

BIRD COMMUNITY OF THE MEDITERRANEAN FOREST OF  
MIGLIARINO (PISA-CENTRAL ITALY)

Almo FARINA

Along the Italian sea-coasts, lowland forests are very rare and reduced in extension. Near the town of Pisa a large wood, named "Selva Pisana", persists. In this area I studied the avifauna in spring and autumn.

Study area

The Migliarino forest, 1500 ha wide, placed between the Tyrrhenian sea and the Massaciuccoli lake, is characterized by a flat sandy ground of sea origin. The ground morphology is typical of consolidated sand dunes. The vegetation is characterized by a high forest with trees in close canopy (20 m high) with dominant *Pinus pinea* planted by man and with several spontaneous species as *Quercus pedunculata*, *Alnus glutinosa*, *Fraxinus oxyphilla*, *Fraxinus excelsior*, *Quercus ilex* and *Pinus pinaster*. Periodical cuts and successive reforestation with *Pinus pinea*, in small areas, increase the vegetational heterogeneity. The undergrowth (2-3 m high) is dominated by *Erica arborea*, *Erica scoparia*, *Rubus* sp. and *Edera helix*. The grass layer is lacking everywhere. Several canals cross the forest and little marshes are present. The tree cover is about 100%, shrubs cover is very variable. Wild-boars and Fallow-deers are abundant. Their activity produces a severe stress to the grass and shrub layer.

Methods

The bird community was studied in two different periods: spring

(from May 2nd to 30th 1979) and autumn (from November 9th to 16th 1979). During the spring, birds were censused using the Line Transect Method (all observations within 25 m from the transect are considered to fall within the mainbelt, while the rest are said to belong to the supplementary belt. The main and supplementary are named survey belt (Järvinen & Väisänen 1975). In all I covered a transect 25 Km long. In the autumn I used a Line Transect Method but without lateral limitation of the censused area, using a time unit of 15'. I recorded only the frequency of occurrence of each species during 28 time units, for a total of 7 hours of observations.

The parameters employed for analysing the bird communities structure were:

S - Richness (Number of species);

H' - Shannon diversity (Shannon & Weaver 1963);

J' - Equitability (Lloyd & Ghelardi 1964);

d - Density (pairs / Km<sup>2</sup>);

D - Dominance (importance of the single species in the community, a species is said dominant when  $D > 0.05$ ) (Turcek 1956);

P<sub>1</sub> and p<sub>2</sub> - (single and two most abundant species) (Wiens & Dyer 1975);

Scb - Standing crop biomass (species weight / density);

Cb - Consuming biomass (species weight 0.7 / density);

Cb/Scb ratio - (Salt 1957);

w - Mean weight of species community;

% - non-Passeriformes and % migrants (summer and winter visitors);

T - Species turnover (net change in species composition from one season to the next) (Wiens & Dyer 1975);

$T = \frac{S_i + S(i+1)}{S_c + S_i + S(i+1)}$  where S<sub>i</sub> = number of species unique to count i,

S<sub>i+1</sub> = number of species unique to the next

successive count, and S<sub>c</sub> = number of species common to both counts.

## Results

The composition of the bird community in the two periods is indicated in Tab. I and II. The birds breeding in Migliarino forest are 31, with a total density of 224 pairs/Km<sup>2</sup>. Eight species are dominant (i.e.  $D > 0.05$ ) Robin, Wren, Blackcap, Great Tit, Blackbird, Firecrest, Blue Tit and Nuthach. The density of nine species was too low to be evaluated with accuracy. The migrant species (summer visitors) are 8 (25% of total number of species): Nightingale, Turtle Dove, Melodious Warbler, Spotted Flycatcher,

Guckoo, Wryneck, Lesser Grey Shrike and Red-backed Shrike. The percentage of non-Passeriformes is 25% of the total number of breeding species. The mean body weight of the breeding community is 83.5 g. The birds present during the autumn period are 30 (Tab. II and III).

Eight species are dominant ( $D > 0.05$ ): Robin, Chaffinch, Firecrest, Wren, Blackbird, Nuthach, Great Tit and Jay. Fifteen species were observed in so few occasions that it was impossible to evaluate the dominance value. The migrants (wintering visitors) are: Song Trush, Dunnock and Siskin (13% of total number of species). The mean body weight of wintering community is 67.5 g.

The results presented in Tab. IV indicate that small species (less than 25 g body weight) dominate in this forest in both periods. The seasonal turnover  $T$  (between breeding and autumn period) is 48% (33% if we compare the dominant species only).

TABLE I - Composition of the breeding bird community (Migliarino Forest)

S = richness; d = density; D = dominance; Scb = standing crop biomass; Cb = Consuming biomass.

S		d	D	Scb	Cb
1	<i>Erithacus rubecula</i>	30.5	0.1360	86.92	39.17
2	<i>Troglodytes troglodytes</i>	27.0	0.1210	50.86	25.95
3	<i>Sylvia atricapilla</i>	26.3	0.1160	98.88	41.01
4	<i>Parus major</i>	24.0	0.1060	84.00	35.59
5	<i>Turdus merula</i>	19.0	0.0840	345.4	89.28
6	<i>Regulus ingicapillus</i>	18.5	0.0827	19.72	11.81
7	<i>Parus caeruleus</i>	15.8	0.0700	32.73	16.23
8	<i>Sitta europaea</i>	13.4	0.0590	58.96	23.62
9	<i>Fringilla coelebs</i>	11.0	0.0480	50.60	19.75
10	<i>Columba palumbus</i>	6.0	0.0270	572.0	89.93
11	<i>Dendrocopus major</i>	5.4	0.0240	86.40	23.20
12	<i>Luscinia megarhynchos</i>	4.7	0.0210	21.50	8.31
13	<i>Garrulus glandarius</i>	4.0	0.0170	139.2	29.61
14	<i>Picus viridis</i>	3.6	0.0160	129.6	27.29
15	<i>Certhia brachydactyla</i>	3.6	0.0160	6.12	3.22
16	<i>Hippolais polyglotta</i>	2.7	0.0120	6.37	3.03
17	<i>Streptopelia turtur</i>	2.0	0.0090	61.00	13.5
18	<i>Phylloscopus collybita</i>	2.0	0.0090	2.88	1.59
19	<i>Sylvia melanocephala</i>	1.7	0.0070	4.62	2.11
20	<i>Aegithalos caudatus</i>	1.0	0.0050	1.40	0.78
21	<i>Muscicapa striata</i>	0.6	0.0020	1.92	0.83
22	<i>Buteo buteo</i>	0.6	0.0020	101.5	13.43
23	<i>Carduelis chloris</i>	-	-	-	-
24	<i>Cuculus canorus</i>	-	-	-	-
25	<i>Carduelis carduelis</i>	-	-	-	-
26	<i>Jinx torquilla</i>	-	-	-	-
27	<i>Cisticola juncidis</i>	-	-	-	-
28	<i>Lanius collurio</i>	-	-	-	-
29	<i>Lanius minor</i>	-	-	-	-
30	<i>Parus ater</i>	-	-	-	-
31	<i>Gallinula chloropus</i>	-	-	-	-

TABLE II - Birds community in the autumn in the Migliarino forest.

S = Richness; d/T - no. occurrences during 15' time unit of line transect;  
D = Dominance.

S		d/T	D
1	<i>Erithacus rubecula</i>	8.9	0.1950
2	<i>Fringilla coelebs</i>	8.2	0.1800
3	<i>Regulus ignicapillus</i>	4.0	0.0870
4	<i>Troglodytes troglodytes</i>	4.0	0.0870
5	<i>Turdus merula</i>	3.3	0.0725
6	<i>Sitta europaea</i>	2.8	0.0610
7	<i>Parus major</i>	2.6	0.0570
8	<i>Garrulus glandarius</i>	2.5	0.0540
9	<i>Certhia brachyactyla</i>	1.8	0.0390
10	<i>Frunella modularis</i>	1.7	0.0370
11	<i>Dendrocopos major</i>	1.5	0.0332
12	<i>Picus viridis</i>	1.3	0.0280
13	<i>Columba palumbus</i>	1.2	0.0260
14	<i>Parus caeruleus</i>	0.8	0.0170
15	<i>Aegithalos caudatus</i>	0.9	0.0190
16	<i>Sylvia melanocephala</i>	-	-
17	<i>Carduelis spinus</i>	-	-
18	<i>Carduelis carduelis</i>	-	-
19	<i>Turdus philomelos</i>	-	-
20	<i>Motacilla alba</i>	-	-
21	<i>Sylvia atricapilla</i>	-	-
22	<i>Cettia cetti</i>	-	-
23	<i>Corvus corone cornix</i>	-	-
24	<i>Phylloscopus collybita</i>	-	-
25	<i>Parus ater</i>	-	-
26	<i>Sturnus vulgaris</i>	-	-
27	<i>Carduelis chloris</i>	-	-
28	<i>Gallinula chloropus</i>	-	-
29	<i>Passer italiae</i>	-	-
30	<i>Passer montanus</i>	-	-

TABLE III - Some characteristics of the bird community of Migliarino forest.

S = Richness;  $p_1, p_2$  = single and two most abundant species; w = Mean weight of species community in g; d = pairs x km<sup>2</sup>; Scb = Standing crop biomass g/km<sup>2</sup>; Cb = Consuming biomass g/km<sup>2</sup>; ratio Cb/Scb; H' = Diversity; J' = Equitability; % = non-Passeriformes; % migrant species.

Period	S	$p_1$	$p_2$	w	d	Scb	Cb	Cb/Scb	H'	J'	% non Pass.	% Migr.
Spring	31	13.6	25.7	83.5	224	19715	5217	0.26	2.64	0.78	25	25
Autumn	30	19.5	37.5	67.5	-	-	-	-	2.44	0.71	13	10

TABLE IV - Body size distribution of the bird communities in spring and autumn. Percent of individuals with body size in g.

	< 25	25-28	> 80
Spring	81.7	2.6	15.6
Autumn	77.9	3.3	18.0

## Discussion

The richness of Migliarino forest is high in comparison to other forested habitats of Northern Italy (Farina, 1981), and this probably depends by the high patchiness (horizontal variability in the type of profile in a habitat, Mac-Arthur *et al.* 1962) of this man made forest.

On the contrary it is difficult to explain the little density of birds. The factors probably reducing the bird abundance in this habitat, are:

- I) Presence of pure associations of *Pinus pinea*. These trees are subjected to annual pruning, so mature trees present clean trunks with high canopies suitable only for few species (as Finches);
- II) Clearcuts of the understory;
- III) Lack of the grass layer;
- IV) High concentration of Wild-boars and Fallow-deers, that certainly disturb birds breeding on the ground or at little height.

The dominance value of the single and two most abundant species is typical of old succession stages, also the mean weight of species is typical of communities of mature biomes. In effect we know that the weight of species increases along a successional gradient (Odum, 1971; Ferry & Frochot, 1970; Salt, 1957). The Ratio Consuming biomass/Standing crop biomass is low, for instance, to the ones of other forested habitats of Northern Italy (Farina, 1981), and this is in accord with the results found by Salt (1957) in American forest biomes, in which this value decrease along the ecological succession. Another factor showing the old successional stage of this habitat is the high percentage of non-Passeriformes. In fact the number of non-Passeriformes species increases along the succession (Ferry & Frochot, 1970).

The low value of seasonal species turnover, characterizes a habitat with a great stability. Above all in the autumn period, the impact of migrant and wintering populations is negligible. Probably this is due largely to the lack of food availability for migrants populations. An other factor that influences negatively the distribution of migrants and wintering birds in this habitat, is the vegetational structure. We know that close habitats are avoided by these categories of birds, which prefer edges or open habitats.

## RIASSUNTO

LA COMUNITA' ORNITICA DEL BOSCO DI MIGLIARINO (PISA)

Durante la primavera e l'autunno del 1979, censimenti di uccelli, impiegando metodi a striscie di osservazione, furono effettuati nella Foresta di Migliarino, un bosco pianiziale, caratterizzato da piantagioni a *Pinus pinea*.

Durante il periodo riproduttivo furono censite 31 specie, e 30 nel periodo autunnale. Il basso avvicendamento stagionale indica una grande stabilità di ambienti caratterizzati da una successione ecologica spostata verso stadi avanzati.

E' stata trovata una bassa densità di coppie (224 Km<sup>2</sup>) difficile da spiegarsi; parecchie cause possono concorrere a ciò. Non sono state trovate grosse differenze tra la diversità e la equiripartizione nei due periodi presi in esame. Bassi valori di dominanza sono stati trovati per la specie più abbondante e per le due specie più abbondanti. La struttura sia della comunità nidificante che di quella svernante è tipica di un ecosistema maturo.

#### RESUME

#### LES OISEAUX DE LA FORÊT DE MIGLIARINO (PISA- ITALIE CENTRALE)

Dans le printemps et l'automne 1979, on a effectué des recensements d'oiseaux dans la forêt de Migliarino, un bois de plaine, caractérisé par des plantations à *Pinus pinea*. Pendant la période de la nidification on a recensé 31 espèces, et 30 dans la période de l'automne. Le bas *turnover* saisonnier montre un grand équilibre du milieu caractérisés par une succession écologique déplacée vers des étages avancés.

On a trouvé faible densité de couples difficile à expliquer; plusieurs causes peuvent contribuer à cela. On n'a pas trouvé de grandes différences entre la diversité et l'equiripartition des deux périodes considérées;

On a trouvé de petites valeurs de dominance pour l'espèce la plus abondante et pour les deux espèces les plus abondantes.

La structure de la communauté d'oiseaux soit in printemps soit in automne est typique d'un écosystème dans un stade avancé de la succession.

#### REFERENCES

- FARINA, A. 1981. Contributo alla conoscenza dell'avifauna nidificante nella Lunigiana. Boll. Mus. S. Nat. Lunig. 1: 21-70.

- FERRY, C. & FROCHOT, B. 1970. L'avifaune nidificatrice d'une foret de chenes peduncoles en Bourgogne: etude de deux succession ecologiques. *La Terre et la Vie*. 153-250.
- JÄRVINEN, O. & VÄISÄNEN, R.A. 1975. Estimating relative densities of breeding birds by the line transect method. *Oikos* 26: 316-322.
- LLOYD, M. & GHELARDI, R.J. 1964. A table for calculating the "Equitability" component of species diversity. *J. Animal Ecol.* 33: 217-225.
- MacARTHUR, R.H., MacARTHUR, J.W. & PREER, J. 1962. On bird species diversity. II. Prediction of bird census from habitat measurements. *Am. Nat.* 96: 167-174.
- ODUM, E.P. 1971. *Foundamentals of ecology*. 3rd Ed. W.B. Saunders Co. Philadelphia 574 p.
- SALT, G.W. 1957. An analysis of avifaunas in the Teton Mountains and Jackson Hole, Wyoming. *Condor* 59: 373-393.
- SHANNON, C.E. & WEAVER, W. 1963. *Mathematical theory of communication*. University of Illinois Press. Urbana.
- TURCEK, F.J. 1956. Zur Frage der Dominanze in Vogel populationen. *Waldhygiene* 8: 249-257.
- WIENS, J.A. & DYER, M.I. 1975. Rangeland avifaunas: their composition, energetics, and role in the ecosystem. *Proc. Symp. Management Forest Range Habitats Nongame Birds*. USDA Forest Service, Report WO 1: 146-182.

---

*Ricevuto il 28 dicembre 1981*