

The bird communities of the abandoned secondary grassland areas in the Šumava Mts.

Společenstva ptáků na neobhospodařovaných plochách sekundárního bezlesí na Šumavě

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Abstract

In the breeding season 1995–1997 there was undertaken the investigation in order to discover more facts about the qualitative and quantitative structure of bird communities in very specific conditions of forestless areas in the former border zone and military areas in the Šumava Mts. Most of these formerly managed areas were abandoned 50 years ago. In total, 28 localities were included into the research in different parts of the Šumava National Park and Protected Landscape Area. In total 97 species of birds were registered, the species diversity was relatively high ($H' = 3.686$, $E = 0.806$). The most abundant and frequent species, typical for these stands are predominantly Whinchat (*Saxicola rubetra*), Grasshopper Warbler (*Locustella naevia*), Tree Pipit (*Anthus trivialis*), Willow Warbler (*Phylloscopus trochilus*), Yellowhammer (*Emberiza citrinella*), Garden Warbler (*Sylvia borin*), Meadow Pipit (*Anthus pratensis*). The studied secondary grassland areas provide also suitable habitats for some threatened bird species which have specific habitat requirements (e. g. Black Grouse *Tetrao tetrix*, Corncrake *Crex crex*, Woodlark *Lullula arborea*, Scarlet Rosefinch *Carpodacus erythrinus*, Corn Bunting *Miliaria calandra* etc.), which are usually missing on more intensively managed grasslands.

Key words: structure of ornithocoenoses, threat status, successive vegetation, ornithological value

Introduction

It is supposed that till the middle age the avifauna of the Šumava Mts. had predominantly a forest-like character. During colonization of the area by people, large areas of forest were cut down. That process resulted to a loss of natural habitats of original forest species, on the other hand there had been creating a mosaic-like landscape and it tends to the higher diversification of its ecosystems. The first really big and probably the strongest disturbance of pristine primeval forests was connected with the glass colonization (ca from the 9th century, in a bigger extent from the 2nd half of the 16th century). The composition of the original forest avifauna was influenced markedly also by intensive forest management (mainly by establishing of large areas of spruce plantations), which resulted to a partial „borealization” of avifauna. The forestless enclaves around the human settlements were consequently managed for agricultural purposes. The decrease of population numbers and abundance of original forest avifauna as well as a bigger landscape diversity and the expansion of forestless and synantropic species were the results of a long term existence of secondary forestless areas. Current

status of a secondary grasslands in the Šumava Mts. is very specific and it was influenced strongly by the development after the second world war, when the continuity of the settlement and the agricultural management were interrupted in the wide belt along the border. Especially the existence of the closed border belt and the big military training areas had a big influence to the landscape history and development of Šumava. Those factors resulted to a considerable limitation of any traditional use of forestless areas. Those had been changing during time to a mosaic of sites in a different stage of a secondary succession and plots specifically influenced by military training activities. These successive plots are unique in comparison to the "normal" landscape, especially looking at the Bavarian side of the mts. (e. g. PYKAL & al. 1997). The outstanding feature of these areas is a relatively high species diversity of bird communities and especially the occurrence of some rare or endangered species which are missing in more intensively managed grasslands.

The forestless areas as an unique complex of stands, important for a biodiversity, are studied recently especially by botanists in order to choose the optimal management for survival of endangered plant species and communities (PRACH & al. 1996). The basic overview of bird communities on these biotopes was already published (BUFKA & KLOUBEC 1997) but in accordance to a limited extent of the publication, some important primary data, necessary for possible repeating of the study, was not possible to present there. That is why the authors decided to present this paper, which contains a more detailed survey of data obtained from the individual localities, more precisely localized, and describe some nature conservation aspects of the results. There are, moreover, some new faunistic data presented here.

Material and methods

The research was carried out in 28 localities in the west, central and southeast part of the Šumava Mts. The localization of the individual localities is represented schematically on Fig. 1. The following main forestless enclaves were studied: the former military area Dobrá Voda (8 transects, total length 14650 m), the existing military area Boletice (6 transects, total length 27950 m) and the parts of the former border zone (14 transects, total length 29400 m). All localities under study consist of the mosaic of different biotopes. Their proportion and influence to the composition of bird communities were described in BUFKA & KLOUBEC 1997. In accordance to a big extent of the surveyed area the line transect method (JÄRVINEN & VÄISÄNEN 1976) was chosen for the research of bird communities. All visually and acoustically found out birds were registered along the accurately set transects. The registrations were made for the whole counting belt (main and supplementary belts together, i. e. without limited width of the belt). The transects were chosen to go representatively through the area and exclude or minimize the influence of surrounding forest stands.

The length of the individual transects vary from 1000 to 7300 m, on average 2571 m. The observation of a pair, singing male, female, observation of the species without determination of a sex or a family with young ones were registered separately. The numbers of the individual species were converted into the number of pairs. The observation of an adult male, pair or a family, finding of a nest and the specimen without determination of a sex were interpreted as one pair. On the basis of these data the relative abundance (number of pairs / 1000 m of transect) was calculated for each locality. For this calculation the control with the highest number of pairs registered was used for a given species and locality.

The research was realized in the years 1995–1997. 3–4 controls were done on each locality during a breeding season (May – June, exceptionally April and July). In total 87 controls were realized, the total length of counting trails (transects) was 219675 m. The counting were realized at standard weather conditions, not during rain, strong wind or a dense fog. All controls

Table 1. – The list of localities and their characteristics

No	name	length of transect (m)	mean altitude (m)
1	Starý Brunst	1000	915
2	Zhůří	1000	945
3	Hadí vrch	2100	956
4	Malý Bor	2175	888
5	Stodůlky	3225	843
6	Vysoké Lávky	2800	860
7	Zadní Chalupy	1100	830
8	Slunečná	1250	903
9	Knížecí Pláně	2000	1000
10	Žďárek	3375	1010
11	kotlina Valné	2000	918
12	Světlé Hory	3000	840
13	Strážný	1500	820
14	Cazov	3000	865
15	Kamenná hlava	2400	940
16	Krásná Hora	2100	901
17	Račín	1000	780
18	Házlův Kříž	2500	775
19	Pestřice – luh	1500	740
20	Pestřice – Lipno	1000	728
21	Borková	1000	728
22	Jasánky	3025	771
23	Otice	2100	755
24	Jablonec	3000	823
25	Květná	7300	978
26	Chlumany	2200	1033
27	Brzotice	8525	778
28	Třebovice	4800	640

were done in the early morning hours, from 4 to 9 o'clock CET, during a maximal voice activity of the most species.

For evaluation of bird communities some common ecological characteristics were used as abundance, dominance, constance, Shannon-Weaver's index of species diversity, equitability. The index of ornithological value (BLANA 1980) was used in order to express the importance of the individual localities for nature conservancy in a simple way and to find the most valuable stands within the secondary grassland areas from the ornithological point of view.

Results and discussion

Structure of ornithocoenoses

In the years of the research there was found out in total 97 species of birds on the secondary grassland areas under study (Table 2, 3). Among this number, 76 species (78. 4 %) is possi-

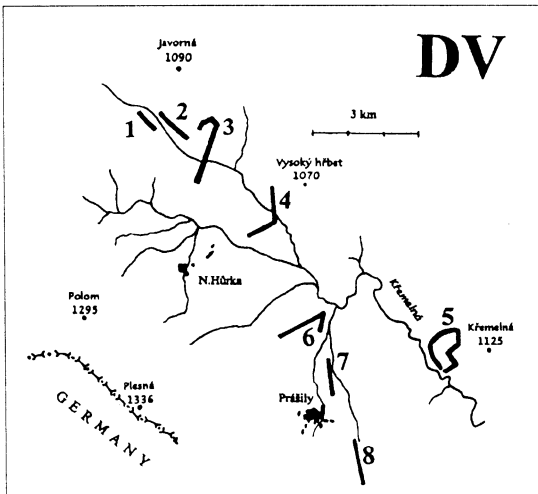
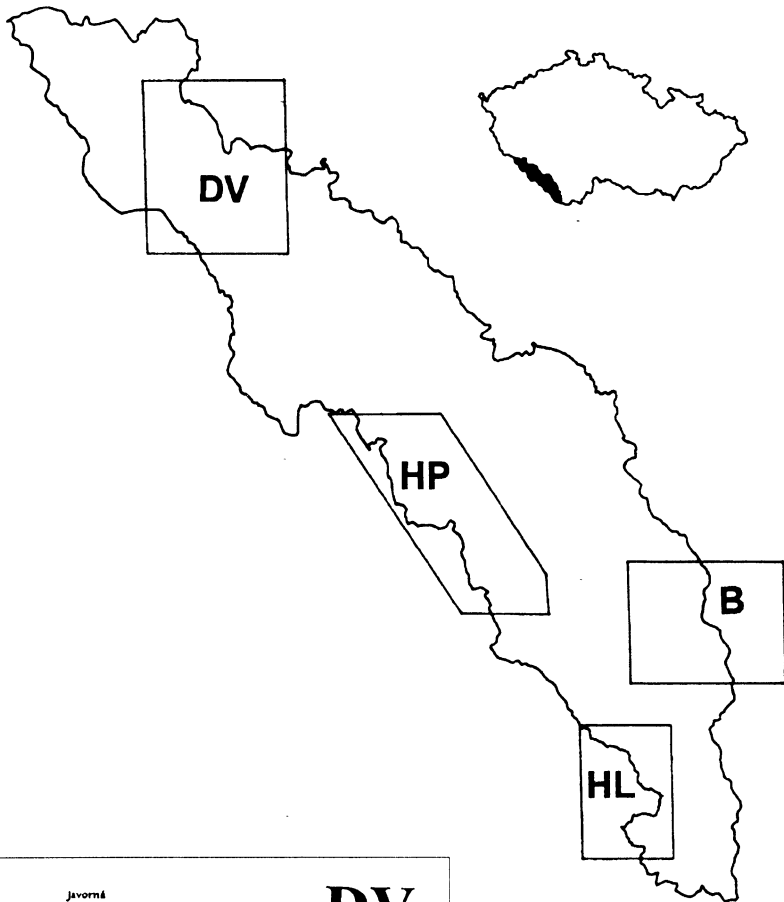
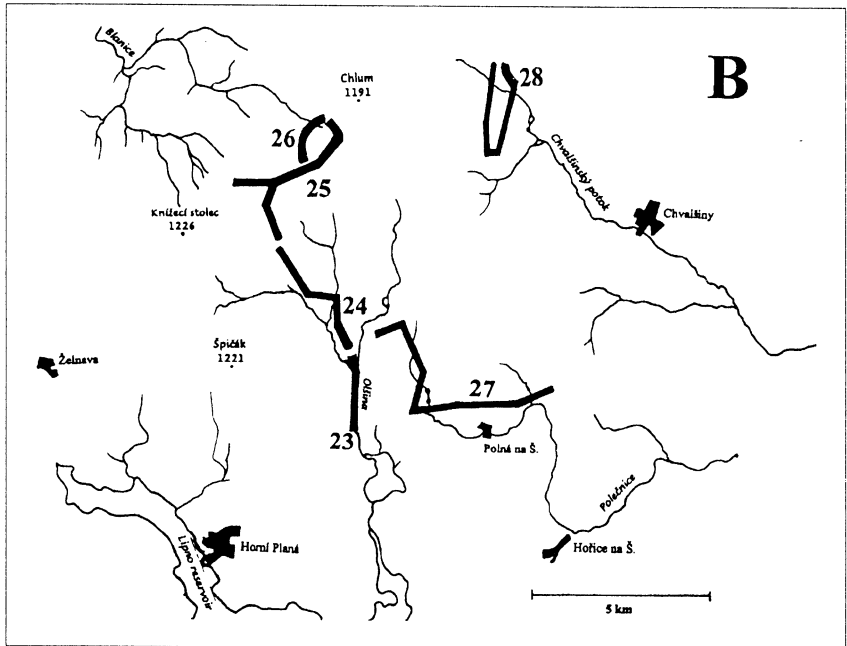
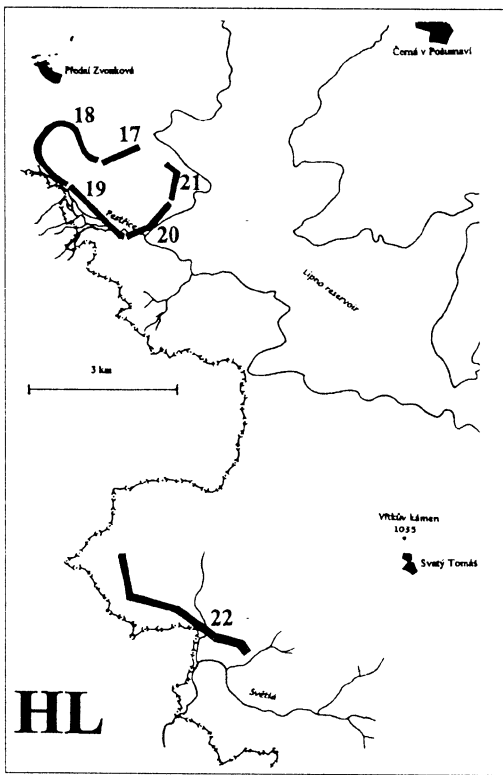
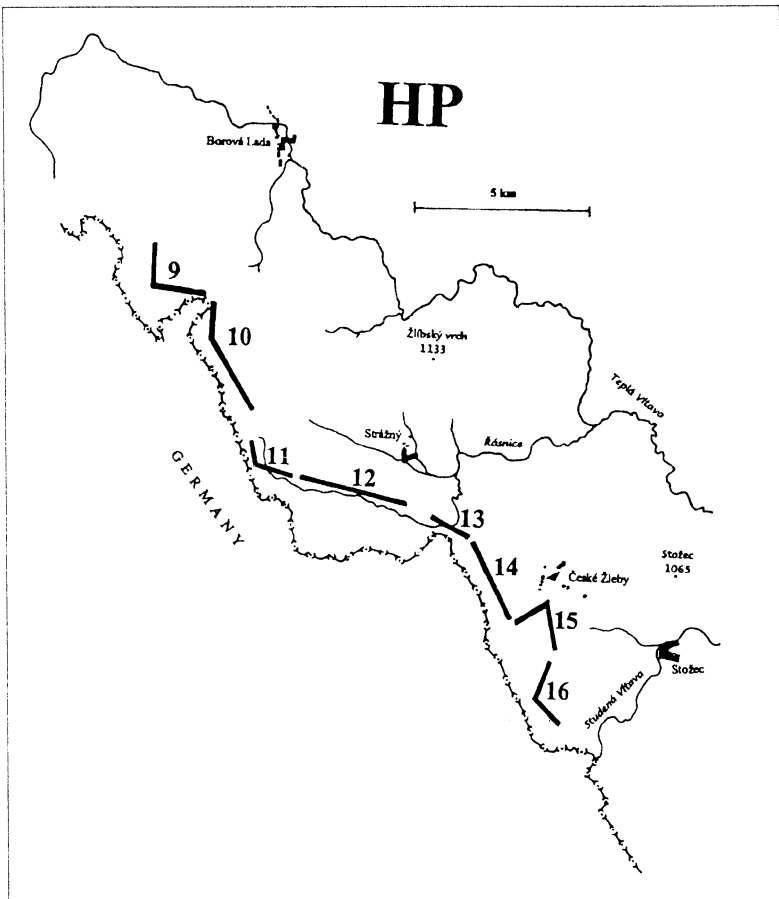


Fig. 1. – Schematic map of the localities (transects 1–28) under study. DV – military area Dobrá Voda, HP – former border zone, HL – border zone at the Lipno water reservoir, B – military area Boletice.





ble to indicate as breeding species. The remaining number (21 species, 21.6 % resp.) consist from the species breeding within the area of Šumava, but on other biotopes, and they appear on grasslands for foraging or resting. Some of this number are also rare species, unusual for the territory, probably non-breeding individuals, species which occur here only during their migration, etc. The character of the occurrence of the individual species is stated in Table 3. The total mean abundance is 37.17 pairs / 1000 m of transect. The value of the Shannon-Weaver's diversity index is relatively high ($H' = 3.686$), the equitability $E = 0.806$.

The bird communities have one eudominant species, Whinchat (*Saxicola rubetra*)—13.18 %. On average there is 4.9 pairs per 1000 m of transect. Six species was found out as dominant (5 % D 10 %): Grasshopper Warbler (*Locustella naevia*)—7.8 %, Willow Warbler (*Phylloscopus trochilus*)—7.2 %, Tree Pipit (*Anthus trivialis*)—6.7 %, Skylark (*Alauda arvensis*)—5.8 %, Yellowhammer (*Emberiza citrinella*), Chaffinch (*Fringilla coelebs*)—5.4 %. Further, 5 species was subdominant (D: 2–5), 10 species recedent (D: 1–2) and remaining 75 species subrecedent (D: 0–1).

From the standpoint of a frequency of occurrence those species with a value of constance 75–100 % are possible to indicate as euconstant. There are 9 euconstant species in our case, three from that number were present on all localities under the survey: Whinchat (*Saxicola*

Table 2. – continued

species/locality No	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28
<i>Jynx torquilla</i>	1	0,48	0,46	0,31	0,36		0,8	0,5					0,33	0,83									0,8	0,8	0,39	0,45	0,42	1,26
<i>Picus canus</i>				0,31											0,83	0,47							0,8					
<i>Picus viridis</i>																							0,8					
<i>Dryocopus martius</i>															0,42								0,8					
<i>Dendrocopos major</i>							0,8	0,29				0,33	0,33					0,4					1,61		0,26	0,45		0,21
<i>Dendrocopos minor</i>																						0,8						
<i>Lullula arborea</i>																									0,26		1,04	0,21
<i>Alauda arvensis</i>	8	3	1,43	1,84	2,48	5,36	1,81	2,5				1,33					2	1,2	6	3	0,33	0,8	2,66	0,39		3,92	3,99	
<i>Hirundo rustica</i>					0,01				0,01				0,33				0,01	1,2									0,01	0,42
<i>Delichon urbica</i>																					0,01							
<i>Anthus trivialis</i>	4	3	0,48	0,46	1,86	1,8	3,63	1,6	4,5	3,48	3	4	3,33	1,66	4,99	4,28	4	1,2	1,99	3	1	3,3	1,62	3,22	2,86	4,05	1,96	0,84
<i>Anthus pratensis</i>	15	6	3,33	2,3	2,79	7,49	2,72	1,6	2	0,58	2	0,66	1,99	0,33	0,83	0,47		1,6		4	3			2,41	0,54	1,8	0,18	0,42
<i>Motacilla flava</i>																					1							
<i>Motacilla cinerea</i>	3		0,92	0,31	0,36			0,8	0,5		0,5	0,66										0,8		0,13				
<i>Motacilla alba</i>			0,46							0,5							1							0,13		0,18		
<i>Cinclus cinclus</i>				0,31						0,5												0,33						
<i>Troglodytes troglodytes</i>											0,5		0,66	0,42													0,13	
<i>Prunella modularis</i>			0,92				4	2,5	3,15	1	1,66		0,66	0,95	1			1,33				0,66	2,43		0,39	0,45		
<i>Erithacus rubecula</i>							3,2	0,5	0,29	0,5	0,33		1,66	0,83	0,47	1		0,66		1		0,99	4,83		0,13	0,45	0,36	
<i>Phoenicurus ochruros</i>			0,46					0,8																				
<i>Phoenicurus phoenicurus</i>			0,46						0,29						0,42													
<i>Saxicola rubetra</i>	11	7	5,24	8,74	5,58	4,99	7,27	6,4	5,5	3,15	4,5	4,33	6,66	3,33	4,99	1,9	2	5,6	5,99	9	5	2,97	1,61	16,9	4,81	6,3	3,22	5,46
<i>Saxicola torquata</i>					0,31							0,66																
<i>Oenanthe oenanthe</i>		0,48							0,5																			
<i>Turdus torquatus</i>				0,46																								
<i>Turdus merula</i>				0,31				0,5	0,87	0,5		0,66	1,32	1,25	0,95	1	0,4	0,66				0,66	0,8	2,41	0,65	0,45	0,91	1,05
<i>Turdus pilaris</i>			0,48	0,46				0,29			0,66					1											0,39	
<i>Turdus philomelos</i>					0,62			1,5	0,58	0,5				0,83	0,95	1		0,66				0,33	2,43		0,26	0,18		
<i>Turdus viscivorus</i>	1		0,48	0,46					0,58	0,5	0,33	0,66				0,47	1	0,66						0,26	0,14			
<i>Locustella naevia</i>	6	7	0,48	2,76	3,41	2,86	2,72	4	0,5	0,29	1	0,33	1,33	2,31	2,08	2,38	1	2	5,33	7	2	2,65	5,64	16,1	2,73	3,15	2,94	6,3

Table 2. – continued

species/focality No	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28				
<i>Locustella fluviatilis</i>																							1,61	0,8				0,26	0,42			
<i>Acrocephalus palustris</i>	1																			1	1	0,53		4,02					0,63			
<i>Hippobolais icterina</i>					0,62																1	0,53		0,13				0,54	0,21			
<i>Sylvia curruca</i>									1	0,29		0,33	0,66						0,66	1	1	1,06		0,13				0,14	0,21			
<i>Sylvia communis</i>	2	7	1,38		0,36	0,8	2,5		0,33	1,99	1,66	0,83	0,47	1	0,4	0,66	2	1	1,59	4,83	2,41	1,69	0,9	2,34	1,89							
<i>Sylvia borin</i>	3	5	0,92	0,31	0,72	7,2	1,5	0,87	0,66	0,66	2,64	2,08	1,43	2	0,4	1,33	1	1	3,18	6,44	0,8	0,91	0,9	3,51	1,89							
<i>Sylvia atricapilla</i>					0,31		2,4	1,5	1,45	1		1,66	0,83	1,43	2	0,4	0,66	2	1,98	6,44	1,61	1,17	0,45	1,43	0,63							
<i>Phylloscopus collybita</i>							1,6	0,29	2	0,33		1,32	0,42					1,99	1	0,99	4,83	0,8	0,39	0,45	1,17	1,26						
<i>Phylloscopus trochilus</i>	3	6	1,38	1,24	2,14	8	3	3,48	2	3,66	3,99	1,66	2,08	2,38	2	5,33	3	6	2,12	16,9	3,22	1,69	2,7	4,9	1,68							
<i>Regulus regulus</i>								0,5	0,29	0,33	0,66	0,33	0,42	0,47								0,33										
<i>Regulus ignicapillus</i>									0,58			0,66		0,66	0,47																	
<i>Ficedula hypoleuca</i>																																
<i>Parus palustris</i>								0,5			0,33	0,42	0,47	1				0,66														
<i>Parus montanus</i>			0,46	0,31			2,4	1			0,66	1,33	0,66	1,25	0,47								1,61		0,13						0,21	
<i>Parus cristatus</i>			0,46						0,29				0,33																			
<i>Parus ater</i>								1	1,45		0,66														0,13			0,14				
<i>Parus coeruleus</i>								1							0,42	1,43						0,33	0,8					0,28	0,21			
<i>Parus major</i>			0,31				0,8	1	0,58	0,33	1,33	0,66	1,66	1,9	1	0,66						1,06	2,43		0,78			0,56	0,63			
<i>Lanius collurio</i>	2	4	0,92	0,62	0,36			1	0,29				0,33	1,25	0,47	1	5,3	2,66	1	1,65	2,43	4,83	1,69	2,7	1,96	3,15						
<i>Garrulus glandarius</i>								0,29	0,5	0,33		0,42	0,47					0,4	0,66			0,66		0,13				0,13				
<i>Pica pica</i>	1							0,5															0,8	0,8								
<i>Corvus monedula</i>	1																			0,01												
<i>Corvus corone</i>	1		0,46	0,31	0,36										0,66	0,47	2			1	1			0,13			0,36					
<i>Corvus corax</i>																					1			0,8								
<i>Sturnus vulgaris</i>			0,01	0,31											1,25		1					0,33	2,43	0,8	0,13			0,14				
<i>Fringilla coelebs</i>	2	0,96	0,46	2,79			4,8	6,5	4,06	4	2,66	1,98	4,17	4,28	5	1,6	5,99					3,18	4,83	0,8	1,82	1,8	1,56					
<i>Serinus serinus</i>												0,42																				
<i>Carduelis chloris</i>			0,46					0,5			0,33		0,66	0,47	2	0,8																
<i>Carduelis carduelis</i>								0,5																								0,13
<i>Carduelis spinus</i>			0,62				0,9	0,8	0,29	0,5	0,33	0,66										1,61			0,39	0,45	0,42					

Table 2. – continued

species/locality No	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	
<i>Carduelis cannabina</i>							0,9														2								
<i>Carduelis flammea</i>	1		0,46			0,72	0,9	1,6	1		0,5	0,66					1			1	3		2,43	1,61		0,45	0,91	0,84	
<i>Loxia curvirostra</i>			0,01							0,58		0,66			0,42										0,13		0,98		
<i>Carpodacus erythrinus</i>	1	6	1,43	2,3	1,24	2,14	0,9	4		0,58	0,5	0,66			0,42		2	0,8	2	3			2,43	3,22			0,13	0,63	
<i>Pyrrhula pyrrhula</i>					0,62			0,8				0,33	0,66										0,8		0,13				
<i>Cocc. coccolithraustes</i>														0,66	0,83	0,95							0,8		0,13				
<i>Emberiza citrinella</i>	2	1	0,96	0,46	0,31	0,36		3,2	3	2,61	1,5	0,66	3,99	0,99	1,25	3,81	3	1,2	0,66	1	2	1,65	2,43	1,61	2,73	4,5	3,77	2,1	
<i>Emberiza schoeniclus</i>																													0,84
<i>Miliaria calandra</i>																									0,8				

Table 3. – List of species and their characteristics (all localities together).

species	A	D (%)	K (%)	occur.	CZ	RB	ETS	f
<i>Tachybaptus ruficollis</i>	0,01	0,03	3,45	C	O	VU	S	3
<i>Egretta alba</i>	0,01	0,03	3,45	T	SO	CR		3
<i>Ardea cinerea</i>	0,01	0,03	3,45	A		LC		1
<i>Ciconia nigra</i>	0,04	0,11	10,34	P	SO	VU	(S)	3
<i>Anas platyrhynchos</i>	0,04	0,11	13,79	C			S	1
<i>Aythya fuligula</i>	0,01	0,03	3,45	C			(S)	1
<i>Haliaeetus albicilla</i>	0,01	0,03	3,45	T	KO	CR	V	3
<i>Pernis apivorus</i>	0,01	0,03	3,45	P	SO	VU	S	3
<i>Accipiter nisus</i>	0,03	0,08	6,9	P	SO	NT	S	2
<i>Buteo buteo</i>	0,17	0,43	41,38	P			S	1
<i>Circus cyaneus</i>	0,01	0,03	3,45	P	SO	E	V	4
<i>Circus aeruginosus</i>	0,03	0,08	6,9	C	O	VU	S	3
<i>Falco tinnunculus</i>	0,14	0,38	31,03	P			D	4
<i>Tetrao tetrix</i>	0,45	1,21	37,93	D	SO	E	V	4
<i>Bonasa bonasia</i>	0,01	0,03	3,45	C	SO	VU	V	4
<i>Coturnix coturnix</i>	0,12	0,32	10,34	C	SO	LC	V	4
<i>Phasianus colchicus</i>	0,01	0,03	3,45	C		LC		1
<i>Crex crex</i>	0,42	1,13	37,93	D	SO	VU	V	4
<i>Fulica atra</i>	0,01	0,03	3,45	D			S	1
<i>Charadrius dubius</i>	0,01	0,03	3,45	B		LC	S	1,5
<i>Numenius arquata</i>	0,01	0,03	3,45	T	KO	CR	D	3
<i>Gallinago gallinago</i>	0,36	0,97	48,28	C	SO	VU	(S)	3
<i>Larus ridibundus</i>	0,01	0,03	3,45	P		LC	S	1,5
<i>Columba palumbus</i>	0,19	0,51	51,72	P			S	1
<i>Columba oenas</i>	0,03	0,08	10,34	P	SO	VU	S	3
<i>Streptopelia turtur</i>	0,07	0,19	13,79	B			D	4
<i>Cuculus canorus</i>	0,39	1,05	51,72	B			S	1
<i>Apus apus</i>	0,01	0,03	13,79	P			S	1
<i>Jynx torquilla</i>	0,35	0,94	51,72	C	SO	VU	D	4
<i>Picus canus</i>	0,13	0,35	27,59	B		LC	D	4
<i>Picus viridis</i>	0,01	0,03	3,45	B		LC	D	4
<i>Dryocopus martius</i>	0,01	0,03	10,34	A		LC	S	1
<i>Dendrocopos major</i>	0,2	0,54	34,48	C			S	1
<i>Dendrocopos minor</i>	0,01	0,03	3,45	C		NT	S	1,5
<i>Lullula arborea</i>	0,16	0,42	10,34	C	SO	E	D	4
<i>Alauda arvensis</i>	2,15	5,78	68,97	C			V	4
<i>Hirundo rustica</i>	0,03	0,08	31,03	P	O	LC	D	4
<i>Delichon urbica</i>	0,01	0,03	3,45	P			S	1
<i>Anthus trivialis</i>	2,5	6,73	100	C			S	1
<i>Anthus pratensis</i>	1,56	4,2	82,76	D			(S)	1
<i>Motacilla flava</i>	0,01	0,03	3,45	T	SO	E	(S)	3
<i>Motacilla cinerea</i>	0,19	0,51	37,93	D			(S)	1

Table 3. – continued

species	A	D (%)	K (%)	occur.	CZ	RB	ETS	f
<i>Motacilla alba</i>	0,07	0,19	17,24	D			S	1
<i>Cinclus cinclus</i>	0,04	0,11	10,34	C		CD	S	3
<i>Troglodytes troglodytes</i>	0,1	0,27	17,24	D			S	1
<i>Prunella modularis</i>	0,58	1,56	48,28	D			S	1
<i>Erithacus rubecula</i>	0,41	1,1	55,17	D			S	1
<i>Phoenicurus ochruros</i>	0,01	0,03	6,9	C			S	1
<i>Phoenicurus phoenicurus</i>	0,04	0,11	10,34	C		LC	V	4
<i>Saxicola rubetra</i>	4,9	13,18	100	D	O	LC	S	2
<i>Saxicola torquata</i>	0,03	0,08	6,9	C	O	CD	S	3
<i>Oenanthe oenanthe</i>	0,03	0,08	6,9	T	SO	E		3
<i>Turdus torquatus</i>	0,01	0,03	3,45	P	SO	VU		3
<i>Turdus merula</i>	0,62	1,67	62,07	C			S	1
<i>Turdus pilaris</i>	0,07	0,19	24,13	D			S	1
<i>Turdus philomelos</i>	0,32	0,86	41,38	C			S	1
<i>Turdus viscivorus</i>	0,2	0,54	41,38	P			S	1
<i>Locustella naevia</i>	2,89	7,78	100	C			S	1
<i>Locustella fluviatilis</i>	0,09	0,24	10,34	B			S	1,5
<i>Acrocephalus palustris</i>	0,17	0,43	20,69	B			S	1,5
<i>Hippolais icterina</i>	0,1	0,27	17,24	C			S	1
<i>Sylvia curruca</i>	0,22	0,59	41,38	C			S	1
<i>Sylvia communis</i>	1,3	3,5	79,31	C			S	1
<i>Sylvia borin</i>	1,55	4,17	89,66	C			S	1
<i>Sylvia atricapilla</i>	0,97	2,61	65,52	C			S	1
<i>Phylloscopus collybita</i>	0,59	1,59	48,28	C			S	1
<i>Phylloscopus trochilus</i>	2,69	7,24	86,21	C			S	1
<i>Regulus regulus</i>	0,14	0,38	34,48	C			(S)	1
<i>Regulus ignicapillus</i>	0,04	0,11	6,9	C			S	1
<i>Ficedula hypoleuca</i>	0,03	0,08	3,45	C			S	1,5
<i>Parus palustris</i>	0,09	0,24	20,69	C			S	1
<i>Parus montanus</i>	0,26	0,7	37,93	C			(S)	1
<i>Parus cristatus</i>	0,04	0,11	10,34	C			S	1
<i>Parus ater</i>	0,17	0,43	20,69	C			S	1
<i>Parus coeruleus</i>	0,16	0,42	24,14	C			S	1
<i>Parus major</i>	0,55	1,48	55,17	C			S	1
<i>Lanius collurio</i>	1,32	3,55	79,31	D	O	CD	D	4
<i>Garrulus glandarius</i>	0,14	0,38	34,48	B			(S)	1
<i>Pica pica</i>	0,07	0,19	17,24	B			S	1
<i>Corvus monedula</i>	0,01	0,03	3,45	P		E	D	4
<i>Corvus corone</i>	0,16	0,42	41,38	B			S	1
<i>Corvus corax</i>	0,01	0,03	3,45	P	O	NT	S	2
<i>Sturnus vulgaris</i>	0,13	0,35	34,48	C			S	1
<i>Fringilla coelebs</i>	1,99	5,35	72,41	D			S	1
<i>Serinus serinus</i>	0,01	0,03	3,45	C			S	1

Table 3. – continued

species	A	D (%)	K (%)	occur.	CZ	RB	ETS	f
<i>Carduelis chloris</i>	0,14	0,38	24,14	C			S	1
<i>Carduelis carduelis</i>	0,03	0,08	6,9	C			S	1
<i>Carduelis spinus</i>	0,23	0,62	41,38	C			S	1
<i>Carduelis cannabina</i>	0,04	0,11	6,9	B			S	1
<i>Carduelis flammea</i>	0,45	1,21	55,17	C		LC	(S)	1
<i>Loxia curvirostra</i>	0,04	0,11	20,69	A			S	1
<i>Carpodacus erythrinus</i>	0,69	1,86	62,07	C	O	E	(S)	3
<i>Pyrrhula pyrrhula</i>	0,1	0,27	27,59	C			S	1
<i>Cocc.coccothraustes</i>	0,13	0,35	20,69	C			S	1
<i>Emberiza citrinella</i>	1,99	5,35	93,1	D			(S)	1
<i>Emberiza schoeniclus</i>	0,06	0,16	3,45	C			S	1,5
<i>Miliaria calandra</i>	0,01	0,03	3,45	B	KO	E	(S)	3
Total	0	0						

A – relative abundance; D – dominance; K – constance; occur. – character of occurrence (ŠTASTNÝ & al. 1997); CZ – Czech nature conserv. legislation; KO – critically endangered, SO – seriously endangered, O – endangered; RB – proposal of the Red Book of the Czech Republic (ŠTASTNÝ & BEJČEK, in press); CR – critically endangered, E – endangered, VU – vulnerable, CD – conservation dependent, NT – near threatened, LC – least concer; ETS – European threat status (TUCKER & HEATH 1994) V – vulnerable, D – declining, L – localized, S – secure, () – status provisional; f – factor of regional scarcity (BLANA 1980).

rubetra), Tree Pipit (*Anthus trivialis*) and Grasshopper Warbler (*Locustella naevia*). The remaining euconstant species are: Yellowhammer (*Emberiza citrinella*) – 93.1 %, Garden Warbler (*Sylvia borin*) – 89.7 %, Willow Warbler (*Phylloscopus trochilus*) – 86.2 %, Meadow Pipit (*Anthus pratensis*) – 82.7 %, Whitethroat (*Sylvia communis*) – 79.3 %, Red-backed Shrike (*Lanius collurio*) – 79.3 %. These species form a core of a breeding bird community on studied secondary grassland biotopes. As constant (50 % C 75 %), 11 following species were found out: Chaffinch (*Fringilla coelebs*) – 72.4 %, Skylark (*Alauda arvensis*) – 69.0 %, Blackcap (*Sylvia atricapilla*) – 65.5 %, Scarlet Rosefinch (*Carpodacus erythrinus*) – 62.1 %, Blackbird (*Turdus merula*) – 62.1 %, Redpoll (*Carduelis flammea*) – 55.2 %, Robin (*Erithacus rubecula*) – 55.2 %, Great Tit (*Parus major*) – 55.2 %, Wryneck (*Jynx torquilla*) – 51.7 %, Cuckoo (*Cuculus canorus*) – 51.7 %, Wood Pigeon (*Columba palumbus*) – 51.7 % (the last case is mainly only a food occurrence). All species of these two categories, euconstant and constant, are possible to indicate as very typical for a studied complex of secondary grasslands, and they are synecologically significant for these stands. Further, there was found out 20 accesoric species (C: 25–50 %). The remaining 57 species (C less than 25 %) go with a category of accidental species.

Although there was surveyed only a specific type of a secondary grassland, it is possible to compare the structure of ornithocoenoses with similar results, which are presented by e. g. JANDA (1989). He presents the occurrence of 57 species of birds for mountaneous meadows and pastures in some localities in the central and southeastern Šumava Mts. The most common species was Whinchat (*Saxicola rubetra*), then Meadow Pipit (*Anthus pratensis*), Chaffinch (*Fringilla coelebs*), Skylark (*Alauda arvensis*), Grasshopper Warbler (*Locustella naevia*) and Yellowhammer (*Emberiza citrinella*) The value of Diversity index was a bit lower than in our case ($H' = 3.31$). The dominant position of Whinchat (*Saxicola rubetra*) in the ornithocoenoses in the forestless stands of the Šumava Mts. is confirmed also by the findings obtained during collecting of data for the atlas of breeding birds in 70ies and 80ies (ŠTASTNÝ & al. 1987, 1997, PYKAL & al. 1990, BÜRGER 1990).

Table 4. – Selected coenological characteristics of bird communities at the individual localities

locality number	1	2	3	4	5	6	7	8	9	10	11	12	13	14
pairs / 1000 m	67	61	28,2	32,7	29,5	32,9	23,6	64	51,5	33,6	28,7	25	38,5	31,1
number of species	17	17	16	31	31	21	11	25	35	34	25	26	25	31
diversity index H'	2,22	2,72	2,52	2,85	2,83	2,44	1,99	2,91	3,16	3,01	2,82	2,64	3,81	3,16
equitability E	0,78	0,96	0,91	0,83	0,83	0,8	0,83	0,9	0,89	0,85	0,88	0,81	1,18	0,92
ornithological value OV	4,1	4,7	23,2	57,6	27	12,2	8,6	19,2	27,5	24,9	21,6	9,1	74,3	37,3
locality number	15	16	17	18	19	20	21	22	23	24	25	26	27	28
pairs / 1000 m	40	36,1	49	26,9	40,5	47	44,1	35,9	99,9	87,7	87,7	31,5	36,9	47,2
number of species	32	29	31	20	22	18	30	30	33	40	44	25	54	39
diversity index H'	3,11	2,87	3,27	2,59	2,67	2,56	2,94	3,08	3,36	2,95	3,14	3,05	3,36	3,11
equitability E	0,9	0,85	0,95	0,86	0,86	0,89	0,86	0,91	0,96	0,8	0,83	0,93	0,84	0,85
ornithological value OV	49,9	25,3	29,5	39,3	5,8	18,4	41,8	23,5	100	48,5	8,31	57	84,4	46

Ornithological value of localities under study

The ornithological value of the individual locality was expressed by the index by BLANA (1980). The results are following (see also Table 4):

- category *especially valuable* (OV more than 100) – locality Otice (23)
- category *valuable* (OV 50.1–100) – locality Brzotice (27), Strážný (13), Malý Bor (4), Chlumany (26)
- category *relatively valuable* (OV 20.1–50) – in total 14 localities
- category *less valuable* (OV 10.1–20) – in total 3 localities
- category *without a significance* (OV less than 10) – in total 6 localities

The question is, if any type of biotopes within the localities under study is specifically responsible for the increase of ornithological value. The significant statistical differences were found in the structure of bird communities in respect to the percentage of different basic categories of biotopes (for details see BUŤKA & KLOUBEC 1997). But the influence of these types of biotopes to the ornithological value of the localities is not very clear and no statistically significant interrelation was found (Multiple Regression Model, ANOVA, $F = 2.311$; $P = 0.066$), although a certain increase of ornithological value is positively correlated with the increase of a percentage of some types of biotopes (especially a belt vegetation along water courses).

Remarks to some selected less abundant, rare and endangered species

Great White Egret (*Egretta alba*)

Only one finding exists – two subadult individuals observed in the tall herb vegetation near the bank of the Lipno water reservoir (locality n. 20, Peřtřice – Lipno) on the 1st of May 1993, out of the years of counting. This occurrence is possible to evaluate as a spring migration.

Black Stork (*Ciconia nigra*)

This species was registered on three localities (2 – Zhůři, 3 – Hadí vrch, 27 – Brzotice). All observations were localized near the streams and the occurrence of the birds on this forestless plots under study was connected evidently with their foraging activities. In all three cases the breeding is confirmed in surrounding forest stands.

White-tailed Eagle (*Haliaeetus albicilla*)

It was registered on the locality 21 – Borková. Two adult birds were observed twice here and also on the opposite (north) side of the Lipno water reservoir, both in April 1995. The breeding was not confirmed, although the number of breeding pairs within the Czech Republic has been increasing (e. g. ŠTASTNÝ & al. 1997).

Marsh Harrier (*Circus aeruginosus*)

The probable breeding was registered on the locality 24, Jablonec, in the altitude 780 m a. s. l., which is the height maximum, known in the Czech Republic. KLOUBEC in ŠTASTNÝ & BEJČEK 1997 presents a maximum breeding occurrence in 740 m also from Šumava, locality Želňava.

Black Grouse (*Tetrao tetrix*)

In most cases, the studied forestless areas include important habitats for the occurrence of this species. Together with adjacent wetlands and forest mosaic with a high proportion of birch they represent the main areas of distribution of black grouse in the Šumava Mts. in recent time. The centre of distribution within the Šumava Mts. now is its southeastern part. In the years 1991, 1996 and 1998 the numbers of displaying cocks on the individual localities (not only those included in this study) throughout the whole Šumava Region were estimated as 136, 190 and 120 respectively (ČERVENÝ & al. 1998, BUŤKA unpubl.). Approximately 1/2 of this number during all three censuses comes from the localities within the military training area Bolestice, where the population seems to be the most stable. In comparison, the former military area Dobrá Voda is inhabited by only very low numbers of black grouse (in total 2–8 cocks counted) which are concentrated predominantly on the suitable habitats within the plateau of the upper Křemelná river.

Quail (*Coturnix coturnix*)

Quail was found out frequently in relatively high altitudes, e. g. loc. Knížecí Pláně (1025 m a. s. l.). The absolute maximum in the Czech Republic is described from the Beskydy Mts. (1040 m a. s. l., ŠTASTNÝ & al. 1997).

Corncrake (*Crex crex*)

The studied localities represent the important refuge of this species. Although the numbers found out in this study are not complete in absence of a night counting, its occurrence was registered on different types of biotopes on altogether 11 localities.

Curlew (*Numenius arquata*)

The occurrence of one bird was registered on the 30th April 1997 on the locality 22 – Jašánky (flight over the locality). The nearest breeding localities are known from Upper Austria (AUBRECHT & BRADER 1997)

Snipe (*Gallinago gallinago*)

Its occurrence was registered on the 14 localities under study always in wetland biotopes.

Wryneck (*Jynx torquilla*)

It was registered relatively frequently, especially on the sites of abandoned settlements, with the remains of old orchards and solitary fruit and other broadleaf trees, usually with a big supply of cavities.

Woodlark (*Lullula arborea*)

In the years of the research it was registered only on the territory of the military area Bolestice. The highest abundance was found out on the locality 27 – Brzotice (1.04 pairs / 1000 m). A vanishing of this species and a decrease of its numbers on the localities of its traditional

occurrence (esp. Šumava) starting from 70ies is stated by PYKAL al. 1990. Our study confirmed the connection between the occurrence of woodlark and the presence of the uncovered soils nearly without vegetation (BUFKA & KLOUBEC 1997). On the localities, where this species was found (military training or bombing plots in Boletice area), the soil cover is permanently disturbed by a heavy military technique and so these places have the relatively biggest percentage of uncovered soils among all localities under study. The interesting phenomenon is the absence of this species on the territory of the military area Dobrá Voda, where similar stands in smaller extent can be still found. The occurrence of woodlark here was registered only once, out of the years of this field study (BUFKA & KLOUBEC 1997). The data of its occurrence in the western parts of the Šumava Mts. at all are very scarce. MATTAS (1990) and ŠTASTNÝ & al. (1997) do not state it from this area. In some parts of the foothills, e. g. surroundings of Kašperské Hory and Hartmanice, it is reported during a breeding season from a bit different biotopes but with some similar features to those in military areas above (usually an agricultural land with a places uncovered by a vegetation, etc.) – KUČERA (1997), BUFKA & KLOUBEC (1997), BUFKA unpubl. Recently (June 1998) the occurrence of woodlark during a breeding season is reported also from the highest positions of the Šumava Mts. (the Modravské slatě peatbogs area) at the bigger clearcut stands after a bark-beetle calamity (ŠTASTNÝ – pers. comm.)

Yellow Wagtail (*Motacilla flava*)

Species sporadically migrates through the territory. During the years of the research we found once one female on the locality 21, Borková. The breeding was not confirmed here.

Stonechat (*Saxicola torquata*)

Its occurrence was registered on 2 localities, Stodůlky (5) and Strážný (13). In both cases that was a single observation of one singing male. The species had been reported only from the foothills of the western part (KUČERA 1972) and several localities in the central parts of the Šumava Mts. (HANZÁK 1987).

Wheatear (*Oenanthe oenanthe*)

It appears regularly during a spring migration, a breeding was not confirmed on any plots under this study.

Ring-ouzel (*Turdus torquatus*)

On the plots we studied, it occurs mainly for feeding purposes. It breeds in surrounding woodland areas, especially in higher altitudes.

Marsh Warbler (*Acrocephalus palustris*)

This species had been found more frequently on the localities in the southeastern part of the mountains, in lower positions, but also on the locality 2, Zhůří, ca. 900 m a. s. l., which corresponds with the height maximum known for this species within the Czech Republic (surroundings of Borová Lada – PYKAL & al. 1990).

Barred Warbler (*Sylvia nisoria*)

This species was registered only out of the time of counting, in spring 1997 and 1998, on the locality Třebovice (28). Several birds (3–4 singing males) were found there (P. HOMOLKA – first observation, BÜRGER, PYKAL – pers. comm., KLOUBEC – unpubl.). It is possible the species could be overlooked during counting, among a lots of Garden Warbler (*Sylvia borin*), they might have also a significantly lower voice activity during the early morning time, used for counting.

Pied Flycatcher (*Ficedula hypoleuca*)

Only one observation of one singing male was registered on the locality 10, Žďárek. Its breeding occurrence within the Šumava Mts. is known recently only from 2 localities from primeval-like mixed beech forests (KLOUBEK & BUŤKA 1997) and also in the upper Otava river valley (locality Radešov, May 1995).

Red-backed Shrike (*Lanius collurio*)

Common species on the plots under study. The highest abundance was found out on the localities 2 (Zhůří), 18 (Házlův Kříž), 24 (Jablonec), always in biotops with a diffuse occurrence of shrubs, mainly willows *Salix cinerea*.

Scarlet Rosefinch (*Carpodacus erythrinus*)

The species is typical for the studied forestless areas. The highest abundance registered were 3–4 pairs/1000 m of transect (e. g. locality Slunečná, Jablonec).

Corn Bunting (*Miliaria calandra*)

It was registered once, one male singing in shrubs and a bank vegetation at a small stream on the locality 24, Jablonec. In 1998, out of the years of study, it was found also on the locality Třebovice. Up to now, its breeding occurrence was known only from the foothills of the western part of the Šumava Mts. (mapping quadrat 6744 – MATTAS 1990) and recently near Vimperk (locality Trhonín – PROKOP 1997).

Conclusions

The data obtained document a big importance of studied abandoned secondary grasslands for avifauna diversity in the Šumava Mts. Region. The occurrence of bird communities with a high species diversity usually need not be connected with the high plant species diversity on these stands. That concern also the presence of some rare species, species, that are considered as globally threatened or with a unfavourable conservation status in Europe, which have frequently more specific habitat requirements (e. g. Black Grouse *Tetrao tetrix*, Corn-crake *Crex crex*, Snipe *Gallinago gallinago*). The most important factor for their occurrence seems to be a high structural diversity of biotopes, variable height and density of a herb layer structure, presence of thickets, wetlands etc., which provide adequate supply of nesting opportunities, shelter, food. These types of biotopes are common on the plots surveyed. From the ornitological point of view, it is possible to say, that many forestless areas in the Šumava Mts. profit from the absence of any management during last 50 years. There had been increasing number of ecotones, and a formerly agricultural land had been returning spontaneously towards more natural stands, especially on wet plots. On the other hand, the total return towards forest biotops would mean also a decrease of bird species diversity and a vanishing of some threatened species. That is why the optimal management is to maintain the recent mosaic of grassland plots in different stage of a secondary succession, from traditional mowed meadows and pastures to those, left to natural development, modified in view of special requirements of key species from a nature conservation aspect.

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