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The Black woodpecker (*Dryocopus martius*) as focal species in alpine protected areas

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Abstract

Woodpeckers have a stronger affinity to forest and woodlands than do most of other taxa. Most woodpecker species depend on forest resources as large trees and deadwood, that are very important for other animal taxa, but also the first to be removed from managed forest. Therefore it seems feasible to use woodpeckers as focal species in forest management of alpine protected areas.

In the present study we systematically evaluated the suitability of the black woodpecker (*Dryocopus martius*) as an indicator, in the Italian Alps, of a closer to nature forest condition and as an "umbrella species" for other components of forest biodiversity.

To this aim we performed a habitat selection analysis and a census on relative abundance and number of species of cavity nesting birds and ground beetles, in three protected areas.

Our data show that black woodpecker cannot be used as a reliable indicator of a closer to nature forest condition, since, only in some areas, the presence of black woodpecker for both breeding and feeding was associated with variables as large trees and deadwood.

However, black woodpecker was found to be a predictor of the number and abundance of mountain cavity nesting birds, suggesting for an ecological role as an "umbrella species", though only for few species. Black woopecker is an important element of forest biodiversity especially where other important forest species, usually used as focal species, as other alpine woodpeckers and Cappercailly are absent.

Keywords

Black woodpecker, forest biodiversity, umbrella species, alpine protected areas.

Introduction and aims

Protected areas play an important role in conservation of biodiversity. In order to develop sustainable ecosystem management strategies, scientific research focusing on the relationship between habitat characteristics and specie diversity is required [1].

To reduce costs in monitoring and management of biodiversity, several shortcuts have been proposed, as focusing on one or few indicator species [2]. Among different approaches to indicator species, the "umbrella species" concept, namely the idea that there are some species encapsulating the requirements of other co-occurring and less demanding species seems to be one of the best [3], although by now, there are only few studies that empirically validated this concept (in Europe: 4,5).

The black woodpecker (*Dryocopus martius*), that is the largest woodpecker of Palearctic region, uses different forest habitat both for breeding and feeding [6] and plays an important ecological role in European forest ecosystems as keystone species for large-sized cavity nesting birds [7].

Some studies carried out in Europe reported evidence suggesting for a possible role of black woodpecker as an indicator of old-growth forest conditions [8,9]. However, also evidence against this hypothesis has been provided [10,11]

Although the black woodpecker is the largest, well distributed, resident bird on the alpine forest areas, there are only few studies on its ecology on the Alps.

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In the present study the suitability of the black woodpecker as indicator specie of closer to nature forest conditions and its possible role as "umbrella species" for other components of forest biodiversity were systematically investigated in protected areas of Italian Alps.

Study areas

The study was carried out from 2001 to 2003 in 3 different protected areas: Orobie Valtellinesi Natural Park (Lombardy), Sciliar Natural Park (South Tirol), Vedrette di Ries Aurina (South Tirol).

Methods

As for the habitat selection, 96 breeding sites and 101 feeding sites were identified and compared with 151 control plots, randomly selected in high forests inside the studied areas.

The following characteristics of habitats were considered in the study: tree diameter (1.30 m dbh), tree height and tree species for each of the 12 trees nearest to the breeding, feeding and random trees, tree basal area, tree density, volume of logs, % of understore cover, and the Shannon Diversity Index of the tree height and species.

Specie richness and relative abundance of both a set of 7 cavity nesting birds and ground occurring beetles, were assessed at 14 black woodpecker breeding sites and 18 randomly selected sites in Orobie Natural Park. For the analysis, birds species were grouped in two categories: "Ubiquists" (occurring in suitable habitat from the bottom to the tree line), and "Mountain specialists" (mainly distributed in the mountain zone of the alps, above approximately 1000 m above the sea level).

Results

To examine whether and which of the habitat components predicted the presence of black woodpecker, logistic regression models were applied, separately for breeding and feeding sites.

As for breeding sites, average diameter ($p=0,000$) and density of tree ($p=0,049$) entered in the logistic regression model as significant predictors.

As for feeding sites, the volume of dead logs ($p=0,001$) and the Shannon Diversity Index ($p=0,02$) were significant predictors.

Moreover, to evaluate the possible effect of the areas at alpine scale, subsequent separate logistic regression analysis for each of the 3 protected areas were carried out. The analysis revealed a more articulated pattern of results: as for the breeding sites, in Orobie three variables were significant predictors of black woodpecker presence, namely the average diameters, the volume of dead logs and the basal area; in Ries the average diameters and the basal area and in Sciliar the Shannon Diversity Index, density of tree and the basal area. As for the feeding sites, in Orobie both the volume of dead logs and the % of understory cover were significant predictors, while in Sciliar only the contribution of volume of dead logs was statistically significant. No significant predictors were found in Ries site.

As for the relationship between abundance and specie diversity of cavity nesting birds and beetle and black woodpecker presence, number of species and relative abundance of "Mountain Birds" were found to be positively related to the presence of black woodpecker. Regression analysis carried out on the data also showed that the average diameter was the significant predictor of woodpecker presence/absence as well as of number of species and relative abundance of "Mountain Birds".

Discussion

In line with some previous findings [10,11], our data show that the black woodpecker cannot be used as a reliable indicator of a closer to nature forest condition. In fact only one of the 3 most relevant characteristics of the natural forest (presence of old trees, dead logs and different forest structure, as evaluated by the Shannon Diversity Index), namely the presence of old trees, was able to distinguish between breeding and random sites in a logistic regression model.

Moreover our findings show that black woodpecker can be used as "umbrella species" for the other Mountain birds, even though only a few number of birds species have been considered in the present study.

However, the pattern of predictors was not completely consistent over the 3 protected areas, the data show that black woodpecker selects variable that are uncommon in managed forest and plays a relevant role in forest ecosystems.

Future developments of research in alpine forest protected areas might therefore include the black woodpecker in a broader set of other birds species to be evaluated and, eventually used as focal species for conservation management.

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