SEASONAL POPULATIONS OF ARMYWORMS AND LOOPERS AT HASTINGS, FLORIDA\(^1\,^2\)

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ABSTRACT

Seasonal populations of the fall armyworm, *Spodoptera frugiperda* (J. E. Smith), beet armyworm, *S. exigua* (Hübner), soybean looper, *Pseudoplusia includens* (Walker), and cabbage looper, *Trichoplusia ni* (Hübner), were surveyed in the Hastings, Florida area with pheromone-baited cylindrical electric grid traps. All 4 species survive the relatively mild winter temperatures (560°F) occurring there most years; therefore, the Hastings area may act as a reservoir for overwintering populations of these pest species. Populations that build up in the spring may contribute to the numbers that migrate into other areas of the South and Northeast each spring and summer.

Migration from an insect population of outbreak proportions in one area often affects populations of the same species in other areas later in the season. This sequence is particularly evident with the fall armyworm, *Spodoptera frugiperda* (J. E. Smith), one of the few species known to disperse throughout the United States each year from areas in southern Florida and southern Texas (Luginbill 1928). In mild winters this insect can survive in most of Florida, in a large area of Texas, and in southern Louisiana (Snow and Copeland 1969). The fall armyworm, as well as several other pest insects, may survive most winters at Hastings, Fla., a large agricultural area in the northeastern part of the state where a variety of crops are produced. If populations build up there, the area could serve as a locus for migrations later in the season.

Little published data are available concerning populations and movement of pest insects in the Hastings area. Although the beet armyworm, *S. exigua* (Hübner), is present, it is generally not an economic pest of crops in the area. In spring 1970, this insect did cause damage and was difficult to control on potatoes (Mead 1970). The soybean looper, *Pseudoplusia includens* (Walker), survives the winter in Florida. Later the moths move northward into Georgia and South Carolina where they build up potentially damaging populations on soybeans. As temperatures decrease in the fall and host material disappears, the moths either perish or migrate southward (Mitchell et al. 1975). Soybean loopers occur in the Hastings area, but are not considered economic pests. In contrast, the cabbage looper, *Trichoplusia ni* (Hübner), is the major pest of cabbage, a winter crop in the Hastings area. Reid and Bare (1952) found cabbage loopers on commercial cabbage plantings throughout the winter in South Carolina, but the num-

\(^1\)Lepidoptera: Noctuidae.
\(^2\)Mention of a commercial or proprietary product in this paper does not constitute an endorsement of that product by the USDA. Received for publication 10 Nov. 1976.
bers were greatly reduced after the weekly mean temperature fell below ca. 50°F.

We report here the results of surveys with pheromone or female-baited traps of the fall armyworm and beet armyworm adult populations during 1974-75 and of the soybean looper and cabbage looper adults from July 1972-December 1975 at Hastings, St. Johns County, Fla.

METHODS AND MATERIALS

Cylindrical electric grid traps (Mitchell et al. 1972) were baited with (Z)-9-dodecen-1-ol acetate (Z-9-DDA) to attract S. frugiperda (Mitchell et al. 1974), (Z)-7-dodecen-1-ol acetate (Z-7-DDA) to capture P. includens (Tumlinson et al. 1972) and T. ni (Berger 1966), and S. exigua females for attracting males of this species (Tingle and Mitchell 1975). Traps were placed along the edges of fields containing host plants. Additional trapping studies in the area facilitated the location of survey traps. One survey trap was maintained routinely for each insect species.

The chemicals (25-100 mg/trap) were dispensed from either a polyethylene vial (OS-6 natural polyethylene closures, Scientific Products) or a polyethylene cap (Olympic Plastics). The compounds were released at a rate of ca. 300 ng/min at 80°F and 0.4 m/s wind velocity. Each trap for beet armyworms was baited with 3 laboratory-reared 2-day-old virgin females. Captured insects were collected and counted every 1-7 days. Moth captures were expressed as the number of moths per trap per night and converted to log, (n+1). Daily minimum temperatures for 1972-75 (Fig. 1) in the Hastings area (recorded at Palatka, Fla., by the NOAA weather reporting station) were used in considering the data.

RESULTS

The rather high level of the fall armyworm population (Fig. 2) early in the spring of 1975 persisted for the remainder of the year. After an extremely mild fall and winter (1974-75), the temperatures increased early in the spring (Fig. 1), and the fall armyworm population built up rapidly. This pest was unusually abundant during 1975 throughout Florida (Mead 1975).

Captures of beet armyworm moths for 1974-75 in female-baited traps are shown in Fig. 3. (Data were not collected Sept.-Dec. 1974). In 1975, we did not find beet armyworm larvae feeding on field corn (mid-whorl stage and older) at Hastings though we observed large numbers of larvae on pigweed (family: Amaranthaceae) growing in the corn fields. In early May 1976, larvae were observed feeding on young corn, but most were in fields where pigweed was abundant. When larvae collected from pigweed were brought to the laboratory and reared on artificial diet for species verification, all collected in May (1975) were beet armyworms. By early June, almost 90% of the larvae collected from pigweed were southern armyworms, S. eridania (Cramer), and no beet armyworm larvae were found on pigweed after 30 June. Only 1 beet armyworm larva and no southern armyworms were found on corn in the same field though the fall armyworm population on corn plants was very high. Few fall armyworm larvae were collected from pigweed.
Fig. 1. Daily minimum temperatures as recorded by the NOAA weather reporting station, Jan. 1972—Dec. 1975, Palatka, Fla.
Fig. 2. Fall armyworms captured in pheromone-baited electric grid traps, number [as log. (n+1)]/night, Jan. 1974—Dec. 1975, Hastings, Fla. Absence of line indicates no data.

Fig. 3. Beet armyworms captured in female-baited electric grid traps, number [as log. (n+1)]/night, Feb. 1974—Dec. 1975, Hastings, Fla. Absence of line indicates no data.

Although high populations of the soybean looper (Fig. 4) occurred each year (1972-75), their source remains obscure. Few known cultivated hosts for the soybean looper are grown in the Hastings area, so those captured were probably either migrants or adults produced from unidentified wild hosts that are abundant in the area throughout most of the year.
Fig. 4. Soybean loopers captured in pheromone-baited electric grid traps, number [as log, (n+1)]/night, Jul. 1972–Dec. 1975, Hastings, Fla.

Cabbage looper populations determined by use of pheromone traps for 1972-75 are shown in Fig. 5. Farmers in the area usually destroy residual cabbage plants within 2 weeks after harvest, much sooner than in past years. Our low trap catches during late summer (1975) may reflect this cultivation practice.

**Discussion**

Chalfant et al. (1974) and Mitchell et al. (1975) surveyed populations of the cabbage looper and soybean looper, respectively, in the tri-state area
Fig. 5. Cabbage loopers captured in pheromone-baited electric grid traps, number [as log. (n+1)]/night, Jul. 1972—Dec. 1975, Hastings, Fla.

of Florida, Georgia, and South Carolina. They reported that significant adult activity, continuous reproduction, and development of these 2 species was restricted to the southern part of Florida where winter temperatures exceeded 60°F. In northern Florida, adult activity was not significant until April and May; then it increased until October. The Hastings area, where winter temperatures often are >60°F, was not included in their surveys.

Hastings is situated in North Central Florida ca. 20 miles inland from the Atlantic Ocean; the farming area is bounded on the western edge by the St. Johns River. Consequently, the winter months are characterized by gen-
erally milder temperatures than at Gainesville, which is ca. 55 miles west. Because of more moderate winter temperatures, Hastings is the major cabbage-producing area in the state. Farmers often follow the winter cabbage crops in the spring with potatoes used for chips. In recent years, many farmers have stopped fallowing their land during the summer and have shifted to planting corn for grain.

The early destruction of the cabbage residue shortly after harvest, followed by the planting of potatoes or corn, appears to have reduced somewhat the buildup of tremendously large populations of cabbage looper previously experienced by cabbage farmers with the onset of warm spring weather. Corn is planted from mid-March through May, which allows the buildup of large populations of both the beet and fall armyworm. The beet armyworm is most abundant in corn fields heavily infested with pigweed. Since little profit is realized from the corn, little or no effort is made to control these insects.

In summary, winter temperatures in the Hastings area are conducive to the overwintering of cabbage and soybean loopers and beet and fall armyworms. Recent changes in cultural practices appear to have reduced the cabbage looper population size in the spring, but increased the potential for large populations of beet and fall armyworms. These shifts certainly affect insect populations in the Hastings area and possibly in other areas to which these pests migrate.

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LITERATURE CITED


BOOK REVIEW

It is a pleasure to know that the revised edition (1971) of Bristowe's "The World of Spiders" has been reprinted and is now available to the American public. This volume is one of the excellent British "New Naturalist" series and, as in most of the others, restricts its subject matter to the British Isles and environs. In this way it is comparable to and well complements W. J. Gertsch's "American Spiders" (which is unfortunately out-of-print).

The first six chapters review the evolution, anatomy, classification, life history and even the folklore of spiders. The next thirteen chapters discuss the natural history of the British spiders by taxonomic group. Detailed observations supplemented by descriptions of informal field experiments give the reader a vibrant and intimate view of each group of spiders in its natural environment. No attempt is made to give a systematic review of the taxa (i.e. no keys, formal taxonomic descriptions, etc.) though discussions of the evolution of certain groups and their habitats are found throughout. The final chapter discusses the strategy and technique of collecting spiders, an invaluable 8 pages of practical advice from a master. An appendix listing all the species of spiders recorded in the British Isles through 1958 is supplemented by an addendum (to 1968) but the bibliography unfortunately cites no work later than 1958.

The 116 line drawings are among the clearest and most beautiful spider illustrations in any work. They include facial views of representatives of every family, an atypical angle from which the spiders take on added character and interest. These drawings and 22 half-tone plates are accurately executed by Arthur Smith. Several photographs (4 in color) are also incorporated.

The American reader will find that all the families but one (the Eresidae with one species, Eresus niger, last found in England in 1906) are also found in North America (as are many of the genera) so that the bulk of the ecological and behavioral observations are applicable and relevant to the related American spider fauna.

One spider unique to Europe, the habits of which are described in elegant detail, is the Water Spider (Argyroneta aquatica, an ageenid sometimes placed in its own family, Argyronetidae). This spider, the only truly aquatic spider known, builds an underwater silk diving bell which it fills with air and in which it lives, reproduces and from which it ventures to capture prey. Here, as throughout the book, the enthusiasm and personal expertise of the author permeates the prose, and make this handsome book a must for all those interested in natural history and arthropods.

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