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GYPSY MOTH (LEPIDOPTERA: LYMANTRIIDAE) SURVEY IN MICHIGAN

Murray Hanna¹

ABSTRACT

Gypsy moth, *Lymantria dispar* (L.), was first discovered in Michigan in 1954. Results of survey for the years 1954–1980 are presented.

Riley (1870) documented the first occurrence of gypsy moth (*Lymantria dispar* [L.]) in North America stating, "And only a year ago the larva of a certain Owllet-moth, (*Hypogymna dispar*), which is a great pest in Europe both to fruit-trees and forest-trees, was accidentally introduced by a Massachusetts entomologist into New England, where it is spreading with great rapidity." Spears (1974) identified human activities which risked extending the range of gypsy moth. Dunlap (1980) traced the history of shifting relationships between science and public policy with regard to gypsy moth from 1889 until now. Responsibility for preventing the introduction and spread of destructive insects has been delegated to the Michigan Department of Agriculture, Plant Industry Division (MDA-PID). The Director of Agriculture is authorized (Act 189, Public Acts 1931, as amended) to promulgate state quarantines regulating the movement of plants and other articles capable of carrying destructive insects. McCubbin (1954) considered survey to determine the state distribution of troublesome pests an indispensable feature of plant quarantine. The United States Department of Agriculture, Animal and Plant Health Inspection Service, Plant Protection and Quarantine (USDA-APHIS-PP&Q), and MDA-PID act together in survey for gypsy moth in Michigan. The Department of Natural Resources, Forest Management Division (DNR-FMD), and the National Campers and Hikers Association (NC&HA) have assisted in survey of parks and campgrounds.

Gypsy moth was discovered in Ingham County, Michigan, when concern and curiosity caused a resident of Lansing to inform the City Forester on 19 May 1954, that many unfamiliar caterpillars were crawling on his house, garage, shrubs, and neighboring elm trees. Specimens which had been sent to entomologists at Michigan State University were recognized as being gypsy moth larvae and of regulatory concern. The MDA-PID and USDA-APHIS-PP&Q were immediately notified and the identity of the insect was quickly verified. The MDA and USDA arranged to secure funding to delimit the area of infestation and to intervene with insecticide. Hurried, visual, roadside scouting for defoliation or other signs of gypsy moth was done from vehicles from 25 May until 5 June in order to delimit the obviously infested area. By this method, it was determined that portions of East Lansing, Lansing, and adjacent Eaton County were infested. O'Dell (1955) thoroughly documented the cooperative gypsy moth management program of 1954.

Gypsy moth is sexually dimorphic, and both sexes are polymorphic varying at least in development, behavior, size, and color. Adult females have off-white wings with dark markings and are flightless. Male gypsy moths have brown wings with dark markings and are strong fliers. The more strongly bipectinate antennae of males are provided with chemoreceptors which discern chemical signals emitted by females. Males are able to locate and to fly to adult female moths which have emitted sex pheromone. Near the turn of the century, a pheromone trap was invented in which virgin female gypsy moths were used to attract male moths. The attractant first used for gypsy moth survey in Michigan was natural sex

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pheromone which had been extracted from adult female gypsy moths. Gyplure, a synthetic attractant, replaced natural pheromone in 1963. Disparlure, an improved synthetic attractant, replaced gyplure in 1972. In 1973, traps were baited with a cotton wad containing 0.3 mg of optically inactive disparlure in 2 mg of trioctanoin keeper. When traps were serviced during the moth flight season, lure lost by volatilization was replaced from a dropper bottle. More sophisticated methods of dispensing disparlure were subsequently developed and, beginning in 1974, the amount of disparlure in each trap was substantially reduced. Attractant enriched with the (+)-enantiomer of disparlure was first used in a few localities in 1978. Nearly all survey traps were baited with (+)-enantiomer disparlure in 1980. Schwalbe (1980) summarized pheromone-based trapping methods used in gypsy moth survey from 1896 to 1977, while Elkinton and Cardé (1980) traced the history of pheromone trapping for gypsy moth in the United States. Systematic placement of pheromone traps during the male flight season has been the principal method of gypsy moth survey in Michigan. Between 1954 and 1980, frequent changes were made in trap number, distance between traps, and locality surveyed. The entire Lower Peninsula of Michigan was surveyed in stages between 1978 and 1980, with an array of one trap per three square miles (about 200 traps per county). The entire Upper Peninsula of Michigan was surveyed in 1980, with an array of 35 traps per county. Descriptions of localities where traps were placed are on file with the Michigan Department of Agriculture.

Figure 1 shows the 83 counties of Michigan. Figures 2–4 present results of gypsy moth survey for years 1954–1980. The numbers of traps used and male moths captured are given. Solid circles indicate for each year, the counties where *L. dispar* was captured in pheromone traps. The solid square in Figure 1, and for 1954 in Figure 2, identifies Ingham county where gypsy moth caterpillars were discovered in May 1954. The locality where caterpillars were found was treated with insecticide in June 1954. During the summer of 1954, results of pheromone trap survey in Ingham County were negative. Traps have not always been placed in every locality where gypsy moth occurred the previous season. No pheromone traps were placed in Gratiot County in 1979, but gypsy moth egg masses were observed in Arcada and Newark townships. No pheromone traps were placed in Midland County in 1980, but all stages of gypsy moth were observed in Mt. Haley Township.

Table 1 presents the chronology of county records for *L. dispar* in Michigan. The earliest verified records of gypsy moth in Eaton and Ingham counties were based on caterpillars which had been found by visual scouting. The earliest verified records of gypsy moth in 45 other counties were based on male moths which had been captured in pheromone traps.

Table 1. Chronology of county records for *L. dispar* in Michigan.

Year	County
1954	Eaton, Ingham, Ionia
1955	Clinton
1956	Shiawassee
1959	Calhoun
1972	Bay, Isabella, Mecosta
1973	Arenac, Cheboygan, Clare, Crawford, Gladwin, Gratiot, Huron, Livingston, Midland, Montcalm, Newaygo, Oceana, Roscommon, Saginaw, Tuscola, Washtenaw, Wayne
1974	Allegan, Macomb
1975	Berrien
1976	Osceola
1978	Barry, Kent, Oakland, Ottawa, Van Buren
1979	Kalamazoo, Lake, Muskegon
1980	Chippewa, Genesee, Grand Traverse, Iosco, Luce, Menominee, Ogemaw, St. Clair, Schoolcraft

Although gypsy moth has been recorded from 47 counties of Michigan, current distribution may be more wide-spread. Regulatory intervention with insecticide has reduced to below detectable levels, over several generations, previously known gypsy moth populations in Clinton, Eaton, Ingham, and Newaygo counties, and it is not certain whether or not the insect occurs in those counties now. Furthermore, Embody (1980) investigated gypsy moth pheromone trap catches as they relate to the populations from which they were collected, and he suggested that if no moths are captured, the judgment that no moths are present cannot be made.



Fig. 1. The counties of the State of Michigan.

For many years, numerous localities of Michigan have been subject to invasion by *L. dispar*. Pheromone traps have been used extensively for early detection, which has had high priority in management strategy. Over a span of 27 years, prompt regulatory intervention plus the unpredictable elements of nature have helped to prevent potentially destructive gypsy moth populations from dangerously exceeding economic thresholds. Perhaps fewer than 4 ha of woodlands throughout all of Michigan were known to have been defoliated by gypsy moth in 1980. Perhaps no more than 10 ha, woodlots and solitary trees all totaled, have been defoliated since gypsy moth was first introduced. Despite these relatively low acreages affected, the potential for wide-spread defoliation is so great that systematic monitoring of gypsy moth distribution and population trends should be continued.

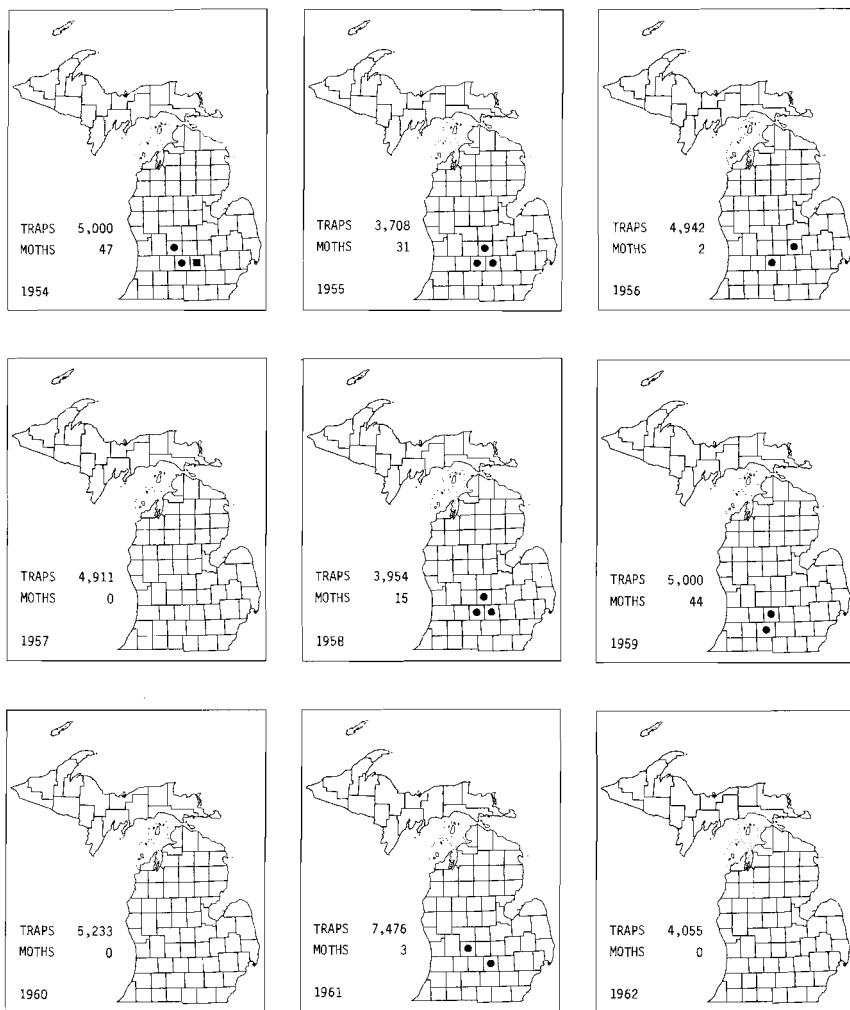


Fig. 2. Results of gypsy moth survey 1954-62.

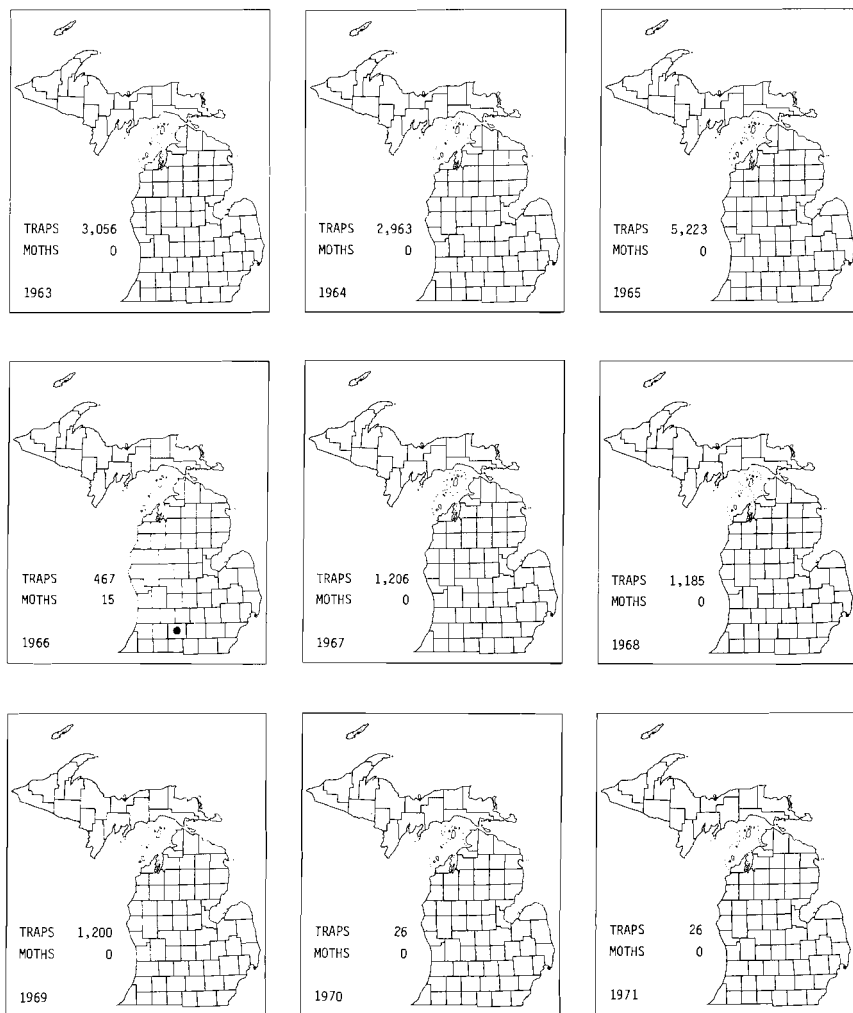


Fig. 3. Results of gypsy moth survey 1963-71.

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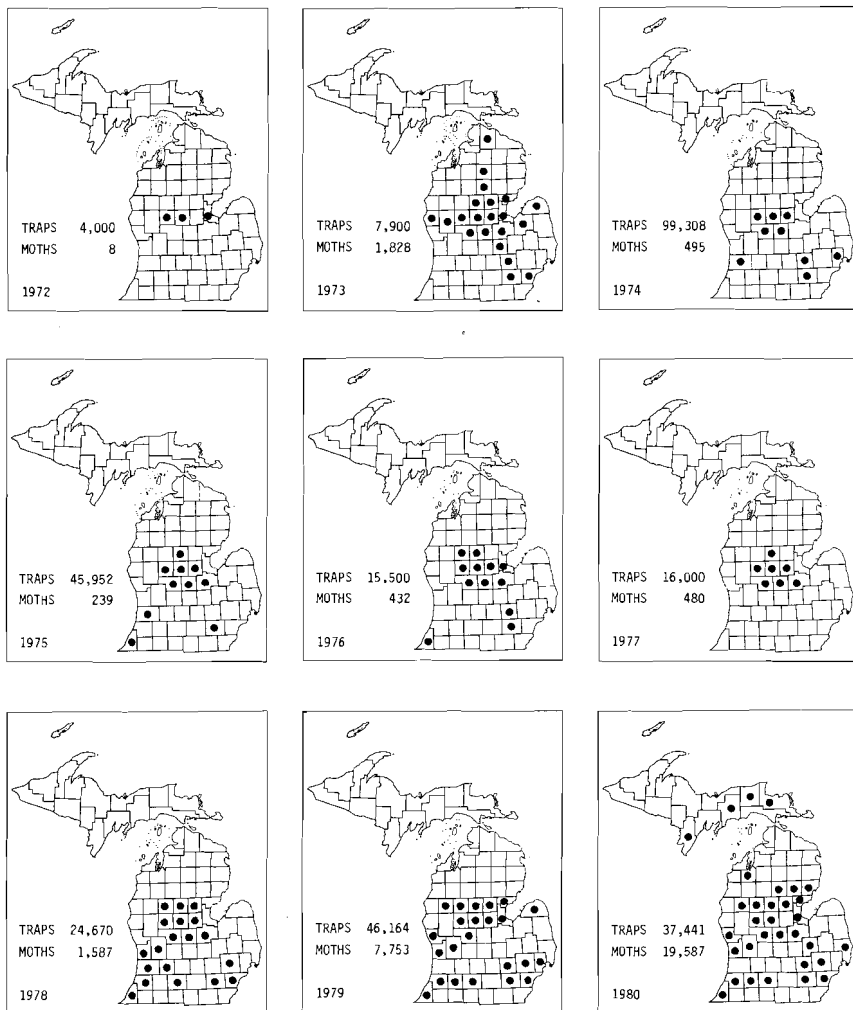


Fig. 4. Results of gypsy moth survey 1972-80.

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