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REGENERATION OF THE APOIDEA INSECT FAUNA IN THE FLOOD AREA, AS A FUNCTION OF THE ECOLOGICAL CONDITIONS

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Abstract

In flood areas, the Apoidea insect regeneration is a function of the durability resp. date of flood-waves. The vegetation regenerates one and a half, two months after the flood-waves have passed. After summer floods there cannot develop any connected plant associations more. The structure of the Apoidea insect population is determined first of all by their connection with nutritive plants. The factors determining the regeneration, resp. structure of the Apoidea population in the area investigated are the climatic conditions, the vegetation poor in species combinations, culture effects, and the distance from protecting dams.

Introduction

The area investigated is Körtvélyes Island. The Mártély–Körtvélyes stretch of the Tisza-valley was declared a Region Conservation District by the National Nature Conservance Office in 1971. The region has relatively still preserved its traits from before the river control of the Tisza. Körtvélyes Island is not exposed to anthropogenous effects. In the region, hymenopterological investigations were performed earlier by G. ZILAHI–SEBESS, and of late years by L. MÓCZÁR, GY. GYÖRFFY, L. GALLÉ, and L. TANÁCS (1975).

Method

After the flood-waves had passed, carried out time collections for one hour in each of the two divided zones of the island, parallel with the regeneration of the vegetation, between 10–15 o'clock. Together with the collections on the island, I have also performed investigations on the dam, as well, in order to establish, resp. compare the structures of the Apoidea insect population. On Körtvélyes Island, collections took place in 3 to 4 weaks periodes. The Apoidea insects were collected with a butterfly net. On the days of investigations, the meteorological data were recorded. In the course of observations, the connections of some Apoidea species with their nutritive plants, as well as the effect of environmental factors on the regeneration and the change in the structural composition of the Apoidea population were followed with attention.

Area of the investigation

Körtvélyes Island lies on a territory of about 800 hectares closed by the living Tisza and a dead-arm (between river-km 201–204). Its ground consists mostly of inundation soils, without structure and deficient in calcium. The material of the ridges

Table 1. *Meteorological data of the investigated days*

	1975			1976				1977				
	IX. 4.	IX. 17.	IX. 18.	VII. 1.	VIII. 7.	VIII. 29.	IX. 20.	VI. 25.	VII. 13.	VII. 27.	VIII. 23.	X. 1.
Temperature	26.2	28.7	25.9	28.9	23.0	26.8	17.6	26.8	26.6	20.1	22.7	25.6
Humidity	53	59	46	31	39	35	87	38	36	85	55	41
Air pressure	1002	1017	1019	1008	1009	1012	1009	1006	1007	1004	995	1008
Clouding	–	–	–	30±5	15±5	20±5	–	25±5	–	75±10	30±8	30±5
Force of wind	1.22	3.78	3.75	1.94	3.33	3.42	3.53	6.11	2.22	3.60	4.25	4.67

Note: Temperature is given in °C, humidity and clouding in percentage, air pressure in mbar, force of wind in m/sec.

of higher relief, extending along the river-bed, is sand. At the eastern and western fringes of the island, soft-woods of half-cultured character, willow-poplar groves (*Salicetum albae-fragilis* ISSLER, 26) ribbonlike follow the riverside-line of the living Tisza and the dead-arms. At their shrub stratum *Rubus caesius* facies is the widest-spread shrub. At the side-line of the river-bed the zone of a shrub-willowy (*Salicetum*

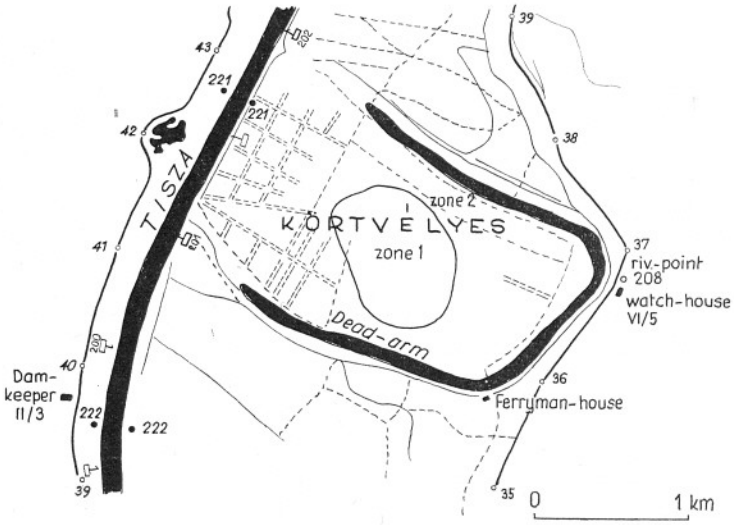

Fig. 1. Area investigated.

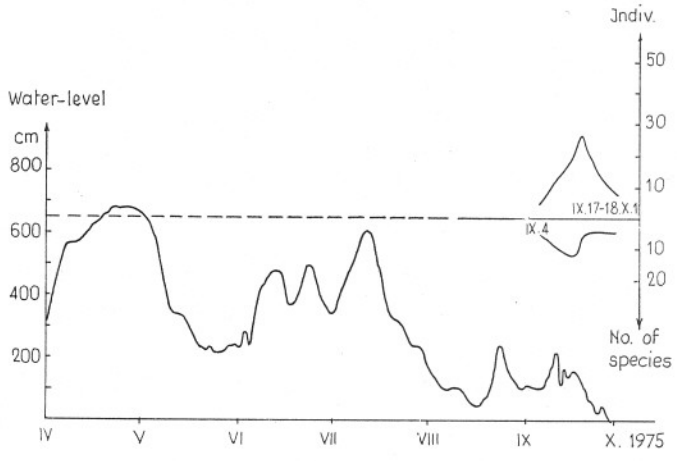

Fig. 2. Regeneration of the Apoidea insect fauna after passing of the flood-wave in 1975.

triandrae MALCUIT, 29) forms a contiguous belt. At the eastern and western fringes of the island Canadian poplar plantations lie. In the central part of the island, the Large-meadow, the plant-coenoses of marshland meadow foxtails (*Lythro-Alopecuretum pratensis* [NOWINSKI, 28] BODROGK. J. J. developed. *Chrysanthemum serotinum*

L., *Lythrum salicaria* L., *L. virgatum* L., *Symphytum officinale* L., *Euphorbia lucida* W & K and *Vicia cracca* L. mean an important pollen- and nectar-source for Apoidea. The species combination is poor because but a few species can endure the 3 to 4 m water-height for weeks and silting up connected with that. In the meanders of filledup beds two associations are wide-spread: those of reed-grass (*Carici-Typhoidetum*

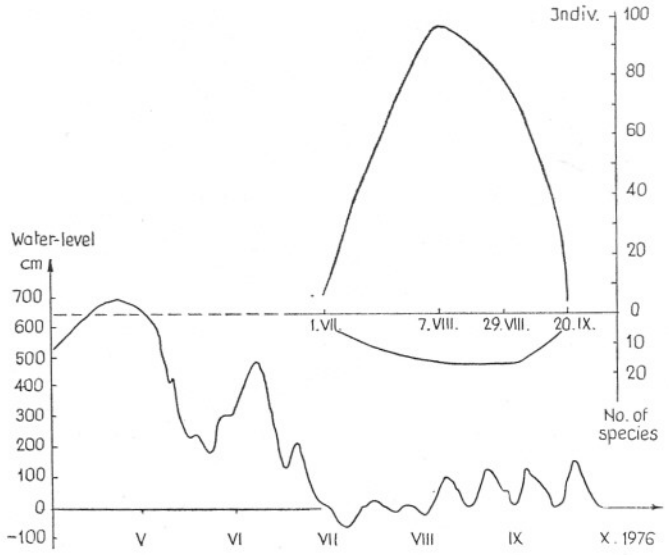

Fig. 3. Regeneration of the Apoidea insect fauna after passing of the flood-wave in 1976.

arundinaceae Soó 71) and sweet-grass (*Glycerietum maximael* Nowinski, 28, Hueck, 31). After filling up, stands of sharp- and bowing-sedges (*Caricetum gracilis* Grabner & Hueck, 31, 37) will gain ground. Their extension in the years with floods is larger. In the northern part of the island, on higher reliefs, cultures of short growing season developed in the zone of sandy soil, like maize for silage and sunflower. Here can also orchards be found sporadically. Independently of hoed plants, the following sub-associations developed (Andó–Bodrogközy–Marián 1974):

(a) Hungarian grass/millet association (*Rorippo-Setarietum,* Újvárosi 54, Soó 61), in sour alluvial soils,

(b) amaranth association (*Amarantho-Chenopodietum albi,* Soó 47),

(c) in hard or loose sand soil, digitated grass — purslane association (*Digitario-Portulacetum* Bodrogk. 55).

After the flood-waves enduring for a longer time passing from Spring through the Summar, the plant associations cannot take shape, resp. they run into one another. The map of the investigated area is contained in Fig. 1.

Climatic conditiom

In summer season, on the flood-plain clearings, temperature is often higher than in the adjacent areas of the Great Plain (Andó–Bodrogközy–Marián 1974). In summer season, the flood-plain woods and their immediate environment have a

lower temperature than the adjacent areas of the Great Plain. The surface of the water of large mass has an extreme modifying effect on climate. The annual cloud formation is here the smallest in the country. The degree of average cloudiness of the month August is lower than 35 percent (ANDÓ 1958, 1969). The meteorological data of the observed days are recorded in Table 1.

Discussion of results

The Apoidea insect generation is influenced by the lastingness and dates of flood-waves. Passing of the flood-wave culminating in late April or early May results the regeneration of the vegetation, one and half — two months after time. In late June, early July — on the basis of some observations at Körtvélyes — there develop contiguous plant associations. On the other hand, if the flood-wave is lasting, resp. if culmination takes place in the middle of Summar, the vegetation can regenerate only partially, there cannot develop any plant associations. According to the data observed on Körtvélyes Island, the island gets under water at a 650 cm height of water. A water-level over 6 metres results in covering 40 to 50 percent of the island with water. This happened in 1975 (Fig. 2). Species combination is poor, mainly the flower-covering of *Lythrum salicaria* L. and L. *Virgatum* L. is important. Consequently, the species number of the Apoidea population is low. In 1975, the individual number of *Melitta nigricans* ALFKEN, *M. tricincta* K., as well as that of *Tetralonia salicariae* LEP., vising the plant *Lythrum salicaria* and *L. virgatum* L., was considerable (Table 2). The first note is marking the individual number, the figure in brackets the zone in Table 2. It is noted with figure 3 if the Apoidea species occurs in both zones. The individual number of honey-bees is not contained in the density data of Figs. 2, 3, and 4 because in the vicinity of the dam-keeper houses the workers, swarming out of the nearby hives, placed on the dams, would make irreal the density values. In 1976, resp. 1977, the passing of the spring flood-wave at the end of May, resp. at the beginning of June, resulted in the formation of plant associations. By the adjoining vegetation the widening of the structure of population, resp. an increase in density is engendered (Table 2). Particularly the number of *Halictus* and *Lasioglossum* species increased. The most important population-producers are the individuals of *Melitta nigricans* ALFKEN — in a probable evolutionary connection with the flower of Lythrum salicaria L. — as well as those of *Melitta tricincta* K. and *Tetralonia salicariae* LEP. The weed associations of the cultivated plants, sown in the northern part of the island, were visited by the considerable number of the individuals of *Andrena flavipes* PZ., *Bombus terrestris* L. and *Lasioglossum malachurum* K. species.

In the course of the regeneration of the vegetation, the first visitors of flowers were the *Bombus* species of long flying radius and pollilectic nourishment, like *B. terrestris* L., *B. silvarum distinctus* VOGT., as well as *Anthophora furcata* PZ. and *Apis mellifica* L. (Table 2). In early Autumn, the bulk of population was composed by the *Bombus,* the *Halictus* and *Lasioglossum* species.

In the middle of the Large-Meadow zone 1 takes place. Its vegetation is poor. Correspondingly, the flowers of the species *Lythrum,* as well as those of *Vicia cracca* L., forming here and there bushes, and of *Symphytum officinale* L., are visited but by few species. The Apoidea population of zone 1 is mainly formed by *Melitta nigricans* ALFKEN, *M. tricincta* K., a few *Halictus,* resp. *Lasioglossum,* as well as the continuously reproductive eusocial *Bombus* species, the latter ones being of large energy flow. The vegetation of zone 2 is, because of the weed associations, more varied.

Table 2. *Structure of the flower-visiting Apoidea population in Körtvélyes Island*

Species	1975			1976				1977				
	IX. 4.	IX. 17.	IX. 18.	VII. 1.	VIII. 7.	VIII. 29.	IX. 20.	VI. 25.	VII. 13.	VII. 27.	VIII. 23.	X. 1.
Prosopis cornuta SM.									1(2)			
P. annularis K.									1(2)			
P. angustata SCHCK.						3(2)						
P. gracilicornis MOR.						1(2)						
P. brevicornis NYL.						1(2)						
P. gibba SAUND,											1(2)	
P. euryscapa FÖRST.											1(2)	
Melitta nigricans ALFKEN.			13(1)		26(3)	15(3)			6(1)	3(1)	23(3)	
M. tricincte K.		3(1)	4(1)			32(3)				1(2)	1(1)	
Macropis labiata F.									3(1)	1(2)		
Dasypoda plumipes PZ.											1(2)	
Andrena cordialis MOR.									1(1)			
A tibialis K.											(12)	
A. flavipes PZ.					23(2)					1(2)	5(3)	
A. ovatula K.									1(2)	1(2)		
Nomada fucata PZ.									1(1)	1(2)		
N. flavopicta K.						1(2)			1(2)	1(2)		
Halictus 4-cinctus F.		2(2)				1(2)			1(2)			
H. simplex BLÜTHG.		1(2)			3(3)							3(3)
H. veneticus EBMER					2(2)	1(2)					2(2)	
H. maculatus SM.												4(2)
H. eurygnathus BLÜTHG.		1(1)										
H. subauratus (ROSSI)						4(3)					(22)	1(2)
H. geminatus PÉREZ												1(2)
H. perkinsi BLÜTHG.												1(2)
H. kessleri BRAMS.												2(2)
Lasioglossum leucozonium (SCHRK.)		1(2)			1(2)							2(3)
L. morbillosum (KRIECHB.)		2(2)			1(1)							
L. zonulum (SM.)												1(2)
L. 4-notatulum (SCHCK.)												7(2)
L. punctatissimum SCHCK.)												1(2)
L. puncticolle (MOR.)												1(2)

L. nitidiusculum (K.)												1(2)
L. malachurum (K.)		2(2)			10(3)							8(3)
L. calceatum (Scop.)					1(2)							
L. albipes (F.)					1(2)							
L. villosulum (K.)	1(2)											
L. nigripes (Lep.)		1(2)										
Megachile pilidens Alfken										1(2)		
M. centuncularis L.											3(2)	
M. willoughbiella K.											1(2)	
M. rubrimana Mor.						1(2)						
Eriades truncorum L.						2(1)			2(2)	2(2)	2(2)	
Anthidium strigatum Pz.										1(2)		
A. florentinum F.									1(2)		1(1)	
A. tenellum Mocs.					2(2)							
A. lituratum Pz.						2(2)						
Coelioxys acuminata Nyl.										1(2)		
C. elongata Lep.						1(2)						
Tetralonia nana Mor.		2(2)										
T. ruficornis F.					2(2)				4(1)	2(2)	3(3)	
T. salicariae Lep.		4(1)			20(3)	11(3)			1(1)	7(3)	3(1)	
Anthophora furcata Pz.						1(1)						
Bombus terrestris L.	1(1)		3(2)	5(3)	2(2)		1(2)	2(2)	4(3)	4(3)	1(2)	
B. agrorum F.										1(2)		
B. derhamellus K.					1(2)	2(2)						
B. silvarum distinctus Vogt.	1(1)	1(2)	6(3)	2(2)	1(1)		2(2)	3(3)	2(1)	4(3)	1(2)	
Apis mellifica L.	1(2)	5(3)	7(3)	3(2)	7(3)	5(3)	1(2)	4(3)	2(1)	3(2)	1(2)	

This results in the widening of population structure. The flowers of *Inula britannica* L. are visited by various Prosopis species but there occur also individuals of Anthidium and *Megachile* species. There were collected from this area two parasitical species: *Coelioxys elongata* LEP. and *C. acuminata* NYL. In the course of examinations, I have not found any Apoidea nest. It is not probable that the populations of nests could go through the difficulties of the 2 to 4 m high water coverage enduring even 2 to 3 months long in annual relation. It is, on the other hand, to be imagined that some species make their nests over the level heights of floods, in the tree-trunks of the flood-plain.

The Apoidea population of the dams fringing the island is considerably richer in species. A comparison of the structure of the Apoidea population is given by Table 3. Several flower-visiting species do not visit the areas of the flood-plain for lack of nutritive plants and as a result of distance. From the structure of population, the considerable visitors of the spring and early summar aspect, like the *Eucera* and *Osmia* species are completely missing the island.

In the flower-visiting and pollination of the orchards (first of all apple, as wel as pear), lying on the higher levels of the flood-plain, apart from the honey-bees the part taken by the *Halictus* species is considerable.

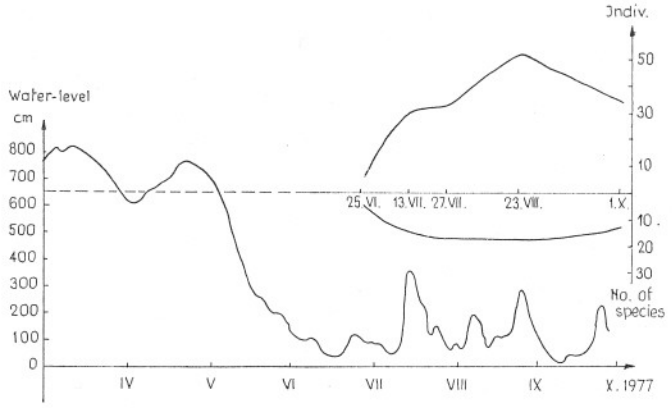

Fig. 4. Regeneration of the Apoidea insect fauna after passing of the flood-wave in 1977.

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Table 3. *Comparison of the structure of the flower-visiting Apoidea population on Körtvélyes Island and the accompanying dams between river-km 201–204*

Species	Dam on the right		Körtvéleyes Island, zone 1		Körtvélyes Island, zone 2		Dam on the left	
	♀	♂	♀	♂	♀	♂	♀	♂
	1.	2.	3.	4.	5.	6.	7.	8.
Prosopis cornuta SM.					+		+	
P. annularis K.					+			
P. angustata SCHCK.					+	+		
P. gracilicornis MOR.						+		
P. brevicornis NYL.					+			
P. gibba SAUND.						+		
P. euryscapa FÖRST.						+	+	+
Melitta tricincta K.			+	+	+		+	
M. nigricans Alfken		+	+	+	+	+		
M. leporina PZ.								+
Macropis labiata F.				+		+		
Dasypoda plumipes PZ.					+		+	
Systropha curvicornis SCOP.		+					+	
Andrena flavipes PZ.			+	+	+	+	+	+
A. labialis K.							+	+
A. ovatula K.					+	+	+	
A. cordialis MOR.				+				
A. dorsata K.							+	
A. tibialis K.					+			
A. toraxaci GIR.								+
Nomada fucata PZ.				+		+		+
N. flavopicta K.					+	+		
N. distinquenda MOR.								+
Camptopoeum friesei MOCS.								+
C. frontale F.								+
Ammobates vinctus GERST.							+	
Halictus 4-cinctus (F.)					+	+	+	+
H. 6-cinctus F.							+	+
H. fulvipes KLUG.							+	+
H. maculatus SM.					+	+	+	
H. eurygnathus BLÜTHG.				+			+	
H. simplex BLÜTHG.	+	+	+	+	+	+	+	+
H. veneticus EBMER					+	+	+	+
H. scabiosae (ROSSI)								+
H. sajói BLÜTHG.								+
H. subauratus (ROSSI)	+		+		+	+	+	
H. kessleri BRAMS.	+				+		+	
H. geminatus PÉREZ					+			
H. perkinsi BLÜTHG.					+			
Lasioglossum morbillosum (KRIECHB.)					+		+	+
L. leucozonium (SCHRK.)			+		+		+	+
L. zonulum (SM.)						+	+	+
L. villosulum (K.)					+			+
L. 4-notatulum (SCHCK.)					+	+		
L. puncticolle (MOR.)						+		
L. calceatum (SCOP.)					+			
L. nigripes (LEP.)						+	+	+
L. nitidiusculum (K.)						+		
L. malachurum (K.)	+	+	+	+	+	+	+	+
L. albipes (F.)					+			
L. marginatum (BR.)							+	+
L. politum (SCHCK.)							+	+

L. pauxillum (SCHCK.)										+
L. trichopygum (BLÜTHG.)	+								+	+
L. lucidulum (SCHCK.)	+								+	
L. lineare (SCHCK.)										+
L. laticeps (SCHCK.)									+	
L. glabriusculum (MOR.)									+	
L. intermedium (SCHCK.)									+	
L. punctatissimum (SCHCK.)							+			
Sphecodes gibbus L.										+
S. monilicornis L.									+	+
Megachile pilidens ALFKEN							+		+	
M. centuncularis L.		+				+			+	+
M. willoughbiella K.							+		+	+
M. rubrimana MOR.						+				
M. argentata F.	+								+	+
M. ericetorum LEP.									+	+
M. rotundata F.									+	
M. leucomalla GERST.									+	
Osmia atrocoerulea SCHILL.									+	
O. aurulenta PZ.									+	
O. spinulosa K.									+	
O. tridentata DUF. & PERR.									+	
O. melanogastra SPIN.									+	
Eriades truncorum L.	+		+	+		+	+		+	
E. appendiculatus MOR.									+	
Anthidium tenellum MOCS.						+				
A. lituratum PZ.						+	+			+
A. oblongatum LATR.									+	
A. strigatum PZ.							+			
A. florentinum F.			+			+				
Coelioxys acuminata NYL.						+			+	
C. elongata LEP.		+				+				
C. rufocaudata SM.										+
Tetralonia armeniaca MOR.									+	+
T. macroglossa ILL.									+	
T. salicariae LEP.			+	+		+	+		+	+
T. nana MOR.						+			+	+
T. ruficornis F.			+	+		+	+		+	
Eucera pollinosa SMITH									+	
E.. tuberculata F.									+	+
E. seminuda BR.									+	+
E. interrupta BAER.									+	+
E. nitidiventris MOCS.									+	+
E clypeata EV.									+	+
Anthophora furcata PZ.			+						+	
Epeolus tristis SMITH									+	+
Xylocopa violacea L.									+	
Ceratina cyanea K.	+								+	+
Bombus argillaceus SCOP.										+
B. derhamellus K.	+						+		+	+
B. helferanus Seidl.									+	
B. hortorum L.									+	
B. agrorum F.							+		+	+
B. terrestris L.	+		+	+		+	+		+	+
B. silvarum distinctus Vogt.	+	+	+	+		+	+		+	+
B. lapidarius L.									+	+
B. muscorum F.									+	+
Psithyrus rupestris F.		+								+
P. vestalis Geoffr. & Fourcr.										+
Apis mellifica L.	+		+			+	+		+	+

Note: The Table contains also the 56 Apoidea species, collected in 1974, on the left-sid dam, in the stretch between river-km 201 to 204 (Tanács, 1975).

Méhalakú rovarregeneráció hullámtéren az ökológiai viszonyok függvényében

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Kivonat:

Hullámtereken a méhalkatú rovarregeneráció az árhullámok tartósságának, illetve időpontjának a függvénye. A vegetáció az árhullám levonulása után másfél, két hónapos késéssel regenerálódik Nyári áradások után már nem tudnak kialakulni összefüggő növénytársulások. A méhalkatú rovarnépesség szerkezetét elsősorban tápnövénykapcsolatok határozzák meg. A populáció zöme nedvességkedvelő, illetve közönbös ökológiai elterjedési típusú faj. A vizsgálati területen a klimatikus viszonyok, a vegetáció fajkombinációjának a szegénysége, kultúrhatások, a védőtöltésektől való távolság a méhalkatú népesség regenerációját, illetve szerkezetét meghatározó faktorok.

Regeneracija Apidae na plavnom području u funkciji ekoloških faktora

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Abstract

Na plavnim područjima regeneracija Apidae zavisi od vremena i du^{9}ine trajanja plavljenja Za regeneraciju vegetacije nakon povlačenja vode potrebno je 1,5 do dva meseca. Posle letnjih plavljenja se ne javljaju kompletne biljne zajednice. Struktura populacija Apidae u prvom redu je odredjen biljkama hraniteljkama. Gro populacija čine vrste prilagodjene uslovima veće vla^{9}nosti ili su vrste prosečnih ekoloških zahteva. Na ispitivanom području regeneracija i struktura populacija Apidae zavisi od klimatskih uslova, siromaštva vegetacije u vrstama, antropogenog uticaja i udaljenosti od odbrandbenih nasipa.

Регенерация насекомых пчёлообразного типа в пойме в зависимости от экологических условий

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Резюме

Регенерация насекомых пчёлообразного типа в поймах зависит от продолжительности и времени наступления паводков. Вегетация регенерируется через полтора-два месяца после оттока паводковых вод. Псоле летних паводков уже не успевают сформироваться взаимозависимые растительные сообщества. Структура насекомых пчёлообразного типа определяется в первую очередь их связью с питающими растениями. Большая часть популяций относится к влаголюбивому типу или типу, нетребовательному к экологическим условиям. На исследуемой территории факторами, определяющими регенерацию или структуру пчёлообразных насекомых, являются климатические условия, бедность видовых комбинаций вегетации, влияние культуры, расстояние от защитых дамб.