Little Blanco River, two larvae were found on *Abutilon incanum*. These larvae were later lost due to improper care in the laboratory.

Bosque Co.: 22 September 1962. At Meridian State Park five larvae were collected on A. *incanum*, but one soon died. The first two of these larvae pupated 9 & 10 October. Adults emerged: 17 Oct. (13), 18 Oct. (13), 24 Oct. (13), and 14 Nov. (13).

Cameron Co.: 21 April 1962. At the Laguna Atascosa National Wildlife Refuge three larvae were collected on *W. amplissima*. The plant on which these larvae were found was almost dormant due to drought. Two of the larvae pupated in due course; a male emerged 15 May and a female 4 June. The third larva entered diapause about 6 May. Examination 11 August disclosed the larva quite blanched and shrunken. In an attempt to break this diapause the larva was placed on a piece of moist cotton and placed near the laboratory window where the afternoon sun could strike it. Examination the following day showed the larva had not only become elongated, it had secured the leaf, under which it was hiding, to the cotton with strands of silk. The larva pupated 13 August, which was the twenty-first consecutive day of local temperatures equal to or greater than  $100^{\circ}$  F. A male emerged 20 August 1962.

Comal Co.: 27 July 1963. Near New Braunfels one larva was found on A. incanum. Larva pupated 23 August and a male emerged 30 August.

Jeff Davis Co.: 1 May 1961. At Davis Mountains State Park ova and larvae were found on *S. lobata*. Lou E. Walker, Park Manager, kindly permitted me to remove some of these "weeds" for transplanting. The plants survived the long journey back to the laboratory but they failed to recover in time to serve the intended purpose. It was now necessary to offer the larvae a substitute. *A. rosea* was provided and found acceptable. The larvae matured in due course and adults emerged: 28 May (1 &); *ex ovis* 6 June (1 &), 9 June  $(1 \wp)$ . All other immatures were preserved.

Kimble Co.: 20 July 1963. At Junction ten larvae were collected on A. incanum. Some of these were first instar. In the laboratory, four larvae proved to have been parasitized; the remaining six were then placed on a caged living plant 5 August. The plant was again carefully examined 20 August; all that could be found was an empty pupal case. Presumably ants had eaten the adult after it died; the same might have happened to the larvae. Maverick Co.: 17 August 1963. At a roadside park on U. S. Highway 277 south of Quemado, one larva was collected on *A. incanum*. It later died, but the cause was undetermined.

McCulloch Co.: 14 August 1961. On U. S. Highway 377 at roadside park which marks the geographical center of Texas, two larvae were found on *A. incanum*. One of these died and the other pupated in due course and a female emerged 13 September 1961.

Nueces Co.: 10 November 1962. At Hazel Bazemore Park near Calallen, two larvae were collected on *A. incanum*. About the beginning of December the larvae entered diapause. An attempt to break larval diapause was made 16 April 1963. Larvae were placed on moist facial tissue and placed near a laboratory window where the morning sun struck them. Both larvae pupated 19 April with adults emerging 27 April ( $\delta$ ) and 28 April ( $\varphi$ ).

San Patricio Co.: 26 April 1962. At the Welder Wildlife Foundation Refuge, 34 larvae were collected on A. *incanum*. They varied in age from first to last instar, the first of which pupated 2 May. Ten live pupae were provided for other scientific research. Adults emerged: 10 May  $(1 \delta)$ , 11 May  $(2 \delta \delta)$ , 13 May  $(1 \delta)$ , 15 May  $(1 \varphi)$ , 16 May  $(2 \delta \delta, 1 \varphi)$ , 17 May  $(2 \delta \delta)$ , 18 May  $(1 \varphi)$ , 19 May  $(1 \delta)$ , 23 May  $(1 \delta, 1 \varphi)$ , 24 May  $(1 \delta)$ , 27 May  $(1 \varphi)$ , 1 June  $(2 \varphi \varphi)$ , 11 June  $(2 \delta \delta)$ . Again at the Welder Refuge 10 November 1962, two more larvae were found on this plant. These larvae entered diapause about 1 December. Examination of them on 3 April 1963 disclosed one larva to be dead. On 18 April the remaining larva was placed on moist cotton and put in a sunny spot; it pupated 23 April and a female emerged 4 May.

Travis Co.: 2 September 1960. At Zilker Park in Austin, 14 larvae were collected on *A. incanum*. Most of these matured in due course but no emergence records were maintained.

Uvalde Co.: 30 April 1961. On U. S. Highway 90 near Cline, two larvae were collected on *A. incanum*. These larvae were reared through and males emerged 21 & 26 May.

The distribution of *C. nessus* in Texas appears to be west of a line from Gainesville, Cooke County to Brownsville in Cameron County. The writer has collected *nessus* in eight other Texas counties: Atascosa 31 Mar. 1957, Bandera 2 Apr. 1959, Dimmit 6 June 1960, Guadalupe 26 Aug. 1962, Jim Wells 5 Apr. 1962, Kinney 22 Mar. 1961, Kleberg 22 Mar. 1961, and Wilson 15 Aug. 1959.

Heliopetes laviana (Hewitson). Although the laviana skipper has been taken throughout the year in the lower Rio Grande Valley of Texas, laboratory studies indicate a larval diapause. The best place to find *laviana* is around the edge of brushy areas where malvaceous plants grow. Immatures have been found in nature on *Abutilon abutiloides* (Jacq.) Garcke, *Sida filipes* Gray, and *Malvastrum americanum* (L.) Torr. (*det.* by Fred B. Jones). In the laboratory, larvae of *laviana* readily accepted *Abutilon incanum* (Link.) Sweet and *Wissadula holosericea* (Scheele) Garcke.

Cameron Co.: 24 October 1960. At the U.S.D.A. Research Center in Brownsville, a cursory examination of several experimental malvaceous plants disclosed one last instar larva on *A. abutiloides*. The larva was removed and reared through, thanks to Perry A. Glick, U.S.D.A. Entomologist. The larva pupated 3 November and a male

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emerged 14 November 1960. Again at Brownsville, near the NW edge of the city where U. S. Highway 281 crosses a railroad, one larva was collected on *A. abutiloides*, 17 October 1963. The writer was accompanied by Mrs. Kendall and Dr. J. W. Tilden. This larva pupated 23 October and a female emerged 4 November 1963.

Hidalgo Co.: 23 October 1960. Along an irrigation canal south of Mission, near the village of Madero, one larva was collected on *A. abutiloides*. Also the same day, four more were collected near Weslaco on this plant. One larva and one pupa were preserved. Pupation occurred from 29 October to 13 November. Adults emerged: 8 Nov. (1 &), 17 Nov. (1 &), and 28 Nov. (1 &). On 16 October 1963, three larvae were found on *M. americanum* near an irrigation canal on U. S. Highway 281 at the south edge of Edinburg. Two larvae pupated 30 October and the third on 10 November. Adults emerged: 13 Nov. (2 &) and 24 Nov. (1 &).

Jim Wells Co.: 23 October 1960. On U. S. Highway 281 just north of Premont in a fencerow, one small larva was found on *A. abutiloides*. It died 30 October, probably due to improper care in the laboratory.

Live Oak Co.: 23 April 1961. At a roadside park on Texas Highway 9 near intersection of FM 534, one larva was collected on *S. filipes*. Larva readily accepted *W. holosericea* in the laboratory and pupated 5 May. A male emerged 16 May 1961.

San Patricio Co.: 21 August 1960. At Lake Corpus Christi State Park, four miles SW of Mathis, one larva was found on *A. abutiloides*. A return visit 10 September 1960 yielded 17 more larvae on this plant. The larvae ranged from first to last instar. These larvae pupated from 12–30 September. A series of immatures was preserved. Four males and five females emerged: 21 Sept.  $(1 \ 2)$ , 22 Sept.  $(1 \ 3)$ , 25 Sept.  $(1 \ 3)$ , 30 Sept.  $(1 \ 2)$ , 2 Oct.  $(1 \ 2)$ , 4 Oct.  $(1 \ 3)$ , 6 Oct.  $(2 \ 2 \ 2)$ , and 10 Oct.  $(1 \ 3)$ .

At the same location on 26 December 1960, three more larvae were found. These appeared to be in diapause. They were transported 100 miles north of the location where found. Here they were placed outdoors without food. An examination 11 February 1961 disclosed one larva dead, a second very hungry and moving about, the third, quite small, appeared in good health. The two remaining larvae were now placed on a living *W. holosericea* plant. The largest ate a few bites then moved beneath a leaf; the other crawled beneath a leaf without eating. Reexamination 15 March showed the largest one had bonded a leaf to the side of the screened cage and cut the petiole free. The other could not be found. The exact pupation date was not observed but a female emerged 1 April.

The Lake Corpus Christi site was visited again 7 October 1961. One larva which was collected pupated 30 October and a female emerged 28 November 1961. In addition to the larva, a gravid female was collected. Confined with A. abutiloides from the spot, it deposited 18 ova. In the laboratory, this same female deposited 25 more eggs on A. incanum. Sixteen eggs and other immatures were preserved. Eggs started hatching about 6:30 P.M. CST 12 October. The larvae were offered A. incanum which they started eating about 90 minutes after hatching. Twenty-one larvae were inventoried 29 October. Except for one, all were then placed on a living A. incanum plant in the laboratory garden. The exceptional larva was kept in a laboratory environment where it pupated 6 December and a male emerged 18 December. An inventory on 23 December disclosed only 11 larvae on the living plant, all last instar. Another examination 14 January 1962, following a week of freezing temperatures (lowest 10° F.), showed all except two had perished. These two had fallen to the ground in their leaf nests. Taken into the laboratory, both pupated 31 January. A female emerged 19 February and a male on 20 February. Emergence most likely would have been a month later in the natural ecological environment.

The above rearings were conducted in Bexar County, about 100 miles north of the capture locality. Here the average date of first  $32^{\circ}$  F. freeze

in the fall is about two weeks earlier than where the larvae were collected. Additional research is necessary to determine what factors constitute the distribution barrier.

Systasea pulverulenta (Felder) larvae were also found on A. abutiloides at Lake Corpus Christi in September, 1960. After collecting a few, it became quite easy to distinguish the two lepidopterous species by the type of shelter constructed. H. laviana simply pulls leaves together or folds them over to form the shelter while pulverulenta systematically eats away part of the leaf edge before constructing the shelter. First instar larvae of laviana eat away the leaf surface then fold it over at the weakened spot to form a protective shelter.

Heliopetes macaira (Reakirt). The macaira skipper is well established in the lower Rio Grande Valley of Texas. From there it ranges up the coast to San Patricio County. Freeman (1951) found it flying throughout the year in Hidalgo County. Its habitat is wooded or brushy areas where Turk's cap, *Malvaviscus drummondii* T. & G., its larval food plant, grows. This deciduous plant may be found in semishady spots over most of central and southern Texas, but *macaira* appears to be confined to an area in southern Texas where the frost-free growing season is 300 days or more; see Hildreth & Orton (1963).

Although *H. macaira* was described in 1866, it is believed that nothing has been published on its larval food plants or life history. Based on limited rearing, an immature diapause is not indicated. Growth and development of immature stages is, however, retarded by temperatures under  $60^{\circ}$  F. Seven reared examples disclosed the immature life-span ranged from 71 to 150 days. Further investigation may show even a greater range. The life of each example, in days and in the order of occurrence, is summarized: EGG TO ADULT: 71 ( $\delta$ ), 90 ( $\mathfrak{P}$ ), 99 ( $\delta$ ), 106 ( $\mathfrak{P}$ ), 116 ( $\delta$ ), 148 ( $\delta$ ), and 150 days ( $\delta$ ). EGG TO PUPA: 63, 68, 88, 98, 108, 126, and 134. DAYS IN PUPAL STAGE ONLY: 8, 12, 11, 8, 8, 22, and 16.

First instar larvae eat buds, blossoms, fruits, and juvenile leaves. A formal shelter is not constructed. Larvae hide in blossoms, brackets around fruits and blossoms, dead leaves on the plant, or any other convenient place. Older larvae may construct a shelter or simply seek the ground when not feeding. One observed larva climbed halfway up the plant to eat then returned to the ground and rested on a fallen leaf, unprotected there except for its excellent camouflage. It finally pupated on bare ground. Most larvae, however, pupate in a makeshift shelter secured at the cremaster. Those that do make shelters do so by pulling leaves together with strands of silk. The petiole of one leaf is then cut into. When it dries, this leaf forms a roof over the nest.

San Patricio Co.: 4 July 1963. At the Welder Wildlife Foundation Refuge, along a trail near the Aransas River, a female was observed to oviposit on *M. drummondii*. Mrs. Kendall and the writer had thought for a year or more that this might be the larval food plant, but this was the first substantiating evidence. Mrs. Kendall caught the insect, also recovered the egg. In the laboratory, 34 more ova were deposited on terminal twigs and blossom buds of this plant. Eggs started hatching 9 July. Second instar larvae were placed on a living plant in the laboratory garden. On 28 August only one larva could be found. Ants were suspect. The one survivor pupated 5 September and a male emerged 13 September.

Again at the Welder Refuge, 13 October 1963, five egg-laying females were observed. One captive female deposited numerous eggs on *M. drummondii* twigs during the following three days. Eggs soon hatched and the larvae were doing quite well until a hard freeze killed the larval food plant early in December. A month later larvae had begun dying from starvation. On 15 January a few plants were found which had been protected from frost by oak trees. This was more than 100 miles north of the capture locality. Provided fresh leaves, three larvae continued to eat and mature. Two of these lived long enough to feed on new growth put forth on potted plants under glass. Pupation occurred: 20 Dec. (1), 10 Jan. (1), 17 Jan. (2), 20 Jan. (1), 30 Jan. (1), 17 Feb. (1), and 24 Feb. (1). The 17 January pupae were forwarded to Dr. C. L. Remington for chromosome studies. Adults emerged: 1 Jan. (1 $\mathfrak{F}$ ), 21 Jan. (1 $\mathfrak{F}$ ), 28 Jan. (1 $\mathfrak{P}$ ), 7 Feb. (1 $\mathfrak{F}$ ), 10 Mar. (1 $\mathfrak{F}$ ), and 11 Mar. (1 $\mathfrak{F}$ ). Specimens representing various immature stages were preserved.

Pyrgus communis communis (Grote). The checkered skipper is common at times throughout Texas. In the southern part of the State, it has been collected each month of the year. It is least likely to be found in January, May, and December. Immatures have been collected on seven malvaceous plants: Callirhoe leiocarpa Martin, Sida (diffusa) filicaulis T. & G., Sida lindheimeri Gray, Sida rhombifolia L., Sphaeralcea angustifolia (Cav.) D. Don, Sphaeralcea cuspidata Gray, and Sphaeralcea lindheimeri Gray. In the laboratory, it was reared on Althaea rosea Cab.

Bandera Co.: 2 April 1959. On Park Road 37, a female was observed to oviposit on S. *filicaulis*. The plant was very small; the egg was preserved.

Bexar Co.: 18 November 1956. In San Antonio, a female was observed to oviposit on S. *rhombifolia*. Eggs were being deposited on the underside of leaves next to the ground, one at a time, on very small plants. Examination of several plants disclosed one larva feeding from within a folded leaf shelter. All immatures were lost. Wild females were again observed to oviposit on S. rhombifolia 28 August and 13 September 1957; ova were not collected. Still another female, collected 16 November 1958 while ovipositing on S. rhombifolia, deposited seven ova under laboratory conditions; the first instar larvae were preserved. Another female was observed to oviposit 30 August 1959 on S. rhombifolia; the eggs were left in the field. On 26 February 1961, a wild female deposited eggs on the blossom buds of C. leiocarpa growing in the laboratory garden; the eggs were not collected. On 20 August 1961, a female was seen to fly from one plant to another ovipositing on S. rhombifolia; the eggs were not collected. Three larvae were found 20 April 1963 on S. angustifolia growing in the laboratory garden. This plant had been transplanted from Jeff Davis County two years earlier. Larvae pupated 27 & 28 April and 1 May. Adults emerged: 6 May  $(1 \circ)$ , 7 May  $(1 \circ)$ , and 13 May  $(1 \circ)$ . Again on 5 October

1963, two females were seen ovipositing on S. rhombifolia in the laboratory garden.

Caldwell Co.: 10 June 1961. At the intersection of U. S. Highways 90 and 183, a female was observed to oviposit on *Sida lindheimeri*. Examination disclosed two larvae on the plant. The egg and one larva were lost before returning to the laboratory, but there the second larva accepted *A. rosea*. It pupated 26 June and a male emerged 4 July 1961.

El Paso Co.: 15 June 1960. On U. S. Highway 80, SE of El Paso near the county line, a female was observed while ovipositing on *S. angustifolia*; the egg was not collected. The female was captured but failed to oviposit under laboratory conditions.

Maverick Co.: 17 August 1963. At a roadside park on U. S. Highway 277 near Quemado, a female was seen to oviposit on *S. cuspidata*; neither the egg nor female were collected.

San Patricio Co.: 14 September 1963. At the Welder Wildlife Foundation Refuge, four larvae were found on Sphaeralcea lindheimeri and one on Sida rhombifolia. The Sida feeder pupated 19 September and a male emerged 27 September. The other larvae pupated 17, 18, and 20 September with adults emerging: 25 Sept.  $(1 \delta)$  and 26 Sept.  $(3 \varphi \varphi)$ ; one larva died. At the same location, a female was observed ovipositing on S. rhombifolia 12 October 1963; it was not collected.

Val Verde Co.: 11 May 1961. At Lake Walk, nine larvae were found on *S. cuspidata*, one of which proved to be parasitized. The remaining eight larvae pupated in due course with adults emerging: 14 May  $(1\&, 2\&, \clubsuit)$ , 18 May (1&), 20 May (1&), 21 May (1&), and 26 May  $(2\&, \heartsuit)$ .

The writer has collected *P. communis* in 38 other Texas counties representing all major botanical areas of the State.

*Erynnis baptisiæ* (Forbes). The distribution of the wild indigo dusky wing in Texas is not too well known at present, nor are the number of broods clearly defined. Freeman (1951) collected it in Dallas County in March, April, May, and August. He also observed females oviposit on *Baptisia tinctoria* R. Br., a cultivated species in Texas (Bailey, 1924), and reared larvae through on this plant. In the botanical Pineywoods area of eastern Texas where an abundance of five native *Baptisia* species may be found (Gould, 1962), the skipper has not been collected. An additional location by the present writer will bring to date all of the known records of *baptisiæ* from Texas.

Nueces Co.: 1 September 1962. Near the Nueces County Park on Padre Island below Corpus Christi, a number of adults were observed flying about, some of them visiting wild flowers. A female was observed to oviposit on *Baptisia laevicaulis* (Gray) Small. It was collected and kept for egg laying in the laboratory. Another female was collected on blossoms of *Helianthus argophyllus* (Torr. & Gray). Examination of several *B. laevicaulis* plants disclosed many eggs. The captive female deposited but five eggs before dying. Due to difficulty of keeping larval food plant fresh, only three were reared to maturity and these emerged: 30 Sept. (2 & &) and 1 Oct.  $(1 \heartsuit)$ . Immatures were preserved.

*Erynnis horatius* (Scudder & Burgess).<sup>2</sup> In Texas this skipper flies from February to November. Reared specimens have emerged in De-

 $<sup>^2\,{\</sup>rm Special}$  thanks go to Dr. John M. Burns, Wesleyan University, who determined or verified the writer's determination of the reared material in this study.

cember and January, but perhaps there are only three broods. It may be found around the edge of wooded areas where oak grows.

Dr. Alexander B. Klots (1951) points out that an old description of Chapman's lists wisteria while Grossbeck and Watson listed oak as the larval food plant. He writes further that, "Someone should check this." The purpose of this report is to present the results of widespread sampling in Arkansas, Louisiana, and Texas for immatures of this skipper. These collections, taken over a period of several years (1958–1963), have yielded sufficient immatures to remove any doubt that oak is a larval food plant. During this same period, wisteria has been under constant surveillance with negative results.

Immatures were found in nature on the following species of oak: Quercus fusiformis Small (Texas), Q. hemisphærica Bartr. (Louisiana), Q. laurifolia Michx. (Texas), Q. marilandica Muenchh. (Texas), Q. nigra L. (Ark., La., Tex.), Q. phellos L. (Texas), Q. stellata Wang. (Ark., La., Tex.), Q. texana Buckl. (Texas), Q. virginiana Mill. (Texas). In the laboratory, larvae readily accepted Q. shumardii Buckl. and Q. gambelii Nutt. Perhaps all species of oak are acceptable. Q. laurifolia was determined by Fred B. Jones, all other species by Dr. C. H. Muller, University of California, Santa Barbara.

IMMATURE STACES. Ova are bonded singly to the tiny juvenile leaves in the tips of new growth. First instar larvae are incapable of eating other than very tender new leaves. This became apparent after witnessing a number of casualties from eggs found in nature. While second instar larvae will survive on older leaves, larval growth appears to be stimulated by more tender foliage. This holds for the entire larval cycle. In certain geographical areas the collector may find gravid females prefer a single species of oak due to the frequency of new growth.

After progressing through four instars, larvae pupate in leaf shelters. The exuvium is eaten after each molt. First and second instar larvae construct very distinctive shelters. The larva makes a bilateral cut near the outer end of the leaf, approximately 45° to the center vein. The tip is then folded over, never under, where it is held in place by strands of silk. When resting, the larva hangs inverted from the top of the shelter. It eats away the edges of the roof and sometimes the foundation. A new shelter is constructed as required to meet growth and development. Last instar larvae usually pull together two leaves, if small, for the shelter. If the leaves are large, the edge may be rolled over to form the shelter. While larval diapause is indicated, some reared immatures remained in the pupal stage for more than two months.

To find ova and larvae in nature one must first locate oaks with tender

new growth. Small cut-over bushes are the best, but large trees will also yield larvae of E. horatius. The collector will find, however, that as the plant size decreases, success in locating larvae increases. This correlates well with the usual low flight of imagos. If there are no small bushes in the collecting area, the branches of larger trees should be examined for new growth. The uppermost growth of small saplings, six to eight feet, will prove rewarding. After a little practice the lepidopterist will recognize a larval shelter as far away as it can be seen.

The best places to find immatures of *horatius* are along rights-of-way, railroad and highway, where the brush is cut once or twice each year, on well-drained slopes and sunny locations. Wooded areas are not so rewarding unless there is an open trail admitting plenty of sunlight. A desirable trail is one that follows a power or pipeline through a wooded area. Here the vegetation is usually cleared away periodically, which causes new growth to appear on the cut-over oaks.

PARASITES AND PREDATORS. Spiders and parasites continually remove many *horatius* in the field. Collections are best made soon enough after eggs have been deposited when greater numbers of small larvae are to be found. Predatory insects and birds undoubtedly get a fair proportion, but, by and large, crab spiders take the greatest toll. For each larva found in nature the collector may expect to find 15 or more larval shelters occupied by arachnids. Parasites are next in order. Of the 298 fieldcollected larvae taken during this investigation, 33 were parasitized.

REARING TECHNIQUE. The juvenile leaves containing the eggs are removed from the main plant and placed in small containers. Containers should not be tightly covered until the juvenile leaves have completely dehydrated, otherwise fungus may develop and kill the embryo. When the eggs hatch, one or two larvae are permitted to crawl upon a small sprig of juvenile leaves and then are placed in a separate container. Overcrowding and heating should be avoided. Should fungus develop, the larvae are transferred to a fresh leaf immediately. The crucial period is the first instar. Second instar larvae may be transferred to larger containers. If closed jars are employed, they should be kept inverted. This will promote sanitation and facilitate removal of frass without disturbing the larvae. Constant room temperature is desirable in controlling condensation within the jar, but not essential. Larvae which are about to pupate or enter diapause should be removed to well-ventilated containers. The time to transfer is when the larva stops feeding and begins to lose its color. A large mouth jar with window screen insert and screened lid makes a good emergence cage. Most adults emerge in midafternoon or early evening.

#### ARKANSAS

Calhoun Co.: 28 September 1962. On U. S. Highway 167 at Champagnolle Creek, 26 larvae were found on *Q. nigra*. Three larvae were parasitized, another died in larval diapause, and a fifth died in the pupa. The first larva pupated 16 October; the last, on 30 December. Ten males and eleven females emerged: 27 Oct.  $(1 \delta)$ , 29 Oct.  $(1 \delta)$ , 30 Oct.  $(2 \delta \delta, 1 \varphi)$ , 2 Nov.  $(2 \delta \delta, 1 \varphi)$ , 3 Nov.  $(2 \delta \delta)$ , 7 Nov.  $(1 \delta)$ , 10 Nov.  $(1 \varphi)$ , 11 Nov.  $(1 \varphi)$ , 12 Nov.  $(1 \delta, 1 \varphi)$ , 17 Nov.  $(1 \varphi)$ , 21 Nov.  $(1 \varphi)$ , 20 Nov.  $(1 \varphi)$ , 27 Nov.  $(1 \varphi)$ , 30 Nov.  $(1 \varphi)$ , 12 Ian. 1963  $(1 \varphi)$ .

Columbia Co.: 17 September 1959. On U. S. Highway 82 near Waldo, one parasitized larva was found on Q. nigra.

Jefferson Co.: 26 September 1962. In Oakland Park at Pine Bluff, two larvae were recovered from Q. nigra. One of these died 9 October the other 20 October; cause unknown. The following day, 27 September, 16 larvae were collected on Q. nigra and Q. stellata just south of the city off Ohio Street. Seven of these larvae were parasitized and another died while in diapause. The first larva pupated 21 October 1962 and the last, 9 March 1963 after larval diapause. Five males and three females emerged: 2 Nov.  $(1 \delta)$ , 4 Nov.  $(1 \delta)$ , 6 Nov.  $(1 \delta)$ , 10 Nov.  $(1 \varphi)$ , 15 Nov.  $(1 \delta)$ , 22 Nov.  $(1 \varphi)$ , 28 Nov.  $(1 \varphi)$ , and 27 Mar. 1963  $(1 \delta)$ .

Union Co.: 16 September 1959. At a small community park in El Dorado, 17 larvae were collected on *Q. stellata*. These larvae were reared through on *Q. shumardii*. Three died, one was parasitized, and one larva and one pupa were preserved. Five males and six females, emerged: 23 Oct. (1 &), 25 Oct. (1 &), 2 Nov. (1 &), 3 Nov. (1 &), 6 Nov. (1 &), 11 Nov. (1 &), 13 Nov. (1 &), 22 Nov. (1 &), 29 Nov. (1 &), 3 Dec. (1 &).

#### LOUISIANA

Calcasieu Parish: 24 November 1960. In an area just east of Lake Charles, eight larvae were found on cut-over *Q. hemisphærica*, *Q. stellata*, and *Q. nigra* bushes along a dirt road. Five of these proved to be parasitized. One larva entered diapause early in December, it pupated 17 January 1961 and a female emerged 18 February. The other two larvae pupated 26 December; a female emerged 9 February, and a male on 12 February 1961.

Sabine Parish: 15 September 1959. On U. S. Highway 171 near Zwolle, five larvae were collected on Q. *stellata*; they were transferred to Q. *shumardii* on 19 September and reared through. One larva was preseved; others pupated: 16 Oct., 5 Nov., 17 Nov., and 11 Dec. Adults emerged: 31 Oct. (1 &), 21 Nov. (1 &), 2 Dec. (1 &), and 29 Dec. (1 &).

Vernon Parish: 4 November 1958. On U. S. Highway 171 about three miles north of Leesville, three larvae were found on small Q. nigra bushes growing along the right-of-way. One larva died, the other two pupated 11 & 14 January 1959. A female emerged 1 February and a male on 6 February. At the same location, 13 September 1959, 12 more larvae were collected. One of these was parasitized; the others pupated from 3 October to 30 November. Eight males and three females emerged: 18 Oct. (1 &), 25 Oct. (1 &), 27 Oct. (1 &), 28 Oct. (1 &), 29 Oct. (1 &), 30 Oct. (1 &), 1 Nov. (1 &), 4 Nov. (1 &), 7 Nov. (1 &), 16 Dec. (1 &).

Webster Parish: 28 September 1962. On La. Highway 2A near Haynesville, 15 larvae were collected on very small Q. *stellata* bushes. One larva died of parasitism, three more from other causes. Eleven larvae pupated from 28 October to 13 January 1963. Six males and five females emerged: 9 Nov. (1 &), 10 Nov. (1 &), 16 Nov. (1 &), 25 Nov. (1 &), 1(2 &), 26 Nov. (1 &), 27 Nov. (1 &), 29 Nov. (1 &), 16 Dec. (1 &), 27 Dec. (1 &), and 26 Feb. 1963 (1 &).

### Texas

Angelina Co.: 29 September 1962. On Texas Highway 103 near the Angelina River, six larvae were collected on *Q. stellata*. Pupation occurred from 20 October to 13 November. Three males and three females emerged: 2 Nov. (2 & &), 6 Nov. (1 &), 11 Nov. (1 &), 25 Nov. (1 &), and 28 Nov. (1 &).

Bastrop Co.: 19 May 1962. At Bastrop State Park one larva was found on Q. marilandica. It continued to feed until 9 September; it pupated 12 September but died 21 September.

Bexar Co.: 11 January 1959. At Helotes, one larva was collected on *Q. fusiformis*. It appeared to be in diapause, but on 17 January it pupated and a female emerged 8 February.

On U. S. Highway 281 about 16 miles south of San Antonio, 5 larvae were found on Q. virginiana 11 September 1960. These larvae pupated from 2 October to 7 October. Two males and three females emerged: 12 Oct. (13), 13 Oct. (13, 19), 15 Oct. (19), and 17 Oct. (19).

In the northern portion of San Antonio just off U. S. Highway 87, four larvae were found on *Q. fusiformis*, 19 September 1960. One larva died and another was killed accidentally. The remaining two pupated 12 & 15 October; two females emerged, one 23 October the other 27 October.

Near Camp Bullis Military Reservation north of San Antonio, five ova and 12 larvae were found 2 October 1960 on *Q. fusiformis.* Eight of the larvae were lost, cause unknown; four pupated from 24 October to 14 November. Three males and one female emerged: 5 Nov. (1 &), 10 Nov. (1 &), 16 Nov. (1 &), and 2 Dec. (1 Q). The eggs hatched soon after being brought into the laboratory, but three first instar larvae died. Another larva entered diapause but died later. The fifth pupated 4 December and a male emerged 23 January 1961.

In north San Antonio, two ova and nine larvae were found 29 October 1960 on seedling *Q. fusiformis.* The eggs hatched in due course, but the first instar larvae soon died. Two of the larvae collected in nature were preserved, the others pupated from 15 November to 10 December. Five males and two females emerged: 1 Dec. (1&), 4 Dec. (1&), 14 Dec. (1&), 19 Dec. (1&), 31 Jan. 1961 (1&), 1 Feb. (1&), and 13 Feb. (1&).

San Antonio, a female collected 5 March 1961 was kept for laboratory experimentation. During the period 6–12 March, 98 eggs were deposited on juvenile leaves of sucker shoots of *Q. fusiformis.* Examples representing the complete life history, including 25 ova, were preserved. The eggs hatched 11–13 March; larvae pupated 7–20 April; 19 males and 16 females emerged: 23 Apr.  $(1 \delta)$ , 24 Apr.  $(3 \delta \delta)$ , 25 Apr.  $(4 \delta \delta, 1 \varphi)$ , 26 Apr.  $(4 \delta \delta, 1 \varphi)$ , 27 Apr.  $(2 \delta \delta, 4 \varphi \varphi)$ , 28 Apr.  $(1 \delta,$  $2 \varphi \varphi)$ , 29 Apr.  $(4 \delta \delta, 4 \varphi \varphi)$ , 30 Apr.  $(1 \varphi)$ , 2 May  $(2 \varphi \varphi)$ , and 5 May  $(1 \varphi)$ .

About 12 miles NW of San Antonio, two larvae were found 17 June 1961 on Q. *fusiformis.* Pupation occurred 24 June and 8 July; a male emerged 3 July and a female on 17 July.

Blanco Co.: 24 September 1960. On U. S. Highway 281 north of Blanco, nine larvae were collected on *Q. texana* growing along the highway. One larva was being eaten by a crab spider when found; two more died of parasitism. The remaining larvae pupated from 15 October to 29 October; one pupa died. One male and four females emerged: 26 Oct.  $(1 \, \wp)$ , 1 Nov.  $(1 \, \wp)$ , 3 Nov.  $(2 \, \wp \, \wp)$ , and 11 Nov.  $(1 \, \wp)$ .

Bowie Co.: 24 September 1962. On U. S. Highway 67 near Basset, one egg was collected on *Q. marilandica*. Egg hatched 26 September; larva pupated 15 December and a male emerged 6 January 1963. The larva was reared on *Q. fusiformis*.

Brazos Co.: 30 September 1962. Near the village of Kurten on Texas Highway 21, nine larvae were collected on *Q. stellata*. One larva preserved, the others pupated from 20 October to 7 November. Two males and six females emerged:

2 Nov.  $(1 \circ)$ , 5 Nov.  $(1 \circ)$ , 11 Nov.  $(1 \circ)$ , 12 Nov.  $(2 \circ \circ)$ , 15 Nov.  $(1 \circ)$ , 20 Nov.  $(1 \circ)$ , and 23 Nov.  $(1 \circ)$ .

Brooks Co.: 23 October 1960. At a roadside park on U. S. Highway 281 about 15 miles south of Falfurrias, four ova and six larvae were collected on Q. virginiana. Two larvae were parasitized; the others pupated from 18 November to 11 February 1961. One male and three females emerged: 3 Dec. (1 &), 24 Jan. (1 &), 17 Feb. (1 &), and 6 Mar. (1 &). Only one of the eggs hatched and that on 26 October; the larva pupated 1 December and a female emerged 9 January 1961.

Brown Co.: 13 August 1961. At Brownwood State Park, three larvae were collected on *Q. fusiformis*. Two larvae pupated 14 September, the third on 23 September. Adults emerged: 24 Sept. (13, 19) and 4 Oct. (13).

Caldwell Co.: 19 May 1962. At a roadside park on Texas Highway 142 near Maxwell, four larvae were found on Q. *stellata*. They pupated from 6–30 June. Three males and one female emerged: 15 June  $(1\delta)$ , 20 June  $(1\delta)$ , 28 June  $(1\delta)$ , and 11 July  $(1 \circ)$ . At the same location and date, one other larva was found on Q. *marilandica*. It pupated 14 September but was accidentally punctured.

Chambers Co.: 22 March 1963. On IH 10 near FM 563, one egg was found on *Q. phellos.* It hatched 27 March, and the larva was reared on *Q. fusiformis.* It pupated 2 May and a female emerged 13 May 1963.

Colorado Co.: 10 November 1961. At a roadside park on U. S. Highway 90 about ten miles west of Columbus, two larvae were found on *Q. virginiana*; both were in diapause. One larva died; the other pupated 9 February 1962 and a male emerged 24 February.

Comal Co.: 27 December 1958. On County Road 311 near Spring Branch, one larva in diapause was found on *Q. fusiformis.* It pupated 15 January 1959 and a male emerged 7 February. On Guadalupe River road about five miles NW of New Braunfels, one larva was collected on *Q. fusiformis*, 27 July 1963. It pupated 14 August and a male emerged 24 August.

Gillespie Co.: 25 September 1960. On Texas Highway 16 about five miles NE of Fredricksburg, two ova and one larva were collected on *Q. texana*. The eggs hatched 28 September, but first instar larvae were soon lost due to improper care. The larva found in nature pupated 27 October and a male emerged 8 November.

Gonzales Co.: 10 June 1961. One larva was found at Palmetto State Park, and three more near the park on *Q. marilandica*. These larvae pupated from 6 July to 1 August. Three males and one female emerged: 15 July (1 &), 16 July (1 &), 25 July (1 &), and 13 Aug. (1 &).

Guadalupe Co.: 11 June 1961. At a roadside park on U. S. Highway 90 near Kingsbury, two larvae were collected on *Q. stellata*. One larva pupated 5 July and a male emerged 14 July. The other larva continued to feed. On 13 August the writer and Mrs. Kendall departed for Crested Butte, Colorado and took the larva along. It was offered *Q. gambelii* 14 August which it ate. Feeding stopped 3 November and larva entered diapause, but it died in January, 1962 before pupation occurred.

Hamilton Co.: 22 September 1962. On Texas Highway 22 at the Leon River, one larva was found on *Q. texana*. It pupated 18 October and a male emerged 29 October.

Harris Co.: 26 November 1960. Along Memorial Drive in Houston, two larvae, killed by crab spiders, were found on *Q. stellata*. Many larval shelters were present.

Harrison Co.: 29 September 1962. At Caddo Lake State Park, three larvae were found on seedling *Q. stellata* and *Q. marilandica*. They pupated 23 October, 28 October, and 8 November; one died later. A male emerged 9 November and another male 23 November.

Henderson Co.: 2 September 1963. Three larvae were found near Athens and

seven more near Malakoff, all on *Q. stellata*. One larva proved to be parasitized and another was killed accidentally. The remaining larvae pupated from 9 September to 9 October. Two males and six females emerged: 17 Sept.  $(1 \circ)$ , 25 Sept.  $(1 \circ)$ , 7 Oct.  $(1 \circ)$ , 9 Oct.  $(1 \circ)$ , 12 Oct.  $(1 \circ)$ , 13 Oct.  $(1 \circ)$ , 15 Oct.  $(1 \circ)$ , and 19 Oct.  $(1 \circ)$ .

Jefferson Co.: 9 November 1961. At a roadside park on Texas Highway 124 about three miles south of Fannett, three last instar larvae were found on *Q. nigra*. One larva was in diapause and the other two stopped feeding about 17 November. Larvae pupated 8 & 10 February 1962. Adults emerged: 21 Feb. (2&&) and 23 Feb. (1&).

Kendall Co.: 25 September 1960. About two miles north of Comfort on U. S. Highway 87, one pupa and four larvae were collected on *Q. texana*. The pupa died, and one larva was parasitized; both were preserved. The remaining three pupated 6, 11, & 16 October. Three males emerged 16, 21, & 27 October.

Kerr Co.: 27 June 1963. On Johnson Creek near Ingram, six larvae were collected on *Q. texana*. Four larvae were lost; the remaining two pupated in due course; a male emerged 22 August and a female on 31 August.

Lee Co.: 30 September 1962. At a roadside park on Texas Highway 21 near Lincoln, one larva was found on a sucker shoot of *Q. marilandica*. It pupated 10 November and a male emerged 22 November.

Leon Co.: 4 September 1960. Between Long Lake and Oakwood near the Trinity River on U. S. Highway 79, three larvae were collected on Q. *stellata*. Larvae pupated 2, 8, & 10 October. Adults emerged: 12 Oct.  $(1 \circleloc)$ , 18 Oct.  $(1 \circleloc)$ , and 20 Oct.  $(1 \circleloc)$ .

Live Oak Co.: 22 October 1960. On U. S. Highway 281 at San Christoval Creek near intersection of FM 2049, three larvae were found on *Q. virginiana*. Two entered diapause. Pupation occurred 18 November 1960, 9 January, and 3 February 1961. Adults emerged: 5 December  $(1 \, \varphi)$ , 16 Feb.  $(1 \, \varphi)$ , 4 Mar.  $(1 \, \varphi)$ .

McCulloch Co.: 14 August 1961. At a roadside park on U. S. Highway 377 which marks the geographical center of the State, two larvae were found on Q. *fusiformis*. One died of parasitism, the other pupated 23 September and a male emerged 2 October.

Nueces Co.: 1 September 1962. At Flour Bluff one larva was found on *Q. laurifolia*. It pupated 1 October and a female emerged 11 October.

Robertson Co.: 2 September 1960. At a roadside park near New Baden on U. S. Highway 79, one pupa and four larvae were collected on *Q. stellata*. Two days later 18 larvae were collected on *Q. stellata* at Ridge. A male emerged from the pupa on 8 September. Three of the larvae died of parasitism and three more from other causes. Two pupae also died. Pupation occurred from 6 October to 5 November. Seven males and seven females emerged: 16 Oct.  $(1 \, \wp)$ , 18 Oct.  $(2 \, \delta \, \delta)$ , 22 Oct.  $(1 \, \wp)$ , 23 Oct.  $(1 \, \wp)$ , 25 Oct.  $(1 \, \delta, 1 \, \wp)$ , 26 Oct.  $(1 \, \wp)$ , 27 Oct.  $(1 \, \delta)$ , 29 Oct.  $(1 \, \delta)$ , 31 Oct.  $(1 \, \delta)$ , 2 Nov.  $(1 \, \wp)$ , 6 Nov.  $(1 \, \wp)$ , and 18 Nov.  $(1 \, \wp)$ .

San Jacinto Co.: 4 November 1961. Near Oakhurst one larva was collected on *Q. nigra*. Numerous empty larval shelters were present. The larva pupated 12 February after a diapausal period of more than two months. A female emerged 26 February 1962.

San Patricio Co.: 11 September 1960. Along the railroad near Ingleside, 19 larvae were found on *Q. laurifolia* and *Q. virginiana*. Six were preserved; the remaining larvae pupated from 6 October to 21 October. Six males and seven females emerged: 16 Oct.  $(1 \delta)$ , 18 Oct.  $(1 \delta)$ , 19 Oct.  $(1 \varphi)$ , 22 Oct.  $(1 \delta)$ , 23 Oct.  $(1 \delta)$ , 24 Oct.  $(1 \delta)$ , 25 Oct.  $(1 \delta)$ , 29 Oct.  $(1 \varphi)$ , 29 Oct.  $(1 \varphi)$ , 30 Oct.  $(1 \varphi)$ , and 31 Oct.  $(1 \varphi)$ . At the Welder Wildlife Refuge, two larvae were found 10 November 1962 on *Q. virginiana*. Both larvae entered diapause, and the exact

population dates were not observed. A female emerged 12 March and another female on 18 March 1963.

Shelby Co.: 29 September 1962. At a roadside park on U. S. Highway 96 near Center, nine larvae were collected on *Q. nigra*. One was parasitized and another was lost. The remaining larvae pupated from 22 October to 25 November. Five males and two females emerged: 3 Nov. (1 &), 20 Nov. (1 &), 22 Nov. (1 &), 23 Nov. (2 & &), 3 Dec. (1 &), and 14 Dec. (1 &).

Smith Co.: 4 September 1960. On Texas Highway 64 at a roadside park about 12 miles west of Tyler, eight larvae were collected on *Q. marilandica*. Four of these died of parasitism and two from other causes. The remaining two pupated 9 & 17 October. A female emerged 18 October and another female on 28 October 1960.

Tyler Co.: 4 November 1961, near Woodville a single larva was found on *Q. stellata*. It stopped feeding 13 November, entered diapause, and died about 12 February 1962, apparently from dehydration.

Upshur Co.: 1 September 1963 at Big Sandy, four ova were found on juvenile leaves of *Q. stellata*. Two of the eggs appeared to have just hatched, but the first instar larvae could not be found. The other two eggs hatched and the larvae were lost before returning to the laboratory.

Victoria Co.: 25 December 1960. At a roadside park on U. S. Highway 59 just inside the Goliad–Victoria County line, one larva in diapause was collected on *Q. virginiana*. It pupated 8 February 1961, and a male emerged 4 March 1961.

Walker Co.: 4 September 1961. At Huntsville State Park, one larva was found on *Q. nigra*. It was reared on *Q. fusiformis*, pupated 30 October, and a male emerged 22 November.

Wood Co.: 31 August 1963. On FM 14 at the Sabine River, one egg and five larvae were collected on *Q. nigra*. The egg hatched, and the first instar larva was lost before reaching the laboratory several days later. One of the larvae collected in nature died and another was accidentally killed. The remaining three pupated 26 September, 23 October, and 12 December. One male and two females emerged: 7 Oct. (1 &), 5 Nov. (1 &), and 7 Jan. 1964 (1 &).

Zavala Co.: 18 August 1963. At Batesville, one larva was collected on Q. *virginiana*. It pupated 20 September and a male emerged 28 September.

The writer has collected adults in seven other Texas counties: Aransas (3 Apr. 1960, 20 Aug. 1960), Bandera (2 Apr. 1959), Bosque (22 Sept. 1962), Bee (3 Sept. 1962), Grimes (29 June 1957), Polk (14 Apr. 1962), and Uvalde (10 Mar. 1962).

Gesta gesta invisus (Butler & Druce).<sup>3</sup> Although the gesta dusky wing is rare in collections, it is well established in southern Texas. Here it is closely associated with the larval food plants *Indigofera suffruticosa* Mill. and *Indigofera lindheimeriana* Schelle. The distribution of Gesta in Texas correlates well with the distribution of these two plants as given by Turner (1959). Except for July, gesta has been field collected in Texas from April to November. Reared specimens have emerged in January, March, and December. The species has a larval diapause. Its flight period should be from late March to late November depending on climatic conditions of any specific location. Four broods are indicated. Larvae entering diapause construct a nest on the ground under fallen

<sup>&</sup>lt;sup>8</sup> Determination by Dr. John M. Burns.

leaves. Other larvae often pupate in a leaf nest on the growing plant.

Comstock & Garcia (1961) found larvae on *Cassia* sp. in Mexico, reared them through, and illustrated the last instar larva and pupa.

Colorado Co.: 30 November 1963. On U. S. Highway 90A near Sheridan, a good stand of *I. suffruticosa* was located in an abandoned field. All except the terminal leaves had fallen. A cursory examination disclosed two unmistakable shelters on one plant.

Comal Co.: 3 August 1963. At the second low water bridge across the Guadalupe River NW of New Braunfels, five larvae and one pupa were found on *I. lindheimeriana*. Very small plants had been selected by the egg-laying females. A male emerged from the pupa on 8 August. One larva died, the other four pupated between 9 & 18 August. Three males and one female emerged: 15 Aug.  $(1 \beta)$ , 16 Aug.  $(1 \varphi)$ , 21 Aug.  $(1 \beta)$ , and 24 Aug.  $(1 \beta)$ . These specimens completed their larval stage on *I. leptosepala* (Nutt.) Turner. No larvae have been found in nature on this species of *Indigofera*. At the same locality, three larvae were collected 9 May 1964. One larva failed to complete pupal transformation. The remaining two pupated 13 & 18 May. Adults emerged 21 May  $(\beta)$  and 26 May  $(\varphi)$ .

Kendall Co.: 28 June 1963. While on a joint field trip with Dr. John M. Burns, we collected in an area beneath U. S. Highway 87 bridge across the Guadalupe River at Comfort. There, Dr. Burns found one last instar larva on a small *I. lindheimeriana* plant and the larva was preserved for his further study.

San Patricio Co.: 11 November 1962. At the Welder Wildlife Refuge, 26 larvae and several eggshells were found on *I. suffruticosa*. A return visit 20 November yielded 27 more larvae on this plant. One larva was parasitized; a few were preserved. These evidently were the first immatures of *G. gesta* to be collected in the United States. Pupation occurred from 8 December 1962 to 16 April 1963, most of which were preceded by larval diapause. Twenty-five males and 23 females emerged: 21 Dec.  $(1 \, \wp)$ , 23 Dec.  $(1 \, \varsigma)$ , 26 Dec.  $(2 \, \varsigma \, \delta)$ , 1 Jan.  $(2 \, \varsigma \, \wp)$ , 2 Jan.  $(1 \, \wp)$ , 22 Mar.  $(1 \, \varsigma)$ , 19), 24 Mar.  $(1 \, \varsigma)$ , 29 Mar.  $(1 \, \varsigma)$ , 31 Mar.  $(3 \, \varsigma \, \delta)$ , 1 Apr.  $(1 \, \varsigma)$ , 39  $\wp)$ , 2 Apr.  $(1 \, \varsigma, 2 \, \varsigma \, \wp)$ , 3 Apr.  $(1 \, \varsigma)$ , 4 Apr.  $(3 \, \varsigma \, \wp)$ , 6 Apr.  $(2 \, \varsigma \, \delta)$ , 7 Apr.  $(6 \, \varsigma \, \delta, 1 \, \wp)$ , 8 Apr.  $(3 \, \varsigma \, \varphi)$ , 9 Apr.  $(1 \, \varsigma)$ , 19 Apr.  $(1 \, \varsigma)$ , 10 Apr.  $(1 \, \varsigma)$ , 29  $\wp)$ , 13 Apr.  $(2 \, \varsigma \, \delta)$ , 15 Apr.  $(1 \, \varsigma, 1 \, \varsigma)$ , and 26 Apr.  $(1 \, \varsigma)$ .

At Ingleside on 21 November 1962, ten unhatched eggs, 67 larvae, and one pupal case were found on *I. suffruticosa*. The eggs and a series of other immature stages were preserved. Live pupae were furnished to Dr. C. L. Remington for chromosome studies. Larvae pupated from 4 December 1962 to 2 April 1963 after an extended larval diapause for most. Nineteen males and 25 females emerged: 18 Dec.  $(1 \, \wp)$ , 19 Dec.  $(1 \, \wp)$ , 20 Dec.  $(1 \, \wp)$ , 21 Dec.  $(1 \, \wp)$ , 23 Dec.  $(2 \, \delta \, \delta)$ , 24 Dec.  $(2 \, \wp \, \wp)$ , 28 Dec.  $(1 \, \varsigma)$ , 20 Dec.  $(1 \, \wp)$ , 26 Mar.  $(1 \, \delta)$ , 27 Mar.  $(1 \, \delta)$ , 39  $\, \wp)$ , 30 Mar.  $(1 \, \wp)$ , 31 Mar.  $(1 \, \delta)$ , 29  $\, \wp)$ , 2 Apr.  $(4 \, \varsigma \, \wp)$ , 3 Apr.  $(2 \, \delta \, \delta)$ , 4 Apr.  $(1 \, \delta)$ , 39  $\, \wp)$ , 6 Apr.  $(6 \, \delta \, \delta)$ , 1 $\, \wp)$ , 7 Apr.  $(2 \, \delta \, \delta)$ , 1 $\, \wp)$ , 8 Apr.  $(1 \, \wp)$ , 9 Apr.  $(1 \, \delta)$ , and 12 Apr.  $(1 \, \wp)$ .

At the Welder Wildlife Refuge, 3 July 1963, three pupae were collected on *I.* suffruticosa; all proved to be parasitized. Again at the Welder Refuge, 14 September 1963, 22 larvae were collected on the same individual plant that yielded 26 larvae on 11 November 1962. Four of these later larvae entered diapause; the remaining 18 pupated from 16 to 25 September. Nine males and nine females emerged: 23 Sept.  $(1 \delta)$ , 24 Sept.  $(1 \delta)$ , 25 Sept.  $(2 \delta \delta, 3 \varphi \varphi)$ , 26 Sept.  $(2 \delta \delta)$ , 27 Sept.  $(1 \delta, 2 \varphi \varphi)$ , 28 Sept.  $(1 \delta, 1 \varphi)$ , 1 Oct.  $(1 \delta, 1 \varphi)$ , 2 Oct.  $(1 \varphi)$ , 3 Oct.  $(1 \varphi)$ . Once again at the Refuge, 14 October 1963, both adults and immatures were found common by the writer, accompanied by Dr. J. W. Tilden. Three larvae pupated shortly and emerged: 8 Nov.  $(1 \delta)$ , 9 Nov.  $(1 \delta)$ , and 13 Nov.  $(1 \delta)$ . The other larvae started pupating in early March, 1964 following larval diapause. One male and 8 females emerged: 17 Mar.  $(1 \circ)$ , 30 Mar.  $(1 \circ)$ , 8 Apr.  $(1 \circ)$ , 14 Apr.  $(1 \circ)$ , 1 $\circ$ , 1 $\circ$ ), 15 Apr.  $(1 \circ)$ , 17 Apr.  $(1 \circ)$ , 20 Apr.  $(1 \circ)$ , and 23 Apr.  $(1 \circ)$ .

Uvalde Co.: 17 August 1963. At a roadside park on U. S. Highway 90 where it crosses the Nueces River, several unmistakable larval shelters were found on *I. lindheimeriana*. These plants were growing in the rocky overflow portions of the riverbed. A more diligent search would undoubtedly have yielded immatures. Freeman (1951) collected one male and one female of *gesta* in Uvalde County 31 May 1942.

Wilson Co.: 15 August 1959. On U. S. Highway 87 at the Cibolo River, two adults were collected while feeding on blossoms of *Phyla nodiflora* (L.) Greene. About one mile NW of Floresville, 20 October 1963, one fresh male was collected and numerous larvae were found on *I. suffruticosa*. Nine larvae were brought to the laboratory and reared through. Seven of these entered diapause; the other two pupated in due course, with a male emerging 4 November and a female 5 November. Two males and four females emerged following larval diapause: 4 Apr.  $(1 \, \wp)$ , 16 Apr.  $(1 \, \wp)$ , 23 Apr.  $(1 \, \wp)$ , 29 Apr.  $(1 \, \wp)$ , and 30 Apr.  $(1 \, \wp)$ . One pupa died.

Zavala Co.: 18 August 1963. On Texas Highway 76 at the Nueces River, one empty pupal case was found in a leaf nest on *I. lindheimeriana*. Only a single plant was to be found along the road. Fenced and posted property prevented further searching along the dry riverbed where the food plant would most likely occur.

Other Texas distribution records include the Aransas National Wildlife Refuge, Aransas County, where the writer collected one male and four females, 3 April 1960. Two individuals of *gesta* were observed at Hidalgo, Hidalgo County, 17 October 1963. Freeman (1951) collected a female at Pharr, Hidalgo County, 4 November 1945. He also collected a male at Kerrville, Kerr County, 3 June 1949. J. W. Tilden (*in litt.*) reports a male collected near Quemado, Maverick County, 8 October 1963 and ten males and ten females at the Welder Wildlife Refuge, San Patricio County, 14 October 1963.

Achlyodes thraso tamenund (Edwards). The sickle winged skipper flies throughout the year in extreme southern Texas, the area where its larval food plant is most abundant. In this area it is most common from mid-August to mid-November. At present it is unknown whether the adult overwinters or there is an immature diapause. At the Corpus Christi Park cited below, the oviposition process was observed on 21 August 1960. A few adults were seen about 9:30 A.M. CST; soon, many more were present as the temperature rose with the hot morning sun. The flight pattern of a few individuals around Zanthoxylum fagara (L.) Sarg. was indicative of females in search of larval food plants. Not more than five minutes later a female was observed ovipositing. After flitting about from one spot to another, a suitable leaf was selected, an egg quickly deposited on the upper surface, and then the skipper dashed off to repeat the process.

San Patricio Co.: 21 August 1960. At the Lake Corpus Christi State Park site four egg-laying females were taken alive for laboratory experimentation. Also, 24 larvae, two pupae, four empty pupal cases, and a number of ova were found in nature on Z. fagara. A return visit to the spot 10 September 1960 yielded more than 110 larvae and 17 pupae. Hundreds of fresh adults were found swarming around blossoms of *Cynanchum unifarium* (Scheele) Woodson at this time. Because Z. fagara was not readily available at the laboratory, it was necessary to rely on refrigeration to keep fresh the food plant. For this reason it was considered impracticable to rear many from the numerous eggs deposited by the captive females. Consequently, many immatures were preserved. Of the larvae collected in nature, 25 males and 34 females were produced in 1960 as follows: 11 Sept. (1¢, 1♀), 13 Sept. (2♀♀), 14 Sept. (1¢, 1♀), 15 Sept. (1♀), 16 Sept. (1¢, 3♀♀), 17 Sept. (1¢, 2♀♀), 19 Sept. (2¢¢, 5♀♀), 24 Sept. (1¢), 25 Sept. (3¢¢, 3♀♀), 26 Sept. (4¢¢, 1♀), 28 Sept. (1¢, 2♀♀), 29 Sept. (2¢¢, 2♀♀), 30 Sept. (1¢, 1♀), 1 Oct. (1¢, 1♀), 3 Oct. (1♀), 5 Oct. (2♀♀).

Live Oak Co.: 23 October 1960. At a roadside park on Texas Highway 9 near Oakville, one female was observed ovipositing on Z. fagara. One larva and three pupae were also found at this spot. Adults emerged, from the pupae: 27 Oct.  $(1 \delta)$ , 29 Oct.  $(1 \delta)$ , 1 Nov.  $(1 \delta)$ , and a female from the larva 5 Nov. 1960. At this same roadside park 8 October 1961, another egg-laying female was seen and taken. It deposited 15 ova under laboratory conditions. The newly hatched larvae were placed on an uncovered Z. fagara bush growing in the laboratory garden. So far as could be determined none survived. Numerous predators were suspect.

Goliad Co.: 25 December 1960. At Goliad State Park, numerous pupal cases were found on Z. fagara.

Kleberg Co.: 26 December 1960. At the Kingsville City-County Park, one larva and many pupal cases were found on Z. fagara. The larva, thought to be in diapause, was not fed and it failed to survive.

Other Texas counties in which the writer has collected A. tamenund adults are: Bexar (18 Aug. 1957, 31 Mar. 1959, 2 Oct. 1960, & 21 Sept. 1961), Brooks (22 Oct. 1960), Cameron (2 & 3 Apr. 1957, 21 Mar. 1961, 22 Apr. 1962, 17 Oct. 1963), Comal (9 Aug. 1959), Hidalgo (22 Oct. 1960, 22 Nov. 1962, 16 Oct. 1963, 10 Nov. 1963), Jim Wells (22 Oct. 1960), Nueces (10 Nov. 1962).

Systasea pulverulenta (R. Felder). The so-called powdered skipper flies from February to November in southern Texas. The earliest and latest dates it has been taken in Bexar County are 9 February and 27 November. The exact number of overlapping broods has not been determined. Except for eight scattered days, reared adults emerged every day from 15 May to 12 July. Late season mature larvae enter diapause. Kendall (1959 & 1961) found Wissadula holosericea (Scheele) Garcke and Abutilon wrightii Gray to be larval food plants of pulverulenta. Four more malvaceous plants are now added: Abutilon abutiloides (Jacq.) Garcke, Abutilon incanum (Link) Sweet, Sphaeralcea angustifolia (Cav.) Don, and Wissadula amplissima (L.) R. E. Fries. W. holosericea seems to be the first choice of egg-laying females, A. incanum the least desirable. As mentioned in connection with Heliopetes laviana, S. pulverulenta displays regular larval habits at least on Abutilon abutiloides.

Bexar Co.: 27 November 1960. Numerous larvae were observed on W. holosericea and A. wrightii growing in the laboratory garden in San Antonio. Ten days later, following near freezing temperatures, a cursory examination disclosed no larval shelters. On 18 December careful examination revealed the larvae in leaves beneath these plants. It was most interesting that only those leaves which had been partially eaten or otherwise damaged had fallen following the cold temperatures. Each larva regularly ate from the edge of the leaf and then returned to its shelter on the same leaf. Forty-four were found. They were placed inside a screened cage and left outdoors all winter. Periodic examinations were made to determine pupation dates. The first larva pupated 23 February 1961. Adults emerged following diapause: 4 Mar. (2), 9 Mar. (5), 12 Mar. (1), 13 Mar. (2), 14 Mar. (2), 15 Mar. (1), 16 Mar. (5), 17 Mar. (6), 18 Mar. (1), 22 Mar. (5), 24 Mar. (2), 25 Mar. (1), 27 Mar. (2) (plus 3 parasities), and 13 Apr. (1). Twenty-three of these fed on W. holosericea the other 13 on A. wrightii. On 15 April a pupa was found in nature representing the spring brood. It is conceivable that adults from the first spring brood actually emerged before the last of the overwintering brood.

Cameron Co.: 24 October 1960. At the U.S.D.A. Research Center in Brownsville, a spot check was made of various species of malvaceous plants growing in an experimental garden. One larva of *S. pulverulenta* was found on *Sphaeralcea* angustifolia. Larva pupated 13 November and a male emerged 28 November 1960. At the Laguna-Atascosa National Wildlife Refuge two larvae were found 21 April 1962 on W. amplissima. One larva died, the other pupated 5 May, and a female emerged 14 May 1962.

Live Oak Co.: 22 October 1960. Near Oakville one larva was collected on A. wrightii. It pupated 12 November and a male emerged 26 November.

McCulloch Co.: 14 August 1961. At a roadside park on U. S. Highway 377 which marks the geographical center of the State, three larvae were found on W. *holosericea*. Larvae pupated in due course and adults emerged 13, 23, & 26 September; all were males.

Refugio Co.: 15 October 1963. On Farm Road 136 between Bayside and Woodsboro, one larva was found on *W. holosericea*. It pupated 8 November and a female emerged 20 November.

San Patricio Co.: 21 August 1960. At Lake Corpus Christi State Park near Mathis, two larvae were collected on A. abutiloides. A return visit on 11 September yielded more than 60 larvae and 10 pupae on this mallow. Some of these were kept under laboratory conditions; others were placed on unprotected malvaceous plants in the laboratory garden. In the controlled environment, adults emerged from field-collected pupae: 10 Sept. (1), 13 Sept. (2), 14 Sept. (2), 16 Sept. (1), 18 Sept. (1), 19 Sept. (1), 20 Sept. (1); from field-collected larvae: 22 Sept. (2), 23 Sept. (3), 24 Sept. (2), 26 Sept. (2), 27 Sept. (1), 2 Oct. (2), 3 Oct. (1), 5 Oct. (1), 7 Oct. (2), 8 Oct. (2), 13 Oct. (1), 16 Oct. (1), and 19 Oct. (1). A third visit to the park on 7 October 1961 yielded two larvae on W. amplissima. Both these larvae pupated 27 October with a male emerging 11 November and a female 13 November. At the Welder Wildlife Refuge near Sinton, one larva was found 11 November 1962 on A. incanum and twelve on W. holosericea. Four more were collected 20 November at the same location on the last named plant. All 17 of these larvae entered diapause. Adults emerged following diapause: 1 Apr. (1 &), 2 Apr.  $(1 \heartsuit), 3$  Apr. (1 &), 4 Apr.  $(1 \heartsuit), 5$  Apr.  $(1 \circlearrowright, 1 \heartsuit), 8$  Apr.  $(2 \delta \delta)$ , 9 Apr.  $(4 \delta \delta, 1 \varphi)$ , 10 Apr.  $(1 \varphi)$ , 13 Apr.  $(1 \varphi)$ , 22 Apr.  $(1 \varphi)$ . It was noted that these adults emerged about one month later than those from other previously observed overwintering immatures. This was attributed to adverse climatic conditions.

The writer has collected this species in three other Texas counties as

follows: Comal (21 June 1959, 9 Aug. 1959, 6 Aug. 1960, and 27 July 1963); Val Verde (30 Apr. 1961); Zavala (18 Aug. 1963).

Staphylus mazans (Reakirt).<sup>4</sup> This skipper, the mazans sooty wing has been recorded every month of the year in extreme southern Texas (Freeman, 1951). In the more northern parts of its range, it may be found from March to November where perhaps three broods occur. A larval or pupal diapause is indicated. An aborted diapause in a few individuals might account for the flight of mazans, sparingly at times, throughout the year in certain localities. Three of the known larval food plants are annuals; when discovered, perhaps all of them will be. Adult hibernation is remotely possible. In any event, further research is necessary to establish the perpetuation factors for mazans. The three larval food plants, recorded for the first time, are: Amaranthus retroflexus L., Chenopodium album L., and Chenopodium ambrosioides L. Doubtless other related plants are equally acceptable.

Bexar Co.: 26 June 1960. In Olmos Park at San Antonio, five larvae were found on *C. album*. They were reared through on this plant. Larvae build protective shelters by pulling leaves together which are enlarged to compensate for growth and pupation. Pupal duration was eight days for three observed examples. Adults emerged: 10 July  $(1\,\text{\ensuremath{\wplength{0.5ex}})$ , 19 July  $(1\,\text{\ensuremath{0.5ex}})$ , 21 July  $(1\,\text{\ensuremath{0.5ex}})$ , and 25 July  $(1\,\text{\ensuremath{\wplength{0.5ex}})$ .

Comal Co.: 6 August 1960. Along the Guadalupe River, NW of New Braunfels, a female was collected and confined over *C. album*. A quantity of eggs were deposited, and these started hatching 13 August. On 25 August all larvae were lost due to development of fungus; a living plant was not used.

Guadalupe Co.: 7 July 1962. At a roadside park on U. S. Highway 90, three miles E of Kingsbury, two larvae were found on *Amaranthus retroflexus* L. They were reared through on this plant. A female emerged 22 July and another female 4 August. One *Pholisora catullus* (Fabricius) larva shared this host plant with *mazans*.

San Patricio Co.: 25 April 1962. At the Welder Wildlife Foundation Refuge, one larva was collected on C. ambrosioides. It pupated 29 April and a male emerged 8 May.

The writer has collected *mazans* in nine other Texas counties from Kimble, Comal, and Bastrop southward.

*Cogia hippalus outis* (Skinner). The outis skipper is widespread but quite local in Texas. Further research will probably disclose that it inhabits most if not all of the area where its larval food plant is found. Due to considerable overlapping, the exact number of broods is unknown. It is believed that the number varies from three to five depending upon the climatic conditions of a given season, with four as the usual number.

In the Olmos Park Bird Sanctuary, San Antonio, fresh adults were found quite common around a large colony of *Acacia angustissima* 

<sup>&</sup>lt;sup>4</sup> Determination verified by H. A. Freeman.

(Mill.) Kuntze var. *hirta* (Nutt. ex Torr. & Gray) Robinson. After a few minutes, it was observed that these individuals were not only feeding on the blossoms but also ovipositing on the under surface of terminal leaves of this plant. Over a period of four years the writer had collected only six examples of *outis*; at Olmos Park more than 20 were taken within an hour. Many more could have been collected.

Bexar Co.: 1 July 1961. At Olmos Park four females were taken alive for laboratory experimentation. One of these had been observed to oviposit in nature; and it was the only one to oviposit in captivity. Forty-six ova were deposited 3–4 July. Seven more egg-laying females were observed in nature 16 July, three of which were collected. Only one of these deposited additional eggs in the laboratory.

The rearing of outis from Bexar County over a period of three years is summarized as follows. Immatures collected in nature. Eggs in 1961: 1 July (3), 2 July (4), 16 July (2), and 20 Aug. (1); in 1962: 22 July (9). Ovipositing females observed in 1961: 1 July (1), 16 July (3); in 1962: 27 May (3); in 1963: 3 July (1), and 25 July (1). Larvae in 1961: 11 July (2), 15 July (9), 16 July (46), 20 Aug. (12), 20 Sept. (7); in 1962: 27 May (10), 26 June (2), 12 July (4), 8 Aug. (8), 12–14 Oct. (12); in 1963: 8 May (9), 30 May (14), and 5 Aug. (12). Emergence of adults. From field-collected larvae in 1961: 23 July (1), 24 July (1), 2–8 Aug. (10), 12–18 Aug. (18), and 20 Aug. (2). Following larval diapause in 1962: 26 Mar. (1), 30 Mar. (1), 6 Apr. (1), 11 Apr. (1), 22 Apr. (2), and from spring 1962 brood; 13–19 June (10). From larval diapause in 1963: 27–29 Mar. (3) and 4 May (1). From spring 1963 brood: 28 May (1), 1–6 June (7), 10 July (1), 1–2 Aug. (3), 19 Aug. (1), 22–27 Aug. (8), and 20 Sept. (1). Reared from eggs in 1961: 4–5 Aug. (4), 11–15 Aug. (9), 17–18 Aug. (3), and 21–23 Aug. (2).

Bastrop Co.: 2 September 1961. At a roadside park on Texas Highway 21 about 5.5 miles NE of Bastrop, a female was observed to oviposit on *A. hirta*. The insect eluded capture, but the egg was recovered. The first instar larva hatched in due course, but fungus later killed it.

Caldwell Co.: 19 May 1962. On Farm Road 20 just NE of Farm Road 1854 junction, 42 larvae were collected on *A. hirta*. Larvae started pupating 26 May and continued to do so at a rate of a few each day until all except seven had pupated; five larvae and two pupae were preserved. Two larvae appeared to enter diapause but later died. Adults emerged: 3 June (13), 5 June (13), 6 June (13), 7 June (13, 499), 8 June (233, 499), 9 June (299), 10 June (13, 299), 11 June (233), 12 June (19), 13 June (13, 499), 14 June (13, 299), 15 June (13, 299), and 16 June (13, 19) for a total of 1333, 2099.

Cottle Co.: 13 August 1961. At a point on U. S. Highway 83 between Paducah and the Pease River 35 larvae were found on a small patch of *A. hirta* which was growing in a fencerow. Seventeen of the larvae later proved to be host to five species of parasites, one of which was undescribed and is being studied by Miss L. M. Walkley of the U. S. National Museum. The remaining 13 larvae went into diapause, but one died before pupation. Larvae were left outdoors where they had spun shelters on the ground under debris. Examination 25 March 1962 disclosed larvae still in diapause. They were next examined 30 March and found all pupated. Adults (7 & &, 5 & &) emerged: 15 Apr. (1 &, 2 & &), 16 Apr. (2 & &, 1 &), 17 Apr. (1 &, 1 &), 19 Apr. (1 &, 1 &), 20 Apr. (1 &), and 21 Apr. (1 &).

Kinney Co.: 17 August 1963. At the railroad and dirt farm road crossing of Pinto Creek, two last instar larvae were found in a small clump of *Acacia texensis* Torr. & Gray. Several abandoned larval shelters were present suggesting that larvae had sought places on the ground to pupate. Both larvae pupated 23 August and males emerged 1 & 2 September.

LARVAL HABITS. Newly hatched larvae construct their shelters by pulling together, beneath the leaf, two leaflets of the compound leaf. Later, as the larva grows, it enlarges the shelter so that all the leaflets may be pulled together below the petiole. With this configuration the shelter is not very conspicuous to the untrained eye. When the larva is fully mature it seeks shelter on the ground under leaves or debris. When fallen leaves or other material was not available, caged larvae actually burrowed under the soil surface for protection during diapause and pupation. The shallow earthen chamber was silk lined, which provided anchorage for cremaster hooks and a smooth surface for the tender pupa.

Thorybes bathyllus (Smith). The southern cloudy, or dusky wing has been collected in Texas during April, May, July, and September. Reared specimens have emerged in March, April, June, October, November, and December. Careful collecting in the right spots should reveal bathyllus flying, in limited numbers, from March to December. The writer has knowledge of only five Texas county locations. Immatures have been collected in nature on Astragalus engelmannii (Sheldon) Jones, Centrosema virginanum (L.) Benth., Desmodium ciliare (Muhl.) DC., Desmodium paniculatum (L.) DC., Lespedeza hirta (L.) Hornem., and in the laboratory reared on Lespedeza texana Britt.

Bastrop Co.: 5 September 1961. At Bastrop State Park, four larvae and one egg were found on *L. hirta*. One larva was preserved, the others reared through on *L. texana* with adults emerging: 29 Oct.  $(1 \, \varphi)$ , 6 Dec.  $(1 \, \beta)$ , and 10 Apr. 1962  $(1 \, \varphi)$ . The egg collected 5 September hatched the same day; its larva pupated 29 October and a female emerged 26 November.

Another visit to the park 19 May 1962 yielded five larvae; two on A. engelmannii and three on D. ciliare. Two larvae which were thought to be in diapause died. The remaining three were reared through on L. texana. Adults emerged: 17 June  $(1 \cite{abs})$ , 18 June  $(1 \cite{abs})$ , and 19 June  $(1 \cite{bbs})$ . The exact pupation date was observed for only one, and it remained in the pupal stage 12 days.

At Buescher State Park, 25 August 1962, one last instar larva was collected on *C. virginanum*. It pupated 4 September and a female emerged 15 September.

Brazoria Co.: 15 April 1962. On the San Bernard River at Churchill Bridge, one larva was collected on *D. paniculatum*. It pupated 23 May and a female emerged 4 June. Freeman (1951) also recorded *bathyllus* from this county.

Smith Co.: 1 September 1963. At Tyler State Park, one larva was collected on *D. paniculatum*. It pupated 5 October and a male emerged 19 October. Freeman also (1951) recorded *bathyllus* from this county.

Walker Co.: 2 September 1961. At Huntsville State Park, three larvae and one egg were found on *C. virginianum*, but the egg was lost. Larvae were reared through on *D. ciliare*. Adults emerged: 13 Oct. (13), 20 Oct. (13), 26 Oct. (19), and 23 Mar. 1962 following larval diapause (13).

Roy W. Quillin collected one female at San Antonio, Bexar Co., on 5 April 1959. The writer examined this specimen and found it to be in excellent condition. It appears that this is the only county record for *bathyllus*.

Thorybes pylades (Scudder). The northern cloudy wing may be found in all major botanical areas of Texas except the South Plains. It flies from March to November. In central Texas, March, April, June, and September are the best months to find it. Laboratory studies indicate a semilarval summer diapause. Three to four broods may be expected under favorable climatic conditions.

Kendall (1959) gave *Rhynchosia* (*Dolicholus*) *texana* Torr. & Gray as a larval food plant for *pylades* in his chart of larval food plants but failed to include life history data in the text. These data are now given together with two additional larval food plants: *Astragalus nuttallianus* DC. and *Desmodium paniculatum* (L.) DC.

Bandera Co.: 2 April 1959. On Park Road 37 to Medina Lake, a female was collected while ovipositing on *R. texana*. Four eggs were found in nature and the captive female deposited 17 more in the laboratory. Ova started hatching 15 April. The first larva pupated 23 May. Four males and nine females emerged: 4 June (1 &), 5 June (1 Q), 15 June (1 Q), 16 June (1 Q), 18 June (2 & Q), 20 June (1 &), 21 June (1 Q), 22 June (1 &), 24 June (1 &), 29 June (1 Q), and 8 July (1 Q). Immatures were preserved. Young larvae hide between leaves pulled together; older larvae hide under debris on the ground.

Bastrop Co.: 19 May 1962. At Bastrop State Park one last instar larva was found on *A. nuttallianus*. It pupated in due course and a female emerged 28 June 1962. At the same location on 30 March 1963 a female was observed to oviposit on *D. paniculatum*.

Bexar Co.: 12 April 1959. Northwest of San Antonio near the intersection of Culebra Road and Loop 410, several eggs were collected on *R. texana* along with two egg-laying females. All eggs were preserved. On 26 April at another location north of the city, one larva and four ova were found on *R. texana*; these were preserved. Two years later at still another location near San Antonio, a pair were taken *in copula* about 11:00 A.M. CST, 8 April 1961. The female was kept for eggs but none were deposited. A return visit to the spot on 16 April yielded one egg-laying female, 14 ova, and seven first instar larvae on *R. texana*. The larvae collected in nature were preserved. In the laboratory, this female deposited 15 more eggs. Ova hatched shortly and the first larva pupated 24 May. Eight males and five females emerged: 3 June  $(1\delta)$ , 5 June  $(1\varphi)$ , 11 June  $(1\varphi)$ , 12 June  $(1\delta)$ , 14 June  $(1\delta)$ , 19 June  $(1\delta)$ , 20 June  $(1\delta)$ , 23 June  $(1\delta)$ , 28 June  $(1\varphi)$ , 29 June  $(1\delta)$ , 30 June  $(1\varphi)$ , 6 July  $(1\phi)$ , and 8 July  $(1\delta)$ . On another visit to the site, 6 October 1963, a female was taken while oviposition.

Blanco Co.: 3 May 1963. On U. S. Highway 281 at the Little Blanco River, one first instar larva was collected on *R. texana*. Larva matured in due course but failed to pupate due to parasitism. An ichneumonid larva appeared 14 June, and the adult parasite emerged 25 June 1963.

Kerr Co.: 24 May 1959. At Kerrville State Park, one first instar larva was found on R. texana.

Medina Co.: 24 April 1960. At Medina Lake, an egg-laying female was collected; five eggs were deposited immediately after capture on R. texana held in a butterfly net. The eggs were preserved.

*Thorybes pylades albosuffusa* Freeman.<sup>5</sup> This "form" seems to be geographically restricted, to Brewster and Jeff Davis counties, where it has been collected from April to August.

Jeff Davis Co.: 2 May 1961. On Texas Highway 118 below McDonald Observatory in the Davis Mountains, this skipper was found visiting flowers and ovipositing on *Rhynchosia* (*Dolicholus*) texana Torr. & Cray. A number of ova, larvae, and adults including one egg-laying female were collected. The female deposited more than 20 eggs on *R. texana* while in transit to the laboratory. A series of all immature stages was preserved. Adults emerged: 11 June (2 & &), 13 June (1 &), 14 June (2 & &), 16 June (1 &), 20 June (1 &, 2 & &), 22 June (1 &), 25 June (2 & &), 27 June (1 &), 29 June (1 &), and 8 July 1961 (1 &).

Achalarus lyciades (Geyer). The hoary edge is not well known in Texas, but it is fairly common at times in certain localities. It has been collected from April to September; laboratory rearings indicate a few may emerge, under favorable conditions, in nature during October, November, and December. Present knowledge limits the distribution in Texas to five counties and the larval food plants to three: *Desmodium ciliare* (Muhl.) DC., *Lespedeza hirta* (L.) Hornem., and *Lespedeza texana* Britt. *ex* Small. For a description of these plants see Turner (1959). A high rate of parasitized immatures is indicated. Klots (1951) states that *lyciades* hibernates as pupa. In Texas, a larval diapause is also established.

Bastrop Co.: 5 September 1961. At Bastrop State Park, one larva was collected on L. *hirta*. It was reared through on L. *texana* in the laboratory. The exact pupation date was not observed, but a male emerged 28 October.

San Jacinto Co.: 14 April 1962. In the Sam Houston National Forest at Double Lake picnic area, several adults were observed sitting in the sun along trails. Although they were too wary to catch, their identity was unmistakable.

Walker Co.: 3 September 1961. At Huntsville State Park, 34 ova were found on D. ciliare. All of these proved to be parasitized, and adult parasites emerged from them 8–14 September. One egg-laying female was also collected 3 September. During the following three days it deposited 64 eggs of D. ciliare in the laboratory. Eggs started hatching 7 September. Larvae were later reared through on L. texana. Some died, and immatures were preserved. Exact pupation dates were not observed. All larvae except one stopped feeding by 31 October; this one stopped feeding 28 November and pupated 30 March 1962. Four had pupated by 19 November and three more between 11 February and 8 March; two others were unobserved. Four larvae in diapause died. Six males and four females emerged: 16 Nov. (1 &), 19 Nov.  $(1 \wp)$ , 22 Nov.  $(1 \wp)$ , 4 Dec. (2 & &), 3 Apr.  $(1 \wp)$ , 6 Apr. (1 &), 10 Apr. (1 &), and 15 Apr. (1 &),  $1 \wp$ ).

A. lyciades is known from only two other Texas counties. Freeman (1951) collected the species each month from May to September in Dallas County, and Mr. E. M. Kinch reported (*in litt.*) collecting one adult at Benbrook Lake near Fort Worth, Tarrant County, on 4 July 1963.

Achalarus toxeus (Plötz). Except for May and August, the toxeus, or

<sup>&</sup>lt;sup>5</sup> Determination by H. A. Freeman.

coyote skipper has been collected in southern Texas each month from February to November. Very little is known of its life history. Three or more broods, and perhaps considerable overlapping of broods, is indicated.

Hidalgo Co.: 19 March 1961. At the Santa Ana National Wildlife Refuge, a female was observed to oviposit on Texas ebony, *Pithecellobium flexicaule* (Benth.) Coulter. The skipper was not captured, but careful examination of twigs from this shrub yielded 12 eggs deposited on leaves, deep in the foliage near the trunk. A few twigs, together with a potted plant from a local nursery, were transported to the laboratory. First instar larvae readily ate the juvenile leaves of this plant. Unfortunately, only a few such leaves were brought to the laboratory and all larvae died before completing the first instar.

It is significant that *toxeus* is well established in areas where *P. flexicaule* is not found. This would indicate that other legumes such as mesquite, *Prosopis glandulosa* Torr., or huisache, *Acacia farnesiana* (L.), may also be acceptable to egg-laying *toxeus* females.

The writer has collected *toxeus* in three other Texas counties: Bexar (1956, month & day not recorded); Live Oak (8 Oct. 1961); San Patricio (10 Sept. 1960, 22 Oct. 1960, 7 Oct. 1961, 2 Sept. 1962, 11 Nov. 1962, 6 July 1963, 15 Sept. 1963, and 12 Oct. 1963). One female collected by Roy W. Quillin 16 September 1961 at San Antonio, Bexar County, was examined by the writer. Freeman (1951) recorded it from San Antonio, Bexar Co., October; McAllen, Hidalgo Co., February; Pharr, Hidalgo Co., March, April, September, October, and November; Corpus Christi, Nueces Co., October; and Laredo, Webb Co., June. Bexar County seems to be its northern limit.

Urbanus proteus Linnæus. The long-tailed skipper has been recorded from only a few counties in Texas. This may be a result of insufficient collecting. U. proteus seems to prefer cultivated beans as a larval food plant. It would therefore seem best to look for it around city vegetable gardens. Commercial bean crops may receive insecticides periodically, which, no doubt, would have a bearing on the abundance of proteus. It flies from June to December with July, August, and September representing the greatest numbers. Three local larval food plants are: Phaseolus limensis Macf., Phaseolus vulgaris L., and Clitoria ternata L.<sup>6</sup>

Bexar Co.: 19 August 1956. In San Antonio, two larvae were found in leaf nests on lima beans, *P. limensis.* Both larvae pupated 29 August and adults emerged 8 September. On 9 October 1956, an egg-laying female was collected in the laboratory garden. Confined over *P. vulgaris* twigs it deposited numerous eggs which started hatching 14 October. The first larva pupated 4 November. Immatures were preserved and 24 adults emerged from 27 November to 26 December. Again, 13 July 1957, larvae were present on *P. vulgaris* in the laboratory garden. Some were collected for preserving. On 8 August eggs were found and 19 August more larvae

<sup>&</sup>lt;sup>6</sup> The last named plant determined by Dr. B. L. Turner, University of Texas.

observed. Sixteen eggs were counted on 21 September 1957. Although a few larvae were reared through from time to time, exact emergence dates were not recorded.

Early in 1963, *C. ternata* was planted in the laboratory garden as an ornamental. It was a pleasant surprise to see egg-laying females visit this plant on 9, 11, & 16 June. Soon thereafter larvae were present and feeding on the foliage when not resting in their leaf shelters. They were observed in their unprotected location, but one by one paper wasps (*Polistes*), and perhaps birds, took them.

Chioides catillus albofasciatus (Hewitson). The white-striped long tail is common in the lower Rio Grande Valley of Texas where it has been taken each month of the year. Based on present life history knowledge, an immature diapause is not indicated. It may be found around the edge of wooded areas where its larval food plants grow.

Freeman (1951) collected *albofasciatus* in June at Alpine, Brewster County. André Blanchard (*in litt.*) collected it in Brazoria County 8 & 10 June 1961 and in Harris County 28 September 1957. The writer collected adults in Bexar County 25 & 31 August 1957, 27 April and 14 September 1958, and 22 March 1959. W. A. Pluemer, formerly of San Antonio, Texas, collected a badly damaged specimen 11 October 1959 at Helotes also in Bexar County; no more specimens have been collected or seen in the county since.

Comstock & Garcia (1961) found larvae in Mexico feeding on *Tephrosia* sp. They also illustrate the mature larva and pupa. Three larval food plants from Texas are here recorded: *Phaseolus atropurpureus* DC., *Rhynchosia minima* (L.) DC., and *Tephrosia lindheimeri* (Gray) Kuntze (all Leguminosae).

Cameron Co.: 18 October 1963. Along a railroad in NW Brownsville, adults were found flying in good numbers. While the writer searched for immatures, his companions, Mrs. Kendall and Dr. J. W. Tilden, collected adults. A female was observed to oviposit on *P. atropurpureus* growing in a fencerow. After netting the insect, examination disclosed several larvae in leaf nests on the plant. Larvae were also found on *R. minima* nearby. Of 19 larvae collected, 13 were preserved. Pupation of the others occurred from 23 October to 7 November except for two which died. Adults emerged: 8 Nov.  $(1 \ g)$ , 18 Nov.  $(1 \ g)$ , 20 Nov.  $(1 \ g)$ , and 26 Dec.  $(1 \ g)$ . Two gravid females collected 18 October deposited 236 ova on *R. minima* and *P.* 

Two gravid females collected 18 October deposited 236 ova on R. minima and P. atropurpureus from 20–30 October. Eggs started hatching within a few days and larvae fed until a freeze killed the food plant in mid-December. Seven larvae had matured enough to pupate by 1 January 1964, five more by 16 January, two more by 18 January, and one 22 January. All the remaining larvae appeared to be in various stages of malnutrition and were preserved. Three of the pupae were provided for chromosome counts. Of the remainder, some were kept in the laboratory, others left outdoors. None survived.

In their natural habitat, larval growth would no doubt have been retarded by lowered nonfreezing temperatures, with feeding possibly taking place on warm days when local temperature exceeded  $60^{\circ}$  F. The length of the pupal period would also be influenced by temperature. In this way a few could emerge from time to time, with the main flight following in mid-March.

A return visit to the county 29 March 1964 found adults flying on Padre Island near Port Isabel and elsewhere. Larvae and eggs were found on *R. minima*. Eight larvae were collected, and pupation occurred from 25 April to 4 May. Adults emerged: 10 May (1 &), 12 May (1 &), 13 May  $(1 \heartsuit)$ , 14 May (1 &), 15 May (1 &), 17 May  $(2 \heartsuit \heartsuit)$ , and 18 May  $(1 \heartsuit)$ .

Hidalgo Co.: 23 October 1960. On U. S. Highway 281 near San Manuel, one larva was found in a leaf nest on *T. lindheimeri*. Another larva was found the following day in the same general area on this plant. Sufficient food plant was kept under refrigeration to rear them through. One larva stopped feeding 4 November, pupated 7 November, and a male emerged 28 November. The other larva stopped feeding 6 November, pupated 8 November, and a male emerged 29 November 1960.

Jackson Co.: 4 June 1961. Mr. & Mrs. André Blanchard took the writer and Mrs. Kendall to one of their favorite collecting spots on Carancahua Creek near the village of Francitas. A female *albofasciatus* was observed to oviposit on *R. minima* which was abundant in the area. The female deposited 41 eggs under laboratory conditions and two which were recovered in the field. Eggs are deposited on the underside of terminal leaves. Hatching started 7 June. Twenty-one larvae pupated between 4–10 July. Twelve males and six females emerged: 13 July (1 $\delta$ ), 15 July (5 $\delta$  $\delta$ ), 16 July (2 $\delta$  $\delta$ ), 17 July (1 $\delta$ , 1 $\varphi$ ), 18 July (1 $\delta$ , 1 $\varphi$ ), 19 July (1 $\delta$ , 1 $\varphi$ ), 20 July (1 $\delta$ ), and 21 July (3 $\varphi$  $\varphi$ ). Representative specimens of the life history were preserved.

*Epargyreus clarus clarus* (Cramer). The silver spotted skipper is at times common in Texas, in certain locations around its larval food plants. The species flies from March to September, with June, July, and August the best months to find it. This skipper is well adapted to metropolitan living because several of its most acceptable larval food plants are grown as ornamentals. Two larval food plants are known from Texas: *Wisteria sinensis* (Sims) Sweet and *Robinia pseudo-acacia* L. Wild females have been observed to oviposit on *Erythrina herbacea* L. and *Rhynchosia minima* (L.) DC. in nature, but the larvae will not eat these plants.

Bexar Co.: Because this insect is so common in the laboratory garden at San Antonio, little attention has been given to rearing it. Although it has been reared and its life history preserved, few emergence records have been made. It is significant to record dates on which females have been observed to oviposit on *W. sinensis* in the laboratory garden: 17 June 1956, 14 June 1958, 15 Apr. and 18 Sept. 1960, 2 July 1962, and 25 May 1963. Larvae have been observed: 8 June and 14 July 1958, 24 Oct. 1959, 14 & 28 May and 1 Oct. 1960, 26 Aug. 1961, 21 July 1962, 2 July and 4 Aug. 1963. The greatest number of adults seen at one time was 13, 1 July 1962, feeding on blossoms of buttonbush, *Cephalanthus occidentalis* L.

On 16 July 1960 Roy W. Quillin of San Antonio reported seeing females oviposit on E. herbacea which grows as an ornamental in his yard. An examination of this plant disclosed a number of eggs of *clarus* on the leaves; some were collected and taken to the laboratory for study. First instar larvae would not sample the leaves of this plant.

In the laboratory garden, females were observed to oviposit on *Rhynchosia minima*, 10 July, 13 July, and 7 September 1963. Numerous ova were to be found on the foliage of this plant. First instar larvae would notch the leaf and fashion a shelter, but then die. A few would venture out for one or two more feedings. Apparently this plant is toxic to *clarus* larvae.

Smith Co.: 3 September 1960. Near Tyler, five larvae were found on *R. pseudo-acacia*. They pupated in due course but died before 1 February 1961 due to dehydration. For best results, pupae of *clarus* should be left outdoors, on the ground in their leaf nests. Adults emerge in March from pupal diapause.

Amaranthus caudatus   Pholisora catullus     Amaranthus retroflexus   Pholisora catullus     Amaranthus spinosus   Pholisora catullus     Cannaceae   Canna indica   Calpodes ethlus     Chenopodiaceæ   Chenopodium album   Pholisora catullus     Staphylus mazms   Staphylus mazms     Chenopodium anbrosioides   Pholisora catullus     Chenopodium ambrosioides   Pholisora catullus     Chenopodium ambrosioides   Pholisora catullus     Chenopodium ambrosioides   Pholisora catullus     Guercus fusiformis   Erynnis horatius     Quercus gambelii   Erynnis horatius     Quercus laurifolia   Erynnis horatius     Quercus sultarifolia   Erynnis horatius     Quercus sultarif   Erynnis horatius     Quercus sultarifolia   Erynnis horatius     Quercus stellata   Erynnis horatius  <	Plant Family	Plant Species	Lepidoptera
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Chenopodiaceæ   Chenopodium album   Pholisora catullus     Staphylus mazans   Chenopodium ambrosioides   Staphylus mazans     Fagaceæ   Quercus fusiformis   Erynnis horatius     Quercus fusiformis   Erynnis horatius     Quercus gambelii   Erynnis horatius     Quercus laurifolia   Erynnis horatius     Quercus narilandica   Erynnis horatius     Quercus narilandica   Erynnis horatius     Quercus sugara   Erynnis horatius     Quercus stellata   Erynnis horatius     Quercus texana   Erynnis horatius     Quercus texana   Erynnis horatius     Quercus stellata   Cogrades aurantiaca     Coga des aurantiaca   Cogia h. oratis     Cours stellata   Cogia h. oratis     Quercus stellata   Cogia h. oratis     Staphylas   Staragalus nuttallianus   Thorybes bathyllus     Leguminosæ   Acacia hirta   Cogia h. oratis     Acacia hirta   Cogia h. ora	Cannaceæ	Canna indica	Calpodes ethlius
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		Rhynchosia minima	Chioides c. albofasciatus

# CHART OF LARVAL FOOD PLANTS

Plant Family	Plant Species	Lepidoptera
	Rhynchosia texana	Thorybes pylades
Leguminosæ	Robinia pseudo-acacia	Epargyreus c. clarus
	Tephrosia lindheimeri	Chioides c. albofasciatus
	Wisteria sinensis	Epargyreus c. clarus
Malvaceæ	Abutilon abutiloides	Heliopetes laviana
		Systasea pulverulenta
	Abutilon incanum	Celotes nessus
		Heliopetes laviana
		Systasea pulverulenta
	Abutilon wrightii	Systasea pulverulenta
	Althaea rosea	Celotes nessus
		Pyrgus c. communis
	Callirhoe leiocarpa	Pyrgus c. communis
	Malvastrum americanum	Heliopetes laviana
	Malvaviscus drummondii	Heliopetes macaira
	Sida filicaulis	Pyrgus c. communis
	Sida filipes	Celotes nessus
		Heliopetes laviana
	Sida lindheimeri	Pyrgus c. communis
	Sida rhombifolia	Pyrgus c. communis
	Sphaeralcea angustifolia	Pyrgus c. communis
		Systasea pulverulenta
	Sphaeralcea cuspidata	Pyrgus c. communis
	Sphaeralcea lindheimeri	Pyrgus c. communis
	Sphaeralcea lobata	Celotes nessus
	Wissadula amplissima	Celotes nessus
		Systasea pulverulenta
	Wissadula holosericea	Heliopetes laviana
		Systasea pulverulenta
Rutaceæ	Zanthoxylum fagara	Achlyodes t. tamenund

CHART OF LARVAL FOOD PLANTS (Continued)

Other Texas counties in which the writer has collected *clarus* are: Comal, 21 July 1963; Polk, 14 April 1962. Mr. André Blanchard (*in litt.*) reports collecting it 10 June 1961 in Brazoria County. Here its larval food plant could be *Gleditsia triacanthos* L.

### Acknowledgments

I would like to express my appreciation for the valued botanical determinations of Fred B. Jones, Dr. C. H. Muller, Dr. B. L. Turner, and Dr. B. H. Warnock. Special consideration is also given to Dr. John M. Burns and H. A. Freeman for making or confirming determinations of certain lepidopterous species. To Dr. Clarence Cottam, Director, Welder Wildlife Foundation, I am especially grateful for the many courtesies and services rendered by him and his staff in connection with field stud-

ies. And to my good wife, Conway A. Kendall, who accompanied me on all field trips and who rendered invaluable laboratory assistance in conducting the numerous rearings, I am greatly indebted.

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# STATUS OF AGRAULIS VANILLAE IN MISSOURI AND KANSAS

The recent article (Jour. Lepid. Soc., 17: 227–228, 1964) by Richard D. Turner regarding Agraulis vanillae (L.) in Missouri was of interest. Its author arrived at the conclusion that simply because vanillae happened to be quite abundant on Passiflora at Green Ridge, Missouri, for several successive summers that the butterfly had successfully survived the winter in the area. Unfortunately this is a conclusion reached by the author who overlooked the fact that A. vanillae is a migratory species in both Missouri and Kansas. Females traveling from much farther south (the Gulf or the tropics?) reach this latitude in sporadic numbers during June and July. Since Passiflora does come up from the roots in this area by late spring, a wandering female, if she happens to be passing through the area and accidentally locates such a vine, will indeed cover its leaves with eggs. Caterpillars are subsequently pro-