

Migrations of the Pieride Butterfly *Ascia monuste* L. in Florida.

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Especially from the observations of Fernald (1937) and Hodges (reported by Williams (1942)) this species is known to make migrations along the east coast of Florida.

An investigation in 1949—1950 has shown that the large populations from which the migrations come are found on the offshore bar which, separated from the inland by a lagoon, follows the coast as a string of long narrow islands (fig. 1). *Ascia* breeds on the saltwort (*Batis maritima*) in the mangrove and salt marshes on the lagoon side of the islands but the imagines feed on the flowers of other dry land plants growing on the ocean-facing part of the islands, especially along the open sides of the main road running along most of the islands.

A number of experiments with marking of the butterflies were carried out. The insects were sprayed with alcoholic solutions of different dyes so that both marking and recognition could be done without catching the individuals. In one feeding area where constantly between 08⁰⁰ and 16⁰⁰ about 300 *Ascia* were feeding at a time, more than 1900 individuals were marked in five and a half hours.

Each individual stays in the feeding area for less than an hour. The egg-laying females feed in the early part of the morning, the males later. It seems that within the time limits for the sexes, each individual has its own regular daily feeding time. In the days following the marking a slowly increasing percentage of the marked butterflies was seen outside of the area where the

marking took place, at distances up to $1\frac{1}{2}$ -2 km to each side. No migration took place from this area during the experiment. The total number of marked individuals de-

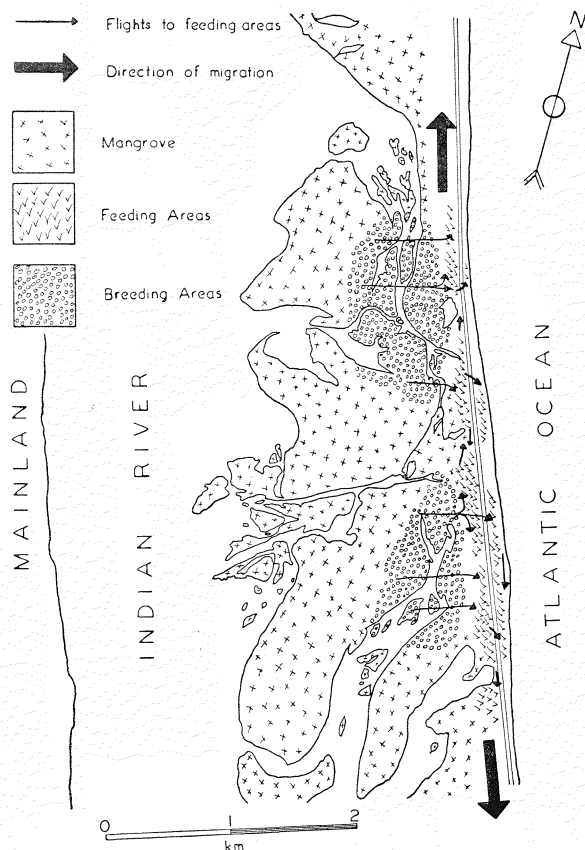


Fig. 1. Migration of *Ascia monuste* on the offshore bar along the east coast of Florida.

creased rapidly, and after the fifth day no more were seen. This indicates the duration of the adult life of *Ascia*; in captivity females can be kept alive for 8-10 days, and males for 4-5 days, if they have not copulated.

Ascia is not sexually mature until about thirty hours after the eclosion but the females may copulate immediately after the emergence.

A yearly cycle is found in fluctuations in the number of individuals in the populations; there is a passive period of eight months with very few butterflies followed by

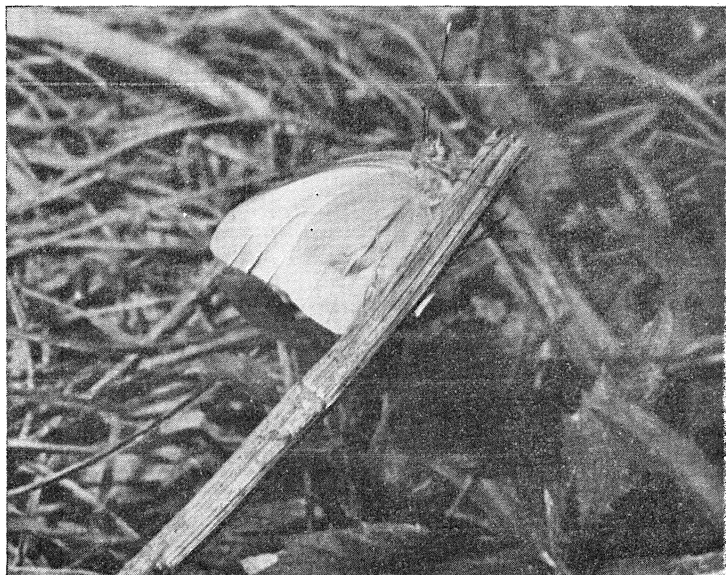


Fig. 2. *Ascia monuste* just hatched.

an active period of four months with rapidly increasing numbers. The cycle is not dependent on climatic factors as the active period in different populations is found in all seasons. At least during the active period there are very pronounced secondary cycles with five to six week intervals between the maxima, corresponding to the time necessary for the development from egg to imago. It is during these maxima, or outbreaks, that the migrations take place. Most of the migratory flights are seen between 09⁰⁰ and 14⁰⁰.

Ascia migrates only in the first part of its adult life, about a half to one and a half day old. The females migrate while still in the preoviposition period, but before they migrate, they copulate with older males and fly with the newly emerged males to the feeding area.

The food flower plants grow mostly on and behind

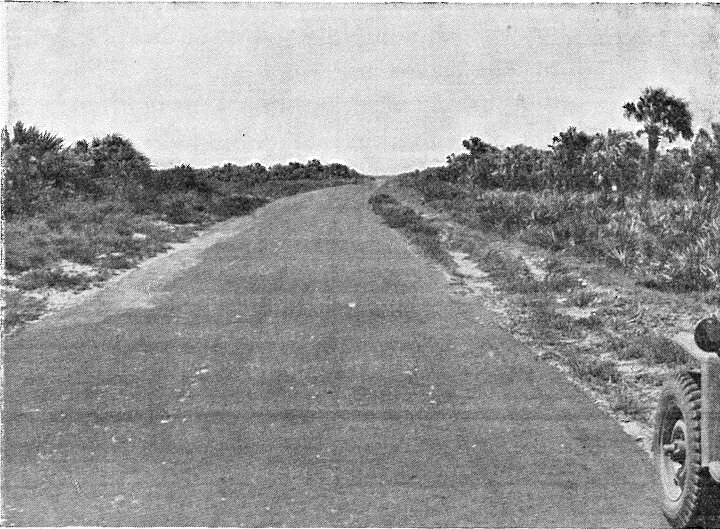


Fig. 3. Road on the offshore bar with feeding place of *Ascia monaste*.

the dunes, or along the roadsides. The flight of the feeding butterfly is in one direction, between visits to flowers. It seems that the direction of the migration is determined by the direction of the flight to or along the feeding area. On the long narrow islands the flights therefore will be mostly along the coast. From feeding areas aligned across the islands, migrations to and over the mainland have been observed. Deliberate flights out over the sea have not been seen.

The migratory flight is conspicuously distinguishable

from other flight types: more or less unidirectional with both air speed and ground speed between 8 and 20 km/h and without any stopping for food or mating. If the temperature is below about 26° C. the flight is less determined and stops for feeding are frequent. The migratory flights have generally the form of narrow streams with intensities ranging from more than 100 passing the observer each minute to single individuals, passing with intervals of minutes and all following the same route apparently without being able to see one another.

The migrants have two different methods of orientation and seem able to use either of them according to the circumstances. In some cases they follow conspicuous landmarks such as the coast line, roads, bridges, etc. In other cases they fly unidirectionally probably by means of a sun compass reaction. In strong wind the flight is low and the butterflies tend to keep on the lee side of dunes or vegetation but other effects of the wind have not been observed.

With the time for migration limited to between 1 and 1½ day the probable range for the majority of the migrating butterflies is limited to one day's flight or 70 km with a medium ground speed of 15 km/hour. It is not likely that the flight goes on for more than one day for an *Ascia*.

Experiments with marked migrants were unsuccessful but countings of the intensities of the streams indicated that the migrations generally came to a stop when the next breeding area had been reached. The distances between the populations range from 8 to 48 km.

All the butterflies emerging from early in the afternoon through the night will start an exodus early in the morning. Close to an outbreak center the migrations therefore have their maximum intensity early in the morning; farther away the maxima arrive later according to the distance and the groundspeed of the flight.

It has in some cases been possible to calculate the origin of a migration by noting the hour at which the maximum passed a certain point; previously unnoticed breeding areas have been found by this method.

Migrations from an outbreak center will in most cases stream out in both directions along the coast. If at the same time there are outbreaks from two neighbouring centers simultaneous migrations in opposite directions will pass over the area between them. Of the 170 records of migrations observed during this work 70 were simultaneous in opposite directions.

In other cases there seems, however, to be a tendency for a population invaded by migrants from one side to start its migrations in a direction which continues that of the invaders. When this is the case with a number of populations an observer might get the erroneous impression that there is a continuous flight over long distances, and that the same individuals fly for several days (or weeks) from one end of the coast to another over hundreds of miles.

The observations reported here refer only to *Ascia monuste* and it is not known to what extent it is possible to generalize the results to other migrating butterflies.

A more detailed account of the observations is given in two papers appearing in *Novitates* and *Bulletins* of the American Museum of Natural History.

- Fernald, H. T. (1937): An unusual type of butterfly migration. *Florida Entomologist* **19**, pp. 55—57.
- Williams, C. B., G. F. Cockbill, M. E. Gibbs, and J. A. Downes (1942): Studies in migration of Lepidoptera. *Trans. Roy. Ent. Soc. London* **92**, pp. 142—146.
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