

R. TURINI (\*)

## A CENSUS OF THE BREEDING BIRDS COMMUNITIES IN TWO DIFFERENT HABITATS IN THE «ORRIDO DI BOTRI» NATURAL RESERVE (TUSCANY, ITALY)

**Abstract** — In 1992 and 1993 breeding birds were censused following the mapping method in two different habitats in the «Orrido di Botri» natural reserve (Tuscany, Italy): beechwood and a mountain ecotone. Most of species breed in the ecotone (wood and clearings). The predominant species in the beechwood are chaffinches, robins and coal tits. The predominant species in the ecotone are chaffinches, tree pipits and blackcaps. The breeding of the goldcrest, firecrest, short-toed tree creeper in the ecotone is related to the presence of mixed woods (beeches and conifers). The comparison between the two communities features (during the years 1992 and 1993) indicate that the aspects of heterogeneous habitat of the ecotone increased species diversity.

**Riassunto** — (*Censimento delle comunità di uccelli nidificanti in due differenti ambienti nell'Oasi Faunistica «Orrido di Botri», Toscana, Italia*). Durante il 1992 e il 1993 l'avifauna nidificante in due differenti habitat dell'oasi faunistica dell'Orrido di Botri (faggeta, ecotono montano) è stata censita utilizzando il metodo standardizzato dal mappaggio. Un maggior numero di specie nidifica nell'ecotono montano (bosco e zone aperte). Le specie dominanti nell'ecotono sono il fringuello, il prispolone e la capinera. La nidificazione del regolo, del fiorrancino e del rampichino nell'ecotono è da porsi in relazione alla presenza di boschi misti con presenza di conifere. La comparazione tra i parametri ecologici delle due comunità (riferiti ai due anni di censimento) indica che gli aspetti più eterogenei dell'ambiente ecotonale incrementano la diversità specifica.

**Key words** — Breeding communities, census, «Orrido di Botri» - Natural Reserve, beechwood, mountain ecotone.

### INTRODUCTION

During research on the Apennine fauna (carried out by the Depart-

---

(\*) Collaboratore a contratto del Dipartimento di Scienze dell'Ambiente e del Territorio - Università degli Studi di Pisa.

ment of Environmental Science of the University of Pisa\*) two regions were taken for census of the breeding bird community. The regions chosen are representative of the surrounding territory and will become a part of the present «Orrido di Botri» Natural Reserve (Lucca, Tuscany).

The characters of the flora and fauna of the Apennine Mountains have changed with human history. In the age before the Second World War man inserted his presence in the Apennines. During the years after the war man has withdrawn himself from the mountains. Today the mountains remain all but abandoned by man. The state of the beechwoods, ecotones and plains of the Apennine mountain today reflects this change of human presence. Only the territories situated at higher altitude maintain their natural features, including: beech clearings, *Fagus sylvatica* L., and altitude plateau (POLUNIN & WALTERS, 1987). When human settlements and traditional cultivations (agricultural, silvicultural and pastoral activities which, in turn, ensured higher primary productivity levels and a higher complexity of consumers trophic networks) were not present any longer the average mountain fauna began to, in richness of species and in biotic diversity, decrease (CRAMP, 1981; PAVAN, 1984; FASOLA (red.), 1991). This note is made in order to examine the present status of the breeding bird communities in beechwoods and ecotones in view of future interventions to reconstitute agricultural and forestal activities within the territory of what will be the natural reserve. The intervention of this reconstruction is to provide a better environment for the mountain fauna.

#### THE STUDIED AREA

The part of the «Orrido di Botri» Reserve which is going to be created will be 20 km<sup>2</sup> and will be situated in the North by North-East part of the district of Lucca (so the reserve will span from forty — four degrees and four minutes to forty — four degrees and seven minutes of North latitude; from one degree and forty-nine minutes to one degree and fifty-three minutes of East longitude)\*NOTE. This area comprises a mountain zone which divides its northern border with the Apennine

---

\* Research sponsored by a convention between the District Administration of Lucca and the University of Pisa (coordinator: Prof. R. Nobili): «Study on the Vertebrate fauna of the "Orrido di Botri" Natural Reserve» (Delib. n. 298 C.A., 06-03-91).

\* NOTE Referring to Italian national geographic System.

ridge (M. Rodinaio, 1964 m., «Foce al Giovo», 1171 m. «Alpe delle Tre Potenze», 1940 m), its eastern border with a mountain spur which goes up until M. Mosca, 1320 m., is southern border with the «Albereta di Montefegatesi», with the «Alta Valle di Fegana» (Ponte a Gaio, 700 m) and eventually its western border with the «Colle dell'Altare» with some little mountains ending up to M. Rondinaio (POGGI, 1991). The morphology of the territory is quite irregular, it alternates between slopes of average grade and sharp cliffs (The Orrido di Botri being one of the most popular). The phytocenosis of Orrido di Botri Natural Reserve are: high mountain plains, pasture lands, beechwoods (*Fagus Sylvatica L.*) and mixed woods with dominance of beeches, turkey oak woods (*Quercus cerris L.*), chestnut (*Castanea sativa Mill.*) and black hornbeam (*Ostrya carpinifolia Scop.*) mixed woods; agricultural and former agricultural zones as well as hygrophyll vegetation. This research has been carried out within two 0.16 Km<sup>2</sup> sample zones which are typical of two different biotopes: beechwood (between 1100 and 1200 m. above sea level) and mountain ecotone (wood borders and clearings: between 1100 and 1200 m. above sea level). In the past the beechwoods were repeatedly capsed: the selected sample zone belongs to an association composed of younger plants communities which are substitute, at higher altitudes, with a older forest of beeches (excluded from this research). The ecotone is situated near the Casentini Alpine Hut. As a result of implantation by men the wood vegetation is predominantly characterized by beech trees, black pine trees (*Pinus nigra*), and larch (*Larix decidua Mill.*). The fore-mentioned zones are spotted by terraced zones which were former agricultural sights. Even today sheep are brought to pasture at these sights. The approximate distribution of the different vegetation is: 25% beech clearings, 20% mixed wood, 55% former agricultural zone with its shrub woods and limited presence of trees (POGGI, cit.).

## METHODS

The breeding bird community has been counted according to «the mapping method» of the IBCC (I.B.C.C., 1969; BARBIERI et al., 1975). The mapping method is an absolute quantitative method to localize Passeriformes and, within wider territories, Columbiformes and Piciformes (BLONDEL, 1969). Presence of species which cannot be counted by this method can only be indicated by previous observations of the species within the sample area. These sightings were during the

feeding phase of the species individuals (FARINA, 1980). In both areas, seven visits in 1992 (March-June) and seven visits in 1993 (April-July) were made. The visits followed different trails which crossed the areas. In counting individual breeding couples in territories situated within the two samples zones a special counting method was imposed.

For breeding couples totally contained in the zone a value of 1 was assigned and for couples found on the boundaries of a zone a value of 1/2 was given. In order to define the approximate limits of these territories, singing males and family group (females and nestlings) have been attentively observed during their movements. The determination of interterritorial borders of co-specific individuals is clearly influenced by the number of investigator's visits, without, however, causing significant alterations of the census' general results (LAMBERTINI, 1981). To make a quantitative description of the breeding community, a common method used by many investigators (BLONDEL et al. 1973; FARINA, 1981; BERNONI et al. 1989; ZAROTTI, 1989; FASOLA (ed.), 1991) was implemented. The parameters used are: S=richness (number of breeding species); d=total density (number of couples per 0.10 km<sup>2</sup>); D=frequency in percentage; Nd=number of dominant species (D>0.05, according to Turcek, 1956); H'=Shannon's diversity index (SHANNON & WEAVER, 1949 in: ODUM, 1973); p1=percentage of the most abundant species; p2=percentage of the two most abundant species; % nP=Non-Passeriformes percentage; % e=migrant species percentage.

## RESULTS AND DISCUSSION

Birds communities composition during their reproduction phase is indicated in tables 1 and 2. Three species not included in the list: hoopoe, *Upupa epops*, song thrush, *Turdus philomelos*, nightjar, *Caprimulgus europaeus*, were observed immediately outside the borders of the ecotone. Those species which did not breed but which have been detected in the sample zones at least three times, have also been tabulated. These species that did not breed (but were sighted) in the sample zone were considered in order to account for local levels of resources and niches (food, roots, temporary lairs, hunting grounds etc.). Breeding is in fact only one of the elements which constitute the «realizable niche» of a species (FASOLA, 1985). In the years 1992 and 1993, twelve species which breed in the beechwood and twenty-four breeding species in the ecotone have been counted: the more heterogenous ecotone has a higher value of specific richness. We have used the specific richness to be a value relating the number of species to the number of «available»

Tab. 1 - Structure of the breeding bird community in the beech-wood (n1= number of the distinct territories; n2 = number of the marginal territories; d=density (n. couples/0.10 Km<sup>2</sup>); D=occurrence of the individuals of one species compared to the total (=1).

Species	1992				1993			
	n1	n2	d	D	n1	n2	d	D
<i>Troglodytes troglodytes</i>	3	1	2.20	0.10	3	1	2.20	0.09
<i>Erithacus rubecula</i>	4	2	3.12	0.13	3	1	2.20	0.09
<i>Turdus merula</i>	3	3	2.81	0.12	3	1	2.20	0.09
<i>Sylvia atricapilla</i>	3	3	2.81	0.12	4	2	3.12	0.13
<i>Phylloscopus collibya</i>	2	-	1.25	0.06	1	2	1.25	0.06
<i>Muscicapa striata</i>	1	-	0.62	0.03	1	-	0.62	0.03
<i>Parus major</i>	3	1	2.20	0.10	4	-	2.50	0.11
<i>Parus ater</i>	2	1	1.56	0.07	5	-	3.12	0.13
<i>Fringilla coelebs</i>	8	1	5.31	0.23	8	3	5.94	0.26
<i>Pyrrhula pyrrhula</i>	1	-	0.62	0.03	-	-	-	-
<i>Garrulus glandarius</i>	-	1	0.31	0.01	-	1	0.31	0.01
<i>Corvus corone cornix</i>	-	-	-	-	-	-	-	-
<i>Cuculus canorus</i>	-	-	-	-	-	-	-	-
<b>Totals</b>	30	13	22.81	1.00	32	11	23.46	1.00

(according to Grinnel, 1917 in: Rolando, 1987) and «realizable» (according to Hutchinson, 1958) niches.

Table 3 summarizes some structural parameters of the community. In 1992, the two most abundant species in the beechwood (p2) are chaffinch (*Fringilla coelebs*) and robin (*Erithacus rubecula*): in 1993, chaffinch and coal tit (*Parus ater*). In the ecotone, value p2 refers, in 1992 to chaffinch and tree pipit (*Anthus trivialis*) and in 1993 to chaffinch and blackcap (*Sylvia atricapilla*). The chaffinch, «ubiquitous» Passeriformis (FARINA, 1980) is the most copious species within the two studies areas; it is constantly present and abundant even in biotopes with the same features but situated in other Apennine zones (FARINA, 1981; AA.VV., 1985; BERNONI, 1988; PANDOLFI & TAFERNA, 1991).

Density values are lower in the beechwood. Other investigators (ex. Bernoni, cit.) have already pointed out that rarely as many as 30 Couples/0.10 Km<sup>2</sup> can be reached in «homogeneous» habitats such as young beechwoods. The value referring to the ecotone is also confirmed by other census carried out within the same type of mountain areas (FARINA, cit.). This value is higher only when compared with ecotone having mixed features of beechwood and altitude plains. The difference of values is explained by the structural simplicity of altitude plains which are characterized by a herb-covered biotope (FARINA,

Tab. 2 - Structure of the breeding bird community in the ecotone (n1=number of the distinct territories; n2=number of the marginal territories; d=density (n. couples/0.10 Km<sup>2</sup>); D=occurrence of the individuals of one species compared to the total (=1).

Species	1992				1993			
	n1	n2	d	D	n1	n2	d	D
<i>Delichon urbica</i>	-	-	-	-	-	-	-	-
<i>Anthus trivialis</i>	5	-	3.13	0.09	4	-	2.50	0.09
<i>Troglodytes troglodytes</i>	3	-	1.88	0.06	3	-	1.88	0.06
<i>Prunella mdularis</i>	1	-	0.62	0.02	-	-	-	-
<i>Erithacus rubecula</i>	2	1	1.56	0.06	3	-	1.88	0.06
<i>Phoenicurus phoenicurus</i>	-	-	-	-	-	-	-	-
<i>Phoenicurus ochruros</i>	-	-	-	-	-	-	-	-
<i>Turdus merula</i>	4	1	2.81	0.08	4	1	2.81	0.10
<i>Sylvia atricapilla</i>	4	1	2.81	0.08	4	2	3.13	0.11
<i>Phylloscopus collibya</i>	4	1	2.81	0.08	2	2	1.88	0.06
<i>Regulus ignicapillus</i>	2	-	1.25	0.04	2	-	1.25	0.04
<i>Regulus regulus</i>	2	-	1.25	0.04	1	-	0.62	0.02
<i>Muscicapa striata</i>	1	-	0.62	0.02	1	-	0.62	0.02
<i>Parus cerulaeus</i>	1	-	0.62	0.02	-	1	0.31	0.01
<i>Parus major</i>	4	1	2.81	0.08	2	2	1.88	0.06
<i>Parus after</i>	2	-	1.25	0.04	2	1	1.56	0.05
<i>Certhia brachydactyla</i>	2	-	1.25	0.04	2	-	1.25	0.04
<i>Lanius collurio</i>	1	-	0.62	0.02	2	-	1.25	0.04
<i>Fringilla coelebs</i>	11	1	7.19	0.22	10	2	6.87	0.23
<i>Carduelis chloris</i>	-	1	0.31	0.01	-	1	0.31	0.01
<i>Carduelis carduelis</i>	-	-	-	-	-	-	-	-
<i>Carduelis spinus</i>	-	-	-	-	-	-	-	-
<i>Cuculus canorus</i>	-	-	-	-	-	-	-	-
<i>Garrulus glandarius</i>	-	-	-	-	-	-	-	-
<i>Corvus corone cornix</i>								
<i>Buteo buteo</i>								
<i>Falco tinnunculus</i>								
<i>Apus apus</i>								
<b>Totals</b>	49	7	32.80	1.00	42	12	29.69	1.00

1980; 1982, in PANDOLFI & FRUGIS, 1988). The calculation of % nP (tab. 3) shows a higher value in the ecotone (29.46%). In this research a calculation of ecological parameters has not been used for those species which did not breed within the studied ecotone; in this case, deeper research (entailing a one great study) would have been necessary in order to understand the effect of migrant and wintering taxa (FASOLA, 1985). The percentage of summering birds (%e) is higher in the ecotone. This is related to the presence of different species: red-black-shrike,

Tab. 3 - Ecological parameters of two communities (see text).

<b>Beech-wood</b>								
	S	Nd	p1	p2	d	H'	%nP	%e
1992	12	8	0.23	0.36	22.81	0.87	16.7	7.7
1993	12	8	0.26	0.39	23.46	0.89	16.7	7.7
<b>Ecotone</b>								
	S	Nd	p1	p2	d	H'	%nP	%e
1992	24	8	0.22	0.32	32.80	0.98	29.46	32.0
1993	24	9	0.23	0.34	29.69	0.95	29.46	32.0

*Lanius collurio*; black-redstart, *Phoenicurus ochruros*; tree pipit, *Anthus trivialis* which breed in clearings. By choosing a sample area in an ecotone with a high percentage of woods (~ 45%/0.16 Km<sup>2</sup>), one finds both species typical of clearings and species which are abundant in wooded area. The fact that Regulidae (*Regulus regulus*, *Regulus ignicapillus*) and short-toed treecreeper (*Certhia brachydactyla*) are in the ecotone is explained by the presence of mixed deciduous and coniferous woods. Thus the results are related to the different vegetational composition and to realizable niches in woods of different composition, variety and ecological value (BEZZEL, 1987; FARINA, 1989). The data of this two-year census stress the need for agricultural and former pastoral interventions in this area. This study confirms other researches conducted in other areas, woods and extremities in the Apennines. Such interventions, in fact, would allow a further diversification of the present fauna and would encourage the resettlement of Passeriformes which eat seeds and insect (ex. Emberizidae) as well as encourage the resettlement of Non Passeriformes which are typical of ecotones and which are absent at this moment (ex. Galliformes).

#### ACKNOWLEDGEMENTS

Thanks are due to Prof. R. Nobili and to Prof. P. Ioalé for their revision of the original manuscript, Dr. S. Fricke for English editing and also to Mr. M. Giuntini, S. Neri, F. Massei, R. Calistri, N. Pierotti (District Administration of Lucca) for their collaboration in the field work.

## REFERENCES

- BARBIERI F., FASOLA M., PAZZUCCONI A., PRIGIONI C., (1975) - I censimenti degli uccelli in ambienti boschivi. *Riv. It. Ornit.*, **45**: 1-27.
- BERNONI M. (1988) - Le comunità di uccelli delle faggete del Parco Nazionale d'Abruzzo. *Naturalista Siciliano*, S IV, XII (Suppl.): 27-28.
- BERNONI M., IANNIELLO L., PLINI P. (1989) - Censimento dell'avifauna nidificante in un bosco deciduo dell'Italia centrale. *Avocetta*, **13**: 25-29.
- BEZZEL E. (1987) - Uccelli: Passeriformi. I ed. it., Bologna, pp. 208.
- BLONDEL J. (1969) - Methodes de denombrement des populations d'oiseaux in Lamotte M., Bourliere F. (eds.), Problèmes d'ecologie: l'échantillonnage des peuplements animaux des milieux terrestres. Masson, Paris.
- BLONDEL J., FERRY C., FROCHOT B. (1973) - Avifaune et vegetation: essai d'analyse de la diversite. *Alauda*, Vol. XLI, n. 1/2: 63-84.
- CRAMP S. (1980) - La conservazione dell'avifauna in Europa. (1 ed. it.) - Bologna, pp. 97.
- EMLEN J. (1974) - An urban bird community in Tucson, Arizona: derivation, structure, regulation. *Condor* **76**: 184-197.
- FARINA A. (1980a) - Contributo alla conoscenza dell'avifauna nidificante in Lunigiana. *Boll. Must. St. Nat. Lun.* **1**: 21-7.
- FARINA A. (1989) - La scelta della scala spazio-temporale nello studio delle comunità di uccelli terrestri, in: Fasola, (ed.) 1991.
- FASOLA M. (1985) - Introduzione all'ecografia degli uccelli. La distribuzione delle specie. *Avocetta*, **9**: 1-62.
- FASOLA M. (1988) - Idee e metodi per lo studio della nicchia trofica negli uccelli. *Naturalista Sicil.*, S IV, XII (Suppl. pp. 83-97).
- FASOLA M. (red.) (1991) - Atti del II Seminario sui censimenti faunistici dei Vretrabati Suppl. *Ric. Biol. Selv.*: **16**, pp. 820.
- HUTCHINSON G.E. (1958) - Concludings Remarks. Cold Spring Harbour Symp. Quant. Biol. I.B.C.C., 1969 - Recommendations for an International Standard for a Mapping Method in Bird Census Work. *Bird Study* **16**: 249-255.
- LAMBERTINI M. (1981) - Censimento degli uccelli nidificanti in un bosco litoraneo della Toscana. *Avocetta* **5**: 65-86.
- ODUM E. (1993) - Principi di Ecologia. (1 ed.it), Padova, pp. 584.
- PANDOLFI M., FRUGIS S. (1988) - Atti del I Seminario italiano sui censimenti faunistici dei Vertrebrati. (Editori), Università di Urbino, pp. 404.
- PANDOLFI M., TAVERNA G., in: FASOLA M. (red.) (1991) - Censimenti del popolamento di Passeriformi in un bosco di conifere e di uno latifoglie nell'Italia centrale.
- PAVAN M. (1984) - Appunti e documenti sulla situazione del patrimonio naturalistico italiano. Università di Pavia, pp. 81
- POGGI U. (1991) - Progetto per la costituzione delle oasi faunistiche «Orrido di Botri» e «Balzo Nero». Relazione tecnica (inedita): pp. 117.
- POLUNIN O., WALTERS M. (1987) - Guida alle vegetazioni d'Europa. I. ed., Bologna, pp. 232.
- ROLANDO A. (1987) - La teoria della nicchia: prospettive e problemi in ornitologia. *Avocetta*, **10**: 1-36.
- TURCEK E.J. (1956) - Zur Frage der Dominanze in Vogelpopulationen. *Waldhygiene* **8**: 249-257.
- ZAROTTI A. (1989) - Gli uccelli nidificanti in un parco urbano in Emilia. *Avocetta* **13**: 47-52.

(ms. pres. il 18 dicembre 1993; ult. bozze il 19 settembre 1994)