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# THE PEST STATUS OF YELLOWJACKETS IN OHIO (HYMENOPTERA:VESPIDAE)

Kenneth J. Stein and Dana L. Wrensch[1]


## ABSTRACT

Since 1975 in Ohio, there has been an escalation in the number of complaints and inquiries regarding yellowjackets (*Vespula* and *Dolichovespula* spp.) to the Ohio pest control operators, the Ohio Cooperative Extension Service (OCES) County Agents and the OCES Entomologists at the Ohio State University. A survey was distributed in May 1985 to both groups in order to determine the pest status of yellowjackets in Ohio.

The results of this survey strongly suggest that yellowjackets in Ohio are largely an "economic pest", with most economic disturbances associated with homeowners, outdoor businesses, and outdoor recreational facilities.


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The perception that yellowjacket populations have been increasing in the Eastern United States and the Midwest is shared by several authors (Menke and Snelling 1975, Morse et al. 1977, Davis 1978, Akre et al. 1980, MacDonald et al. 1980, 1984, Parrish and Roberts 1982).

Menke and Snelling (1975) described an "increasing abundance" of *Vespula germanica* (F.) in New York, Pennsylvania, New Jersey, Delaware, and Maryland. They believed that the increase began in the late 1960's and that perhaps *V. germanica* was becoming more common than the native *V. maculifrons* (Buysson).

Morse et al. (1977) ascribed pest status to *V. germanica* after they found that 88% of 1,022 randomly collected vespids in Ithaca, New York, during the summer of 1974–1975 were *V. germanica.*

Davis (1978) noted increasing numbers of yellowjackets in urban environments throughout various parts of the world and pointed to man's restructuring of natural environments as favorably enhancing the establishment of yellowjacket colonies.

MacDonald et al. (1980) described the spread of *V. germanica* into the northern Midwest, specifically Indiana, Illinois, Michigan, and Minnesota. Although Morse et al. (1977) believed they traced the spread of *V. germanica* through Ohio in 1976, MacDonald et al. (1980) obtained a specimen from Rock Creek, Ohio in 1971.

MacDonald et al. (1980) believed that *V. germanica* was emerging as the primary urban pest yellowjacket throughout Indiana and cited increasing numbers of telephone calls regarding yellowjackets at the Department of Entomology, Purdue University, The Indiana State Board of Health, and the State Entomologist's Office as indicative of increasing yellowjacket population densities. Although the majority of these phone calls were from concerned homeowners, there was a proportionate number of inquiries from pest control operators noting a rise in numbers of phone requests to treat structurally-located yellowjacket colonies. Akre et al. (1980) provided further support to the observation that the German yellowjacket was becoming the primary urban/industrial pest yellowjacket. These authors observed an increase in inquiries from the general public and

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thought that the public's knowledge was insufficient for either the proper control of yellowjackets or the determination of their pest status. Although most experts (e.g. Akre and MacDonald) agreed that *V. germanica* was increasing in urban environments, no one had actually quantified this perception prior to 1980. Parrish and Roberts (1982) demonstrated that *V. germanica* colonies were more closely associated with human population density in urban environments than the other yellowjacket species and saw this yellowjacket's potential to become an important urban pest.

Davis (1978) and Akre et al. (1980) have documented some of the damages and problems that arise when yellowjackets conflict with people. Akre et al. (1980) cite instances where logging and sawmill operations have been curtailed because yellowjacket densities were extremely high, and workers could not perform their jobs effectively. In addition, the production of food products within fruit processing plants declined when yellowjackets were abundant within them. The yellowjackets were attracted to the smell of fruit and sweet juices emanating from the processing plant, and became so numerous that they repelled the employees. Consequently, the employees refused to work for fear of being stung. Hawthrone (1969) reported that yellowjackets in California cost agricultural operations an estimated $200,000 in 1968. Most of these losses were due to attacks of yellowjackets on fruit pickers and feedlot workers. Davis (1978) also estimated that thousands of dollars are lost annually in beekeeping throughout the world because of yellowjackets. Even in North America, yellowjackets are a nuisance to beekeepers, often creating severe financial losses (Akre et al. 1980). In all these instances, yellowjackets are directly responsible for lost man-hours, lost wages, and medical expenses due to treatment of stings, and thus are a factor when assessing the overall economic importance of yellowjackets.

Although most people believe that yellowjackets are a nuisance, very few recognize their ecological significance as predators (MacDonald et al. 1980, Akre et al. 1980). Several authors (Spradbery 1973, MacDonald et al. 1974, Greene et al. 1976, Schmidtmann 1977, Akre et al. 1980) have described some of the beneficial aspects of yellowjackets, including their role as predators of pest insects. However, depending on the locality, it may be difficult to determine whether yellowjackets are more of a nuisance than a benefit. Akre et al. (1980) and MacDonald (1980) believe more research is needed in order to fully understand the beneficial nature of yellowjackets.

In 1975 in Ohio, survey entomologists noted an increase in yellowjacket populations (Lewis 1975). During 1983–1986, official records of the OCES (based on the number of phone calls) have suggested that the yellowjacket has been the most abundant "pest" in Franklin County (W. F. Lyon pers. comm.).

In 1985, a survey was distributed (in cooperation with the OCES) to 88 OCES County Agents (CA's) and 185 Ohio Pest Control Operators (PCO's). The primary intent of the survey was to assess qualitatively whether the yellowjackets in Ohio create sufficient losses to be considered an economic pest. In addition, the survey provided information to determine the working knowledge possessed by the professionals who dealt with yellowjacket problems on a regular basis. The results might point to needed areas of research aimed at yellowjacket ecology and control.

## METHODS

A survey was developed (Table 1) to provide results for evaluating the perceptions held by the PCO's and the CA's regarding yellowjackets. This survey asked a variety of questions about yellowjacket ecology, biology, control, abatement and economic damages. These questions were based on yellowjacket-related problems described in the literature and discussions with the extension entomologists at The Ohio State University. Draft copies of the survey were critiqued by Dr. Donald Johnston and Dr. William Lyon of the Entomology Department at The Ohio State University. Eighty-eight surveys were sent to the CA's and 185 were sent to the PCO's.

## RESULTS AND DISCUSSION

The number of surveys returned by the PCO's was 71 out of a total of 185 distributed (38.4% returned). The CA's had a much higher response, returning 78 surveys out of 88 sent (88.6% returned). Refer to Table 1 for the responses given to each question.

The response to question 1 indicates the perceptions of the relative abundance of yellowjackets in Ohio prior to May, 1985. Fifty-five percent of the PCO's and CA's observed yellowjackets to be frequently or occasionally troublesome. This observation is strongly reinforced by the response to question 2; the majority of the PCO's and CA's (54.1%) have answered 50–100 yellowjacket inquiries/year during 1983 and 1984. PCO's overall received more inquiries. This large number of inquiries concurs with what has been observed by the OCES entomologists for the past three years in Columbus, Ohio. Furthermore, 63.3% of the total agents surveyed (question 3) thought yellowjackets were increasing as a pest. Our results affirm the views of several entomologists who believed yellowjacket populations to be increasing or expanding their range.

The PCO's and the CA's both received 71.2% (question 4) of all their yellowjacket complaints during August and September. These two months correspond to near maximum worker populations of most vespids (MacDonald, 1980) and therefore strengthen the likelihood that the PCO's and CA's are describing yellowjackets and not other insect pests. The majority of these complaints (54.5%; quesion 5) come from homeowners, businesses, and outdoor recreational facilities. The origin of these complaints accurately depicts the nature of the yellowjacket problem in Ohio; essentially, yellowjackets are an urban problem. Although there is more than one species of yellowjacket found in Ohio's urban environments, *V. germanica*'s foraging behavior and nest-site location makes it largely responsible for the nuisance problem.

Although the survey results indicate that some businesses (question 5) and farmers (question 6) often complain about yellowjackets, the yellowjackets in Ohio are apparently not as severe a pest as that described by Davis (1978) and Akre et al. (1980). Both of these authors have indicated that yellowjackets in California, Oregon and Washington frequently become economic pests for many businesses and industries.

Question 7 was designed to investigate the cumulative economic cost of yellowjacket disruption in a specific area. Although 54.6% of the agents responded to question 7 with no opinion/no information, about 20% considered them causing in excess of $5,000/year damage. Thus, when the respondents had information, yellowjackets are economically important. These costs may not be "severe" in the sense of Davis (1978) and Akre et al. (1980) but are nevertheless greater than one would assign to nuisance pest status. The PCO's and the CA's perceptions of yellowjackets are incomplete because certain aspects of the economic importance of yellowjackets are unknown. Their reports do not include the medical costs due to treatment of yellowjacket stings, which will be confined largely to medical facilities and insurance companies, or building costs associated with yellowjacket structural damage. Evidence that yellowjackets in Ohio are an economically important pest are reinforced by question 8. Thirty-one point four percent of the PCO's and CA's believed abatement funding is warranted for yellowjackets as for mosquitoes.

Some of the economic complaints included an agent who spoke of yellowjackets stripping the skins off of a grape crop and ruining them. By the time he treated it with pesticide, it was too late. Additional complaints come from roadside fruit vendors who find that yellowjackets can be so dense on fruit at times that people are repelled at the sight and will not remain to buy. One PCO treated trash cans (for yellowjackets) at a county fair where 112 people were stung in one week. One positive comment came from a pig farmer who was going to destroy a yellowjacket nest until he noticed that the yellowjackets were removing flies from his pigs. Apparently the beneficial aspects of yellowjackets are often overlooked.

The PCO's and CA's are the personnel who deal with urban yellowjacket problems on a regular basis. Therefore it is surprising that only 28.2% of the respondents claimed to have knowledge of the species of yellowjackets in their homes (question 9). This total consists of 50.7% of the PCO responses compared to only 8% of the CA's reporting. This discrepancy is not unexpected because PCO's are involved in yellowjacket extermination, and are thus more likely to know species.

Also surprisingly, only 40.3% of the respondents thought yellowjackets have any positive ecological benefit (question 10). This total consists of 47.7% of the PCO's versus only 34.2% of the CA's responding in the affirmative. Although it does not require a knowledge of vespid ecology to effectively remove unwanted yellowjacket colonies, it is remarkable that a majority of experienced agents do not know that yellowjackets have some ecological benefit.

Most of the respondents preferred carbaryl as the best pesticide to kill yellowjackets (63.8%, question 11). The distinction between PCO's and CA's is interesting here: 91.7% of the CA's chose carbaryl as compared to only 44.0% of the PCO's, of whom 30.1% preferred dichlorvos.

Question 12 attempted to investigate future control strategies. The response to question 12A and 12C included an appreciable number of responses that suggested poison baits, attractant lures, and repellents were useful for yellowjacket control. The literature regarding yellowjacket control for the last ten years or so is replete with references to potential control by the use of poison baits, attractant lures and repellents (Akre et al. 1980, MacDonald et al. 1976, MacDonald 1980). Even though poison baits, attractant lures and repellents are not a widespread method of control, 46.7% of the PCO's and CA's were aware of their potential.

Although male sterile techniques would theoretically be possible as a control strategy, yellowjackets have a unique biology, and it is doubtful that such a control strategy would ever be practical. However, 37.7% of the PCO's and CA's (question 12) believed male sterile techniques would be effective as a control strategy.

The results of this survey indicate that the persons most likely to handle complaints about yellowjackets consider them a serious economic pest. The number and recent increasing frequency of phone calls (in Ohio), and the variety of businesses making inquiries, supports the hypothesis that yellowjackets are a serious urban pest.

The PCO's and CA's do not have the specific information necessary for assessing the medical costs related to the treatment of yellowjacket stings and allergic reactions. In addition, economic losses to the business community caused by yellowjackets may also remain unknown. Thus, the PCO's and CA's perceptions and responses to this survey underestimate the actual economic impact caused by yellowjackets.

At the February, 1986 National Urban Entomology Conference in College Park, Maryland, many entomologists, PCO's and CA's believed the yellowjacket to be a primary urban pest (R. D. Akre pers. comm.). Questions were raised regarding the lack of current research applied to yellowjackets. Perhaps additional investigations such as this survey will help stimulate research (or funding) in other states where yellowjackets are also economically important. Ultimately, this research may lead to an increased knowledge of yellowjacket ecology and control.

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## APPENDIX

TABLE 1. Twelve questions of a survey that were sent to the County Agents (CA's) and the registered Ohio Pest Control Operators (PCO's) in 1985. Following the answers to each of the questions are the total number and percent total number of responses given by the PCO's and CA's.

T = Combined responses from both Pest Control Operators and County Agents; % = Percent of responses; N = Total number of responses; NA = No response

For the following questions please circle the one letter or letters that best represents your opinion.

1) Yellowjackets have been a problem in my area:

| T% | (N) | T% | (N) |
|---|---|---|---|
| A. Very much and often troublesome | | C. Very little, rarely receive inquiries and complaints | |
| 55.0 | (82) | 3.3 | (5) |
| B. Only occasionally, or infrequently troublesome | | D. Not at all | |
| 40.3 | (60) | 1.3 | (2) |

2) How many inquiries or complaints have you received about yellowjackets in the last two years?

| | | | |
|---|---|---|---|
| A. Greater than 100/year | | C. 10 or more, but less than 50/year | |
| 25.7 | (38) | 31.1 | (46) |
| B. 50 or more, but less than 100/year | | D. Less than 10 per year | |
| 28.4 | (42) | 14.9 | (22) |

3) Yellowjackets are increasing as a pest in your area:

A. Yes
63.3 (95)

B. No
15.3 (23)

C. No opinion/no information
21.3 (32)

4) What month of the year do you receive the most calls involving inquiries or complaints about yellowjackets?

| | T% | (N) |
|---|---|---|
| A. June | 4.5 | (10) |
| B. July | 18.0 | (40) |
| C. August | 37.4 | (83) |
| D. September | 33.8 | (75) |
| E. October | 5.8 | (13) |
| F. Other— | NA | NA |

5) Circle any of the following letters that reflect areas of complaint or inquiries about yellowjackets:

A. Homeowners (residential problem; gardens, barbecues, structures, etc.)
26.9 (144)

B. Amusement or recreational facilities (parks, playgrounds, county fairs, zoos, picnic areas)
15.5 (83)

C. Business facility (e.g. packing plants, bakeries, garbage disposals)
12.1 (65)

D. Vegetable or fruit grower
3.5 (19)

E. Vegetable or fruit seeder
NA NA

F. Restaurant or food vendor (e.g. McDonald's, Wendy's, country clubs, etc.)
11.0 (59)

G. Education (school teachers or students wanting biological or pest status information)
5.8 (31)

H. Pest control companies
3.9 (21)

I. Persons expressing fear of the insect or its sting
18.9 (96)

J. Hospitals, doctors, veterinarians
3.2 (17)

K. Other—
NA NA

6) Yellowjackets have probably been responsible for the destruction or damage to which of the following commercial products:

| | T(%) | (N) |
|---|---|---|
| A. Beehives | 7.6 | (11) |
| B. Grapes | 15.2 | (22) |
| C. Melons | 9.0 | (13) |
| D. Apples | 24.1 | (35) |
| E. Peaches | 11.0 | (16) |
| F. Plums | 4.8 | (7) |
| G. Fruit juice companies, wineries, cider manufacturers | 13.1 | (19) |
| H. Bakeries | 9.0 | (13) |
| I. Other— | 6.2 | (9) |

7) If you can assess the cumulative economic cost of yellowjacket damage or disruption in your area, would you estimate that cost at:

A. Greater than $10,000/year
9.9 (14)

B. $5,000 or more per year, but less than $10,000/year
9.9 (14)

C. $1,000 or more per year, but less than $5,000/year
11.3 (16)

D. Less than $1,000/year
14.2 (20)

E. No opinion/no information
54.6 (77)

8) Should there be funding appropriated similarly to mosquitoes for abatement control programs?

| | T% | (N) |
|---|---|---|
| A. Yes | 31.4 | (43) |
| B. No | 68.6 | (94) |

9) Do you have any knowledge of the species of yellowjacket in your home?

A. Yes

B. No

28.2 (40) 71.8 (102)

10) Do you personally think yellowjackets have any positive ecological benefit?

A. Yes
40.3 (58)
B. No
23.6 (34)
C. No opinion
36.1 (52)

11) What is the best pesticide to kill yellowjackets?

A. Carbaryl (Sevin)
64.8 (107)
B. Resmethrin (Synthrin)
6.7 (11)
C. Dichlorvos (DDVP)
18.2 (30)
D. Other—
10.3 (17)

12) What is a future control strategy that might work to reduce yellowjacket infestations?

A. Poison baits
26.6 (41)
B. Male sterile techniques
37.7 (58)
C. Attractants and repellents
20.1 (31)
D. Genetic engineering
13.6 (21)
E. Trapping
1.9 (3)