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Seasonal and Diurnal Distributions of Adult Female HORSE FLIES (DIPTERA, TABANIDAE) at Gold Hill, Alabama

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CONTENTS

SUMMARY

Horse flies (*Tabanus* spp. L.) and a few closely related species were studied in 1970 and 1971 at Gold Hill, Alabama, to determine their seasonal and diurnal distribution patterns. Collections showed horse flies were active from early May to mid-October, with peak activity from mid to late June. Activity was slight early in the morning but gradually increased from mid-morning until near dark when activity generally ceased. Twenty-nine species of *Tabanus* and five species of relatively uncommon tabanids were collected. *Tabanus fulvulus* Wiedemann and *T. pallidescens* Philip were the most abundant species collected.

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Information contained herein is available to all regardless of race, color, or national origin.

SEASONAL and DIURNAL DISTRIBUTIONS of ADULT FEMALE HORSE FLIES (Diptera, Tabanidae) at Gold Hill, Alabama

ALTA M. BURNETT and KIRBY L. HAYS[1]

INTRODUCTION

The first records on seasonal distribution and relative abundance of the horse flies (*Tabanus* spp. L.) of North America appeared in the literature in the early 1900's [Hine *(8)*]. The first graphic representation of seasonal distribution of tabanid species was presented by Stone *(21)* in 1930. In 1942 Fairchild *(3)* reviewed the literature pertaining to seasonal distribution of tabanids. Research in this area has increased since the mid 50's [Abbassian-Lintzen *(1)*, Glasgow *(4)*, Hanec and Bracken *(6)*, Judd *(12)*, Smith et al. *(20)*, Thompson *(22)*]. Some reports [Hoffman *(9)*, Pechuman *(18)*] presented data concerning seasonal distribution of species in the southeastern U.S.

Most reports on the diurnal activity of horse flies have been superficial and brief. There are occasional references to the time of hovering, mating, feeding, and flight activities of specific flies as well as tabanids in general [Blickle *(2)*, Jones and Anthony *(10)*, Jones and Bradley *(11)*, Lavigne et al. *(14)*, Mosier and Snyder *(17)*]. A few studies of hourly activity [Haddow and Corbet *(5)*, Harley *(7)*, Miller *(16)*, Roberts *(19)*, Twinn et al. *(23)*] and one graphic presentation of diurnal distribution data [Harley *(7)*] have been reported.

[1] Graduate student and Head, Department of Zoology-Entomology.

This circular is the first report on seasonal distribution and diurnal activity of horse flies in Alabama.

MATERIALS AND METHODS

Four modified Malaise traps [Malaise *(15)*] baited with CO_2 were used to collect adult female horse flies. Each trap was tent-like, ca. 2.6 m (8.5 ft) square, 2.1 m (7 ft) high along the edge, and 2.7-3.0 m (9-10 ft) high at the center. The five legs of the trap were wooden (5.1 x 5.1 cm or 2 x 2 in). Aluminum I-beams (1.8 m or 6 ft long) connected each outer leg with the center leg at ground level and 2.1 m (7 ft) above the ground. A 25.4-cm or 33-cm (10-in or 13-in) wire-spoked wheel was attached horizontally on a steel rod above the center leg. The wire-spoked wheel and the outer legs were all interconnected with soft iron wire to make a sturdy framework, Figure 1.

A canvas top, sprayed with black rubber-base paint, was attached around the wire-spoked wheel by a draw string and was stapled to the four outer legs. To prevent escape of the flies, an outer baffle of green netting (2.6 x 1 m or 8.5 x 3.3 ft) was sewn to the four edges of the top. Aluminum rods (2.6 m or 8.5 ft long) were placed through hems sewn along the free edges of the outer baffles and were nailed to the outer legs about 1.2 m (4 ft) above the ground. Then the vertical edges of the

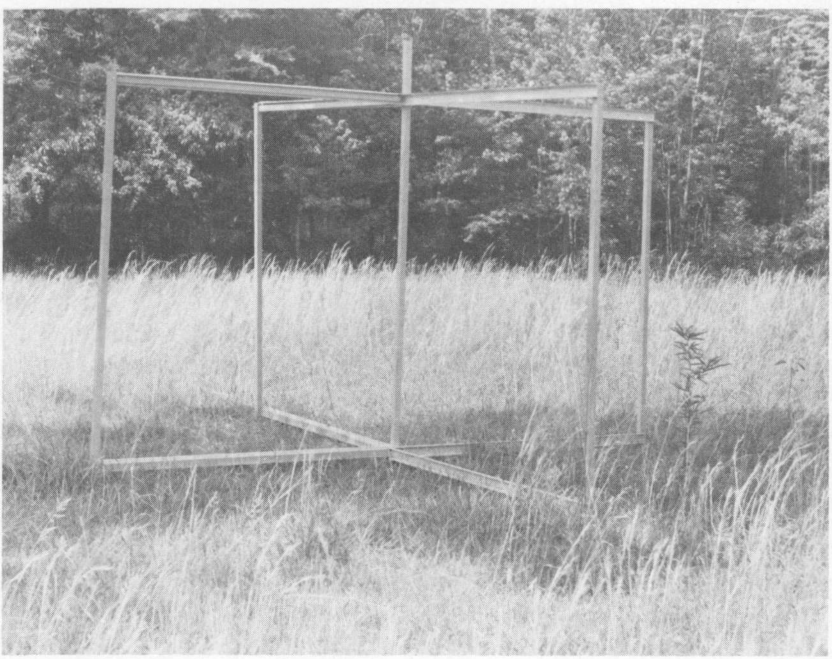


FIG. 1. Framework of modified Malaise trap.

FIG. 2. Modified Malaise trap with canvas top and net baffles.

outer baffles were sewn together. An inner baffle of green netting (2.1 x 1.8 m or 7 x 6 ft) bordered with 5-cm strips of muslin was stapled to a piece of wood nailed to each of the four upper horizontal I-beams, Figure 2.

A cylindrical no-return collecting cage (25.4 cm or 33 cm diameter and 30.5 cm or 1 ft high) was constructed to sit at the top of each trap on a circular piece of plywood wired to the rim of the wire-spoked wheel, Figure 3. The cage had a body of fine-mesh wire screen and a plywood top. An inverted funnel of fiberglass screen inside the cage was held in place with a narrow metal strip bolted around the inside of the cage bottom. A circular door was cut in and hinged to the plywood top, and a swing hook was attached to the cage top. The cage was placed on and removed from the trap with a 3-m (10-ft) aluminum rod curved to fit into the swing hook, Figure 4.

The four traps were placed in a northeast-southwest row, 0.16 km (0.1 mi) apart, in open pasture adjacent to a wooded area containing a beaver swamp and creek. This area was part of the L. E. Ensminger farm at Gold Hill in Lee County, Alabama, which was known to contain high populations of tabanids.

Relative population abundance and seasonal and diurnal activity data were taken by identifying and counting the number of each species of

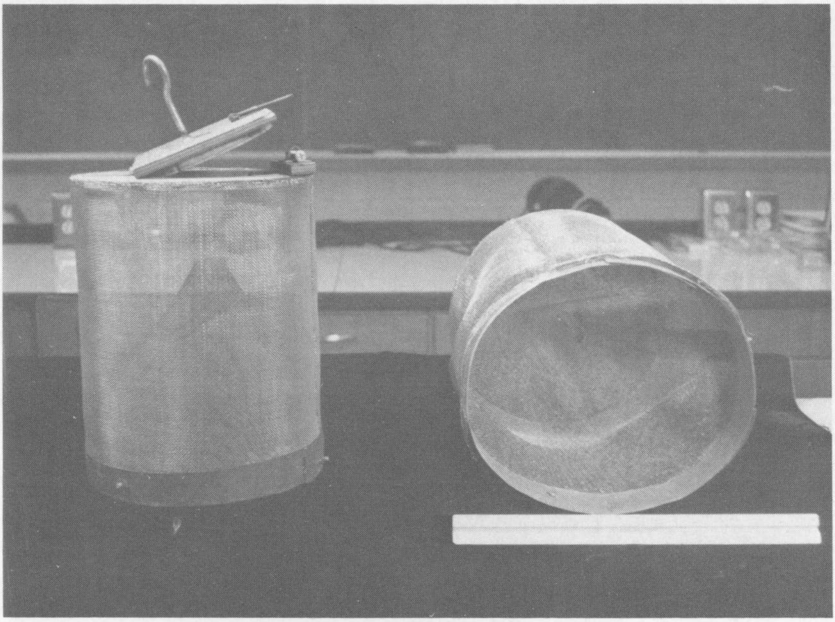


FIG. 3. No-return collecting cage of heavy-gauge screen wire.

horse fly caught in the modified Malaise traps. At the beginning of each work period, the traps were prepared for catching horse flies by lowering and securing the four inner net baffles and by placing a no-return collecting cage on the top. A pressure gauge or flow-meter[1] was attached to a CO_2 cylinder at each trap and regulated for a constant flow of 425 liters/h (15 ft^3/h), as previous research had indicated that this rate most efficiently attracted tabanids [Knox and Hays *(13)*]. The cylinders were replaced every two work days. One 22.7-kg (50-lb, net) cylinder regulated to release CO_2 at the above rate lasted about 32 hours.

Horse flies were attracted to the trap by carbon dioxide released from the cylinder. Immediately after the flies flew into the inner net baffles, they flew upward under the canvas top, crawled through the inverted funnel, and into the no-return collecting cage.

This trapping phase of the study was conducted from May 22 to October 7, 1970, and from May 11 to October 7, 1971. Additional trapping was conducted with unattended traps for 4 weeks before the start and 1 week after the end of the data collection period, to define more clearly the limits of the active horse fly season. In 1970 traps were operated 1 day per week during the early and late season, i.e., May, September, and October. During June, July, and August 1970,

[1] Smith Welding Equipment, Div. of Tescom Corp., Minneapolis, Minn.

FIG. 4. Complete Malaise trap. Dr. Burnett shows how a rod was used for removing and replacing the no-return collecting cage.

and during the entire 1971 season, traps were operated 2 days per week.

Trap operation generally corresponded to photoperiod. Trapping operations started about sunrise and ended at sunset. As a result, the daily trapping period was 14 hours per day until late August, when it was shortened to 13 hours per day. In late September the trapping period was shortened to 12 hours per day.

During the trapping period, collecting cages were removed at 1-hour intervals and replaced with empty cages. The flies were killed by placing each cage in a plastic bag containing a piece of cotton saturated with chloroform. Dead flies were placed in plastic bags indicating trap number, collection time, and date. Collected flies were stored in a freezer until removal for identification. All flies were identified using Watson's *(24)* key to the Alabama Tabanidae.

While the primary daily collection period occurred during daylight, trap operation was continued throughout the night to detect nocturnal activity of horse flies. For this nocturnal phase however, the traps were not monitored each hour. Instead, collecting cages were installed on the traps at sunset and removed the following morning.

RESULTS AND DISCUSSION

Relative Abundance

The species of adult female horse flies collected at Gold Hill, Alabama, during 1970 and 1971 are listed in Table 1. Seasonal abundance for each year is presented as the total catch per year for each species; relative abundance is presented as a percentage of the total seasonal catch. In 1970, 6,332 flies of 31 species were captured in 20 work periods of 31 days, or 459 hours of actual collection time; in 1971, 19,877 flies of 33 species were captured in 22 work periods of 43 days, or 598 hours of actual collection time.

In 1970 the species most commonly caught was *Tabanus fulvulus* Wiedemann, while in 1971 it was *T. pallidescens* Philip. Together

TABLE 1. SPECIES OF ADULT FEMALE HORSE FLIES COLLECTED AT GOLD HILL, ALABAMA, MAY-OCTOBER, 1970 AND 1971

Species	Number collected		Percent of total	
	1970	1971	1970	1971
Tabanus fulvulus Wiedemann, 1828	1,794	4,403	28.33	22.15
T. pallidescens Philip 1936	1,125	8,668	17.76	43.60
T. melanocerus Wiedemann 1828	793	1,288	12.52	6.47
T. lineola Fabricius 1794	630	976	9.94	4.91
T. petiolatus Hine 1917	593	902	9.36	4.53
T. trimaculatus Palisot de Beauvois 1806	262	981	4.13	4.93
T. sackeni Fairchild 1934	206	167	3.25	0.84
T. sparus Whitney 1879	201	743	3.17	3.73
T. nigripes Wiedemann 1821	127	398	2.00	2.00
T. moderator Stone 1938	104	143	1.64	0.71
T. sulcifrons Macquart 1855	88	109	1.38	0.54
T. sublongus Stone 1938	74	79	1.16	0.39
T. nigrescens Palisot de Beauvois 1809	71	69	1.12	0.34
T. aranti Hays 1961	41	118	0.64	0.59
T. maculipennis Wiedemann 1828	27	17	0.42	0.08
T. americanus Forster 1771	26	15	0.41	0.07
T. fairchildi Stone 1938	24	49	0.37	0.24
T. pumilus Macquart 1838	23	358	0.36	1.80
Leucotabanus annulatus (Say) 1823	20	11	0.31	0.05
T. molestus Say 1823	18	104	0.28	0.52
T. gladiator Stone 1935	15	25	0.23	0.12
T. turbidus Wiedemann 1828	13	41	0.20	0.20
T. molestus mixis Philip 1950	11	34	0.17	0.17
T. calens Linnaeus 1758	10	12	0.15	0.06
Hybomitra trispila (Wiedemann) 1828	10	67	0.15	0.33
T. atratus Fabricius 1775	9	5	0.14	0.02
T. superjumentarius Whitney 1879	8	76	0.12	0.38
T. coarctatus Stone 1935	3	6	0.04	0.03
T. wiedemanni Osten Sacken 1876	2	1	0.03	0.01
Chlorotabanus crepuscularis (Bequaert) 1926	2	5	0.03	0.02
T. subsimilis Bellardi 1859	1	2	0.01	0.01
T. abdominalis Fabricius 1805	1		0.01	
Whitneyomyia beatifica (Whitney) 1914		2		0.01
H. cincta (Fabricius) 1794		2		0.01
T. longiusculus Hine 1907		1		0.01
Totals	6,332	19,877		

these two species represented about 46 percent of the 1970 catch and about 66 percent of the 1971 catch, and were the most abundant horse flies in the research area. The six most abundant species of horse flies represented about 85 percent of the total seasonal catch each year. Some of the remaining species were quite rare. Some species caught only during 1 of the 2 years were probably present in small numbers during the other year.

Seasonal Distribution and Abundance

The seasonal distributions of the total horse fly populations for both 1970 and 1971 are presented in Figure 5. The seasonal distributions for populations of each of those species represented by a total catch of more than 10 are presented in Figure 6. In both figures the catch is

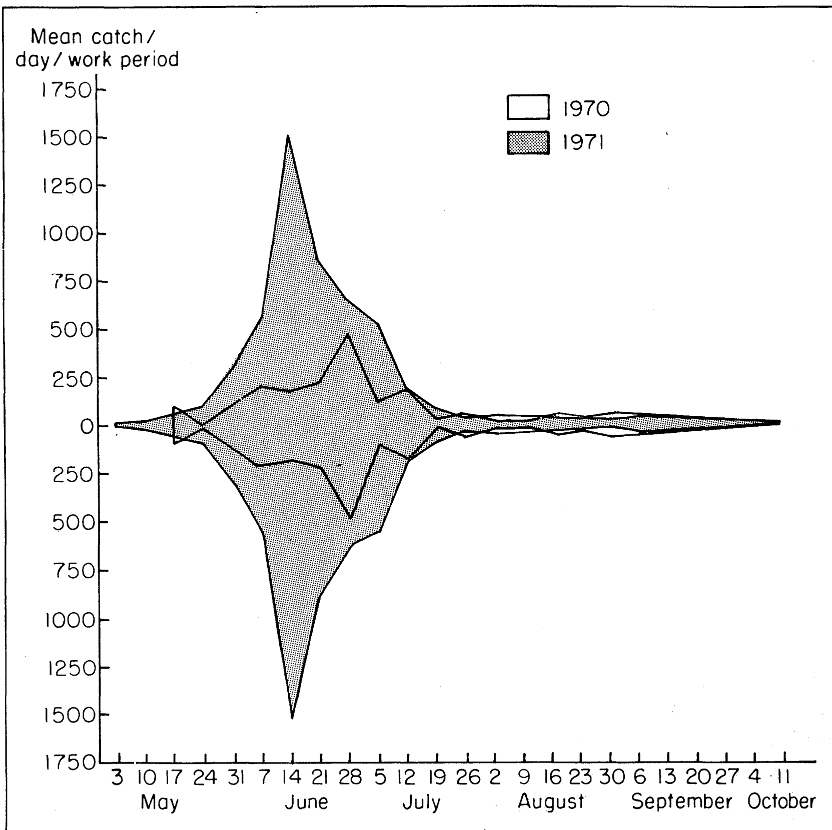


FIG. 5. Seasonal distribution of the total adult female horse fly population at Gold Hill, Alabama, 1970 and 1971.

presented as a mean number of flies collected per day for each work period.

Horse flies were collected at the research site throughout the trapping period (early May to mid-October). Combined data for all populations, Figure 5, show that the total populations were small in early May but began increasing in late May. As the season progressed, the total populations increased rapidly and peaked during the week of June 28 in 1970, and the week of June 14 in 1971. The greatest number of species was on wing near the seasonal peak both years. Following these peaks, the number of both species and individuals declined slowly until the end of the trapping season, even though a few species did not appear until late August.

An analysis of the data on individual species, Figure 6 indicated that few individuals and few species were active during the early weeks of the trapping season. In 1971 *T. lineola* Fabr., *T. pumilus* Macquart, and *T. trimaculatus* Palisot de Beauvois were the first species to become active. An accurate determination of early horse fly activity for 1970 was prevented by a later initial trapping date.

Most species had short, well-defined flight seasons; however, some species, e.g., *T. lineola* and *T. nigripes* Wiedemann, were active throughout the entire season. Most species had similar seasonal activity peaks in both 1970 and 1971. The order of appearance and disappearance was similar both years. The variation in time of appearance and disappearance was 2 weeks or less for all species. The species active in October in either year were *T. atratus* Fabr., *T. lineola, T. nigripes, T. sackeni* Fairchild, *T. sulcifrons* Macquart, and *T. gladiator* Stone.

Diurnal Distribution

All species of horse fly had low flight activity from 5:00 to 9:00 a.m. (CST). Total activity increased during the day and usually appeared greatest during the 2 to 3 hours before dark. Data analysis indicated however that the mean catch per hour per trap was fairly uniform in late morning through early evening hours ($p < 0.05$).

The mean catch per hour per trap for 1970 and 1971 combined, for those species represented by a total catch of more than 10, is presented in Fig. 7. Many species, such as *T. aranti* Hays, *T. lineola, T. melanocerus* Wiedemann, *T. petiolatus* Hine, *T. pallidescens,* and *T. trimaculatus,* were active throughout the day.

Of these species, *T. melanocerus* had no definite diurnal peak of activity. *Tabanus aranti* had a mid-morning peak of activity, and *T. trimaculatus* had an early afternoon peak of activity. *Tabanus lineola, T. petiolatus,* and *T. pallidescens* had late afternoon activity peaks. Many species, such as *T. fairchildi* Stone, *T. gladiator, T. nigripes, T. pumilus, T. sparus* Whitney, and *T. sublongus* Stone, were active mostly in the afternoon and early evening hours. *Tabanus molestus* Say, *T. molestus mixis* Philip, *T. moderator* Stone, and *T. turbidus* Wiedemann had distinct activity peaks 1 or 2 hours before dark, but also were collected from the traps during the early morning hours. Apparently the morning catch resulted primarily from residual flies remaining under the traps during the night.

Mosier and Snyder *(17)*, however, reported flight activity of *T. turbidus* 2 hours after sunrise in Florida. Individuals of this species occasionally were observed flying around the research vehicle between 5:00 and 7:00 a.m. (CST) at Gold Hill. Thus this fly exhibited some early morning activity. *Tabanus sackeni* Fairchild was active mostly in the early evening but was collected in small numbers throughout the day. *Tabanus maculipennis* Wiedemann was not collected during the hour before dark. *Chlorotabanus crepuscularis* (Bequaert) was always crepuscular and was collected only during the hour before dark.

Although many of the species were collected at night during the work periods, observations and actual counts indicated that these horse flies were under the traps before dark, and entered the collecting cages before work began the next morning. Additional night work performed on June 24, July 9, August 13, September 13 and 29, 1971, produced catches only the first two nights. *Tabanus turbidus* was the only horse fly collected during hours of complete darkness.

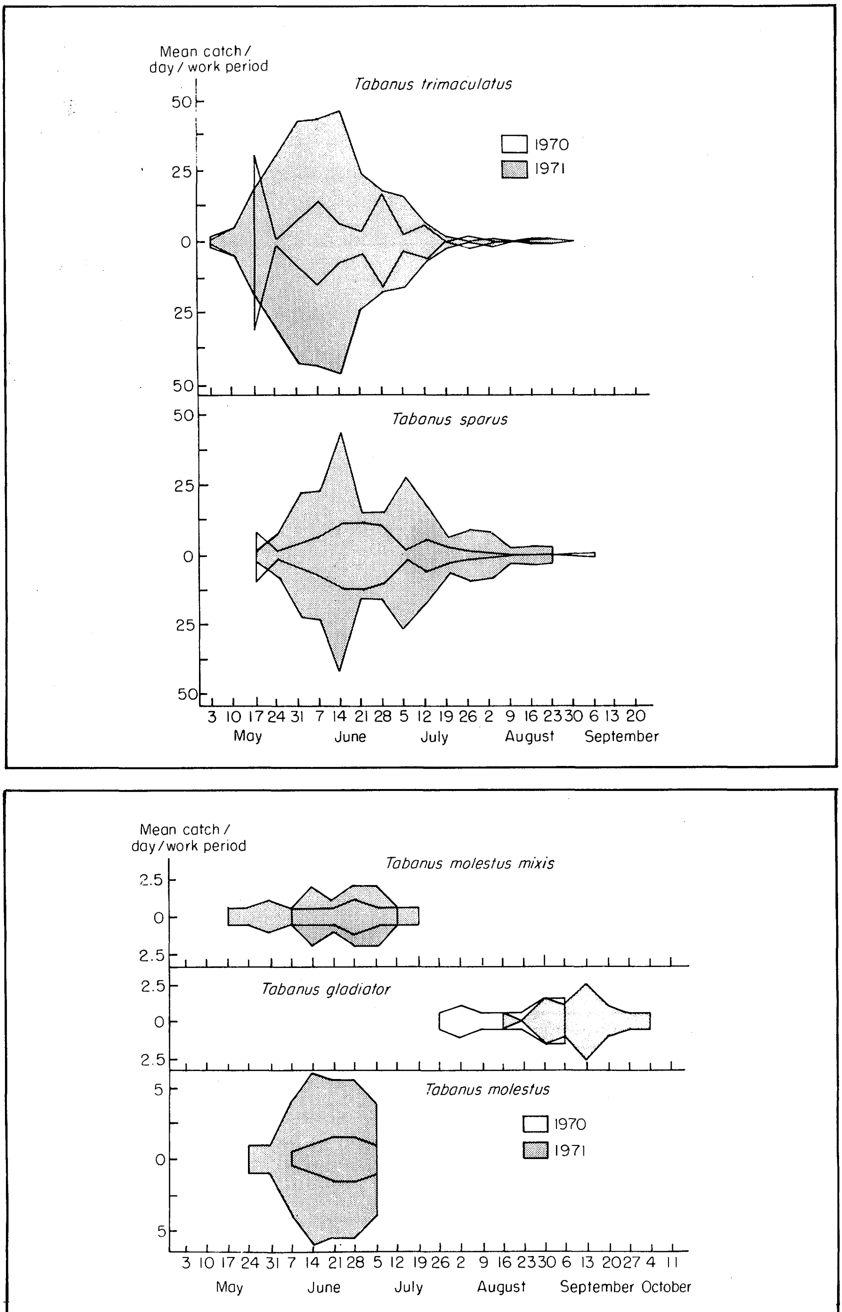
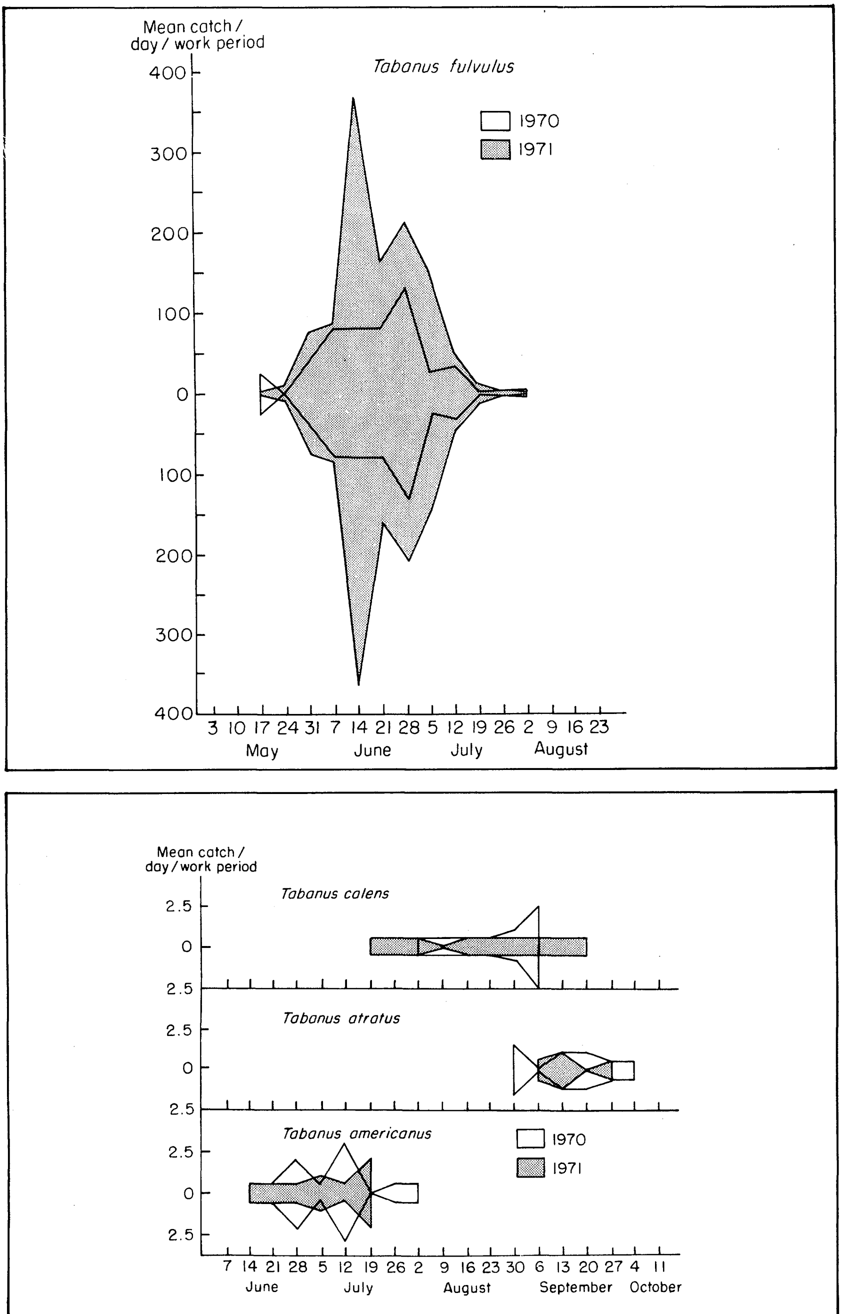


FIG. 6. Seasonal distribution of species of adult female horse flies collected at Gold Hill, Alabama, 1970 and 1971.



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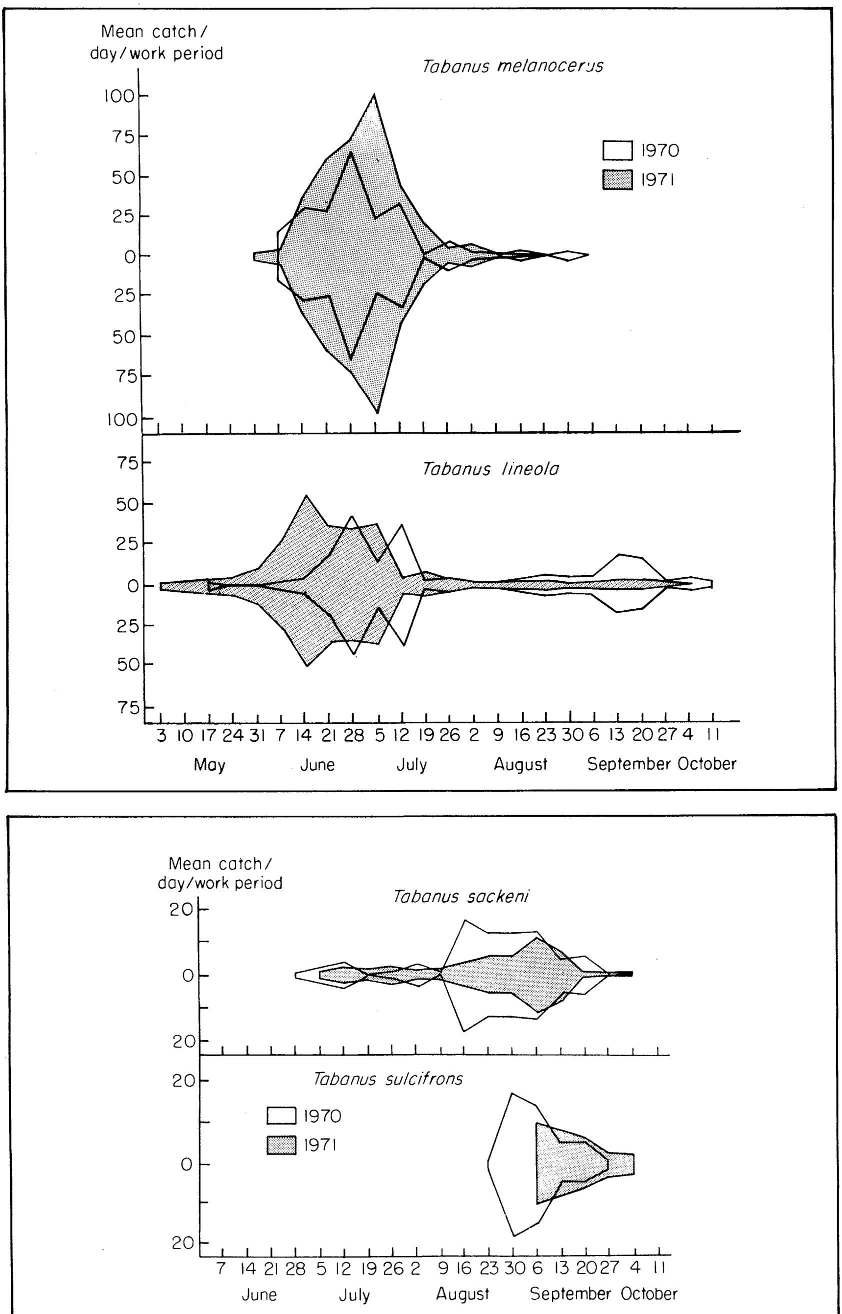

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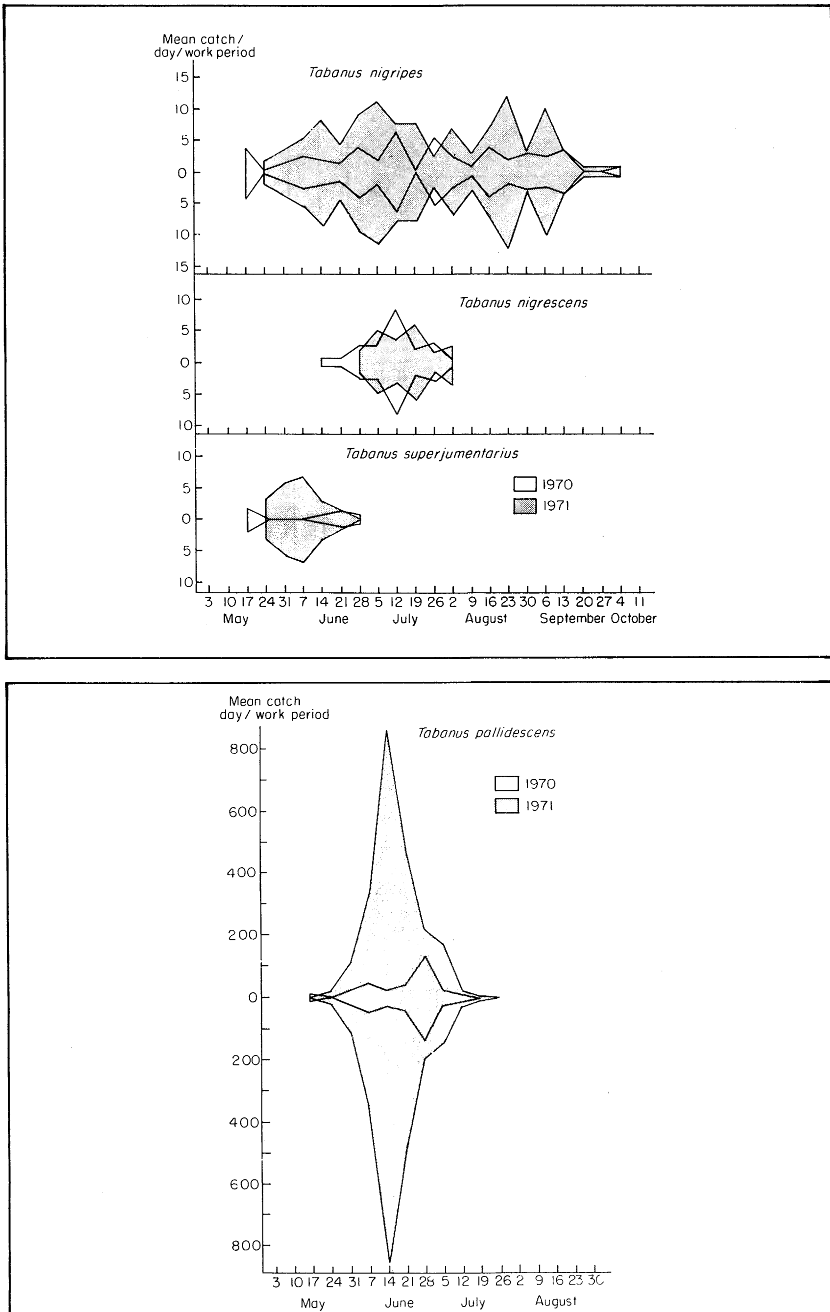

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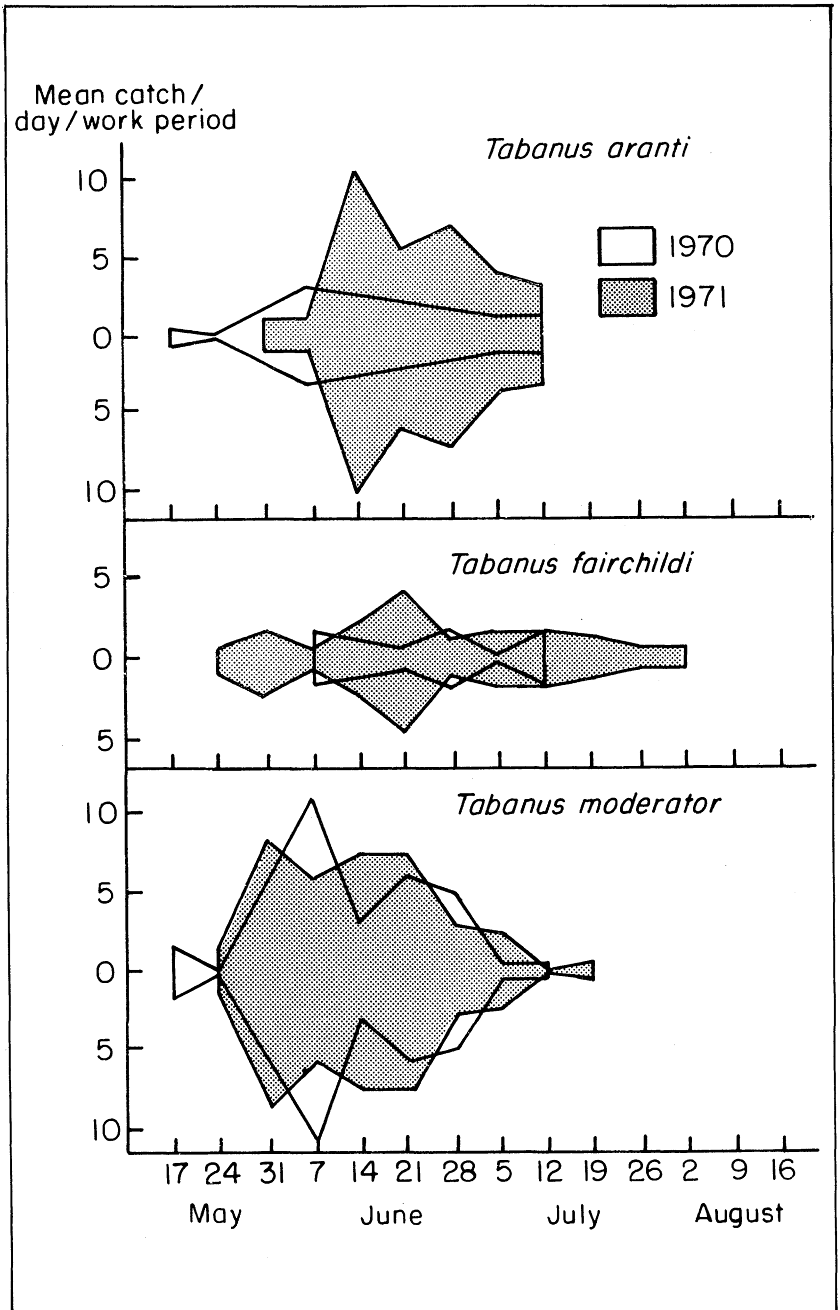

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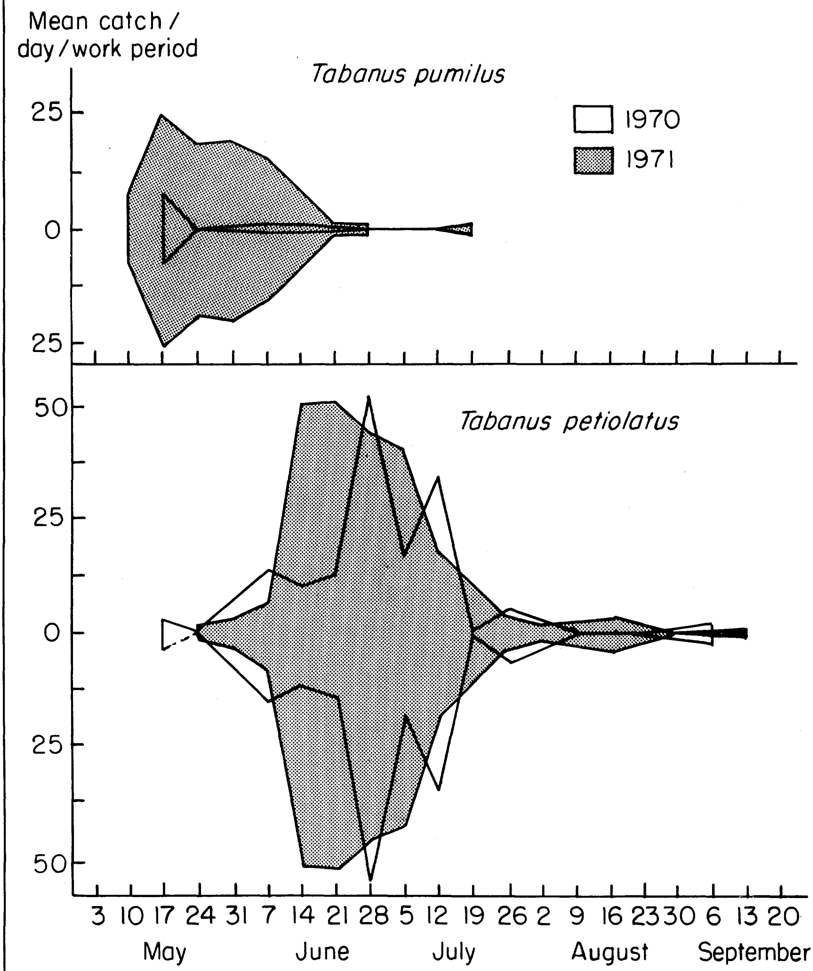

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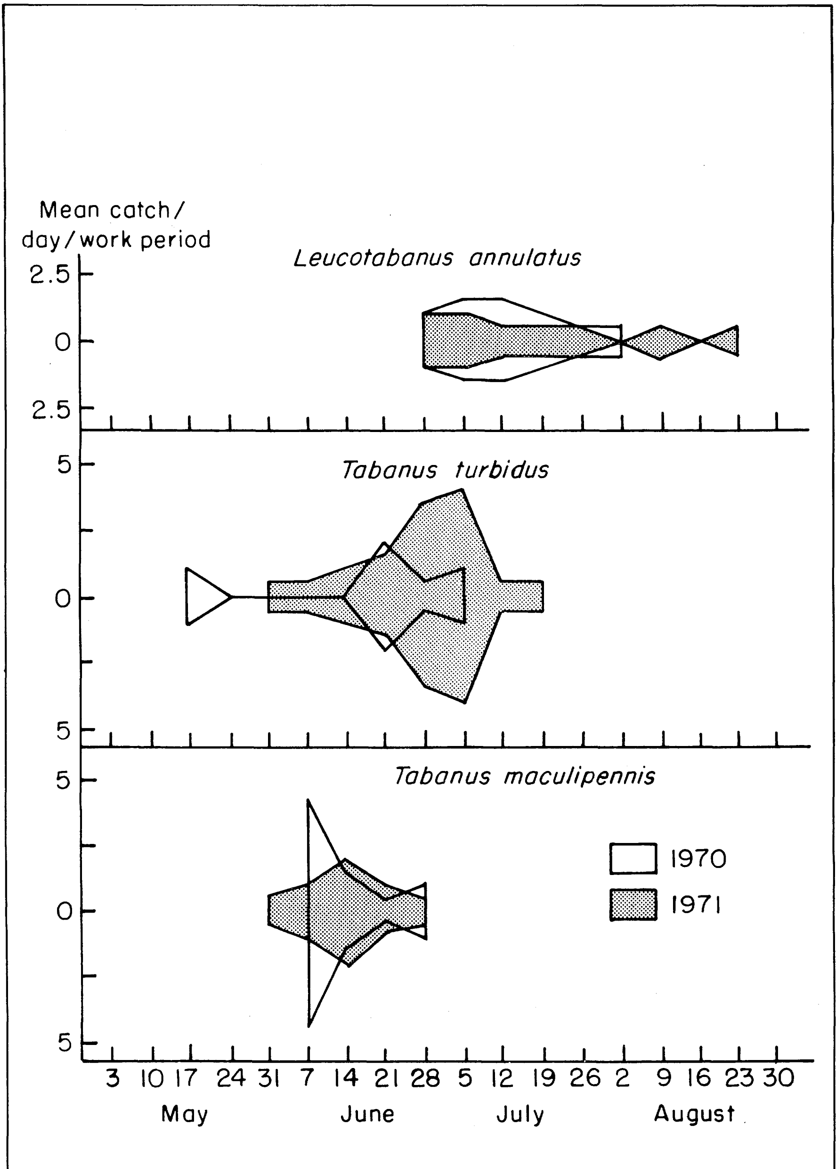

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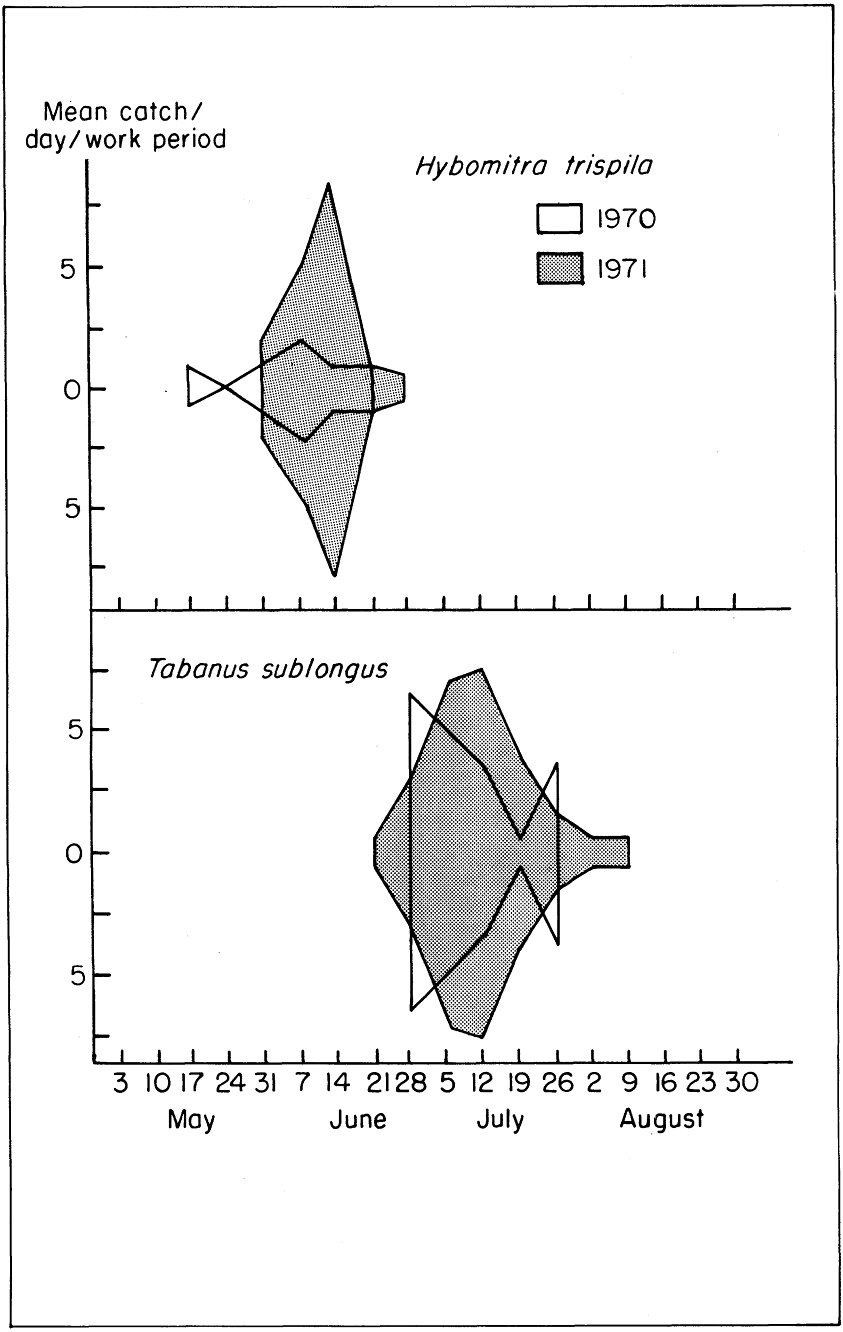

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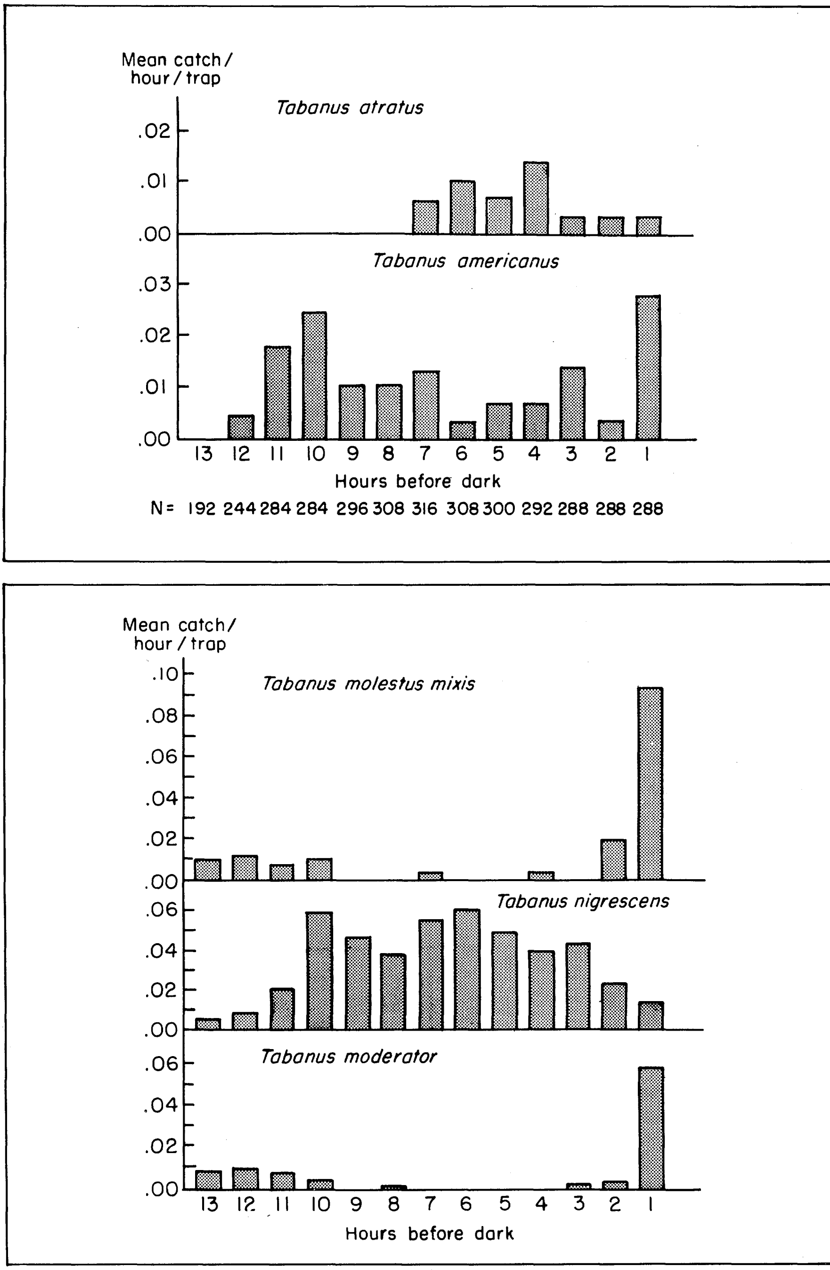
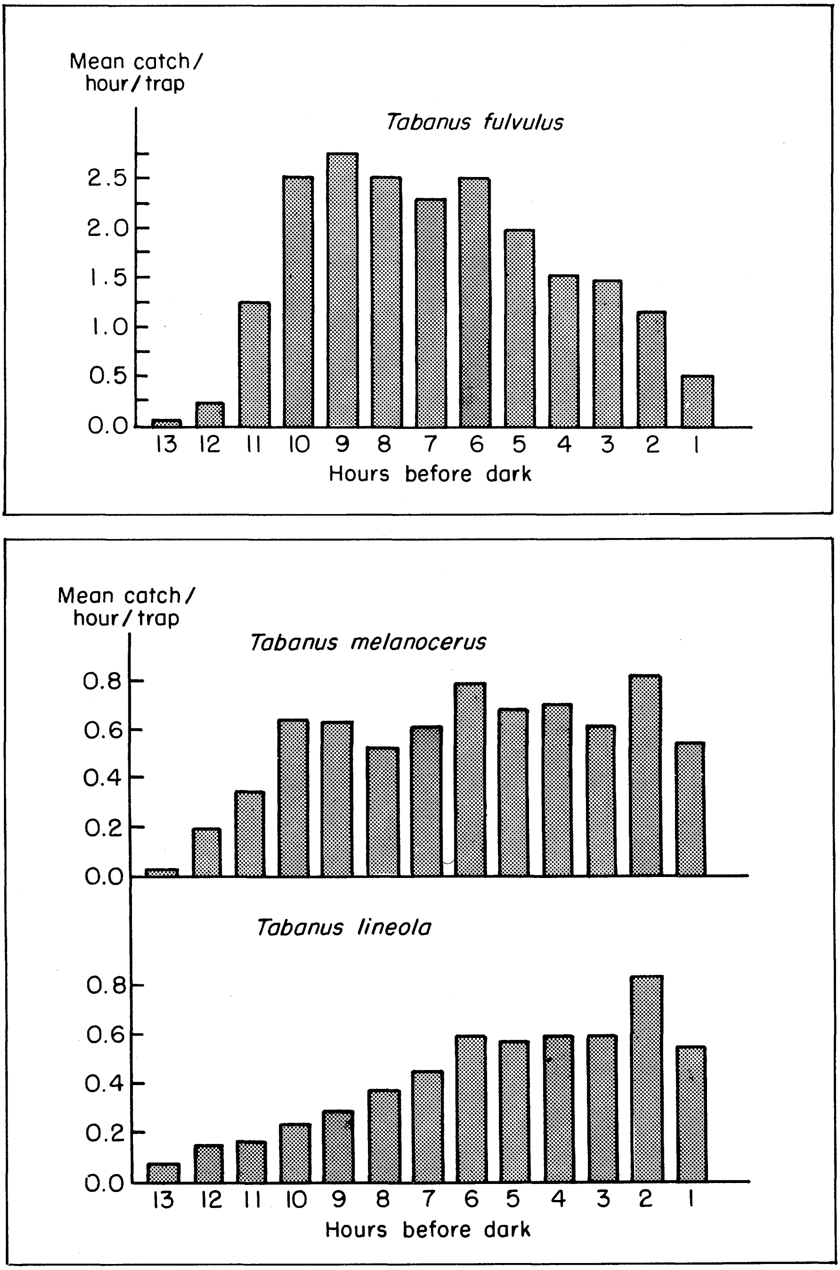


FIG. 7. Diurnal distribution of species of adult female horse flies collected at Gold Hill, Alabama, 1970 and 1971 combined. The N values below the abscissa represent the number of observations per hour. To obtain the total number of flies collected per hour, multiply N by the mean for the hour.



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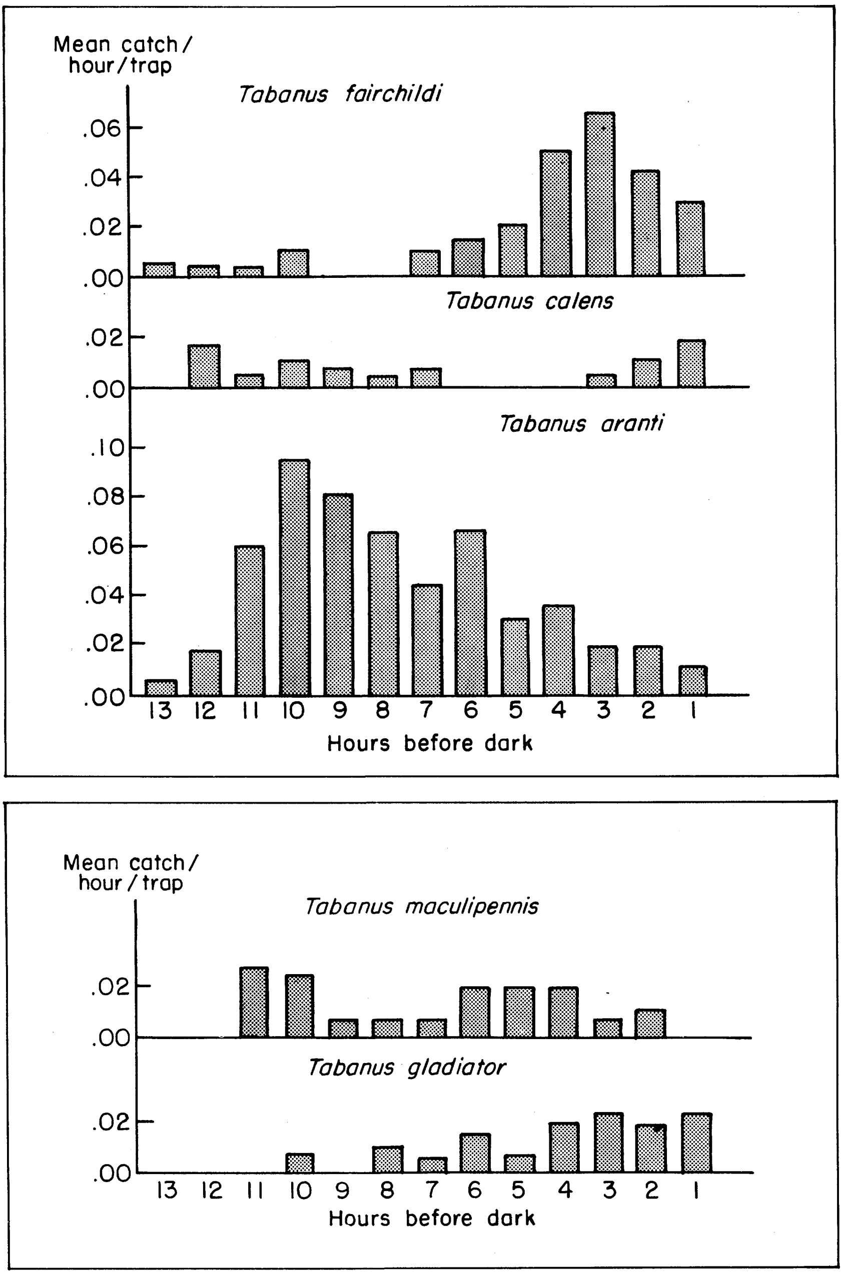

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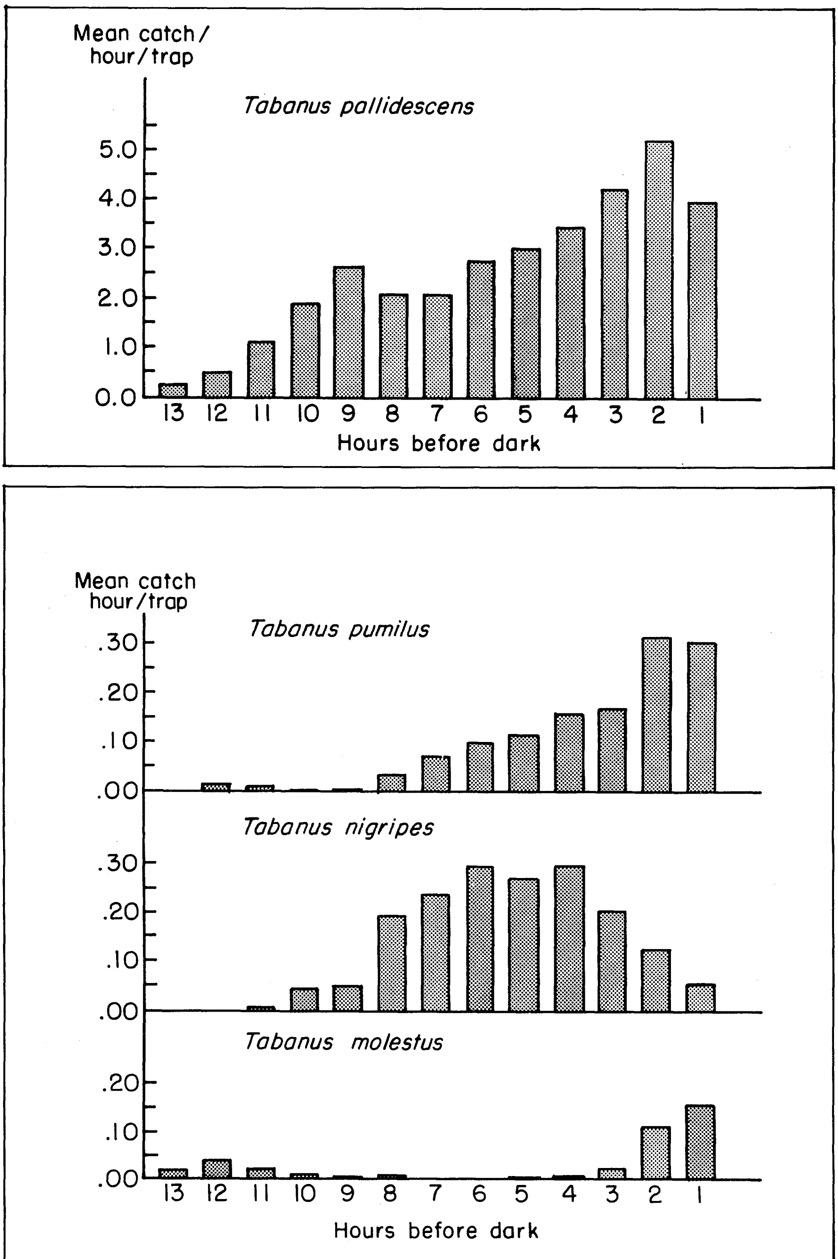

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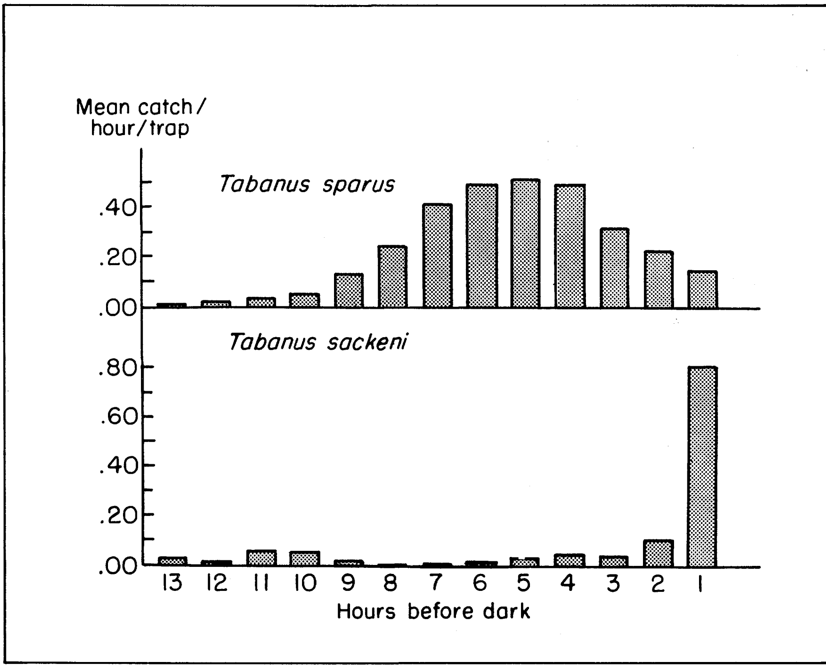

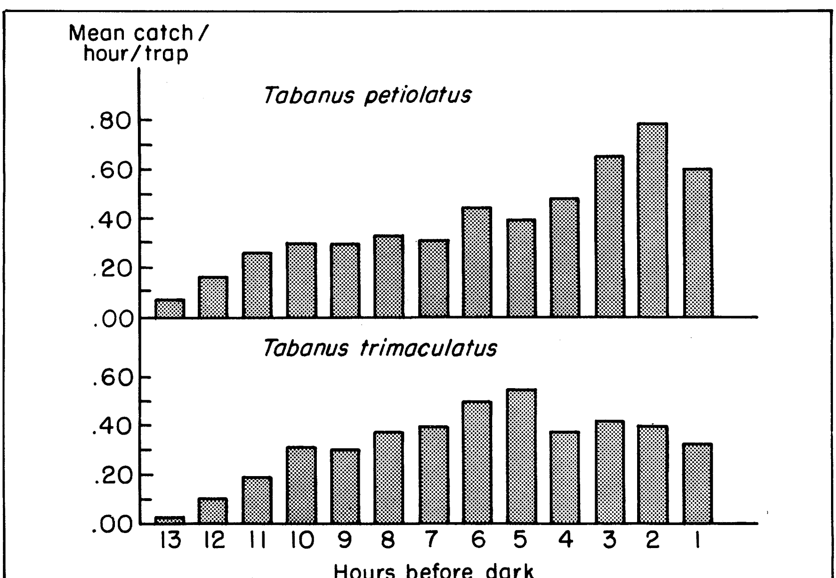

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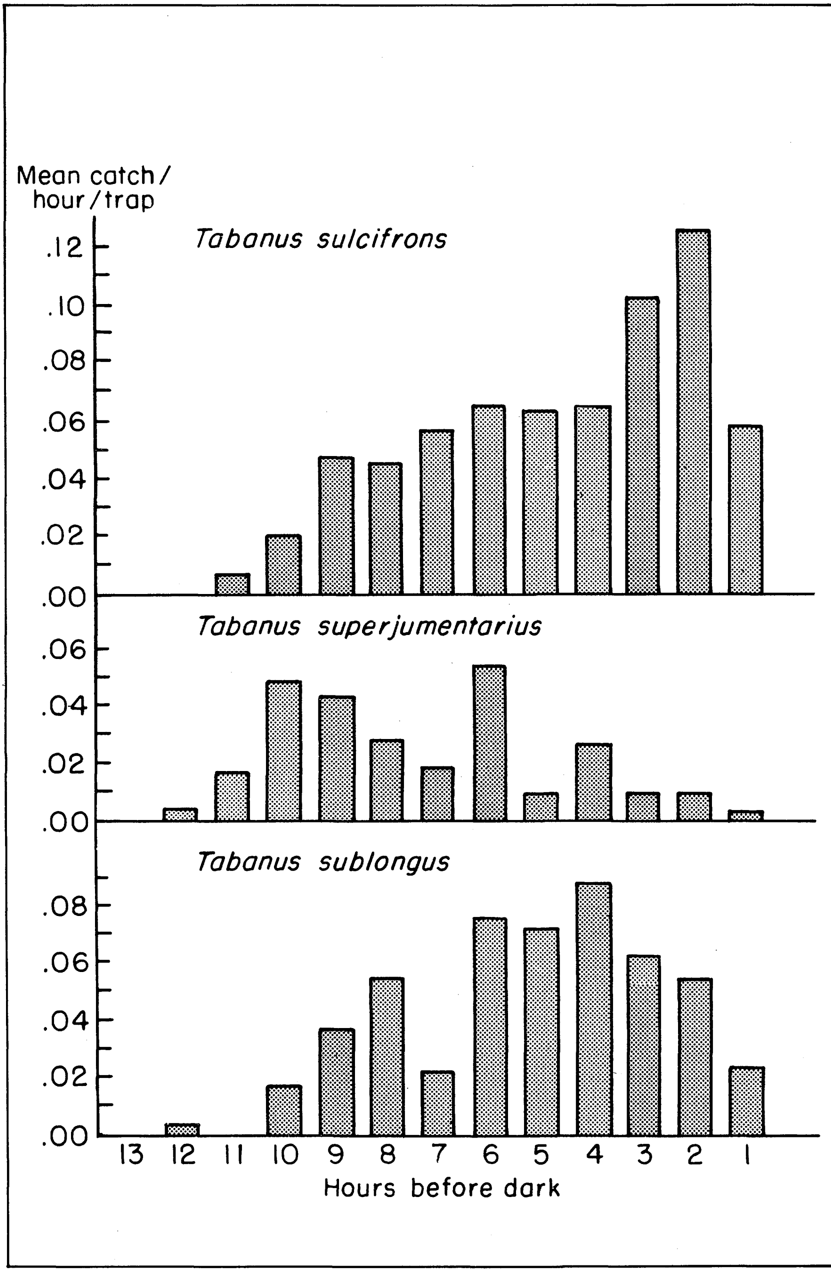

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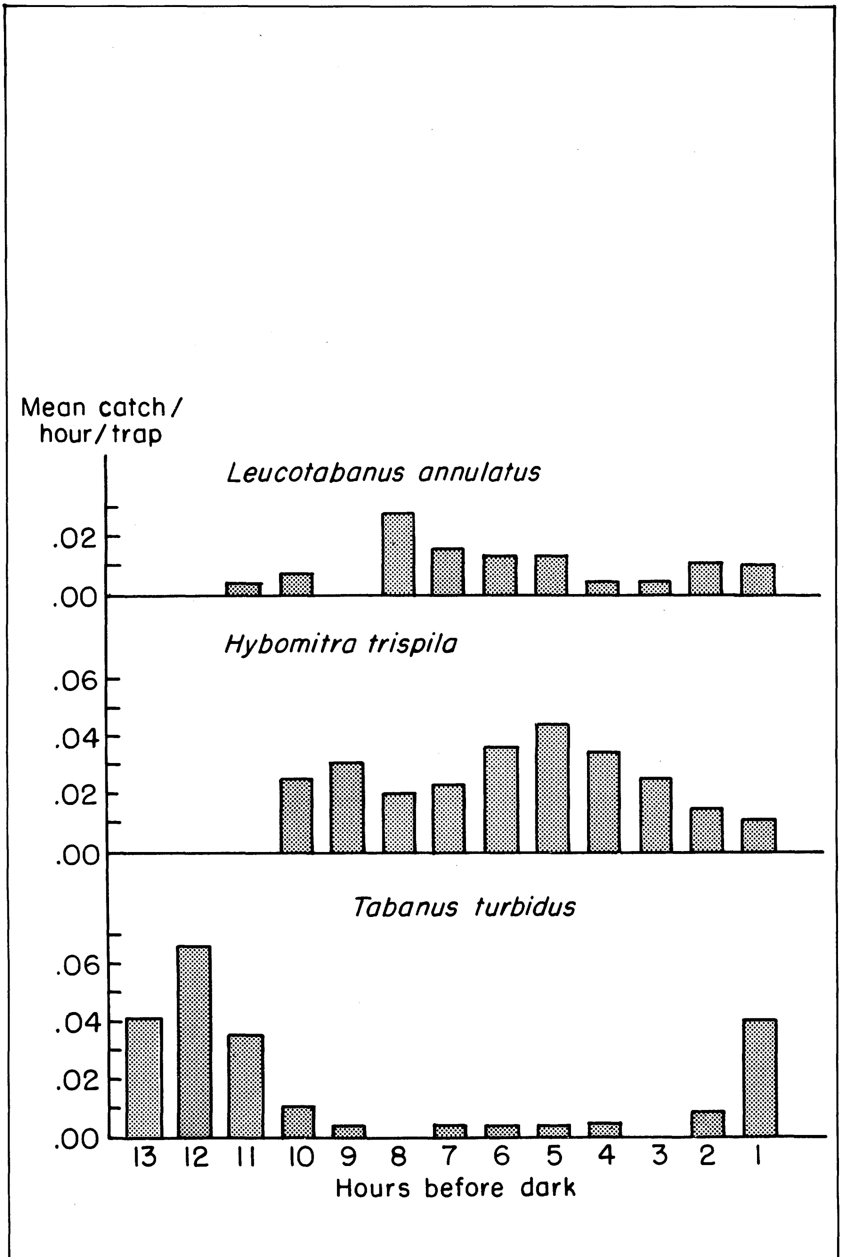

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