Podoces, 2007, 2(2): 127–140

The Phenology of the Common Swift *Apus apus* in Eurasia and the Problem of Defining the Duration of their Stay

ULRICH TIGGES
Erlanger Straße 11, 12053 Berlin, Germany – Email: tigges@bgu.ac.il

Received 23 October 2006; accepted 20 October 2007

Abstract: The breeding range of the Common Swift *Apus apus* covers large parts of Eurasia from the Atlantic Ocean to the Yellow Sea. Arrival and departure dates were clearly defined. The phenological dates from different locations were analysed and compared. There are only a few dates from most of the locations, while those from places in north and central Europe were numerous. The situation regarding the phenological dates of the different locations is variable. Arrival in the breeding areas extends from February in Israel to June in the Murmansk area. It turned out that the first birds seen were the local breeders. The dates presented do not show a consistent pattern. The stay in the whole breeding area seems to be 95±3 days. In all sub-areas, however, shorter and longer stays are recorded. This article discusses whether or not these differences result from locally differing behaviour of the Common Swift or simply from insufficient data. There are indications that the geographical location as well as the elevation above sea level influences the duration of their stay.

Keywords: Common Swift, *Apus apus*, phenology, latitude, duration of stay, arrival, departure, Eurasia.

دامنه پراکنش جوجه‌آوری پرستوی معمولی (*Apus apus*) بخش‌های زیادی از قاره‌های اروپا و آسیا (اقیانوس اطلس تا دریای زرد) را پوشش می‌دهد. در مورد تاریخ‌های ورود و خروج پرستوهای معمولی تا به حال روش‌های مختلفی به کار رفته است. بنابر این این پدیده‌ها به وضوح تعریف شده‌اند و در مکان‌های مختلف تجزیه و تحلیل و مقایسه شدند. در بیشتر مکان‌ها ثبت‌های کمی وجود داشت، در حالی که از شمال و مرکز اروپا اطلاعات بیشتری وجود داشت. زمان ورود پرندگان مهاجر از فوریه تا ژوئن در نواحی مختلف این دو قاره متفاوت است. اولین گروه از پرندگانی که وارد منطقه‌ای می‌شوند احتمالا از پرندگان جوجه‌آور محلی هستند. جمع‌بندی تاریخ‌های ثبت شده در مورد تاریخ‌های ورود و خروج در مناطق مختلف الگوهای یکسانی را نشان نمی‌دهد. به نظر می‌رسد که طول دوره اقامت در کل ناحیه جوجه‌آوری ۳±۹۵ روز باشد. در همه مناطق، طول دوره کوتاه‌تر یا بلندتر ثبت شده‌اند. این مقاله همچنین بحث می‌کند که این تفاوت‌ها احتمالا یا از تفاوت‌های رفتار محلی این پرنده ناشی می‌شود یا به علت کمی داده‌ها می‌باشد. نشانه‌هایی وجود دارد که موقعیت‌های جغرافیایی مانند ارتفاع از سطح دریا نیز بر طول دوره اقامت تاثیر می‌گذارند.

INTRODUCTION

During the Common Swift's stay in its breeding areas, two aspects of its behaviour have to be carefully differentiated. The first is distinguishing between the breeders' and the non-breeders' presence in the colonies, and the second is identifying which movements are of migrants on passage and which are the temporal activities of local birds. It is all too easy to introduce confusion if such discrimination is absent. This paper offers a better understanding of the phenology of the Common Swift at its breeding colonies, particularly at the nest, over a very large geographical area.

The species has been a subject of study for a long time and it is known as a 'punctual' species (*e.g.* Taczanowski 1888). A comparison of dates in west, central and northern Europe shows that the phenological dates have not changed since the 1750s, thus characterising the Common Swift as a species whose migratory behaviour is rigid.

The duration of stay is the difference between the arrival and the departure dates, where the determination of both events is complicated. The extant ornithological literature uses loosely defined and inconsistent terminology, for example such terms as “first seen” and “first observation” (Weitnauer & Scherner 1980), "arrival", "migration" (sometimes specifying "return" [spring] or "outward" [autumn]) (Berthold 1999) and "departure" (where "departure" all too often refers to passage migrants). To regularise the terminology that should be applied to the movements of Common Swift in and across its breeding area, I have defined from my analyses the arrival of the species from its wintering ground as developing in four waves during the return migration – these four waves can clearly be differentiated.

In a previous paper (Tigges 2006), the most recent data from a nest under observation in Berlin were presented. The medians of breeding birds’ arrival at, and departure from that nest from 1990 until 2005 are 8 May and 10 August respectively (n=13). The variation of the arrival date is from 27 April to 17 May and for the departure is from 30 July to 20 August, producing a median duration of stay on the nest of 95 days (variation: 84–106 days). If the days are counted from the first record of the Advance Guard, which in Berlin is (median date) 24 April (n=25, variation: 16 April to 1 May, for sources see Tigges 2000a), a median of duration of stay in the breeding area of 109 days can be obtained.

Koskimies (1950) compared data sets from South Finland and North Switzerland and found a similar length of stay of about 80 days; Tigges (2002) recorded dates from Tel Aviv and found them similar to Berlin (95 days); both surmised that the Common Swift stays for the same amount of time in its breeding grounds, no matter what their geographical location. To test this thesis I collected phenological data from as many different locations in the breeding grounds as possible.

MATERIALS AND METHODS

The breeding distribution of the Common Swift stretches from western European coasts east to the northwest Korean border and from Morocco and Beer Sheva in Israel in the south to beyond the Arctic Circle to as far as 20 km south of Murmansk (Cramp 1994, Cheng 1987, Shirihai 1996, A. Gyljazov *in litt*.).

To determine the duration of stay of Common Swift in a breeding area, we must obtain local correlation with records from a colony. Ideally, the observer should monitor nest-hole selection to assess the number of occupied nest-holes, keeping careful records from regular visits to maintain a register of arrivals at and departures from the site, over a continuous sequence of breeding seasons.

Table 1 lists the arrival and departure dates from 45 different locations across much of the Common Swift’s breeding range. The locations are those available where dates have been recorded and are not statistically representative across the breeding range. Except for Europe, I know of no other published or otherwise recorded data. I omitted data which are suspect or cannot be validated, such as a reported stay of more than five months in Cyprus (Bannerman & Bannerman 1958). Where dates were imprecise, I indicated this in Table 1 in the Remarks column, using phrases such as ‘early May’ or ‘from…to…’. All records that did not specifically note ‘first sightings’ might, theoretically, be regarded as either inclusive or exclusive of the period of occurrence of the Advance Guard. As explained, where the duration of stay closely coincides with the expected limits when the Advance Guard was neither detected nor reported, it is likely that the duration of stay excluded the Advance Guard period.

RESULTS AND DISCUSSION

Phenology

The first wave of arrival is the ‘Advance Guard’, which may arrive 12–14 days before the ‘Vanguard’ and the ‘Main Body’, while the ‘Rearguard’ which contains the immature birds will arrive about the middle of the stay (Tigges 2000a, 2002, 2006). The first three waves comprise mature birds. Until recently, it was not clear to which wave the first birds seen could be assigned. But the analysis of the dates shows that they are also local breeders.

Von Haartman (1951) and Tigges (2000a, 2001) noted that at first, one sees only one or two birds, or sometimes small flocks of 1–5 that tend to disappear for periods. I want to make clear that this pattern is not evenly spread, and therefore does not occur everywhere across the breeding range. Furthermore, these birds do not perform social or partner flights which the observer might see easily, which is why despite an observer's best efforts, it may not be possible to find them. In Berlin, for example, the first Common Swifts are registered on (median) 24 April (*n*=25, sources in Tigges 2000a). My own first records in the city are for (median) 30 April (*n*=14) and the first breeder arrives in the nest under my observation on (median) 8 May (*n*=13). These represent the main values of the arrival process, and have been confirmed by long-running observation schemes. The first wave comprises the sighting of the first breeders (the Advance Guard), but the more spectacular arrival of the second wave (the Vanguard) and the third wave, the Main Body (or Mass) of the residents arriving, tends to occur about two weeks later and is more commonly seen. The first wave represents the beginning of the species' stay in the breeding area and the second the beginning of the breeders' period of stay at the nest site, two quite different events.

Dr Esa Lehikoinen established arrival dates at Turku in south Finland over the period 1749–1761, the median date being 19 May (*n*=11). More recently, the median date for the Advance Guard at Turku is 8 May (*n*=36, E. Lehikoinen *in litt*.). Meisner & Schinz (1815) describe the arrival time in Switzerland as "end of April" and Maumary *et al.* (in press) cited the "last decade of April" (21st–30th). The median of Couch's dates (1832) for the arrival in the early 19th century in southwest England is 5 May (*n*=17), where since 1977 it has been 29 April (S. Christophers *in litt*.). Hintz (1857) reported a median date arrival on the southern Baltic Sea shore as 10 May (*n*=24) for the first half of the 19th century and P. Busse (*in litt*.) quotes 6 May (*n*=6) as the recent median. The arrival median from 1914–1920 in Viborg, north Denmark is 8 May (Skovgaard 1924) and from 1981–2005 is 10 May (*n*=22, H. Pedersen *in litt*.). Heinroth & Heinroth (1924) quote the last days of April or the first days of May as the arrival date at, and 6–8 August for the departure from, Berlin in Germany.

Determination of departure dates and patterns from the breeding area is also difficult. Departure here is defined as the time when the breeders leave their nesting sites and colonies. Non-breeders may leave earlier, because they have a more sensitive reaction to weather conditions, having no endogenous imperative to feed young. They will leave the colonies when the weather is bad and may not return, especially later in the breeding season. Non-breeders may be numerous and so their leaving may lead observers to assume that the species has left as a whole, yet breeders' behaviour at this time is relatively inconspicuous because they do not take part in the demonstrative social flights over the colony territory because of their demanding, full-time involvement in feeding their young.

This makes it understandable why the durations of stay reported in the literature differ so much (*e.g.* Beklová 1975, Klůz 1950, Couch 1832 and S. Christophers *in litt*). These apparent differences cover periods of up to about two weeks, depending upon which arrival wave the birds belonged to, or upon the degree of fortune the observers had in recording the first wave.

Because the first wave comprises only a few scattered birds, it is important to obtain and find as many records as possible to test and support the hypothesis of its occurrence. From Beklová (1975), the duration of stay for Czechoslovakia as a whole was 106 days, indicating that the arrival of the first wave was indeed noticed, whereas local observers stated 95 days (Klůz 1950). For larger, long-observed colonies, it was a relatively straightforward process to record the birds from the first wave. Analysis of the dates shows correspondence between these first sightings and the Advance Guard being breeders. Lack (1958) reported the first Common Swifts arriving at the colony at the Museum in Oxford around 1 May, most of them having left by around 17 August, representing a duration of about 109 days. E. Kaiser (*in litt*.), who has observed a colony of about 55 breeding pairs since the 1960s, has confirmed that the first birds he finds at the beginning of the breeding season fly to his colony in

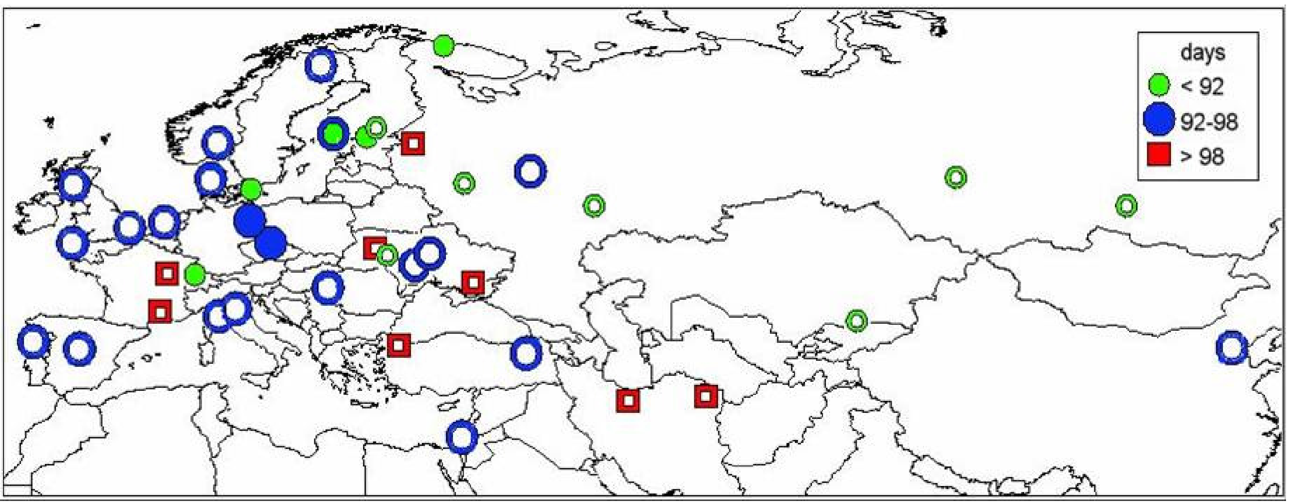

Figure 1. Map of Eurasia showing different lengths of duration of stay for Common Swift presence on the nest. The half filled symbols indicate an uncertain situation (records $n<12$).

Kronberg and into the neighbouring church tower. Weitnauer & Scherner (1980) stated that the arrival phase lasts "1–14 days". Tigges (2003) documented an early arrival on nest some 10 days earlier than the median. One can also find this pattern in Bernis (1988), noting that in Madrid, the first sightings are on 12 April (n=21) and that they go to the nest site on 25 April (n=18). Furthermore, a figure in his book shows that 5 different observers recorded a major departure of the population around 27 July 1985, giving durations of stay of 94 days for the Main Body and 107 days since the arrival of the Advance Guard.

Duration of stay

In this survey, the arrival and departure dates from 22 locations (Table 1) are very similar, being within ±3 days of the Berlin dates. The 22 locations include all geographical extremes, Tel Aviv in the south, Coimbra/Porto and Glasgow in the West, Drammen and Viborg in the north and Peking in the east. But from some places there are only few records, for example, from Tel Aviv, Peking and from Portugal. The number (n) of breeding seasons monitored per site (where known or listed) is higher in the north than in the south, which tends to validate the shorter duration of stay recorded in the north.

If the breeding range of *A. apus* is roughly divided into three regions, the northernmost being 56°–68°N, the middle 44°–55°N and the southernmost 32°–43°N, then we find a reasonable correlation with the recorded duration of stay in those regions, the values obtained being; north, *c.* 85–100 days, middle, *c.* 90–110 days and south, *c.* 100-120 days (Fig. 1).

In general, the duration of stay recorded in the south of the breeding range is longer than in the north. The dates given for the duration of stay in breeding areas (Table 1 and Fig. 1) show that the duration increases with decreasing latitude. In most places the species stays 95 ±3 (92–98) days on the nest; longer and shorter stays appear to be widely spread, but concentrate in the north and east (shorter, 77–91) and south (longer, 99–111) (Fig. 1).

Observations of fewer than 13 records in 37 locations are presented separately in Table 1. Although they cannot provide more than suggestions, we have to take them into discussion, because of the lack of other dates. Observations of at least 13 years ($n\geq13$) are valued as conclusive, because both in Berlin and in Skurup the control of dates from 13 and 14 data showed that the dates got the same results, either as median or as medial calculation. Observations with fewer dates are therefore judged as inconclusive. This is why the duration of stay of only 8 locations in this collection can be seen as conclusive, and I want to stress that the following discussion can take place only under the condition that many dates are inconclusive.

To my knowledge, only a few authors (Klůz 1950, Koskimies 1950, Weitnauer 1990) ever broached the issue of the duration of the Common Swift's stay. The average length of stay at Lázně Bělohrad in northeast Bohemia was 96.5 days for 1936–1949 (n=14), the median being 95 days. Beklová (1975) calculated the average stay in the whole of what was then Czechoslovakia (ČSSR) as 106 days (1964–1971), citing Zdenĕnek Klůz' shorter period, but without any explanation of the difference. The shortest durations of stay were in northwest Russia, 77 days in the Murmansk (n=45) region, and in Fennoscandia, 81 days at Lahti (n=5), south Finland, and 87 days at Skurup (n=11), south Sweden and in 97/88 days in Oltingen, north Switzerland (n=42/43). These dates were collected over a longer period.

The longest stay of 125 days comes from the Bosphorus area (n=6), but here the data are in parts imprecise. The better the differentiation between the different phases of the arrival process and the differentiation between residents and migrants, the higher the quality of the data. However in each region, both longer and shorter stays have been recorded in sub-areas.

Mean duration of stay

All dates, with the exceptions of the Murmansk area, Lahti, and the Bosphorus area occur in the 85 to 122 day band, and lie inside the variation recorded in Berlin of 84 to 123 days. A mean duration of stay value of from 95 to 109 days (±3 days), which also corresponds to the median dates in Berlin, is the most common value, occurring across the whole area, like Aasla Island, Drammen, Ivanovo, Viborg, Glasgow, Aalsmeer, Oxford, the ČSSR, Lázně Bělohrad, Cornwall, Cherkasy, Tul'chin, Solymosvár, Forlì, Livorno, Coimbra, Porto, Madrid, Erzurum and Tel Aviv. In Fennoscandia and Northwest Russia, the stay at four locations (Skurup, Lemsjöholm, Lahti, Murmansk) is shown to be becoming steadily shorter from south to north; apart from the isolated short stay in Oltingen (Switzerland).

Shorter Duration of Stay

In 12 locations a shorter period (<92 days) was reported; six of these are in the north, five are in the central region and the last is at Bishkek (Frunse) in the south. The dates, from the northernmost locations in the Murmansk region are the shortest recorded from any locations in this paper, the median being 77 days (n=44/45). There are no dates from nest sites in the Murmansk area; but in three out of 21 successfully raised broods in Skurup the last adult left the nest after 73, 77 and 78 days (J. Holmgren *in litt.*), which indicates that successful broods were possible in the Murmansk area as well.

In Switzerland a 44-year data sequence proves a stay of 97 (species) and 88 (individuals) days. On Aasla Island the 104-day duration of stay is indeterminate, for it could represent a stay of normal duration or a short stay if two weeks of it has been included because the Advance Guard had been detected. The single observation from Bishkek reports that the start of nest building was observed over a period of 10 days, which occurs just a short time after arrival at the colony, and so these data might actually be representative of the normal duration of stay.

However, the duration of stay in Skurup does not correspond latitudinally with the dates obtained from Drammen, Glasgow, Viborg, Konakovskiy, Ivanovo and Ulyanovsk, all of which are situated further north than Skurup. Why this should be is unclear. In Drammen, Glasgow and Viborg the range of the duration of stay is 95–97 days, coinciding almost precisely with that measured in Berlin.

Table 1. Arrival, departure and duration of stay of Common Swift in Eurasian breeding areas (Sequence followed is from south to north). Key: C=central, N=north, W=west, E=east, S=south, dec. = decade, M = median, Mass = main body of migrants, Max/min stay = days (median arrival to median departure at extremes recorded). Dates follow European convention of 'day - month'.

Location	Decimal Lat/Long; Elevation above sea level	Arrival date range	*n*=	Departure date	*n*=	Max/min stay	Sources	Remarks
Oltingen, N Switzerland	47.43°N, 7.93°E 600m	M 29.4/M 8.5	43	2./3.8	42	97/88	Weitnauer 1990	Only generalized dates. A consecutive row of *n*=16 is 1./2.5
Lázně Bělohrad, Czech Republic	50.42°N, 15.58°E 300m	M 4.5	14	M 6.8	14	95	Klůz 1950	
Berlin, E Germany	52.48°N, 13.42°E 53m	M 24.4/M 8.5	24/13	M 10.8	13	109/95	Tigges 2000, U. Tigges	
Skurup, S Sweden	55.46°N, 13.50°E 50m	M13.5/24.5	14/36	17.8	14	97/87	Holmgren *in litt.*	
Helsinki, S Finland	60.17°N, 24.94°E 20m	M 8.5/ M 27.5	29/20	M 20.8	20	105/86	Kolunen *in litt.*; Kärkkäinen *in litt.* after Hällsten	Early/late dates Kolunen. 20.5-1.6/15-25.8 over 20 years
Aasla Island, SW Finland	60.29°N, 21.95°E 20m	M 21.5	31	31.8	20	104	Saari *in litt.*	
Lemsjöholm, SW Finland	60.50°N, 22°E 6m	20.5/27.5	13	23.8	14	96/89	von Haartman 1951	Mass 27.5
Murmansk area, NW Russia	68.96°N, 33.08°E 100m	M 9.6	45	M 24.8	44	77	Gyljazov *in litt.*	Some remain into September
Infirm situation (*n*≤12)								
Tel Aviv, C Israel	32.07°N, 34.77°E 10m	11.2/28.2	1	7.6	1	118/101	Tigges 2001	Leap year! Many 28.2
Tel Aviv, C Israel	32.07°N, 34.77°E 10m	19.2/6.3	1	8.6	1	110/95	Geron 2005	Many 6.3
Teheran, N Iran	35.67°N, 51.43°E 1300m	M 11.3	4	5.7	4	117	Khaleghizadeh 2005	
Meshed, NE Iran	36.27°N, 59.57°E 980m	29.3/8.4		27.7		121/111	Zarudnoï 1903 [Fefelov 2006]	17.3./26.3 and dep. "middle July". Jul. calendar in original
Beidaihe, E China	39.90°N, 119.48°E 40m	3.5					Jesper Hornskov *in litt.*	27.4-8.5 (1997-2005)
Erzurum, E Turkey	39.91°N, 41.29°E 1900m	M 29.4	2	M 17.8	2	111	McGregor 1917	
Peking, E China	39.93°N, 116.40°E 50m	1.4		31.7		122	David & Oustalet 1877	Arr April, dep end July
Peking, E China	39.93°N, 116.40°E 50m	12.4		3.8		114	la Touche 1931-1934	Arr from 1-23 April dep early Aug
Peking, E China	39.93°N, 116.40°E 50m	1/6.5					Bertilsson, Hornskov, Johannessen on different websites	Spot observations on 1, 5 and 6 May

Location	Decimal Lat/Long; Elevation above sea level	Arrival date range	*n=*	Departure date	*n=*	Max/min stay	Sources	Remarks
Coimbra, C Portugal	40.22°N, 8.43°W 90m			18.7			Tait 1924	Third week July
Madrid, C Spain	40.42°N, 3.71°W 670m	M12.4/25.4	21/18	27.7		107/94	Bernis 1988	2 different medians: M 15.4 + M 17.4 in summary
Bosporus, NW Turkey	41.10°N, 29.00°E 50m	M 13.4	6	15.8		125	Mathey-Dupraz 1921	Breeders have left mid Aug.
Oporto (Porto), N Portugal	41.15°N, 8.42°W 400m	11.4/18.4				99/92	Tait 1924	Occ. 2nd week and 3rd week April abundant
Frunse (Bishkek), N Kyrgyzstan	42.87°N, 74.57°E 750m	29.4	1	27.7	1	90	Fedyanina 1981	25.4-4.5 “start nest building“
Livorno, NW Italy	43.55°N, 10.30°E 10m	5.4	1	19.7	1	106	Paesani *in litt.*	
Nîmes, S France	43.84°N, 4.35°E 70m	13.4		5.8		115	Hugues & Cabanès 1918	4-6.8
Nîmes, S France	43.84°N, 4.35°E 70m	19.4		10.8		114	Hugues & Cabanès 1918	
Forlì, NE Italy	44.22°N, 12.03°E 30m	M 9.4	4	13.7		96	Belosi *in litt.*	Dep. 17.7.03, 9.7.04
Solymosvár (Arad), W Romania	46.19°N, 21.32°E 106m	21.4	1	12.8	1	114	Warga 1929	
Solymosvár (Arad), W Romania	46.19°N, 21.32°E 106m	4.5	1	6.8	1	95	Warga 1929	
Berdyansk, E Ukraine	46.75°N, 36.79°E 4m	M 30.4	4	M 25.8	4	118	Loshakov 1969	
Dijon, E France	47.33°N, 5.03°E 250m	M 23.4	6	30.7		99	Paris 1910	Last days of July
Tul’chin, W Ukraine	48.68°N, 28.86°E 250m	M 12.5	6	16.8	2	97	Ocheretny 1998 [Fefelov 2005]	
Letychiv District, W Ukraine	49.30°N, 27.50°E 300m	M 15.5	5	M 13.8	10	91	Novak 2002 [Fefelov 2005]	
Cherkasy District, C Ukranie	49.43°N, 32.07°E 100m	M 1.5	6	M 20.8	4	112	Gavrilyuk 2002 [Fefelov 2005]	
ČSSR, former Czechoslovakia	50°N, 15°E 200-300m					106	Beklová 1975	M after source
Bil'kivitsi village, C Ukraine	50°N, 28°E unknown	M 8.5	5	M 28.8	2	113	Poljushkevich 1998 [Fefelov 2005]	
Polperro, SW England	50.33°N, 4.51°W 5m	M 5.5	17	M 9.8	10	97	Couch 1832	
Cornwall, SW England	50°N, 4°W 50m	M 20.4	29				Christophers *in litt.*	
Oxford, S England	51.76°N, 1.26°E 60m	1.5		17.8		109	Lack 1958	
Aalsmeer, Netherlands	52.27°N, 4.76°E 0m	24.4		29.7		97	Middlekoop *in litt.*	
Ulyanovsk (Simbirsk), S Russia	54.15°N, 48.50°E 100m	M 9.5	5	5.8		90	Moskvichev 2005	1. dec. August
Uyan, SE Siberia	54,34°N, 101,99°E 420m	M 21.5	6	M 17.8	6	89	Fefelov 2004a	

Location	Decimal Lat/Long; Elevation above sea level	Arrival date range	*n*=	Departure date	*n*=	Max/min stay	Sources	Remarks
Glasgow, Scotland	55.87°N, 4.27°W 30m	13.5	7	16.8	5	96	John S. Wilson *in litt.*	
Konakovskiy District, W Russia	56°N, 35°E 200m	16.5	2	12.8	2	89	Nikolaev 1998 [Shergalin 2005a]	
Viborg, N Denmark	56.46°N, 9.41°E 40m	M 8.5	7	M 10.8	6	95	Skovgaard 1924	
Tomsk, W Siberia	56.50°N, 84.97°E 100m	27.5		19.8		85	Savchenko *et al.* 2001 [Fefelov 2004b]	18.5-4.6; 15-23.8
Ivanovo, W Russia	57.01°N, 40.99°E 120m	M 19.5	8	20.8	8	94	Gerasimov *et al.* 2000 [Shergalin 2005b]	15-23.5; end 2.dec begin 3.dec August
Drammen, S Norway	59.75°N, 10.20°E 20m	M 20.5	8	24.8		97	Haftorn 1971 [E.Chapman *in litt.*]	15-25.5; last 2 weeks of August
Leningrad (St Petersburg), Russia	59.93°N, 30.32°E 10m	M 18.5	9	10.9	10	116	Khrabryi 1991 [Shergalin 2005c]	
Lahti, S Finland	60.99°N, 25.66°E 100m	12.5/30.5	41/5	18.8	7	99/81	Kolunen *in litt.*	
Dokkas/Gällivare, N Sweden	67.15°N, 20.65°E 360m	22.5/10.6		(10.9) uncertain		(112/93)	Leidgren 1985 [Holmgren *in litt.*]	Outward migration starts 14.8; many stay late September

NB. When dates taken from different years were not close, they were assessed separately. Decimal latitudes and longitudes of locations are from http://www.world-gazetteer.com, from contributors or Google Earth. The altitude is taken from Google Earth.

Table 2. Comparison of Common Swift datasets at four sites; Lahti, Skurup, Berlin and Oltingen.

Year► Sites▼	Arrival of 1st bird in area	Arrival of 1st adult on nest	First egg laid	Adult begins to incubate	Hatching begins	Departure of 1st chick	Departure of last adult	Duration of adults' stay on nest	Brooding duration of 1st chick (omits hatch day)	Duration of 1st chick's stay in nest (omits day of departure)	Source/ Remarks
Murmansk area 68.96°N 33.08°E	M 9.6 *n*=45						M 24.8. *n*=44				Gyljazov *In litt.*
Lahti 60.99°N 25.66°E 100m	10.05 *n*=3 (18.05 *n*=5)	30.05 *n*=5	10.06 *n*=6	12.06 *n*=6	03.07 *n*=7	11.08 *n*=7	18.08 *n*=7	Difference from medians 81 days	Difference from medians 21 days	Difference from medians 39 days	Kolunen *In litt.*
Skurup 55.46°N 13.50°E 50m	13.05 *n*=14	24.05 *n*=36	09.06 *n*=33	13.06. *n*=24	02.07 *n*=7	10.08 *n*=25	16./17.08 *n*=14	Difference from medians 86 days	Difference from medians 19 days	Difference from medians 39 days	Holmgren *In litt.*
Berlin 52.52°N 13.38°E 53m	30.04 *n*=14	08.05 *n*=13	27.05 *n*=12	30.05. *n*=11	21.06 *n*=9	03.08 *n*=13	10.08 *n*=13	Difference from medians 95 days	Difference from medians 22 days	Difference from medians 43 days	U. Tigges
Oltingen 47.43°N 7.93°E 600m	29.04 *n*=43	29.04/ 08.05 (mass) *n*=43	20.5 *n*=43	*22.5	*10.6	*22.7 *n*=43	3.08 *n*=42	Difference from medians (mass) 88 days	Difference from medians 19 days	Difference from medians 43 days	Weitnauer 1990; * it is unclear if these dates are measured or calculated

Longer Duration of Stay

In nine locations, durations of stay longer than the mean were reported. Two in east China are the furthest known from the wintering grounds. The older datasets from Peking give dates covering a very wide range (*e.g.* "April" or "1–23 April"). These very generalised dates of an unknown number of observations which I mediated to 12 April, do not correlate with more recent datasets (around 1st week of May**;** Bertilsson (*in litt.*), Hornskov (*in litt.*), Johannessen (*in litt.*), nor do they align with those from Beidaihe (China, Hebei Province), 280 km further east on the coast (J. Hornskov *in litt.*). Although the recent dates from Peking are from travellers passing through making observations and not from study sites, Bertilsson (*in litt.*) reported an increasing count later in the month, and so it is likely that the latter observations coincide with the arrival of the Main Body. This conclusion is supported by his observation from Beidaihe, where J. Hornskov (*in litt.*) ascertains the Main Body as arriving between 27 April and 8 May, the early arrivals (Advance Guard) being seen on 10 April, in both 1997 and 2005. However, none of the three observers have recorded departure dates yet.

Nevertheless, since this breeding area is the furthest away from the African wintering areas (Ali & Ripley 1970), the later arrival date would be more likely, especially if we assume that the species does not arrive at the same time in places like Turkey, relatively close to the wintering area, and distant eastern China. Although Ali & Ripley (1970) mentioned that small numbers of Common Swifts overwinter in northern India, they allowed that this might have been casual and not regular. Certainly Grimmett *et al.* (1998) and Rasmussen & Anderton (2005) do not admit to this hypothesis.

Confusion may be sown amongst observers by the possible presence of birds from further north or east pausing on passage to Africa; the scope for erroneous records of departure is considerable. For example, Table 1 shows that in Tel Aviv the median departure date of Common Swift is 8 June, but in Jerusalem some Common Swifts can often be seen in late June or early July (Y. Cornfeld *in litt.*). However, unlike Tel Aviv, Jerusalem lies on the main outward migration route through the Middle East (Leshem & Bahat 1996). Although it remains to be confirmed whether the Common Swift actually uses this route, it seems a worthwhile assumption explaining why the species is recorded in Jerusalem for longer than the 109 day period on a more or less regular basis. It is also unlikely that the Common Swift would exhibit radically different behaviour in locations separated by only 70 km.

The observations of Mathey-Dupraz (1921) from the Bosphorus area differ widely from the others. She quotes a range of 10 days for the departure, which I mediated. In addition, the Bosphorus, like Iran and the south of France, lies on a migration route. The dates from Teheran indicate a duration of stay of 117 days, at Meshed 121/111 (max/min) and at Berdyansk 118, all of which may indicate a longer stay in the south. But when we consider the migration factor and compare the Teheran results with those from Berdyansk, *c.* 1650 km further north, the question arises as to why shorter periods have not (yet) been detected over such a long distance. Some Mediterranean and central Asian locations are in the distribution ranges of *A. pallidus, affinis* and *unicolor*, whose movements and their timing might be a source of confusion, contributing to apparent longer durations of stay.

The development of the chicks at mean and shorter stays is presented in Table 2, but the discrepancies revealed are not linear. There are no dates available from the Murmansk area. The development time from the first egg to the departure of the last chick in Skurup from the three broods observed during the very short stays of 73, 77 and 78 days were 64, 64, 62 days, respectively.

Is length of stay influenced by behavioural differences or physical conditions?

Nearly all the collected dates are within the variation of the length of stay that the Common Swift shows in Berlin, which lies right in the middle of the three approximate latitudinal divisions of its breeding range. Only the data from parts of Fennoscandia, northwest Russia and the Bosphorus area lie outside these variation limits of which the latter is an infinite date.

Koskimies (1950) compared the arrival and departure dates in northern and central Europe (Finland and Switzerland) and found that the northern dates just shifted into the summer. So far, Oltingen in Switzerland seems to be an island of a short stay amongst middle term stays. This might be caused by the vertical temperature gradient, because the location lies at 600 m altitude (see further below).

What makes the Common Swift leave the breeding areas? Certainly not the food supply, because flying insects are available everywhere until deep into autumn. Because the light period across its range reduces with reducing latitude, it is also certainly not a light period of 17 hours, as Weitnauer & Scherner (1980) surmised.

What I and other observers (*e.g.* Koskimies 1950) have seen is that the main departure is related to the end of the breeding process, when the fledglings leave the nest. When early broods leave the nest, the adults may linger, probably to attain ideal migration condition, for a few days in the colonies, but parents of late broods tend to depart immediately after the young have left the nest.

There are two potential ways that the Common Swift might adapt its breeding process either to cope better with year-on-year conditions (weather, food availability) or changing conditions (environmental, climatic), and both involve varying the duration of stay. The species is therefore less than adequate as an indicator of climate changes.

The first is the degree by which the Common Swift might vary the extent of the arrival process, which in central Europe, for example, takes two weeks. It could be imagined that evolutionary pressures might produce behavioural changes in favour of shortening this aspect for the northernmost populations and possibly enlarging it for populations in the south of the breeding range, if such changes favoured better breeding success. Amongst other migrant species, some exhibit the adaptive behaviour of some males and females arriving early and breeding early, if conditions permit, well ahead of the majority, yet others arrive early to commandeer primary breeding habitat. Generally, such a strategy is not favoured by the Common Swift, which almost always uses the same nests or nest locations.

The second adaptation that the Common Swift might exhibit is variability in chick development. Because the species is limited to airborne food, periods of bad weather can cause long periods of food shortage, to which pressure the development of young has adapted by entering a process of torpidity whereby normal bodily processes enter dormancy. The parents may even leave the nest area for some days. Consequently the growing process may extend, the median for those studied by Lack & Lack (1951) was 41.5 days, but they recorded 35% extensions to 56 days (Lack & Lack 1951). The longer process of development does result in a longer duration of stay. The median period of 41.5 days also occurs in Berlin. Cramp (1994) similarly gives 42.5 days.

In the warm and dry year of 1995 the development of the young in the nest in Berlin under my observation took only 40 days (Tigges 2000b). During brooding, the duration of the eggs to fledging stage is about 68 days in the middle region and differs little from other swifts, *A. pallidus* taking 67 days or *A. affinis* 62 days, but further to the south (Cramp 1994). It might be expected that the less than ideal weather conditions for Common Swift in its northernmost breeding range that the duration of stay there would extend rather than shorten, but counterintuitively, the dates from Skurup, Lahti and the Murmansk area indicate that the opposite happens. The different phases of the stay (Tigges 2000b) shorten like this (The numbers are the median periods, in days, for Berlin, Skurup and Lahti in that sequence):

a. From arrival at the nest until the first egg is laid – 19-16-11.
b. Length of time first egg takes to hatch – 25-23-21.
c. Age of oldest chick at fledging – 43-39-39.
d. From fledging of first chick to departure of parents – 7-5-7.

An evident advantage of early arrival at the breeding ground and a shorter chick development period is the chance of producing a second clutch over an extended duration of stay where conditions permit, behaviour exhibited by many resident and migratory species. However, for the Common Swift this phenomenon is conspicuous by its absence. There have been recent reports from central Europe of attempts at a second clutch (Kaiser 2004), but I was unable to find any from the southern region of the breeding range, where conditions would seem to be ideal for this strategy. It would seem that even a duration of stay of 125 days in the Bosphorus region is insufficient for a second brood. A pair that raised a successful second brood in Germany stayed about 145 days on the nest (E. Kaiser *in litt.*). If conditions rule out the possibility of a second brood, or if the impulse to do so is not endogenous in the bulk of the breeding population, there is no need for a longer stay in the breeding grounds.

If we exclude genetic determinations causing differing behaviour in the Common Swift, we do have to consider that climatic values would be a reason for the apparent differences in the duration of stay. The shorter stay in some places in the north leads us in that direction. The same goes for the shorter stay recorded in Switzerland at an elevation of 600 m above sea level. A comparison of the climatic situation in the different locations, such as sums of temperature during the stay and the fictive additional period would bring more light to the problem. But since weather varies from year to year, a long period of recorded dates would be necessary for any definite statements. A first check had to be abandoned, because dates for only four years were available (Table 3; Source: Russia's Weather Server – Weather Archive, http://195.170.225.189/wcarch/html/). This survey of temperatures over four years does not show any significant changes from short or long to mean stays. The years of 2000–2003 are remembered as having been warm.

Table 3. Comparison of weather dates of some locations with different lengths of stay. Fictive data (calculated to and from the mean stay of 95 days) are in square brackets.

		Arrival date temperatures from 2000-2003										Stay temperatures from 2000-2003					
		sum arrival temperature		sum departure temperature [fictive dates]						days until next frost		sum stay temperature					
	days from last frost			short stay		95 days		long stay				short stay		95 days		long stay	
Location		max	min	max	min	max	min	max	min	true	[fictive]	max	min	max	Min	max	min
Murmansk	14	54	28	48	34	[62]	[23]			26	[8]	4772	2685	[5653]	[3135]		
Ulyanovsk	4	72	11	96	52	[106]	[44]			50	[44]	7980	3923	8562	4221		
Uyan	13	76	24	89	41	[96]	[45]			28	[22]	8369	3967	8862	4223		
Oltingen	26	87	42	112	52	[99]	[59]			92	[84]	8002	4062	[8795]	[4522]		
Berlin	37	102	47			103	68			97				8772	5851		
Viborg	30	74	34			92	58			86				7143	4368		
Teheran	-8	54	6			[112]	[74]	144	95	141	[163]			[8251]	[3912]	11140	5568

At present there is no evidence that the Common Swift is responding to long-term climate change by breeding earlier or by raising second broods. However, the relatively low observer density across much of the Common Swift's southern breeding distribution might have a bearing on the lack of double-brood records in that region. Nevertheless, it seems clear that in its northernmost breeding distribution, the species does seem to have adapted to take advantage of the short Arctic summer, when insect food is superabundant. With regard to the differences in the recorded stays there (on one hand the coincidence with dates from the middle area and on the other, proven shorter stays on the nest), there is evidence that the species is probably in the process of adapting to the northern conditions.

Further research is clearly needed to establish the limits of the area and the governing conditions (*e.g.* altitude, temperature, *etc.*) in which this shortened duration of stay is apparent, because it is not simply related to latitude.

Acknowledgements: This research in its preparation essentially represents a joint work. Its presentation relies upon the thorough and painstaking efforts of many people, much from published data, but also an immense amount of information from many contributors to whom I am very grateful. Heartfelt thanks go for translations by Dr Jevgeni Shergalin and Dr Igor Fefelov (Russian sources), Jan Holmgren (Swedish), Eddie Chapman (Norwegian) and Dr Esa Lehikoinen (Finnish). I am grateful also to Hannu Kärkkäinen, Lennart Saari, Hans Schmid, Michael Blair and Michael Westerbjerg Andersen who arranged friendly contacts with many other contributors. Special thanks go to Rabbi Yosef Cornfeld, Peter Middelkoop, J. Holmgren, John S. Wilson, Alberto Belosi, Giorgio Paesani, Henning Pedersen, Kaj Hällsten, Erich Kaiser, Stan Christophers, Lennart Saari, Prof. Przemysław Busse, Alex Gyljazov, Dr E. Lehikoinen, Jesper Hornskov and Heikki Kolunen, who sent me their invaluable observation dates. Much support in preliminary discussion and advice came from George Candelin, J. Holmgren and M. Blair; and to Oscar Gordo, who assisted to draw the map. I particularly appreciate the patience shown by all contributors and advisers, and not least by M. Blair and Edward Mayer who helped to produce the text in readable English. But the most joyful 'Thank you!' goes to the late Dr Jonathan Couch and the late W. Hintz, whose precise notations of the species' phenology over 17 and 24 years respectively were the first ever of their kind for *Apus apus* – these data and with the unique datasets from Finland collected by Dr E. Lehikoinen have enabled me to confidently state that the species' behaviour has been constant for at least 250 years.

REFERENCES

Ali S. & Ripley S.D. 1970. *Handbook of the Birds of India and Pakistan, vol. 4*. Oxford University Press, Oxford, pp. 25–60.

Bannerman D.A. & Bannerman M.W. 1958. *Birds of Cyprus*. Oliver and Boyd.

Beklová M. 1975. Ankunft und Abzug der tschechoslowakischen Population *Hirundo rustica* L. 1758, *Delichon urbica* L. 1758 und *Apus apus* L. 1758 [Arrival and departure of the Czechoslovakian population of *Hirundo rustica* L. 1758, *Delichon urbica* L. 1758 and *Apus apus* L. 1758]. *Zoologické listy / Folia Zoologica* **24**: 21–42. Brno [In German]

Bernis F. 1988. [The Common Swift *Apus apus* in the Spanish Plateaus, with a comparative revision of its biology and ethology]. Universidad Complutense de Madrid, Facultad de Ciencias Biológicas. Madrid, 186 pp. [In Spanish with English summary]

Berthold P. 1999. *Bird Migration: a general survey, 2nd edn*. Oxford University Press, Oxford.

Cheng T.-H. [Zheng Zuo-Xin]. 1987. *A Synopsis of the Avifauna of China*. Science Press, Paul Parey Scientific Publishers, pp. 348–355.

Couch J. 1832. Habits of the Swift. *The magazine of natural history and journal of zoology, botany, mineralogy, geology, and meteorology* **5**: 736–737.

Cramp S. (ed.). 1994. *Handbook of the Birds of Europe, the Middle East and North Africa: The Birds of the Western Palearctic, vol 4.* Oxford University Press, Oxford, pp. 657–670.

David A. & Oustalet M.E. 1877. *Les oiseaux de la Chine [The birds of China]*. G. Masson, Paris.

Fedyanina T.F. 1981. [Swifts in the city]. [*Ecology and Protection of Birds. Abstracts of 8th All-Union ornithological conference*], p. 226. [In Russian].

Fefelov I. 2004a. Common Swifts (*Apus apus*) in the Baikal area. ***APUS***life 2942 at http://www.commonswift.org/2942Fefelov.html

Fefelov I. 2004b. Report on the Wildlife of the Yenisei Plain (Russian). ***APUS***life 2935 at http://www.commonswift.org/2935SavchenkoReport.html.

Fefelov I. 2005. Report on the Ukrainian Avifauna]. ***APUS***life 3074 at http://www.commonswift.org/The%20Avifauna%20of%20the%20Ukraine.html

Fefelov I. 2006. Report on Zarudnoï's Birds of East Persia from 1903. ***APUS***life 3133 at http://www.commonswift.org/3133Fefelov.html

Gavrilyuk M.N. 2002. [Times of season migrations of birds in the area of Cherkasy in 1991–2002]. *Berkut*, Supplement: *Avifauna of Ukraine* **2:** 86–96. [In Ukrainian]. Accessible under Fefelov [2005].

Geron A. 2005. Departure of Common Swifts in Ramat Aviv, Israel in 2005. ***APUS***life 3026, http://www.commonswift.org/3026Geron.html

Gerasimov Yu.N., Sal'nikov G.M. & Buslaev S.V. 2000. [*Birds of the Ovanovo Region*].Kamchatka Institute of Ecology and Land Management. Moscow, p. 54. [In Russian]. Accessible under Shergalin [2005b].

Grimmett R., Inskipp C. & Inskipp T. 1998. *The Birds of the Indian Subcontinent*. Helm, London.

von Haartman L. 1951. Die Ankunftszeiten des Mauerseglers, *Apus apus* (L.), und ihre Beziehungen zur Temperatur [The arrival dates of the Common Swift *Apus apus* (L.) and their relation to temperature]. *Commentationes Biologicae Societas Scientiarum Fennica* **11(2):** 1–21. [In German]

Haftorn S. 1971. *[Birds of Norway]*. Universitetsforlaget, Oslo-Bergen-Tromsö, p. 468–473. [In Norwegian]

Heinroth O. & Heinroth M. 1924. *Die Vögel Mitteleuropas [The birds of central Europe], vol. 1.* Hugo Bermühler Verlag, Berlin-Lichterfelde, p. 269–274. [In German]

Hintz W. 1857. Ankunft u. Wegzug der Vögel Pommerns [Arrival and departure of the birds of Pomerania]. *Journal für Ornithologie* **5:** Appendix. ***APUS***life 2136, 2002, http://www.commonswift.org/2163Hintz.html

Hugues A. & Cabanès G. 1918. Le départ des Martinets en 1917 [The departure of the Swifts in 1917]. *Revue française d'Ornithologie* **102:** 146–148. [In French]

Kaiser E. 2004. Gehäuftes Auftreten von Zweitbruten beim Mauersegler *Apus apus* [Accumulating reports of second broods in Common Swifts *Apus apus*]. *Vogelwelt* **125:** 113–115. [In German]

Khaleghizadeh A. 2005. Phenology of Common Swift *Apus apus* in the Middle East - Tehran, Iran. S*andgrouse* **27(1):** 79–82.

Khrabryi V.M. 1991. [*Birds of St.-Petersburg. Fauna, distribution, conservation*]. St.-Petersburg. ***In:*** Paevskiy V.A. (ed.), *Proc. of Zool. Institute of Russ. Ac. of Sc*. 236, 276 pp. [In Russian]. Accessible under Shergalin [2005c].

Klůz Z. 1950. [Contribution to the nidobiology of the Swift (*Micropus a. apus (L.)*]. *Sylvia* **11/12:** 37–51. [In Czech with English summary]

Koskimies J. 1950. The life of the Swift, *Micropus apus* (L.), in relation to the weather. *Annales Academiæ Scientiarum Fennicæ*, Series A. IV *Biologica* **15:** 1–151.

Lack D. & Lack E. 1951. The breeding biology of the Swift *Apus apus*. *Ibis* **93:** 501–546.

Lack D. 1958. The return and departure of Swifts *Apus apus* at Oxford. *Ibis* **100:** 477–502.

Leidgren A. 1985. [Notes on the Swifts of Lapland]. *Fåglar i Norrbotten* **2:** 10–15. [In Swedish].

Leshem Y. & Bahat O. 1996. *[Flying with the birds]*. Yedioth Ahronoth & Chmed Books Ltd., Tel Aviv. [In Hebrew]

Loshakov A.S. 1969. [On ecology of *Apus apus* L.] *Vestnik zoologii* (*Zoological Record*) **3:** 88–89. [In Russian with English summary]

Mathey-Dupraz A. 1921. Notes ornithologiques de la région du Bosphore [Ornithological notes from the Bosphorus region]. *Ornithol. Beob.* **18:** 101–104. [In French]

Maumary L., Vallotton L. & Knaus P. (in press). *Die Vögel der Schweiz [The Birds of Switzerland]*. Schweizerische Vogelwarte, Sempach. [In German]

McGregor P.J.C. 1917. Notes on Birds observed at Erzerum. *Ibis* **10:** 20.

Meisner F. & Schinz H.R. 1815. *Die Vögel der Schweiz [The Birds of Switzerland]*. Orell, Füßli und Comp., Zürich. [In German]

Moskvichev A.N. 2005. Arrival and departure of Common Swift in Ulyanovsk, Russia, in 1999–2004. ***APUS***life 3003, http://www.commonswift.org/3003Moskvichev.html

Nikolaev V.I. 1998. [Birds of the march landscapes of National Park "Zavidovo" and Upper Volga River area], 214 pp. [In Russian]. Accessible under Shergalin [2005a].

Novak V.O. 2002. [Materials on the phenology of bird migrations in Podolia.1. Non-Passeriformes]. *Berkut*, Supplement: *Avifauna of Ukraine* **2:** 73–86. [In Ukrainian]. Accessible under Fefelov [2005].

Ocheretny D.G. 1998. [Materials on the phenology of bird migrations in the Tulchin District of the Vinnitsa Region]. *Berkut*, Supplement: *Avifauna of Ukraine* **1:** 74–82. [In Ukrainian]. Accessible under Fefelov [2005].

Paris P. 1910. Arrivée et départ des Hirondelles et des Martinets aux environs de Dijon [Arrival and departure of Swallows and Swifts in the Dijon area]. *Revue française d'Ornithologie* **8:** 255. [In French]

Poljushkevich I.M. 1998. [Materials on the phenology of bird migrations in the Koristyushiv District of the Zhitomir Region]. *Berkut*, Supplement: *Avifauna of Ukraine* **1:** 62–74. [In Ukrainian]. Accessible under Fefelov [2005].

Rasmussen P., Anderton J.C. 2005. *Birds of South Asia: The Ripley Guide, 2 vols.* Lynx Editions, Smithsonian Institution, Barcelona-Washington.

Savchenko A.P., Sidorkin V.N. & Belyakov A.V. 2001. [The *Wildlife of the Yenisei Plain. Vol. 1. Amphibians, reptiles, birds*]. Krasnoyarsk State University Publ., 264 pp. [In Russian]. Accessible under Fefelov [2004b].

Shergalin J. 2005a. Report on the Birds of the National Park "Zavidovo" and Upper Volga River. Tver. ***APUS***life 3114 at http://www.commonswift.org/3114Shergalin.html

Shergalin J. 2005b. Report on the Birds of the Ivanovo Region. ***APUS***life 3115 at http://www.commonswift.org/3115Shergalin.html

Shergalin J. 2005c. Report on the Common Swift in St. Petersburg. ***APUS***life 3118 at http://www.commonswift.org/3118Shergalin.html

Shirihai H. 1996. *The Birds of Israel*. Academic Press Ltd., London.

Skovgaard P. 1924. [New dates from the migration of the Common Swift (*Cypselus apus*)]. *Danske-Fugle* **61–64**. [In Danish]

Taczanowski L. 1888. Liste des oiseaux observés depuis cinquante ans dans le Royaume de Pologne [List of birds observed in the Kingdom of Poland over fifty years]. *Ornis* **4:** 452. [In French]

Tait W.C. 1924. *The birds of Portugal*. H.F. & G. Witherby, London.

Tigges U. 2000a Mauersegler in Berlin und Brandenburg [Common Swifts in Berlin and Brandenburg]. ***APUS***life 2405, http://www.commonswift.org/2405Tigges.html [in German with English summary]

Tigges U. 2000b. On the breeding phenology of the Common Swift (*Apus apus*) - the last diurnal return to nest with reference to environmental and social factors. ***APUS***life 2340, http://www.commonswift.org/2340TiggesU.html

Tigges U. 2001. Departure and arrival of Common Swift *Apus apus* in Tel Aviv, Israel, in 1999–2000. *Sandgrouse* **23:** 59.

Tigges U. 2002. The Migration of the Common Swift *Apus apus* to its Breeding Areas. *Osprey* **2:** 19.

Tigges U. 2003. Very Early Return of a Common Swift *Apus apus* Breeding Bird. *Osprey* **3:** 47.

Tigges U. 2006. The Breeding Cycle in calendar form of the Common Swift *Apus apus* across its Eurasian breeding range – A testable hypothesis? *Podoces* **1(1/2):** 27–33.

la Touche J.D.D. 1931–1934. *A Handbook of the Birds of Eastern China, Vol. 2*. Taylor and Francis, London.

Warga K. 1929. Die Mauerseglerkolonie in Solymosvár. *Aquila* **35:** 380–381. [In Hungarian with German translation]

Weitnauer E. 1990. *Mein Vogel. Aus dem Leben des Mauerseglers [My bird. From the life of the Common Swift], 4th edition.* Basellandschaftlicher Natur- und Vogelschutzverband, Liestal, Switzerland. [In German]

Weitnauer E. & Scherner E.R. 1980. *Apus apus* Mauersegler [*Apus apus* Common Swift]. ***In:*** Glutz von Blotzheim U. & Bauer K. (eds), *Handbuch der Vögel Mitteleuropas [Handbook of the birds of central Europe], vol. 9.* Aula Verlag, Wiesbaden, pp. 671–712.

Zarudnoï [Zarudnyi] N. 1903. Les oiseaux de la Perse Orientale, Matériaux ornithologiques du voyage fait en 1898 [The Birds of easteren Persia, ornithological matewrials of a trip in 1898]. *Mémoires de la Société Impériale Russe de Géographie. Sec. géo.gén.* **36(2):** 20 and 177–180. [In Russian]. Accessible under Fefelov [2006].