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WHERE DO PALLAS'S AND YELLOW-BROWED WARBLERS (*PHYLLOSCOPUS PROREGULUS, PH. INORNATUS*) GO AFTER VISITING NORTHWEST EUROPE IN AUTUMN? AN IBERIAN PERSPECTIVE

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SUMMARY.—*Where do Pallas's and yellow-browed warblers (*Phylloscopus proregulus, Ph. inornatus*) go after visiting northwest Europe in autumn? An Iberian perspective.*

Aims: The occurrence patterns of these Siberian passerines in the western Palearctic are examined in order to test the different hypotheses regarding their causes. In particular, it is attempted to check whether the geographical distribution of records may be biased by an uneven distribution of potential observers.

Location: Europe, with particular reference to the Iberian Peninsula and the Atlantic islands of Spain and Portugal.

Methods: The distribution of records by countries is compared with that of the ringing effort currently employed in each. Occurrence patterns are also analysed both by dates and by the locations in which records tend to be concentrated in each country.

Results: Differences between countries in numbers of records are much greater than differences in the distribution of potential observers. On the other hand, autumn arrivals are much earlier on average in Scandinavia and the British Isles than on the Atlantic coasts of central Europe, in the Iberian peninsula or in other Mediterranean areas, where there are also much higher percentages of winter and spring records.

Conclusions: The scarcity of records of these species in southwest Europe can not be accounted for by a low density of potential observers. This, coupled with the differences existing in the mean arrival dates, suggests that just a small fraction of the birds visiting Scandinavia and the British Isles during the autumn move later on through the Iberian Peninsula. On the other hand, the minimal incidence of these species during the spring in the whole of Europe suggests that just a small part of the autumn population spends the winter in Africa. Taking all this into account, a new hypothesis is put forward: that these birds arriving at Europe are mainly juveniles on exploratory migration (*Zwischenzug*) and that later in the autumn they travel back to Asia directly from northwestern Europe.

Key words: Asia, Canary Islands, Europe, exploratory migration, Iberian Peninsula, migration theories, reverse migration, ringing effort, Pallas's warbler, yellow-browed warbler.

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RESUMEN.—*¿A dónde viajan los mosquiteros de Pallas y bilistado (*Phylloscopus proregulus *y* Ph. inornatus*) tras visitar el noroeste de Europa durante el otoño? Una perspectiva ibérica.*

Objetivos: Se examinan los patrones de aparición en el oeste del Paleártico de estos paseriformes de distribución siberiana, a fin de poner a prueba las predicciones de diferentes hipótesis que tratan de explicarlas. En particular, se intenta ver hasta qué punto las distribuciones geográficas de los registros pudieran encontrarse sesgadas en función de la desigual distribución de los observadores potenciales.

Localidad: Europa y con atención preferente, la península Ibérica y las islas atlánticas de España y Portugal.

Métodos: Por un lado se compara la distribución entre países de los registros con el esfuerzo de anillamiento llevado a cabo en los mismos. Por otro, se analizan los patrones de aparición de estas especies, atendiendo tanto a las fechas como a las áreas geográficas donde tienden a concentrarse los registros en cada país.

Resultados: Las diferencias en el reparto de los registros entre países son mucho mayores que las que pudieran derivar de las desiguales densidades de observadores. Además, las llegadas en otoño se producen en promedio mucho antes en Escandinavia y las islas Británicas que en las costas atlánticas de Europa central, la península Ibérica u otras áreas del Mediterráneo, donde, en cambio, es mucho mayor la proporción de registros no otoñales.

Conclusiones: La escasez de registros de estas especies en el suroeste de Europa no se puede explicar por una supuesta baja densidad de observadores, lo que unido a las diferencias que se aprecian en las fechas de aparición de las aves sugiere que tan sólo una pequeña proporción de los individuos que llegan cada otoño a Escandinavia y las islas Británicas atraviese con posterioridad la península Ibérica. Por otra parte, la mínima incidencia primaveral de estas especies en el conjunto de Europa hace pensar que sea sólo una pequeña parte de la población otoñal la que pase finalmente el invierno en África. Se plantea por ello una nueva hipótesis: la de que estas aves, que en su mayoría serían jóvenes del año en migración intercalar (*Zwischenzug*), partan de nuevo en otoño con dirección a Asia directamente desde el noroeste de Europa.

Palabras clave: Asia, esfuerzo de anillamiento, Europa, islas Canarias, migración intercalar, migración revertida, mosquitero bilistado, mosquitero de Pallas, teorías sobre la migración, península Ibérica.

INTRODUCTION

The regular autumn occurrence in westernmost Europe of passerines breeding in Siberia has long aroused interest (e.g. Williamson, 1959; Bernis, 1966; Sharrock, 1972; Berthold, 1993). Among the species concerned, Pallas's warbler *Phylloscopus proregulus* and the yellow-browed warbler *P. inornatus* stand out because of the relatively very high numbers of records involved (Alström *et al.*, 1991; Cramp, 1992; Phillips, 2000; Gilroy and Lees, 2003) and the exponential increases in their abundance (Cambi and Cambi, 1986; Van Impe and Derasse, 1994). For example, in Britain there were just three records of Pallas's warbler before 1958 compared with 341 during 1958-85 and 1,783 up to 2003 (when an annual maximum of 303 individuals was attained). Similarly there were very few records of the yellow-browed warbler in Britain before 1958 but there were 2,648 there during 1958-85 and a total of 9,093 up to 2003: also a record year, with 853 birds (Dymond *et al.*, 1989; Fraser and Rogers, 2006). Most european records relate to the autumn, those of the yellow-browed

warbler occurring in September and October and those of Pallas's warbler in mid October and November (Mitchell and Young, 1997). An important feature in the pattern of occurrence of these leaf-warblers in Europe is the extremely uneven distribution of their records, most being found in the north and northwest and with a very high concentration in the British Isles. For example, in the case of Pallas's warbler the 1,851 records compiled by Mitchell and Young (1997) are distributed approximately as follows: 42 % in the British Isles, 40 % in Fennoscandia, 6 % in Denmark and the Faeroes, 5 % in the Benelux countries, 4 % between Germany, Poland and the former Czechoslovakia, 2 % in the Baltic Countries, and 1 % in France, as well as single records in Malta and Spain.

Formerly these occurrences were mainly attributed to meteorological causes, such as strong easterly winds coinciding with high-pressure areas above central Siberia, forcing the birds to drift west (Williamson, 1959; Baker, 1977; Howey and Bell, 1985; Baker and Catley, 1987; Elkins, 1988). However, much evidence contradicts this theory (e.g. Alerstam, 1990; Van Impe and Derasse, 1994; Thorup, 1998; Elkins, 2002). Some alternative explanations assume that the individuals arriving in Europe are misorientated, defective ones. The most popular among such explanations nowadays is probably the "reverse migration" theory, proposing that the birds have a defect in their sense of orientation, perhaps due to reversed polarity, making them fly precisely in the opposite direction to that required to reach the wintering areas in southeastern Asia (Rabøl, 1969 and 1976; Thorup, 1998 and 2004). A similar explanation, known as 'mirror-image migration', has been proposed to explain the occurrence of certain Asian passerines in California (De Sante, 1983). However, these kinds of theories are not supported by the substantial numbers of birds involved (Phillips, 2000), nor especially by the continued and very strong temporal increase in records, given that the reversed flight directions would imply the death of the birds involved in the Atlantic (Cottridge and Vinicombe, 1996) and therefore the extinction of their defective trait.

It has also been suggested that the geographic pattern of occurrence in Europe that promoted the reverse migration theory, i.e. with most records in the northwest of the continent and the British Isles, could be just an artefact reflecting the uneven distribution of potential observers (Phillips, 2000). Genetic variation in the innate migration heading would happen at random so that the individuals involved would fly in every possible direction, but only those moving to where they can temporarily survive and be discovered by birdwatchers would be recorded (Alerstam, 1990). However, this idea again fails to explain why records have increased so much during recent years. It has since been proposed that the birds occurring in Europe are perhaps not true vagrants but regular migrants on their way to still undiscovered wintering areas in Western Europe or West Africa (Gilroy and Lees, 2003). In this case, the rising numbers of records would be a reflection of high winter survival rates, leading to a progressive increase of the 'west- orientating' genotypes within the Siberian breeding populations. Nevertheless, to demonstrate that this is true requires discovering the hypothetical wintering areas and the migratory routes, which is a problem given the uneveness in observer distribution (Gilroy and Lees, 2003).

In this context, it seems interesting to examine how the occurrence patterns of these species correspond with the distribution of potential observers in different parts of western Europe. In this paper I present and discuss the available data for the yellow-browed and Pallas's warblers in the Iberian Peninsula and the Atlantic islands of Spain and Portugal, in the light of the several theories proposed so far to explain their vagrancy into Europe. I compare the distribution of potential observers in these regions with those of other European areas, Iberia

and the Atlantic islands being a geographic zone for which information on these species has been very scanty until now (de Juana, 2006) and where the number of potential observers has been assumed to be rather low (Alström *et al.*, 1991).

Material and methods

Information on the occurrences of Pallas's and yellow-browed warblers in the study area has been gathered mainly from the annual reports of the rarities national committees in Portugal (last report in Elias *et al.*, 2006), Gibraltar (Garcia, 2005) and Spain (de Juana *et al.*, 2006).

In order to compare the distribution of potential observers in different countries, I have primarily used the figures on ringing effort, available through EURING (reports presented to its last general meeting at Strasbourg: www.euring.org/meetings/general_assemblies/strasbourg_2005 complemented by information provided by people from several ringing schemes (see Acknowledgments). This type of information is readily available and may be especially relevant in the context of this study since a large proportion of the records result from ringing activities (e.g. 47 % of yellow-browed warblers in Spain). Bird densities are given as numbers ringed per km^2 and ringer densities as number per 1,000 km^2.

Results

Pallas's warbler

Up to 2004 there were accepted records of just eight Pallas's warblers and 61 yellow-browed warblers for Spain, Portugal and Gibraltar combined. Those of Pallas's warbler (table 1) are distributed between the Iberian Peninsula (two in Spain, two in Portugal and one in Gibraltar), the Balearic Islands (two) and the Spanish Chafarinas Islands off northeastern Morocco (one), with none from the Canaries, the Azores or Madeira. Most were from the east and south of the region and all were in the littoral zone except for one at Cazorla, Andalucía: some 130 km from the Mediterranean coast. The first accepted record is rather recent, from 1987 (Klinkhamer and van der Maat, 1990), although one was reported from the coast of Catalonia, in northeast Spain, on 31st March 1960, before the establishment of the Spanish Rarities Committee (Mestre, 1979). Of the accepted records, four were in spring (March-April), two in autumn (October) and two in winter (December).

Table 1

Accepted records of Pallas's warblers *Phylloscopus proregulus* in Spain, Portugal and Gibraltar, up to 2004.
[Registros homologados de mosquitero bilistado Phylloscopus proregulus *en el conjunto de España, Portugal y Gibraltar, hasta 2004.]*

Site *[localidad]*	**Country** *[país]*	**Date** *[fecha]*
Cazorla (Jaén)	Spain	17 April 1987
Loulé (Faro)	Portugal	27 December 1990
Pollença	Balearics	12–15 April 1995
Upper Rock	Gibraltar	30 October 1996
Artà (Mallorca)	Balearics	26 October 1997
Barcelona city	Spain	19 March to 8 April 2000
Spanish Chafarinas islands	Off NE Morocco	29 April 2001
Lagos (Faro)	Portugal	31 December 2002

Yellow-browed warbler

Yellow-browed warbler records up to 2004 comprise 45 in Spain, 11 in Portugal and 3 in Gibraltar. By geographic sectors (figure 1) 40 were in the Iberian Peninsula, 10 in the Balearics, 8 in the Canaries and 1 in the Azores.

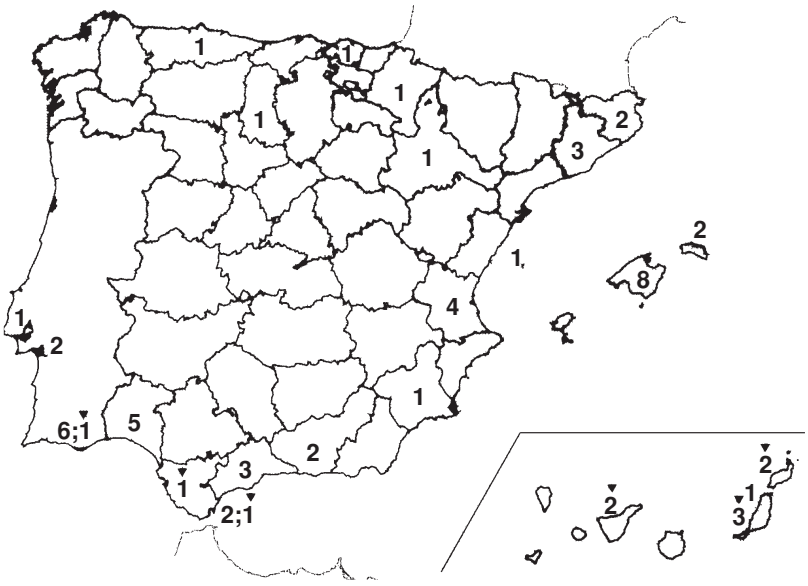

FIG. 1.—Records of yellow-browed warblers *Phylloscopus inornatus* in the Iberian Peninsula and the Balearic and Canary Islands. Figures marked with ▾ relate to winter or spring records (January to April). *[Registros de mosquitero bilistado* Phylloscopus inornatus *en la península Ibérica y las islas Baleares y Canarias. Las cifras señaladas con ▾ se refieren a registros de invierno o primavera (de enero a abril).]*

In the Peninsula, most records come from the eastern and southern coasts, with very few in the hinterland, only two on the Biscayan coasts and none in the northwest (Galicia and northern Portugal). The first published occurrence was at Gibraltar in 1932 but this record is now discounted (Cortés *at al.*, 1980). The next two recorded occurrences were both in 1967 (Valverde, 1968). Afterwards the distribution of records by five-year periods is as follows: 3 in 1980-84, 11 in 1985-89, 6 in 1990-94, 14 in 1995-99 and 22 in 2000-04. Although half of the Pallas's warbler records were in spring only three of the yellow-browed warblers were in March (all of them in the Canaries: on 6th March 1987, 27th March 1991 and 18th January–10th March 1997) and only one in April (Albufeira, southern Portugal, 1st April 2001). Up to 45 records (73.8 %) fall in October–November but 13 were between December and February: five in Iberia, seven in the Canaries and one in the Azores (December 2002). Comparing geographical sectors (figure 2) it becomes apparent that the birds arrive earlier in northern Iberia and the Balearic Islands than in southern Iberia, and earlier in the latter than in the Canaries (where all records fall between 5th December and 27th March).

Comparisons with other countries

Table 2 shows the total numbers of both species recorded up to 2003 in different countries along the Atlantic coast of Europe. The Iberian totals are very low. For Spain, Portugal and Gibraltar combined, the records of Pallas's warblers amount for example to just 0.45 % of those in Great Britain, 0.7 % in Sweden and 12.3 % in France, while those of the yellow-browed warbler are only 0.7% of those in Great Britain, 6.7 % in Sweden and 7.4 % in France.

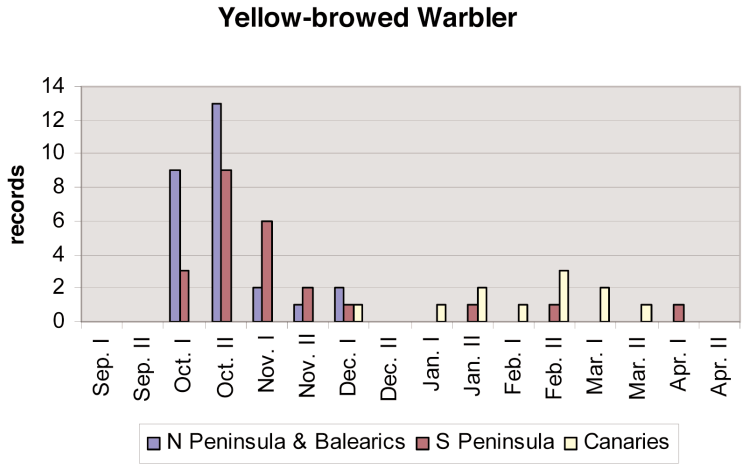

FIG. 2.—Occurrence by fortnights of yellow-browed warblers *Phylloscopus inornatus* in the Iberian Peninsula (Spain, Portugal and Gibraltar) and the Balearic and Canary Islands (see fig. 1; "S Peninsula" comprises the records at Portugal, Andalusia and Gibraltar).
[Reparto por quincenas de los registros de mosquitero bilistado Phylloscopus inornatus *en la península Ibérica (España, Portugal y Gibraltar) y las islas Baleares y Canarias (ver fig. 1; "S Península" abarca los registros de Portugal, Andalucía y Gibraltar).]*

TABLE 2

Numbers of Pallas's *Phylloscopus proregulus* and yellow-browed warblers *Ph. inornatus* recorded in different western European countries, up to 2003.
[Cifras de registros de mosquiteros de Pallas Phylloscopus proregulus *y bilistado* Ph. inornatus *en diferentes países de Europa occidental, hasta 2003.]*

	Pallas's warbler *[mosquitero de Pallas]*	**Yellow-browed warbler** *[mosquitero bilistado]*	
Sweden	1,175	911	Strid (2004)
Denmark	283	422	A. B. Kristensen in litt.
Britain	1,783	9,093	Fraser and Rogers (2006)
Ireland	27	ca. 700	Milne (2004); P. Milne, in litt.
France	65	829	Frémont *et al*. (2005)
Spain	5	42	present study
Portugal	2	10	present study
Gibraltar	1	3	present study

TABLE 3

Numbers of licenced ringers and birds ringed during the year of reference in different western European countries (after EURING, see text).
[Cifras de anilladores y de aves anilladas en diferentes países de Europa occidental durante los años de referencia (de acuerdo con EURING, véase texto).]

Country *[país]*	**Year** *[año]*	**Ringers** *[anilladores]*	**Ringers/1,000 km²** *[anilladores/ 1.000 km²]*	**Birds ringed** *[aves anilladas]*	**birds ringed/km²** *[aves anilladas/ km²]*
Sweden	2004	246	0.55	314,653	0.70
Finland	2004			217,542	0.64
Estonia	2003	100	2.21	57,122	1.26
Latvia	2004			11,834	0.18
Lithuania	2004	51	0.78	97,996	1.50
Poland	2004	270	0.87	132,407	0.49
Germany	2004			193,512	0.54
Denmark	2004	175	4.06	67,166	1.56
Netherlands	2005	412	9.92	243,941	5.87
Belgium	2004	374	12.25	695,353	22.78
United Kingdom	2004	2,116	8.64	881,889	3.60
France	2004	421	0.76	208,440	0.38
Spain	2004	794	1.57	409,479	0.81
Portugal	2004	130	1.41	~20,000	~0.22

Observer coverage

Table 3 shows the current ringing effort in different countries of Atlantic Europe. More birds in total were ringed in the United Kingdom in 2004 than anywhere else but more birds were ringed per km² in Belgium. Capture densities above one bird per km² were also attained in the Netherlands, Denmark, Lithuania and Estonia, but then by followed Spain (0.81 birds/km²), preceding Sweden (0.70) and France (0.38). In terms of total bird captures, Spain is in third place behind the United Kingdom (where twice as many birds were ringed) and Belgium (approximately 1.7 times as many), but again ahead of Sweden and France. Regarding the numbers of ringers, Spain had only 38 % as many as the United Kingdom in 2004 but almost twice as many as in France and three times as many as in Sweden.

Within Spain, ringers are concentrated mainly around the big cities of Madrid and Barcelona, with comparatively high numbers also in the southern region of Andalucía, along the Mediterranean coast and in the Balearic Islands (Pinilla *et al.*, 2006). The ringing effort was very low up to the 1970s but during the 1980s around 100,000–150,000 birds were ringed annually, rising to 150,000–300,000 per year in the 1990s (Pinilla *et al.*, 2006).

Ringing is not the only well established aspect of ornithology in Spain, where although the science has certainly developed much more recently than in Britain and probably than in most other western European countries, it has greatly expanded in recent decades (Fernández, 2004). The national ornithological society (SEO/BirdLife, www.seo.org), founded in 1954, has over 10,000 members, many of them active fieldworkers. For example, around 2,000

people participated in the fieldwork for the second *Spanish breeding bird atlas* (Martí and del Moral, 2003); the common birds census scheme, established in 1996, sampled 583 10 km-squares in 2005 (Escandell, 2006), and the last report of the Spanish Rarities Committee presents 258 records of 114 different species (de Juana *et al.*, 2006). In Portugal the national ornithological society (SPEA, www.spea.pt) has also seen rapid development (A. Lopes and D. Leitão, pers. com.) although the ringing effort is still rather low (average of some 20,000 birds per year, after V. Encarnação, pers. com.).

Discussion

Although the present coverage of the Iberian Peninsula and associated islands by ringers and birdwatchers is still much lower than in Britain, it is already quite similar to that of Western Europe as a whole. Therefore, contrary to earlier suppositions (Allerstam, 1990; Phillips, 2000), the very low autumn totals of Pallas's and yellow-browed warblers in Iberia can not be explained by a lack of observers. Furthermore, the analysis of the Iberian records shows several important differences in their occurrence patterns when compared with those from northwest Europe.

The geographical distribution of the records in the Iberian Peninsula shows that occurrences of both species are concentrated on the eastern and southern coasts: northern coasts have just two records of the yellow-browed warbler (3.3 % of the total) and the northwest corner of Iberia has no records at all. Although ringing effort is lower there than in the Mediterranean seabord, it should be emphasised that the northern Iberian coasts receive rather good observer coverage, being a rarity 'hot spot'. In addition, there are no autumn records for the Atlantic Islands, where Pallas's warbler has never been reported and where the ten records so far of the yellow-browed warbler all fall within December–March. This lack of autumn western records clearly refutes the hypothesis that the birds reaching Scandinavia and Britain keep heading west, since if they do so and reach the Atlantic they would be expected to be much more frequent in northwest Iberia than in the east or the south, and at least a few might be expected to reach the Atlantic Islands in autumn. On the other hand, the Iberian record pattern is compatible with the relative lack of Irish records (where records of Pallas's warbler represent just 1.5 % of those in Britain and records of the yellow-browed warbler about 8 %) or indeed of records from the western coast of Britain (Sharrock, 1972; Dymond *et al.*, 1989). This was also pointed out by Michaelsen and Ree (1975), when comparing the scarcity of records in Scotland, especially of Pallas's warbler, with the situation in southern Norway.

For yellow-browed warblers, the occurrence patterns detected in England, France, eastern and southern Iberia, and the Canary Islands, as well as the fact that their arrivals in these areas are far from synchronous, make it apparent that most birds must at some point change their flight direction to head south. In general, they first arrive in Scandinavia, where Ullman (1989) has pointed out that the Swedish records of yellow-browed warblers are a week earlier on average in the north than in the south of the country (mean dates 26th September at Västerbotten and 3rd October at Öland) and those of Pallas's warblers two weeks earlier (11th October at Västerbotten and 24th October at Öland). For southern Norway, Michaelsen and Ree (1975) gave mean dates of 28th–29th September. In the British Isles, the first autumn records usually come from the Shetlands in the far north, where September records predominate, while in October most are from England where they appear earlier in the southeast than in the southwest: this finding applies both to the data as a whole (Sharrock, 1972; Dymond *et al.*, 1989) and for particular years (i. e., Howey and Bell, 1985; Baker and Catley, 1987; Millington, 1994; Fraser and Rogers,

2006). Morover, there are considerable average differences between the British and the French data, which initially may seem rather surprising given that most British records are in the south and most French records come from the coast between Pas-de-Calais and Brittany, on the southern side of the English Channel. For example, yellow-browed warblers peak in Britain in the first half of October (Dymond *et al.*, 1989; Wernham *et al.*, 2002) while in France they do so between the 20th and the 25th of October (Dubois *et al.*, 2000). Still more to the south, in the central and eastern Mediterranean islands (Malta, Sicily and Cyprus), the rather few records known for yellow-browed warblers are more or less equally distributed between October and November and there are none in September (Cambi and Cambi, 1986).

The Iberian data fit neatly within this general pattern, showing earlier arrivals in the north than in the south of the Peninsula. The Canary Islands introduce a further element to the comparison, since their earliest records are not until December. All this favours the idea of a slow progressive southward movement and contradicts the hypothesis of misorientated vagrants, which would be expected to appear at more or less the same time at all those European coasts located at similar distances from the Siberian breeding areas. Sharrock (1972) proposed as an alternative explanation that a reverse migration occurs on a broad front but with the more southerly breeding yellow-browed warblers lagging behind the more northerly ones, because they start later, because they have a greater distance to travel, or because the 'centre of gravity' of the population shifts southwards as time progresses. However, the spread in arrival dates between the different western European areas (from late September in Scandinavia to December in the Canaries) is simply too big to sustain this possibility, especially when it is considered that the breeding areas in Siberia are abandoned rapidly, between August and early September (Cramp, 1992).

It seems that a north to south movement of Pallas's warblers through west Europe also takes place. The records peak in Britain within the first third of October (Dymond *et al.*, 1989), in the Netherlands within the last two thirds of the month (van den Berg and Bosman, 1999) and in France, where most are from the northern coast, between October 23rd and 27th (Dubois *et al.*, 2000). The latest autumn record in France, on a 2nd December, is from the Mediterranean coast (Hérault). The only Iberian records during the second half of the year are two from late October and two from late December, while in Italy, of eight records accepted so far (Brichetti *et al.*, 1995, 1997; Brichetti and Occhiato, 2004a, 2004b, 2005) four were in spring, one in early October (7th), two in late October (25th and 31st) and one in late December (27th), this last one from the southern tip of the Italian Peninsula (Calabria). The only Moroccan record was on 7th December 1985, near Agadir (Thévenot *et al.*, 2003).

The fact that high percentages of the Iberian records of both species are not in autumn is another obvious difference from the occurrence patterns detected in northwest Europe. In Pallas's warbler, 50 % of Iberian birds were in spring, which matches the Italian data (four spring records from a total of eight) and is very different from the situation in more northerly countries: there are just single spring records for this species in Britain (Cottridge and Vinicombe, 1996), Sweden (Alström *et al.*, 1991) and the Netherlands (Van den Berg and Bosman, 1999) and just two for France (Dubois *et al.*, 2000). In the case of the yellow-browed warbler, the proportion of non-autumn records in northwest Europe is even lower than for Pallas's warbler (Dymond *et al.*, 1986; Brown and Grice, 2005; Dubois *et al.*, 2000), while it amounts to 12 % for the Iberian Peninsula and to 100 % for the Atlantic Islands. On the one hand, the relatively high number of non-autumn records in Iberia and the Canaries is another argument to refute the

thesis that birds are simply overlooked there in autumn. On the other, it supports the possibility of winter quarters existing somewhere in Africa, as suggested by Gilroy and Lees (2003).

For Pallas's warbler, the records in Portugal (two) and Morocco (one) during December may relate to birds still moving south, while those in March–April in the Chafarinas Islands (one), eastern Iberia (two), the Balearic Islands (one), southern France (two) and Italy (two) suggest return movements, although in very low numbers. I am not aware of records from Africa to the south of the Sahara or from the eastern Mediteranean region. Regarding the yellow-browed warbler, at least some of the records in the Canaries must relate to wintering birds, as was the case with an individual seen at Costa Teguise, Lanzarote, between 18th January and 10th March 1997 (Martín and Lorenzo, 2001; de Juana *et al.*, 2002) and there is one record from Senegal, in September 1987 (Urban *et al.*, 1997). A few yellow-browed warblers may also winter in Europe, as suggested by one seen in Cádiz province on 27th January 1993 (de Juana *et al.*, 1995) or two on the Mediterranean coast of France (Alpes-Maritimes, 11th January to 6th March 1988, and Var, 6th January to 3rd February 1991 [Misiek, 1990; Dubois *et al.*, 2000]). Similarly, a few yellow-browed warblers have wintered in Britain, mainly on the south coast, departing by mid-April (Marchant 2002), while during 1958-85 there were just four spring records (late March to mid May) all along the British south coast (Dymond *et al.*, 1989). Although spring records are exceptional both in Iberia and in France, and apparently unknown for northern Africa, there are a few for Sicily (one at Pantelleria, 9th April 1931; Iapichino and Massa, 1989), Malta (20th February and March 1913, Sultana and Gauci, 1982) and Greece (16th April 1976 and 19th May 1992; Handrinos and Akriotis, 1997) that may indicate birds returning to the Siberian breeding grounds by a more easterly route.

Nevertheless, for both species these winter and spring records account for just a minor fraction of the birds which arrive in Europe during the autumn. Even accounting for a very high mortality during the first winter, it seems that many more individuals should be recorded in Europe during the spring migration in case that they overwinterd somewhere in Africa. Is it possible any other explanation? In my view, there is a possibility that after visiting northern Europe they may fly later in the autumn to the already known wintering grounds in Asia. Autumn movements in which birds fly initially in one direction and then, after a given date, migrate in an almost opposite direction are known for other species, at least since Adelheid Studer-Thiersch showed that many juvenile common starlings *Sturnus vulgaris* fledged in Switzerland migrate up to 500 km to the northwest, in summer: into Germany, the Low Countries and northern France, before moving south in autumn to winter in northwest Africa or Spain (Studer-Thiersch, 1969).

This kind of migration, termed *Zwischenzug* by german authors and 'exploratory migration' by Baker (1978), seems to be performed also by such species as the barred warbler *Sylvia nisoria*, the red-breasted flycatcher *Ficedula parva* and the common rosefinch *Carpodacus erythrinus,* that regularly visit the British Isles during the autumn but whose nearest breeding areas lie in Central Europe (Berthold, 1993; Wernham *et al.*, 2002). Their occurrences almost exclusively involve juveniles and are also characterised by the significant number of records and by the notable regularity of their arrival and departure dates. They also recall strongly the occurrence patterns of the Siberian warblers in that they affect similar areas in Great Britain (Dymond *et al.*, 1989) and France (Dubois *et al.*, 2000), while in Spain there are very few records and most of them relate to the eastern seaboard of the Iberian Peninsula and to the Balearic islands (de Juana, 2006).

The reverse migration hypothesis has also been advocated to explain the occurrence of these species although there are a few recoveries showing that at least some individuals reorientate to the southeast (Cramp, 1992; Wernham *et al.*, 2002). The autumn migration of continental blackcaps *Sylvia atricapilla* into Scandinavia (Fransson and Stolt, 1993) may be another good example, since many arrive there during the autumn but very few stay to winter.

Hence, the occurrence of Pallas's and yellow-browed warblers in Europe may be just instances of *Zwischenzug*, although involving longer journeys than usual. It is commonly assumed that the great majority of individuals of these two species which reach Europe in autumn are juveniles (Cramp, 1992), despite the apparent impossibility of aging them reliably at that season (Svensson, 1992; Wernham *et al.*, 2002). The fact that trapped birds are in good body condition (Dubois *et al.*, 1986; Woodbridge and Duncan, 1998) may be an indication that they are ordinary migrants and not accidental ones. There is at least one recovery illustrating a change in the migratory direction of a yellow-browed warbler: one ringed on 21st October 1988 at Portland Bill (Dorset, southern England) and recovered the following day in Guernsey (Channel Islands), some 115 km to the south (Marchant, 2002). Another indication that birds may change their migratory direction may be that one out of six Pallas's warblers and three out of ten yellow-browed warblers captured at Christiansø in Denmark in September-October 1994 and tested in Emlen funnels by Thorup (1998) showed eastward movement tendencies. In these kinds of tests, deviations from the expected flight directions are usually attributed to erroneous behaviour due to the experimental conditions but there is also the possibility that they were perfectly genuine tendencies in at least some individuals (e. g., Marchetti and Baldaccini, 2003). An endogenously controlled change of direction, similar to those known for other species (Berthold, 1984; Berthold *et al.*, 2003), may be contained in the migration scheme of juveniles of these two species.

This new hypothesis seems to me the only one so far that may account for the patterns of occurrence of these two Siberian warblers in southwest Europe and at the same time, for the steady increase in their records in the northwest. Their exploratory migration into Europe may be resulting in higher survival rates and, as a result, in the progressive spread through their populations of an innate tendency to migrate westwards. Eventually this may end up in configuring larger scale changes in these species' migratory behaviour, as has been seen with those central European populations of the blackcap that have recently taken to wintering in Britain (Berthold and Terrill, 1988). Some of the many changes already documented in the winter distribution of birds (Sutherland, 1998; Fiedler, 2003) may have started in a similar way.

It may be suggested finally that, in order to test this hypothesis, it may be useful to record in a systematic way the body condition of the individuals trapped in Europe and to keep on testing its fligt directions by means of Emlen funnels, in different areas.

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