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Avian diversity on golf courses and surrounding landscapes in Italy

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Abstract

Golf courses are increasingly occupying land worldwide. This study investigates whether golf courses can contribute to wildlife conservation and to the enrichment of the local biodiversity. In 23 Italian golf courses, the presence of species of conservation concern was related to land use. In addition, censuses of birds and predators were conducted in three golf courses and the immediate surrounding urban–agricultural areas. Similarity between the 23 golf courses and Italian urban–agricultural territory was complete for the groups of generalist species and minimum for the species of conservation concern belonging to the groups of specialists. In the 23 golf courses, the proportion of forested area was positively related to the richness of species and to the number of species sensitive to forest fragmentation. In two of the three golf courses where censuses were conducted, the proportion of forested area, the number of species of conservation concern and those sensitive to forest fragmentation, were higher than in the surrounding areas. All groups of nest predators were more abundant in the two above golf courses than in the surrounding areas. Golf courses play a minor role in the conservation of specialist species. However, a good amount of forested area in golf courses that are located in urban and agricultural areas can positively affect wildlife. Predation pressure upon nests might be higher in some golf courses than in the relative surrounding areas. This source of concern requires future investigation.

Keywords: Golf courses in Italy; Birds; Species richness; Predator densities; Wildlife conservation; Land cover

1. Introduction

Urbanization and intensive agriculture have created habitats where opportunistic species are mostly found (e.g., O'Connor and Shrubb, 1986; BirdLife International, 2004; Palomino and Carrascal, 2006). The preservation, recovery, and creation of natural patches in highly disturbed areas might provide a first step towards the conservation of wildlife and natural corridors. Species richness may be at its peak in moderately disturbed areas (Jokimäki and Suhonen, 1993; Blair, 2001). Small protected areas and private land have a considerable potential for the preservation of wildlife, and may provide stepping-stones linking larger natural areas (Shafer, 1995).

Golf courses occupy large green areas and their numbers are growing worldwide (Priestley, 1995; Kunimatsu et al., 1999; Tanner and Gange, 2005). For example, almost one golf course a day has been opened in the USA over the last 10 years (Smith et al., 2005). In Europe, there are 5200 golf courses and over 31,500 worldwide (Tanner and Gange, 2005). In Italy, about 300 golf courses cover roughly 7500 ha, and their numbers have been increasing in recent years (Caggiati et al., 1999).

The growing number of golf courses raises concern about their possible negative effects on ecosystems due to pesticide application and alteration of water sources (e.g., Miles et al., 1992; Cohen et al., 1999; Davis and Lidy, 2002), and possible alteration of the air quality (Koerner and Klopatek, 2002). However, if managed in a naturalistic way, golf courses could have a potentially positive role for wildlife conservation (Pearce, 1993; Terman, 1997; Tanner and Gange, 2005).

On the Sefton Coast (United Kingdom), 20% of the dune system is protected by the presence of golf courses (Simpson, 2000). Some threatened species are even more abundant in golf courses than in native habitats (Green and Marshall, 1987; Rodewald et al., 2005; Smith et al., 2005). However, Platt (1994) pointed out that many hectares of forest are lost annually to golf course development (e.g., 5000 ha in Japan). Natural areas are likely

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to lose many bird species if golf courses are created on that site (Blair, 1996; Terman, 1997; see also LeClerc and Cristol, 2005).

An accepted strategy by many national golf federations is to avoid setting up golf courses where they would compromise the original habitats (www.committedtogreen.org/foundation.html, www.golfecology.co.uk/articles/valdec.html). However, the effectiveness of placing a golf course in highly-disturbed areas to promote wildlife conservation was scarcely tested in the past. This requires comparing wildlife living in the golf courses with that living in the surrounding disturbed territory (Jones et al., 2005; LeClerc and Cristol, 2005; Tanner and Gange, 2005; Yasuda and Koike, 2006).

The first aim of this paper was to evaluate the similarity between the avian community in the 23 Italian golf courses and that in the Italian agricultural and urban territories. In these golf courses, we investigated whether the proportions of natural patches positively affected the richness of species and the number of species of conservation concern or sensitive to habitat fragmentation. The second aim of the paper was to compare bird community parameters of three golf courses with the immediate surrounding areas to evaluate whether golf courses can lead to an enrichment of the local biodiversity. The three courses were representative of the main type of land cover where golf courses are usually located namely urban areas, intensively cultivated areas, or extensively cultivated areas.

We focused on bird species due to their sensitivity to environmental change and habitat fragmentation, reduced costs of sampling, broad distribution, and relative independence by sample size (e.g., Noss, 1990; Croonquist and Brooks, 1991; Francl and Schnell, 2002). We also estimated predator abundance, based on the assumption that possible observed benefits from golf course creation to wildlife might be lost in case of increased predation pressure.

2. Study area

The study was undertaken in 23 golf courses (Table 1) characterized by the use of registered and authorized non-toxic chemical products for turf grass preservation (applied once a year). The golf courses are located in the Italian lowlands and hilly territories (below 400 m a.s.l.) (Fig. 1). According to the Corine Land Cover database (see Krynitz, 2000), they are located in areas with dominant agricultural and urban land use. Several golf courses show intermediate aspects going from the 'Scottish style links' golf courses to the Japanese/American courses with little rough; other golf courses are more similar to the latter. In general, some houses (2–7) are close to the golf courses.

The percentage of forest and other land cover in each golf area was estimated by means of local maps analysed using Arcview software (Table 1). In 20 out of the 23 golf courses, we only investigated the occurrence of different bird species (qualitative assessment). In the remaining three golf courses (Olgiata, Verona, Le Querce), we also estimated species abundance (quantitative assessment). For these three golf courses a more detailed description is included below.

Table 1
Proportion of different habitat types in the 23 study golf courses

	Turf grass[a]	Forest[b]	Uncultivated area[c]	Wetland[d]	Area size[e] (ha)
Antognolla	40	20	30	10	80
Casentino	79	20	0	1	20
Cà della Nave	79	6	1	14	70
Cosmopolitan	47	20	8	25	70
Fioranello	60	30	8	2	50
Fiordalisi	30	30	20	20	60
Frassanelle	55	15	15	15	50
Fiuggi	75	20	0	5	70
Is Arenas	41	50	6	3	100
La Margherita	87	5	6	2	70
La Montecchia	75	5	5	15	85
Le Querce	39	31	21	9	70
Olgiata	35	51	11	3	100
Padova	90	10	0	0	85
Parco di Firenze	90	5	0	5	7
Poggio dei Medici	40	30	25	5	70
San Michele	30	30	38	2	44
Terme di Galzignano	82	5	3	10	13
Tirrenia	30	70	0	0	60
Ugolino	40	50	8	2	80
Venezia	45	50	0	5	56
Verona	48	43	8	1	40
Vicenza	74	5	2	19	25

[a] Turf grass includes tee, fairway, green and semi-rough.
[b] Forest category includes tree rows and bushes.
[c] Uncultivated area includes the rough, i.e., the scarcely managed semi-natural belt around turf grass.
[d] Wetlands includes small lakes, ponds and small streams.
[e] The area size is the area managed by each golf course club.