

Longevity records of citril finches *Carduelis citrinella*: analysing 43 years of continuous ringing

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Abstract

Longevity records of citril finches Carduelis citrinella: analysing 43 years of continuous ringing. Longevity records (maximum lifespan) of free-ranging birds are basic to understand the evolution of avian senescence patterns. Here we provide minimum longevity records for the citril finch *Carduelis citrinella*, an endemic cardueline finch of high mountains in Central and Western Europe. Continuous ringing over 43 years in the Eastern Pyrenees allowed recording of a male of seven years and seven months, a female of six years and three months old, and 60 individuals of more than three years of age. There was no difference in the sex ratio between individuals of more than three years of age. These values agree with the potential natural longevity of the species computed from previously recorded mortality rates of the species.

Key words: Longevity, Maximum lifespan, *Carduelis citrinella*, Citril finch, Stable long term ringing stations, Pyrenees

Resumen

Registros de longevidad del verderón serrano Carduelis citrinella: análisis de 43 años de anillamiento continuado. Los registros de longevidad (esperanza de vida) de aves en libertad son básicos para entender la evolución de los patrones de senescencia aviar. Aquí proporcionamos registros de longevidad mínima para el verderón serrano *Carduelis citrinella*, un fringílido endémico de las montañas altas de Europa central y occidental. El anillamiento continuado a lo largo de 43 años en los Pirineos orientales permitió registrar un macho de siete años y siete meses de edad y una hembra de seis años y tres meses, así como 60 individuos de más de tres años de edad. No existieron diferencias en la ratio de sexos entre los individuos de más de tres años de edad. Estos valores concuerdan con la longevidad natural potencial de la especie calculada a partir de las tasas de mortalidad registradas anteriormente.

Palabras clave: Longevidad, Esperanza de vida, *Carduelis citrinella*, Verderón serrano, Estación de anillamiento constante, Pirineos

Resum

Registres de longevitat de la llucareta europea *Carduelis citrinella*: anàlisi de 43 anys d'anellament continuat. Els registres de longevitat (esperança de vida) d'ocells en llibertat són bàsics per entendre l'evolució dels patrons de senescència aviària. Aquí proporcionem registres de longevitat mínima per a la llucareta europea *Carduelis citrinella*, un fringíl·lid endèmic de les muntanyes altes d'Europa central i occidental. L'anellament continuat al llarg de 43 anys als Pirineus orientals va permetre registrar un mascle de set anys i set mesos d'edat i una femella de sis anys i tres mesos, així com 60 individus de més de tres anys d'edat. No hi va haver diferències en la ràtio de sexes entre els individus de més de tres anys d'edat. Aquests valors concorden amb la longevitat natural potencial de l'espècie calculada a partir de les taxes de mortalitat registrades anteriorment.

Paraules clau: Longevitat, Esperança de vida, *Carduelis citrinella*, Llucareta, Estació d'anellament continuat, Pirineus

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Introduction

Longevity records (maximum lifespan) of free-ranging birds are basic to understand the evolution of avian senescence patterns (Holmes and Austad, 1995; Møller, 2006, 2008). Such records, however, are difficult to obtain because long-term studies of marked birds are rare. This is the case of the citril finch *Carduelis citrinella*, for which there are no published records of longevity in standard papers on the topic (Rydzewski, 1962; Kennard, 1975; Staav, 1998). In this paper we analyse capture-recapture data of citril finches in the eastern Pyrenees along 43 years to provide the first estimates of the longevity of the species.

Material and methods

Citril finches were monitored between 1977 and 2020 at the breeding area in the Catalan Pyrenees, from Vall d'Aran to Vallter, including the adjacent Pre-Pyrenees, and at the wintering area in Central Catalonia (Borràs et al., 2010, 2011). The survey range included 80 ringing stations in an area of about 8,000 km², with an altitudinal variation from 300–2,100 m a.s.l. (Borràs, 2016) (fig. 1). Birds were captured using mist nets at drinking vessels, at feeding spots and at bird feeders using modified Yunic platform traps (Yunic, 1971a, 1971b, 1971c; Senar, 1988). The sample we used included birds trapped along the whole year. Sex and age of birds was determined according to Svensson (1992) and Jenni and Winkler (1994). We also reviewed longevity data from the EURING data bank and from the Oficina de Anillamiento of SEO Birdlife.

The weighted mean annual mortality, the expectation of life, and the potential natural longevity was computed according to the formulas of Botkin and Miller (1974). The mortality rate of citril finches used in this study was based on estimates in Senar et al. (2002), with an average value of 0.62 pooling all the localities, and 0.58 when considering the locality with lowest mortality values (Senar et al., 2002). Mortality rates were estimated by capture-recapture using program MARK (White and Burnham, 1999; Senar et al., 2002).

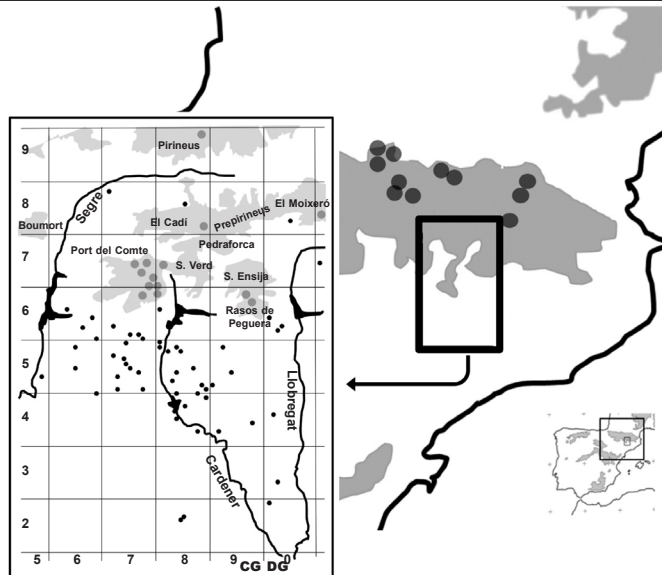


Fig. 1. Map of the study area, located in the NE of the Iberian Peninsula, where citril finches have been marked. The map on the right shows the area above the 800 m a.s.l. contour line in grey. Capture locations are shown with dark gray dots, and all correspond to subalpine breeding areas. The large gray dots in the enlargement on the left, within the rectangle, show the subalpine breeding localities for ringing in the eastern Pre-Pyrenees area, included within the 1,500 m a.s.l. contour. The black minor dots are wintering and/or opportunistic breeding locations below 1,500 m a.s.l.

Fig. 1. Mapa de la zona de estudi, situada en el NE de la península Ibèrica, en el que se ha realitzat el marcaje de verderones serranos. El mapa de la dreta mostra en gris la zona situada per encima de la curva de nivell de los 800 m s.n.m. Los lugares de captura se muestran con puntos gris oscuro y todos corresponden a zonas de reproducción subalpinas. La ampliación de la izquierda, dentro del rectángulo, muestra con puntos grises grandes las localidades de reproducción subalpina de anillamiento de la zona de los Prepirineos orientales incluidas dentro de la curva de nivel de 1.500 m s.n.m. Los puntos negros pequeños son localidades de invernada y/o reproducción oportunista por debajo de los 1.500 m s.n.m.

Results

During the 43 years of the study, we trapped and ringed a total of 36,331 citril finches and obtained a total of 1,812 recaptures of > 12 months, which means a recapture rate of 5%. We recaptured 60 individuals (0.2%) that were over three years of age (table 1). The longevity record was seven years and seven months for a male, and six years and three months for a female. Ring recovery data from the EURING data bank and from the Oficina de Anillamiento de SEO Birdlife did not show any individual with a longer longevity than that obtained from our capture–recapture study. No sexual differences appeared in the number of males and females recaptured at a minimum age of three years ($\chi_1^2 = 0.74$, $p = 0.39$).

Table 1. Citril finches recaptured over various years after ringing in the eastern Pyrenees. Age zero in years refers to birds recaptured within a year (< 12 months from capture to recapture).

Tabla 1. Verderones serranos recuperados en diferentes años tras el anillamiento en los Pirineos orientales. La edad de cero años se refiere a aves recapturadas en el plazo de un año (< 12 meses desde la captura hasta la recaptura).

Age in years	Total of recaptured birds
0	2,612
1	1,121
2	473
3	158
4	42
5	13
6	4
7	1

Potential natural longevity was estimated as 7.1 years, assuming an average mortality rate of 0.62; if we assume a minimum mortality rate of 0.58 (typical of high-quality areas), potential natural longevity would rise to 8.0 years. Expectation of life should be estimated as 1.1 years, assuming the average mortality rate.

Discussion

The longevity record we obtained for citril finches in the Pyrenees was seven years and seven months. This is higher than the published value of five years provided to date for the species (Cramp and Perrins, 1994; Glutz and Bauer, 1997). However, it agrees with that of small, temperate-zone songbird species, for which few individuals living under natural conditions are known to reach over seven years of age (Kennard, 1975). The obtained values also agree with the potential natural longevity obtained from demographic models. A previously published record of nine years, using SEO Birdlife data base (Borràs et al., 2012), was later been confirmed as an error in the database by SEO (Arantza Leal, pers. comm.). The agreement between the observed and expected longevity records supports the view of a moderately important fidelity to breeding and/or wintering areas (Balph, 1978). This extrapolated site fidelity agrees with previous data on the species (Senar et al., 2002; Borràs et al., 2011).

Higher male longevity is typical for species where the males have a higher survival rate than females. In house sparrows *Passer domesticus*, for instance, males show higher survival and larger longevities than females (McGillivray and Murphy, 1984). This is also the case of the American goldfinch *Carduelis tristis* (Middleton and Webb, 1984). In Citril finches we did not find any sex effect regarding longevity data, in agreement with previous findings that survival rates in males and females of this species do not differ (Senar et al., 2002).

We wish to emphasize that the recovery rate of ringed birds is usually less than 1% for small passerine birds (Dorst, 1962; Botkin and Miller, 1974), and that our higher than usual recapture rate of 5% was due to intensive ringing activity. Additionally, our capture–

recapture data provided a better appraisal of longevity than data from bird recoveries from ringing centers. Altogether, these findings support the interest of working at stable long term ringing stations.

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