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Bird population of Palermo's urban and suburban areas

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INTRODUCTION

In 1980 we started a study of bird populations in different vegetal backgrounds. We examined mostly natural areas where human incidence was relatively low. For comparisons we also made several avian censuses in some urban and suburban green areas of the city of Palermo, where human presence is continuous.

Here we present the first results on the avifauna of Palermo's urban and suburban green areas.

METHODS

The qualitative and quantitative aspects of the avifauna were surveyed by E.F.P. method (frequency sampling method from point counts with unlimited distance) (Blondel, 1975) and by the method of the search for nests (tree by tree in sample areas of 2-5 ha, only in citrus plantations). The E.F.P. method consists in recording the species as present, independently of their abundance, at several points chosen randomly inside the extensive and patchy environments. The point count done only in the breeding season lasts 20 minutes. For each species we obtained ratio between the number of presences and the total number of point counts, which represents a centesimal frequency.

To analyse the bird community we used the Shannon-Wiener diversity index (H'). For citrus plantations and mixed citrus plantations we calculated the values of vegetation diversity (H_v). These values consider both the structure of plants and the vegetation of the whole area.

$$H_v = \log_2 \frac{N!}{R! (N-R)!}$$

where N is the sum of the potential coefficient of covering of different layers present on the vegetation (100 for herbaceous vegetation, 200 for very low shrubs, 300 for low trees, 400 for high, 500 for very high), and R is the covering coefficient obtained in different layers (Blondel *et al.*, 1973). This covering was estimated according to codification by Blondel (1978). The estimate of vegetation covering depends only partly on the leaf covering. To value how great is the influence of leaf-covering on the breeding of the species present in two tangerine tree plantations (*Citrus nobilis*), both in the suburbs of Palermo inside the Parco della Favorita, we photographed from the bottom of the foliage of 34 trees in these two areas. In the first, the tangerine trees had been pruned recently (in March); in the

ABSTRACT

The avifauna of some green areas in the outskirts and in the urban centre of Palermo (Parco della Favorita, Fondo Micciulla, Orto Botanico, Valle dell'Oreto) was investigated.

Several censusing procedures were used: 1) mapping with direct search of nests in sample areas; 2) point counts for survey of the frequency of each species (E.F.P.). Mapping of nests enabled us to collect several biological data on the breeding of some species (Blackbird, Blackcap) and to compare very relevant parameters from a citrus plantation and a mixed plantation with citrus and loquat trees. The interference and presence of man proved a factor in the rate of breeding success. Absolute densities resulted particularly high. The analysis of the frequency of the species showed that bird diversity is closely connected with the composition of vegetation.

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second, there had been no pruning. We reproduced the photographs of the leaf covering on millimetered paper, calculated the average percentage of this covering in both citrus plantations, and then correlated the values obtained with the absolute density found by the search for nests.

We followed the breeding cycle of some pairs of some species, obtaining some parameters for the biology of breeding in suburban areas.

STUDY AREA

We subdivided the 80 bird surveys carried out by the E.F.P. method into five different types, according to the shape and structure of the vegetation.

A) Pagliarelli and Borgo Molara (Palermo). Area: about 100 ha; number of point counts: 20. Mixed gardens: vegetable and fruit cultivations alternating with fruit-trees of different species in the Oreto River Valley.

B) Parco della Favorita (PA). Area: about 150 ha; number of point counts: 11. Citrus plantation consisting essentially of Tangerine trees.

C) Fondo Micciulla (PA). Area: about 100 ha; number of point counts: 12. Citrus plantations mixed with loquat trees (*Eryobotria japonica*; in the same area lemon trees *Citrus lemon*, orange trees *C. aurantium*). Tangerine and loquat trees are cultivated together (the latter forming 50% of the vegetation).

D) Urban gardens (PA). Area: about 70 ha; number of point counts: 29. Ornamental plants and reafforestation; plantations which consist of a lot of species in public (Botanic Garden, Villa Giulia) and private gardens (Mondello), and re-afforestation of Coniferae and Eucalypti (Parco della Favorita).

E) Parco della Favorita (PA). Area: about 15 ha; number of point counts: 8. Natural vegetation: residues of Mediterranean maquis consisting of *Ilex* (*Quercus ilex*), *Lentisk* (*Pistacia lentiscus*), *Terebinth* (*P. terebinthus*), *Arbutus* (*Arbutus unedo*) and other shrubs.

The search for nests was carried out in citrus plantations and citrus plantations mixed with loquat trees as described above.

RESULTS AND DISCUSSION

a) *Species frequency*

The results of these censuses (carried out by E.F.P. method) are reported in Table I. We report the values of H' , total richness (S) and average richness (\bar{s}), and for each species the habitat extent in

the five vegetation forms considered ($AH5 = e^{H'}$).

The Blackcap (*Sylvia atricapilla*), the Blackbird (*Turdus merula*), the Chaffinch (*Fringilla coelebs*) and the Wren (*Troglodytes troglodytes*) proved to be the most eclectic and eurihaline species, while the Tree-Sparrow (*Passer montanus*) and the Fan-Tailed Warbler (*Cisticola juncidis*), the most stenohaline ones.

The first type of urban and suburban vegetation (gardens and vegetable gardens) has the greatest number of species, followed by the area with ornamental plants and reafforestation. In these two forms of artificial vegetation we found also the most diversity. The lowest values of S and H' were found in the pure citrus plantation. The low value of H' in the maquis is due to the small number of samples imposed by the smallness of the area. It is known that the number of species increases as soon as the sample area increases. In similar, much more extensive areas on the Madonie mountains and Etna, we found 24 as the value for S and 2.9 for H' , and so we do not think that a comparison between the data from the small urban area with maquis and those from other urban vegetation forms can be useful.

We consider the value of H' in the citrus plantation mixed with loquat trees very interesting, for it is clearly higher than that in the pure citrus plantation.

b) *Density of species*

These data are relative only to the breeding species in the citrus plantations in Fondo Micciulla and Parco della Favorita. Table II gives the results of density (pairs/10ha), obtained in 1981 and 1982 from the search for nests, and at the foot of this Table are the values of H' (the frequencies of the different species results this time from the absolute densities and not from E.F.P. point counts), and the value of H_v .

Blondel *et al.* (1973) and Lo Valvo *et al.* (in press) found between H' and H_v a significant correlation ($r = 0.76$ and 0.72). Some authors found a good relationship between bird community diversity and diversity of vegetation height (e.g. MacArthur *et al.*, 1966; Rotenberry & Wiens, 1980) while others failed to demonstrate this relationship (e.g. Roth, 1981; Wiens & Rotenberry, 1981).

This is possible because the number of variables involved by the index of vegetation diversity may or may not be of importance to the birds, and different bird species may respond differently to various habitat features that are incorporated into a single index (Wiens, 1983).

The higher value of H' in the area of Fondo Micciulla (area C), depending also on the greater number of species, may be the effect of a more diversified structure of vegetation, but it may also depend on other parameters not here considered. The comparison between data of 1981 and 1982 permits some particular considerations. In the two areas the value of H' remained almost constant. In the second year there was an increase, in both cases, in the total number of pairs (24.7%/10 ha at the Fondo Micciulla and 42.6%/10 ha in the Parco della Favorita). At the Fondo Micciulla the increase is essentially due to the increase of the Blackcap which contributes with the 42.4% to the total increase, and to the Wren population which contributes with the 42.4% to the total increase. The increase in the Wren population is due probably to the recent immigration into the area (1979: La Mantia, 1982) and to an optimal density of this species still to be reached. In the citrus plantation of the Parco della Favorita the total increase (42.6%) is due to population increases in the Linnet (*Carduelis cannabina*) (60% of total increase) and the Blackbird (25% of total increase). Probably the lower number of pairs in 1981 was due to the citrus trees having

less foliage than in 1982, for heavy pruning. Pruning of Tangerine trees (which form the citrus plantation of the Parco della Favorita) is generally carried out in March, and so the trees look rather bare for some months. In this season the breeding of the most forward species, like the Linnet and Blackbird, begins.

We found that, in an inpruned citrus plantation, with an average leaf covering of 85.3% (see methods), the density of all the breeding species was higher than of those in the second, contiguous citrus plantation recently pruned and with an average leaf covering of 73.3%. Probably the difference in leaf covering from 1981 to 1982 helped in the installation of new pairs of Linnet and Blackbird in the second year.

Essential differences between the citrus plantations in the Parco della Favorita and in the Fondo Micciulla depend on different reasons. The first area is formed of Tangerine trees only, placed in rows about 2.5 m from each other. The foliage is about 1 m above the ground, and on average it reaches 2.5 m, so the leaf covering forms a rather homogeneous layer between 1 and 3 metres. In the Fondo Micciulla the citrus plantation is formed mostly of lemon trees with an average height of about 5 m, dominated by loquat trees attaining on average about 8 metres. Both citrus and loquat trees are placed without exact order, so that the leaf covering is formed of different superimposed layers, variously spaced between about 1.5 and 12 metres.

We also measured the height above ground of 91 nests in the Parco della Favorita and of 40 in the Fondo Micciulla (Table III). No comparison is possible because of the small number of samples in the latter area. However, some considerations are possible for some species. In the Fondo Micciulla the Blackbird has a vertically more extensive layer of vegetation available, though it nests at the

same height, on average, as in the Parco della Favorita. Paradoxically, the Blackcap nests at a lesser mean height (we found a statistically significant difference between the two samples: Wilcoxon test, $P < 0.01$). The only other reliable sample is that of the Linnet which nests clearly higher in the Fondo Micciulla. Lastly, it seems that the more leaf layers over 3 metres allow for a greater number of niches in the Fondo Micciulla, where there are also Serin (*Serinus serinus*) and Grenfinch (*Carduelis chloris*), absent from the Parco della Favorita. Therefore the greater richness and diversity in species in the Fondo Micciulla are due probably to the vegetation complexity.

c) *Data on the fledging success of the Blackbird and the Blackcap in the citrus plantations.*

We observed the breeding of 50 pairs of Blackbird (15 at the Fondo Micciulla in 1981, 12 in 1982, 6 at the Parco della Favorita in 1981 and 17 in 1982) and of 35 pairs of Blackcap (15 at the Fondo Micciulla in 1981, 11 in 1982, 4 at the Parco della Favorita in 1981, 5 in 1982), and obtained the results reported in Table IV, where the meaning of each parameter is explained.

There were many hatchlings from each Blackbird pair in 1982. The population at Micciulla seemed to be more stable with fewer pairs and fewer fledgings but lower mortality. For the Blackcap, the population in the Favorita remained almost stable, but in 1982 fledging success went down. Data for 1983 (which are not reported in Table IV) seem to indicate a decrease in the Blackcap population at the Favorita, a probable effect of the low fledging success in 1982. At the Fondo Micciulla, on the contrary, we recorded an increase in the Blackcap of 25 pairs/10 ha, parameters of reproduction and mortality being unchanged. Therefore we think that this increase is through immigration of new pairs.

CONCLUDING REMARKS

According to some authors (see Emlen, 1974), bird communities in urban areas contain higher bird densities than outlying natural areas. However many species are lacking in urban bird communities because of scarce vegetative covering, particularly shrub layers (Beissinger & Osborne, 1982). The type of covering obviously influences bird communities: we found the highest avifaunistic richness in the most diversified vegetation. Nevertheless, the urban species are granivorous or omnivorous birds which can also feed on fruits of ornamental or introduced trees. Probably because few species of insects live on these trees, there are very few insectivorous bird species in urban areas.

In our case, in ornamental urban and suburban green areas, we could diversify the vegetation as much as possible recreating vegetative cover in each layer, particularly shrub layer. As for the productive areas in the suburbs, it seems that disturbance by man is greater from the periodic interventions (pruning and fruit-picking). In mixed citrus plantations this disturbance is still greater because of the pruning of tangerine, lemon and loquat trees, and lemon and loquat picking. Man's intervention begins in March and ends in July, occupying almost the whole of the bird breeding period. However, fledging success keeps rather high and so probably the disturbance by man is restricted.

But these productive areas keep few species and only eurihaline species. In order to increase the avifaunistic diversity in these areas it would be necessary to vary as much as possible these artificial habitats, recreating between the borders of properties natural islands of vegetation of high foliage trees and of shrub layers in continuous succession. The increase of general covering probably would increase not only the omnivorous and granivorous but also the insectivorous bird species.

TABLE I. — Absolute and relative (in brackets) frequency (E.P.F. method) of species of urban and suburban green areas of Palermo in the five vegetal classes. At the foot, values of diversity (H'), total richness (S) and mean richness (\bar{s}); on the right, the values of habitat extent in the five classes ($AH = eH'$). A = mixed gardens; B = citrus plantation; C = citrus plantation with loquat trees; D = ornamental plants and reafforestation; E = natural vegetation.

	A	B	C	D	E	AH_s
<i>Sylvia atricapilla</i>	100.0 (20.6)	100.0 (20.6)	100.0 (20.6)	86.2 (17.7)	100.0 (20.6)	4.99
<i>Turdus merula</i>	70.0 (18.3)	81.8 (21.4)	83.3 (21.8)	72.4 (18.9)	75.0 (19.6)	4.99
<i>Fringilla coelebs</i>	95.0 (20.6)	100.0 (21.7)	91.7 (19.9)	86.2 (18.7)	87.5 (19.0)	4.99
<i>Troglodytes troglodytes</i>	15.0 (8.5)	36.4 (20.5)	58.3 (33.0)	17.2 (9.7)	50.0 (28.3)	4.41
<i>Serinus serinus</i>	95.0 (24.3)	100.0 (25.5)	100.0 (25.5)	96.5 (24.7)	—	4.00
<i>Carduelis chloris</i>	85.0 (28.3)	72.7 (24.2)	66.7 (22.2)	75.9 (25.3)	—	3.98
<i>Parus major</i>	80.0 (26.2)	—	91.7 (30.0)	58.6 (19.2)	75.0 (24.6)	3.95
<i>Carduelis carduelis</i>	30.0 (22.1)	54.5 (40.2)	100.0 (12.3)	34.5 (25.4)	—	3.69
<i>Sylvia melanocephala</i>	40.0 (63.6)	—	—	10.3 (16.4)	12.5 (19.9)	2.47
<i>Carduelis cannabina</i>	10.0 (8.1)	54.5 (44.4)	58.3 (47.5)	—	—	2.42
<i>Passer hispaniolensis</i>	100.0 (51.0)	—	—	96.2 (49.0)	—	2.00
<i>Pica pica</i>	5.0 (42.0)	—	—	6.9 (58.0)	—	1.97
<i>Muscicapa striata</i>	—	—	25.0 (59.2)	17.2 (40.8)	—	1.97
<i>Certhia brachydactyla</i>	—	—	—	3.4 (21.6)	12.5 (28.4)	1.68
<i>Motacilla cinerea</i>	30.0 (81.3)	—	—	6.9 (18.7)	—	1.60
<i>Sylvia cantillans</i>	5.0 (11.8)	—	—	—	37.5 (37.5)	1.44
<i>Cisticola juncidis</i>	5.0 (100)	—	—	—	—	1.00
<i>Passer montanus</i>	25.0 (100)	—	—	—	—	1.00
						$\bar{x}=2.92$ ± 1.43
H'	2.45	1.81	2.20	2.32	1.88	
S	16	8	10	14	8	
\bar{s}	7.95 ± 1.90	8 ± 1.41	6.9 ± 1.44	6.78 ± 1.60	7.4 ± 2.61	

TABLE II. — Pair/10 ha (1981 and 1982) in the citrus plantation of Parco della Favorita (P.F.) and citrus plantation mixed with loquat trees of Fondo Micciulla (F.M.). For the values of diversity (H') and vegetational structure diversity (H_v), see methods.

	1981		1982	
	F.M.	P.F.	F.M.	P.F.
<i>Parus major</i>	10	0	10	0
<i>Troglodytes troglodytes</i>	10	0	35	3
<i>Turdus merula</i>	20	23	29	36
<i>Sylvia atricapilla</i>	20	15	45	18
<i>Muscicapa striata</i>	10	0	10	0
<i>Carduelis chloris</i>	10	0	10	0
<i>Carduelis carduelis</i>	10	3	10	52
<i>Carduelis cannabina</i>	10	21		
<i>Serinus serinus</i>	50	0	50	0
<i>Fringilla coelebs</i>	30	8	30	13
Total	180	70	239	122
H'	2,11	1,43	2,1	1,32
H_v	495,2	480,7	495,2	480,7

TABLE III. — Height in metres from the ground of 91 nests in the Parco della Favorita and of 40 nests in the Fondo Micciulla.

	PARCO DELLA FAVORITA			FONDO MICCIULLA		
	\bar{x}	Min-max	N°	\bar{x}	Min-max	N°
<i>Troglodytes troglodytes</i>	80		1	190		1
<i>Turdus merula</i>	186.5 ±45.9	(0.270)	23	189.2 ±58.2	(90-300)	12
<i>Sylvia atricapilla</i>	210.0 ±19.4	(180-250)	19	188.3 ±37.1	(150-250)	6
<i>Muscicapa striata</i>	130		1	131.4 ±75.5	(50-220)	7
<i>Carduelis chloris</i>	—			311.7	(245-380)	3
<i>Carduelis carduelis</i>	193.3	(190-200)	3	—		
<i>Carduelis cannabina</i>	211.6 ±22.4	(180-250)	37	259.8 ±80.3	(220-400)	8
<i>Serinus serinus</i>	—			307.5	(265-350)	2
<i>Fringilla coelebs</i>	210 ±24.5	(160-230)	7	250		1

TABLE IV. — *Reproduction parameters of Blackbird and Blackcap in Fondo Micciulla and Parco della Favorita (1981 and 1982). A = n° of pairs rearing young; B = n° of pairs producing eggs; C = total laid eggs, D = total young hatched; E = total young flying; A/B % = % breeding success; C/B = clutch size; D/C = brood size; E/B = productivity; E/A = fledging success; 1 - (E/D) = nestling mortality.*

		FONDO MICCIULLA					
		A/B %	C/B	D/C %	E/B	E/A	1-(E/D) %
<i>Turdus merula</i>	1981	87	3.4	80	2.29	2.75	21
			± 0.51		± 1.59	± 1.36	
		(15)	(15)	(10)	(14)	(12)	(10)
	1982	51	3.12	43	1	1.83	20
			± 0.51		± 1.41	± 1.47	
		(11)	(12)	(7)	(11)	(6)	(7)
<i>Sylvia atricapilla</i>	1981	92	3.73	88	2.75	3	16
			± 0.46		± 1.10	± 0.67	
		(12)	(15)	(11)	(11)	(10)	(9)
	1982	100	4	83	2.8	2.8	15
			± 0.45		± 1.30	± 1.30	
		(6)	(11)	(3)	(5)	(5)	(4)
		PARCO DELLA FAVORITA					
		A/B %	C/B	D/C %	E/B	E/A	1-(E/D) %
<i>Turdus merula</i>	1981	100	3.83	100	3.0	3.0	25
			± 0.41		± 1.55	± 1.55	
		(6)	(6)	(4)	(6)	(6)	(4)
	1982	88	3.47	76	1.71	2.07	34
			± 0.51		± 1.57	± 1.49	
		(17)	(17)	(12)	(17)	(14)	(10)
<i>Sylvia atricapilla</i>	1981	100	3.67	73	2.25	2.25	18
			± 0.58		± 0.96	± 0.96	
		(4)	(3)	(3)	(4)	(4)	(4)
	1982	60	3.8	47	1.6	2.67	29
			± 0.45		± 1.82	± 1.53	
		(5)	(5)	(4)	(5)	(3)	(2)

REFERENCES

- Beissinger S.R., Osborne D.R., 1982 - Effects of urbanization on avian community organization. *Condor*, 84: 75-83.
- Blondel J., 1975 - L'analyse des peuplements d'oiseaux, élément d'un diagnostic écologique. I. La méthode des échantillonnages fréquentiels progressifs (E.F.P.). *Terre et Vie*, 29: 533-589.
- Blondel J. (with the collaboration of David P., Lepart J., Romane J.), 1978 - L'avifaune du mont Ventoux, essai de synthèse biogéographique et écologique. *Terre et Vie*, 32 (suppl. 1): 111-145.
- Blondel J., Ferry C., Frochot B., 1973 - Avifaune et végétation, essai d'analyse de la diversité. *Alauda*, 41: 63-84.
- Emlen J.T., 1974 - An urban bird community in Tucson, Arizona: derivation, structure, regulation. *Condor*, 76: 184-197.
- La Mantia T., 1982 - Dati quantitativi sull'avifauna nidificante in una zona suburbana di Palermo. *Avocetta*, 6: 41-46.
- Lo Valvo M., La Mantia T., Massa B., Sarà M. in press - Censimenti avifaunistici con metodi relativi: alcuni risultati. Atti I° Seminario sui Censimenti Faunistici. Urbino, 20-22.IX.1982.
- MacArthur R.H., Recher H., Cody M., 1966 - On the relation between habitat selection and species diversity. *Am. Nat.*, 100: 319-332.
- Rotenberry J.T., Wiens J.A., 1980 - Habitat structure patchiness, and avian communities in North American steppe vegetation: a multivariate analysis. *Ecology*, 61: 1228-1250.
- Roth R.R., 1981 - Vegetation as a determinant in avian ecology. *Proc. Ist. Welder Wildlife Found. Symp.*, pp. 162-174.
- Wiens J.A., 1983 - Avian community ecology: an iconoclastic view pp. 355-403 in: Brush A.H., Clark G.A. (ed.). *Perspectives in Ornithology*. Cambridge University Press, Cambridge, London, New York, 560 pp.
- Wiens J.A., Rotenberry J.T., 1981 - Habitat associations and community structure of birds in shrubsteppe environment. *Ecol. Monogr.*, 51: 21-41.