

PHENOLOGY OF SOCIAL WASPS (*HYMENOPTERA: VESPINAE*) IN THE KUJAWY REGION UNDER THE INFLUENCE OF CLIMATIC CHANGES IN 1981-2000

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INTRODUCTION

Wasps are predators of insects and prefer anthropogenic habitats. In rural areas, alike in urban areas, they act as main reducers of dipterans. They also eat many miscellaneous carbohydrate foods. When searching for food, they often visit flowers of *Umbelliferae*, *Scrophulariaceae* and thickets of *Symphoricarpos albus*, as well as different rooms and places with products or food scraps subjected to ethyl fermentation. When visiting those places they can become not only a pollinators, but also a vectors of pathogenic microorganisms. Thus, they may constitute a sanitary threat. At the same time, as a very active and aggressive aculeata insects they also constitute a high allergological and toxicological threat.

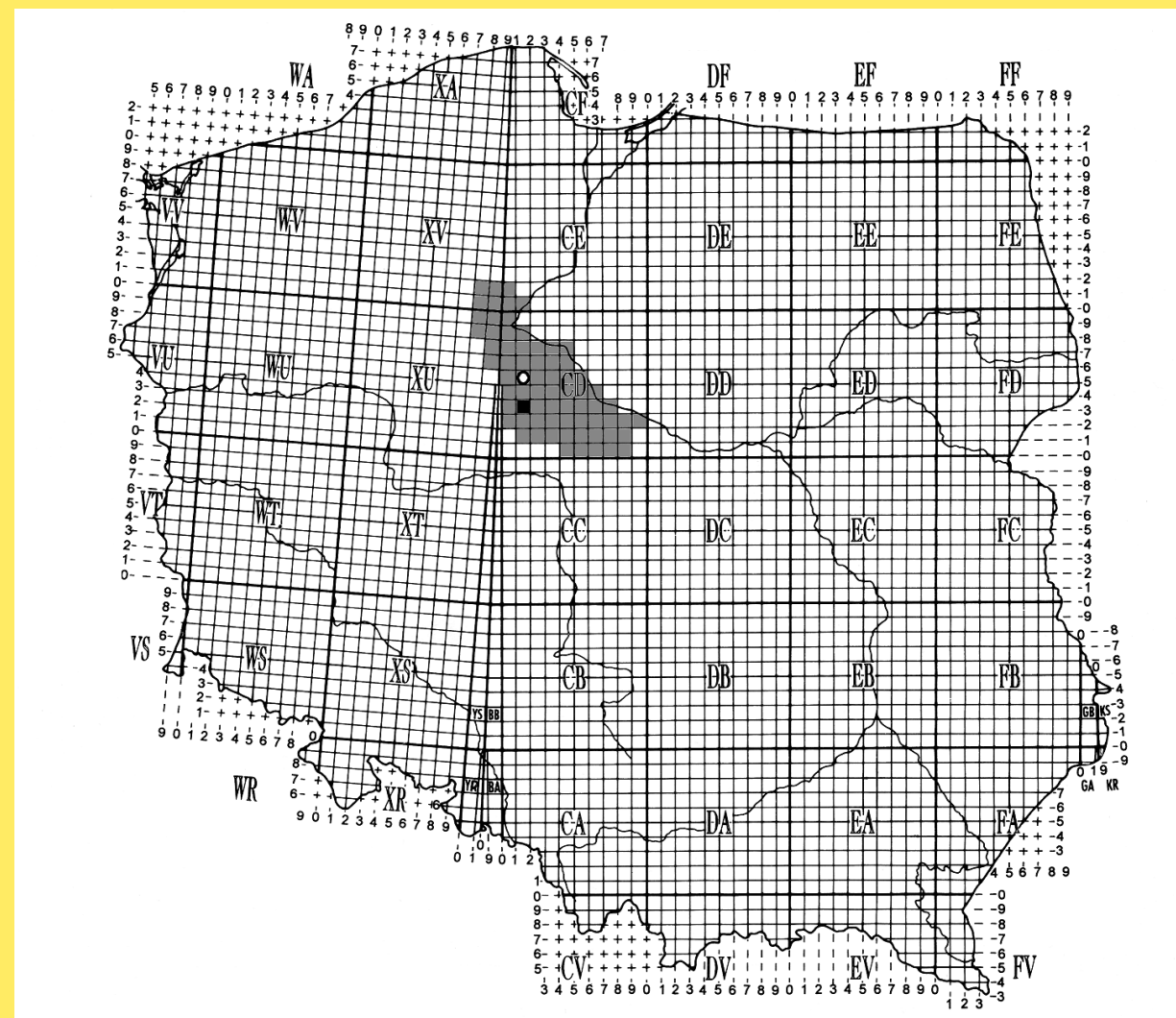


Fig. 1. Research area (black square) in the Kujawy Region (gray squares) superimposed on map of Poland in the UTM grid system. Location of the Meteorological Station in Inowrocław marked with white circle.

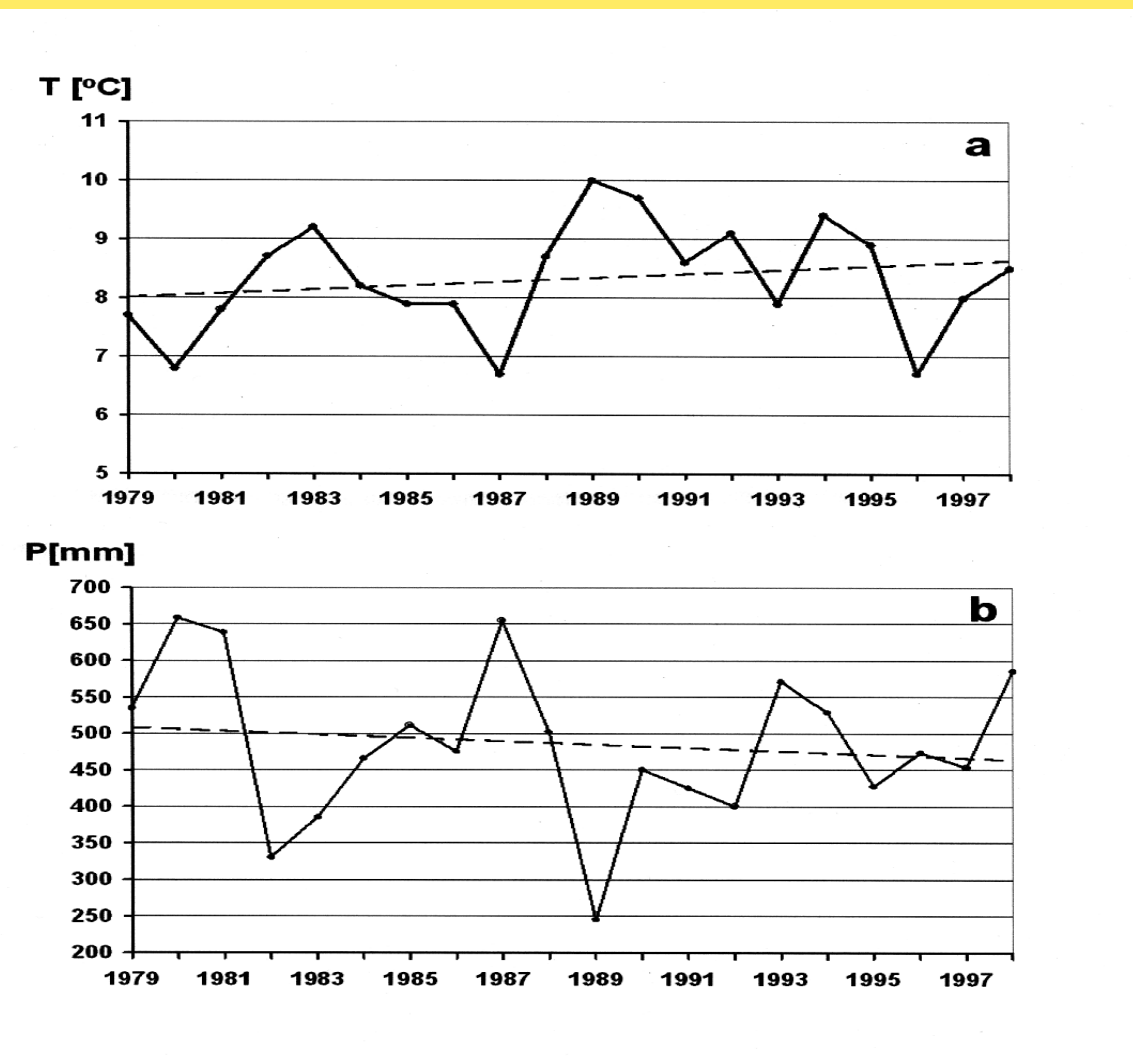


Fig. 2. Mean annual air temperature (a) and total rainfalls (b) for the Kujawy Region according to data from the Meteorological Station in Inowrocław in 1979 - 1998 (Rogowski, unpublished). A dotted lines indicates trend of changes.

RESULTS

Based on the first flights of queen mothers and on the last observed flights of different castes of imagines, the phenology of flights of wasps *Vespinae* was determined in two ten-year intervals of the last 20 years of the previous century (Table 1, Fig. 1). The superdominant *V. germanica* had a shorter range of flights in 1991-2000 by 18.5%, as compared with the years 1981-1990. Also the range of *V. vulgaris*, the second dominating species, was shorter in the second ten-year interval by 16.3%. For the remaining species, the tendency to shorten the range of flights was also observed in the last ten years of the 20th century. Only for the hornet - *Vespa crabro*, the range of flights remained constant. However, it was revealed that in 1991-2000, the range of its flights used to begin and end, on average, one week earlier. The recorded downward trend of the average annual precipitation and at the same time the growth trend of the annual air temperature in the vegetation season during the last 20 years in Kujawy (Fig. 2), as well as the significant ($P \leq 0.05$) tendency to shorten the average flight range of imagines *Vespinae*, would indicate the general deterioration of habitat conditions for this group of insects. However, this deterioration would concern mainly the nutritional factors. Since the reduction of rainfalls influences the decrease of humidity in habitats of open cultivations in the agricultural landscape. This in turn, most probably limited the growth of dipterans, and consequently limited the essential nutritional resources of social wasps.

Table 1. Phenology of *Vespinae* wasps' flights in the Kujawy Region during 1981-2000

Species	MND	Years	Months and 7 - 8 day periods						
			IV	V	VI	VII	VIII	IX	X
1. <i>Vespa germanica</i> (F.)	168 ^a	1981-1990	--oo	oooo	oxxx	xxxx	xxxx	xxxx	xv--
	137 ^a	1991-2000	---o	oooo	oxxx	xxxx	xxxx	xv--	----
2. <i>Vespa vulgaris</i> (L.)	141 ^b	1981-1990	---o	oooo	vvxx	xxxx	xxxx	xxxv	vv--
	118 ^b	1991-2000	----	-ooo	ovvx	xxxx	xxxx	xxv-	----
3. <i>Vespa crabro</i> L.	122	1981-1990	----	-ooo	ovvv	xxxx	xxxx	xxv-	----
	122	1991-2000	----	-ooo	vvvx	xxxx	xxxx	xv--	----
4. <i>Dolichovespula saxonica</i> (F.)	113 ^c	1981-1990	----	ooov	vvxx	xxxx	xxxv	----	----
	99 ^c	1991-2000	----	-oov	vvvx	xxxx	xxv-	----	----
5. <i>Dolichovespula sylvestris</i> (Scop.)	113?	1981-1990	----	oooo	ovxx	xxxx	xxx-	----	----
	96?	1991-2000	----	-ooo	ovxx	xxxx	xx--	----	----
6. <i>Vespa rufa</i> (L.)	91?	1981-1990	----	-ooo	ovxx	xxxx	xx--	----	----
	90?	1991-2000	----	-ooo	ovvx	xxxx	xx--	----	----
7. <i>Dolichovespula media</i> (Ret.)	89?	1981-1990	----	-ooo	vvxx	xxxx	xx--	----	----
	82?	1991-2000	----	-ooo	ovxx	xxxx	xx--	----	----
Number of <i>Vespinae</i> species		1981-1990	0012	4477	7777	7777	7754	3332	2200
		1991-2000	0001	1567	7777	7777	7743	3310	0000

MND – mean number of flight days (? = not completed data), ^{a,b,c} values are a difference with the significance level $P \leq 0.05$, o = spring queen flights, v = probably flights of queens and workers, x = worker and other caste flights

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