Online Resource 1

City park vs. national park - is it possible to preserve natural level of bee richness and abundance in a city park?

Urban Ecosystems

Weronika Banaszak-Cibicka[1], Lucyna Twerd[2], Monika Fliszkiewicz[1], Karol Giejdasz[1], Aleksandra Langowska[1]

[1] Institute of Zoology, Poznań University of Life Sciences, Wojska Polskiego 71C, 60-625 Poznań, Poland, e-mail: banaszak@up.poznan.pl

[2] Institute of Environmental Biology, Kazimierz Wielki University, Ossolińskich 12, 85-093 Bydgoszcz, Poland

Table 1. ANOVA and Tukey results for indices describing the structure of bee communities and share of species with particular functional traits in natural (Wielkopolska National Park) and urban (Citadel Park; Botanical Garden) landscapes.

Functional traits	**Mean richness, abundance and diversity** ± s.e. in different landscape types			**Effect of landscape types**		**Tukey *post hoc* test**	
	WPN	**CP**	**BG**	**F**	***p*-value**	**direction**	***p*-value**
Bee richness							
all taxa	38.37 ± 6.14	40.87 ± 4.01	38.25 ± 5.83	0.074	0.928	-	-
Social behaviour							
solitary bees	20.62 ± 4.48	21.25 ± 3.17	23.75 ± 4.33	0.167	0.846	-	-
social	10.50 ± 0.68	14.87 ± 0.81	12.10 ± 1.06	5.557	**0.011**	WPN<CP WPN<BG	**0.004** **0.022**
cleptoparasites	7.00 ± 1.01	4.50 ± 1.05	3.00 ± 0.62	4.830	**0.018**	WPN>CP WPN>BG	**0.048** **0.005**

Nesting place							
soil	20.25 ± 3.97	24.37 ± 2.01	23.00 ± 3.89	0.377	0.690	-	-
hive	7.00 ± 0.18	7.25 ± 0.41	6.25 ± 0.31	2.676	0.092	-	-
cavity	4.13 ± 1.66	5.12 ± 1.91	5.37 ± 1.52	0.150	0.861	-	-
Floral specificity							
polilectic	26.12 ± 3.50	29.87 ± 2.86	30.50 ± 4.39	0.421	0.661	-	-
oligolectic	2.87 ± 1.46	4.62 ± 0.67	4.25 ± 1.05	0.608	0.553	-	-
Body length							
small	32.25 ± 5.71	36.25 ± 4.12	33.62 ± 5.79	0.148	0.862	-	
large	7.87 ± 0.44	4.63 ± 0.32	4.62 ± 0.26	4.242	**0.028**	WNP>CP WNP>BG	**0.019** **0.012**
Phenology							
spring (early)	23.62 ± 2.36	25.37 ± 1.89	24.62 ± 2.65	0.142	0.868	-	-
spring (late)	11.75 ± 3.10	13.25 ± 2.49	12.62 ± 3.28	0.063	0.938	-	-
summer	0.50 ± 0.07	1.00 ± 0.26	0.50 ± 0.21	0.875	0.431	-	-
Zoogeographical elements							
southern	1.62 ± 0.67	4.00 ± 0.62	2.75 ± 0.52	3.741	**0.040**	WNP<CP	**0.012**
other	36.38 ± 5.34	36.25 ± 3.34	35.37 ± 5.28	0.013	0.986	-	-
Occurrence							
rare	4.00 ± 0.42	3.50 ± 0.70	1.00 ± 0.37	9.434	**0.001**	WNP>BG CP>BG	**0.001** **0.007**
common	34.00 ± 5.53	37.38 ± 3.40	41.37 ± 2.87	0.809	0.458	-	-
Bee abundance							
all taxa	357.62 ± 63.74	349.88 ± 50.09	361.25 ± 79.59	0.064	0.995	-	-
Social behaviour							
solitary bees	136.87 ± 29.98	121.25 ± 36.12	167.38 ± 73.30	0.217	0.806	-	-
social	195.75 ± 41.96	222.00 ± 31.94	190.25 ± 46.13	0.175	0.839	-	-
cleptoparasites	26.75 ± 2.04	6.50 ± 2.11	3.25 ± 0.61	53.941	**<0.001**	WNP>CP WNP>BG	**<0.001** **<0.001**
Nesting place							
soil	146.33 ± 33.04	202.88 ± 41.90	188.88 ± 44.63	0.263	0.771	-	-
hive	176.00 ± 35.90	128.25 ± 19.60	157.00 ± 33.15	0.624	0.545	-	-
cavity	8.87 ± 3.63	12.75 ± 9.05	10.87 ± 3.68	0.103	0.902	-	-
Floral specificity							
polilectic	305.25 ± 52.72	264.25 ± 40.88	296.25 ± 41.95	1.124	0.883	-	-
oligolectic	18.75 ± 1.46	72.87 ± 36.31	60.75 ± 36.17	3.429	**0.042**	WNP<CP WNP<BG	**0.020** **0.037**
Body length							
small	234.00 ± 45.90	255.25 ± 44.46	235.38 ± 93.51	0.033	0.967	-	-
large	123.12 ± 26.37	94.75 ± 17.15	125.50 ± 25.29	0.538	0.591	-	-
Phenology							

spring (early)	280.25 ± 47.72	317.63 ± 47.35	333.00 ± 46.70	0.130	0.878	-	-
spring (late)	59.25 ± 13.07	26.25 ± 5.52	26.00 ± 8.18	4.888	**0.031**	WNP>CP WNP>BG	**0.022** **0.010**
summer	0.63 ± 0.41	2.75 ± 1.37	0.50 ± 0.21	2.250	0.130	-	-
Zoogeographical elements							
southern	6.62 ± 3.90	49.12 ± 15.60	11.75 ± 4.10	5.857	**0.009**	WNP<CP CP>BG	**0.005** **0.011**
other	349.50 ± 60.14	300.25 ± 42.23	349.00 ± 48.15	0.130	0.878	-	-
Occurrence							
rare	12.00 ± 2.90	4.87 ± 1.55	1.00 ± 0.37	8.506	**0.001**	WNP>CP WNP>BG	**0.039** **0.001**
common	345.25 ± 62.37	344.75 ± 49.32	353.88 ± 50.39	0.089	0.491	-	-
Bee diversity							
all taxa	2.61 ± 0.11	2.46 ± 0.13	2.49 ± 0.11	0.419	0.662	-	-
Social behaviour							
solitary bees	2.15 ± 0.19	1.99 ± 0.24	2.33 ± 0.12	0.773	0.474	-	-
social	1.54 ± 0.13	1.88 ± 0.51	1.47 ± 0.16	3.061	0.068	-	-
cleptoparasites	1.64 ± 0.13	1.22 ± 0.28	0.92 ± 0.15	3.935	**0.046**	WNP>CP WNP>BG	**0.041** **0.035**
Nesting place							
soil	2.18 ± 0.19	2.11 ± 0.14	2.41 ± 0.11	1.054	0.365	-	-
hive	1.27 ± 0.13	1.20 ± 0.86	1.05 ± 0.08	1.101	0.350	-	-
cavity	0.82 ± 0.32	1.17 ± 0.18	1.16 ± 0.34	0.442	0.648	-	-
Floral specificity							
polilectic	2.24 ± 0.10	2.36 ± 0.05	2.37 ± 0.12	0.541	0.589	-	-
oligolectic	0.39 ± 0.21	0.70 ± 0.23	0.51 ± 0.22	0.453	0.641	-	-
Body length							
small	2.57 ± 0.13	2.40 ± 0.15	2.63 ± 0.09	0.856	0.438	-	-
large	1.05 ± 0.15	0.82 ± 0.10	0.75 ± 0.05	2.384	0.116	-	-
Phenology							
spring (early)	2.19 ± 0.10	2.12 ± 0.16	2.23 ± 0.08	0.238	0.789	-	-
spring (late)	1.71 ± 0.23	2.16 ± 0.18	1.93 ± 0.37	0.686	0.514	-	-
summer	0.13 ± 0.89	0.16 ± 0.08	0.08 ± 0.01	0.127	0.881	-	-
Zoogeographical elements							
southern	0.30 ± 0.14	0.61 ± 0.11	0.64 ± 0.12	2.351	0.141	-	-
other	2.56 ± 0.10	2.34 ± 0.15	2.41 ± 0.11	0.830	0.449	-	-
Occurrence							
rare	1.19 ± 0.12	1.05 ± 0.17	0.22 ± 0.08	11.801	**<0.001**	WNP>BG CP>BG	**<0.001** **0.002**
common	2.49 ± 0.12	2.40 ± 0.13	2.62 ± 0.11	0.795	0.464	-	-