

Population density and demographic trend of the Scops Owl *Otus scops* in the Northern Apennine (Oltrepò Pavese, Northern Italy)

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Abstract - From 1992 to 1994 European Scops Owls (*Otus scops*) were censused in the Oltrepò Pavese, a hilly area (448 Km² in extent) south of Pavia (Northern Italy), using the playback of tape recorded songs. In the first year 37 territories were found for an average population density of 0.08 terr./Km² (8 territories over 100 Km²). However, Scops Owls were not regularly distributed throughout the area, but they concentrated in the town of Voghera and in the central part of the hilly area. In 1993 we observed a dramatic decline of the Scops Owl population since 21.4% of territories were not re-occupied. The decline was confirmed in 1994, when 3 other territories were lost for a total decrease of 32.1% relative to the first year of the study. The intensification of agricultural practices (namely vineyards) and the intensive use of pesticides were probably the main factors responsible for this decline.

Introduction

The European Scops Owl (*Otus scops*) is a migratory, nocturnal raptor distributed in the Mediterranean climatic zone (Cramp 1985). In Italy Scops Owls inhabit the warm-dry habitats from the seaside to 600-700 m in height. The Northern limit of its Italian distribution is the Po Valley, but sometimes it breeds in the main valleys of the Alps (Casini 1993). The Lombardy population has been declining in recent decades, and currently is confined to two sub-populations located in the Oltrepò Pavese and in the hilly area from the city of Bergamo up to the Lake Garda (Galeotti 1990a). At beginning of the nineteenth century, Scops Owls were widespread throughout lowlands of the Lombardy and also bred, often extensively, in the Province of Milano (Prada 1864), Pavia (Prada 1877) and Cremona (Bertoletti 1990). Today, however, it breeds only occasionally there (R. Sacchi, unpubl. data). The Scops Owl disappearance from these areas followed the changes in agricultural practices determining loss of suitable habitats (tree lines and scrubs) and reduction in food availability as a result of the increasing use of pesticides (the Scops Owl is mainly insectivorous, Galeotti 1990a, Perani *et al.* 1997). A similar decline is also reported for Piedmont (Carpegna and Vineis 1988), Emilia-Romagna (Santolini 1987, Foschi 1990, Chiavetta 1992) and Veneto (Mezza-

villa 1989) but not in Friuli (Benussi, unpubl. data). In fact, the general decline of the North-Italian populations falls into a pattern of a strong and widespread decrease of the species in the central and western parts of the European Scops Owl distribution. The species is also declining in Switzerland (Glutz and Bauer 1980, Arlettaz 1990), Austria (Cramp 1985), ex-Czechoslovakia (Cramp 1985) and Northern France (Yeatman 1976). In all cases, the intensification of agricultural practices, with the increase in farmland evenness and the intensive use of pesticides, is likely to be the main factor responsible for this decline (Arlettaz 1990, Arlettaz *et al.* 1991).

This paper presents the results of a 3-year study on the Scops Owl population density and distribution in the Oltrepò Pavese (Lombardy-Northern Italy). The aims of the study were i) to census Scops Owl territories settled in the study area; ii) to investigate the demographic trend of this population over time and iii) to examine vocal territorial behaviour in relation to phases of breeding season.

Study area

The study was carried out from March to September 1992-1994 in an area of 448 Km², including the hilly area of the Oltrepò Pavese up to 700 m in height and

the lowland surrounding the towns of Voghera, Casteggio e Rivanazzano (Lombardy Region, Northern Italy). In detail, the study area was delimited by the State Road n.10 'Padana Inferiore' to the North, the regional boundaries to the East and the West and the Ardivestra valley to the South (Fig.1).

The lowland area is dominated by intensive cereal crops with scattered towns and many small farms. Habitats of the hilly area are: cereal, vineyards and orchards. Woodlands are scarce and concentrated along rivers (*Populus alba*, *Salix* spp., *Alnus glutinosa* and *Robinia pseudoacacia*), stands dominated by Oaks (*Quercus pubescens*, *Quercus petraea* and *Quercus cerris*) cover the most inaccessible sides of the valleys. Normally, they are scrubs subjected to irregular and frequent cuts. Many villages and

isolated farmhouses were scattered throughout the hilly area.

Scops Owls arrive in the study area in late March and stay until September. Egg-laying and incubation start in late May-early June, and parental care continues throughout July and August. Ants are the main food item consumed by the species in the Oltrepò Pavese during breeding (Perani *et al.* 1997).

Climate during the Scops Owl stay in the study area is cool-dry in March, cool-wet in April, warm-wet in May and October and warm-dry in June, July, August and September. Precipitation increases from 780 mm/year at 200 m a.s.l. up to 900 mm/year at 700 m a.s.l. Monthly average temperature varies between 0°C in January and 24°C in July (Soldavini 1977, Rossetti and Ottone 1979).

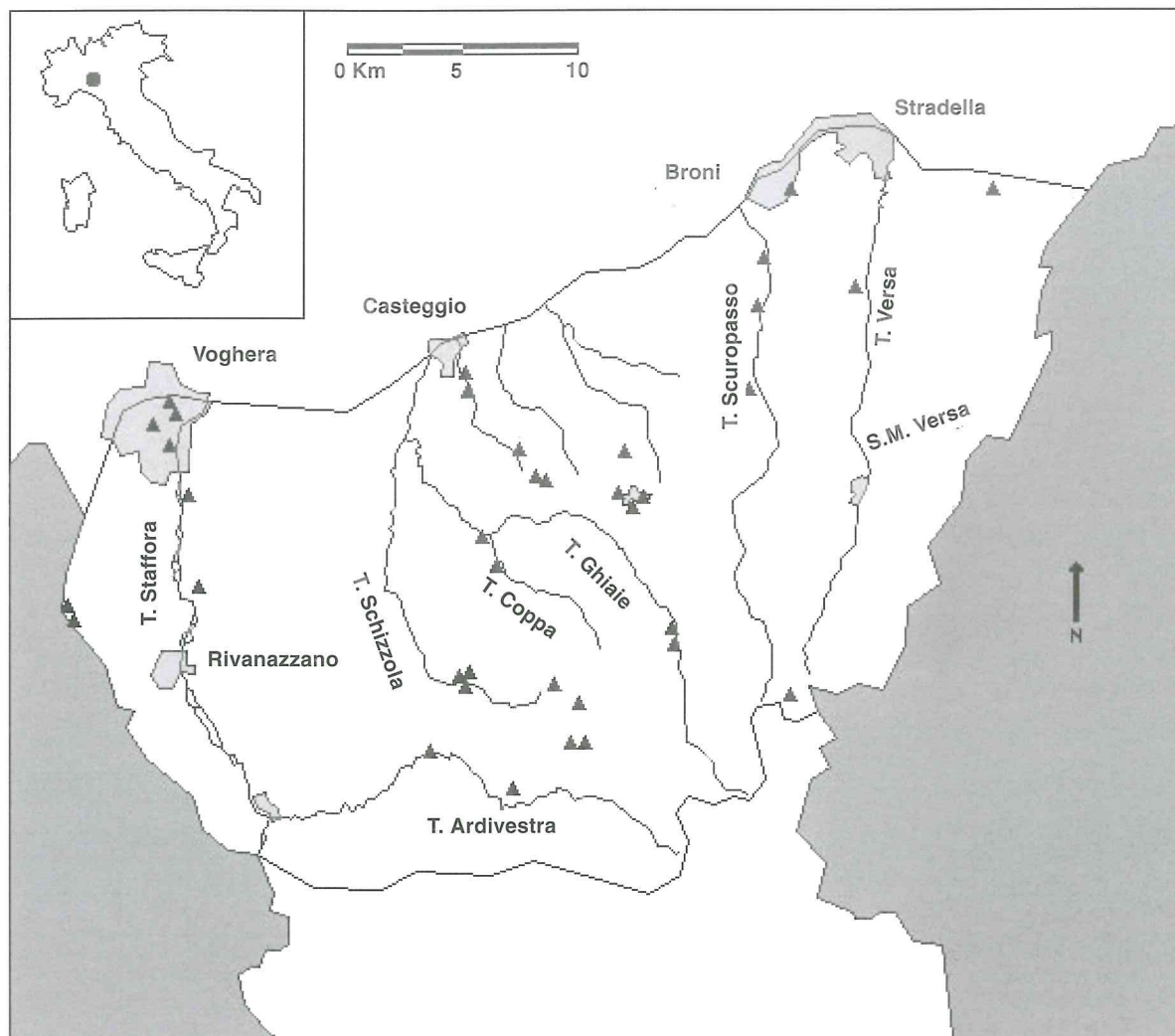


Fig. 1. Distribution of the Scops Owl territories represented by triangles in 1992.

Methods

In 1992 Scops Owls were censused extensively throughout the whole study area; in 1993 and 1994 owl surveys were limited to areas with the highest population densities (i.e. surroundings of Voghera, Valleys of rivers Coppa, Schizzola, Ghiaie and Ardivestra). We established a network of route-transects (varying from 5 to 15 km in length) covering the whole study area, on which we fixed a mean of 12 broadcasting-spots (range 5-19). The distance between two consecutive spots varied according to the habitat structure: 100-200 m in urban areas, 800-1000 m in open farmland and 500-700 m in woodlands and hilly areas. Census-transects were carried out from April 4th 1992 to June 10th 1994, and between 19.00 hrs and 3.00 hrs and lasted on aver-

age 4.30 hrs. Each route-transect was surveyed by car 3-5 times per year (\bar{x} = 4.13, SD=1.23, range 1-8); areas not accessible by car were checked for owls on foot. We elicited vocal responses from Scops Owls by using the playback of tape-recorded territorial songs of conspecific males (Falls 1981, Johnson *et al.* 1981, Fuller and Moser 1981, Galeotti 1990b). For playbacks we used tapes of males that had been recorded in the study area in the previous years; owl calls were broadcast from an AIWA HS-JS215 tape-recorder with an amplified loudspeaker (5 watt) located on the top of the car. At each spot, we played a series of owl calls, arranged in the following sequence: check for spontaneous song: 1 minute; first playback: 2 minutes; first check-listening: 1 minute; second playback: 1 minute and second check-listening: 1 minute.

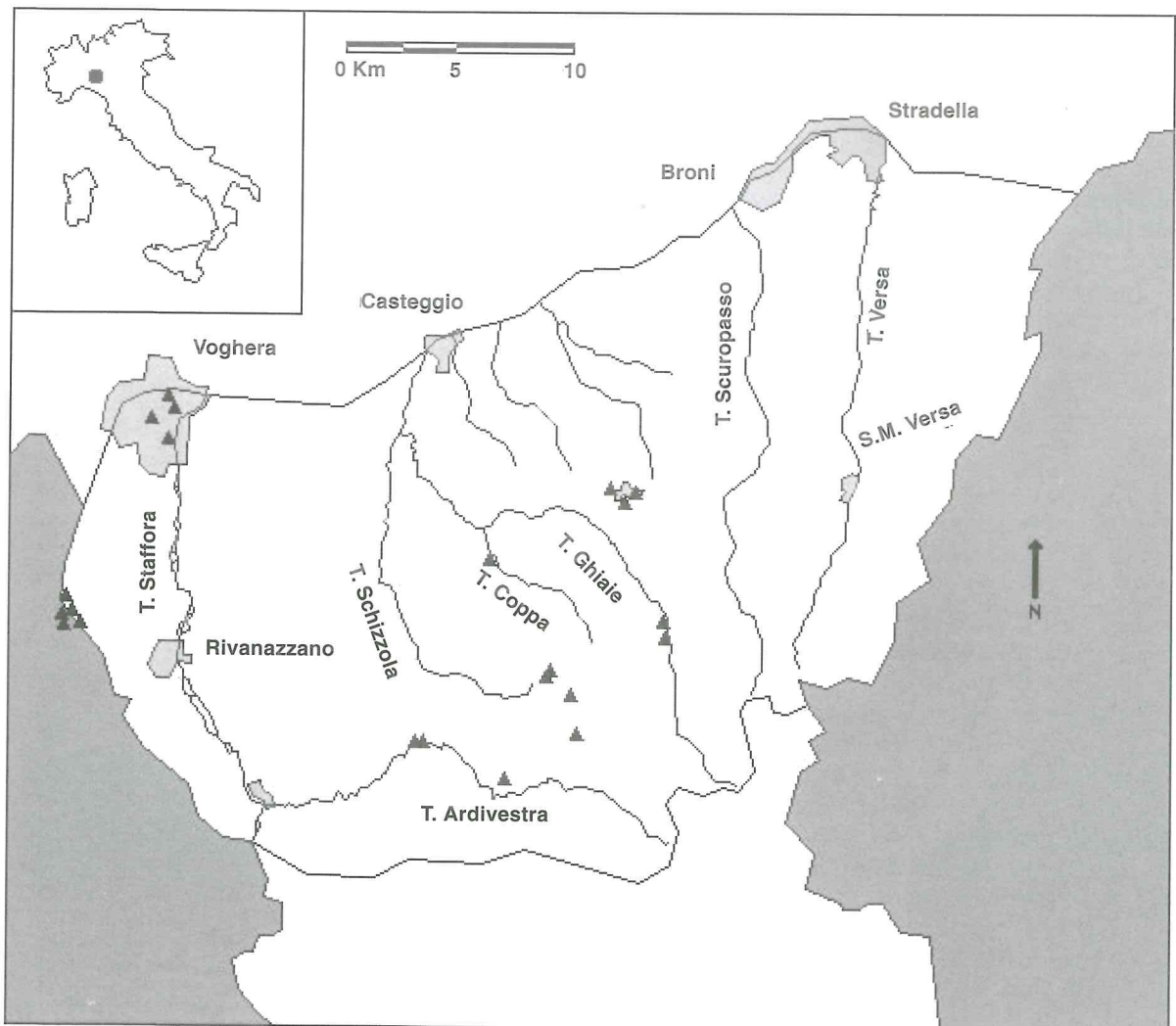


Fig. 2. Distribution of the Scops Owl territories represented by triangles in 1993.

For each response we recorded the number of responding owls, latency of response from the first playback, weather condition and moon phase. Owl position were reported accurately on a 1:25,000 map. All males were recorded to distinguish different individual males by spectrographic analysis (Galeotti and Pavan 1991). Overall, we performed 1060 playbacks during 107 surveys, with a total census effort of c.a. 150 hrs of observation. Analysis of response rate was based on 830 out of the 1060 trials performed during the survey, since we excluded repeated playbacks to the same owl in the same night.

We considered a territory to be stable when the owner responded to 3 playbacks at fortnightly intervals (Blondel 1969).

Results

Density, distribution and demographic trend of Scops Owl population

In 1992, a total of 37 pair-territories were found for an average population density of 0.08 terr./Km² (8 territories over 100 Km², range: 0.03 terr/ Km², Valley Versa – 0.2 terr/ Km², Valley Ghiaia). Scops Owls were indeed absent in the Staffora valley and in most parts of the Versa and Scuropasso valleys (Fig. 1). Moreover, the territories were not regularly distributed in the study area, but they concentrated in two districts: the town of Voghera (8 territories) and the central part of the hilly area (Valleys Coppa, Schizzola, Ghiaie and Ardivestra, 20 territories).

In 1993 we observed a dramatic decline in the Scops

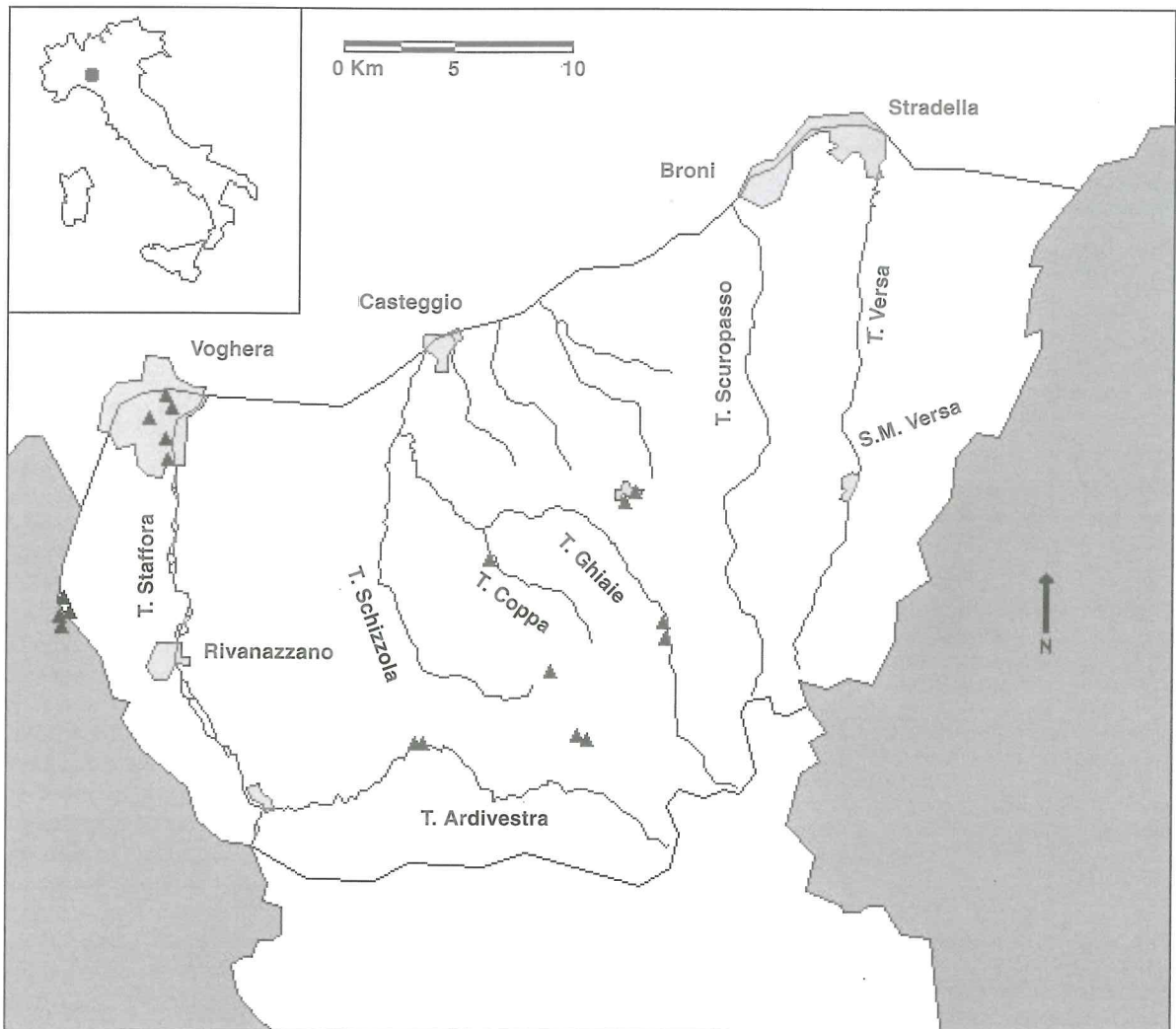


Fig. 3. Distribution of the Scops Owl territories represented by triangles in 1994.

Owl population, since 21.4% (n=6) of territories were not re-occupied (Fig. 2). The hilly population lost 7 territories (-35%), but the lowland population gained 1 territory (+12.5%). The negative trend of the hilly population was confirmed in 1994 since 3 other territories were lost, while the lowland population remained stable compared to the first year of the study (Fig. 3).

In 1993, 77.3% of territories (17 out of 22) were re-occupied by Scops Owls, and in 1994 this value increased to 89.5% (17 territories out of 19). Moreover, 13 territories were consistently defended over the whole study period. New settlements were conversely scarce: 5 in 1993 (3 in the lowland population and 2 in the hilly population) and only 2 in 1994 (one for each population).

Territorial behaviour and response rate

Both members of a pair responded to playbacks with a typical vocal display; females responded at the same

time or soon after males. Normally, owls sang from fixed perches, located on dense foliage of older trees inside the territory. Some individuals did not give vocal response, but flew over or around the loudspeaker and remained nearby for several minutes without singing.

Vocal display could be associated to other different patterns of territorial defence behaviour. In March-April, male Scops Owls called along territorial boundaries from up to five preferred perches, switching from one to another in a regular sequence.

Co-operative defence plays an important role in this species (Galeotti *et al.* 1997): pairs frequently sang in duet, male and female giving antiphonal song, but not perfectly synchronous, as reported by some authors (Koenig 1973, Wan der Weijden 1975).

Overall, the Scops Owl response rate to the playback (number of responses/number of playbacks) was 53.3% (442 responses to 830 playbacks); 76.1% of owls responded within 3 minutes from the start of playback, and 88.2% within 5 minutes. This suggests

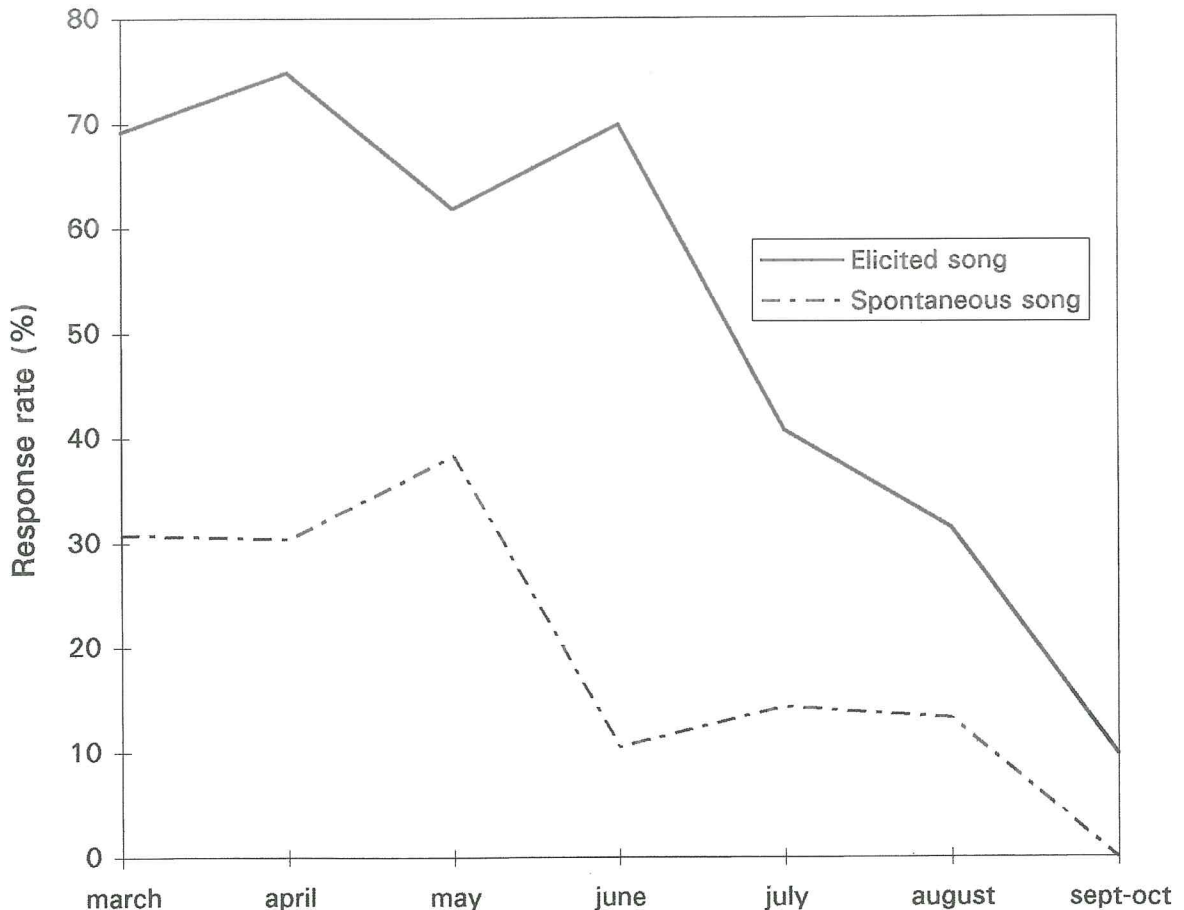


Fig. 4. Response rate and spontaneous song in relation to breeding season. (Cumulative data from three years of the survey).

that longer times of stimulation does not greatly improve census success.

The response rate varied according to a seasonal pattern (Fig.4), reaching a maximum during spring (March-May), when response rate was 70%, and strongly decreasing in autumn (September-October) when Scops Owl response rate was only 15%. The difference was highly significant ($\chi^2=123.0$, d.f. = 6, $P<0.000$), and this pattern was confirmed in all years of the study. Spontaneous song activity followed the same trend observed for elicited song activity, varying from a maximum in spring (34.7% of owls sang spontaneously between March and May), declining during summer and completely disappearing in autumn. In this case also differences in singing activity were highly significant ($\chi^2=81.9$, d.f.=5, $P<0.000$).

Discussion

The Scops Owl population of the Oltrepò Pavese is scarce and most owl territories are presently isolated. The overall density found in the Oltrepò is the lowest value reported for central and southern Europe: ex-Yugoslavia: 10 males over 2 ha (Cramp 1985), Tirol: 5 pairs/ha (Glutz and Bauer 1980), South France: 5 terr./Km² (Glutz and Bauer 1980), Port-Cros (F): from 1.8 to 4.6 pairs/Km² (Bavoux *et al.* 1991), Val Rosandra (I): from 2.4 to 3.2 terr./Km² (Galeotti and Gariboldi 1994). However, Scops Owls are irregularly distributed throughout our study area, since large areas (such as the Staffora Valley) are completely deserted by owls, whereas other areas, in which Scops Owl territories concentrated, support densities most similar to those observed in Europe (Voghera: 5 territories over 3 Km²; farmland areas close to Voghera: 5 territories over 4 Km²). Unfortunately, the species is rapidly declining in the hilly area, since 10 territories disappeared during the study and only 3 (2 in 1993 and only 1 in 1994) were new settlements. Therefore, population recruitment did not compensate for territory losses in the hilly area. The main factor responsible for this decline was probably the rapid development of intensive vineyards since Scops Owls avoided this habitat in our study area (E.Perani, unpubl. data). The lowland population, concentrated in the town of Voghera, remained substantially stable during the three years of survey. Therefore, urban areas appeared to function as refuges because of the absence of pesticides and the abundance of parks, gardens, tree-lines and buildings, which provide food and suitable nest-sites (the Scops Owl nests in tree cavities and in buildings, Sacchi *et al.* 1997, Perani *et al.* 1997).

In any case, the negative trend results in a strong fragmentation of the Scops Owl population which may increase the risk of breeding isolation up to local extin-

tion. A similar trend was reported for the Rhône Valley (Valais Central, Switzerland) where the local extinction of the Scops Owls was intensively monitored between 1930 and 1988 (Arlettaz *et al.* 1991). The intensification of agriculture in the valley bottom and the swift development of vineyards on the valley slopes were responsible for the decline only in the first stage of the survey (1930-1980). During this period, the decrease in density was directly related to the fragmentation of suitable habitats, involving isolation of individuals into small breeding groups. Nevertheless other unknown factors intrinsic to population dynamics play a role in the general decrease of European Scops Owl populations.

Scops Owls defend their territories by singing; song informs conspecifics about individual presence and the risk of being attacked by territorial owners (Galeotti *et al.* 1997). Song activity (either stimulated or spontaneous) varied according to season, reaching the maximum intensity soon after the owl's arrival in the breeding territories, and strongly declining in early September, just before the migration towards wintering quarters. The strong seasonal effect on responses to playback may be due to the breeding cycle of the Scops Owl. Thus, Scops Owls concentrated territorial marking and defence early in their stay in the study area (March to May) and thereafter reduced territorial behaviour during summer and autumn, when they were engaged in parental care (June to August).

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Riassunto - Nel triennio 1992-1994 è stata censita, utilizzando il metodo del playback, la popolazione di Assiolo (*Otus scops*) presente nella prima fascia collinare dell'Oltrepò Pavese (PV-Italia Settentrionale). Su di una superficie di 448 Km² sono stati individuati, nel primo anno di indagine, 37 territori stabili per una densità media di 0.08 terr./Km². Gli animali non erano distribuiti in modo uniforme ma si concentravano in due nuclei principali intorno alla città di Voghera e nella zona centrale della fascia collinare. Nel 1993 è stato osservato un drastico decremento della popolazione con la scomparsa del 21.4% (n=6) dei territori presenti; questo decremento è stato confermato nel 1994 con un ulteriore calo del 13.2% (n=3) e una diminuzione complessiva rispetto al primo anno di indagine del 32.1% (n=9). Le cause di questo decremento sono verosimilmente da attribuire all'industrializzazione e all'espansione della coltura della vite che riduce i siti di nidificazione e le disponibilità trofiche per l'Assiolo.

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