

Estimation of a local population size of *Megascolia flavifrons* (Hymenoptera: Scoliidae)

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PIEK, T., 1990. ESTIMATION OF A LOCAL POPULATION SIZE OF *MEGASCOLIA FLAVIFRONS* (HYMENOPTERA: SCOLIIDAE) – *ENT. BER., AMST.* 50 (10): 146-148.

Abstract: During six days of full flowering of artichoke at La Londe les Maures (Var, France), female *M. flavifrons* (Fabricius) visiting these flowers, were marked. From recaptures during the following days the local population size was estimated. Moreover, this method provided the possibility to evaluate the presence of *haemorrhoidalis*-characters without killing large numbers of wasps. It is concluded that the high frequency of *haemorrhoidalis*-characters, observed in 1985, has been a transient phenomenon.

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Introduction

From 1982 to 1988, the author has collected more than 600 females of *Megascolia flavifrons* (Fabricius) for the research of the venom. After removing of the venom reservoirs the insect integuments were conserved. From this material the presence in the Provence (France) of *M. flavifrons haemorrhoidalis* (Fabricius) has been described (Piek, 1986). Independently Carrière (1985) described a male *M. flavifrons haemorrhoidalis* from the adjacent French province Bouches-du-Rhône. Piek & Carrière (1990) described the variable appearance of the *haemorrhoidalis*-characters in the Provence, showing a marginal score in 1982, a peak in 1985 and a decrease during the following years; the score of 1988 being about of the level of 1981. The latter authors suggested that the presence of the *haemorrhoidalis*-form could be transient, leaving the possibility of a fluctuating phenomenon.

The only possibility for continuing the observations was to capture about a hundred female wasps every year. Since a good reason to kill these wasps in such amounts for the venom collection, is no longer present, an alternative method was chosen, which is described here.

Materials and methods

(fig. 1, table 1)

During maximal flowering from 2 to 7 July (1989) in an artichoke field in La Londe les Maures (Var, France; 43.2025° N, 6.2411° W) every day a number of female *M. flavifrons* wasps were immobilized transiently with ethylacetate (pro analysis; Merck, Darmstadt, F.R. Germany) and marked with coloured nail polish on the dorsal side of the meta- and prothorax (fig. 1). The wasps recovered after 5-10 min. Recaptures were noted from 3 to 7 July (table 1). Three specimen out of 105 showed characters of *M.f. haemorrhoidalis*. They were killed for evaluating the characters according to the method by Piek (1988).



Fig. 1. Female of *Megascolia flavifrons* feeding on artichoke and marked the day before with nail polish (arrow).

Table 1. Captures and recaptures of marked females of *M. flavifrons* in an artichoke field (f. *haem.* = forma *haemorrhoidalis*). The number of captured wasps includes the recaptures during that day.

date in July, 1989	nr. of wasps captured	nr. of wasps marked	nr. of f. <i>haem.</i>	recaptures from day				
				02	03	04	05	06
02	27	23	2					
03	21	17	1	2				
04	15	11	0	1	3			
05	39	33	0	4	1	1		
06	17	10	0	1	0	2	4	
07	9	5	0	1	0	0	2	1
Total	128	99	3	9	4	3	6	1
Total recaptures						23		

Results

Population density of M. flavifrons

The total number of first captures of 105 female wasps in 1989 is comparable to the number of collected females in the preceding years. However, now all of them, except six (including three *haemorrhoidalis*) were marked once (Table 1) and released.

Regarding all recaptures together, an estimation of the local density of specimens, visiting frequently the artichoke field, can be made by dividing the product of the total number of wasps captured during a particular day and the total number of wasps marked during the preceding day(s), by the number of recaptures. In this way an estimation of the population size could be made every day from 3 to 7 July. Table 2 shows that the estimation of the population size does not change progressively with time, only varies from day to day. Nevertheless, exchange of specimens with

other crops cannot be excluded, reason for estimating also the population size from observations of recaptures of the day following marking. Table 3 shows that the average estimation made at this way is lower than calculated in table 2. Moreover, the standard error of the mean (SEM) is larger. Since in this case the possibility of exchange with other crops in the vicinity is minimal, this estimation may be more reliable than that of table 2. A comparable examination has been made in the second decade of July, 1986 in a lucerne field near Argelès-sur-Mer (Pyrénées Orientales, France), resulting in an estimated population size of 240 ± 76 (SEM, $n = 3$).

The presence of M. flavifrons haemorrhoidalis

Two specimens of *M. flavifrons* showed red setae on the tergites 5 and 6 and red setae on

Table 2. Estimation per day of the local population size, with the average and standard error of the mean (SEM). The total number of marked wasps is considered.

date in July, 1989	total nr. of wasps marked before	nr. of wasps captured	total nr. of recaptures	popula- tion size
03	23	21	2	242
04	40	15	4	150
05	51	39	6	332
06	84	17	7	204
07	94	9	4	212
Average (\pm SEM, $n = 5$)				228 \pm 30

Table 3. Estimation per day of the local population size, with average and standard error of the mean (SEM). Only the recapture of wasps marked on the preceding day is considered.

date in July, 1989	nr. of wasps marked day before	nr. of wasps captured	nr. of recaptures	popula- tion size
03	23	21	2	242
04	17	15	3	85
05	11	39	1	429
06	33	17	4	140
07	10	9	1	90
Average (\pm SEM, $n = 5$)				197 \pm 64

Table 4. Color scores of gastral setae of females of *M. flavifrons*, according to the scoring system by Piek (1988). n = number of observations; \bar{x} mean of scores; SEM = standard error of the mean. The values from 1982-1986 are from Piek (1988). The values of 1988 from Piek & Carrière (1990).

Year	n	\bar{x}	SEM
1982	75	0.01	0.01
1983	86	0.07	0.04
1984	101	0.12	0.04
1985	101	0.33	0.07
1986	128	0.20	0.04
1988	123	0.04	0.01
1989	105	0.03	0.01

the posterior margin of the pronotum. One out of the 105 females showed red setae on tergite 6 only. Based on red setae present on the gaster, Piek & Carrière (1988) showed a bell shaped distribution of the average from 1982 to 1988. Table 3 shows the values of mean scores (\bar{x}) from 1982 to 1989. It is clear, that the transient increase in colouration of the setae has returned to a very low value, comparable to that in 1982.

Discussion

Marking wasps allows establishing local population sizes as well as variation in taxonomic characters, without killing a large number of wasps. Although the collection results of the preceding years do not show any decrease in population size (Piek, 1988), we now know that every year a 30-50 percent of the local population might have been killed. In this context the term local means a single agricultural

field. From many other fields within a distance of a few kilometers, exchange may have compensated the yearly assessment.

Marking and recapture provides a reliable determination of the frequency of the *haemorrhoidalis*-characters, because of the high percentage of recaptures (table 1, 23%). For this purpose marking is an acceptable alternative to collecting and killing. Moreover, it provides the possibility to estimate the size of the local population.

It is concluded that the relatively high frequent presence during the eighties of *haemorrhoidalis*-characters within the population of *M. flavifrons* in the vicinity of Salins d'Hyères (or La Londe les Maures, Var, France) with a maximum observed in 1985, probably is a transient phenomenon.

References

- CARRIÈRE, J., 1985. Les scolies de Saint-Martin-de-Crau (Bouches-du-Rhône) (Quelques réflexions à propos de *Scolia flavifrons* F.) - *Bull.Soc.Sc.nat., Compiègne* 47: 20.
- PIEK, T., 1986. *Megascolia flavifrons haemorrhoidalis* (Fabricius), found in the Provence (Hymenoptera: Scoliidae) - *Ent.Ber.,Amst.* 46: 45-47.
- PIEK, T., 1988. Variation in some scollid wasps of the French Mediterranean coast (Hymenoptera: Scoliidae) - *Ent.Ber.,Amst.* 48: 37-43.
- PIEK, T., & J. CARRIÈRE, 1990. *Megascolia flavifrons haemorrhoidalis* (Fabricius, 1787) en Provence: phénomène transitoire ou ondulatoire? - *Bull.Soc.Sc.nat., Compiègne* in press.

Accepted 23.v.1990.