SUPPLEMENTARY ELECTRONIC MATERIAL

ARDEOLA 64(2)

IMPORTANCE OF INTERTIDAL WETLANDS FOR THE FRENCH COASTAL ENDEMIC BLUETHROAT *CYANECULA SVECICA NAMNETUM* AND CONSERVATION IMPLICATIONS IN THE CONTEXT OF GLOBAL CHANGES

IMPORTANCIA DE LOS HUMEDALES INTERMAREALES PARA EL RUISEÑOR PECHIAZUL *CYANECULA SVECICA NAMNETUM* ENDÉMICO DE LA COSTA FRANCESA E IMPLICACIONES DE CONSERVACIÓN EN EL CONTEXTO DEL CAMBIO GLOBAL

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APPENDIX 1

Study site.

[Área de estudio.]

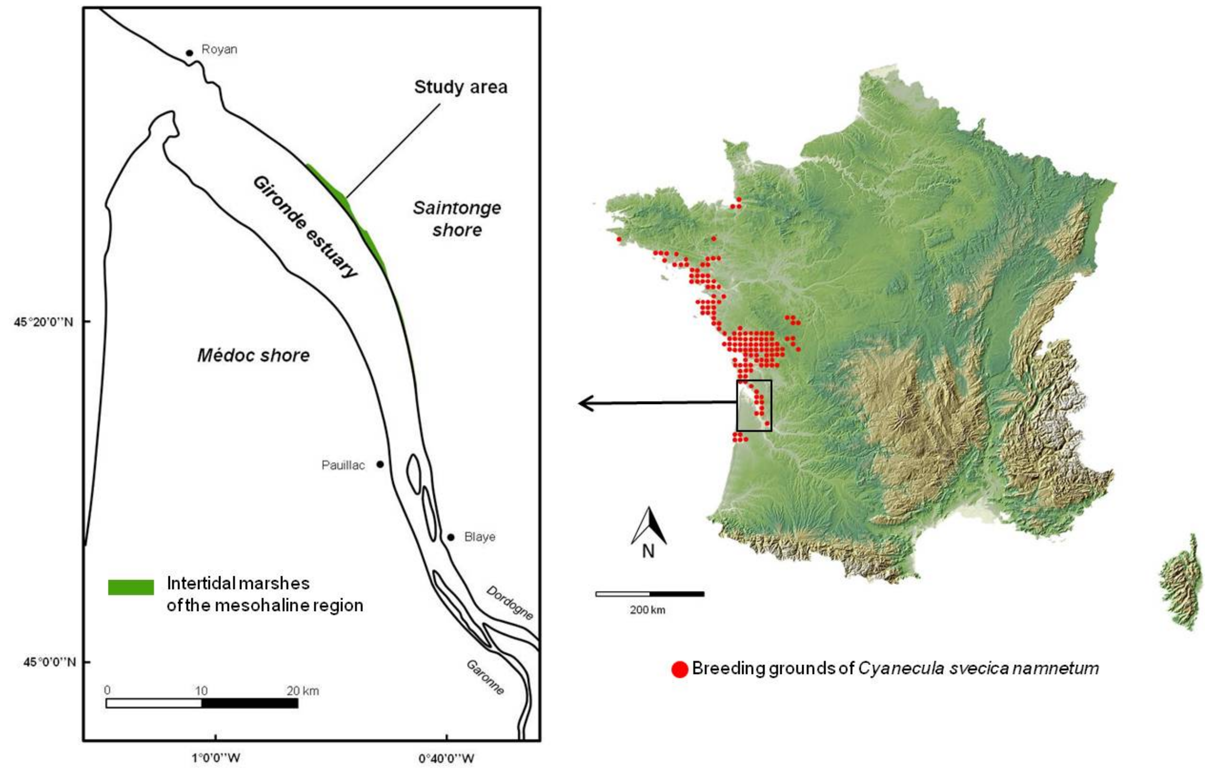

FIG. A.1._Location of the study site and distribution of *Cyanecula svecica namnetum* (red spots) during the breeding season (years 2005-2012, according to Issa & Muller, 2015).

[Localización del área de estudio y distribución de Cyanecula svecica namnetum (puntos rojos) durante el periodo reproductor (años 2005-2012, de acuerdo con Issa & Muller, 2015).]

FIG. A.2 & A.3._Illustration of shore erosion of intertidal wetlands of the Gironde estuary (France). Left: shore unaffected by erosion (gentle slopes with a gradual habitat zonation). Right: shore affected by erosion: steep slopes (disappearance of the lowest habitats of the foreshore).

[Ilustración de la dinámica erosiva de los humedales intermareales del estuario de la Gironda (Francia). Izquierda: costa no afectada por la erosión (pendientes suaves con evolución gradual de los hábitats). Derecha: costa afectada por la erosión: pendientes acusadas (desaparición de los hábitats más bajos en el frente de la costa).]

APPENDIX 2

Flight feather moult chronology of the *namnetum* morphotype.

[Cronología de la muda de plumas de vuelo en el morfotipo namnetum*.]*

Feather scores following Ashmole (1962):

0 = old feather.
1 = old feather missing or new feather completely in pin.
2 = new feather just emerging from sheath, up to one third grown.
3 = new feather between one and two thirds grown.
4 = new feather more than two thirds grown, but waxy sheath still at its base.
5 = new feather fully-grown with no trace of sheath at its base.

For the 10 primaries (PP) of each wing, a global score of 0 indicates totally worn plumage (2 wings x 10 feathers x 0) whereas a global score of 100 indicates totally renewed plumage (2 wings x 10 feathers x 5). For the 6 secondaries (SS) of each wing a global score of 0 indicates totally worn plumage (2 wings x 6 feathers x 0) whereas a global score of 60 indicates totally renewed plumage (2 wings x 6 feathers x 5) with all the intermediate scores possible.

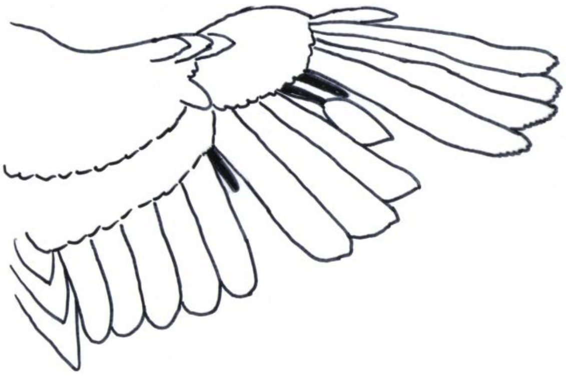

FIG. A.4._Example of moult score for primaries (PP) on a right wing. Moult score of PP = 18 = 5 + 5 + 4 + 3 + 1 + 0 + 0 + 0 + 0 + 0.

[Ejemplo de marcador de muda para primarias (PP) en un ala derecha. Marcador de muda de PP = 5 + 5 + 4 + 3 + 1 + 0 + 0 + 0 + 0 + 0.]

APPENDIX 3

Radiotrack equipment.

[Equipo de radioseguimiento.]

We used 'pico-pip' tags (0.35 grams) from Biotrack Ltd. that cover a range from 80 to 300 m, configured to radiate in the 148 MHz frequency range with the emission of one signal of 20 milliseconds per second. These tags were chosen in order to not exceed 5% of the body mass of the birds (fixing kit included) as recommended by Caccamise & Hedin (1985). The transmitters were fitted to sampled birds with a leg harness made with a 0.8 mm natural thread of rubber (round section) glued on the tags using glue Loctite® 454 and the activator Loctite® 7455 (see method described by Rappole & Tipton, 1991). Lengths of harness loops were adjusted following the Naef-Daenzer allometric function (Naef-Daenzer, 2007). Tagged birds were released at the location of their capture. Once released, the birds were located by using a directional Yagi-Uda antenna and a Sika receiver (Biotrack, Ltd.). At each radio contact with a transmitter, the geographical coordinates of the contact point were recorded on a GPS (Garmin eTrex®) and the signal direction relative to magnetic North (azimuth) was determined using the directional antenna and a magnetic compass. From a minimum of three geo-referenced locations and associated azimuths (to determine the direction of the tag signal), bird locations were determined according to the principle of triangulation defined by White & Garrott (1990).

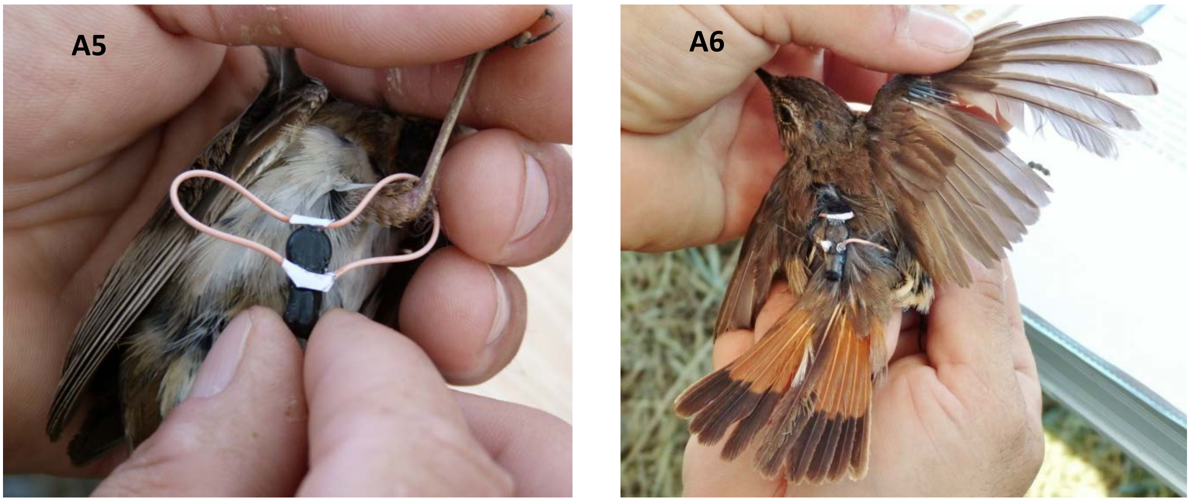

FIG. A.5 / A.6._Fitting of a radio-tag on a moulting Bluethroat.

[Ajuste un emisor de radio a un ruiseñor pechiazul en muda.]

APPENDIX 4

Radiotracking duration

[Duración del radioseguimiento.]

Each bird was radio-tracked until a flattening of the curve representing the number of locations (x-axis) versus the surface explored by birds (y-axis) was obtained.

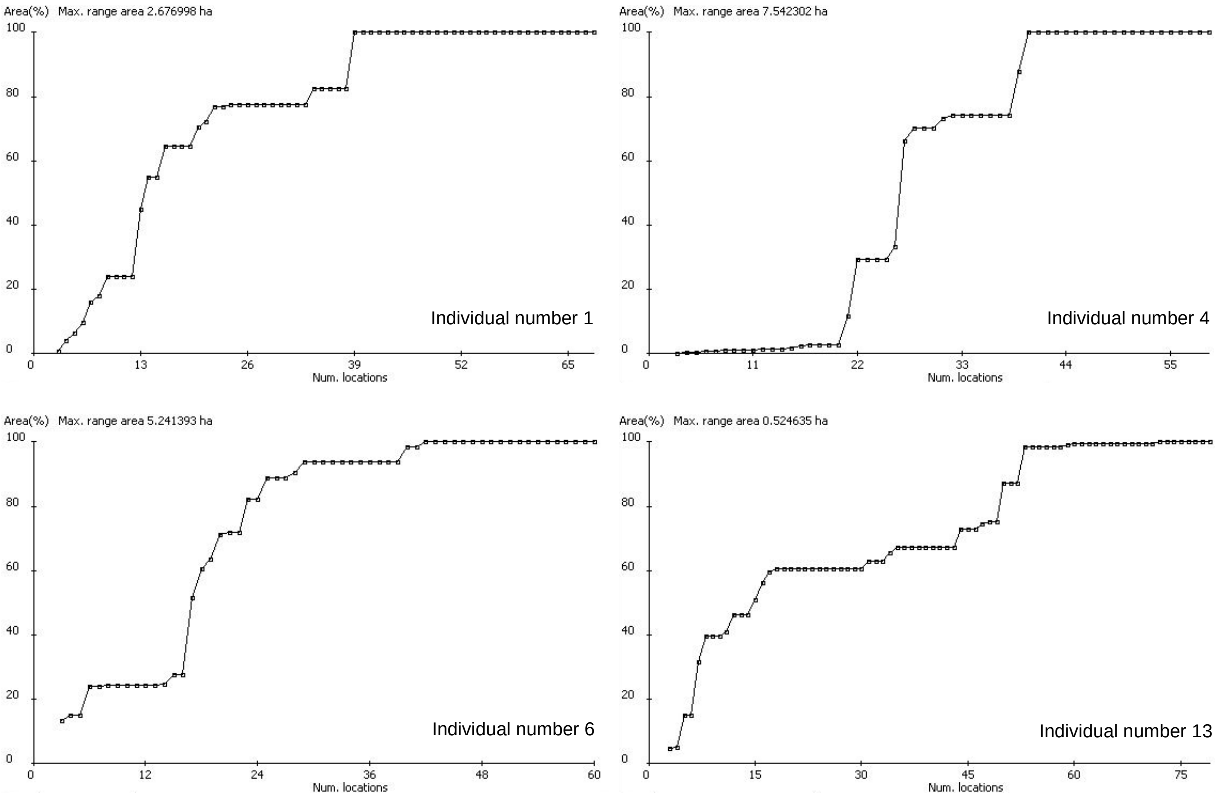

FIG. A.7._Examples of flattening of the curves representing the number of locations (x-axis) versus the area explored by four radio-tracked birds (y-axis).

[Ejemplos de la atenuación de las curvas que representan el número de localizaciones (eje de abcisas) contra la superficie explorada por cuatro aves controladas por radioseguimiento (eje de ordenadas).]

TABLE A.1

Details of data collected for the 16 radio-tracked Bluethroats and their home range sizes (kernels K50 and K95).

[Detalles de los datos recogidos para los 16 ruiseñores pechiazules controlados por radioseguimiento y tamaño del área de campeo (en núcleos de K50 y K95).]

N° of Individuals	Sex	Duration of survey (days)	Number of locations	Mean number of locations / days	Range K50 (ha)	Range K95 (ha)
1	M	6	68	11.33	0.46	1.66
2	M	6	61	10.17	0.7	2.94
3	F	4	59	14.75	3.41	13.00
4	M	5	59	11.8	0.92	3.24
5	M	4	59	14.75	0.57	2.34
6	F	4	60	15	0.88	4.34
7	M	4	69	17.25	1.7	6.98
8	M	4	59	14.75	0.26	0.8
9	M	3	42	14	0.29	1.06
10	M	4	59	14.75	0.24	0.8
11	M	5	65	13	0.58	2.25
12	M	4	51	12.75	0.67	2.49
13	F	5	79	15.8	0.16	0.4
14	M	5	80	16	0.12	0.54
15	M	4	56	14	0.13	0.28
16	F	4	67	16.75	0.14	0.43

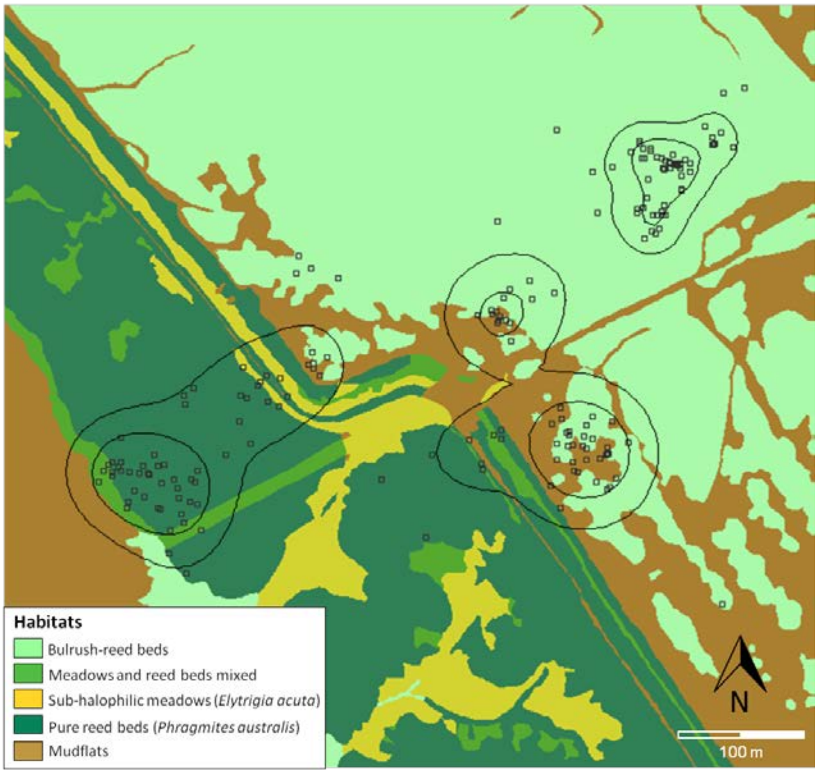

FIG. A.8._Example of radio-tracking locations and kernel home ranges (K50: smallest to K95: largest) of three Bluethroats monitored in intertidal wetlands of the Gironde estuary (France).

[Ejemplo de localizaciones de radioseguimiento y áreas de campeo nucleares (K50 la más pequeña a K95 la más grande) de tres ruiseñores pechiazules seguidos en los humedales intermareales del estuario de la Gironda (Francia)]

APPENDIX 5

Diet of birds during moulting period.

[Dieta de las aves durante el periodo de muda.]

TABLE A.2

Formulas used to calculate arthropod biomasses for taxa representing more than 5% of the prey consumed by Bluethroats in intertidal wetlands of the Gironde estuary (France).

[Fórmulas usadas para calcular la biomasa de artrópodos para los taxones que representan más del 5% de las presas consumidas por ruiseñores pechiazules en los humedales intermareales del estuario de la Gironda (Francia).]

Taxa	Mean length (mm, personal data)	Reference to calculate biomass	Model used	Formula used to calculate biomass
Arachnida Araneae	9	Ganihar 1997	Aranae	EXP(-3.2105+(2.4681*(ln(length))))
Coleoptera Carabidae	9	Ganihar 1997	Coleoptera adults	EXP(-3.2689+(2.4625*(ln(length))))
Coleoptera Coccinellidae	4	Ganihar 1997	Coleoptera adults	EXP(-3.2689+(2.4625*(ln(length))))
Coleoptera Cucurlionidae	5	Ganihar 1997	Coleoptera adults	EXP(-3.2689+(2.4625*(ln(length))))
Coleoptera Species	11	Ganihar 1997	Coleoptera adults	EXP(-3.2689+(2.4625*(ln(length))))
Diptera Dolichopodidae	6	Ganihar 1997	Diptera	EXP(-3.4294+(2.5943*(ln(length))))
Diptera Tipulidae	4	Ganihar 1997	Diptera	EXP(-3.4294+(2.5943*(ln(length))))
Diptera Species	4	Ganihar 1997	Diptera	EXP(-3.4294+(2.5943*(ln(length))))
Heteroptera Cicadellidae	3	Ganihar 1997	Homoptera	EXP(-3.1984+(2.3487*(ln(length))))
Hymenoptera Formicidae	3.5	Ganihar 1997	Formicidae	EXP(-3.1415+(2.3447*(ln(length))))
Malacostraca Amphipoda	8.2	Lastra *et al.,* 2008	*Talitrus saltator*	EXP(1.99*(ln(length))-1.99)

We used a species accumulation curve (Package 'vegan' in R, function "specaccum", Oksanen *et al.*, 2013) to assess the number of species detected in Bluethroat diet for a certain number of sampled faeces. We assessed the whole dataset and evaluated the effect of bird age (juvenile *vs* adults) or period (we split the dataset into two periods; a first period from 15th July to 18th August; a second period from 19th August to 10th September).

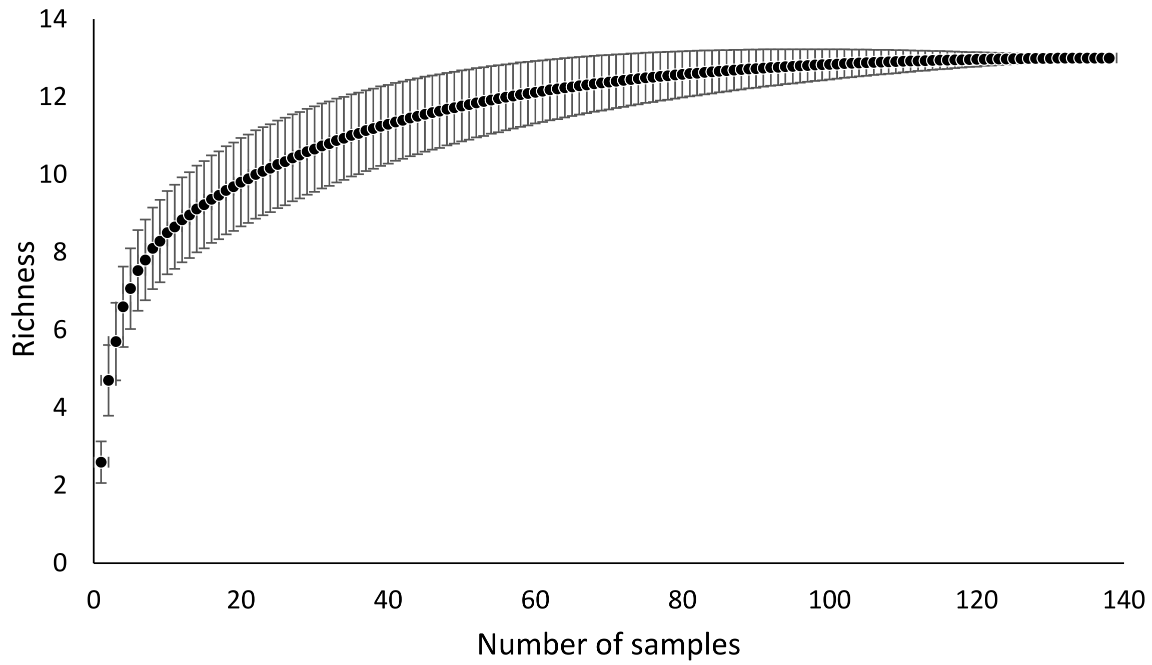

FIG. A.8._Assessment of prey species according to sample size for the whole dataset.

[Evaluación de las especies presa de acuerdo al tamaño de la muestra en el total del conjunto de datos.]

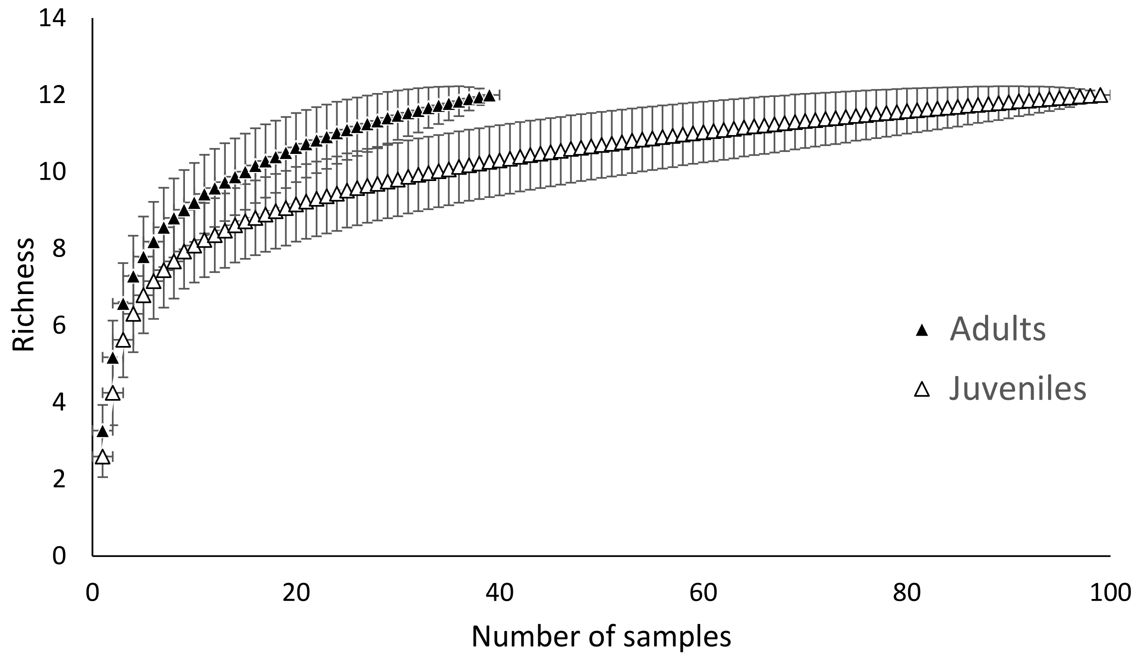

FIG. A.9._Assessment of prey species according to sample size and Bluethroat age.

[Evaluación de las especies presa de acuerdo al tamaño de la muestra según la edad de los ruiseñores pechiazules]

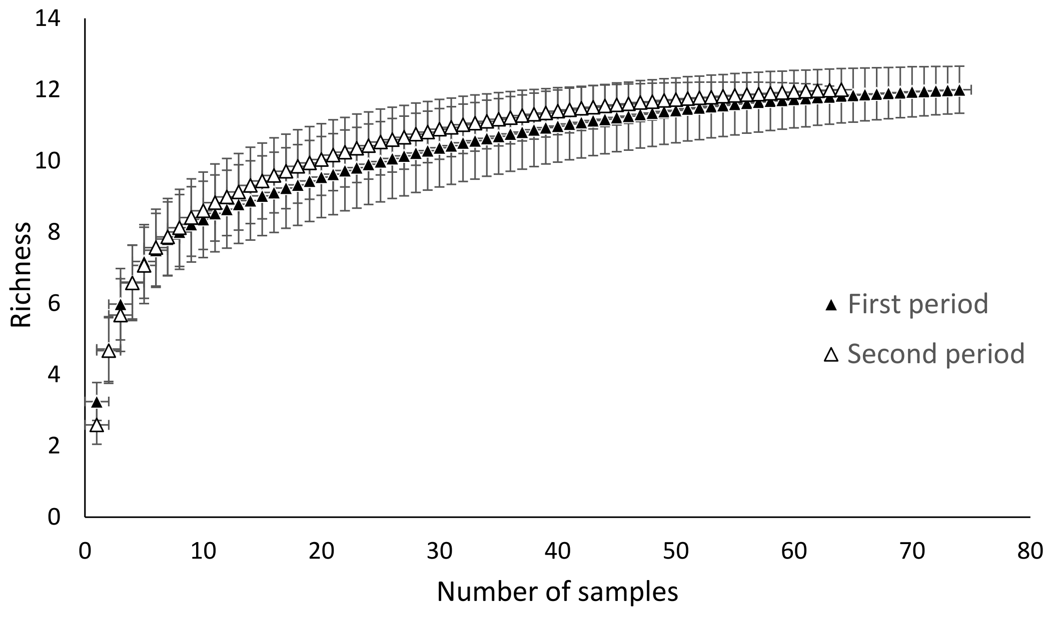

FIG. A.10._Assessment of prey species according to sample size and period (first period from 15th July to 18th August; second period from 19th August to 10th September).

[Evaluación de las especies presa de acuerdo al tamaño de la muestra según el periodo de estudio (primer periodo: del 15 de julio al 18 de agosto; segundo periodo del 19 de agosto al 10 de septiembre).]

TABLE A.3

Samples of droppings analysed to study Bluethroat diet in intertidal wetlands of the Gironde estuary.

[Muestras de excrementos analizados para estudiar la dieta del Ruiseñor Pechiazul en los humedales intermareales del estuario de la Gironda (Francia).]

	Number of samples to achieve, less than 1% of new taxa prey for each supplementary sample	Sample size to achieve, to get 95% of the total number of taxa preys
Total sampling (n = 138)	18	69
Adult samples (n = 39)	20	29
Juvenile samples (n = 99)	16	73
First period samples (n = 74)	17	49
Second period samples (n = 64)	18	40

We use Generalised Linear Mixed Models to test the differences between numbers of prey species per sample size (obtained from species accumulation curve analysis) according to age (i) or period (ii) and assuming normal distribution. With the aim of keeping the paired structure we added the number of samples as a random effect. Finally, we gave the response variable (i.e. numbers of species preys) different weights according to the associated standard error (1 per SD) obtained from species accumulation curve analysis.

Thus our statistical models were structured in the following way:

(i) [richness] ~ age + 1 **|** number of sample*, weights = (1/sd), family = 'gaussian'.*
(ii) [richness] ~ period + 1 **|** number of sample*, weights = (1/sd), family = 'gaussian'.*
Where richness is the number of taxa assessed with species accumulation curve (richness where log transformed for reach normality pattern), age is a categorical variable with two classes: juvenile and adult, period is a categorical variable with two classes: first period samples and second period samples.

TABLE A.4

Variation of the number of preys per sample according to age and period.

[Variación en el número de presas por muestras de acuerdo a la edad y el periodo.]

	Chisq	**df**	**P-value**
Age effect			
Difference between juvenile and adult	2419.4	1	P < 0.0001 -0.153 ± 0.003
Period effect			
Difference between second and first period	25.7	1	P < 0.0001 +0.024 ± 0.005

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