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Effectiveness of Malaise Traps for Collection of Wasps (Hymenoptera: Aculeata)

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Abstract.- In 1985-1996 wasps were captured, using Malaise traps. The total of 24,000 wasp specimens of eight families were collected with 123 Malaise traps. Sphecidae (53.2%), Vespidae (18.0%), Pompilidae (14.3%) and Chrysididae (12.5%) were most often caught by the traps. Malaise traps appeared to be highly effective in the studies of the seasonal activity of the wasps, and of their number and species compositions in the biotopes. Comparison of the efficiency of standard Malaise traps with the efficiency of some other sampling methods (small Malaise traps, Moericke traps, collecting by net) confirms their high efficiency in catching wasps.

Key words: Hymenoptera, Aculeata, wasps, Malaise traps.

INTRODUCTION

At present, Malaise trap is the main sampling tool in studies of species diversity and dynamics of number of insects. Malaise traps were used to investigate arthropods (Moeed and Meads, 1987) and insects (Tereshkin and Shlyakhtenok, 1989; Nieves, 1991) as a whole, some insect orders (Hutcheson, 1990; Mohr, 1993) and insect families such as Vespidae (Archer, 1990; Coln, 1993), Sphecidae and Pompilidae (Sorg, 1993; Shlyakhtenok, 1995), Ichneumonidae (Tereshkin, 1996), Syrphidae (Decleer, 1990), Phoridae (Brown and Feener, 1995), Sphaeroceridae (Yen and DeBruyn, 1991) and Pselaphidae (Chandler, 1987). Some works were devoted to a number of technical matters concerning trapping efficiency of the traps (Hosking, 1979; Darling, 1988). It should be noted that most publications contain information that was collected during a single field season. The main goal of the present work was to estimate the effectiveness of Malaise traps for investigation of particular wasp families on the basis of data obtained over a dozen years.

MATERIALS AND METHODS

The studies were carried out in 1985-1996 in different biogeocenoses of the Republic of Belarus, mainly in protected ares (Belovezhskaya Pusha and Pripyatsky National Parks and the Berezinsky Biospheric and Polessky Radioecological Reserves). For this 123 Malaise traps modified by Townes (1972) were used. It should be noted that in different years different numbers of the traps (from 2 to 20) were set out for the field season (April to November). For comparative estimation of the effectiveness of these traps 19 small Malaise traps (one third the standard ones) were used in 1986 to 1990. Moericke traps (yellow plastic dishes, 8 cm in height and 18 cm in upper diameter) were set in 1989 to 1992 (36 on the ground and 33 in pine crowns). In 1984 to 1996 wasps were caught with a net over the whole territory of Belarus.

RESULTS AND DISCUSSION

For 12 years of the studies, 23,986 wasp specimens from eight families were caught with the standard Malaise traps (Table I). More than a half of all the wasps (53.2%) were of sphecids and other abundant groups were Vespidae (18.0%), Pompilidae (14.3%) and Chrysididae (12.5%). For most of the families, the number of the wasps caught with the traps was found to increase from April to August.

Malaise traps appeared to be effective in studies of occurrence of wasps in particular biotopes (the structure of the biotope was taken into consideration in setting the traps). The number of wasps was highest in sandy areas near the Pripyat bed, where 1185 individuals were caught with one Malaise trap during one field season. In the other biotopes the numbers were much lower, varying from 30 (outinundated oak forests) to 438 (abandonded settlements) individuals (Table II). The number of particular families in the biotopes also varied markedly, mainly depending on factors affecting availability of sites suitable for nesting of wasps.

The Malaise traps appeared equally effective in determination of the species composition of particular wasp families that inhabited different

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Table I.- The number (individual) of wasps collected with Malaise traps in different months (1985-1996).

	April	Mary	June	July	August	September	October	November	Total
Sphecidae	2	906	3312	3558	3882	759	349	3	12771
Vespidae	3	269	849	1251	1263	442	208	32	4317
Vespinae	3	226	433	913	1080	362	174	32	3223
Eumeninae		43	416	338	183	80	34		1094
Pompilidae	1	397	753	1107	922	188	49	2	3419
Chrysididae	1	414	799	830	793	112	153		3102
Sapygidae	1	45	52	53	57	4			212
Mutillidae		1		30	43				74
Tiphiidae			6	22	44	1			73
Scoliidae				1	16	1			18
Total	8	2031	5770	6852	7020	1507	759	37	23986

Table II.- The number (ind./trap-year) of particular wasp families in different biotopes.

	P.f.	Y.p.s.	R.b.	B.f.	I.o.k.	O.o.K	S.f.	A.f.	D.m.	M.m.	P.r.	S.	A.s.
Sphecidae	65,3	109,0	18,3	26,5	45,5	18,6	29,9	89,2	79,3	65,8	839,5	99,4	265,6
Vespidae	36,6	48,3	19,5	6,0	93,5	9,3	10,7	43,5	10,8	56,5	64,5	63,3	34,4
Vespinae	25,2	44,3	13,7	5,5	5,5	7,4	9,0	37,2	4,4	53,8	47,0	53,4	18,7
Eumeninae	11,4	4,0	3,8	0,5	1,0	1,9	1,7	6,3	6,4	2,7	17,5	9,9	15,7
Pompilidae	46,9	48,7	7,1	2,5	12,5	2,0	6,6	14,5	22,4	9,7	145,0	29,6	37,5
Chrysididae	9,8	9,7	2,2	1,5	16,5	0,6	2,4	17,3	7,0	26,2	108,0	43,3	93,8
Sapygidae	0,5		0,03	0,5	1,5	0,1	0,1	1,7		1,8	12,5	0,4	6,4
Mutillidae	0,9	0,7	0,03								0,5	0,7	0,7
Tiphiidae	0,6	2,0				0,6					15,0	0,4	0,2
Scoliidae		4,3											
Total	160,6	222,7	45,2	37,0	82,5	30,6	50,3	166,2	119,5	160,0	1185,0	237,1	438,6

P.f., pine forest (*Pinetum pleuroziosum*), P.y.s., young pine stand, R.b., raised bog (*Pinetum sphagnosum*), B.f., birch forest (*Betuletum pteridiosum*), I.e.f., Inundated oak forest (*Quercetum subalveto-fluvialis*), O.o.f., Outinundated oak forest (*Quercetum pteridiosum*), S.F., spruce forest (*Piceetum oxalidosum*), A.f., Alder forest (*Alnetum urticosrum*), D.m., Dry meadow., M.m., Moist meadow, P.r., pripat riverside, S, settlement; A.s., abdondoned settlements in the evacuation zone of the Chernobyl nuclear power station)

biotopes. Studies of aculeate hymenopterans that were carried out on a raised bog for many years (Shlyakhtenok, 1996a) showed that for good coverage of the species composition of all families, it was necessary to use several Malaise traps for several years, bearing in mind that the number of traps depend on the structure of the biotope. Use of only one trap in continuous action for eleven years revealed as little as 50% of all the species recorded in the high bog. About 70% of all the species were recorded with eight Malaise traps that were set simultaneously in 1992. Thus, in the studies of the species composition in a habitat, it is necessary to take into consideration both the species distribution of the wasps and their temporal dynamics.

As regards the comparative effectiveness of particular traps, according to average data, it appears that the highest trapping efficiency is typical

of the standard Malaise trap (195 individuals were collected by one trap for a season). The number was much lower in a small Malaise (trap 28 individuals) and in a Moericke trap (7 individuals). It should be noted that the Moericke traps were more effective for collecting wasps in the crown as compared with the ground. In the case of collecting by netting, the number of captured wasps varied from 50 individuals (1995) to 450 individuals (1984), amounting on an average to 138 individuals years. The relatively low catches of collecting by net can be explained mainly by the fact that a large number of Malaise traps set in particular years substantially decreased the number of wasps.

The high effectiveness of Malaise traps allowed us to obtain rather complete data on the species diversity of particular wasp families in this region. For example, the number of spider wasps found with Malaise traps constituted 90% of the Pompilidae fauna in Belarus (Shlyakhtenok, 1996b). Thus, Malaise traps are an effective sampling tool for various wasp families and provide comparable information about the species composition and individual numbers. There can be used in faunistic, ecological, zoogeographic and other studies of these insect groups.

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