THE DADIA–LEFKIMI–SOUFLI FOREST NATIONAL PARK, GREECE: BIODIVERSITY, MANAGEMENT AND CONSERVATION

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The landbird community: composition, abundance and management suggestions

Vassiliki Kati and Eleftherios Kakalis

We present an ecological analysis of landbird (Passeriformes, Piciformes, Coraciiformes) distribution in Dadia–Lefkimi–Soufli Forest National Park and suggest measures for their conservation. We conducted two point-count studies, one inside the park (155 points) and the other in an adjoining agricultural zone (75 points) and recorded 120 species of landbirds, including 39 species with an unfavourable conservation status in Europe (SPEC 2 and 3). Vegetation cover and height were the two main environmental gradients affecting bird distribution (Principal Coordinate Analysis). We also identified eight distinct bird habitats (k-means clustering) and found 13 species characterizing them (IndVal procedure). Hence, we proposed a set of selected species to be monitored on a permanent basis (SPEC/typical species). We demonstrated the importance of the buffer zone for landbird conservation rather than the pine-dominated core zone, and more particularly the mosaic sites and forest clearings. Both studies confirmed the unique importance of rural mosaics, thus providing strong arguments against further land re-allotment and agricultural intensification in the broader area around the park.

Keywords: Agricultural intensification, indicator species, forest management, multivariate analysis, SPEC

Introduction

Birds are the best known major group of organisms (Hawksworth and Kalin-Arroyo 1995, BirdLife International 2004), providing a wide range of ecological services to mankind (Diamond and Filion 1987, Sekercioglu 2006). The conservation status, distributions, and population trends of European birds are particularly well-known (Heath et al. 2000, Birdlife International 2004), and birds are widely used in European conservation planning (Council of Europe 1979). Population trends of farmland bird species are one of the fifteen "Quality of Life" indicators used by the UK government (BirdLife International 2004, Gregory et al. 2004).

Passerine communities in particular have been the focus of many conservation management studies (King and DeGraaf 2000, Griffis-Kyle and Beier 2003, Laiolo 2003, Laiolo et al. 2003, Chapman et al. 2004). Passerine birds are generally small-sized birds, numbering more than 4,500 species all over the world and about 170 species in Europe. They inhabit a variety of habitats, including grasslands, rocks, scrub, forests, agricultural fields, or even human settlements. They feed on seeds and insects, but also on fruits and crops, and exceptionally on bird's eggs and nestlings. Passerine species are called "songbirds" because of their ability to produce, in addition to a variety of calls such as contact and alarm calls, territorial songs, typically uttered by the males during the breeding season. Passerines have often been proposed as potential indicators of the presence of other, unrelated taxa (Prendergast et al. 1993, Lombard 1995, Howard et al. 1998, Kati et al. 2004a) or as indicators of environmental change to be integrated into broader monitoring schemes (Gregory et al. 2004). Songbirds are also frequently included in evaluation studies for overall biodiversity conservation (Dobson et al. 1997, Lawton et al. 1998, Vessby et al. 2002, Kati et al. 2004b).

The need for a better ecological understanding of the role of landbird diversity patterns and community structure in relation to environmental assessment and conservation decision-making should be obvious. Nevertheless, in Greece passerine birds, together with woodpeckers, constitute two of the least well-studied groups (S. Kazantzidis, pers. comm.). The current article attempts to fill this gap for the Dadia–Lefkimi–Soufli Forest National Park (DNP) and its nearest surroundings, primarily with reference to passerine birds (Passeriformes) but also to woodpeckers (Piciformes) and rollers (Coraciiformes) (hereafter referred to as landbirds). In the current chapter we attempt a synthesis of bird studies conducted in the broader area of the DNP (Adamakopoulos et al. 1995, Kati 2001, Kakalis 2002, Kati and Sekercioglu 2006). In summary we:

(1) Evaluate the importance of the DNP in conserving landbird diversity;
(2) assess, compare and explain the importance of the different vegetation types in regard to landbirds;
(3) analyse the ecological structure of the landbird community;
(4) identify typical species that characterize different habitat types;
(5) discuss the conservation status and, in particular, habitat requirements of species of conservation concern in the DNP (SPEC species, i.e. Species of European Conservation Concern); and
(6) propose conservation measures for the maintenance of landbird diversity in the DNP.

Study area and methods

The list of species presented refers to the broader area of DNP, i.e. the park and a zone of 10 km width around its buffer zone and is based on bird observations from 1995 onwards (Appendix I). The quantitative data were collected inside the area of the National Park; two sites outside its borders (beech woods in the locality "Treis Vrysses") were also included.

We conducted a total of 230 point counts (Blondel et al. 1970, Bibby et al. 1992) during spring 1999. At each point, all bird species seen or heard during 10 minutes in the early morning hours were recorded, counting as a pair the territorial song of a male and as one individual every other alarm or contact call. The first dataset (Kati 2001, Kati and Sekercioglu 2006) consists of 155 point counts that were repeated twice, in early and late spring (310 counts in total). They were conducted in 36 different sites, randomly selected to represent the 21 vegetation types of the study area according to the Corine typology (Devillers and Devillers-Terschuren 1996). The second dataset (Kakalis 2002) consists of 75 point counts repeated three times in early, mid and late spring (225 counts in total). They were located in a systematic way in the farmland zone of Soufli, covering an area of 25 km^2 and representing four habitat types.

Both datasets were used to explore the diversity patterns of birds in the DNP, in terms of species richness (S), weighted species richness (WS), and Shannon-Wiener index (H). Weighted species richness is the species richness of the site, with each species having a different weight based on its conservation status (SPEC category, BirdLife International 2004). We gave a standard weight (w = 1) to species of the SPEC 4 category, double weight (w = 2) to species of the SPEC 3 category, and quadruple weight (w = 4) to species of the SPEC 2 category, or to the species of Annex I of the European Directive 79/409 EU. The first dataset was used to analyse the ecological structure of the bird community and identify species typical for each habitat type. We ordinated point counts using Principal Coordinate Analysis with corrected eigenvalues (DistPCoA) (Legendre and Anderson 1998), we produced a top to bottom robust dendrogram using the k-means clustering procedure (SAS® software) and we identified typical species for the clusters produced by using the Indicator Value procedure (Dufrêne 1999). For methodological details, see Kati and Sekercioglu (2006).

National Park species richness

The DNP hosts 120 landbird species out of which 109 are passerines, whereas the presence of 10 more species is considered uncertain, given that they have not been recorded in the park since 1994 (Adamakopoulos et al. 1995). The list includes 91 breeding species, 80 of which are passerines (Appendix I). The contribution of

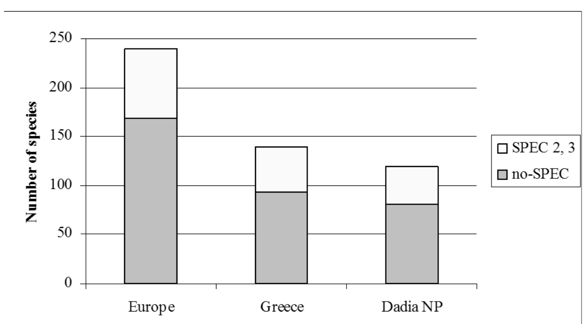

Fig. 1. Overall number of landbird species and species with unfavourable conservation status (SPEC 2, 3) in DNP, Greece and Europe.

DNP to the conservation of the landbird communities of Greece and Europe is important, given that the Park hosts respectively 83% and 33% of those Greek and European landbirds that have an unfavourable conservation status in Europe (Fig. 1). In particular, 15 species are concentrated in Europe (more than 50% of their global breeding or wintering population or range occurs in Europe) and have an unfavourable conservation status (SPEC 2), while 24 species are not concentrated in Europe but have an unfavourable conservations status (SPEC 3) (Table 1). We counted 13,604 individuals of 76 landbird species (67 passerine species) when conducting the 230 point counts.

Table 1. Landbird species of DNP with unfavourable conservation status in Europe, concentrated in Europe (SPEC 2) or with main distribution elsewhere (SPEC 3).

SPEC 2	SPEC 3
Coracias garrulus	*Alcedo atthis*
Picus viridis	*Merops apiaster*
Lullula arborea	*Upupa epops*
Phoenicurus phoenicurus	*Picus canus*
Oenanthe hispanica	*Melanocorypha calandra*
Phylloscopus bonelli	*Calandrella brachydactyla*
Phylloscopus sibilatrix	*Galerida cristata*
Ficedula semitorquata	*Alauda arvensis*
Lanius minor	*Riparia riparia*
Lanius senator	*Hirundo rustica*
Lanius nubicus	*Delichon urbica*
Carduelis cannabina	*Anthus campestris*
Emberiza hortulana	*Oenanthe oenanthe*
Emberiza melanocephala	*Monticola solitarius*
Milaria calandra	*Hippolais pallida*
	Sylvia hortensis
	Muscicapa striata
	Parus palustris
	Lanius collurio
	Lanius excubitor
	Sturnus vulgaris
	Passer domesticus
	Passer montanus
	Emberiza cia

Diversity patterns

The diversity values of the two datasets (Table 2) are not comparable and are therefore considered separately. The reason is that different observers were involved in the sampling procedure and that sampling effort differed between the two studies (two and three counts, respectively).

Which are the most important vegetation types for the conservation of the landbird community? In the first dataset, the most species-rich sites are the mosaic site (M1a) and the rural mosaics (A1a, A1b) (ranking criteria mean S and mean WS) (Table 2). We reach similar conclusions when considering the second dataset for the importance of the mosaic sites (A5) located in the ecotones between the forested and the agricultural zone and hosting bird species from both habitat types. The sites described as rural mosaics (A5) are also habitats of exceptional bird richness containing species of conservation concern, whereas the agricultural sites with sparse natural hedges (A3) are poorer. Finally, we found that clearings inside the extensive forested zone of the DNP, such as the grassy clearing dotted with *Phillyrea* bushes (S3), the serpentine grassland (G3) and the xeric grassland (G2) are also important habitats with a high bird species richness (mean S), together with the remaining mosaic sites (M1b and M2).

Cultivated areas are generally known to play a fundamental role in maintaining breeding bird diversity in the Mediterranean region (e.g. Farina 1997, Suarez-Seoane et al. 2002, Kati et al. 2009). However, agricultural intensification has led to a dramatic decline in farmland bird diversity in many European countries (Pain and Pienkowski 1997, Chamberlain et al. 2000, Donald et al. 2001). During the last 50 years, the Greek Ministry of Agriculture has promoted the combining of small agricultural properties to form larger ones through land re-allotment projects, in order to enable the use of large machinery and an intensified crop production. Unfortunately land re-allotment plans did little to avoid removing "living fences", tree and bush vegetation that constituted natural borders of the former small-scale properties. Our results verify the already well established fact that rural mosaics (A1, A3) are richer in bird species than intensified crop monocultures without natural vegetation patches (A2) or with sparse natural hedges (A4).

We also documented that semi-open mosaic sites and forest clearings are among the most species-rich sites in our study area and host species of conservation concern. How can this be explained? Mosaics are mixtures of woodland, shrubs, and pastures within a small area,

Table 2. Bird diversity in the 40 different sites sampled and number of point counts.

Vegetation type	Site code	Corine code	Site description	S	WS	H′	Mean S	Mean WS	No. of points
Shrubs	S1a	32.313	High maquis *(Arbutus* sp.)	24	35	2.74	13.60	20.20	5
	S1b			24	38	2.67	13.20	22.00	5
	S2	32.161	Oak mattoral	28	42	2.96	16.40	23.80	5
	S3	32.21A4X34.53	*Phillyrea* bushes	23	36	2.91	17.00	24.00	3
Heaths	Ha	32.32	Low ericaceous maquis	22	37	2.70	12.67	23.67	3
	Hb			18	36	2.38	10.33	24.67	3
Grassland	G1a	37.4 X41.8221	Humid grassland	27	49	2.94	15.25	26.75	4
	G1b			13	22	2.38	9.33	15.33	3
	G2a	34.53	Xeric grassland	21	40	2.65	16.00	22.00	2
	G2b			22	30	2.83	16.00	19.50	2
	G3	34.2	Serpentine grassland	22	32	2.78	16.50	25.00	2
Mosaics	M1a	32.71X38.1	Mosaic	37	59	3.26	22.00	35.60	5
	M1b			32	48	2.99	15.80	21.00	5
	M2	32.71X38.1X37.1X 44.12X41.733		34	53	2.96	15.80	22.40	5
Forests	F1a	41.1BX41.19311	Beech wood	25	37	2.79	13.40	17.80	5
	F1b			22	29	2.67	12.00	13.40	5
	F2a	41.76	Oakwood	22	38	2.69	11.20	16.60	5
	F2b			24	40	2.75	11.60	19.00	5
	F3a	41.733	Oakwood	17	34	2.29	8.20	15.80	5
	F3b			19	35	2.31	8.80	15.40	5
	F4a	41.733	Oakwood with scrub	26	43	2.81	14.60	24.80	5
	F4b		undergrowth	28	52	2.89	14.40	24.40	5
	F5a	43.7	Mixed pine-oakwood	20	27	2.67	12.80	16.40	5
	F5b			24	39	2.83	15.60	21.60	5
	F6	42.661(C)	Pinewood (*P. nigra)*	16	22	2.22	10.50	13.50	2
	F7	42.85A	Pinewood *(P. brutia)*	19	29	2.30	9.00	10.60	5
	F8a	42.85A	Pinewood (*P. brutia)* with scrub undergowth	21	31	2.65	9.75	15.25	4
	F8b			15	14	2.48	12.50	12.00	2
	F9a	44.514	Alder vegetation	29	36	2.94	15.40	19.40	5
	F9b			21	28	2.75	11.00	13.40	5
	F10a	44.615	Poplar vegetation	23	36	2.87	11.80	15.40	5
	F10b		Poplar vegetation	28	41	2.85	11.40	14.00	5
Agricultural land	A1a	84.4	Rural mosaic	35	60	3.11	17.60	29.80	5
	A1b			35	65	3.17	17.80	35.40	5
	A2a	82.11	Field crops	15	35	2.05	8.20	19.40	5
	A2b			19	48	2.29	8.00	21.40	5
Farmland zone	A3	84.4	Rural mosaic	41	66	2.83	20.59	36.58	28
	A4	82.11	Field crops	38	66	2.62	17.70	31.58	17
	A5	84.4 X 42.85A X 41.733	Ecotones of agriculture and forests	38	66	2.92	23.29	43.71	22
	A6	42.85A X 41.733 X 84	Forested zone near agricultural land	46	66	2.77	20.38	34.12	8
Total	**40**	**21**							**230**

S = species richness. WS = weighted species richness. H′ = Shannon-Wiener diversity index. Mean S = mean species richness of point counts. Mean WS = mean weighted species richness of point counts.

whereas clearings in forest enhance heterogeneity on the landscape level. Spatial heterogeneity is often one of the most important non-equilibrium factors that increase local avian species diversity (Huston 1994, Bohning-Gaese 1997, Farina 1997, Sekercioglu 2002).

Interestingly, most species-rich habitats are located in the less forested buffer zone rather than in the strictly protected zone, which is predominantly pine forest (85% cover). This is because of the low value of pine forests for landbirds. The high value of the buffer zone has also been shown for other biological groups studied in the reserve (e.g. Grill and Cleary 2003, Kati et al. 2004c). The main conservation value of the Dadia pine forests is for the maintenance of the Eurasian Black Vulture *Aegypius monachus* population (Poirazidis et al. 2004) and several forest-dwelling raptor species, rather than for the landbird community.

Ecological structure

An important issue in conservation management research is to reveal the main ecological parameters determining bird distribution in one's study area. The first output of the ordination procedure (DistPCoA) clearly distinguished the point counts conducted in the field crops (A2) from the clouds of samples (first axis: 23% of variation). The new ordination output (cloud of 145 point counts), positioned all counts conducted in shady sites to the left on the horizontal axis (19% of the variation), counts conducted in semi-open sites in the centre, and counts conducted in open sites to the right (Fig. 2). All points characterized by tall trees were also separated from shrubby sites along the vertical axis (16% of the variation). Hence, two major environmental gradients seem to affect bird distribution in the DNP: vegetation cover and vegetation height. These results are consistent with other studies in the Mediterranean region (Blondel et al. 1973, Prodon and Lebreton 1981, Catsadorakis 1997, Kati et al. 2009). The height gradient corresponds mainly to successional stage of the vegetation while vegetation cover corresponds to the degree of clearings, formed either by humans (agriculture, logging, livestock grazing) or by natural processes (fire, grazing by native herbivores).

In the study area we distinguished 21 vegetation types on the basis of a standard habitat typology using dominant vegetation species and vegetation physiognomy as classification criteria. Do these vegetation types correspond to bird habitat types?

Combining the results from the ordination and the k-means clustering procedure (for more methodological details, see Kati and Sekercioglu 2006) (Figs 2 and 3), we conclude that the landbird community identifies eight

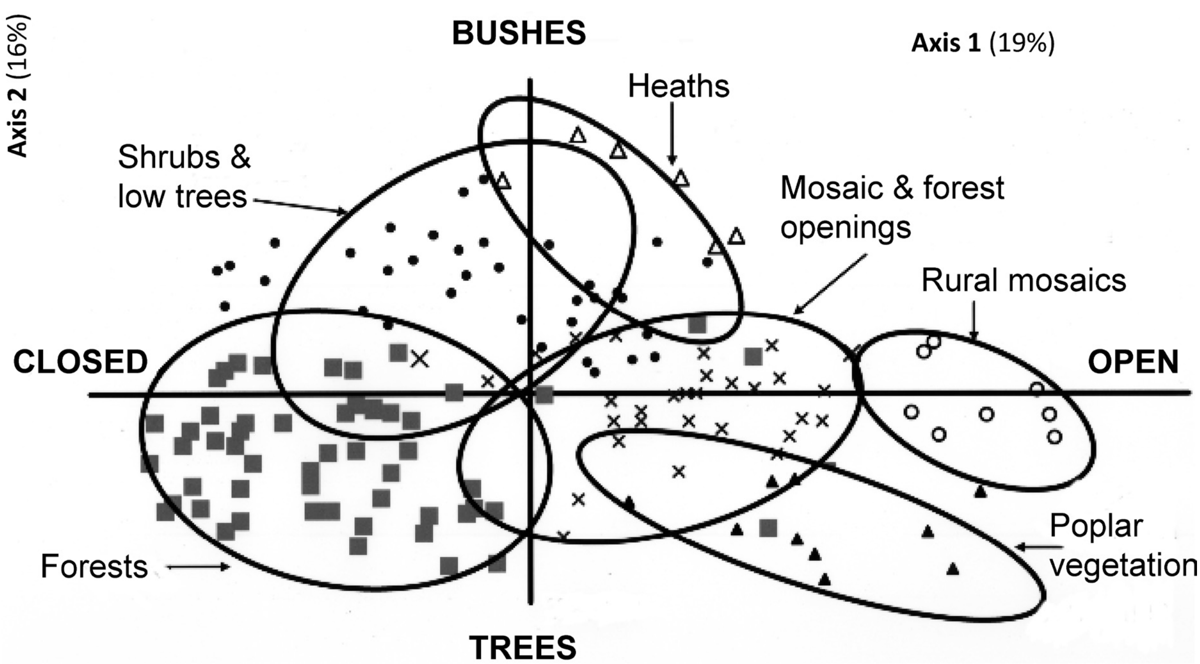

Fig. 2. Ordination of 145 point counts using Principal Coordinate Analysis (Dist. P.Co.A). Different symbols refer to points in the different clusters produced by the k-means procedure.

distinct bird habitat types: field crops, rural mosaics, semi-open mosaics and grasslands, poplar vegetation, broad-leaved woods, pinewoods, shrubs, and heaths. Therefore birds seem to identify landscape features at a coarse scale, grouping the 21 vegetation types of the study area into eight habitat types.

Typical species of various habitats

According to article 1.e of the Habitats Directive 92/43, the conservation status of a priority habitat requires, among other things, that the conservation status of its typical species is favourable. This definition

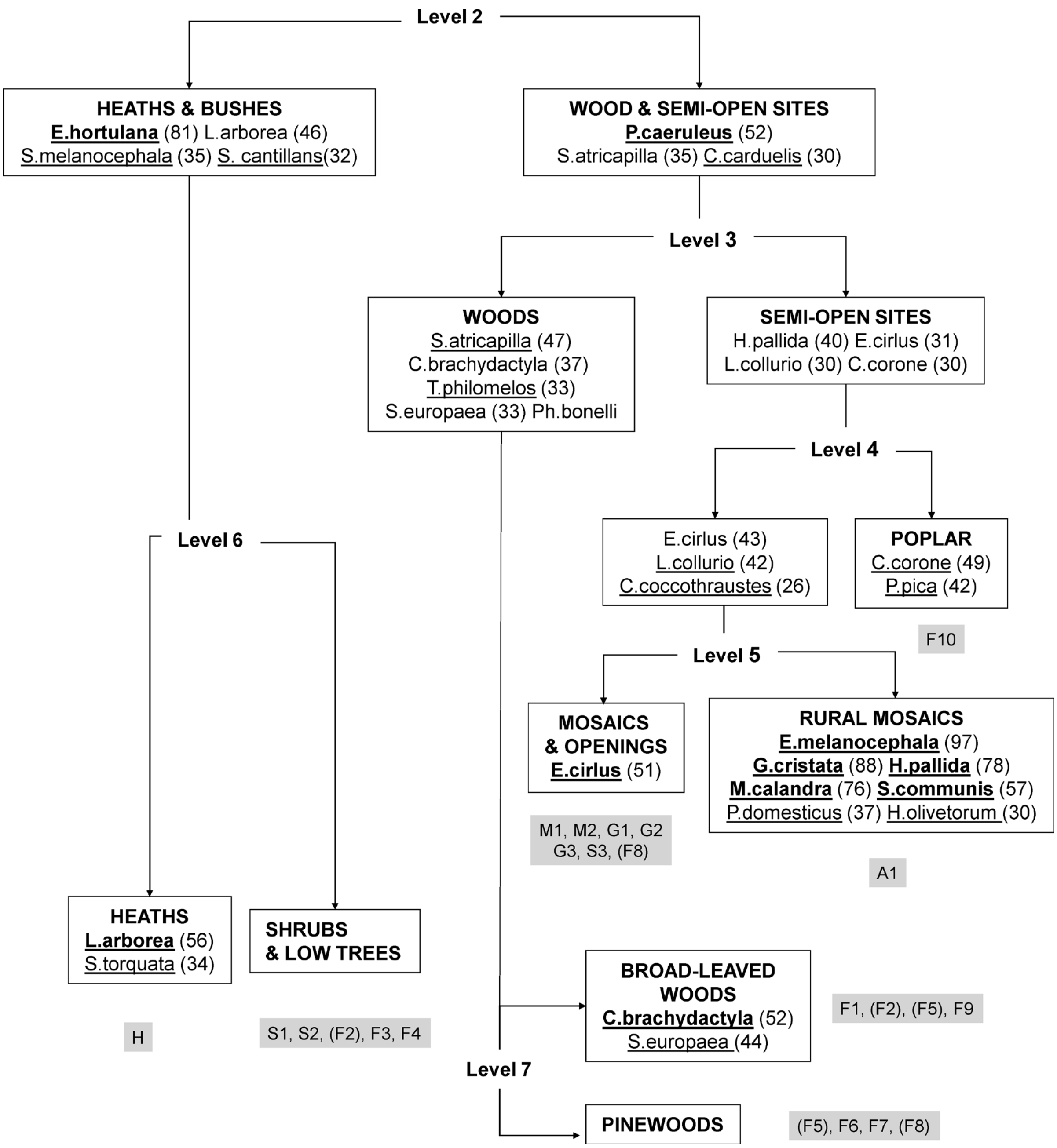

Fig. 3. Dendrogram produced by the k-means procedure, with typical species (indicators) for each cluster (habitat). Species in bold are symmetrical indicators with IndVal>50% and underlined species have their maximum IndVal in that cluster. Vegetation types that belong to more than one cluster are given in parentheses.

means that the conservation status of typical species needs to be assessed. In this context, it is essential in conservation management to detect typical species that have their optima within a priority habitat type and that are mainly dependent on the targeted habitat for their survival and therefore are responsive to its management.

Fig. 3 presents the typical species of each habitat type in the study area using the first dataset of 145 point counts, after running the k-means clustering and IndVal procedure. IndVal is a percentage that ranges between 0 (species is present in only one cluster) and 100 (species is present in all sites of this cluster). A species is considered to be a "symmetrical indicator" (IndVal> 50%) for one cluster, when it is present in > 70% of the sites of the cluster and when > 70% of its individuals occur in the cluster. Some birds have their maximum IndVal (>50%) at the first level of the hierarchy. These species are generalists, occurring throughout the study area, such as Chaffinch *Fringilla coelebs*, Blackbird *Turdus merula*, Nightingale *Luscinia megarhynchos*, Robin *Erithacus rubecula*, Eurasian Jay *Garrulus glandarius*, Great Tit *Parus major* and Greenfinch *Carduelis chloris*. Two species in our study, Golden Oriole *Oriolus oriolus* and Hoopoe *Upupa epops*, appeared to belong in many different habitat types. This is, however, mainly explained by the fact that their songs carry very far. They were therefore recorded at count points situated in widely different habitats. As far as typical species are concerned, Woodlark *Lullula arborea* characterizes heath and Short-toed Treecreeper *Certhia brachydactyla* broad-leaved woods. Cirl Bunting *Emberiza cirlus* characterizes the mosaic sites and the grassy clearings inside forest areas (ecotones). Five species are typical of agricultural fields separated by hedges and trees: Black-headed Bunting *Emberiza melanocephala*, Crested Lark *Galerida cristata*, Olivaceous Warbler *Hippolais pallida*, Corn Bunting *Milaria calandra* and Whitethroat *Sylvia communis.* Ortolan Bunting *Emberiza hortulana* characterizes areas with low trees, shrubs and heath, while Blue Tit *Parus caeruleus* characterizes forest habitats. No characteristic species exist for shrubs and low trees, pinewoods, and poplar habitats. We also note that we recorded three bird species exclusively in the field crops cluster: Calandra Lark *Melanocorypha calandra*, Short-toed Lark *Calandrella brachydactyla* and Tawny Pipit *Anthus campestris* (IndVal = 20%, 20% and 10% respectively). Hence, we propose that the above thirteen species should be regarded as typical species to be monitored for the conservation of the landbird community and its habitats.

Species of European Conservation Concern (SPEC)

The diversity of habitat types in the National Park of Dadia explains the presence of 39 SPEC species. Rural mosaics and ecotones (A5) between forested and agricultural zones are among the richest habitats and are inhabited by many SPEC species. Species such as Lesser Grey Shrike *Lanius minor*, Masked Shrike *Lanius nubicus*, Woodchat Shrike *Lanius senator* and Red-backed Shrike *Lanius collurio* have their strongholds in these habitats. The mean number of individuals recorded per point in these habitats was 2.1 birds for Red-backed Shrike and 0.76 birds for Woodchat Shrike indicating a high breeding density of these two species. Despite their small population size (6–12 pairs and 2–4 pairs/25 km^2) in DNP, Masked Shrike and Lesser Grey Shrike are almost entirely found in rural mosaics. Little is known about these species' long-term trends due to lack of relevant data, but at least for Lesser Grey Shrike it seems that a sharp decline during the last two decades has taken place within DNP.

Other species closely linked to rural mosaics are Roller *Coracias garrulus,* Hoopoe and Orphean Warbler *Sylvia hortensis*. Ecotones between forested and agricultural zones are favourable habitats for Woodlark, with a mean of 2.4 birds recorded per point. Of the above four species, the Roller seems to have suffered a strong decline within the DNP during the last decade, with many former breeding territories having been abandoned.

Cultivated areas with intensive crop monocultures without natural vegetation elements (A2) or with sparse hedges (A4) also hold SPEC species. One of the most abundant species in cultivated areas is Crested Lark with a mean of 4.2 birds per point. Other species are Calandra Lark, Short-toed Lark and Tawny Pipit with only a few breeding pairs. The species have a patchy distribution in both the agricultural area of Soufli and in the whole DNP. In cultivated areas with sparse hedges (A4) two more species are abundant, Black-headed Bunting and Corn Bunting, which have their strongholds in this specific habitat. More than 300 pairs of each species were found breeding in the agricultural area of Soufli.

In forested areas, the bird community contains five SPEC species (Bonelli's Warbler *Phylloscopus bonelli,* Green Woodpecker *Picus viridis,* Grey-headed Woodpecker *Picus canus,* Semi-collared Flycatcher *Ficedula semitorquata* and Marsh Tit *Parus palustris*). Apart from the first two, which are well adapted to mixed forests, all the other species are extremely rare in the DNP. Semi-collared Flycatcher holds small isolated populations in a few mature riverine forests mainly in the central and southern part of the park.

Conservation management

The present article emphasizes the important contribution of the DNP to the conservation of Greek and European landbirds, because of its particularly high bird species richness as well as its high number of SPEC species. Precise conservation measures should therefore be put into practice for the maintenance of such a high avian diversity.

In nature, what is good for one biological group is not always good for another. We found, for instance, that the core zone, which is essential for the conservation of the Black Vulture, is not equally important for the landbird community, which prefers the less forested and more diverse landscape of the buffer zone. It is encouraging that the management plan (Specific Environmental Study) of the DNP (Adamakopoulos et al. 1995), which mainly targets the conservation of birds of prey, is also compatible with the conservation of the landbird community. That plan suggested that rural mosaics should be preserved, that forest clearings in the core area should be maintained through livestock grazing, tree-felling and the reintroduction of natural herbivore populations. Hence, there is no conservation conflict in the reserve's core areas as far as management practices are concerned.

However, the current legal frame and management plan of the DNP do not adequately protect areas of primary importance for the conservation of the land bird community outside the core areas. Both bird studies confirmed the unique importance of mosaics in which small fields alternate with pastures, woodlots, hedges, forest ecotones and tree-lines, thereby providing strong arguments against further land re-allotment and agricultural intensification. This agro-forest zone is located in the buffer zone and also outside the borders of the DNP in the surroundings of the small town of Soufli. Future actions of the DNP authorities should involve the mapping of the rural mosaic zone, the prohibition of any destruction of natural hedges, and the provision of incentives against land re-allotment, towards the maintenance of "living fences" in the rural mosaic zone, and the restoration of sparse vegetation elements within the intensively cultivated agricultural zone. These actions are compatible with the European Common Agricultural Policy (CAP), which encourages the maintenance of the rural mosaics as a habitat of great importance for farmland breeding birds. The study also provided enough evidence for the importance of mosaic sites, ecotones and forest clearings to recommend that horizontal heterogeneity should be maintained in the buffer zone at both local and landscape scales to preserve its bird communities.

Finally, we propose that the landbird community should be incorporated as a monitoring parameter in the ongoing pilot monitoring project of the DNP. A standard monitoring methodology should be followed, targeting the species of European Conservation Concern plus the species typical of specific habitat types. This would result in a species list of 44 bird species (15 SPEC2, 24 SPEC3, 5 typical species).

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Appendix I. List of the 120 landbird species (Coraciiformes, Piciformes, Passerifomes) in the Dadia–Lefkimi–Soudli Forest National Park. Conservation status according to the SPEC category and the Annex of EEC 79/409, breeding status in DNP, population size (breeding pairs) in Greece, and breeding population trends in Greece and Europe (by BirdLife International, 2004). Abbreviations and symbols are explained in footnotes

Species	SPEC	79/409	DNP status	Min. breeding pairs in Greece	Max. breeding pairs in Greece	Population trend in Greece	Trend in Europe	Ref.
				CORACIIFORMES				
Alcedinidae								
Alcedo atthis	3	I	B-M	100	300	↓	~	1
Meropidae								
Merops apiaster	3		B-M	2000	3000	=	↑↑	1
Coraciidae								
Coracias garrulus	2	I	B-M	200	300	↓	↓↓↓	
Upupidae								
Upupa epops	3		B-M	5000	20,000	=	↓↓	1
				PICIFORMES				
Picidae								
Picus viridis	2		R	5000	10.000	=	=	1
Picus canus	3		R	50	200	=	=	
Dryocopus martius		I	R	1000	2000	=	=	1
Dendrocopos major		I*	R	1000	2000	=	=	1
Dendrocopos syriacus	e	I	R	10,000	20,000	=	↓	1
Dendrocopos medius	e	I	R	10,000	30,000	=	=	1
Dendrocopos minor			R	500	1000	=	?	1
				PASSERIFORMES				
Alaudidae								
Melanocorypha calandra	3	I	B-M-W	3000	5000	↓	↓↓	1,2
Calandrella brachydactyla	3	I	B-M-W	20,000	30,000	↓	↓	1,2
Galerida cristata	3		R	50,000	100,000	=	=	1,2
Lullula arborea	2	I	R	5000	20,000	=	=	1,2
Alauda arvensis	3	II/2	B-M-W	2000	5000	↓	↓	1,2
Hirundinidae								
Riparia riparia	3		B-M	10,000	20,000	↓	?	1
Hirundo rupestris			B-M	5000	20,000	=	=	
Hirundo rustica	3		B-M	50,000	200,000	↓	↓	1
Hirundo daurica			B-M	10,000	50,000	↓	=	
Delichon urbica	3		B-M	50,000	200,000	↓	↓↓	1
Motacillidae								
Anthus campestris	3	I	B-M	5000	20,000	↓	?	1,2
Anthus trivialis			B-M	400	800	=	↓	
Anthus pratensis	e		M-W	0	0		↓	
Anthus spinoletta			M-W	200	500	=	=	
Motacilla flava feldegg			B-M	10,000	20,000	↓	↓	

Motacilla cinerea			B-M-W	5000	10,000	=	=	1
Motacilla alba alba			B-M-W	5000	10,000	=	=	1,2
Troglodytidae								
Troglodytes troglodytes		I*	R	50,000	100,000	↓	↑	1,2
Prunellidae								
Prunella modularis	e		M-W	1000	5000	=	=	
Turdidae								
Erithacus rubecula	e		B-M-W	50,000	100,000	=	↑	1,2
Luscinia megarhynchos	e		B-M	100,000	200,000	↓	=	1,2
Luscinia luscinia			M	0	0	=	=	
Phoenicurus ochruros			B-M-W	10,000	30,000	↓	↑	
Phoenicurus phoenicurus	2		B-M	2000	5000	=	=	1
Saxicola rubetra	e		M	500	1000	=	↓	1,2
Saxicola torquata			B-M-W	50,000	100,000	↓	↑↑	1,2
Oenanthe oenanthe	3		B-M	30,000	100,000	=	↓↓	1
Oenanthe pleschanka			M	0	0		=	
Oenanthe isabellina			B-M	50	200	=	=	
Oenanthe hispanica	2		B-M	50,000	150,000	=	↓	2
Monticola solitarius	3		R	10,000	30,000	=	=	2
Turdus merula	e	II/2	B-M-W	800,000	2,000,000	=	↑	1,2
Turdus pilaris	eW	II/2	M-W	10	100	=	=	
Turdus philomelos	e	II/2	B-M-W	1000	3000	=	=	1,2
Turdus iliacus	eW	II/2	M-W	?	?	?	=	
Turdus viscivorus	e	II/2	B-M-W	20,000	50,000	=	=	1,2
Sylviidae								
Cettia cetti			R	50,000	200,000	↓	↑	1
Locustella luscinioides	e		M	500	2000	=	=	
Acrocephalus melanopogon		I	M-W	50	200	=	=	
Acrocephalus schoenobaenus	e		M	500	1000	=	=	
Acrocephalus palustris	e		M	200	2000	=	=	
Acrocephalus scirpaceus	e		M	50,000	100,000	=	=	
Acrocephalus arundinaceus			M	50,000	100,000	↓	↓	
Hippolais pallida	3		B-M	50,000	200,000	↓	=	1,2
Hippolais icterina			M	0	0		↓	
Hippolais olivetorum	e	I	B-M	3000	5000	↓	=	1,2
Sylvia cantillans	e		B-M	200,000	500,000	↓	?	1,2
Sylvia melanocephala	e		B-M	500,000	1,000,000	=	=	1,2
Sylvia hortensis	3		B-M	5000	10,000	=	↓	1,2
Sylvia nisoria	e	I	B-M	100	1000	=	?	2
Sylvia curruca			B-M	5000	20,000	↓	=	1,2
Sylvia communis	e		B-M	50,000	100,000	↓	↑	1,2
Sylvia borin	e		B-M	100	1000	=	=	2
Sylvia atricapilla	e		B-M-W	5000	20,000	↓	↑	1,2

Phylloscopus bonelli	2		B-M	10,000	30,000	=	↓↓	1,2
Phylloscopus sibilatrix	2		M	500	2000	=	↓↓	
Phylloscopus collybita			B-M-W	20,000	50,000	↓	=	1,2
Phylloscopus trochilus			M	10	100	=	↓	
Regulidae								
Regulus regulus	e		R	1000	5000	=	=	
Regulus ignicapilla	e		R	20,000	100,000	=	=	1,2
Muscicapidae								
Muscicapa striata	3		B-M	10,000	20,000	↓	↓	1,2
Ficedula parva		I	M	5	10		=	
Ficedula albicollis			M	0	0		↑	
Ficedula hypoleuca			M	0	0		↓	
Ficedula semitorquata	2	I	B-M	1000	3000	↓	↓↓	
Timaliidae								
Panurus biarmicus				1400	2700	↑	=	
Aegithilidae								
Aegithalos caudatus			R	20,000	50,000	=	=	1,2
Paridae								
Parus palustris			R	2000	10,000	=	↓↓	1
Parus lugubris	e		R	10,000	30,000	=	=	1,2
Parus ater		I*	R	100,000	500,000	=	=	2
Parus caeruleus	e		R	500,000	1,000,000	=	=	1,2
Parus major			R	1,000,000	2,000,000	=	=	1,2
Sittidae								
Sitta europaea			R	10,000	50,000	=	=	1,2
Certhiidae								
Certhia familiaris			R	2000	5000	=	=	1
Certhia brachydactyla	e	I*	R	30,000	100,000	=	↑	1,2
Remizidae								
Remiz pendulinus			R	5000	30,000	=	=	1
Oriolidae								
Oriolus oriolus			B-M	20,000	30,000	↓	↓	1
Laniidae								
Lanius collurio	3	I	B-M	10,000	30,000	↓	↓	1,2
Lanius minor	2	I	B-M	2000	3000	↓	↓↓	2
Lanius excubitor	3	I	W	0	0		↓↓	
Lanius senator	2		B-M	10,000	30,000	↓	↓↓	1,2
Lanius nubicus	2	I	B-M	500	2000	↓	↓↓	2
Corvidae								
Garrulus glandarius		II/2	R	20,000	50,000	=	=	1
Pica pica		II/2	R	10,000	50,000	=	↓↓	1
Corvus monedula	e	II/2	R	100,000	200,000	=	=	
Corvus frugilegus		II/2	M-W	50	2000	=	?	

Corvus corone		II/2	R	50,000	100,000	↑	=	1
Corvus corax			R	5000	10,000	↑	↑	1
Sturnidae								
Sturnus vulgaris	3	II/2	B-M-W	10,000	20,000	=	↓↓	1
Sturnus roseus			S-M	0	1000	~	~	
Ploceidae								
Passer domesticus	3		R	200,000	1,000,000	↓	↓↓	1
Passer hispaniolensis			R	200,000	500,000	↓	=	
Passer montanus	3		R	10,000	30,000	↓	↓↓	
Fringillidae								
Fringilla coelebs	e	I*	B-M-W	1,000,000	3,000,000	=	=	1,2
Fringilla montifringilla			M-W	0	0		=	
Serinus serinus	e		R	10,000	30,000	=	=	1
Carduelis chloris	e		B-M-W	50,000	200,000	↓	=	1,2
Carduelis carduelis			B-M-W	100,000	500,000	=	=	1,2
Carduelis spinus	e		M-W	500	2000	~	~	
Carduelis cannabina	2		B-M-W	50,000	100,000	=	↓↓	
Pyrrhula pyrrhyla			M-W	500	2000	=	=	
Coccothraustes coccothraustes			B-M-W	5000	20,000	=	=	1,2
Emberizidae								
Emberiza citrinella	e		M-W	2000	5000	↓	↓	
Emberiza cirlus	e		R	50,000	200,000	↓	↑↑	1,2
Emberiza cia	3		R	10,000	20,000	=	=	
Emberiza hortulana	2	I	B-M	20,000	50,000	↓	↓	1,2
Emberiza schoeniclus			M-W	300	500	=	↓	
Emberiza melanocephala	2		B-M	30,000	100,000	↓	↑	1,2
Milaria calandra	2		B-M-W	200,000	500,000	↓	↓↓	1,2

SPEC: 2: Species whose global populations are concentrated in Europe, and which have any unfavourable conservation status in Europe, 3: Species whose global populations are not concentrated in Europe, and which have an unfavourable conservation status in Europe, e: Species whose global populations are concentrated in Europe, and which have a favourable conservation status in Europe, eW: Species whose global populations are concentrated in Europe in wintertime, and which have a favourable conservation status in Europe. **DNP status:** B: Breeding, R: Resident, M: Migratory, W: Present in Winter, S: Present in Summer. **Population trend:** ~: Fluctuating, =: Stable, ↓: Decline, ↓↓: Moderate Decline, ↓↓↓:Large Decline, ↑: Increase, ↑↑: Moderate increase, ?: unknown: **Ref:** 1: Kati (2001), Kati and Sekercioglu (2006), 2: Kakalis (2002), no number (Adamakopoulos et al. 1995)

* The presence of the following 10 species is considered as disputable and doubtful (data from Adamakopoulos et al. 1995): *Anthus cervinus, Cinclus cinclus, Cercotrichas galactotes, Monticola saxatilis, Turdus torquatus, Parus montanus, Sitta neumayer, Tichodroma muraria, Loxia curvirostra, Emberiza caesia*.