

## STUDIES OF DROSOPHILIDAE (DIPTERA) IN YUGOSLAVIA. XV. COLLECTIONS FROM BAČKO GRADIŠTE AND PALIĆ

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This paper presents the faunistic data of drosophilids from two localities in the Yugoslav part of the Pannonia Lowland: Bačko Gradište and Palić. Among more than 7500 collected specimens there is a total of 19 species identified. The differences in the composition of species between various microhabitats at mentioned localities have also been discussed.

KEY WORDS: Diptera, Drosophilidae, *Drosophila* ecology, Pannonia Lowland.

### INTRODUCTION

There is not enough data of Drosophilidae fauna from the Yugoslav part of the Pannonia Lowland north of the Danube. As far as I know, there is only a paper of ARADI (1959) on four species (*Scaptomyza pallida*, *Scaptomyza graminum*, *Amiota variegata* and *Drosophila phalerata*) found at localities Apatin, Deliblato, Vršac and Senta, and there is our paper on studies conducted near Apatin (KEKIĆ *et al.*, 1996a).

We continued our ecological-faunistic studies of Drosophilidae in the light of this fact, and also taking into account a very important role of *Drosophila* species in contemporary theoretical and experimental population and evolutionary biology - see e.g. excellent monographs in "The genetics and Biology of *Drosophila*" ASHBURNER *et al.*, eds., (1983-1986).

This paper presents results of studies on two localities in the Pannonia Lowland, Bačko Gradište and Palić.

## COLLECTING SITES

Bačko Gradište (20° 02' longitude E; 45° 32' latitude N) is a typical Pannonia village, about 100 km north from Belgrade. Studies were conducted in a small weekend settlement at the bank of the lake Mrtva Tisa (4 km from the village). This artificial lake is a result of meliorative workings of the River Tisa, finished in 1858; it is about 28 km long and 100-200 m wide.

The banks of the lake are covered with reed, willows, poplars and black locust, and on arable land around the lake there are orchards (plums, apples, peaches, pears, apricots, cherries, sweet cherries, etc.), vineyards, crops, vegetable gardens and other cultivars.

Flies were captured by sweeping net: (a) over standard fermenting fruit bait around the house, under plum, apple, cherry trees and firs; (b) over fruit remnants (plum, apricot and pear) after brandy distillation (at the bank of the lake) and (c) over a pile of fallen and disposed apples (also at the bank of the lake). All types of fruit baits were placed within the range of a circle of 100 m diameter. Flies were collected from 19th to 23rd August, 1993.

Palić (19° 46' long. E; 46° 07' lat. N) is a small settlement near Subotica in the northern part of Yugoslavia, on the border with Hungary. Flies were captured in the large park between settlement and the Lake Palić in two different, but neighboring localities. One of them, designated as dark microhabitat, is characterized by dense distribution of trees, it is very humid, and the ground is covered by a thick layer of *Hedera helix* L. - with dominant tree species *Celtis australis* L., *Crataegus* ssp. L., *Platanus acerifolia* Willd., *Katalpa bignoionioides* Walt., *Juniperus virginiana* L., *Populus alba* L., *Populus nigra* L., *Sophora japonica* L., *Robinia pseudoacacia* L., *Acer platanoides* L., *Acer pseudoplatanus* L., *Aesculus hippocastanum* L. and *Tilia* ssp. L. The other microhabitat, in the vicinity of the previous one, designated as the light one, is rather dry, with the ground covered by old pines needles (*Pinus nigra* Arn. and *Pinus silvestris* L.) and *Picea abies* L., *Picea excelsa* L., with frequent *Quercus robur* L. and *Ailantus altissima* (Mill.), etc. Flies were captured at this locality from 5th to 7th September, 1995, by standard fruit bait.

## MATERIAL AND METHODS

In this study, as well as in previous, I captured flies using "standard" fruit bait. Briefly, a mixture of fruits in the process of fermenting was put on plastic trays and distributed over the habitat. During maximum flies' activity (in the morning and evening) flies attracted by baits were captured by entomological net. In the "stan-

dard" bait, which I use, the largest amount is made of apples and bananas, smaller amount is season fruit, and very small amount of bakers' yeast and sugar.

Capturing by fruit bait is a very efficient method of estimation of Drosophilidae fauna (for details and other methods see CARSON & HEED, 1983).

Also, as I already mentioned, at the locality Bačko Gradište I captured flies around other substrates, as well.

## RESULTS AND DISCUSSION

Figure 1 presents localities of the Yugoslav part of the Pannonia Lowland north of the Danube, where Drosophilidae fauna studies have been investigated so far.

The list of Drosophilidae found in Bačko Gradište is presented in Table I.

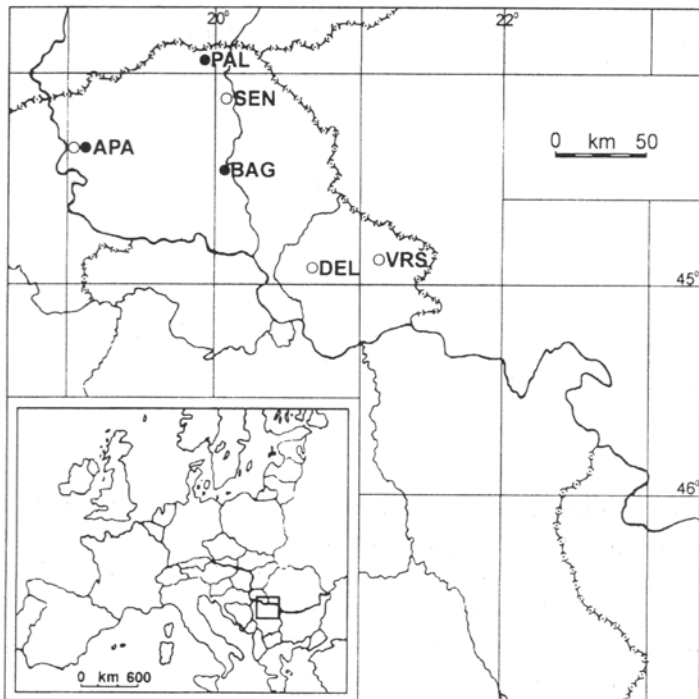


Fig. 1. Localities of the Yugoslav part of Pannonia Lowland north of the Danube where studies of Drosophilidae fauna were performed: Apatin (APA), Bačko Gradište (BAG), Deliblato (DEL), Palić (PAL), Senta (SEN) and Vršac (VRŠ).

Table I

Drosophilidae species collected at the locality Bačko Gradište (Mrtva Tisa), 19-23 August 1993.

SPECIES	Standard	Fruit	Apple	Total
	Fruit bait	remnants		
	(a)	(b)	(c)	
<b><i>Drosophila</i></b>				
<i>D. ambigua</i>	1			1
<i>D. bifasciata</i>	5			5
<i>D. busckii</i>			2	2
<i>D. funebris</i>			1	1
<i>D. hydei</i>	31	391	76	498
<i>D. immigrans</i>		10	1	11
<i>D. littoralis</i>		2		2
<i>D. melanogaster</i>	3334	1466	692	5492
<i>D. obscura</i>	1			1
<i>D. phalerata</i>	12	7		19
<i>D. rufifrons</i>	1			1
<i>D. subobscura</i>	68	14	1	83
<i>D. testacea</i>		1		1
<i>D. tristis</i>	2			2
<b><i>Scaptomyza</i></b>				
<i>S. pallida</i>	90	10	5	105
Total	3545	1901	778	6224
No. of species	10	8	7	15

Flies were captured, as already mentioned: (a) around standard fruit bait, (b) near fruit remnants, after brandy distillation and (c) around fallen and discarded apple piles. All of those various substrates ("microhabitats") were placed in the area within the circle, with diameter of 100 m. Differences in the composition of species captured at each of the substrates are obvious and highly significant - testing performed by Kolmogorov-Smirnov test (SOKAL & ROHLF, 1981) resulted in  $D_{\max(a/b)}=0.21 > D_{0.01}=0.05$ ;  $D_{\max(b/c)}=0.11 > D_{0.01}=0.07$ ;  $D_{\max(a/c)}=0.09 > D_{0.01}=0.06$ .

Differences in *Drosophila* species composition can only be explained by different characteristics of fruit substrates (yeast composition, stage of fermentation, de-

caying products, various alcohols, etc.) and specific ecological demands of species preferring one of the "microhabitats", considering the fact that flies can easily fly 100 m distance (see e.g. TAYLOR *et al.*, 1984; TAYLOR, 1987).

Spatial distribution of the domestic species *D. hydei* is very interesting. It can be met at each substrate, although it prefers fruit remnants of brandy distillation.

Three other species were captured at each substrate, beside this one: *D. melanogaster* (dominant in this habitat), *D. subobscura* and *S. pallida*. Each species has various frequencies at each "microhabitat".

Table II presents results of Drosophilidae fauna studies in the Palić Park.

Table II

Drosophilidae species collected at the locality Palić, 5-7 September 1995.

SPECIES	Microhabitats		Total
	"Dark"	"Light"	
<b><i>Drosophila</i></b>			
<i>D. ambigua</i>		2	2
<i>D. cameraria</i>		1	1
<i>D. confusa</i>		1	1
<i>D. funebris</i>		3	3
<i>D. immigrans</i>	180	51	231
<i>D. kuntzei</i>	6	3	9
<i>D. melanogaster</i>	20	16	36
<i>D. obscura</i>	2	2	4
<i>D. phalerata</i>	425	241	661
<i>D. subobscura</i>	125	209	334
<i>D. testacea</i>	110	45	155
<i>D. transversa</i>		1	1
<i>D. tristis</i>	1	1	2
<b><i>Scaptomyza</i></b>			
<i>S. pallida</i>	1		1
Total	870	576	1446
No. of species	9	13	14

In these cases flies were captured by standard fruit bait in both microhabitats, the dark and the light one. Differences in composition of drosophilids in both habi-

tats are statistically significant, as well  $D_{\max(d/f)}=0.17 > D_{0.01}=0.09$ . *D. phalaerata* is dominant species among 14 captured, making 46% specimens in the collection, *D. subobscura* with 23%, *D. immigrans* with 16% and *D. testacea* with 11%, etc.

According to our *a priori* *Drosophila* habitats classification, Palić park belongs to the "semidomestic" type (KEKIĆ *et al.*, 1996b).

According to a *posteriori* *Drosophila* habitats classification, on the basis of *Drosophila* species composition in the habitat (after capturing and identification of flies), this habitat should be said that it is between "semidomestic" and "wild" habitat. It is especially indicated by the low proportion of *D. melanogaster* (only 2.5% of individuals in the collection). Nevertheless, in order to classify a habitat as "wild" or "semidomestic" it is necessary to conduct studies in various seasons during the year, because of the well-known fact that species composition at the same habitat varies from month to month (see e.g. ROCHA PITE, 1980; OCHANDO, 1980; PAVKOVIĆ-LUČIĆ *et al.* 1997).

Table III presents results of all studies of Drosophilidae fauna in the Pannonia Lowland north of the Danube river, conducted so far. There are 29 species found so far, and it is certainly positive that the number must be far larger.

Table III

List of Drosophilidae species collected in the Yugoslav part of the Pannonia Lowland north of the Danube.

SPECIES	ARADI*	Apatin**	Bačko Gradište	Palić	Total
<i>Drosophila</i>					
<i>D. acuminata</i>		x			x
<i>D. ambigua</i>		x	x	x	x
<i>D. bifasciata</i>		x	x		x
<i>D. busckii</i>		x	x		x
<i>D. cameraria</i>				x	x
<i>D. confusa</i>		x		x	x
<i>D. fenestrarum</i>		x			x
<i>D. funebris</i>			x	x	x
<i>D. helvetica</i>		x			x
<i>D. hydei</i>		x	x		x
<i>D. immigrans</i>		x	x	x	x

SPECIES	ARADI	Apatin	Bačko Gradište	Palić	Total
<i>D. kuntzei</i>		x		x	x
<i>D. limbata</i>		x			x
<i>D. littoralis</i>		x	x		x
<i>D. melanogaster</i>		x	x	x	x
<i>D. obscura</i>		x	x	x	x
<i>D. phalerata</i>	x	x	x	x	x
<i>D. rufifrons</i>		x	x		x
<i>D. simulans</i>		x			x
<i>D. subobscura</i>		x	x	x	x
<i>D. testacea</i>		x	x	x	x
<i>D. transversa</i>		x		x	x
<i>D. tristis</i>		x	x	x	x
<b>Amiota</b>					
<i>A. semivirgo</i>		x			x
<i>A. variegata</i>	x				x
<b>Chymomyza</b>					
<i>C. amoena</i>		x			x
<b>Leucophenga</b>					
<i>L. maculata</i>		x			x
<b>Scaptomyza</b>					
<i>S. graminum</i>	x				x
<i>S. pallida</i>	x	x	x	x	x
<b>Stegana</b>					
<i>S. similis</i>		x			x
No. of species	4	26	15	14	30

\* ARADI (1959)

\*\* KEKIĆ *et al.* (1996)

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## ИСТРАЖИВАЊА DROSOPHILIDAE (DIPTERA) ЈУГОСЛАВИЈЕ. XV. КОЛЕКЦИЈЕ ИЗ БАЧКОГ ГРАДИШТА И ПАЛИЋА

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### Извод

О фауни Drosophilidae југословенског дела Панонске равнице северно од Дунава не зна се много. Прва информација потиче од ARAD-а (1959) а следећу дају КЕКИЋ и сар. (1996а), види Слику 1 и Табелу III.

У овом раду приказују се резултати истраживања на локалитетима Бачко Градиште и Палић (Слика 1). На оба локалитета мушице су ловљене у различитим "микростаништима".

У Бачком Градишту, у малом викенд насељу поред Мртве Тисе, у воћарско-виноградарско-повртарском станишту, на различитим супстратима: (а) на стандардном воћном супстрату, (б) на остацима воћа после печења ракије и (с) на гомили отпалих јабука.

На Палићу у великом парку између насеља Палић и језера, уз коришћење стандардног воћног супстрата, у два суседна дела парка. Према склопу дрвенас-



тих биљака које их чине, према осветљености и влажности, једно микро-станиште сам условно назвао “тамним” а друго “светлим”.

На оба локалитета је уловљено преко 7500 јединки и међу њима откривено 19 врста Drosophilidae.

Композиција Drosophilidae врста на оба локалитета и у сваком од посматраних станишта је била специфична и значајно се разликовала од осталих (Табеле I и II).

Узимајући у обзир сва досадашња истраживања југословенског дела Панонске низије северно од Дунава, пронађено је укупно 30 Drosophilidae врста (Табела III).

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