

Wasteland bird use. Evidence from the NW Mediterranean coast (Genoa, Italy)

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Abstract - Bird occurrence was recorded from January 1989 to June 1991 in a wasteland area located on a sea embankment within a dammed sea basin close to the city of Genoa. The study area was visited almost weekly, globally recording 173 species whose occurrence ranged from a few to more than one thousand individuals at a time. Regularly detected species showed seasonal occurrence or seasonal fluctuations in numbers of individuals. Bird communities also showed seasonal turnover as testified by the cyclic trend of the herbivores/carnivores ratio. A description of the year succession of bird communities was achieved by correspondence analysis between months and a total of 69 most common species. The first axis (37.6% of inertia) displayed species typical of different seasons, while the second one (22% of inertia) was related to the transient occurrence of migrant species. The most complex bird community was that of wintering species, mainly divided into sea birds and a crowded group of passerine species, whereas the warm season community was less defined, excluding the Ringed Plover and the Short-toed Lark which bred in the area. Additionally, the area was also used as a refuelling ground by many migrant species, especially wetland birds when it was flooded by rain. Based on these data, and considering natural environment depletion, the value of wasteland as wildlife habitat and the opportunity of planning the occurrence of low-disturbance plots within heavily urbanized areas is discussed.

Introduction

The continuous decrease of natural environments has raised the interest towards the potentials of urban areas as wildlife habitats (e.g. Bernadzki 1990). Birds are a recurrent subject in this kind of studies, as their high dispersal capabilities may allow a partial reconstitution of natural communities within anthropic sites (Luniak 1983, Arcamone and Mainardi 1984, Adams *et al.* 1985, Perkins and Lawrence 1985, Martin and Randall 1987, Rosenberg *et al.* 1987). For the same reason, birds are also used as quality indicators for reclaimed sites and recreational areas (Cicero 1989, Bhat 1990).

Excluding man commensals, human activities are generally adverse for bird species (Keller 1991, Piatt *et al.* 1990). Yet, in some cases the presence of man has been found to produce positive effects on some non-commensal birds (Titus and VanDruff 1981, Woinarski 1990).

Along the Ligurian coast (NE Italy), human population density rates among the highest of Europe and natural coastal environments have been deeply modi-

fied (Barberis and Mariotti 1981). This study aims to show that in such heavily urbanized regions, wasteland areas may become important bird refuges, particularly where disturbance is relatively low. These areas can be exploited the year round by different species as wintering, stopover and breeding sites.

Methods

Study area

This investigation concerned a transient wasteland area located on a wide sea embankment aimed at the realization of a new harbour west to the city of Genoa (NW Mediterranean). The embankment neighbored main industrial sites and the city airport. It measured about 1x0.5 Km and was surrounded by a dammed basin of about 2x1.5 km. The region has a relatively wet Mediterranean climate, where the mean temperature of July is 24 °C, that of January is 8 °C, the mean annual precipitation is 1350 mm, and the average for relative humidity is 60%.

The area was visited almost weekly from January 1989 to June 1991, recording all detected birds.

Working activities produced land changes preventing the use of transect census techniques. However, a complete survey of the land and water portions of the area was achieved by walking along both perimetric and mid crossing paths of the peninsular strip, also making stops at such bird-attractive sites as temporary rainwater ponds or vegetation thickets. Open landscape and low vegetation allowed panoramic views, which minimized the risk of repeated bird records.

Data analysis was based on the numbers of individuals recorded for each species on the whole area. Each month was divided into three periods, referred to as ten-days periods (1st-10th day 11th-20th day and 21th-last day), assigning to each species the highest count recorded within each period. The two and a half years of the study were thus divided into 90 ten-days periods.

Statistics were performed on a desktop computer by using the SAS System, Release 6.04.

Land and sea-water environments

The land portion of the investigated area had the features of wasteland consisting of vegetation alternating with bare ground. A survey of plants led to the identification of more than 200 species showing a sharp dominance of herbs (e.g. *Chenopodium album*, *Kochia scoparia*) and grasses (e.g. *Polypogon monspeliensis*). Most species were typical of ruderals and grassland, about 10% derived from cultures, whereas smaller portions belonged to coastal environments such as wetland, mediterranean scrubland and seashore.

Information about the hard-bottom fauna of the basin derived from the fouling of hauled buoys, showing a typical harbour community.

Results

A total of 173 bird species were recorded during this study. The frequency of records varied consistently from species to species: 49 rare or accidental species were seen only once or twice, 69 most common species occurred in more than 10% of the 90 ten-days periods, while the remaining species showed an intermediate occurrence.

Numbers of individuals were also highly variable among species and through time. The majority of species ranged from a few to tens of individuals occurring at a time, but a few species were more abundant, reaching in some cases hundreds of individuals (e.g. House Sparrow, Starling, Mediterranean Gull), or even more than thousand individuals (e.g. Black-headed Gull, Herring Gull). Many of the 69 most common species followed a marked seasonality, while typical year-round species also showed seasonal numeric

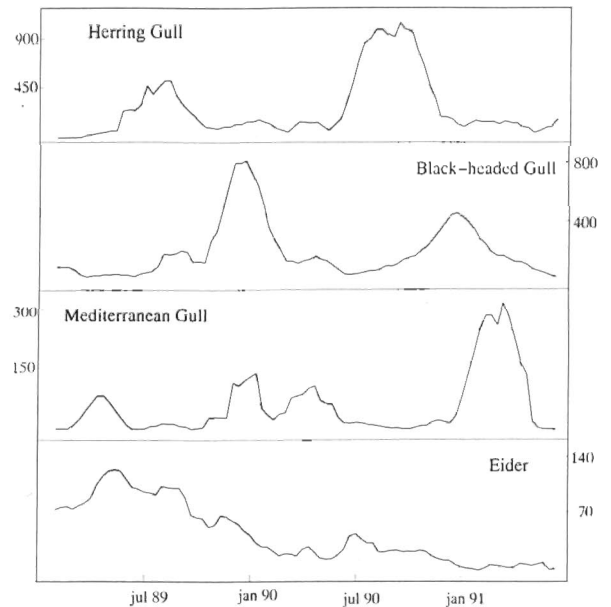


Fig. 1. Running means ($n = 5$) of the numbers of individuals of some common species recorded each ten-days period along two and a half years.

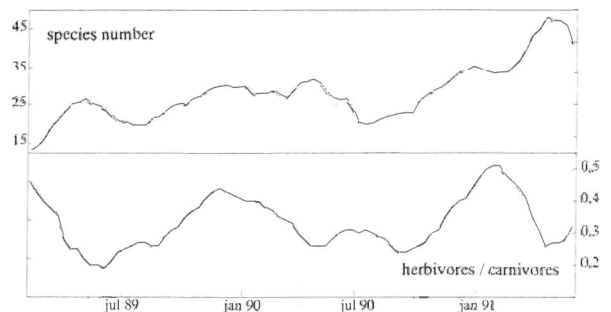


Fig 2. Running means ($n = 5$) of species richness (above) and of the ratio between herbivores and carnivores (below), derived from data recorded each ten-days period along two and a half year.

fluctuations, e.g. the three most common gull species (Figure 1).

A peculiar pattern was shown by the Common Eider, with a resident population at the beginning of the investigation due to an unusual Southward dispersal of immature individuals in the end of 1988 (Borgo et al. 1991a, 1991b). These birds reached maturity in the area, and progressively abandoned it during the investigation period (Figure 1).

Total species diversity showed both seasonal and year-to-year variations. The time plot of the total num-

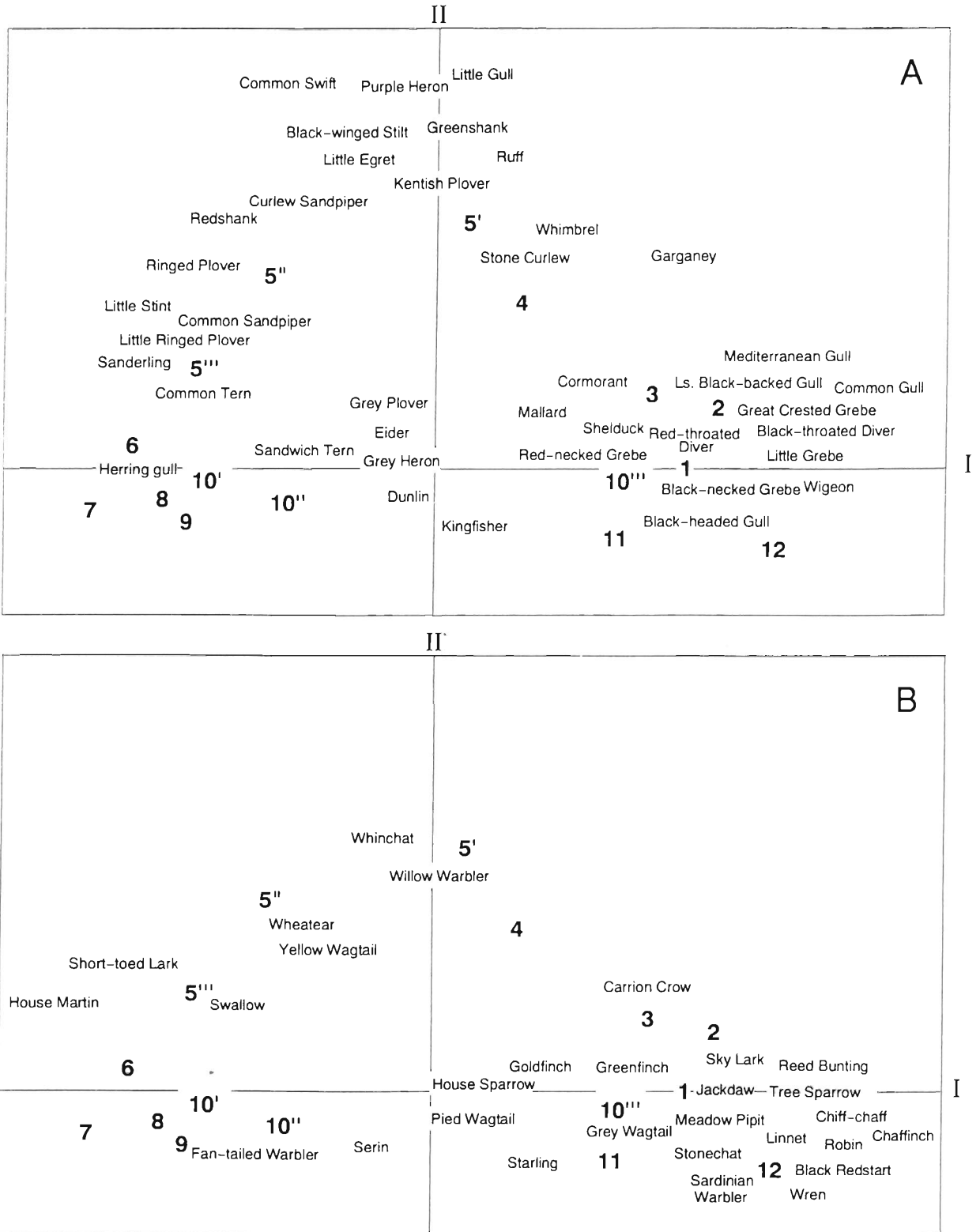


Fig. 3. Correspondence analysis ordination where column points are months (numbers) and row points are species. May and October are represented by distinct ten-days periods (quoted numbers). To allow for readability, separate charts have been drawn for non-passerine (A) and passerine (B) species. First axis (I) yields 37.6% and second axis (II) yields 22% of inertia. See text for further explanation.

ber of species recorded in each ten-days period shows an upward drift, mostly due to the last year of investigation (Figure 2). A periodic pattern is shown by the time plot of the ratio between herbivores and carnivores (guilds are based on the prevailing diet of each species), showing a constant prevalence of carnivorous species with major peaks of herbivores in the cold season and secondary peaks in summer (Figure 2).

An attempt at describing the year succession of bird communities in the area was made by correspondence analysis (Benzécri 1982) using a matrix having 36 ten-days periods as columns, globally covering the twelve months of the year, and the above mentioned 69 most common species as rows. For each species, numbers of individuals recorded throughout the study period were averaged over each of the 36 ten-days periods of the year, and these data were then standardized (mean 0; std 1) to avoid bias due to the great numeric differences among species.

The first axis of the correspondence analysis yields 37.6% of inertia, while the second one yields 22% of inertia, both axes resulting significant according to the Lebart's (1975) tables. Column points (months) are mostly distributed along the first axis, which can be interpreted as the seasonal variation of bird communities in the investigated area. The three ten-days periods of every month except May and October are clustered close to each other and have been comprehensively plotted by a single number coding for the corresponding month. Conversely, the ten-days periods of May and October have been individually plotted on the graph since they are distinctly scattered. Cold-season months cluster to the right side of the origin, warm-season months to the opposite side, while intermediate-season months are interspersed between these two extremities following a chronological order. Column points corresponding to springtime also show a dispersion along the second axis (Figure 3).

The space ordination of the row points (species) suggests that the second axis is indicative of the length of time spent each year by a species in the area. The densest aggregation occurs around late autumn and winter months, which depicts the wintering bird community of the area, including gulls, divers, grebes, ducks and the Cormorant (Figure 3A), together with many passerine species (Figure 3B). Species lying along the first axis towards or just within the cluster of summer column points, e. g. the Herring Gull, are not exclusive of summer but are the only species regularly recorded throughout the warm season.

Excluding the Eider, whose occurrence in the area was unusual, row points falling around the origin represent residents and local migrants recorded along most of the year (e.g. Kingfisher and some passerines), or

long-distance migrants visiting the area during both spring and autumn movements, and sometimes also in other periods (e.g. Grey Heron, Grey Plover, Dunlin). Most spring migrants are dispersed along both the first and the second axis, following the pattern of the column points corresponding to April and the three ten-days periods of May. Proceeding from right to left these species can be roughly divided into: (1) early spring migrants, typically the Garganey; (2) most transient migrants regularly recorded in the area between late April and early May, lying on the second axis at topmost distances from the first axis; (3) later migrants and partial summer residents, the latter including the Little Ringed Plover and the Short-toed Lark, which regularly bred in the area.

Discussion

The investigated wasteland area, located in a densely urbanized portion of the city of Genoa, resulted particularly attractive to many bird species, confirming previous data about avian presence in the neighbouring city airport (Spanò and Toschi 1969, Spanò 1974). A number of species showed seasonal fidelity to the investigated area, as shown by the cyclic profile of the ratio between carnivorous and herbivorous birds, and by the sharp correspondence ordination pattern between months and species. Notwithstanding an upward drift of total species diversity, possibly reflecting long-term variations due to climatic events, the year-round predictability of bird presence in the area suggests some community structuring and niche partitioning, particularly in the most complex assemblage of winter visitors.

The winter bird community consisted of two major groupings: (1) sea birds and waterfowl, which prevalently exploited marine resources; (2) passerine birds, generally relying upon land resources. The main attractive factor for water birds was doubtless the occurrence of an artificial basin characterized by a relatively low disturbance. The presence of streams and waste water flowing into the basin contributed to create a highly productive brackish environment and fish nursery area, where developed fouling organisms and fish schools provided foraging sources to water birds. The importance of bivalves, crabs and other crustaceans in the diet of Eiders was ascertained (Borgo *et al.* 1991a), while scattered observations also testified the feeding of cormorants, divers, and terns upon fish occurring within the basin.

The value of the Mediterranean region as a wintering and stopover area for bird species is known (Blondel 1969, Moreau 1972, Lövei 1989). In the investigated plot no true Mediterranean plant community was found, but climate effects allowed abundant seed crop

for wintering granivorous species, as well as prey availability for insectivorous ones. Wintering passerines could be roughly divided into scrub species (e.g. finches, warblers, Robin, Wren, etc.) mostly occurring on dried herb remnants and low scrubs, and field species (e.g. larks, wagtails, pipits) occurring prevalently on bare ground and grassland.

The area was also important as a stopover site for migrant birds. From the correspondence analysis it can be inferred that the transition from the winter to the summer bird community, spanning from March to May, was more complex than the opposite shift, occurring rather abruptly by the second half of October. This is clearly related to the higher importance of spring migration, during which maximum species diversity was recorded. About migration time, wide portions of the area were frequently flooded by rain, hence creating refuelling ground particularly for waders and waterfowl. This had a relevant ecological meaning, as wetland birds are mostly affected by coastal urbanization in this region, where their typical stopover sites are naturally rare.

Based on our data, the value of coastal wasteland as a nesting site seems low, but the studied area showed limited extension, landscape uniformity, poor vegetation coat and densely urbanized surroundings. Conversely, data from a wider and more diversified Mediterranean industrial site indicate good nesting opportunities for several species (Delitala and Casu 1991).

The intensive use of wasteland by bird species during non-breeding and perhaps also breeding periods suggests that the occurrence of low-disturbance plots within heavily urbanized areas be planned rather than chancy. This could substantially reduce the effects of natural environment depletion, hence being a potential support even for more ambitious projects of wilderness preservation.

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Riassunto - La presenza di uccelli è stata registrata dal Gennaio 1989 fino al Giugno 1991 in un'area situata su un riempimento a mare realizzato per la costruzione del nuovo porto di Genova. L'area indagata è stata visitata quasi ogni settimana registrando globalmente la presenza di 173 specie, con consistenza variabile da poche unità a più di un migliaio di individui alla volta. Distinte variazioni stagionali sono state riscontrate a livello di tutte le specie presenti con regolarità, come mostrato ad esempio dalle variazioni cicliche stagionali del rapporto tra erbivori e carnivori. Una descrizione della successione annuale delle comunità ornitiche è stata ottenuta tramite analisi delle corrispondenze utilizzando i dati di presenza numerica nei vari mesi dell'anno di 69 tra le specie più comuni. Nell'ordinamento spa-

ziale ottenuto, il primo asse (37.6% dell'inerzia) riguarda la stagionalità delle specie, mentre il secondo (22% dell'inerzia) descrive il grado di persistenza di ciascuna specie nell'area nel corso dell'anno: le specie residenti o stagionali giacciono sul primo asse mentre le migratorie sono disperse sul secondo. La comunità più articolata è risultata quella invernale, divisa essenzialmente in uccelli acquatici e passeriformi, mentre la comunità della stagione calda non era altrettanto ben definita ma comprendeva anche specie nidificanti quali il Corriere piccolo e la Calandrella. L'area era anche usata come zona di sosta e rifornimento da molte specie migratorie. In base ai dati di questa indagine, e considerando l'impovertimento delle aree naturali, viene discusso il valore delle aree dismesse come possibili habitat per specie selvatiche, e quindi l'opportunità di pianificare la presenza di spazi con ridotto disturbo antropico all'interno di aree intensamente urbanizzate.

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