

Autumn migration of some passerines on the island of Capri, southwestern Italy

Höststräcket av några tättingar på Capri i sydvästra Italien

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Abstract

This paper presents and analyses autumn migration data on phenology and biometrics for 12 species of birds trapped at the Capri Bird Observatory, south-western Italy. The material has been collected over 15 years, mainly in two periods, 1959–1963 and 1994–2004. The passage of trans-Saharan migrants (like the Garden Warbler *Sylvia borin*) peaks in late September and these birds generally carry moderate to large fat stores, some probably large enough for the full journey to just south of the desert. The short-distance migrants that are mainly due to winter in the Mediterranean region (like the Robin *Erithacus rubecula*) arrive later, around

the beginning of October, and carry less fuel deposits. Mainly resident birds (like the Sardinian Warbler *Sylvia melanocephala*) do not build up any substantial fat reserves and their phenologies do not indicate much migratory movement.

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Received 14 February 2005, Accepted 22 November 2005, Editor: R. Sandberg

Introduction

The study of bird migration across the Mediterranean-Saharan topographical and ecological barrier has a long tradition and was summarised by Moreau (1972). Since then a large number of papers have been written on the subject, both regarding the spring and autumn passages. A good overview, containing much phenological and biometrical data from the westernmost part of the Mediterranean, was Finlayson's (1992) book on the migration across the Strait of Gibraltar. Recently Italian scientists have published three reports with a profusion of similar data on the Italian avifauna, covering the whole year and both resident and migrant birds. The report relevant in the present context is the one by Licheri & Spina (2002). The standard work on ornithology of the Naples and Capri area is the book on the bird fauna of the Campania region by Scebba (1993).

The present paper presents autumn migration data on phenology and biometrics for 12 species of birds trapped for ringing at the Capri Bird Observatory in south-western Italy during 15 years between 1959 and 2004. Italy, and the island of

Capri, lies on what can be called the “central flyway”, where birds from the Baltic basin and areas east thereof, and from much of central Europe pass southwards in autumn en route for winter quarters in eastern West Africa and around the Congo basin – and largely return the same way in spring. At the same time Capri and the surrounding region is the wintering area for many resident species and northern short-distance migrants.

Material and methods

Capri Bird Observatory (40°33'N 14°15'E) resides 400 m a.s.l. in the remnants of an old castle, Castello Barbarossa, on a mountain above Anacapri town. The island of Capri is situated 5 km off mainland Italy, in the bay of Naples, approximately 250 km north of Sicily and 500 km NE of Cape Bon in Tunisia.

Data have been collected during 15 autumns from 1959 to 2004, with the coverage in individual seasons varying from 4 (1989) to 102 days (1961), with a total of 524 working days (Table 1). Birds were trapped with mistnets in the mostly macchia vegetation in and around the castle. However, the

Table 1. Trapping effort in different years.
Fångstinsatsen under olika år.

Year <i>År</i>	Trapping days <i>Fångst dagar</i>	Period <i>Period</i>
1959	58	7 Aug – 3 Oct
1960	32	4 Oct – 4 Nov
1961	102	6 Aug – 15 Nov
1962	32	22 Sep – 23 Oct
1963	8	30 Jul – 13 Aug
1989	4	10 Oct – 13 Oct
1994	64	17 Aug – 19 Oct
1995	44	31 Aug – 13 Oct
1996	25	2 Sep – 5 Oct
1997	12	25 Sep – 6 Oct
1998	42	19 Jul – 29 Aug
1999	21	16 Sep – 25 Sep
2000	41	4 Aug – 13 Sep
2001	11	26 Sep – 6 Oct
2004	28	10 Sep – 7 Oct
Total	524	

number of nets used varied considerably between years, with little efforts of standardisation. The study area has been hit by fire at least twice during the time period, with large if mainly temporal effects on the tree and bush vegetation. Thus, the material is of a heterogeneous nature, but data assembled from so many years still gives a good picture of the general pattern of migration.

We divided the trapping dataset into 24 pentads, starting on 19 July and ending on 15 November. For each pentad we calculated the trapping activity as the proportion of days with active trapping of the total possible days (i.e. for the first pentad: 5 days with active trapping out of a total of 75 possible days (1 pentad, 15 years) = 6.7% trapping activity; Table 2). Generally, coverage was less good in the early and late parts of the study period. Out of the many species caught at the observatory, we chose 12 for the sake of this article. These species were the most numerous in the trappings, ranging from 1847 Robins to 76 Northern Wheatears *Oenanthe oenanthe* (Table 2). With such a large variation in sample size, the number of potential analyses will also vary between species. For each treated species we have produced a phenology chart. However, to adjust these charts for the variation in trapping intensity we divided the number of trapped birds in each pentad by the number of active trapping days. Thus the y-axis in each chart shows the average number of trapped birds per day in each pentad.

Birds were aged according to characters presented in Svensson (1984, 1992), in all but the earliest study years (1959–1963), as either juveniles, adults or birds of unknown age. Individual sex has been determined in species with pronounced plumage dimorphism. Fat stores have, since 1989, been determined according to the scale of Hasselquist & Pettersson (1985), which judge the amount of fat deposited on the abdomen and in the tracheal pit based on seven scores. This scale has later been enlarged to ten scores, by inclusion of three additional classes of really fat birds (Falsterbo Bird Observatory, unpublished). These higher scores are similar to the three largest ones in the scale of Kaiser (1993; see also Bairlein 1995), and have been used on Capri since 1994.

The extent of post-juvenile moult was noted in juvenile birds according to the six score scale of Bensch & Lindström (1992).

Species accounts

Tree Pipit *Anthus trivialis*

The Tree Pipit is a common breeding bird in most parts of Europe, including Italy. It winters in sub-Saharan Africa in open woodland and wooded savannah (Keith et al. 1992). The first birds trapped on Capri appeared in pentad 6, in the middle of August, but the migration peaks in mid September (median pentad 12; Figure 1A). October records are generally rare in Italy (Licheri & Spina 2002) and only six individuals were ringed during this month on Capri.

Body masses ranged from 17.5 to 35.3g (mean 22.8g and 24.6g for adults and juveniles, respectively), a really remarkable span (Table 3). Mean fat scores were around 4.5–5. There was no difference between the age classes in mass ($F_{1,80} = 3.42$, $p = 0.068$), and both juvenile and adult birds increased in mass with the progress of the autumn (adult: Pearson $r = 0.505$, $n = 17$, $p = 0.030$; juveniles: Pearson $r = 0.422$, $n = 64$, $p = 0.001$; Figure 2). Both the phenology of the passage and the pronounced increasing trends in mass with time is similar to data from the rest of Italy (Licheri & Spina 2002).

Blackcap *Sylvia atricapilla*

On Capri the Blackcap occurs both as a common resident, as a numerous passing migrant and as winter visitor. Many of the wintering birds come from northern populations (Hjort et al. 2006), being generally larger and longer-winged than

Table 2. Number of trapped birds and the trapping activity in different pentads. Species abbreviation: first letter of genus and three first letters of latin species name; see Table 3. Days is the sum of days with active trapping in all years.

Antalet fångade fåglar och fångstaktiviteten i olika pentader. Artförkortning: första bokstaven i släkt- och tre första i latinska artnamnet, se Tabell 3. "Days" är antalet dagar med aktiv fångst alla åren.

Pentad	Period	Species abbreviation														Days	%
		Attriv	Satr	Sbor	Smel	Scan	Pcol	Ptro	Pstib	Rign	Ooen	Erub	Tphi				
1	19-23 Jul	-	25	-	30	2	-	-	-	2	-	-	-	-	5	6.7	
2	24-28 Jul	-	19	-	11	1	-	-	-	1	2	-	-	-	5	6.7	
3	29 Jul - 2 Aug	-	7	-	18	7	-	1	2	1	-	-	-	-	8	10.7	
4	3-7 Aug	-	10	2	22	5	-	-	3	3	-	-	-	-	16	21.3	
5	8-12 Aug	-	9	2	26	11	-	2	17	4	1	-	-	-	20	26.7	
6	13-17 Aug	1	4	4	9	4	-	-	2	4	4	-	-	-	22	29.3	
7	18-22 Aug	3	3	11	30	9	-	2	14	3	1	-	-	-	25	33.3	
8	23-27 Aug	7	4	10	21	8	-	3	7	7	3	-	-	-	25	33.3	
9	28 Aug - 1 Sep	2	7	15	22	5	-	3	2	7	6	-	-	-	24	32.0	
10	2-6 Sep	3	12	19	13	3	-	9	15	6	13	-	-	-	30	40.0	
11	7-11 Sep	23	25	46	34	9	-	10	18	12	11	4	-	-	32	42.7	
12	12-16 Sep	19	21	37	25	3	2	8	13	7	8	12	-	-	28	37.3	
13	17-21 Sep	11	33	71	32	14	-	17	7	8	15	16	-	-	31	41.3	
14	22-26 Sep	12	58	146	24	11	3	19	4	9	5	69	-	-	42	56.0	
15	27 Sep - 1 Oct	11	124	127	49	2	14	25	1	23	6	368	1	40	53.3		
16	2-6 Oct	2	97	43	38	3	27	20	2	20	-	240	1	49	65.3		
17	7-11 Oct	2	130	26	21	-	28	10	-	17	2	337	23	33	44.0		
18	12-16 Oct	1	129	8	21	-	52	9	1	15	2	273	48	25	33.3		
19	17-21 Oct	1	52	1	2	-	26	2	-	8	2	191	88	18	24.0		
20	22-26 Oct	-	25	-	1	-	5	15	-	11	-	102	32	12	16.0		
21	27-31 Oct	-	5	-	-	-	8	-	-	5	1	62	34	10	13.3		
22	1-5 Nov	-	7	-	2	-	22	-	-	5	-	139	76	9	12.0		
23	6-10 Nov	-	5	-	11	-	-	4	-	5	-	27	1	5	6.7		
24	11-15 Nov	-	1	-	-	-	1	1	-	-	-	7	1	5	6.7		
Total		98	812	568	462	97	188	160	109	184	76	1847	305	519			

bird of the resident population. The phenology diagram, based on 812 ringed individuals (Figure 1B), illustrates this pattern of residents versus migrants, with two peaks in the numbers of ringed Blackcaps. The first peak, in late July, is probably exclusively consisting of breeding local birds. This peak is followed by a period of lower trapping numbers until a marked increase starts from pentad 13, with a peak at pentad 18 in mid-October, after which the numbers drop again. This second peak coincides with that of the Robin and most likely mainly consists of migrant Blackcaps. We divided the material in two groups: birds with $\leq 71\text{mm}$ or $\geq 72\text{mm}$ in wing length (Table 3). The long-winged group was heavier ($t_{1,745} = -11.9$, $p > 0.001$), carried larger fat stores ($t_{1,745} = -10.0$, $p > 0.001$) and peaked on average two weeks later in the season (1 October vs. 16 September; $t_{1,746} = -9.0$, $p > 0.001$).

Garden Warbler *Sylvia borin*

The Garden Warbler is a widely distributed species in Europe, breeding from the northern parts of the Mediterranean region to northern Fennoscandia, and eastwards from Great Britain well into Russia (e.g. Cramp 1992). It is one of the most frequently trapped birds on Capri in spring (Pettersson et al. 1990, Messineo et al. 2001). The breeding area for birds passing Capri is indicated by recoveries in Lithuania, Finland and Byelorussia, and at least three wintering records have been made in the Congo basin (Pettersson et al. 1990). In autumn, 568 Garden Warblers have been ringed and the phenology shows a distinct peak in the last weeks of September (median passage pentad 14; Figure 1C). However, the earliest birds are trapped already in mid-August and the latest well into October. Adult Garden Warblers pass through the area on average c. 10 days earlier than juveniles (Mann-Whitney $U = 6749.0$, $n = 530$, $p < 0.001$; Figure 1C).

The mean body mass levels were c. 5g heavier than an estimated lean body mass of 15g (Ottosson et al. 2005), and the mean fat scores were between 4 and 5 (Table 3). The heaviest recorded individual weighed 33.1g. These body masses are similar to those observed in Garden Warblers which in central Nigeria prepare for their spring departure across Sahara and the Mediterranean Sea (Ottosson et al. 2005), and are thus probably sufficient to cover the energy demands for the full journey to sub-Saharan Africa without refuelling. There were no trends in mass or fat score within the

season (Pearson $r = -0.002 - +0.193$, $n = 44-464$, n.s.) and no body mass differences between age classes ($F_{1,506} = 1.04$, $p = 0.308$).

Sardinian Warbler *Sylvia melanocephala*

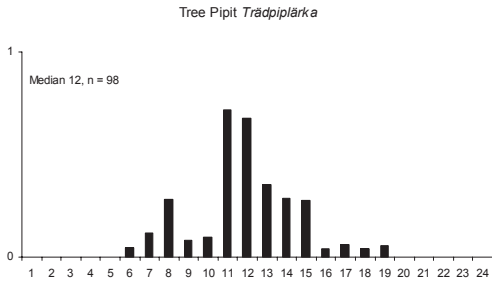
The Sardinian Warbler is mainly sedentary in the Mediterranean region, but some birds, at least some years, winter south of the Sahara (e.g. Urban et al. 1997, Borrow & Demey 2001). It is a common breeder on Capri and most birds trapped in autumn may be local, or from the surrounding region. This view is supported by the phenology diagram with a rather even distribution in all pentads, except for a somewhat higher number in the very first pentad of the season (Figure 1D). The median "passage" for both juveniles and adults is in the second week of September (pentad 11; Figure 1D), but these figures are most likely somewhat affected by increased trapping activity in these pentads. The extent of post-juvenile moult of body feathers shows a marked change from predominantly low scores before pentad 10 to predominantly high scores after (Figure 3), which indicates that before pentad 10 the majority of juvenile birds are still within or near their breeding territories, still in heavy moult of juvenile body feathers. Juveniles trapped after pentad 10, with nearly completed post-juvenile moult, could be either local progeny, dispersing juveniles from neighbouring areas, or true migrants.

The body mass of trapped Sardinian Warblers was very similar between age and sex classes (Table 3), and only marginally lower than corresponding values from other Italian Sardinian Warblers (Licheri & Spina 2002). We found no temporal trend in body mass, neither for adults (Pearson $r = 0.084$, $n = 51$, $p = 0.559$) nor for independent juveniles (post-juvenile moult scores > 3 : Pearson $r = -0.087$, $n = 69$, $p = 0.475$). Licheri and Spina (2002) noted an increase in mass during the autumn, most pronounced in October – December. As only few Sardinian Warblers were trapped after mid-October we could have missed that trend.

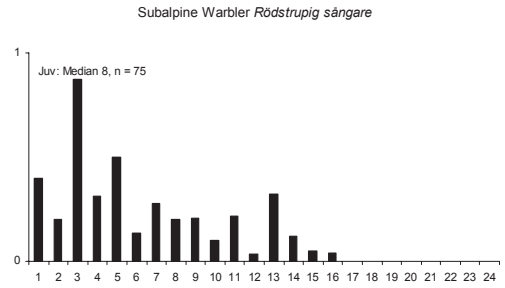
Subalpine Warbler *Sylvia cantillans*

Breeds in large parts of the central and western Mediterranean region, including the Iberian peninsula and the Mahgreb of North Africa (Cramp 1992), and winters in the northern, drier parts of sub-Saharan Africa (e.g. Urban et al. 1997). The trapping data from Capri indicates four peaks in the migration phenology of the Subalpine War-

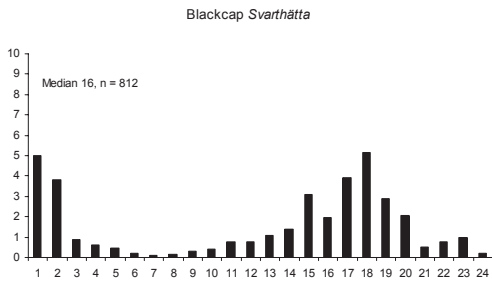
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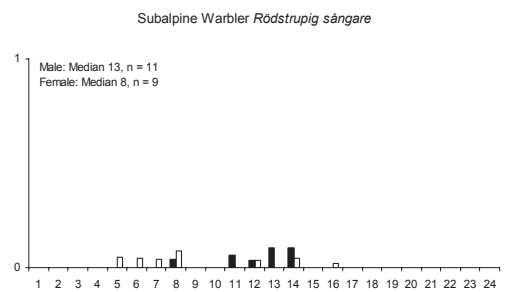
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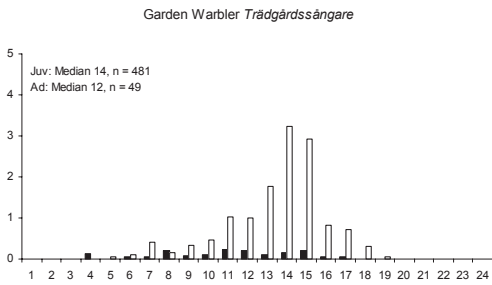
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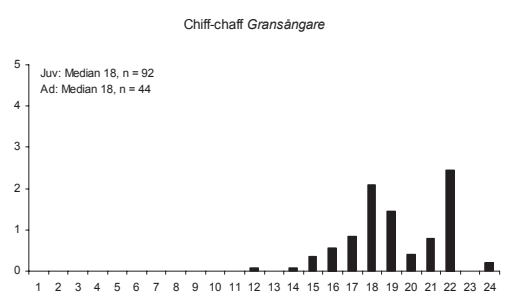
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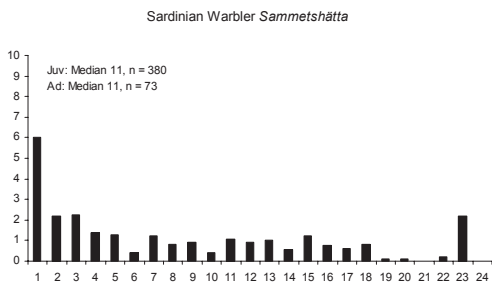
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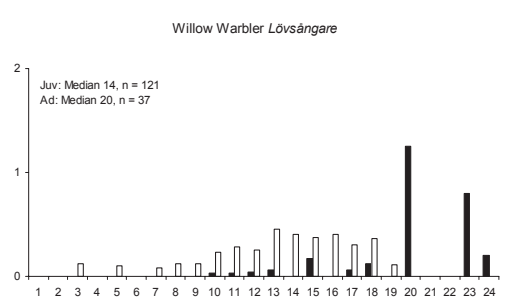
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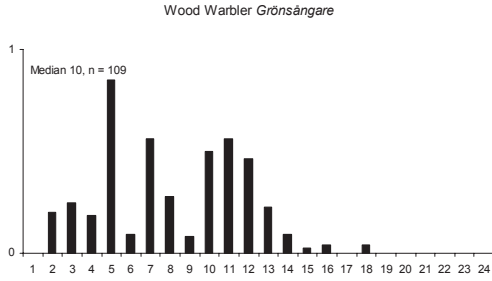
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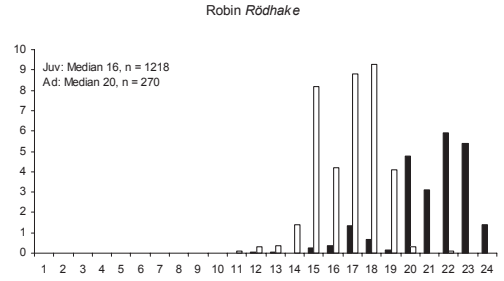
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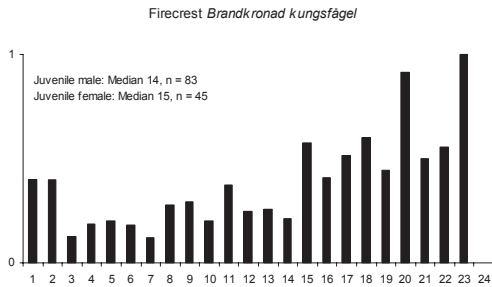
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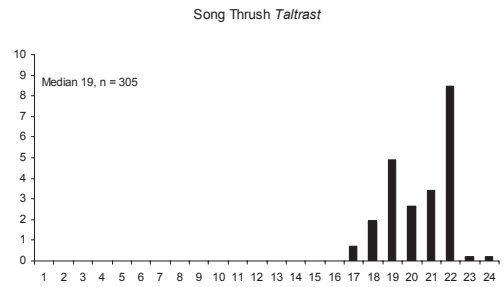
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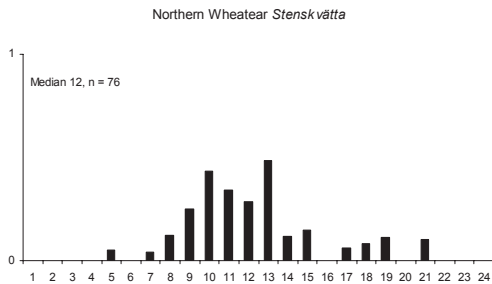


Figure 1. The mean number of trapped individuals per trapping day in each pentad. When distinguished, we give numbers for different ages and sexes, and sample size and median pentad. Solid bars=adults, open bars=juveniles. *Det genomsnittliga antalet fångade individer per fångstidag i varje pentad. Vi ger antal för olika åldrar och kön när vi separerade dem, samt stickprovsstorlek och medianpentad.*

bler (Figure 1E). For adults, the first peak consists mainly of females (median pentad 8) and the second primarily of males (median pentad 13; Figure 1F). However, the material is rather small and statistically speaking there was no significant difference in passage time between adult males and females (Mann-Whitney $U = 33.5$, $n = 20$, $p = 0.216$). There is a clear tendency for a bimodal phenology also for juveniles, but very few of this age class have been sexed (Figure 1E). In general, adults peaked later than juveniles (Mann-Whitney $U = 478.0$, $n = 96$, $p = 0.003$).

Body mass ranged from 8.6 to 15.3g (Table 3). There was a positive trend in juvenile body mass with time (Pearson $r = 0.647$, $n = 74$, $p = 0.044$), not found in the smaller adult dataset (Pearson $r = 0.129$, $n = 22$, $p = 0.566$).

Chiffchaff *Phylloscopus collybita*

The Chiffchaff is a common species in most of Europe, occurring with different subspecies in different parts of the continent (Cramp 1992). The wintering area ranges from the Mediterranean

Table 3. Morphometrics of birds trapped on Capri during 15 autumns, 1959–2004.
Morfometrisk data från fåglar fångade på Capri under 15 höstar 1959–2004.

Species <i>Art</i>	Age <i>Ålder</i>	Sex <i>Kön</i>	Body mass <i>Kroppsvikt</i> (g)			Fatscore <i>Fettskala</i>			
			Mean <i>Medel</i>	Range <i>Spann</i>	s.d.	n	Mean <i>Medel</i>	s.d.	n
Tree Pipit <i>Trädpiplärka</i>									
<i>Anthus trivialis</i>	ad		22.8	18.2–28.6	2.7	17	4.5	1.9	17
	juv		24.6	17.5–35.3	3.9	64	5.1	1.9	64
Blackcap <i>Svarthätta</i>									
<i>Sylvia atricapilla</i>									
			16.2	13.0–20.6	1.2	260	1.8	1.3	259
			17.6	13.2–24.6	1.7	487	3.0	1.6	488
Garden Warbler									
<i>Trädgårdssångare</i>									
<i>Sylvia borin</i>	ad		19.4	13.7–29.5	3.2	44	4.5	2.1	44
	juv		19.9	14.3–33.1	3.2	464	4.8	1.8	464
Sardinian Warbler									
<i>Sammetshätta</i>									
	ad	M	11.9	10.4–13.4	0.7	29	2.1	1.2	29
	ad	F	12.0	11.0–13.0	0.6	22	1.6	1.2	22
<i>Sylvia melanocephala</i>									
	ad		11.9	10.4–13.4	0.6	51	1.9	1.2	51
	juv	M	12.0	10.2–15.4	0.8	101	1.8	1.2	101
	juv	F	11.8	10.4–13.6	0.8	124	1.8	1.2	122
	juv		11.8	10.0–15.4	0.7	356	1.9	1.1	352
Subalpine Warbler									
<i>Rödstrupig sångare</i>									
<i>Sylvia cantillans</i>	ad		11.7	8.9–15.3	2.1	22	5.6	1.9	22
	juv		10.8	8.6–14.0	1.2	74	4.5	1.8	74
Chiffchaff <i>Gransångare</i>									
<i>Phylloscopus collybita</i>									
	ad		6.6	5.1–10.3	1.1	41	2.4	1.2	41
	juv		6.5	4.4–9.2	0.8	83	2.4	1.7	83
Willow Warbler									
<i>Lövsångare</i>									
<i>Phylloscopus trochilus</i>	ad		10.3	7.4–13.6	2.1	12	4.6	2.1	12
	juv		9.1	7.0–13.2	1.2	110	4.3	1.7	110
Wood Warbler									
<i>Grönsångare</i>									
<i>Phylloscopus sibilatrix</i>	ad		10.2	8.8–13.0	1.7	5	3.8	2.2	5
	juv		10.0	7.6–14.6	2.0	47	4.1	2.1	47
Firecrest									
<i>Brandkronad kungsfågel</i>									
<i>Regulus ignicapillus</i>	ad		5.1	5.0–5.3	0.1	5	1.2	1.1	5
	juv	M	5.1	4.1–5.9	0.3	78	1.1	1.2	78
	juv	F	5.0	4.2–6.2	0.4	42	1.6	1.5	42
	juv		5.1	4.1–6.9	0.4	129	1.3	1.3	129
Northern Wheatear									
<i>Stenskvätta</i>									
<i>Oenanthe oenanthe</i>	ad	M	22.7	21.4–25.6	1.7	5	3.8	1.9	5
	ad	F	-	20.2–21.6	-	2	-	-	-
	juv		22.5	17.3–29.2	2.4	43	4.1	1.4	40
Robin Rödhake									
<i>Erithacus rubecula</i>									
	ad		15.9	10.9–18.9	1.4	70	3.2	1.5	68
	juv		15.8	11.4–22.5	1.5	1130	2.9	1.6	1129
Song Thrush Taltrast									
<i>Turdus philomelos</i>									
	ad		-	62.0–80.0	-	2	-	-	-
	juv		64.5	48.5–79.5	6.5	48	2.2	1.4	50

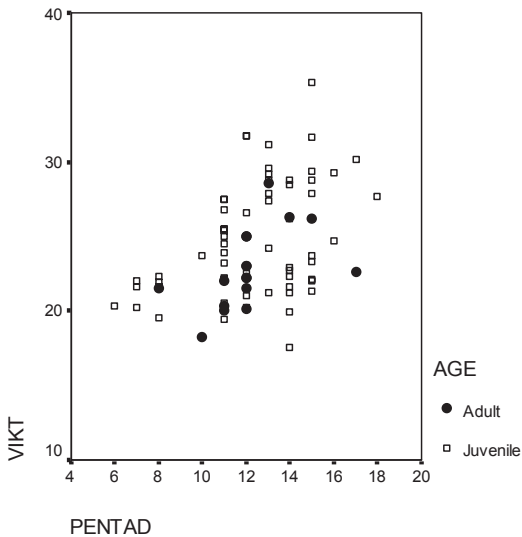


Figure 2. Body mass in relation to pentad in adult (filled circles) and juvenile (open boxes) for Tree Pipits *Anthus trivialis* trapped on Capri in autumn. *Trädpiplärkans Anthus trivialis viktutveckling under hösten på Capri (adulta fåglar = svarta cirklar, juvenila = öppna kvadrater).*

region to tropical Africa (Urban et al. 1997) and includes the island of Capri (Hjort et al. 2006). Chiffchaffs occur at the study site from the last days of September onwards to early November, with a median passage for both age classes at pentad 18 (Figure 1G). This is similar to a study covering the whole of Italy, where autumn migration peaks in the middle of October, but where good numbers of Chiffchaffs are trapped throughout the winter (Licheri & Spina 2002).

The mean body masses were low, 6.6g in adults and 6.5g in juveniles (Table 3), with no significant differences between ages ($F_{1,122} = 0.70$, $p = 0.406$). These values were approximately 0.5–1.1g lower than in the study of Licheri and Spina (2002). We noted a tendency for a negative temporal trend in adult body mass (Pearson $r = -0.306$, $n = 41$, $p = 0.051$), which was not observed in juvenile birds (Pearson $r = -0.093$, $n = 83$, $p = 0.401$).

Willow Warbler Phylloscopus trochilus

This is one of the most common birds in Europe north of the Mediterranean region, divided into two subspecies: *trochilus* that winters in West Africa, and *acredula*, a northern subspecies, that

winters in East and Southeast Africa (e.g. Cramp 1992). The origin of the Willow Warblers passing Capri is not fully resolved, but probably includes central European populations of the *trochilus* subspecies (Zink 1973).

A total of 160 Willow Warblers, of which 37 were adults, have been ringed on Capri in autumn. The period of passage is long and seems to differ between age classes. Juveniles appear already in early August, peak in the last week of September (median pentad 14) and show declining numbers throughout October (Figure 1H). Adult individuals appear later, starting at pentad 10 and are trapped into November. However, the number of adult Willow Warblers is fairly low, and the apparent peak at pentad 20 is largely due to 15 individuals trapped during this pentad in 1961. Body mass ranged from 7.0g to 13.6g (Table 3), and adult Willow Warblers were heavier than juveniles (adults mean 10.3g, juveniles mean 9.1g; $F_{1,121} = 8.26$, $p = 0.005$). Furthermore, body mass increased with pentad in juvenile (Pearson $r = 0.213$, $n = 110$, $p = 0.026$), but not in adult warblers (Pearson $r = 0.480$, $n = 12$, $p = 0.114$). The sexes differ in size in this species, with males being larger than females, but the increase in mass was not due to an increased size as indicated by wing length (Pearson $r = 0.069$, $n = 110$, $p = 0.471$).

Wood Warbler Phylloscopus sibilatrix

A widely distributed species in Europe, most commonly found in mature deciduous forest, mainly wintering in forested parts of equatorial West and Central Africa (e.g. Urban et al. 1997). A total of 109 Wood Warblers have been trapped on Capri in autumn and the median passage occurred in the first days of September (Figure 1I), which is similar to previously published data from the whole of Italy (Licheri & Spina 2002). The majority of the aged individuals were juveniles; only five birds were aged as adults. The body masses were close to 10g and fat scores around 4, with no differences between the age classes ($F_{1,51} = 0.35$, $p = 0.851$; Table 3). Juveniles increased in mass (Pearson $r = 0.337$, $n = 47$, $p = 0.021$) and fat score (Pearson $r = 0.304$, $n = 47$, $p = 0.038$) with time, but not in wing length (Pearson $r = 0.115$, $n = 47$, $p = 0.441$).

Firecrest Regulus ignicapillus

Firecrests breed on Capri in gardens and woods and are fairly common in the autumn trappings at the observatory, with a total of 184 birds trapped

in the 15 seasons. Nearly all trapped individuals were juveniles. Firecrests were trapped in all pentads except for the last one in mid-November, but the number of trapped birds per pentad was low for the whole period (Figure 1J). The disappearance in pentad 24 may reflect an effect of deteriorating feeding possibilities at the trapping site (at the exposed top of Monte Barbarossa) in winter. This is also indicated by the fairly good trapping numbers of Firecrests at Villa San Michele further down the slope in winter (Hjort et al. 2006)

Northern Wheatear *Oenanthe oenanthe*

The Northern Wheatear breeds commonly all over Europe, including Italy, and winters in the dry savannah zones south of the Sahara (e.g. Borrow & Demey 2001). Only 76 birds have been trapped on Capri in autumn, the majority juveniles. The very first was trapped already in early August, the last in late October (Figure 1K). The migration period

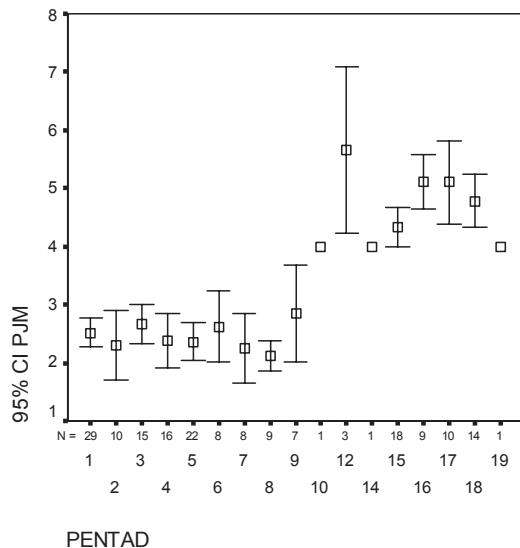


Figure 3. An error-bar plot showing the 95% confidence interval of the mean of post-juvenile moult scores (CI PJM) in juvenile Sardinian Warblers *Sylvia melanocephala* in different pentads. Numbers of investigated individuals are indicated for each pentad. Data on post-juvenile moult is lacking for birds trapped in pentads 20–24.

Förändringen av postjuvenila ruggningsgraden (95% konfidensintervall för medelvärdet: CI PJM) över tiden för juvenila sammetshättor Sylvia melanocephala vid höstmärkning vid Capri Fågelstation. Antalet undersökta fåglar per pentad anges över x-axeln. Inga datapunkter fanns för pentaderna 20–24.

is long and there was no trend in juvenile body mass over the autumn (Pearson $r = 0.169$, $n = 43$, $p = 0.278$). The measured body mass values were similar (mean combined age classes c. 22.5g; Table 3) or slightly lower than the few weights published by Licheri & Spina (2002) – the mean body mass 22.9–24.6 g depending on ten day period.

Robin *Erithacus rubecula*

The Robin is the most frequent species trapped, with a total of 1847 ringed individuals (Table 2). The first birds appear in the middle of September and they can thereafter be found at the ringing site throughout the autumn. The trappings of juvenile birds peak in early October (median passage pentad 16), while the catches of adult birds seem to peak later in the same month (median passage pentad 20; Figure 1L). In a large study covering all ringed passerines in Italy, Robins peaked in the middle of October (Licheri & Spina 2002). There were significant negative trends in body mass with progress of the season, for both juvenile (Pearson $r = -0.158$, $n = 1133$, $p < 0.001$) and adult Robins (Pearson $r = -0.270$, $n = 70$, $p < 0.024$). The species winters in fairly large numbers on Capri (Hjort et al. 2006), in gardens, orchards and vineyards, but this is just part of a much larger wintering area covering all southern parts of Italy, including Sicily, as well as parts of North Africa (Cramp 1988). The birds trapped on Capri therefore probably include birds that will winter on the island and others heading further south. The decreasing trends in mass for both age classes suggest a larger proportion of passing migrants during the early parts of the migration period and an increasing proportion of Capri wintering birds in the latter part. The fat stores in many birds are sufficient for onward flight (mean fat deposits 2.9 in juveniles and 3.2 in adults; Table 3), and the heaviest bird weighed as much as 22.5g, more than twice the leanest body masses of c. 11g.

Song Thrush *Turdus philomelos*

The Song Thrush is a common species in most of Europe, from the northern Mediterranean to Scandinavia (Cramp 1988). It winters in parts of the breeding range, but migrant populations may reach as far south in winter as North Africa – very occasionally also to south of the Sahara (Borrow & Demey 2001). Comparatively many Song Thrushes ringed on Capri have been recovered elsewhere during late autumn and winter, primarily on the

Italian mainland and probably as a result of hunting. There is also one recovery from Tunisia and one from Algeria (Pettersson et al. 1990).

The Song Thrush is a fairly common species in the trappings on Capri in autumn, but only in the years with coverage late in the season. In total 305 birds have been ringed of which all but 29 were juveniles. The phenology diagram shows a distinct peak in October-early November (Figure 1M). The body masses of juvenile Song Thrushes were c. 3g lower than a dataset from the whole of Italy (Licheri & Spina 2002), and showed no temporal trends (Pearson $r = 0.037$, $n = 48$, $p = 0.804$).

Discussion

The analysed species can be divided into three categories that are typical of the Mediterranean region as a whole (Finlayson 1992): (1) tropical migrants, (2) short-distance migrants and (3) resident species. The tropical migrant group was composed of Tree Pipit, Garden Warbler, Subalpine Warbler, Willow Warbler, Wood Warbler and Northern Wheatear and winters in sub-Saharan Africa. For all these species, except the Subalpine Warbler, most of the birds passing Capri in autumn are probably from northern breeding populations, from central Europe, eastern Scandinavia and the Baltic states (Pettersson et al. 1990, Scebba 1993). The Subalpine Warbler, on the other hand, has a generally more southerly distribution in Europe, in and around the Mediterranean area, and it may be that the uptake area for this species at Capri consists mainly of Italy. The Garden Warbler, Wood Warbler and to some degree also the Willow Warbler are confined in winter to the southernmost wooded regions of West Africa, from the Guinea savannah zones south to the rainforest belt. Garden Warblers ringed at Capri, for example, have been recovered in the Congo Basin (Pettersson et al. 1990). The other tropical migrants in this sample are mainly wintering in the dry savannahs in the Sahel, Sudan and Guinea climate zones.

Diagnostic of the tropical migrant species on Capri is that their body masses span large intervals (Table 3); often with the heaviest individuals weighing twice as much as the leanest. Migration strategies might differ between species and individuals, but it seems likely that the heaviest birds carry enough fuel for making the Mediterranean-Saharan passage without refuelling. There was a generally positive relationship between mass and progress of the autumn for this group of birds which, particularly for the species with breeding

populations on Capri, was influenced by low post-fledging mass at beginning of the season.

The second group of birds, the short-distance migrants, consisted of Chiffchaffs, Robins and Song Thrushes. When sampled on Capri, they probably included both birds on passage and birds come to winter in the region. All three species have winter distributions that include Italy and the North African coast (Cramp 1988, 1992). Chiffchaffs are numerous also south of the Sahara, the Song Thrush is only a vagrant there (Borrow & Demey 2001). These species either showed no trend (Song Thrush) or negative trends (Robin and Chiffchaff) in mass with season, indicating that as the autumn progresses the proportion of migratory birds in the trappings diminished. The mean body masses of the different migratory species on Capri were generally slightly lower than those from the rest of Italy (Licheri & Spina 2002).

Lastly, the resident birds, here represented by Sardinian Warblers and Firecrests, did not show much migratory activity. There were no peaks in their phenologies and no trends in body mass with season; rather the trapping pattern seemed mainly affected by the trapping activities. However, for both species the numbers trapped decreased in the latest part of the season in November, which could possibly be linked to low-scale altitudinal movements away from the observatory on the peak of the mountain down to the lower slopes of the mountain.

The Blackcap was the species which most clearly included birds of different types. Those of the breeding population in the region (*ssp. pauluccii*) are smaller and somewhat darker, whereas longer-winged and paler northern birds appear in numbers later in the autumn. Also body mass and fat score data illustrate the differences between the groups, with larger reserves, indicating possibilities for further flights, in the latter group.

To conclude, these autumn data, although patchy, add to our knowledge of annual routines for birds in the region, and should be used in conjunction with similar data from this site in spring and winter (Pettersson et al. 1990, Messineo et al. 2001, Hjort et al. 2006) and from the region as a whole (Scebba 1993, Messineo et al. 2001, Licheri & Spina 2002, Spina & Licheri 2003).

Acknowledgements

The board, directors and staff of Villa San Michele are thanked for all their support through the years, and the bird ringers for their good work. This is

contribution no. 210 from Ottenby Bird Observatory.

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Sammanfattning

Medelhavet och Sahara-öknen är två viktiga ekologiska barriärer som palearktiska flyttfåglar möter under flyttningen till och från vinterkvarteren. Flyttfågelforskningen har en lång tradition i Medelhavsområdet, med studier från Gibraltar i väster till Israel i öster. Ett betydande sträck går även genom de centrala delarna av Medelhavsområdet, exempelvis via den italienska halvön vidare mot Nordafrika. Italienska forskare har under en rad år studerat vårflyttningen ett antal öar i centrala Medelhavet (Messino m.fl. 2001) och även sammanställt data från höst och vinter från italienska ringmärkningsplatser (Licheri & Spina 2002, Spina & Licheri 2003). Huvuddelen av alla studier omfattar dock det italienska vårsträcket och vi vill därför i den här artikeln sammanställa och analysera höstdata från Capri Fågelstation i sydvästra Italien.

Material och metoder

Capri Fågelstation grundades 1956 av svenska ringmärkare efter att Axel Munthe vid sin död 1949 testamenterat sin egendom till svenska staten. Fågelstationen ligger på toppen av Barbarosaberget ovanför Villa San Michele i Anacapri, i en delvis raserad borg omgiven av maciavegetation. Fågelstationen har mestadels använts för att studera det massiva vårsträcket, men stationen har också varit bemannad i varierande grad under 15 höstar. Sammanlagt fanns data från 524 höstringmärkningsdagar under perioden 1959–2004 (Tabell 1).

För att illustrera sträcket på bästa sätt utifrån detta heterogena material delade vi in materialet i 24 pentader, med start 19 juli och slut 15 november. För varje pentad räknade vi sedan fram ett aktivitetsindex där antalet aktiva fångstdagar i pentaden delades med det totala möjliga antalet dagar. Detta index varierade från 6,7% i de sämst täckta pentaderna (5 dagar med fångst delat med 75 möjliga dagar) till 65,3% i pentaden med bäst täckning (Tabell 2). Då fångstintensiteten uppvisade dessa variationer valde vi att i alla fenologifigurer dela det faktiska antalet fångade fåglar i pentaden med antalet dagar med aktiv fångst. Y-axeln visar således det genomsnittliga antalet fångade fåglar per aktiv fångstdag i varje pentad. Vi valde att bara analysera de 12 arter som fångats i störst antal under höstarna (Tabell 2).

Fåglarna art-, köns- och åldersbestämdes i möjligaste mån enligt karaktärer i Svensson (1984,

1992). Fångade fåglar vägdes och mättes enligt standardmetoder och den visuella fettmängden bestämdes enligt Ottenby-skalan (Hasselquist & Pettersson 1985) utökad med tre steg för riktigt feta fåglar enligt Falsterbo Fågelstation (liknar de tre högsta stegen i skalan utvecklad av Kaiser 1993). Postjuvenil kroppsuggning bestämdes enligt Bensch & Lindström (1992).

Resultat

Följande lista är en kort sammanfattning för varje art. För mer detaljerad information bör man läsa de engelska texterna samt studera de figurer och tabeller som utgör grunden till artikeln.

Trädpiplärka *Anthus trivialis*. De första trädpiplärkorna fångades redan i början av augusti men sträcktoppen infaller först i mitten av september (Figur 1A). Sex oktoberfynd gjordes. Kroppsvikten varierade från 17,5–35,3 g och uppvisade positiva trender över säsongen både för adulta och juvenila fåglar (Figur 2).

Svarthätta *Sylvia atricapilla*. Förekommer i två former i fångsten på Capri, dels den kortvingade lokala rasen *pauluccii* och dels som mer långvingade flyttande former från nordliga populationer. Svarthättan är en vanlig övervintrare på ön. De 812 ringmärkta fåglarna visar två toppar, en tidig redan i slutet av juli bestående av lokala fåglar och en större i oktober mestadels bestående av inflyttade nordliga individer (Figur 1B).

Trädgårdssångare *Sylvia borin*. De 568 fångade trädgårdssångarna uppvisar en distinkt sträcktopp i slutet av september även om enstaka individer fångades betydligt tidigare och senare (Figur 1C). Adulta fåglar passerar ca 10 dagar tidigare än juvenila fåglar. Medelvikten låg ca 5 g över den fettfria vikten och enstaka individer hade dubblat sin vikt. Det fanns inga skillnader mellan åldersgrupperna med avseende på vikt.

Sammetshatta *Sylvia melanocephala*. Det finns några publicerade fynd av sammetshattor söder om Sahara, men den absoluta merparten övervintrar i Medelhavsområdet. Sammetshattan är en mycket vanlig häckfågel i macciavegetationen på Capri och fenologidiagrammet visar inte heller på någon uttalad sträckbild (Figur 1D). Dock märks en snabb förändring av utbredningen av postjuvenila fjädrar runt pentad 10, vilket skulle kunna antyda att ungfågeln börjar röra sig mer vid den tiden.

Rödstrupig sångare *Sylvia cantillans*. Sammanlagt har 97 rödstrupiga sångare fångats vid fågelstationen under höstarna, av vilka merparten

utgjordes av juvenila fåglar. Rödstrupig sångare häckar i större delen av Medelhavsområdet, inklusive på Capri, och övervintrar i Afrika, mestadels söder om Sahara. Adulta fåglar passerade i genomsnitt senare än juvenila fåglar (Figur 1E,F). Hos juvenila fåglar fanns en signifikant positiv trend i kroppsvikt över säsongen och vikterna varierade från 8,6 g till 15,3 g.

Gransångare *Phylloscopus collybita*. Gransångare är framför allt en senhöstfågel på Capri, med en medelpassage i mitten av oktober (Figur 1G). Enstaka fåglar fångas redan i slutet av september och en del finns kvar på ön hela vintern. Vikterna hos fångade fåglar var generellt låga.

Lövsångare *Phylloscopus trochilus*. De lövsångare som förekommer på Capri om hösten tillhör troligen centraleuropeiska populationer av rasen *trochilus* (Zink 1973), vilket innebär att övervintningsområdena bör ligga i Västafrika. Sammanlagt har 160 lövsångare fångats, av vilka en hög andel bestämts som adulta fåglar (37 st). Sträckbilderna på Capri är utdragen (Figur 1H) och medelpassagerna i viss mån präglad av ett par dagar med riktigt goda fångster 1961, vilket gör att man kan ifrågasätta dess representativitet. Kroppsvikterna varierade från 7,0 g till 13,6 g och adulta fåglar var genomsnittligen tyngre än ungfåglar. Hos juvenila fåglar fanns det en positiv korrelation mellan kroppsvikt och pentader.

Grönsångare *Phylloscopus sibilatrix*. De 109 fångade grönsångarna uppvisar en relativt tidig sträckbild, med en medelpassage redan i början av september (Figur 1I). Alla utom 5 fångade fåglar var juvenila, vilket kontrasterar mot förhållandet hos lövsångaren. Medelvikten var ca 10 g och juvenila fåglar uppvisade en positiv trend i vikt mot pentad.

Brandkronad kungsfågel *Regulus ignicapillus*. Arten är en vanlig häckfågel på ön och de 184 fångade fåglarna härstammar troligen från närområdet. Brandkronade kungsfåglar fångades under alla pentader utom under de allra sista dagarna av säsongen (Figur 1J). Under vintern förekommer den rikligt i de lägre delarna av berget (Hjort m.fl. 2006) varför avsaknaden under de senaste höstpentaderna antingen är skenbar eller avspeglar förändrade förhållanden på platsen under senhösten.

Stenskvätta *Oenanthe oenanthe*. Sträckperioden förefaller lång för stenskvättan på Capri med fångster från augusti till och med oktober (Figur 1K). Merparten av de 76 fångade fåglarna var juvenila och ingen trend fanns i kroppsvikten över tiden. Medelvikten var ca. 22,5 g.

Rödhake *Erithacus rubecula*. Rödhaken var den vanligaste fågeln vid Capri Fågelstation om höstarna, med hela 1847 fångade individer. De första fåglarna dyker upp i mitten av september varefter arten återfinns i ringmärkningen under resten av säsongen (Figur 1L). Juvenila fåglar har en sträcktopp i början av oktober medan adulta fåglar toppar först i slutet av samma månad. Medelvikten för båda ålderskategorierna minskade med säsongens fortskridande. Detta skulle kunna ses som en indikation på ett skifte av rödhakar med olika flyttningsstrategier under hösten. Under tidig höst dominerar feta fåglar som avser att fortsätta flyttningen söderut medan senhösten domineras av magrare fåglar som är i slutet av flyttningsresan.

Taltrast *Turdus philomelos*. De 305 fångade taltrastarna är alla fångade under senhösten, från oktober in i tidig november (Figur 1M). Ringåterfynden av Capri-märkta taltrastar inkluderar förutom ett antal italienska fynd även ett fynd vardera från Tunisien och Algeriet (Pettersson m.fl. 1990).

Diskussion

De tolv undersökta arterna kan klassas som antingen tropikflyttare, kortdistansflyttare eller stannfåglar. Av de tropikflyttare som fångas vid Capri Fågelstation på hösten härstammar de flesta (trädpiplärka, trädgårdssångare, lövsångare, grön-sångare och stenskvätta) från populationer som häckar norr om Italien, exempelvis Centraleuropa,

östra Skandinavien och de baltiska staterna. Undantaget utgörs av rödstrupig sångare vilken mestadels häckar i Medelhavsområdet. Generellt var spridningen av kroppsvikter stor bland de fångade tropikflyttarna, där de tyngsta individerna vägde uppemot dubbelt så mycket som de magraste. Troligen bar de tyngsta tillräckligt stora fettdepåer för att flyga den resterande sträckan till söder om Sahara utan att behöva fylla på lagren längs vägen. Generellt uppvisade tropikflyttarna också positiva trender i viktutvecklingen över säsongen.

Kortdistansflyttarna utgjordes av gransångare, taltrastar och rödhakar. Deras vinterutbredning inkluderar Capri och Italien, men även sydligare områden, framför allt Nordafrika och i gransångarens fall även Afrika söder om Sahara. Kortdistansflyttarnas viktutveckling visade antingen ingen förändring (taltrast) eller negativa trender med säsongen (rödhake och gransångare). I det senare fallet skulle detta kunna tyda på ett gradvis skifte av fåglar under säsongen: den första delen domineras av fåglar som skall vidare söderut och den senare delen av fåglar som skall övervintra i närområdet.

Stannfåglarna utgjordes av sammetshättor och brandkronade kungsfåglar. Ingen av dessa arter uppvisar någon sträcktopp eller trender i kroppsvikt. Antalet fåglar minskade i de sista pentaderna, vilket skulle kunna tyda på en altitudinell flyttning nerför berget när vintern närmar sig.