VILLANUEVA BARRADAS, J. 1972. El gusano cogollero del maiz. Pp. 297-300 *en* "Memoria del II Simposio Nacional de Parasitologia Agricola y I Reunion Nacional Sobre Plagas y Enfermedades de las Hortalizas" (eds. Legunes Tepeda, A., Saenz Colin, A., and Leon Lopez, R.). 694 pp.

FALL ARMYWORM DISTRIBUTION AND POPULATION DYNAMICS IN THE SOUTHEASTERN STATES

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ABSTRACT

Following the winters of 1983-85, fall armyworm (FAW), *Spodoptera frugiperda* (J. E. Smith), populations in the continental United States were restricted to extreme south Florida. Reinvasion of northerly areas occurred predictably each year with larval infestations on whorl-stage corn in southwest Georgia by mid- to late April each year. Pheromone trap catches indicated populations at Dade and Palm Beach Counties, FL, were greater and peaked earlier than those at more northerly locations during the early spring, indicating this area as either a major contributor or recipient of migrant FAW. Initial trap captures of FAW males occurred earlier and higher larval infestations were observed at Baldwin County, AL, than in locations in south Georgia. The proximity of weather systems inducing southerly wind components in areas ahead of the front were associated with initial trap captures of FAW males at northerly locations in all three years. Pheromone trap captures indicated FAW populations were lower in 1984 than in 1983 or 1985, probably because of the colder winter and spring temperatures recorded in 1983 and 1984, respectively. Severe outbreaks of FAW did not occur during the study although severe winters occurred each year. These data indicate that the conditions following extremely low winter temperatures may influence FAW populations more than extreme low temperatures alone. The (a)synchrony of emerging FAW adults at overwintering sites timed with the availability and amounts of susceptible stages of corn planted in more northerly areas may be the most important factors determining the magnitude of FAW populations each year throughout the southeastern states.

RESUMEN

A consiguiente de los inviernos de 1983-85, poblaciones del gusano cogollero, *Spodoptera frugiperda* (J. E. Smith), fueron restringidas al extremo sur de la Florida en los Estados Unidos continental. Anualmente se reinvadieron, como era predecible, las áreas del norte, con infestaciones larvales en la etapa del verticilo del maíz, en el suroeste de Georgia de a mediados a tarde Abril cada año. Temprano en la primavera, capturas con trampas de feromonas indicaron que poblaciones en los condados de Dade y Palm Beach fueron mayores y llegaron a su auge mas temprano que quellas en lugares más al norte, indicando que estas áreas son mayores contribuidoras o recipiente de gusanos cogolleros migrantes. Se observó capturas de gusanos cogolleros machos más temprano e infestaciones de larvas más altas en el condado de Baldwin, Alabama, que en lugares de sur de Georgia. En los tres años, la proximidad de sistemas metereológicos induciendo compuestos de vientos sureños en áreas delante del frente, fue asociada con capturas iniciales de gusanos cogolleros machos en localidades norteñas. Trampas de feromonas indicaron que poblaciones de gusanos cogolleros fueron más bajas en 1984 que en 1983 o 1985, probablemente por los inviernos más fríos, y las temperaturas registradas en las primaveras de 193 y de 1984 respectivamente. Erupciones severas de gusanos cogolleros no ocurrieron durante el estudio, aunque inviernos severos ocurrieron cada año. Los datos indican que las condiciones que le siguen a temperaturas extremas bajas en el invierno, pudieran influenciar las poblaciones de gusanos cogolleros más que solamente las temperaturas extremas bajas. La sincronización o no sincronización de gusanos cogolleros adultos emergiendo de los lugares donde pasan el invierno, junto con la disponibilidad y cantidades de etapas susceptibles de maíz sembrado en áreas más norteñas, pudieran ser los factores más importantes que determinan la magnitud de las poblaciones de gusanos cogolleros cada año através de los estados del sudeste.

Fall armyworm, *Spodoptera frugiperda* (J. E. Smith), annually reinvades its host range from overwintering sites in south Florida and Mexico. Occasionally, because of factors still not well understood, outbreak years occur over wide geographic areas of the U.S. resulting in tremendous economic losses. The outbreak of 1977 serves as our most recent example of the potential for fall armyworm (FAW) to devastate crops (Sparks 1979).

The potential source areas for overwintering populations and their seasonal distribution throughout the United States have been identified (Luginbill 1928, Vickery 1929, Snow and Copeland 1969). Waddill et al. (1982) documented the seasonal abundance of FAW populations at 4 sites in Florida. Pair and Sparks (in press) reported on the northward progression of larval infestations from sites below ca. 28°N latitude in south Florida into adjacent southeastern states.

Prevailing winds during the spring are thought to largely determine the extent and direction of FAW adult movement; Luginbill (1928) recognized earlier that the prevailing wind vectors in the southeastern U.S. consisted of south-southeasterly components during the spring months. More recently, Muller (1979) identified several synoptic weather systems conducive for the northward transport of migratory insects. Pair and Sparks (in press) associated the initial spring captures of FAW males in pheromone traps positioned in several Gulf Coast states with those synoptic weather types having southerly wind components. This phenomenon is consistent with other insect movement reports in the U.S. and Africa. Frontal systems with their convergent air masses govern the direction and fallout areas of *Spodoptera exempta* (Walker) in Africa (Rainey 1979).

Hogg et al. (1982) associated fall armyworm oviposition with southerly winds and frontal systems producing rain in Mississippi. Standard weather stations, however, may not report or detect low-level jet systems with different wind vectors which are capable of transporting insects long distances.

The potential overwintering source areas and migratory aspects of FAW require more exact definition. Such information requires an accumulation of data on seasonal distribution trends on a long-term basis in the southeastern states before reliable predictions of potentially damaging FAW populations can be made in any given year or region. We report seasonal pheromone trap captures at selected locations in several southeastern states during 1983-85 and the extent of larval infestations as they advance northward during the spring. The influences of weather in delineating overwintering populations and in the aerial transport of FAW adults are discussed.

Methods and Materials

Weather: Weekly average minimum and maximum temperatures and precipitation data were collected from National Oceanic and Atmospheric Administration (NOAA) for the following locations and their respective latitudes and longitudes: Miami FL (25°45′N, 80°15′W); Orlando, FL (28°30′N, 81°50′W); Mobile, AL (30°45′N, 88°20′W); and Tifton, GA (31°20′N, 83°30′W) (Fig. 1). These were selected based on their location in or near suspected overwintering areas (Miami, Orlando), or in areas where FAW survival does not normally occur (Mobile, Tifton). In addition, the number of days each week with 0°C or less temperatures for 1983-85 were calculated for each location. These were used as a relative measure of the potential FAW winter mortality among years at each location. Hogg et al. (1982) reported 13.8°C as the lower limit for FAW development and 0°C temperatures are known to kill FAW life stages as well as their plant hosts (Luginbill 1928). Surface weather charts (NOAA) were employed to assess the transport potential of FAW from suspected source areas during the spring.

Adult Populations: Seasonal population trends based on catches of FAW males in 75-50 cm cone traps (Hartstack et al. 1979) were measured for three years at the following selected locations: Dade, Palm Beach, Seminole, and Gadsden Counties, FL, Tift County, GA, Baldwin County, AL, and Acadia County, LA (Fig. 1). In addition, cone traps were positioned at several locations in Florida, Georgia, Alabama, South Carolina, and Louisiana, to detect the initial FAW flights during the spring. One to three traps were operated at each location and were positioned adjacent to corn fields whenever possible. Traps at most of the locations were in continuous operation since 1982 although the numbers of sites and the seasonal duration of monitoring have varied from year to year. During 1983 and 1984, traps were baited with 25 mg of a synthetic pheromone mixture consisting of (Z)-9-dodecen-1-ol acetate (Z9 DDA) and (Z)-9-tetradecen-1-ol acetate (Z9 TDA) in a 10:1 ratio (Mitchell 1979, Jones and Sparks 1979). In 1985, a four-component bait (Terochem®) was used in all traps; this new formulation is at least 5 times more attractive to FAW males than baits containing Z9 DDA and Z9 TDA (S. D. Pair et al. unpublished data). In all cases, pheromone baits were changed every two weeks.

Larval Surveys: Host plants (primarily corn) were sampled for the presence of FAW beginning in early spring each year in south Florida initially and in more northerly areas as the season progressed. Previous studies had indicated that FAW rarely attack other hosts when corn or sorghum is available (Pair and Sparks, in press); therefore, efforts were concentrated on these two crops. Infestation levels were determined by counting infested plants on 4 m of row at four locations per field. In most instances,

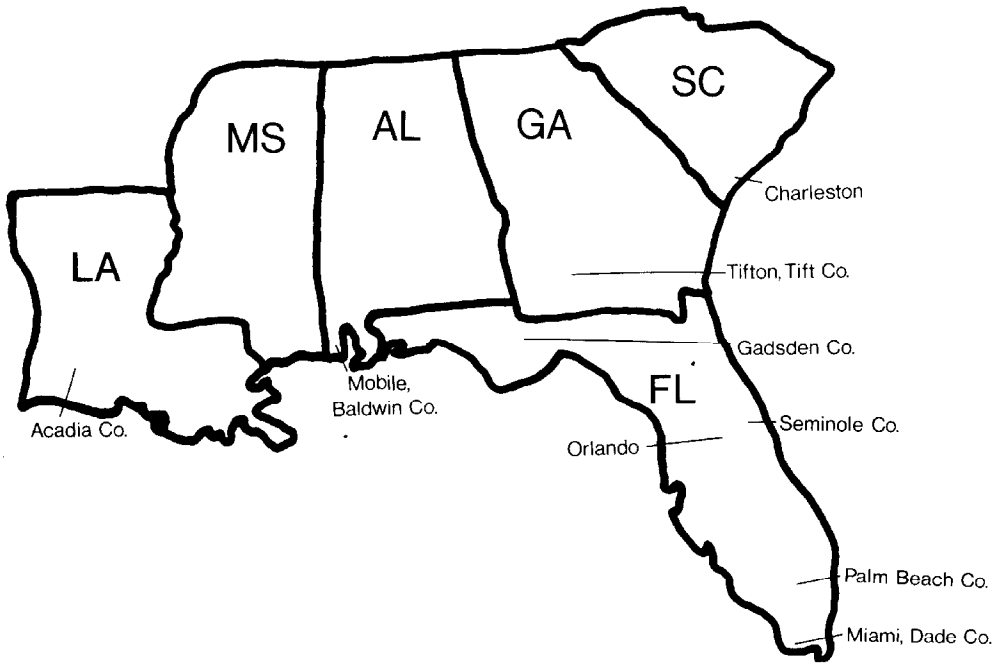


Fig. 1. Locations of primary weather and FAW trap data collection sites.

two to five fields were sampled for each location. When FAW were not observed in the counts, a more thorough search of the field was conducted to determine if infestations were actually present since in many cases these involved larvae hatching from only a few isolated egg masses. Where volunteer corn was encountered, primarily in south Florida, 50 plants were selected at random and examined for the presence of FAW larvae. Infestations in each sampling area were assigned a number on a scale of 0-5 that reflected the relative degree of infestation in each area as follows: 0 = no detection, 1 = 1-5%, 2 = 6-25%, 3 = 26-50%, 4 = 51-75%, and 5 = 76-100%.

Results and Discussion

Climatic Trends: Figure 2 illustrates the average rainfall, temperature, and number of days with 0°C or colder temperatures at Miami and Orlando, FL, Mobile, AL, and Tifton, GA, during 1983-85. Highly variable departures from normal rainfall were recorded during the spring at each location. Rainfall at Miami and Orlando tends to be least in the spring and winter due to the subtropical climate. Rainfall at Mobile and Tifton tends to be higher during the spring and fall months.

As expected, average spring and winter temperatures become progressively cooler with increased latitude. Of the three years, 1985 was one of the coldest on record and freezing temperatures were recorded as far south as Miami during January. However, temperatures warmed rapidly and higher than normal average readings were recorded at the Mobile and Tifton locations. Cold fronts and warming trends may be directly involved in limiting FAW survival in their early spring movement northward. Prior to and following cold fronts, adults may be transported northward with prevailing winds. If suitable host plants are available and temperatures favor development and survival,

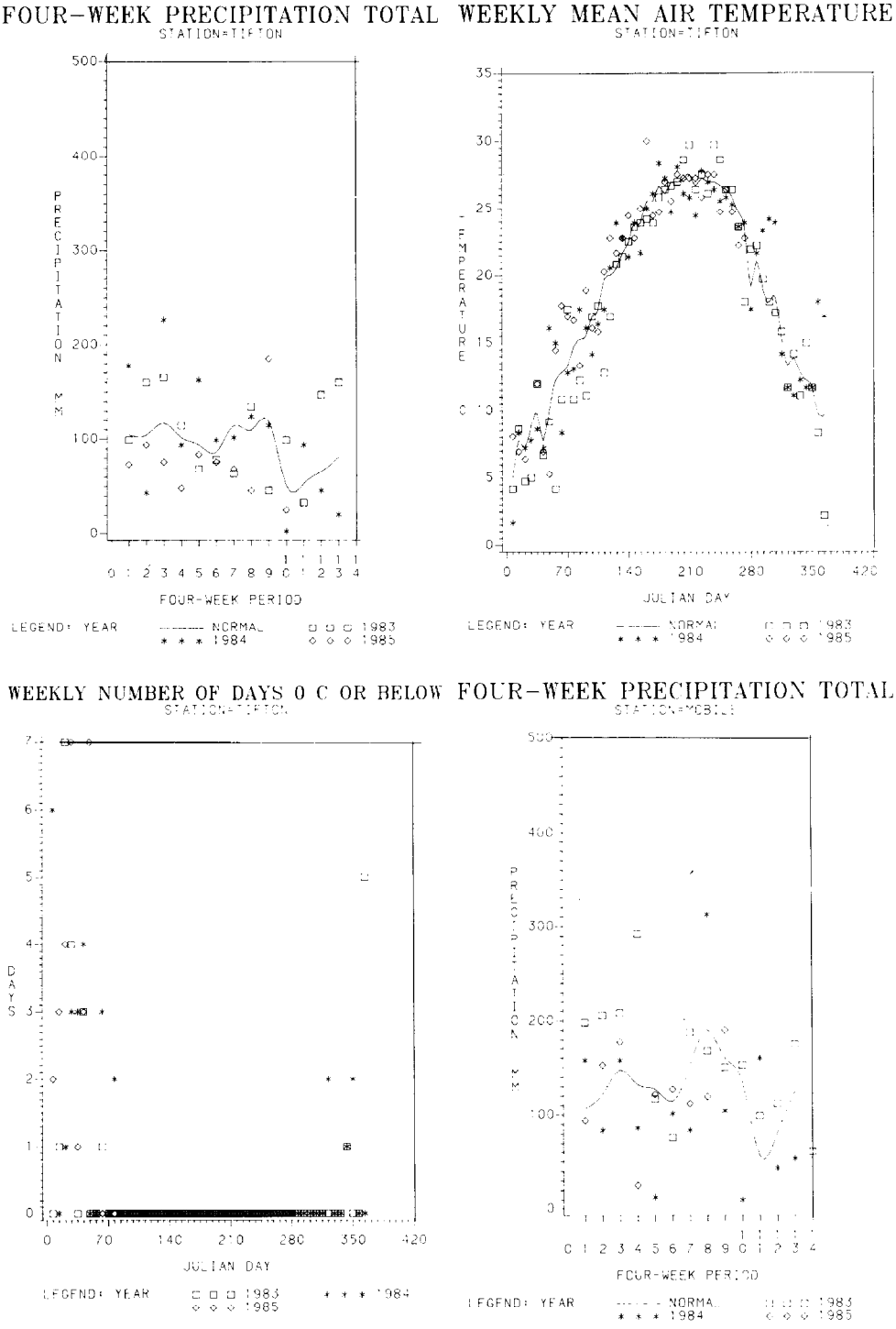
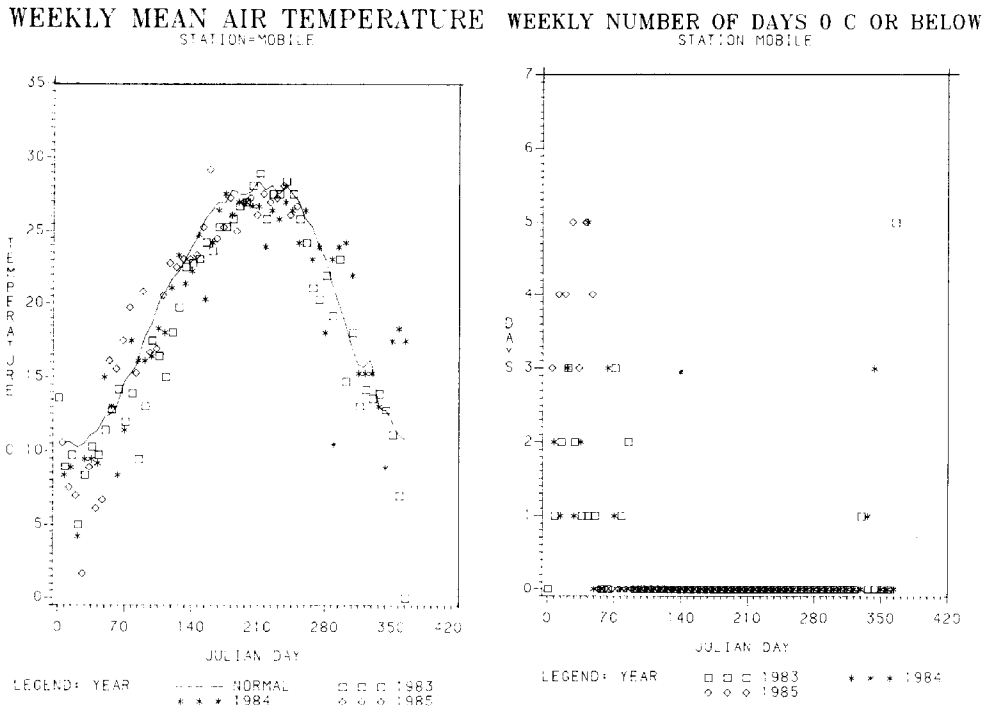


Fig. 2. Climatological records for Miami and Orlando, FL, Mobile, AL, and Tifton, GA, 1983-85.



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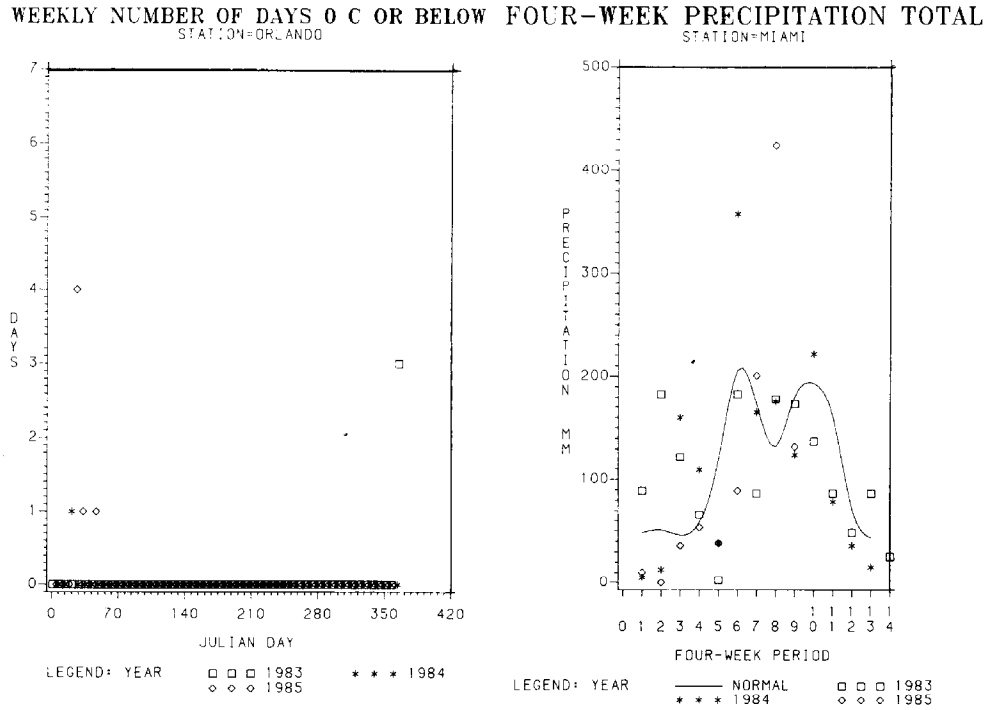


Fig. 2. Continued

an FAW infestation may develop. However, subsequent cold fronts with extended periods of lower than normal temperatures do not favor survival. The degree of warming following the typical coldest weather recorded in January of each year could determine the rate of FAW population movement from south Florida. For example, the winter of 1983-84 was not as severe as 1982-83, but produced lower than average spring temperatures at all locations. These cooler temperatures prevailed during the spring months longer during 1984 than in either 1983 or 1985. Further, at Tifton in March 1984, four days of 0°C or below were recorded while no freezing temperatures were recorded in March, 1983 and 1985. Although the progression of larval infestations was similar in all 3 years, these cooler spring temperatures may account for the observed 3-week delay in initial FAW adult captures at Mobile, AL, and the lengthy time interval between second and third captures at Seminole County, FL, during 1984 (Fig. 3).

ADULT POPULATION TRENDS: Captures of FAW males at Dade and Palm Beach Counties, FL, were similar in that the highest captures tend to occur during the spring and in the late fall and winter months (Fig. 3). This bimodal occurrence of FAW populations in south Florida probably results from the distinct wet-dry seasons often associated with subtropical or tropical areas. A major peak in trap capture in Dade County occurred between days 75-115 during all 3 years, while those in Palm Beach County often consisted of several sharp peaks during the spring and thus were less defined in terms of time. Catches at Palm Beach County were consistently greater in both the spring and fall months than at Dade County or for any of the other trap locations. For example, during 1985, a maximum of ca. 450 FAW males per night were captured on day 60 in Palm Beach County compared with a maximum catch of ca. 240 per night in Dade County on day 115. This may be explained by the increased availability of host plants due to the season-long production of vegetables, including sweet corn, in the more fertile soils in areas adjacent to Lake Okeechobee or these hosts may serve to concentrate FAW moths migrating from other areas. Conversely, most of the hosts in Dade County are grown in smaller-sized fields with marl-type soils that are typically low in fertility, and are usually available to FAW only in the spring, winter, and fall months.

The effects of winter temperature on FAW survival in more northerly locations in Florida can best be illustrated through adult captures in Seminole County. FAW males were captured during January of each year at or prior to the occurrence of subfreezing temperatures, often in higher numbers than during the summer months. However, cold January temperatures had the dual effect of destroying the host plants and FAW larvae, and possibly pupae in the soil. In 1983, following the mid-January freezes, 11 FAW males were trapped in February, one in March, but additional specimens were not captured until 12 April. These few adults may have emerged from pupae in the soil that were not killed by the freeze or may represent migrant adults from the south. In 1984, following the mid-January freezing temperatures, FAW were not detected at all until 13 March.

Trap captures in Gadsden County, FL, are more indicative of distinct generational peaks with the maximum numbers occurring in late summer and fall. Similar population trends, differing only in magnitude of catches, were observed at Baldwin County, AL, Acadia County, LA, and Tift County, GA. Although not presented, lower trap catches were recorded at South Carolina locations, probably due to their more northerly location and/or the relative scarcity of host plants, particularly corn.

Populations observed at Tift County consistently followed similar trends from year to year and peaked at ca. day 200 each year. At Baldwin County, AL, catches generally exceeded those observed at Tifton, particularly during the periods from day 100-200.

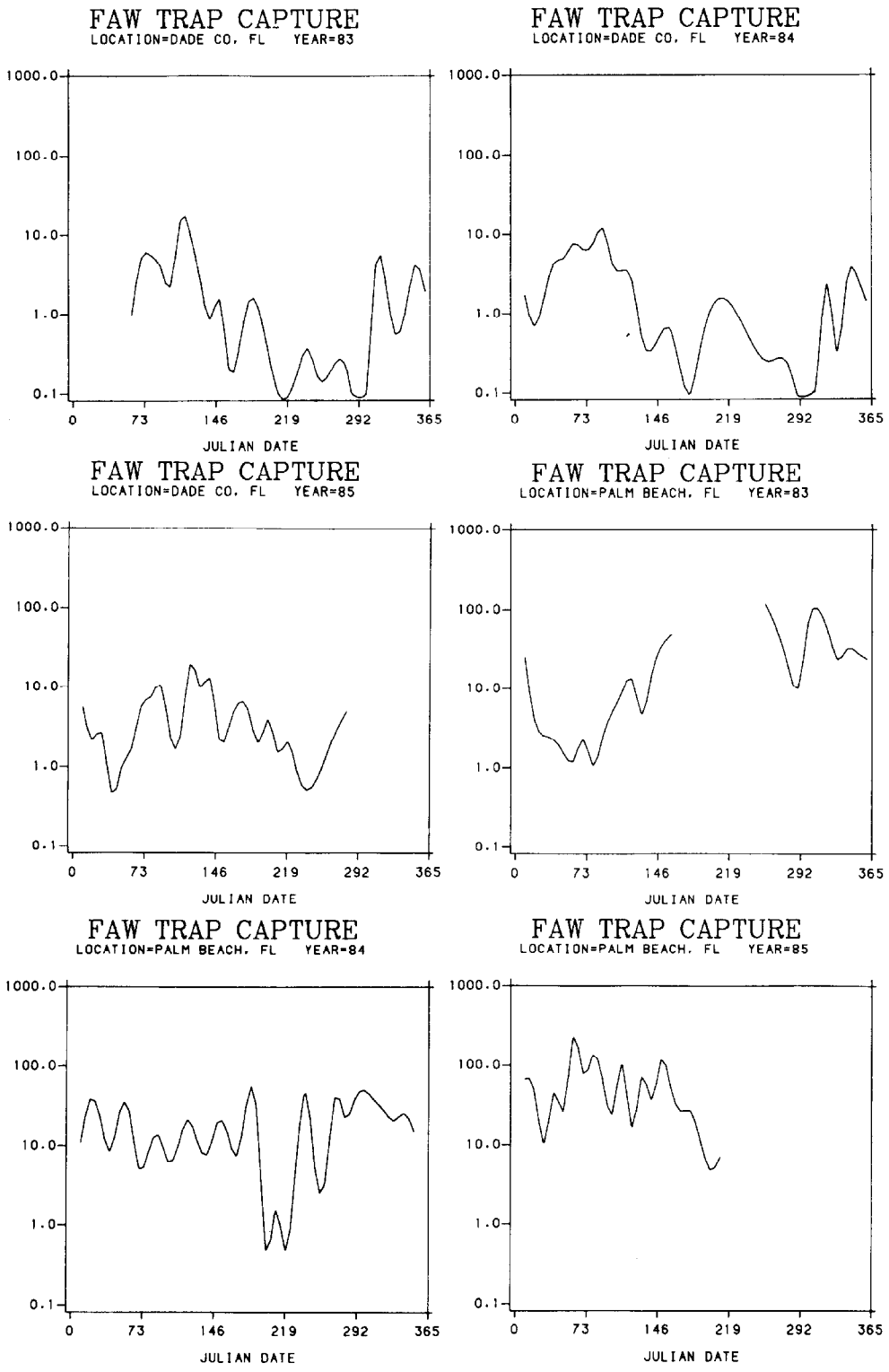
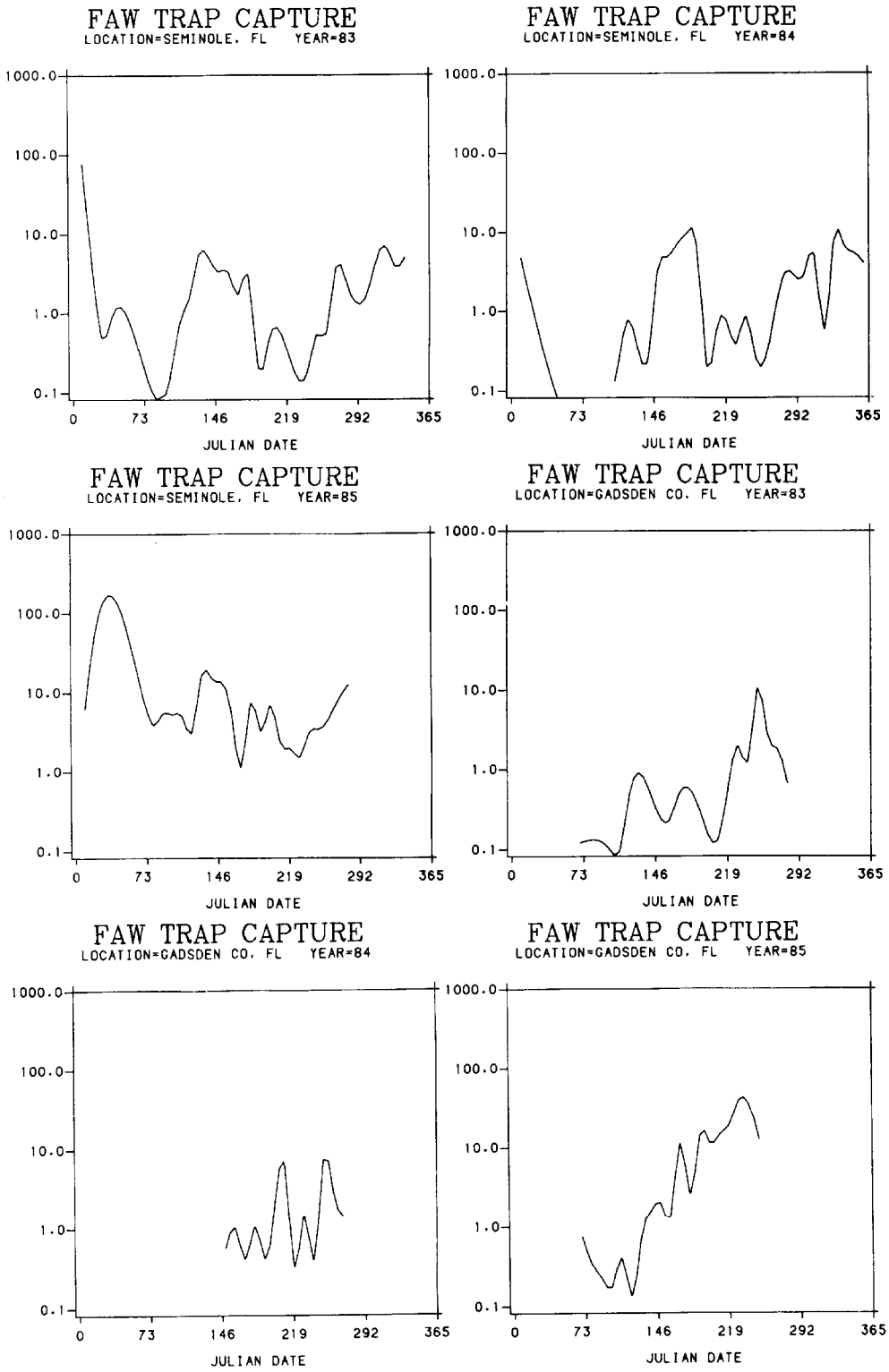


Fig. 3. Seasonal trap catches of FAW males at selected locations, 1983-85.



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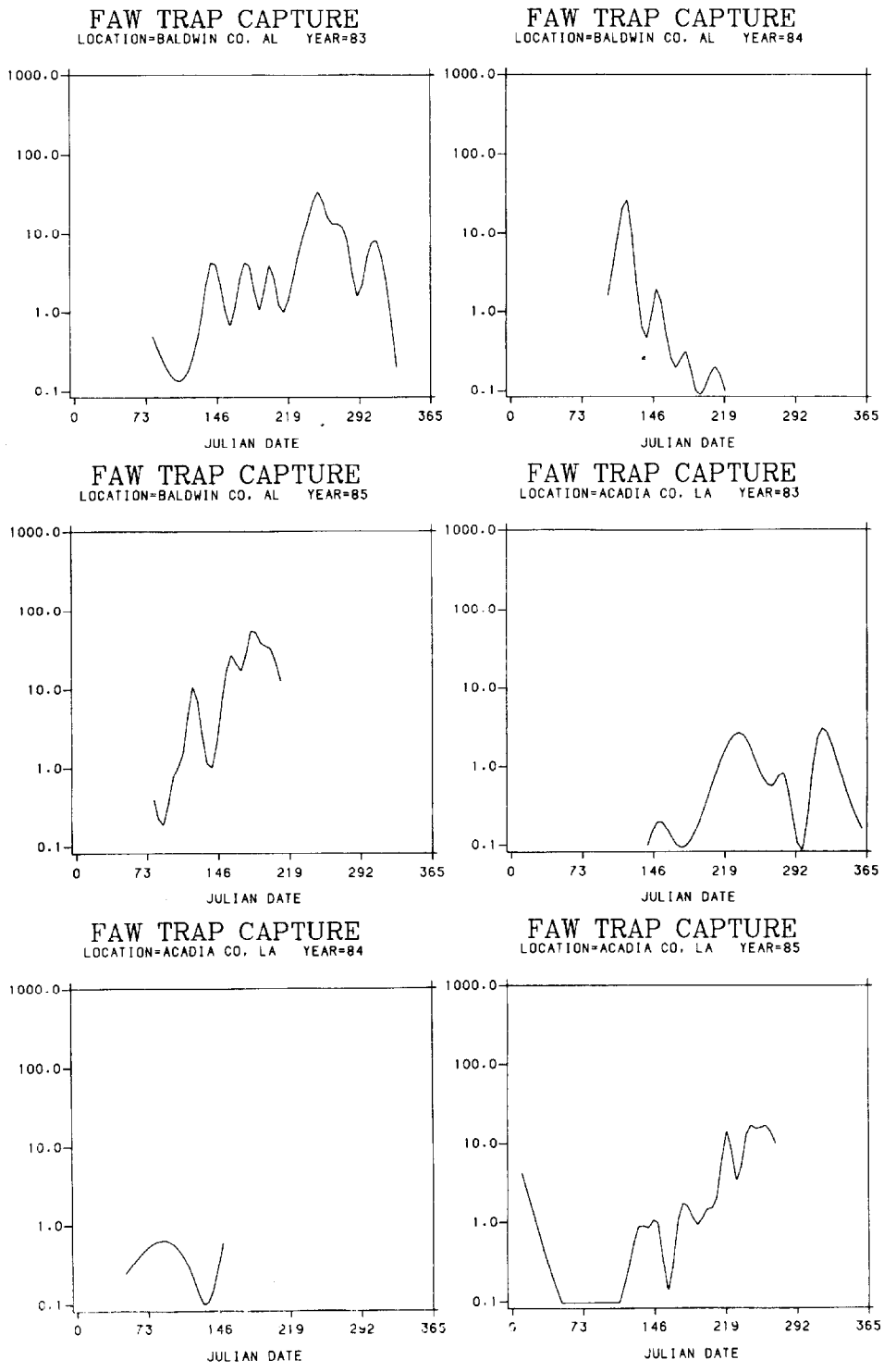

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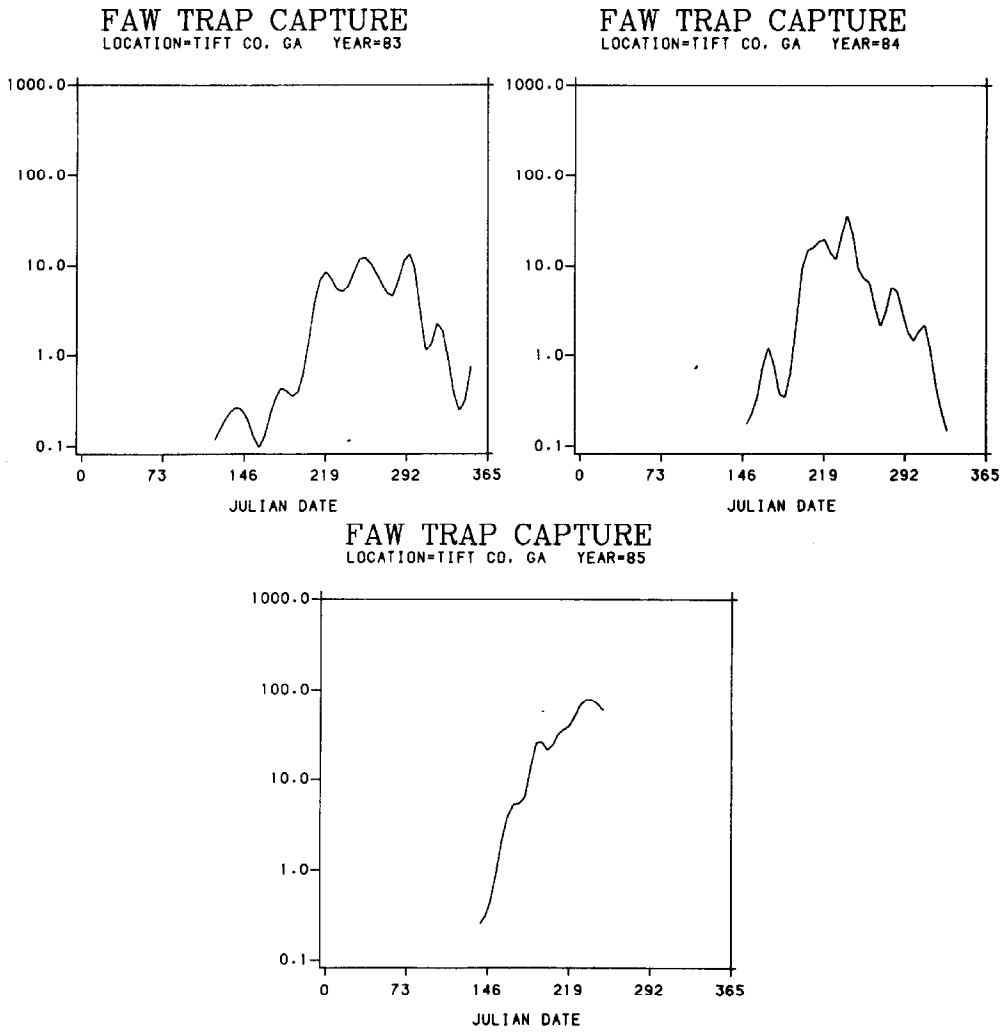

Fig. 3. Continued

In 1984, unusually high catches occurred in Baldwin County from day 100-120; however, catches declined thereafter and remained low for the remainder of the year. Indeed, lower catches of FAW males were recorded in 1984 than in either 1983 or 1985 at all locations except those in south Florida, possibly because of the cooler spring temperatures occurring in 1984 or due to the increased efficiency of pheromones used in 1985.

SPRING LARVAL INFESTATIONS: During February 1983 and 1985, FAW larval populations on volunteer or row crop corn were limited to areas below ca. 28°N latitude following the subfreezing temperatures in January of each year (Fig. 4). Highest spring infestations were observed in extreme south Florida. The progression of infestations from south Florida throughout peninsular Florida was similar for all 3 years, and larvae were detected during mid- to late April each year in corn fields located in southwest Georgia. In February 1983, FAW larvae were abundant on young volunteer corn in Dade County, FL; however, March larval populations were decimated by heavy rains (Steve Sims, personal communication). In April, infestations were detected in southwest Georgia, and FAW were present throughout Florida and south Georgia in May.

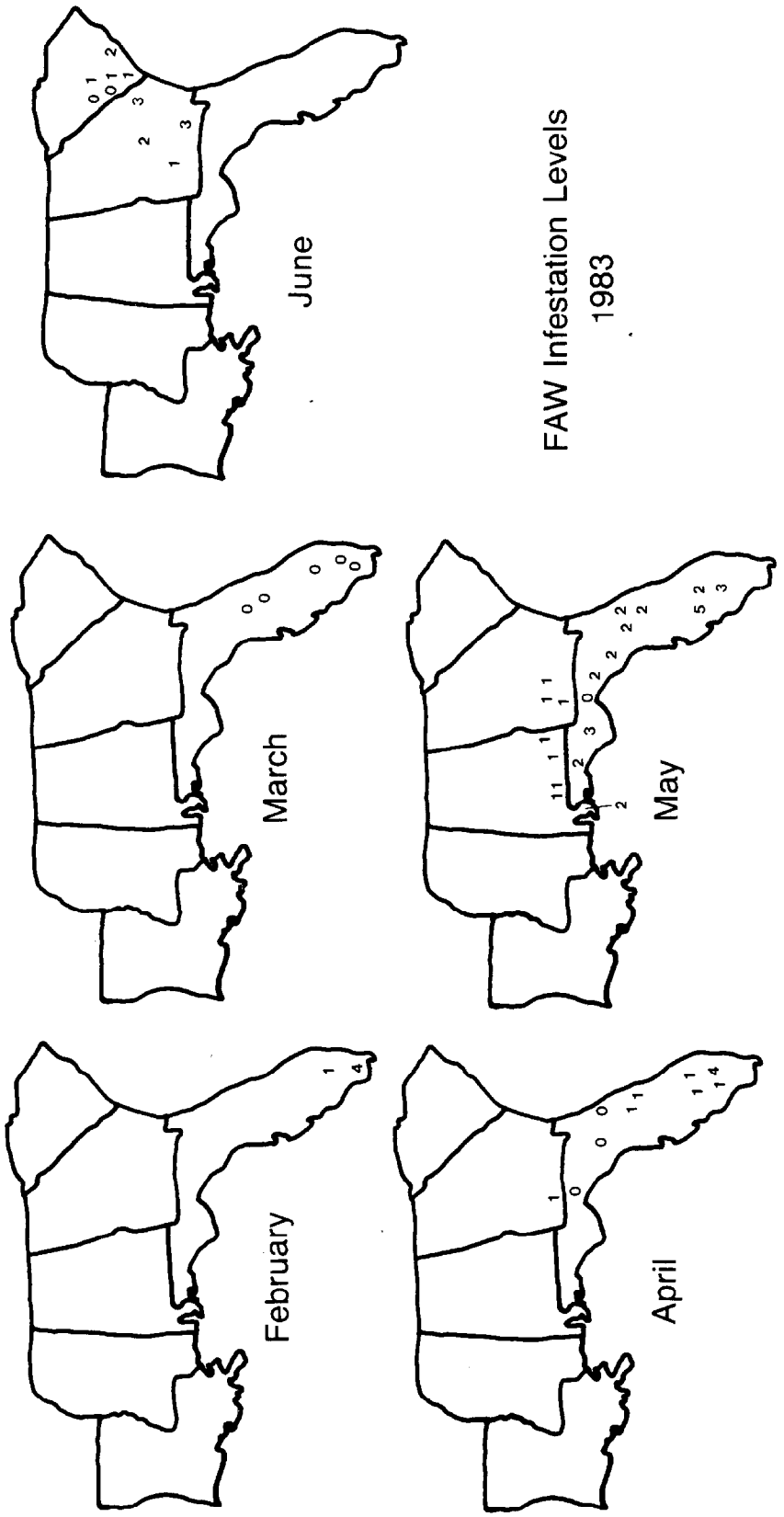

Fig. 4A. Infestations of FAW larvae on corn in Florida and adjacent states during the spring months, 1983.

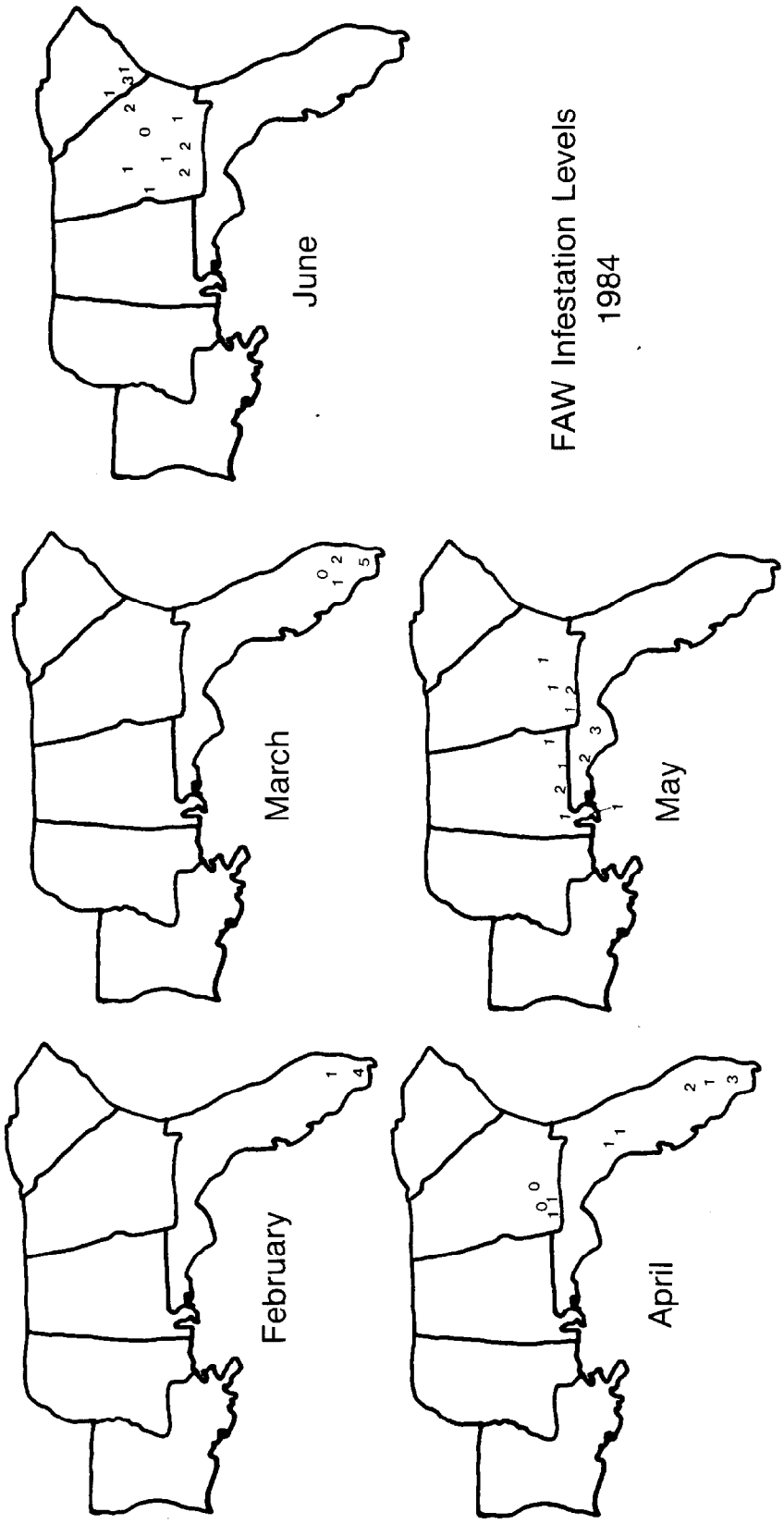

Fig. 4B. Infestations of FAW larvae on corn in Florida and adjacent states during the spring months, 1984.

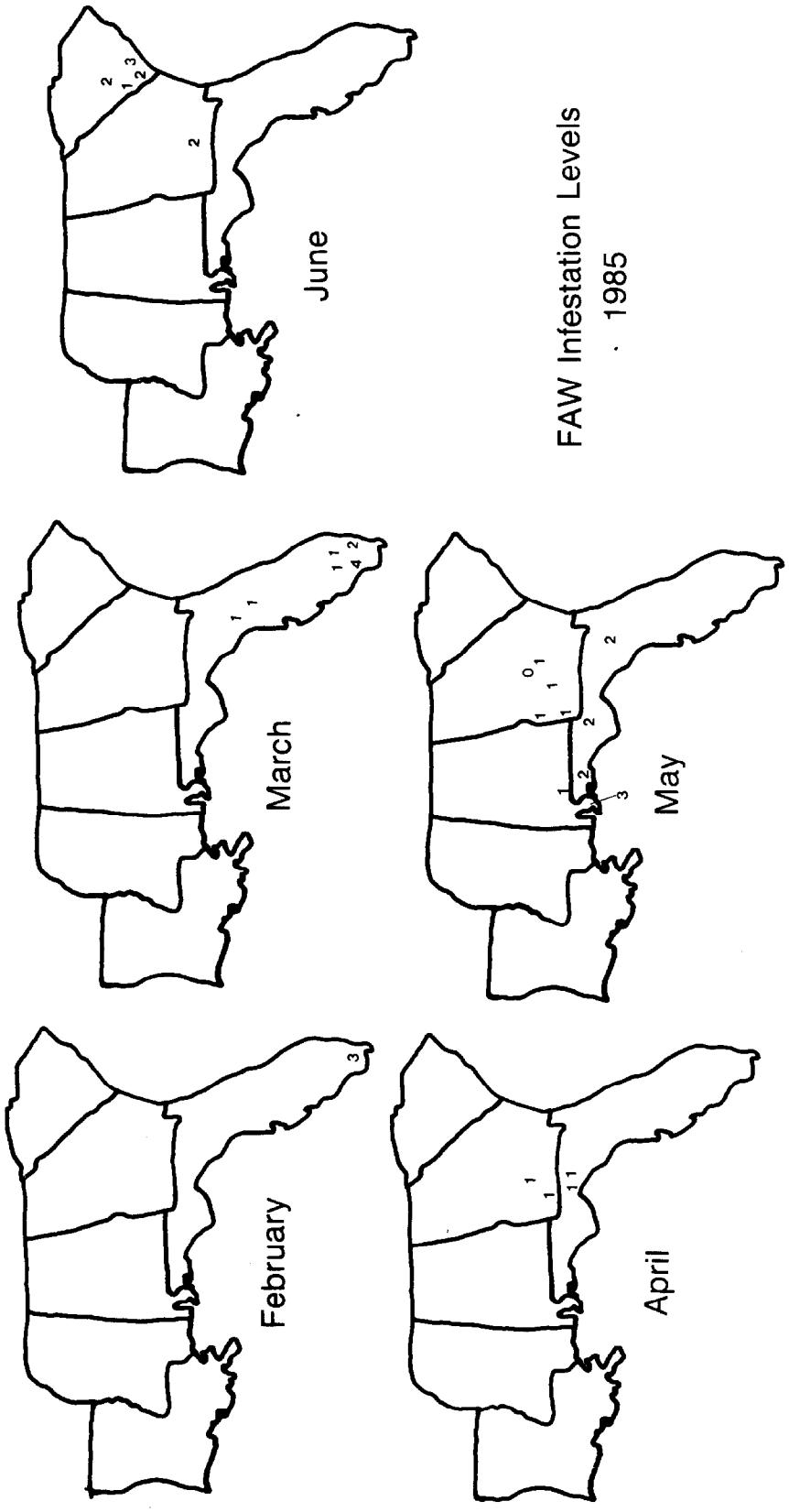

Fig. 4C. Infestations of FAW larvae on corn in Florida and adjacent states during the spring months, 1985.

In 1983-85, infestations did not approach those observed in 1981-82 (Pair and Sparks, in press). These earlier surveys and those of the present study indicate that FAW infestations tend to be higher during May at locations in the Florida panhandle and Baldwin County, AL, than in south Georgia. Hinds and Dew (1915) reported that FAW infestations in Alabama were always detected earlier in Baldwin County than other areas of the state. June infestations of FAW were greater near Charleston, S.C., than inland locations of the state. Thus, warmer spring temperatures due to the proximity of both locations to the warming influences of the ocean may advance FAW infestations. Early appearances of FAW at Baldwin County, AL, could result from the prevailing southeasterly winds blowing across southern Florida and/or other areas of the Caribbean which harbor overwintering populations.

INITIAL OCCURRENCE OF FAW MALES: The first and successive captures of FAW males are illustrated in Figure 5 for the years 1983-85. Since continuous generations occur throughout the year in southern Florida, these trap locations are not shown. In the southernmost study area above the overwintering area (Seminole County, FL) FAW males were often captured throughout December and January. However, following invasion of polar air, no males were captured between 6 January and 13 March. The influence of a colder than normal spring is reflected in the month delay at most locations in captures of males during 1984.

A general northward and northwesterly progression of FAW trap captures through time is indicated for north Georgia and South Carolina. Generally, FAW males were captured in traps located in South Carolina during May and June. However, no FAW were captured in Saluda County until 4 August 1983. Males were observed in Charleston County 2 and 3 months prior to capture in other South Carolina locations in 1983 and 1985, respectively. FAW males often appeared in locations such as Baldwin County, AL, which is northwest of southern Florida, prior to their capture in south Georgia and Acadia County, LA, indicating that overwintering FAW populations in southern Florida could be responsible for the annual reinfestation of crops along the Atlantic Seaboard and the central Mississipppi Valley states.

Raulston et al. (in press) reported that FAW were not captured until days 150-180 at College Station, TX, in 1984-85 and that quite low FAW larval populations were present in northeastern Mexico and the Lower Rio Grande Valley. This further suggests that the southeastern states are a major contributory area to summer FAW populations in the eastern U.S.

Figure 6 illustrates the typical weather patterns that are conducive to the northward transport of FAW in the spring of 1983-85. These frontal systems occur at frequent intervals in the spring across the U.S. The advance of these systems with their warm southerly and southeasterly wind components ahead of the front may largely determine the direction and extent of FAW adult movement. Prior to a particular frontal passage, FAW were recorded at five sites in April 1983 and in 1984, and at eight sites in late March 1985. After passage of these frontal systems, northerly wind components usually prevail, and FAW captures are rarely observed until additional systems again move into position and again produce the southerly winds. When FAW emergence in areas of overwintering sites coincides with such weather events, long-range movement is likely.

SUMMARY

These studies were conducted in "off-years" of FAW populations during which widespread outbreaks did not occur. The initial captures of FAW males, coupled with the

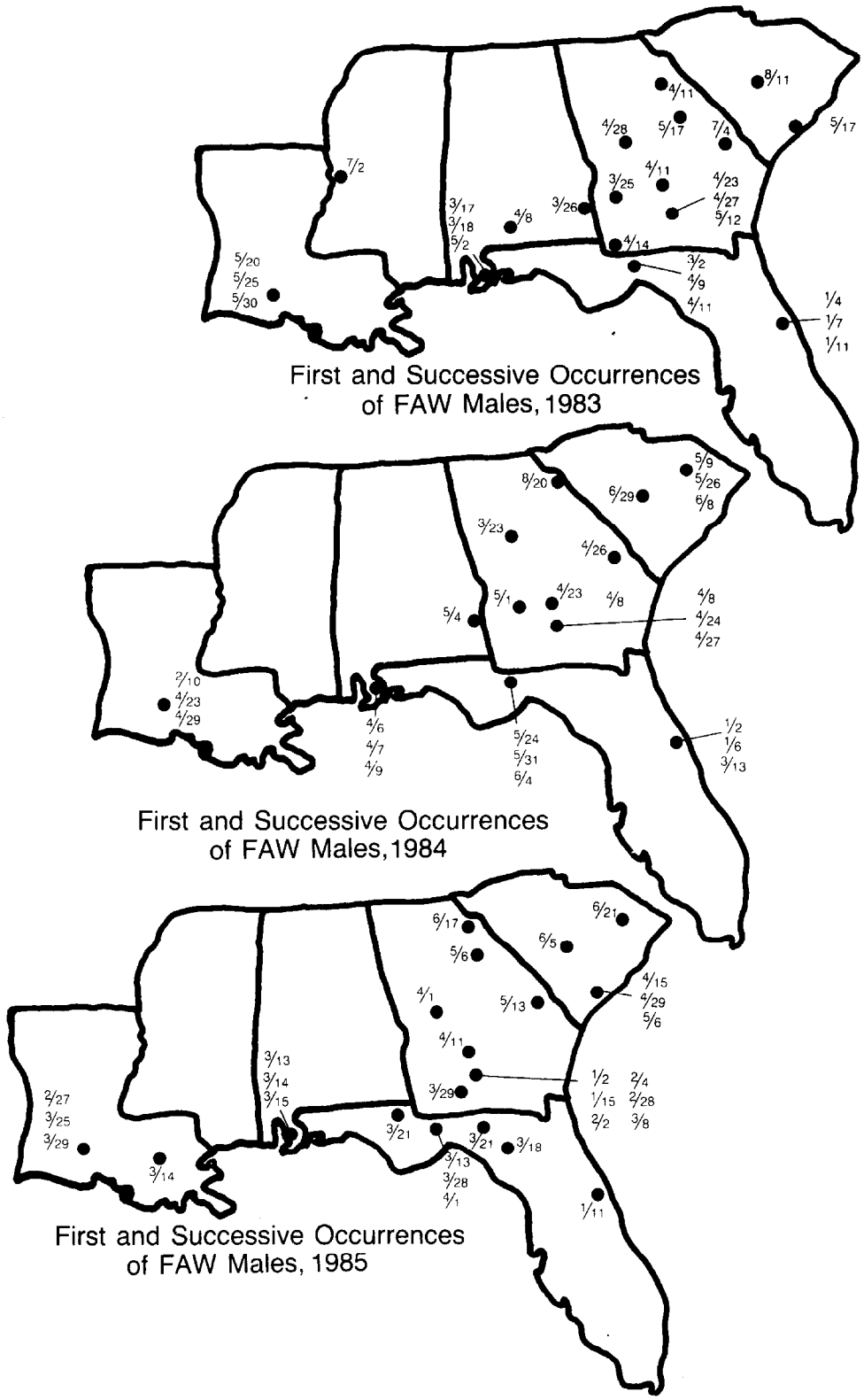

Fig. 5. First and successive captures of FAW males during 1983-85.

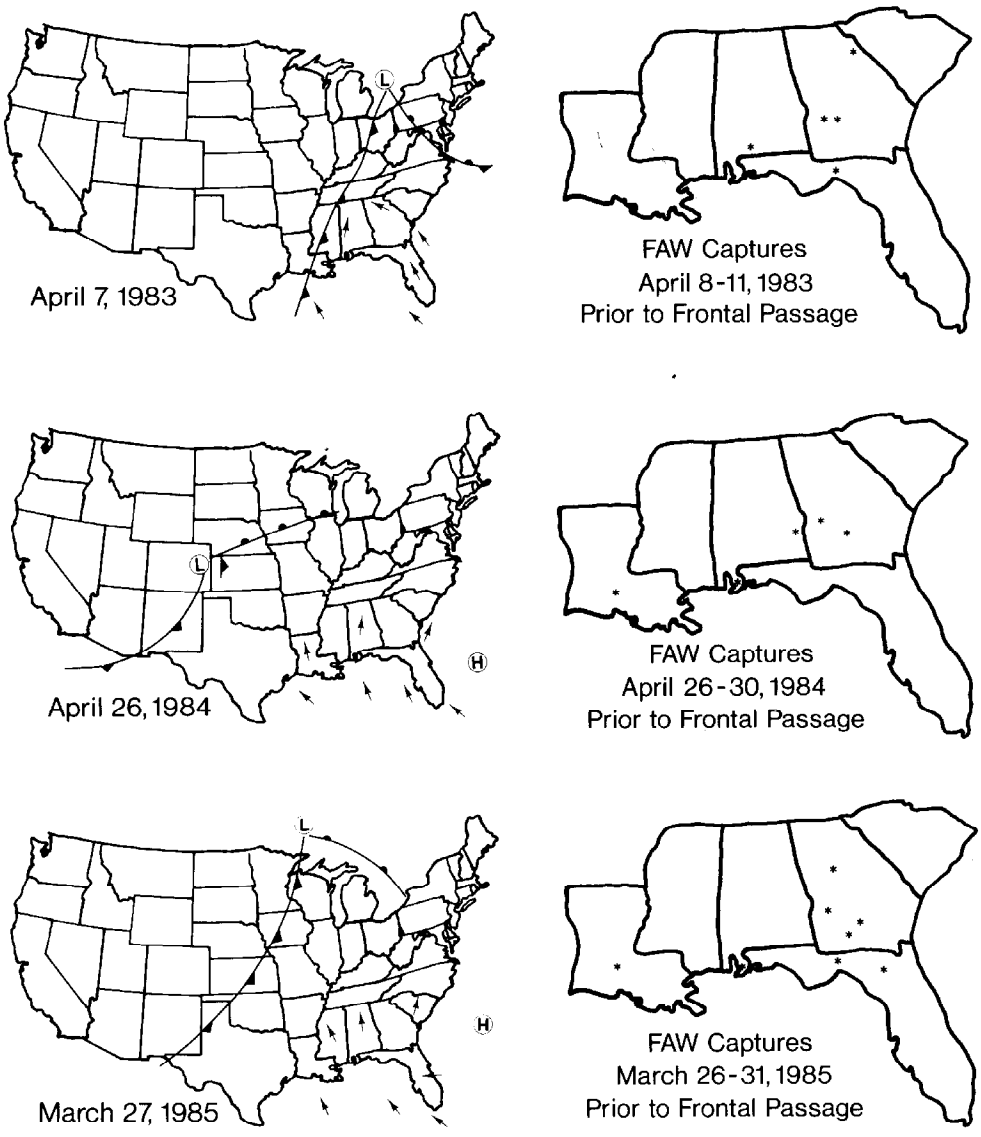

Fig. 6. Frontal systems associated with the capture of FAW males in pheromone traps during the spring months, 1983-85.

progression of FAW larval infestations in corn, implicate south Florida as a major contributor of FAW to areas of the eastern U.S. and perhaps southwestern Alabama. The influence of severe winters as the determining factor for FAW outbreaks in any one season has not been resolved. Certainly, the conditions that follow particularly severe influxes of polar air into Florida may play even greater roles on FAW population dynamics than temperature extremes alone.

Volunteer and commercial seed corn are the primary overwintering host reservoirs for FAW in south Florida. Production of seed corn requires insecticidal applications to prevent severe FAW attack and yield losses; thus, FAW mortality due to parasitism is higher in volunteer corn. However, spraying of seed corn in the latter stages of

maturity may be terminated, allowing FAW to develop in the ear stages. Similarly, fields of sweet corn are sometimes abandoned because of low market values, allowing FAW to develop in the ears. Prior to ca. 1981, most seed-corn was planted during late fall and winter and matured in January-February (Van Waddill, personal communication). Corn maturing at these times produced FAW at a time well suited for adult emergence and movement onto corn in central Florida during March and April. However, in recent years, planting dates have been changed to August to avoid winter kills of late fall and winter plantings in extreme south Florida. Corn planted in August matures by December, and FAW produced at this time emerge prior to the time corn is available during March and April in more northerly areas of Florida. Furthermore, migrant FAW moths in December-February, as well as larvae they produce, would have to contend with the cold weather normally associated with January and February.

Other important factors often overlooked are the times of planting and extent of corn hectarage available for FAW colonization each year in north Florida and south Georgia. For example, during the outbreak of 1977 following a severe winter, 0.9 million ha of corn were planted in Georgia alone. This situation presented a tremendous potential for producing overwhelming FAW populations in the absence of mortality factors. In comparison, greatly reduced acreages (0.3-0.4 million ha/yr) of corn were planted in Georgia from 1982-85.

The factors determining "normal" and "outbreak" years require additional long-term studies of FAW population dynamics, particularly the relationship of weather and host availability during the early spring months. A large hectarage of corn in north Florida and southern Alabama and Georgia, planted at an opportune time for a synchronous, massive FAW invasion from overwintering sites, may well determine the magnitude of FAW densities in northerly areas during summer and fall months.

References Cited

HARTSTACK, A. W., JR., J. A. WITZ, AND D. R. BUCK. 1979. Moth traps for the tobacco budworm. J. Econ. Ent. 72: 519-522.

HINDS, W. E., AND J. W. DEW. 1915. The grass worm or fall armyworm. Alabama Agric. Exp. Stn. Bull. 186: 61-92.

HOGG, D. B., H. N. PITRE, AND R. E. ANDERSON. 1982. Assessment of early-season phenology of the fall armyworm (Lepidoptera: Noctuidae) in Mississippi. Environ. Ent. 11: 705-710.

JONES, R. L., AND A. N. SPARKS. 1979. (Z)-9-tetradecen-1-ol acetate, a secondary sex pheromone of the fall armyworm, *Spodoptera frugiperda* (J. E. Smith). J. Chem. Ecol. 5: 721-725.

LUGINBILL, P. 1928. The fall armyworm. USDA Tech. Bull. No. 34.

MITCHELL, E. R. 1979. Monitoring adult populations of the fall armyworm. Florida Ent. 62: 91-98.

MULLER, R. A. 1979. Synoptic weather types along the central Gulf Coast: variability and predictability. Pages 133-146 In R. L. Rabb and G. G. Kennedy, eds. Movement of highly mobile insects: concepts and methodology in research. North Carolina State Univ., Raleigh.

PAIR, S. D., AND A. N. SPARKS. 1986. Evidence of annual long distance migration by the fall armyworm. *In* A. N. Sparks (ed.), Long-Range Migration of Moths of Agronomic Importance to the United States and Canada: Specific Examples of Occurrence and Synoptic Weather Patterns Conducive to Migration (ESA Symposium, 1982). USDA Misc. Publ. (In press).

RAINEY, R. C. 1979. Interactions between weather systems and populations of locusts and noctuids in Africa. Pages 109-119. In R. L. Rabb and G. G. Kennedy, eds. Movement of highly mobile insects: concepts and methodology in research. North Carolina State Univ., Raleigh.

RAULSTON, J. R., S. D. PAIR, A. N. SPARKS, J. LOERA G., F. A. PEDRAZA M., A. PALAMON, T., A. ORTEGA, J. R. SANCHEZ M., P. MARQUEZ C., H. RUELES A., JOEL PEREZ M., R. RODRIGUEZ R., H. CARILLO R., R. ARCHUNDIA R., AND FRANCISCO HUERRERA R. Fall armyworm distribution and population dynamics in the Texas-Mexico Gulf Coast area. Florida. Ent. 69: 455-468.

SNOW, J. W., AND W. W. COPELAND. 1969. Fall armyworm: use of virgin female traps to detect males and to determine seasonal distribution. USDA Prod. Res. Rep. No. 110.

SPARKS, A. N. 1979. A review of the biology of the fall armyworm. Florida Ent. 62: 82-87.

VICKERY, R. A. 1929. Studies of the fall armyworm in the Gulf Coast district of Texas. USDA Tech. Bull. No. 138.

WADDILL, V. H., E. R. MITCHELL, W. H. DENTON, S. L. POE, AND D. J. SHUSTER. 1982. Seasonal abundance of the fall armyworm and velvetbean caterpillar (Lepidoptera: Noctuidae) at four locations in Florida. Florida Ent. 65: 350-354.

ADULT SAMPLING AS A MEANS OF PREDICTING DAMAGE LEVELS OF FALL ARMYWORM (LEPIDOPTERA: NOCTUIDAE) IN GRAIN CORN

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ABSTRACT

Any attempt to correlate adult fall armyworm, *Spodoptera frugiperda* (J. E. Smith) captures with infestation is complicated because plant maturity at the time migrating moths arrive in Maryland determines the extent to which larvae infest and damage corn, *Zea mays* L. Plants in mid-whorl and older escape injury whereas younger plants become infested. This work attempts to explain the difference maturity makes in susceptibility to fall armyworm and to correlate moth trap catches in pheromone traps with percent plants becoming infested. Observations in 4 separate plantings indicated the number of neonate larvae is reduced when Pioneer 3184 grain corn attained a maturity level of ca. 40% tassel-height ratio. The time from emergence from the soil to 40% T-H was hypothesized as a susceptible period. A regression analysis of % plants infested and moths captured in pheromone traps during this susceptable period resulted in a significant regression and an r^2 of 0.87.