

Census, phenology and habitat choice of Baillon's Crakes *Zapornia pusilla* in Navarre (N Spain)

Jesús Mari Lekuona, Alberto Artázcoz, José Luis Remón & José David Muñoz

Trends in the Baillon's Crane *Zapornia pusilla* population of 150 natural or naturalized wetlands and two areas of rice paddies in Navarre were analysed in the period 1998–2016. Most of the total potential habitat for the species was surveyed. Territorial calls were used to estimate the breeding population in the study area. Estimates of the number of breeding pairs were based on a combination of direct counts of birds and records of calls in April–October. Taped calls were used during periods in which birds are hardest to detect on their breeding grounds. In Navarre this species lives in wetlands with fresh or brackish, shallow or semi-permanent water, and short dense vegetation. The most appropriate breeding habitat for the species in Navarre consisted of flooded rush beds, with plant cover less than one meter high, that were not dominated by tall helophyte vegetation. Notable fluctuations in the breeding population were observed during the study period. The detected breeding population (maximum nine pairs in 1999 and 2000) was restricted to natural or naturalized wetlands in the first years of the study period. Subsequently, after seven years with no records of the species, nesting in rice paddies in the south of Navarre was confirmed in 2012. This recently detected population is small (1–4 breeding pairs). The species breeds earlier in natural or naturalized wetlands (April–July) than in rice-paddies (July–October).

Key words: Baillon's Crane, *Zapornia pusilla*, census, phenology, calls, Navarre.

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Received: 26.09.16; Accepted: 28.09.17 / Edited by P. Pons

The Rallidae family (Cramp 1980, Taylor 1996, Taylor & van Perlo 1998) consists of several species, well adapted to wetlands, whose biology is generally poorly known due to their extremely shy behaviour (Glahn 1974, Cramp & Simmons 1980, Chacón 1984, 1997). Several of these species are included in Annex I of the EU Birds Directive (79/409/EEC) given that their populations are threatened by habitat alteration and destruction (Eddelman *et al.* 1988, Blanco & González 1992, Koshelev 1994, Tucker & Evans 1997, Birdlife International 2000). In the case of Baillon's Crane *Zapornia pusilla*, available data is scarce and estimates of its European breeding population lie in the range 3,000–4,200 indivi-

duals (BirdLife International 2017). Its status in Spain is unclear due to the lack of accurate information, although a recent population decline has been detected (Dies & Dies 2003, Dies 2004), as in the rest of Europe. Therefore, it is important to estimate accurately the breeding and wintering populations of Baillon's Crane if we are to determine its current status and undertake compensatory actions to protect – if necessary – its habitats.

Baillon's Crane is a territorial species and is most active at dawn and dusk (Cramp 1980, Koshelev 1994), a pattern of behaviour that complicates any estimates of its abundance. In addition, males are largely silent after pair

formation takes place, 1–4 days after arrival on breeding grounds (Taylor & van Perlo 1998). It is a skulking species with, moreover, a varied repertoire of calls that is hard to learn (Hagemeijer & Blair 1997; J. D. Muñoz pers. obs.).

Of the six recognised subspecies of Baillon's Crake, *Z. p. intermedia* occurs in Spain. Although a trans-Saharan migrant, this crake has been recorded in winter in some wetlands along the Mediterranean coast and in the Guadalquivir marshes (Taylor & van Perlo 1998, García 2012; J. D. Muñoz pers. obs.), which suggests that some individuals may be resident and/or partial migrants (e.g. French breeders; Glutz von Blotzheim *et al.* 1973, Taylor & van Perlo 1998). The breeding population in Spain is very small (around 52 pairs) and is confined to a few sites, mainly located along the Ebro valley and in the Doñana area (Dies & Dies 2003).

The aims of this study were to improve knowledge of this poorly known species and, specifically, to 1) develop a methodology for accurately estimating its breeding population; 2) estimate the size of its breeding population in Navarre; 3) describe its breeding phenology in both natural and naturalized wetlands and rice paddies in Navarre; 4) characterize its breeding habitat; and 5) assess the importance of rice paddies for this species.

Material and methods

Study area

Altitudes in the province of Navarre (10,391 km²; N Iberian Peninsula; approximately 42–43° N and 0.9–2.5° E) range from less than 400 m a.s.l. in the centre and the south of the region, to 2,433 m a.s.l. in the Pyrenees in the north: in all, 40.6% of its total surface area lies above 600 m a.s.l. (source: Government of Navarre). Two principal climatic areas can be distinguished: wetter and colder (Atlantic) in the north and warmer and drier (Mediterranean) in the south and in the Ebro valley. There are over 190 wetlands scattered throughout the province (lagoons, ponds, wetlands associated with rivers and rice paddies, etc.) but only 20–25 of these sites possess vegetation cover that matches the requirements of Baillon's Crake (J. M. Lekuona, pers. obs.). Most of

these wetlands are natural lagoons, although naturalized ponds and rice paddies are also potential habitats for this crake.

Fieldwork in natural and naturalized wetlands

We visited all 150 natural wetlands included in the Navarre Breeding Waterbird Census (Figure 1) once in April–May (Lekuona 1999, 2000, 2001, 2002). Only those (20–25, depending on the year) with good potential habitat, as per descriptions in the literature, were then more fully surveyed for Baillon's Crake (Taylor & van Perlo 1998). Several volunteers were trained to search for the species before fieldwork began. In those wetlands where Baillon's Crake was detected on the first or second visit, weekly visits were subsequently carried out in April–August 1998–2016. Otherwise, no more visits were made. Consequently, every wetland was surveyed 2–10 times. Visits lasted from two hours before sunrise to three hours afterwards, and from one hour before sunset to one hour afterwards. Calling was recorded mainly at night (Taylor & van Perlo 1998; Nina Seifert, pers. comm.), although in the Guadalquivir marshes



Figure 1. Map of Navarre showing the locations of the wetlands in which Baillon's Crake occurred during the study period. The small figure locates Navarre within Spain.

Mapa de Navarra amb la localització de les zones humides amb presència de Rasquet europeu.

vocal activity has been recorded during the day in response to taped calls (J. D. Muñoz, pers. obs.). Every visit to the selected wetlands was carried out by a group of 2–4 people consisting of a combination of the three authors (JML, AA, JLR) and a variable number of trained volunteers (3–10). One observer carried a portable tape-recorder and a map of the area and the second one only a map (Glahn 1974, Hagemeyer & Blair 1997). Transects were carried out in marginal vegetation where census points were established every 100 meters (Blondel *et al.* 1970, Affre 1975, Chacón 1984, Hagemeyer & Blair 1997). At each census point, the two observers stood 10 m apart in order to triangulate any calls that were detected. The movement from one position to the following one was rapid to avoid any overestimation of bird numbers. Both members of the team marked on the maps all the point counts and the relative positions of the responses (taking into account the deviation from the north). Subsequently, combinations of positions established by triangulation enabled us to determine the exact positions of detected birds. In smaller wetlands (i.e. with lengths and widths under 200 meters) counts were carried out from a single slightly elevated (if possible) point. Although Taylor & van Perlo (1998) state that Baillon's Crake songs can be heard at 250 m in good conditions, our own empirical experience (J. D. Muñoz pers. obs.) with populations in southern Spain does not bear this out in most cases, and so shorter distances between census locations were established.

At every survey point, 20 minutes of passive listening were performed. Then, taped recordings of the male's call (30 seconds) were played if there were no spontaneous calls detected during the passive listening period. Censuses were not taken in the event of strong winds and/or rain. At every point, the taped recordings were only played five times, as this crake responds less well to taped calls than other rails (Koshelev 1994, Sackl *et al.* 2003; J. M. Lekuona & A. Artázcoz pers. obs.). The total time spent at every point was thus around 25 minutes. During every census, we recorded the following information: date, time, number and type of calls, number of birds observed, behaviour of birds (flying, feeding, chasing, walking) and water level. Three categories of water depth were established: 0–10 cm, 11–20 cm and >20 cm. Depths were estimated

using markers in still water. When a calling bird was detected, the following data were recorded: coordinates of the observer, approximate distance to the bird (meters), deviation to the north and habitat type.

The number of breeding pairs was estimated on the basis of the number of calling males after at least two censuses taken at approximately the same point. Two or more responses with other types of calls from the same point were taken to be evidence of a breeding pair until mid-July. Data for birds detected thereafter were used to study phenology as they could correspond to either local or migrant birds. Densities were calculated by dividing the number of birds detected by the total surface area of the potential habitat (excluding large areas of open water). Finally, data were transformed to calculate the number of breeding pairs or single birds per 10 ha.

Fieldwork in rice fields

After the discovery that crakes in Spain use rice paddies (J. D. Muñoz, pers. obs.), in 2012 we decided to expand our field surveys to the rice paddies around Arguedas and in 2016 to those around Figarol. Based on the timing of the flooding of rice fields and growth of the rice in Navarre, which is similar to the Guadalquivir marshes, and on the observations of Baillon's Crakes in rice paddies in the Guadalquivir marshes (J. D. Muñoz, pers. obs.), surveys were carried out in July–October at Arguedas and Figarol. At both sites, rice is planted in May. Plants are not fully grown until late June or early July and so the vegetation cover is neither dense nor tall enough for crakes until summer (J. D. Muñoz, pers. obs.). Usually, the rice harvest starts around mid-October and so birds probably leave the paddy fields before then. We did not search for birds later than mid-October.

Given that the survey area in the rice paddies was much larger than in natural or naturalized habitats, we employed a modified survey method. A 5-km line transect was driven at low speed (<30 km/h) once a week. Transects were conducted by two observers who detected calling or flushed birds (on both sides of the car). Only the main tracks were used. The car was stopped every 100 meters for passive counts and tape-luring, using the same method as deployed in the natural wetlands. A 50-m strip on both sides

of the line of advance was taken into account for the density calculations as no birds were observed or heard farther away. Distances were estimated using markers present in the paddies. The variables measured in wetlands were also used during the census in rice paddies. Water depth and plant height was measured using a tape measure at five random points in five paddies. All measurements in paddies fell into the first category of water depth (see previous section).

Phenology of Baillon's Crakes

To study the phenology of the species during the breeding season, we made the following assumptions during surveys: every calling event or other type of vocalization was regarded as an occurrence; more than two occurrences of individuals in, approximately, the same place in subsequent censuses were regarded as 'possible breeding'; birds carrying nesting material were noted as 'probable breeding'; and the observation of downy chicks or chicks with growing feathers were considered as 'confirmed breeding'. All observations were made with binoculars and field telescopes.

Habitat choice

The methodology used to assess and characterize habitats (Peralta *et al.* 2013) was based on phytosociological classifications (Braun-Blanquet 1957, 1979; Ursúa 1986, Biurrun 1999, Ursúa & Báscones 2000, García-Mijangos *et al.* 2004, Molina & Díez 2007). Habitats were described according to the associations of plant species (plant communities) found in the aforementioned references, and are named according to EU Council Directive 92/43/EEC (Table 3). The software package Arc Gis 9.0 was used to pinpoint every Baillon's Crake record and to overlay information about habitats. Surveys of habitat characteristics were performed outside the breeding season since habitats did not change between years, and so their characteristics during the winter can be assumed to be fully representative of the conditions found by crakes in spring-summer. Plant height was measured using a tape measure at five random points during the first survey in which no bird was detected in every formerly occupied wetland.

Results

Abundances

We detected 32 breeding attempts in natural or naturalized wetlands in 1998–2004 (Table 1). No Baillon's Crakes were detected in 1998, or in 2005–2015. Therefore, a strong decline in this species was detected in this type of wetlands during the study period. Densities ranged from 0.2 (Embalse de Las Cañas, 1999, 2000 and Balsa del Pulguer, 2001) to 13.95 (Balsa de Rada, 2004) breeding pairs/10 ha (bp/10ha); the mean density of the eight wetlands for the whole period 1998–2004 was 1.03 bp/10ha. After recent restoration work, conditions at another wetland, Balsa de La Mueda, have become more favourable for the species and so this site has been included in our surveys since 2016, year in which we detected two breeding pairs. On the other hand, the number of breeding pairs in rice paddies ranged from 0–4 pairs in the surveyed area (0.5 km² in 2012–2015 in Arguedas, 0.5 km² in 2016 in Arguedas and in Figarol). Densities were in the range 0–0.8 bp/10ha in Arguedas and 0.2 bp/10ha in Figarol.

Phenology

The first hints of the occurrence of the species in 1999–2004 in natural wetlands were spontaneous calls detected on 15 April–15 May. After this period, although no spontaneous songs were heard, adult birds did response to tapes until August in wetlands with water. The same pattern was observed in Balsa de La Mueda in 2016.

In 2011–2016, the following records were made in rice paddies: 1) adults were detected from early July to August and spontaneous songs were heard; 2) a silent period occurred from mid-August onwards, comparable to the calling behaviour observed in natural or naturalized wetlands from mid-May onwards; 3) positive responses to taped calls occurred until mid-October after a pause of 1–2 weeks with no spontaneous songs, which suggests that the crakes were still present; 4) two different, not fully fledged chicks were observed in 2015, confirmation of reproduction; 5) adult birds were observed but not heard until September and October in the same rice fields as where spontaneous songs had been heard some months before.

Table 1. Breeding population of Baillon's Crane *Zapornia pusilla* in Navarre in 1998–2016. For those years in which the species was detected, the number of breeding pairs in each wetland is shown. For each wetland, the type (N=natural, A=Rice fields), its surface area and the approximate surface area of the potential habitat are given. The maximum density of breeding pairs in the study period in the surveyed area at each site is given in the final column. Cells in grey indicate that the wetland was not surveyed that year.

Població reproductora de Rasclot europeu Zapornia pusilla a Navarra entre 1998 i 2016. Per aquells anys amb presència de l'espècie es donen el nombre de parelles reproductores a cada zona humida. Per a cada lloc es dona el tipus (N=natural, A=Arrossars), àrea total i àrea potencial per a l'espècie. La densitat màxima de parelles reproductores assolida a cada lloc durant el període d'estudi es dona a la darrera columna. Les caselles en gris són els llocs sense mostrejar.

Wetland name Localitat	Type Tipus	Total area (ha) Àrea total (ha)	Potential habitat (ha) Hàbitat potencial (ha)	Total breeding pairs Total de parelles reproductores												Maximum density (bp/10ha) Densitat màxima (parelles/10ha)	
				1999	2000	2001	2002	2003	2004	2012	2013	2014	2015	2016			
Laguna de Pitillas	N	216	214	2	3	1	1	1								0.14	
Laguna de Dos Reinos	N	30	10	3	2	1		1								1.00	
Embalse de Las Cañas	N	100	100	2	2											0.20	
Laguna del Juncal	N	2.5	2.5	1	1	1	1									4.00	
Balsa de Rada	N	2.15	2.15				1		3							14.00	
Badina de Escudera	N	12	12			1		1								0.83	
Carrizal de Valdefuente	N	2	2				1									5.00	
Balsa del Pulguer	N	50	50													0.20	
Balsa de La Mueda	N	1	0.5											2		20.00	
Figarol rice paddies	A	350	350												1	0.20	
Arguedas rice paddies	A	1275	1275									1		1	2	4	0.80
Total breeding pairs/ Total parelles reproductores				9	9	5	3	3	3		1	0	1	2	7		
No. of localities/ Núm. localitats				5	5	5	3	3	1		1	0	1	1	3		

Habitat choice

All known breeding pairs in the study years were detected in wetlands with shallow water. Some birds were found in the shallowest areas of wetlands that also had areas of deeper water. Water depths ranged from 1–30 cm (Table 4). Most of the wetlands were permanent or semi-permanent and hence had water in their deepest parts. Water was fresh or brackish (Government of Navarre; unpublished data). With the exception of stands of *Juncus acutus*, which could reach 150 cm in height, crakes were found in vegetation with cover dominated by sedges or rushes under 100 cm in height (Table 5). Reed beds of *Phragmites australis* were avoided.

All the wetlands that held Baillon's Crakes in Navarre in the breeding season lie within the 12°C isotherm and the 800-mm isohyet

(Gobierno de Navarra, 2015), that is, areas of Mediterranean climate with continental tendencies: low annual rainfall, with rains concentrated in autumn and spring, often with a just few days of intense rainfall and 2–5 dry months; high temperatures in summer and mild winters with few frosts (Elósegui 1985; <http://meteo.navarra.es/climatologia/>).

Discussion

The Baillon's Crane population in Navarre was estimated at fewer than 10 pairs in the 1980s. It was thought to be confined to a small group of wetlands, and the only successful breeding recorded from the period was from Laguna de Pitillas in 1983 (Elósegui 1985). Very few data for this species were available before the present

Table 2. Plant communities, main plant species and characteristics of the wetland habitats with Baillon's Crake in Navarre (N Spain). Community names follow the EU Council Directive 92/43/EEC. *Comunitats vegetals, espècies de plantes i principals característiques dels hàbitats de les zones humides de Navarra amb presència de Rasclat europeu. Les comunitats s'anomenen segons la Directiva de la Comissió Europea 92/43/EEC.*

Plant community Comunitat vegetal	Main species Espècie principal	Principal features Característiques principals
Sub-halophile rushes <i>Schoeno nigricantis-Plantaginietum maritimae</i>	<i>Schoenus nigricans</i> <i>Plantago maritima</i>	Flooded in winter and spring but dry in summer, normally found on the margins of brackish lagoons
Long-flooded halophile rushes <i>Inula crithmoidis-Juncetum subulati</i>	<i>Inula crithmoides</i> <i>Juncus subulatus</i>	Normally permanently flooded, fresh water.
Rushes corresponding to the community <i>Cirsio monspessulani-Holoschoenetum vulgaris</i>	<i>Scirpus holoschoenus</i> <i>Cirsium monspessulanum</i>	Wet meadows, temporarily flooded
Communities of <i>Bolboschoenus maritimus Phragmito-australis-Bolboschoenetum maritimi</i>	<i>Bolboschoenus maritimus</i> <i>Phragmites australis</i>	Temporarily flooded with fresh water; but normally dry in summer
Low rushes <i>Calliergonello cuspidatae-Eleocharietum palustris</i>	<i>Eleocharis palustris</i>	Temporarily flooded with fresh water; dry in summer although not every year
Rice paddies	<i>Oryza sativa</i>	Maximum plant growth in July–August; flooded in May–October with fluctuations of water level twice to four times in the season

study. We detected no Baillon's Crakes in 1998, probably due to our lack of experience with such a difficult-to-detect species. By contrast, nine pairs were detected the following year using a suitable methodology. The absence of the species in natural wetlands in 2005–2011 can be explained by changes in water levels in wetlands due to evaporation, heavy rains and the management of sluice gates. Rises in water

levels of more than 20–25 cm after heavy rains occurred in 2005, 2007, 2008, 2010, 2012, 2014 and 2015, years in which levels were 20 cm higher than the years in which the species was detected. Droughts leading to water levels of less than 10 cm in depth at the beginning of the breeding season occurred in 2002, 2011 and 2013. The year 2016 was, however, the first year in which the species was detected in both

Table 3. Distribution of the total number of Baillon's Crake breeding pairs in habitats of European Community Interest (ECI) in wetlands in Navarre (N Spain) in 1999–2016. *Distribució del nombre total de parelles reproductores de Rasclat europeu als hàbitats d'interès comunitari de les zones humides de Navarra durant el període 1999-2016.*

ECI habitat Hàbitat d'interès comunitari	No. of pairs Núm. parelles	%
Sub-halophile rushes <i>Schoeno nigricantis-Plantaginietum maritimae</i>	19	44.2
Long-flooded halophile rushes <i>Inulo chrithmoidis-Juncetum subulati</i>	13	30.2
Rushes corresponding to the community <i>Cirsio monspessulani-Holoschoenetum vulgaris</i>	2	4.6
Communities of <i>Bolboschoenus maritimus</i> in ion-rich shallow water <i>Phragmito australis-Bolboschoenetum maritimi</i>	3	7.0
Low rushes <i>Calliergonello cuspidatae-Eleocharietum palustris</i>	1	2.3
Rice paddies	5	11.6
Total	43	100.0

Table 4. Number of Baillon's Crake breeding pairs according to water depth in wetlands in Navarre. Data pooled for all study years (1998–2016). *Distribució de les parelles reproductores de Rascllet europeu segons la profunditat de les zones humides a Navarra amb tots els anys d'estudi acumulats.*

Depth (cm) Profunditat (cm)	No. of breeding pairs Núm. parelles reproductores	%
0-10	35	81.4
10-20	7	16.3
>20	1	2.3

natural wetlands and paddies after a long period of absence.

The population of Baillon's Crake detected in 1998–2016 in Navarre occupies only 1–9 natural or naturalized wetlands out of a total of 150 monitored sites (Lekuona 1999, 2000, 2001, 2002), a figure that can be considered to represent a minimum number of breeding pairs for the province. The inherent difficulties in detecting this species and the fact that some birds probably did not respond to the taped calls (J. D. Muñoz, pers. obs.) ensure that our results are not entirely conclusive. Many wetlands had large surface areas covered by tall helophytic plants (mainly reeds); however, Baillon's Crake seems to prefer cover with rushes under 100 cm in height as breeding areas. The surveyed rice fields are less than 5 km from many of these wetlands and our results suggest that these paddies represent alternative breeding habitat for crakes (Koshelev 1994). In general, they offer low but stable water levels and abundant prey items, including small amphibians, insects and spiders. Although the cover afforded by rice plants is generally too dense, there are clearings and areas with lower density of plants. In addition, the height of plants is generally suitable for the species. Paddies thus represent available habitat in June–July for second or replacement clutches, as apparently occurs in the Guadalquivir marshes (Muñoz 2007).

The phenology observed in natural wetlands could correspond to the period in which males call, pair formation or, possibly, the first clutches laid in second half of April until May, as has been reported from other areas of Europe (Cramp & Simmons 1980, Taylor & Van Perlo 1998, Glutz von Blotzheim *et al.* 1973, Sackl *et al.* 2003). The

subsequent period of silence could correspond to pair formation and the beginning of egg-laying (Sackl *et al.* 2003). The second or replacement clutches that occur in July and August in rice paddies may involve local pairs from Navarre or from elsewhere. It is known that Baillon's Crakes and other rail species can have second broods before they depart to the winter quarters (Cramp & Simmons 1980, Taylor 1996, Taylor & van Perlo 1998, Seifert *et al.* 2012). In addition, birds are apparently faithful to their breeding territories as some were detected in the same plots during the whole study period, while other similar plots never held any birds.

From a methodological perspective, the census technique should be complemented with a subsequent 1–2-week period in which taped calls are used to assess occurrences and breeding attempts in places where spontaneous calls have been recorded. It is known that male Baillon's Crakes minimize their vocal activity after pair formation and/or at the onset of egg-laying, a type of behaviour that makes species detection very difficult thereafter (Glutz von Blotzheim *et al.* 1973, Taylor & van Perlo 1998, Sackl *et al.* 2003).

Acknowledgements

We would like to thank to the Government of Navarre for its support and, especially, for all the fieldwork carried out under the auspices of Navarre Breeding Waterbird Census. We are also grateful to the public

Table 5. Range of heights of the main rush species found at five random points in wetlands where Baillon's Crake occurred in Navarre (N Spain) in 1999–2016. *Rang d'alçades de les principals espècies de joncs presents a cinc punts a l'atzar a les zones humides amb presència de Rascllet europeu a Navarra en el període 1999-2016.*

Species Espècies	Height range (cm) Rang d'alçades (cm)
<i>Schoenus nigricans</i>	15-80
<i>Juncus maritimus</i>	25-120
<i>Juncus subulatus</i>	30-120
<i>Juncus acutus</i>	70-180
<i>Bolboschoenus maritimus</i>	10-110
<i>Eleocharis palustris</i>	15-70
<i>Oryza sativa</i>	50-100

company GANASA for permission to publish data obtained during the contracting of J. M. Lekuona.

Resum

Cens, fenologia i caracterització de l'hàbitat del Rascllet europeu *Zapornia pusilla* a Navarra

S'ha analitzat l'evolució de la població del Rascllet en 150 zones humides naturals o naturalitzades i dues zones arrossaires de Navarra durant el període 1998-2016. S'ha mostrejat la major part de l'hàbitat potencial per a l'espècie. Els cants nupcials han estat claus per a l'estima precisa de la població reproductora a l'àrea d'estudi. El mètode per estimar el nombre de parelles nidificants ha consistit en la combinació de recomptes directes d'individus, més el registre d'ocells cantant espontàniament, i l'ús de cants gravats com a reclam durant els períodes en què els rascllets es tornen més elusius en les seves zones de cria. Aquesta metodologia es va aplicar d'abril a octubre. A Navarra aquesta espècie viu en aiguamolls semipermanents d'aigua dolça o salobre amb vegetació baixa i densa. Els hàbitats més apropiats per a la reproducció de l'espècie han estat diversos tipus de jonqueres inundades amb cobertura d'alçada inferior a un metre i sense dominància de grans helòfits. S'han observat grans fluctuacions de la població reproductora en el període d'estudi. La població reproductora (màxim de nou parelles el 1999 i 2000) va estar confinada a zones humides naturals o naturalitzades en els primers anys d'estudi. Després de set anys sense registres de l'espècie, se n'ha confirmat la nidificació en arrossars del sud de la província. La població detectada recentment és petita (1-4 parelles nidificants). L'espècie presenta dos patrons fenològics diferents quan nidifica en aiguamolls naturals (abril-juliol) que quan ho fa en arrossars (juliol-octubre).

Resumen

Censo, fenología y caracterización del hábitat de la Polluela chica *Zapornia pusilla* en Navarra

Se analiza la evolución de la población de Polluela chica en 150 humedales naturales o naturalizados y en dos zonas arroceras en Navarra durante el periodo 1998-2016. Se ha muestreado la mayor parte del hábitat potencial para la especie. Los cantos nupciales han sido claves para la estima precisa de la población reproductora en el área de estudio. El método para estimar el número de parejas nidificantes ha consistido en la combinación de recuentos directos de individuos más el registro de aves cantando espontáneamente y

el uso de cantos grabados como reclamo durante los periodos en los que las aves se vuelven más elusivas en sus zonas de cría. Esta metodología se aplicó desde abril hasta octubre. En Navarra esta especie vive en humedales semipermanentes de agua dulce o salobre con vegetación baja y densa. Los hábitats más apropiados para la reproducción de la especie han sido varios tipos de juncales inundados con cobertura de altura inferior a un metro y sin dominancia de grandes helófitos. Se han observado grandes fluctuaciones del tamaño de la población reproductora en dicho periodo. La población reproductora (máximo de nueve parejas en 1999 y 2000) estuvo confinada a humedales naturales o naturalizados en los primeros años de estudio. Tras siete años sin registros de la especie, se ha confirmado la nidificación de la misma en arrozales del sur de la provincia. La población detectada recientemente es pequeña (1-4 parejas nidificantes). La especie presenta dos patrones fenológicos diferentes cuando nidifica en humedales naturales (abril-julio) que cuando lo hace en arrozales (julio-octubre).

References

- Affre, G.** 1975. Estimation de l'évolution quantitative des populations aviennes dans une region du Midi de la France au cours de la dernière décennie (1963-1972). *L'Oiseau et R.F.O.* 45: 165-187.
- BirdLife International.** 2017. Species factsheet: *Zapornia pusilla*. Downloaded from <http://www.birdlife.org> on 19/03/2017.
- Biurrun, I.** 1999. Flora y vegetación de los ríos y humedales de Navarra. *Guineana* 5: 1-339.
- Blanco, J.C. & González, J.L. (eds.).** 1992. *El libro Rojo de los Vertebrados de España*. Colección Técnica. Madrid: ICONA.
- Blondel, J., Ferry, C. & Frochot, B.** 1970. La méthode des indices ponctuels d'abondance (IPA) on des relevés d'avifaune par "stations crecoute". *Alauda* 38: 55-71.
- Braun-Blanquet, J. & de Bolòs, O.** 1957. Les groupements végétaux du bassin moyen de l'Ebre et leur dynamisme. *Anales de la Estación Experimental de Aula Dei* 5: 1-266.
- Braun-Blanquet, J.** 1979. *Fitosociología. Bases para el estudio de las comunidades vegetales*. Madrid: Blume Eds.
- Chacón, G.** 1984. Datos diversos sobre la F. Rallidae (Aves, Gruiformes) en el Delta del Llobregat (Barcelona). *Misc. Zool.* 8: 213-216.
- Chacón, G.** 1997. *Polluela chica*. In Purroy, F.J. (ed.): *Atlas de las aves de España (1975-1995)*. Barcelona: Lynx Edicions.
- Cramp, S. & Simmons, K.E.L.** 1980. *The Birds of Western Palearctic*. Vol II. Oxford: Oxford University Press.
- Dies, J.I.** 2004. *Polluela chica, Porzana pusilla*. In Madroño, A., González, C. & Atienza, J.C. (eds.): *Libro rojo de las aves de España*. Pp. 198-199. Madrid: Dirección General para la Biodiversidad-SEO/Birdlife.
- Dies, J.I. & Dies, B.** 2003. *Polluela Chica*. In Martí,

- R. & del Moral, J.C. (eds.): *Atlas de las Aves Reproductoras de España*. Pp. 222–223. Madrid: Dirección General de Conservación de la Naturaleza / Sociedad Española de Ornitología.
- Eddleman, W.R., Knoff, F.L., Meanley, B., Reid, F.A. & Zembal, R.** 1988. Conservation of North American railbirds. *Wilson Bull.* 100: 458–475.
- Elósegui, J.** 1985. *Atlas de aves nidificantes*. Pamplona: Caja de Ahorros de Navarra.
- García E.F.J.** 2012. Polluela chica. In SEO/BirdLife: *Atlas de las aves en invierno en España 2007–2010*. Pp. 570. Madrid: Ministerio de Agricultura, Alimentación y Medio Ambiente-SEO/BirdLife.
- García-Mijangos, I., Biurrun, I., Darquistade, A., Herrera, M. & Loidi, J.** 2004. *Nueva cartografía de los hábitats en los Lugares de Interés Comunitario (L.I.C.) fluviales de Navarra. Manual de interpretación de los hábitats*. Informe técnico. Gestión Ambiental, Viveros y Repoblaciones de Navarra. Universidad del País Vasco. Leioa.
- Glahn, J.F.** 1974. Study of breeding rails with recorded calls in north-central Colorado. *Wilson Bull.* 86: 206–214.
- Glutz von Blotzheim, U.N., Bauer, K.M. & Bezzel, E.** 1973. *Handbuch der Vögel Mitteleuropas*. Vol. 5. Wiesbaden: Aula-Verlag.
- Gobierno de Navarra.** 2015. *Manual de Estadística Agraria. Navarra y comarcas*. Pamplona: Departamento de Agricultura, Ganadería y Alimentación. Secretaría Técnica.
- Hagemeijer, W.J. & Blair, M.J. (eds.)**. 1997. *The EBCC Atlas of European Breeding Birds. Their Distribution and Abundance*. London: T & AD Poyser.
- Koshelev, A.I.** 1994. *Baillon's crake Porzana pusilla*. In Tucker, G.M. & Heath, M.F.: *Birds in Europe: their conservation status*. Cambridge: BirdLife International (BirdLife Conservation Series no. 3).
- Lekuona, J.M.** 1999. *Censo de aves acuáticas nidificantes en las zonas húmedas de Navarra*. Departamento de Medio Ambiente, Ordenación del Territorio y Vivienda. Gobierno de Navarra. Octubre 1999. Unpublished report.
- Lekuona, J.M.** 2000. *Censo de aves acuáticas invernantes en las zonas húmedas de Navarra, Enero 2000*. Departamento de Medio Ambiente, Ordenación del Territorio y Vivienda del Gobierno de Navarra. Noviembre 2000. Unpublished report.
- Lekuona, J.M.** 2001. *Censo de aves acuáticas nidificantes en las zonas húmedas de Navarra, 2001*. Departamento de Medio Ambiente, Ordenación del Territorio y Vivienda del Gobierno de Navarra. Agosto 2001. Unpublished report.
- Lekuona, J.M.** 2002. *Censo de aves acuáticas nidificantes en las zonas húmedas de Navarra, 2002*. Departamento de Medio Ambiente, Ordenación del Territorio y Vivienda del Gobierno de Navarra. Agosto 2002. Unpublished report.
- Molina, C. & Díez, A.** 2007. *Gestión de hábitats en humedales mediterráneos de Navarra*. Informe técnico. Pamplona: Gestión, Ambiental, Viveros y Repoblaciones de Navarra.
- Muñoz, J.D.** 2007. Las polluelas en las Marismas del Guadalquivir. *Quercus* 253: 22–26
- Peralta, J., Biurrun, I., García-Mijangos, I., Remón, J.L., Olano, J.M., Lorda, M., Loidi, J. & Campos J.A.** 2013. *Manual de hábitats de Navarra*. Pamplona: Gobierno de Navarra.
- Sackl, P., Bozic, L. & Stumberger, B.** 2003. Baillon's Crake *Porzana pusilla* on the lower Neretva River: notes on a possible breeding location in southern Dalmatia. *Acrocephalus* 24: 21–27.
- Seifert, N., Becker, P. & Flade, M.** 2012. Breeding in a postulated wintering site: first evidence for the breeding of Baillon's Crake *Porzana pusilla* in Senegambia, West Africa. *Ostrich* 83: 79–84.
- Taylor, B.** 1996. Family Rallidae. In del Hoyo, J., Elliott, A. & Sargatal, J. (eds.): *Handbook of the Birds of the World*. Vol. 3. Barcelona: Lynx Edicions.
- Taylor, B. & van Perlo, B.** 1998. *Rails. A guide to the Rails, Crakes, Gallinules and Coots of the World*. Sussex: Pica Press.
- Tucker, G.M. & Evans, M.I.** 1997. *Habitats for birds in Europe: a conservation strategy for the wider environment*. Cambridge: BirdLife International. BirdLife Conservation Series no 6.
- Ursúa, C. & Báscones, J.C.** 2000. Vegetación de las lagunas endorreicas de Navarra. *Actas Congr. Bot. F. Loscos* 687–701. Teruel: Instituto de Estudios Turolenses.
- Ursúa, M.C.** 1986. *Estudio de la flora y vegetación de la Ribera tudelana (Navarra)*. Tesis Doctoral. Pamplona: Universidad de Navarra.