

ORNITOLOGIA**Phenology of a selected bird community in the Besòs river (NE Spain)**Xavier Larruy ¹, David Perpiñán ²**ABSTRACT**

Annual phenology of birds in riverside Mediterranean environments has been scarcely described. The present study aims to contribute to a better understanding of the intrannual variations of abundance of birds in a Mediterranean river. Phenology of 12 species of birds was studied in the Besòs river (NE Spain) by weekly lineal censuses in two different years (1999 and 2002). The years of study belonged to a period of time where the river underwent major transformation and the water quality began a gradual improvement. The Black-winged Stilt (*Himantopus himantopus*) was classified as a post-breeding migrant. The Reed Warbler (*Acrocephalus scirpaceus*) was classified mainly as a post-breeding migrant, but a few pairs bred in 2002. The Meadow Pipit (*Anthus pratensis*), the Grey Wagtail (*Motacilla cinerea*), the Bluethroat (*Luscinia svecica*), and the Reed Bunting (*Emberiza schoeniclus*) were classified as wintering species. The Common Sandpiper (*Actitis hypoleucos*) was a wintering species with an important population of pre and post-breeding migrants. The Little-ringed Plover (*Charadrius dubius*) and the Fan-tailed Warbler (*Cisticola juncidis*) were mainly recorded during the breeding season and migratory periods. The White Wagtail (*Motacilla alba*), the Cetti's Warbler (*Cettia cetti*) and the House Sparrow (*Passer domesticus*) were found all year round.

Keywords: avian, Barcelona, Catalonia, census, density, riparian, urban.

RESUM

La fenologia anual d'aus en ambients de ribera de rius mediterranis s'ha descrit escassament. Aquest estudi pretén oferir informació exhaustiva sobre les variacions anuals de l'ornitofauna d'un riu mediterrani. Es va estudiar la fenologia de 12 espècies d'aus al riu Besòs (NE d'Espanya) mitjançant censos lineals en dos anys diferents (1999 i 2002). Els anys d'estudi pertanyen a un període de temps on el riu va patir una transformació significativa i la qualitat de l'aigua va començar a millorar. El Cames llargues (*Himan-*

¹C/Santapau 32, Entresòl 1^a, Barcelona 08016, Spain. Correu elec.: xavilarruy@gmail.com

²C/Balmes 17, Baixos, Badalona 08918, Spain. Correu elec.: info@davidperpinan.com

topus himantopus) es va classificar com a migrador postnupcial. La Boscarla de canyar (*Acrocephalus scirpaceus*) es va classificar principalment com a migrador postnupcial, però una petita població va nidificar el 2002. La Titella (*Anthus pratensis*), la Cuereta torrentera (*Motacilla cinerea*), la Cotxa blava (*Luscinia svecica*) i el Repicatalons (*Emberiza schoeniclus*) es van classificar com espècies hivernants. La Xivitona (*Actitis hypoleucos*) es va classificar com una espècie hivernant amb una població elevada de migradors pre i postnupcials. El Corriol petit (*Charadrius dubius*) i el Trist (*Cisticola juncidis*) es van observar majoritàriament durant l'estació reproductiva i durant els seus períodes migratoris. La Cuereta blanca (*Motacilla alba*), el Rossinyol bord (*Cettia cetti*) i el Pardal comú (*Passer domesticus*) es van observar durant tot l'any.

Paraules clau: Aus, Barcelona, Catalunya, censos, densitat, riparis, urbans.

1. INTRODUCTION

The Besòs basin covers an area of 1038 km² in the central coastal region of Catalonia (NE Spain) near the city of Barcelona (Figure 1). The total length of its rivers and tributaries is 182 km, and therefore it is considered a short basin (PUCHADES 1948). Most of its rivers and streams finally flow into the Besòs river, which has a length of 17.7 km from its source to its mouth in the Mediterranean Sea (PUCHADES 1948). A river flow of 4.3 m³/s is maintained in summer due to artificial contributions from other basins, and this fact hides the normal summer hydrological regime of a Mediterranean river, characterized by strong depletion of water discharge (PRAT et al. 2000b). On the other hand, torrential rains, together with marked slopes in the headwaters and strong urbanization of its surroun-

dings, produce episodes of heavy floods, especially during the autumn. The river forms a delta with sediment deposition along 10 km length after passing the Marina and Collserola mountains (PUCHADES 1948).

The Besòs river suffered an extreme process of degradation and pollution during the second half of the 20th century (PUCHADES 1948, FONT et al. 1995). The river channel was reduced to 5-10 m width and canalized in half of its length with concrete or granite blocks. The flooding zone was also limited by high concrete or granite walls, with urbanization outside, particularly in the last 10 km of river. The space between walls (about 140 m) is now occupied by the river channel and river banks of ruderal vegetation. Only the first 5 km of ri-

ver posses some areas of riparian forest, but the historic marsh area of the delta (the last 10 km of river) is now occupied by the metropolitan area of Barcelona. The water was considered extremely polluted during the second half of the 20th century, with high levels of ammonia, low levels of oxygen, high degree of eutrofization and absence of macroinvertebrates (PRAT et al. 1996, MUNNÉ et

al. 1998, PRAT et al. 1999). However, a slight improvement started in 1998, and macroinvertebrates (chironomids) became progressively abundant (PRAT et al. 2000a, PRAT et al. 2001). Also by 1998 major work began in the river in order to create a park (Parc Fluvial del Besòs) that included a natural area (included in the study) and a recreational area (excluded from the study).



Figure 1: Map showing the area of study (square) in NE Spain

Studies on bird phenology in coastal Mediterranean rivers are scarce (e.g. CORDERO-TAPIA & LÓPEZ DE VILAR 1985). In Catalonia, most published data on birds of Mediterranean rivers are dispersed and included within articles or books (e.g. RIBAS 2000) or have not

been obtained throughout the year (e.g. ESTRADA et al. 2004). The present study reports phenological patterns of 12 species of birds inhabiting the Besòs river using data obtained from weekly visual censuses during the years 1999 and 2002.

2. MATERIAL AND METHODS

2.1 Study area

The study was carried out in 3.55 km of Besòs river (UTM x=4322 y=4592 41.458329, 2.190528; Catalonia, NE Spain), between the mouth of the Ripoll river and a point located at 6 km from the mouth of the Besòs river in the Mediterranean sea. The area of study had a slope of 2-4‰ (PUCHADES 1948).

The river channel (or main channel) was canalized with granite blocks in some areas, while others maintained beaches of boulders. Meanders were scarce (Figure 2). The riparian banks (or flooding zone) were also limited by 4 m height concrete walls. The area was surrounded by the cities of Montcada i Reixac and Santa Coloma de Gramenet, within the metropolitan area of Barcelona (Figure 3).



Figure 2: Besòs river in the area of study. Canalized river channel, scarcity of meanders and concrete walls delimiting the flooding zone may be seen.

2.2 Vegetation

No trees were present in the area of study, and compaction and nitrophilia of the soil facilitated the presence of weed and ruderal vegetation (*Rudero-*

Secalietea community). Most abundant genera were *Alyssum*, *Chenopodium*, *Parietaria*, *Urtica*, *Bromus*, *Conium*, *Cynodon* and *Oryzopsis*. Plantations with forage species such as *Medicago*

sp. and *Melilotus* sp. were performed in 1999. In addition, artificial areas of reedbeds were also constructed for wastewater treatment. These reedbeds represented a nearly monospecific population of *Phragmites australis*, with scarce *Typha* sp. and *Iris* sp. One section of the study area (section 4) did not ha-

ve artificial reedbeds and had a significant population of *Silybum* sp., *Carduus* sp. and *Arundo* sp. Reedbeds were cut in during the winter season to obtain a better growth in the summer months. Floods occurred in the autumns of 1999 and 2002.



Figure 3: Besòs river in the area of study. A: artificial area with grown reedbed. B: artificial area with reedbeds recently planted. C: concrete wall delimiting the flooding zone. D: city of Montcada i Reixac. Arrow: river channel

2.3 Methodology

Total length was divided into 4 sections of 1.1, 0.9, 0.8 and 0.75 km in order to mirror the sections defined in the construction planning. Section 4 inclu-

ded the mouth of the Ripoll river and had extensive beaches of boulders. Lineal transects were performed weekly in 1999 and 2002. Transects started half an hour after sunrise and were performed upstream to avoid direct sun, at

a constant rate speed of 1 km/h. Binoculars were used and all birds detected between the concrete walls delimiting the flooding zone were counted. The total number of field journeys (104) was divided randomly and performed equally by both authors. Twelve species were selected for this study prioritizing those that occupied the river regularly and significantly, particularly the riparian ones. For each species, density (individuals/lineal km) was plotted in a chart for every week of the year and for both years (1999 and 2002).

Black-winged Stilt (*Himantopus himantopus*). Individuals were detected only during the summer, but reproduction did not occur (Figure 4). The origin of these birds was unknown, but at least some of them were families arrived from outside the Besòs basin with fledged chicks that needed to complete their development. Similar summer concentrations have also been reported in other Catalanian Mediterranean rivers and marshes (COPETE 1998, COPETE 2000) and may be related to the increase in the breeding population in Catalonia (ESTRADA et al. 2004).

3. RESULTS & DISCUSSION

Himantopus himantopus

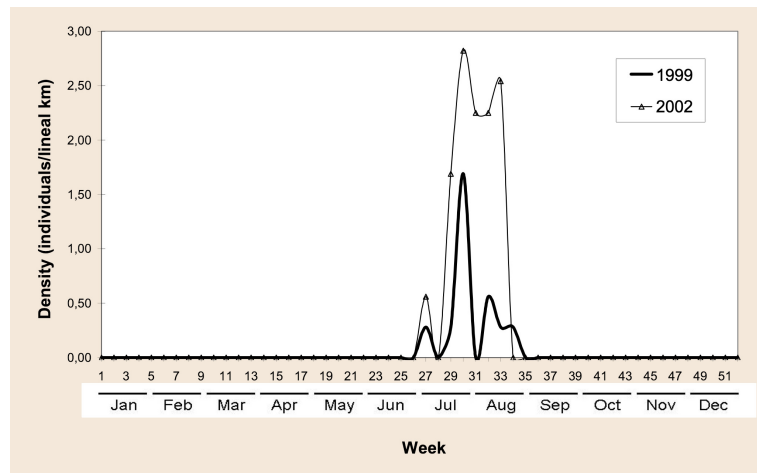


Figure 4: Phenology of the Black-winged Stilt (*Himantopus himantopus*) in the Besòs river.

In the case of the Besòs river, the gradual improvement of water quality may have also had a positive impact for Black-winged Stilts. Individuals were found in small groups (generally less than 10 individuals), which agree-

es with CRAMP AND SIMMONS (1983), who reported that Black-winged Stilts were gregarious and generally formed small groups outside the breeding season. The present study provided the first post-breeding records for the Besòs basin (with the exception of the river mouth) (RIBAS 2000); the species became progressively more abundant after

1999, in accordance to the increase in the Catalanian population.

Charadrius dubius

Little-ringed Plover (*Charadrius dubius*). Individuals were detected during the whole summer season and in both pre and post-migratory periods, with some individuals wintering in 1999 (Figure 5).

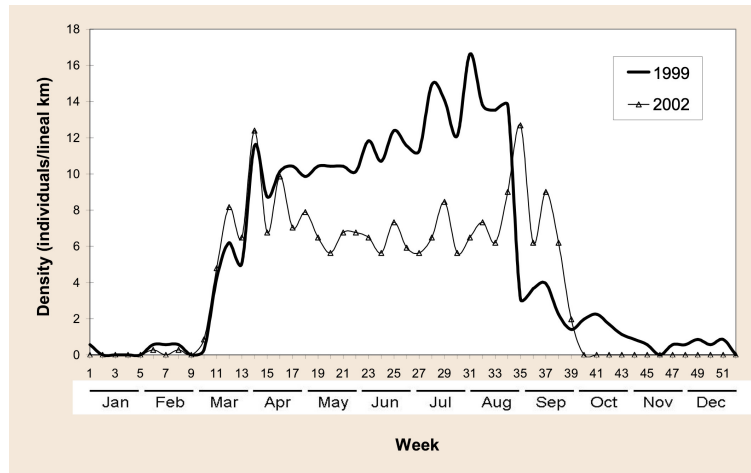


Figure 5: Phenology of the Little-ringed Plover (*Charadrius dubius*) in the Besòs river.

The phenology is therefore similar to what has been reported in other Mediterranean areas, with spring migration between late February and early May, and post-breeding migration between the second half of July and late October, with an August peak and only some individuals left after mid September (COPETE 2001, CRAMP AND SIMMONS 1983, RIBAS 2000). Breeding densities varied between years, most

likely due to differences in vegetation cover. Density recorded in the studied area (3-6 pairs/lineal km) was higher than that for the whole Besòs river (2.5 pairs/lineal km) (RIBAS 2000). Wintering individuals have been a scarce, irregular and local phenomenon in Catalonia (COPETE 1998) and have also been reported in other areas of the Besòs river basin (PERPIÑÁN & LARRUY 2003, RIBAS 2000).

Actitis hypoleucos

Common Sandpiper (*Actitis hypoleucos*). Individuals were detected during winter and in the pre and post-migratory period, with peaks of spring migration in late April and May, and peaks of post-breeding migration in July-September (Figure 6). Despite not breeding in the area, Common Sandpipers were commonly seen in all months except for June, and the species was not generally detected during the last 10 days of May and the first 20 days of June; however, a few records have been provided for those dates in the Besòs basin (SALES 2006). Therefore, the sim-

ple observation of individuals without the visualization of nests or chicks is not an appropriate technique to determine reproductive status at this latitude, as overlapping may exist between individuals undergoing spring migration and individuals undergoing post-breeding migration. This agrees with CRAMP & SIMMONS (1983), who reported that migrant dates can overlap with breeding dates in this species. In addition, territorial and courtship displays can be seen in migrant birds (CRAMP AND SIMMONS 1983), but such displays were not detected in the area and years of study.

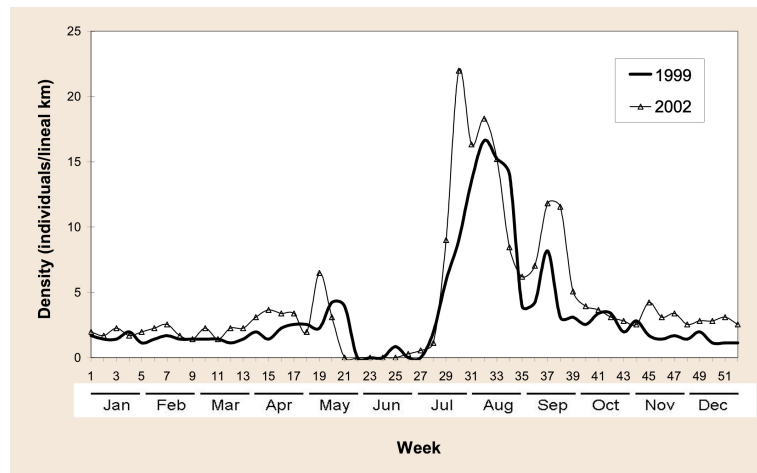


Figure 6: Phenology of the Common Sandpiper (*Actitis hypoleucos*) in the Besòs river.

The Common Sandpiper shows differential migration, with adults migrating before juveniles, which produces two peaks of migration (BALMORI 2003). In

Spain, those peaks have been reported in late July to early August (adults) and in late August to early September (juveniles) (BALMORI 2003, GALARZA

1984). However, other studies have reported three peaks of migration, the first one formed by adults, the second one formed by adults and juveniles and the third one formed just by juveniles (MEISSNER 1996, MITRUS et al. 1998). In the present study, two clearly distinct peaks were observed during the post-breeding migration, which is consistent with the dates reported by BALMORI (2003) and GALARZA (1984). An additional peak could be detected in 2002,

but this peak could not be confirmed nor ruled out for 1999; this peak of 2002 occurred in August (immediately after the first peak) and could represent the third peak reported by MEISSNER (1996) and MITRUS et al. (1998).

Anthus pratensis

Meadow Pipit (*Anthus pratensis*). Individuals were present during the winter, with high densities occurring between November and February (Figure 7).

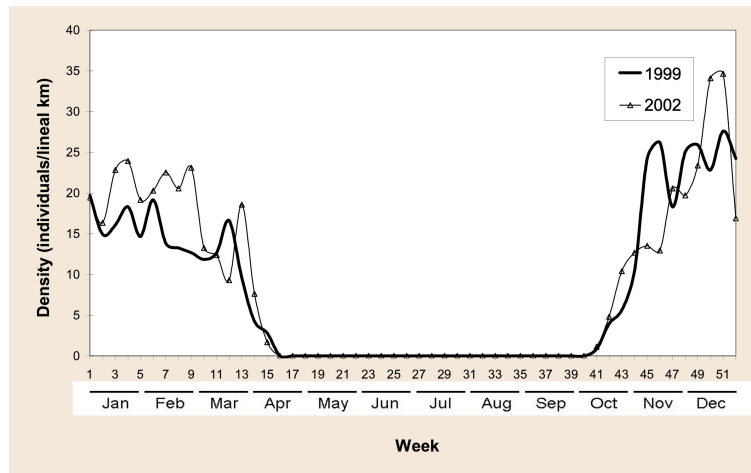


Figure 7: Phenology of the Meadow Pipit (*Anthus pratensis*) in the Besòs river.

In the study area, the presence of open and degraded margins with low vegetation cover during the winter facilitated the presence of this species. Overlapping of migrant and wintering birds precluded the assessment of migratory dynamics, which was also reported by RIBAS (2000). In the Besòs river, Meadow Pipits began to arrive in the first

third of October and the last birds were usually seen in mid April, which is consistent with the pattern observed in other areas of Catalonia (COPETE 1998, RIBAS 2000).

Motacilla cinerea

Grey Wagtail (*Motacilla cinerea*). Individuals were observed during the win-

ter, between September and April, with the exception of two individuals on June 15th and one individual on June 21st, both observation from 1999 (Figure 8). No breeding was observed during the study period, probably due to the open margins lacking trees and bushes and the insufficient water quality, conditions that were also more favourable to the White Wagtail, a species that competes and usually excludes the Grey Wagtail (RIBAS 2000). Migratory pattern in the study area was similar to that described

in other areas of Spain (PÉREZ-TRIS and ASENSIO 1997, RIBAS 2000), with autumn migration between September and mid November. The isolated observations of June 1999 might correspond to dispersive individuals, as RIBAS (2000) noted that the species breeds in the upper Besòs basin and dispersive individuals can be seen from June to September; in addition, some pairs breeding in small tributaries that dry up during the warmer months also move to other areas during summer.

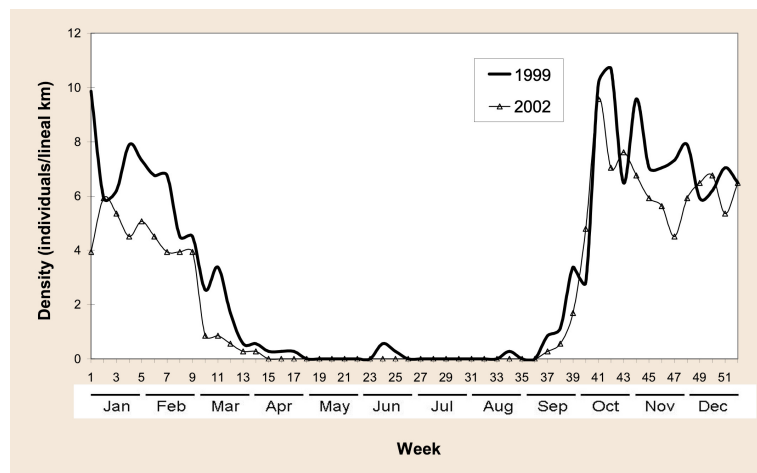


Figure 8: Phenology of the Grey Wagtail (*Motacilla cinerea*) in the Besòs river.

Motacilla alba

White Wagtail (*Motacilla alba*). The species was detected all year round with increased numbers in winter (Figure 9). This phenological pattern is consistent with previous studies in Catalonia (RIBAS 2000) and in Spain (PÉREZ TRIS and ASENSIO 1997), with a se-

condary breeding population and increasing numbers of individuals from June onwards due to dispersing juveniles and from late September onwards due to migrants. The increased population due to wintering birds is very important in the Besòs river and surrounding areas (RIBAS 2000).

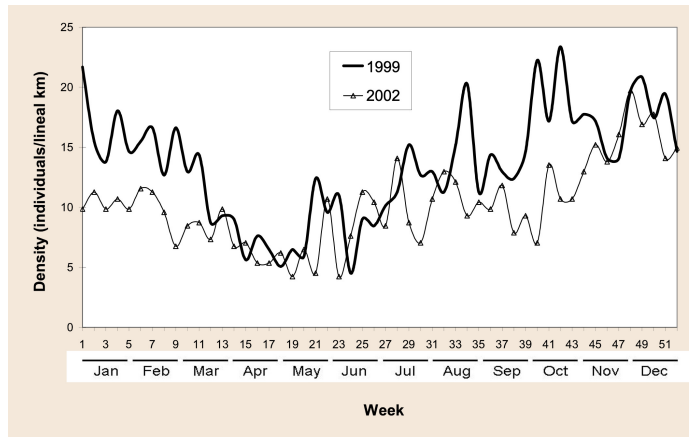


Figure 9: Phenology of the White Wagtail (*Motacilla alba*) in the Besòs river.

Luscinia svecica

Bluethroat (*Luscinia svecica*). Individuals were detected scarcely during the winter, between mid August and late March (Figure 10). Wintering Blueth-

roats have been scarcely reported in catalan rivers (HERRANDO et al. 2011), and the observations from the present study are the first records in the Besòs basin (RIBAS 2000).

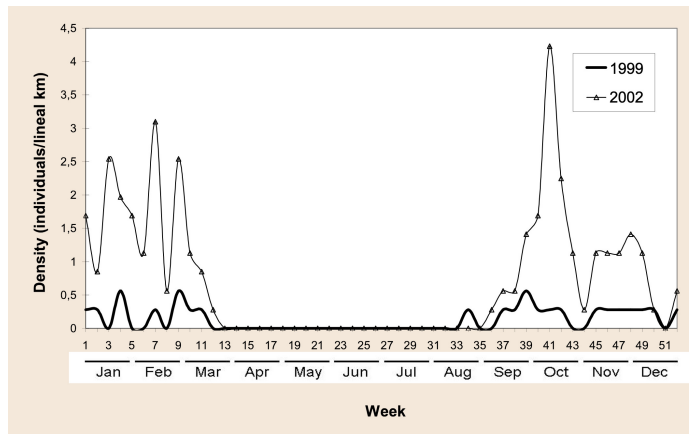


Figure 10: Phenology of the Bluethroat (*Luscinia svecica*) in the Besòs river.

Cettia cetti

Cetti's Warbler (*Cettia cetti*). The species was detected all year round with increased numbers in winter, from Sep-

tember to March (Figure 11). However, the species was not detected from the study area in May-June 1999 probably due to the lack of vegetation cover suita-

ble for reproduction. VILLARÁN (2000) reported that wintering individuals in another location within the Iberian Pe-

ninsula were mostly females that moved to wetlands, with a more favourable microclima.

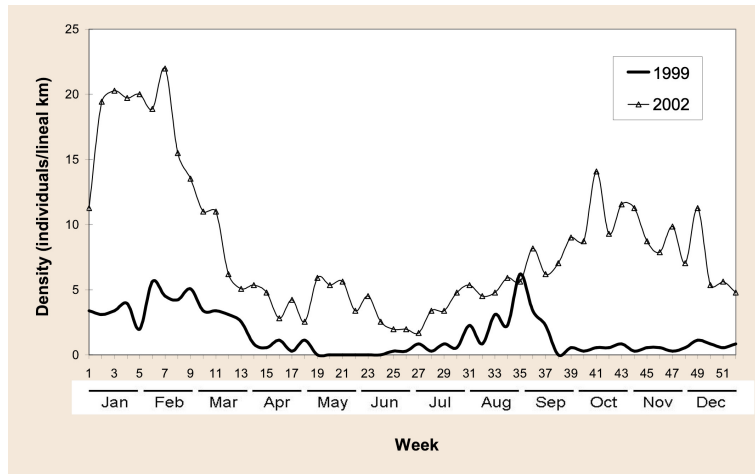


Figure 11: Phenology of the Cetti's Warbler (*Cettia cetti*) in the Besòs river.

Cisticola juncidis

Fan-tail Warbler (*Cisticola juncidis*). This species was detected all year round, although most individuals left the area of study during the winter (Figure 12). The species is considered mainly sedentary in the Iberian Peninsula, but local movements occur (e.g. from inland to coastal areas) and some populations are more widely dispersive (DE JUANA & GARCIA 2015). In Catalonia, movements caused by climatological and trophic factors have been reported (e.g. AYMERICH & SANTANDREU 1998), resulting in a more restricted distribution during the winter, when the species occupies mainly

lowland (below 300 m) riverine and marshy vegetated areas (HERRANDO et al. 2011) with access to insects that keep wintering activity (SENAR & BORRÀS 2004). These abundance and distributional patterns do not agree with the present study, where the lowest abundance was obtained in winter despite the characteristics of the study area; reed harvesting, floods, temperature, loss of vegetation cover and the associated decrease in invertebrate abundance may have played a role. RIBAS (2000) reported that changes in vegetation and mortality during very cold winters had a significant negative influence in the populations of fan-tail warblers in an area of Catalonia close to the Besòs river.

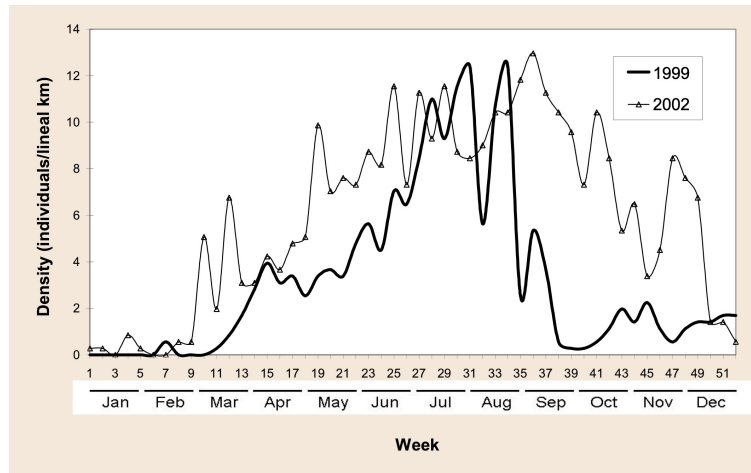


Figure 12: Phenology of the Fan-tail Warbler (*Cisticola juncidis*) in the Besòs river.

Acrocephalus scirpaceus

Reed Warbler (*Acrocephalus scirpaceus*). This species was observed during the post-breeding migration, although the proper development of reedbeds in 2002 favoured the establishment of a breeding population (Figure 13). The Reed Warbler is a local and scarce breeding species in the Besòs basin (RIBAS 2000), but plantation of reedbeds for the tertiary depuration of water in the area of study has provided a good habitat for the species (PERPIÑÁN & LARRUY 2003, PERPIÑÁN & LARRUY

2006). In the area of study, Reed Warblers are strongly associated with reed during the breeding season as 85% of the observations are made within reedbeds; however, the species is less selective during migration, when just 30% of the observations are made within reedbeds (PERPIÑÁN & LARRUY 2006). The phenological pattern in the area of study is consistent with RIBAS (2000), who reported that the species is significantly more abundant during the autumn migration than during the spring migration.

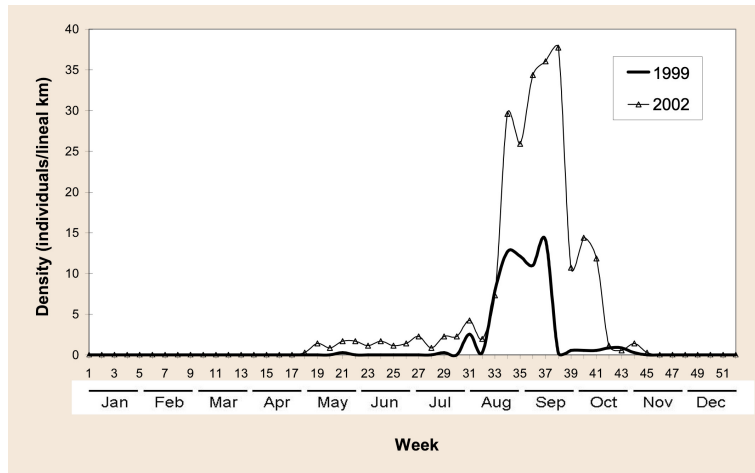


Figure 13: Phenology of the Reed Warbler (*Acrocephalus scirpaceus*) in the Besòs river.

Passer domesticus

House Sparrow (*Passer domesticus*). This species occurs throughout the year in the area of study and breeds in the holes of the walls that limit the river and in the surrounding urban are-

as (Figure 14). A significant part of the population abandons the area of study in winter, which is consistent with CRAMP & SIMMONS (1983), who reported short-distance autumnal movements as a result of dispersion and occupation of more urban habitats.

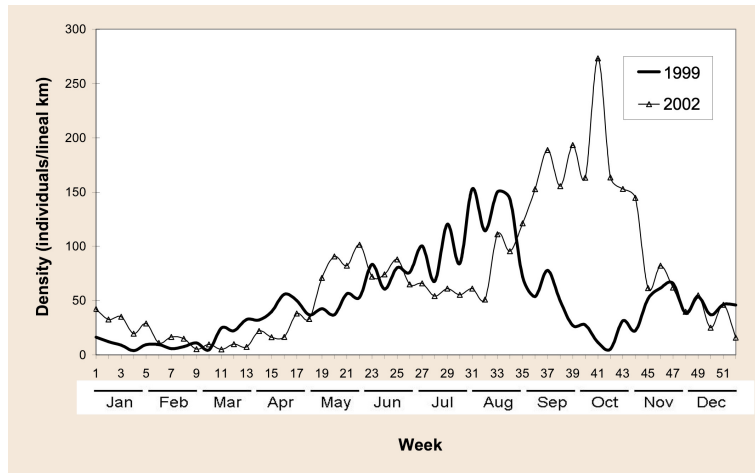


Figure 14: Phenology of the House Sparrow (*Passer domesticus*) in the Besòs river.

Density differences between years could not be completely explained, but growth of vegetation and production of seeds by those plants could have played a role; however, it cannot be ruled out the contribution of floods and human action (vegetation cuts).

Emberiza schoeniclus

Reed Bunting (*Emberiza schoeniclus*).

Individuals were detected during the winter of 2002 (Figure 15). The species was nearly absent in 1999 due to the poor development of vegetation. In the Besòs basin and surrounding areas the Reed Bunting is described as a wintering and migrating species (RIBAS 2000), which agrees with the results from the present study for 2002.

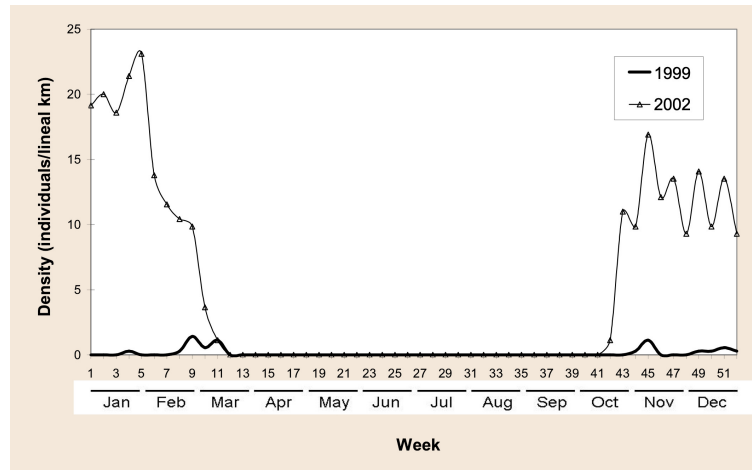


Figure 15: Phenology of the Reed Bunting (*Emberiza schoeniclus*) in the Besòs river.

4. OVERALL CONCLUSIONS

Important changes in the habitat occurred during the study period due to the normal evolution of the site (after major work done in 1998-1999), climatic conditions (floods and temperature) and human intervention (mainly reed cuts). These factors may have had a significant impact over the population of birds occupying the river. The growth of vegetation in 2002 compared to the

poor coverage in 1999 probably favoured Bluethroats, Cetti's Warblers, Fantail Warblers, Reed Warblers and Reed Buntings, species that are commonly associated with vegetation (CRAMP & SIMMONS 1983, RIBAS 2000). In particular, the significant increase of reed cover during 2002 had a strong positive correlation with the densities of Reed Warblers and Reed Buntings, although Reed Buntings seemed to have

also benefited from the growth of vegetation outside reedbeds, where they were detected with far more frequency than Reed Warblers. As reedbeds in the study area did not have superficial water, the association of both the Reed Warbler and the Reed Bunting with the study area was directly with reedbeds, but not with water. This indirect association with water has also been described by CRAMP & SIMMONS (1983) and ESTRADA et al. (2004). At the same time, the overall increase in vegetation cover had a negative effect on the population of Little Ringed Plovers and White Wagtails, as these species prefer open habitats (CRAMP & SIMMONS 1983, RIBAS 2000).

Sharp declines were seen in the population of some species after autumn floods. Particularly, a significant flood occurred in mid September 1999 which could have contributed to the sharp population declines (some of them temporary) seen in species such as the Reed Warbler, the Cetti's Warbler, the Fan-

tail Warbler or the House Sparrow. In addition, human intervention to keep reedbeds dry could have had a negative effect on the population of the Bluethroat, as this species was commonly detected associated with water.

Finally, temperature could have had an influence on the population of some birds during the winter 2001-2002, as a cold wave affected Catalonia in December 2001. In the study area, this could have increased the populations for that period of some species such as Reed Buntings and Cetti's Warblers.

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