

MIGRATION OF PASSERINES THROUGH SOME PROTECTED AREAS IN THE EASTERN PART OF EGYPT

Wed Abdel Latif Ibrahim and Przemysław Busse

ABSTRACT

Ibrahim W.A.L., Busse P. 2012. *Migration of passerines through some protected areas in the eastern part of Egypt*. Ring 34: 69-205.

The fieldwork – catching and ringing birds using mist-nets – were conducted at several sites during both spring and autumn migration seasons in 2001-2008. These sites were: Burulus Protected Area, Wadi El Rayan Protected Area, Hurghada, Sharm El Shiekh (Ras Mohamed National Park), Saluga and Ghazala Protected Area and Wadi El Gemal Protected Area. Altogether 21 site/seasons were covered (9 in spring and 12 autumn). In the most cases the work in a season lasted 1-2 months and the timing of work was not standardized. This make the results not exactly compatible, but still this is a first so wide study of the mainly passerine migration over the area. The aim of this paper is to make accessible the basic information on passerine migration there. Some non-passerines, that are more easily caught with mist-nets or that are caught occasionally are listed too. Altogether 19 748 individuals of 117 species were ringed in spring and 11 238 individuals in autumn. The data are presented in the text as faunistics style lists of birds caught in spring and autumn separately, as tables of birds ringed at stations and those that show relative abundance and dominance of species and in Appendices I and II (for spring and autumn) as maps with average numbers per station and as seasonal number dynamics – total for seasons and yearly, if possible. The data included in the paper are treated as a source information about migration over the area studied, while the more detailed data about migration pattern, measurements, stopover ecology will be evaluated in next papers being under preparation.

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Publication appointed to the SE European Bird Migration Network papers

Keywords: bird migration, migration dynamics, passerines, spring, autumn, eastern Egypt, network

INTRODUCTION

Birds are a good indicator of biodiversity, at least on a large scale, and they are useful for monitoring environmental changes. Many species of birds are migrants, thus they have a valuable input to the biodiversity of very large areas – breeding grounds, migration flyways and winter-quarters.

Migration is a critical stage in bird life cycle, in which birds are susceptible to death during the long distance migration due to natural reasons and human activities (hunting, habitat changes, *etc.*). Thousands of birds die every year due to several reasons. These are not only migrants but also resident species – in order to prevent birds from loss or extinction there should be safe habitat for resident birds and safe stopover sites for migrant species. To protect bird species and their habitats, studies on their diversity, distribution, and crucial sites (both during breeding and migration) are essential. General methods used for studying these problems are direct observation, acoustic registration, radar recording, telemetry, and bird ringing with associated methods.

Bird capturing and ringing give a clear picture of bird diversity in an area, including small and shy species. Additionally, capturing birds offers possibility of the comprehensive studies on morphology, population differentiation, orientation as well as investigating bird parasites and/or diseases. Ringing stations can be used for training purposes, ecotourism (bird watching tourism) and they are good laboratories for specialists. They can also serve as “alarm sites” in the case of crises related to migratory birds (*e.g.* avian flu). The importance of ringing stations comes mainly from networking as this can support the conservation activities not only on a local but also on a national and international scale. For the best results the work should cover the whole migration period and be continued over many years as such data enable monitoring of the populations migrating over the studied region. The best example is the 50-year activity of the Polish Operation Baltic programme. Individual marking of birds by ringing is very useful for studying migratory routes, migration times, migratory strategies, *etc.* Such work is very important for studying flyways’ details and population description for environmental planning, bird and habitat protection.

The aim of this paper is a general overview of, mainly passerine, migration over the eastern part of Egypt, with special attention given to protected areas. It must be stressed, however, that the picture is not complete yet as there were many constraints, like limited funds and/or qualified staff. The licensed ringers came mainly from Poland and represented the SE European Bird Migration Network (SEEN). So, the present study is rather a starting point for future research than a detailed picture of the bird migration in Egypt.

STUDY SITES

Contemporary ringing activities in Egypt started in collaboration with the SEEN in Wadi El Rayan. Six sites have been identified and studied for passerine migration so far. The fieldwork has been conducted during both spring and autumn migration seasons. These sites are: Burullus Protected Area, Wadi El Rayan Protected Area,

Hurghada, Sharm El Shiekh (Ras Mohamed National Park), Ghazala Protected Area (shortened form “Ghazala” will be used here) and Wadi El Gemal Protected Area (“Wadi Gemal”) – Fig. 1, Plates 1-6.

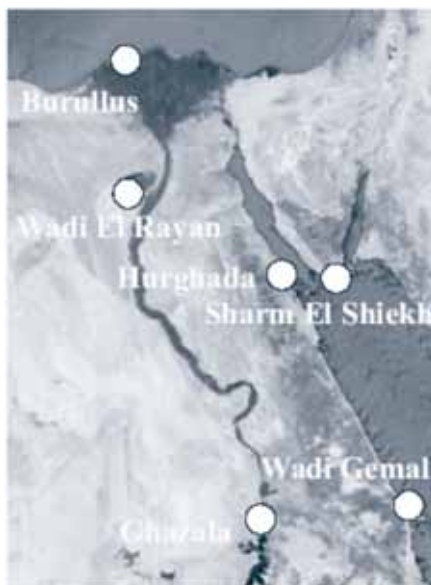


Fig. 1. Location of SEEN ringing stations in Egypt covered by the work

Burullus (Plate 1)

Location and site description: Burullus protected area is characterized by a wide range of habitats including marine waters, brackish and fresh lagoon waters, sandy shores, salt marshes, sand dunes rich in flora, islets within the lake mudflats, hyper saline sabkhas, freshwater swamps and reedbeds. Several man-made wetlands are also found in the protectorate including fish farms, salt pans, canals and drains. The gradient between the marine and fresh water in salinity levels gives the marine and fresh water flora the chance to flourish. The northern sandbar includes two threatened habitats in the protectorate: sand dunes and salt marshes. These habitats support highly threatened species in the Mediterranean coast of Egypt (Baha El Din 1999).

Reed swamp habitats form the greatest biomass and they are of particular importance as breeding habitats for several waterbirds, supporting populations of some 15 breeding species as well as holding one of the largest population in the Western Palearctic of the Purple Gallinule (*Porphyrio porphyrio*) and the Little Bittern (*Ixobrychus minutus*). The ecosystem supports the valuable fish and waterfowl population (Meininger and Atta 1994).

Total of 32 mist-nets were situated in the southern part of Lake Burullus (31°30'N, 30°04'E). The nets were located in reedbed habitat at different sites along the fish-ponds. The habitat was dominated by the Common Reed (*Phragmites australis*) with some Nile Tamarisk (*Tamarix nilotica*) shrubs.

Work: During autumn seasons (2005-2007) the work was carried out from the end of August / beginning of September to the first week of November. In spring 2006-2007, the work was conducted from the beginning of March to the beginning of May (Table 1).

Table 1
Periods of work at ringing sites

Site	Year	Season	From	To
Burullus	2005	Autumn	1 Sep.	2 Nov.
	2006	Spring	12 Mar.	8 May
	2006	Autumn	28 Aug.	6 Nov.
	2007	Spring	5 Mar.	2 May
	2007	Autumn	2 Sep.	3 Nov.
Wadi El Rayan	2001	Spring	1 Mar.	30 Apr.
	2001	Autumn	24 Sep.	30 Oct.
	2002	Spring	3 Mar.	28 Apr.
	2002	Autumn	1 Sep.	30 Oct.
Ghazala	2003	Autumn	28 Aug.	11 Sep.
	2003	Autumn	25 Sep.	25 Oct.
	2004	Spring	19 Mar.	16 May
	2004	Autumn	15 Aug.	15 Oct.
	2005	Spring	1 Mar.	29 Apr.
	2005	Autumn	1 Sep.	20 Oct.
Hurghada	2007	Spring	9 Mar.	20 May
	2007	Autumn	24 Sep.	18 Oct.
	2008	Spring	5 Mar.	28 Apr.
Sharm El Shiekh	2003	Autumn	27 Aug.	25 Sep.
Wadi El Gemal	2005	Spring	16 Mar.	30 Apr.
	2005	Autumn	1 Sep.	23 Oct.

Wadi El Rayan (Plate 2)

Location and site description: The importance of Wadi El Rayan for birds became more significant after Wadi El Rayan lakes were created. A new habitat in the desert became an important stopover site for migrating birds. Wadi El Rayan is characterized by the variety of habitats and rich natural resources where migrants can stop to rest and then continue their flight from breeding to wintering areas and back. The ringing station was located on the eastern coast of Wadi El Rayan lower lake (29°16'N, 30°42'E). The vegetation was composed mainly of the Nile Tamarisk shrubs and reedbeds.

Work: Ringing activities started in spring 2001. Altogether 43 mist-nets were located in small shrubs and reedbeds along the lake shoreline. Ringing data were collected from the beginning of March to the end of April in the spring and from the end of September to the end of October in the autumns of 2001 and 2002 (Table 1).



Plate 1. Biotopes at Burullus station



Plate 2. Biotopes at Wadi El Rayan station



Plate 3. Biotopes at Ghazala station



Plate 4. Biotopes at Hurghada station



Plate 5. Biotopes at Sharm El Shiekh station



Plate 6. Biotopes at Wadi Gemal station

Ghazala Island (Plate 3)

Location and site description: The area was declared as protected due to its botanical importance: 94 species were recorded, from which 4 *Acacia* species are present only on these islands. The place is the only protected area that encompasses a part of the Nile Valley ecosystem in Egypt (Baha El Din 1998). Ringing station was established on Ghazala in the Nile Valley at Aswan (24°04'N, 32°52'E), which is one of the first cataract island (Saluga and Ghazala Protected Area) between Aswan Bridge and Aswan Reservoir (one of Important Bird Areas). About 34 mist-nets were put between *Acacia* trees and along the island's shoreline in the reedbeds.

Work: The work started in Ghazala ringing station in autumn 2003 and continued till 2005. Ringing was conducted from the middle of August / beginning of September to the second half of October in autumn, while in spring the work started in March and continued to the end of April / middle of May in 2004-2005 (Table 1).

Hurghada (Plate 4)

Location and site description: The ringing station was situated on the mainland close to the Hurghada archipelago that is known as an Important Bird Area (IBA) and contains 22 uninhabited islands, plus a handful of very small islets, scattered from the Straits of Gebal (at the mouth of the Gulf of Suez) to Hurghada (Baha El Din 1999). The vegetation in the area is poor and consists mainly of saltmarshes, including such plants as *Halocnemum strobilaceum*, *Arthrocnemum sp.* and *Nitraria sp.* Therefore the area around the waste water treatment plant in Hurghada acts as an emergency landing place for many migrants.

The ringing site was located 10 km north of Hurghada (27°14'N, 33°45'E), at the Hurghada waste water treatment station. The passerines were captured in the reedbeds along the seepage canal of waste water. The vegetation in this area was dominated mainly by the Common Reed and Nile Tamarisk shrubs, within which the mist-nets were located, whereas some nets were put in planted forest consisting mainly of *Casuarina* trees in front of treatment ponds.

Work: Hurghada ringing work started in spring 2007 from the end of the first decade of March until the end of the second decade of May. In autumn 2007 work in Hurghada was conducted less than one month, starting in the middle of migration (on 24 September) and finishing at the end of the second decade of October. In spring 2008 the work at Hurghada was conducted from the beginning of March till the end of April (Table 1).

Sharm El Shiekh (Plate 5)

Location and site description: Ras Mohamed National Park is located at the southernmost tip of the Sinai Peninsula, where the Gulf of Aqaba meets the Gulf of Suez. It was declared as the Important Bird Area by the BirdLife International in 1999 (Baha El Din 1999). In addition to its importance as a unique marine national park for its coral reef, Ras Mohamed is considered an important bottleneck for migratory soaring birds, which concentrate there in large numbers, mainly to rest during the migration

seasons. It is estimated that more than 400 000 individuals pass the area and mainly gather to rest in the area before crossing the Gulf of Suez to continue for the coast of Africa. Most studies focused on the large birds such as the White Stork (*Ciconia ciconia*), Black Stork (*C. nigra*), Black Kite (*Milvus migrans*), buzzards (*Buteo spp.*), sparrowhawks (*Accipiter spp.*) and eagles (*Aquila spp.*) that are mostly soaring birds (Baha El Din 1999).

The ringing station was situated at an old sewage farm (28°53'N, 34°19'E) of Sharm El Shiekh city, which was the most suitable site to capture passerine migrants. About 25 mist-nets were located in the site between different species of shrubs.

Work: Ringing activities started from the end of August and lasted till the end of September: 179 individuals were captured and ringed. As both the daily average of captured birds and the number of migrants were very low (most of captured birds were residents, except one or two species) the decision was made to close Ras Mohamed ringing station (Table 1).

Wadi El Gemal (Plate 6)

Location and site description: Wadi El Gemal area encompasses an island declared as the IBA, which is a small coralline island, fringed by coral reefs to the north-east, with good seagrass beds offshore to the south-west. A small mangrove stand is located in an isolated pool in the middle of the island, and another occurs on the south-west shore, which slopes very gently, forming extensive mudflats. A moderate-sized saltmarsh is found along the inland fringe of the coastal mangrove, and many isolated halophytic shrubs are scattered over the rest of the islands (Baha El Din 1999).

The ringing site was located in the mouth of Wadi El Gemal (24°40'N, 35°10'E) in the vicinity of the headquarters of the Wadi El Gemal National Park. The site is characterized by the presence of tamarisk shrubs, while in the coastal area of the site there were some reedbeds, Nile Tamarisk shrubs, *Nitraria retusa*, and palm trees. Altogether 27 mist-nets were situated there.

Work: The work started in spring 2005, from the middle of March to the end of April, while in autumn 2005 the work was carried out from the beginning of September until the third decade of October (Table 1).

MATERIAL AND METHODS

Data collection

The data were collected according to the SEEN standards described in detail in "Bird Station Manual" (Busse 2000). In the areas selected for bird capturing mist-nets were distributed according to local habitats. The nets were four-shelf nets of 16 mm (knot to knot) netting, made of dtex 210/2 thread. Standard nets were 7 and 12 m long. The number of nets as well as their total length varied among different stations and seasons, but the number was stable within a season. Only a few accidental breaks in ringing occurred because of unexpected events, *e.g.* sand storms. Thus, daily catch-

ing dynamics is compatible within a season. Unfortunately, the periods of work in different years and seasons were not standardized and varied according to logistics reasons. So, the numbers of birds reported for seasons and stations are rough approximations only and they do not reflect relations between stations in this respect (Figs. 2-3).

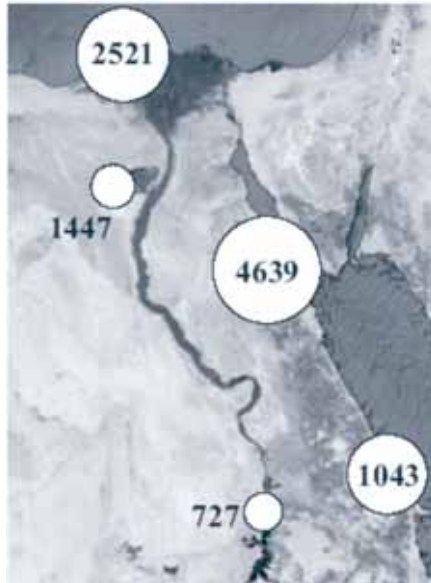


Fig. 2. Average seasonal numbers of birds caught at the ringing stations in spring. For the stations names see Figure 1.

Nets were open during the day and night, except the midday – they were closed between 11.00 and 16.00 approximately, due to the heat. The nets were controlled every hour starting from around half an hour after sunrise in the morning session and then from 17.00 to the sunset in the afternoon session. Captured birds were ringed and measured (standard set of measurements included wing length, tail length, wing formula, fat score and weight). Some individuals were tested for directional preferences (orientation tests).

Data elaboration

The data were noted in standard SEEN ringing notebooks and digitalized using special software – PODAB 7.0 (available from the SEEN headquarters). PODAB programme creates files being input for seasonal catching dynamics graphs. These (as e.g. Figs. 3-4, 6-7 and graphs in *Appendices I* and *II*) show both raw daily data presented as dots and data smoothed by five-day running average as continuous lines. The data for spring and autumn seasons are presented separately as: (1) total catching dynamics at each station, (2) seasonal dynamics in separate years and (3) species catching dynamics – total and yearly, if possible (Figs. 3-4, 6-7, *Appendices I* and *II*). Maps presenting relative numbers of birds at different stations show average yearly values for a defined season (Fig. 2 and 5, maps in *Appendices I* and *II*).

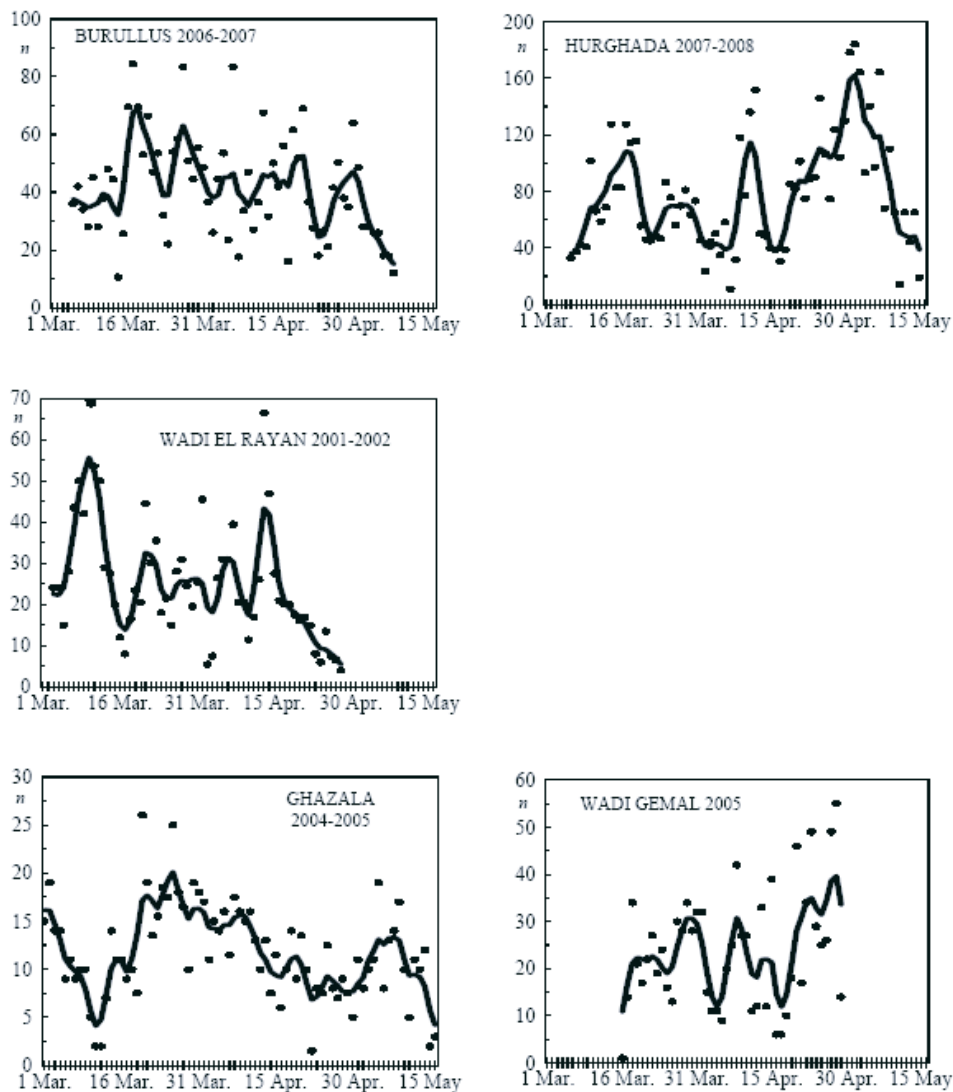


Fig. 3. Total spring catching dynamics at ringing stations. Dots – number values, lines – 5-day moving average smoothed data.

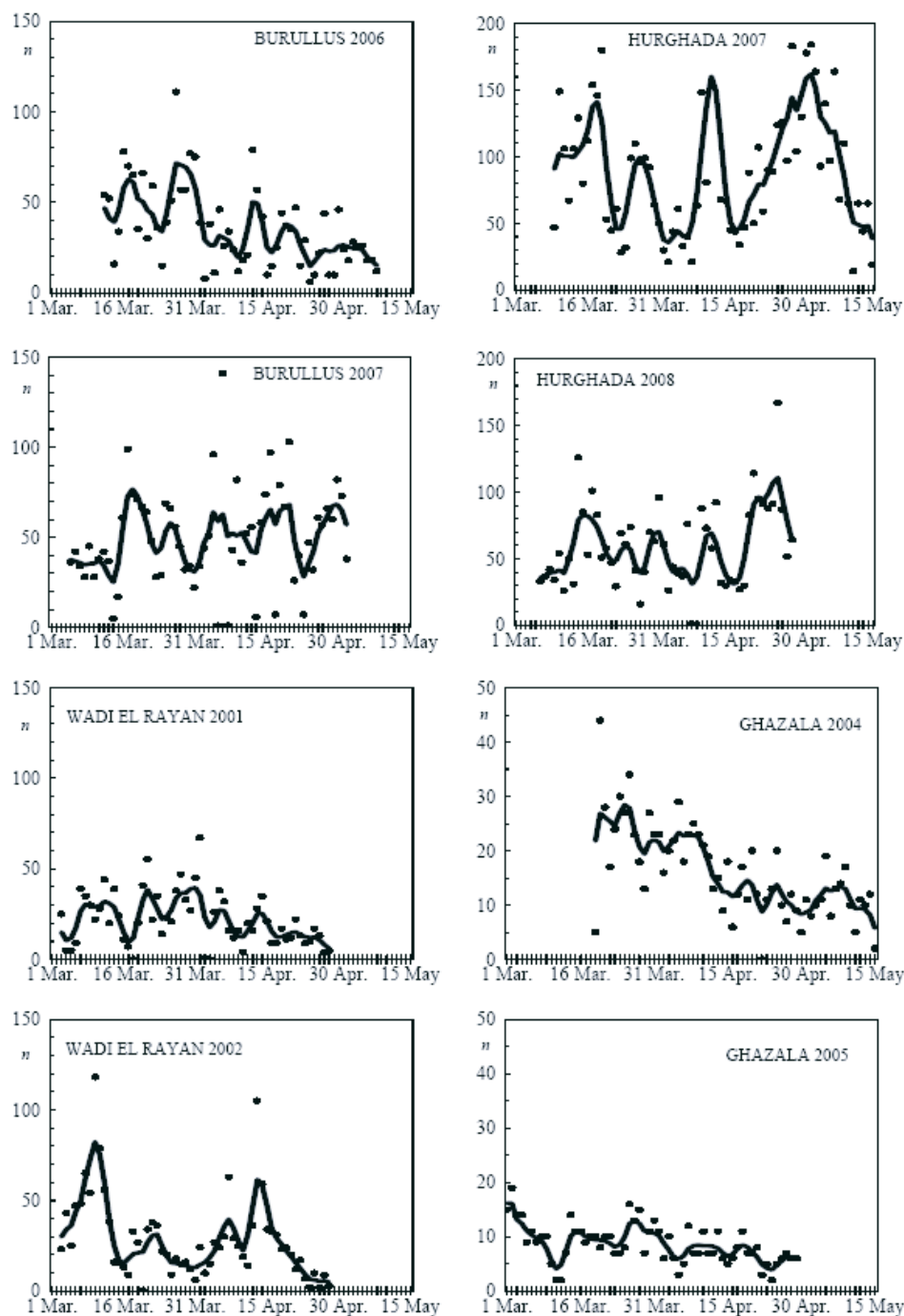


Fig. 4. Yearly spring catching dynamics at ringing stations. Explanations as in Figure 3.

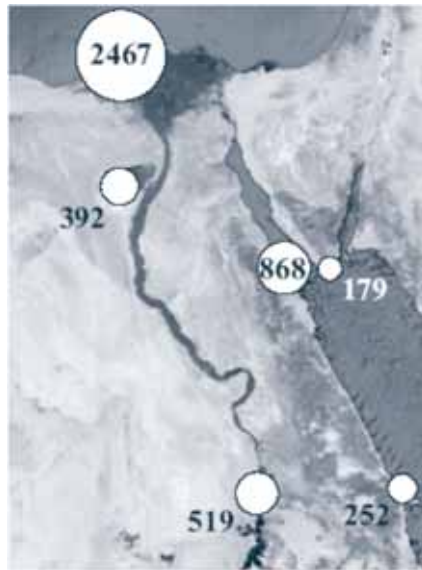


Fig. 5. Average seasonal numbers of birds caught at the ringing stations in autumn. For the station names see Figure 1.

RESULTS

Spring migration

From 2001 to 2008 during spring migration birds were captured and ringed at five sites in Egypt, *i.e.* Burullus (2006-2007), Wadi El Rayan (2001-2002), Ghazala (2004-2005), Hurghada (2007-2008) and Wadi Gemal (2005) ringing stations (Table 2). The average number of birds captured during ringing activities from 2001 to 2008 varied among the ringing stations (Fig. 2); the highest seasonal average was 4639 individuals in Hurghada, while the lowest was only 727 individuals in Ghazala. In Wadi El Rayan and Wadi El Gemal the seasonal average number of captured birds was quite similar (1447 and 1043 individuals, respectively), while in Burullus the seasonal average (2521 individuals) was nearly twice as high as in both Wadi El Rayan and Wadi El Gemal ringing stations.

Seasonal migration dynamics of passerines (Fig. 3) in different ringing stations showed that birds generally started migration at the beginning of March with a relatively high peak of migration (from 16 to 31 March in Burullus and Hurghada and 1-16 March in Wadi El Rayan), but sometimes even earlier as in Ghazala (2004-2005), where passerines might start migrating at the end of February. Birds generally finished migration at the end of April / middle of May in Wadi El Rayan, Burullus, Hurghada and Ghazala. At almost all stations ringing was conducted during two seasons and in Figure 4 one can see year to year variation in the migration patterns. These patterns differ both in the number of captured birds and the seasonal pattern (migration waves). However, a number of similarities from year to year at the same station could be also noted.

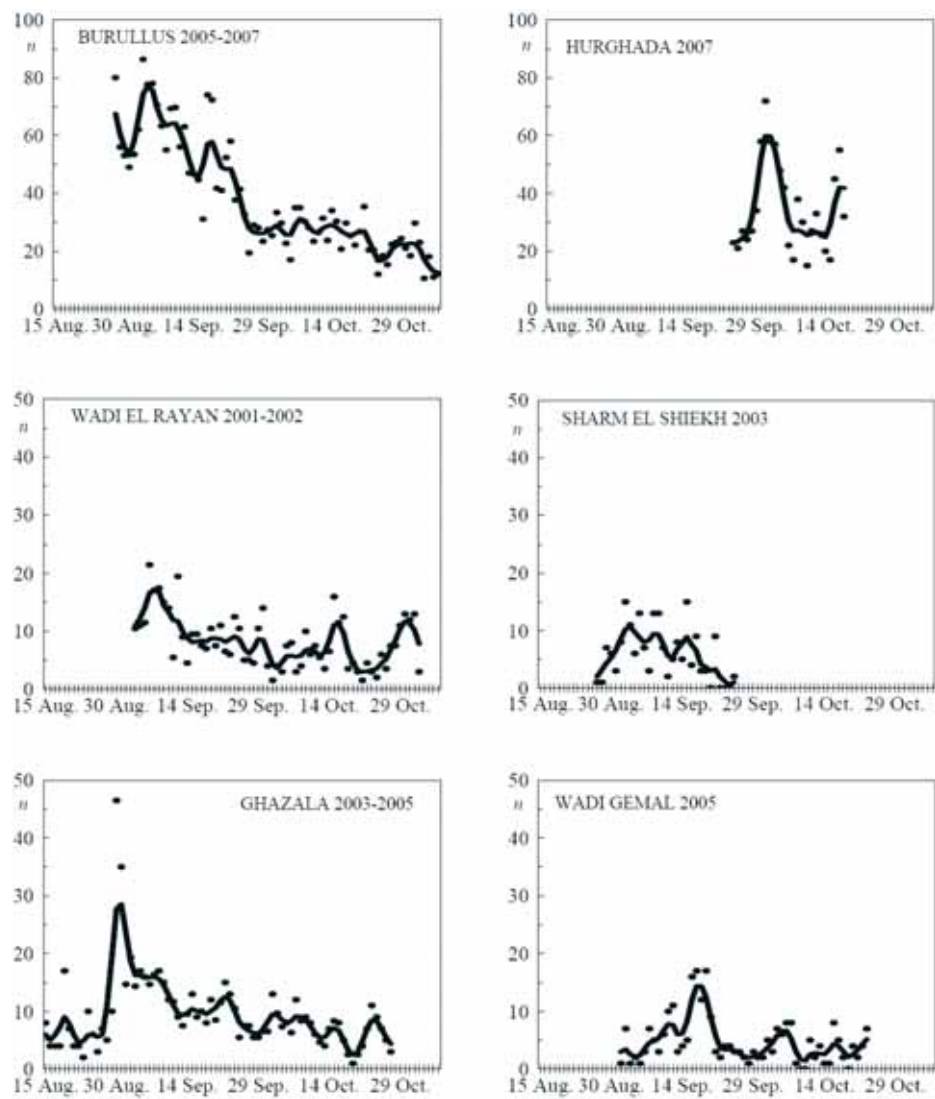


Fig. 6. Total autumn catching dynamics at the ringing stations. Explanations as in Figure 3.

Migration of individual species is presented below as Table 2 and a list of birds captured at Egyptian stations, with comments on their occurrence and distribution. For more numerous and/or regularly captured species more detailed data are presented in *Appendix I (App. I) – Distribution Maps (SMap) and Migration Dynamics graphs (SDyn.)*. These are yearly average numbers of captured birds (at maps), average daily numbers (dots) and the smoothed data on the species migration dynamics (graphs). The order of both map and graph plates is according to the occurrence of the species in the list given below, therefore the species are not placed in any systematic order.

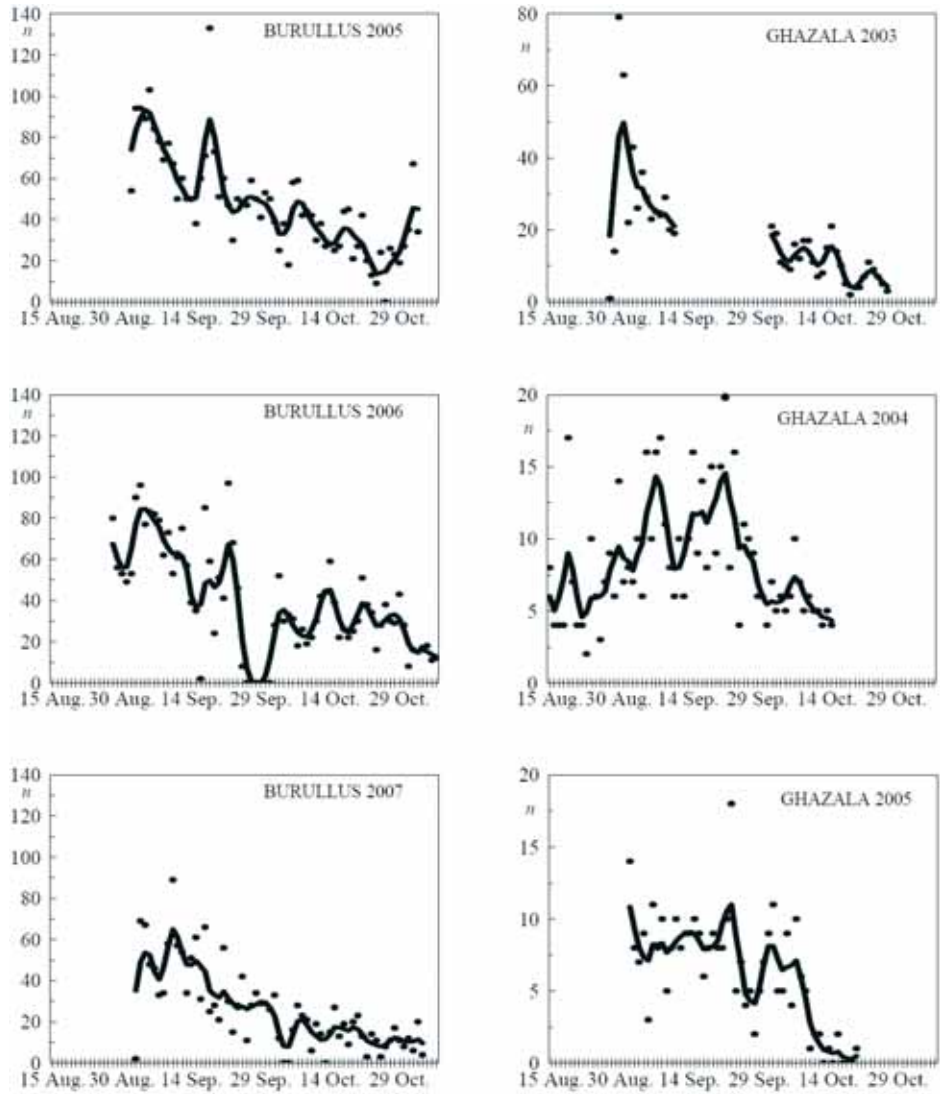


Fig. 7. Yearly spring catching dynamics at Burullus and Ghazala stations. Explanations as in Figure 3.

Table 2
Numbers of birds caught during spring seasons 2001-2008 at different sites in Egypt

	Burullus		Wadi El Rayan		Ghazala		Hurghada		Wadi El Gemal	Total
	2006	2007	2001	2002	2004	2005	2007	2008	2005	
Passerines										
<i>Galerida cristata</i>		3								3
<i>Calandrella brachydactyla</i>							296	207		503
<i>Calandrella rufescens</i>								1		1
<i>Melanocorypha bimaculata</i>							4	4		8
<i>Ptyonoprogne rupestris</i>					2					2
<i>Riparia riparia</i>	37	40	2	1	2		1197	365	162	1806
<i>Hirundo rustica</i>	21	19	10	2	8		882	719	190	1851
<i>Hirundo daurica</i>					1		11	42	1	55
<i>Delichon urbica</i>			2				34			36
<i>Anthus campestris</i>				1			11	13	1	26
<i>Anthus spinoletta</i>			1	1			2			4
<i>Anthus pratensis</i>							1			1
<i>Anthus trivialis</i>	2		9	12	2		95	9	40	169
<i>Anthus cervinus</i>							148	7	3	158
<i>Motacilla alba</i>	3	2	4	20			33	12	1	75
<i>Motacilla flava</i>	83	102	12	50			854	87	32	1220
<i>Pycnonotus barbatus</i>	1				5	1				7
<i>Erithacus rubecula</i>	1	1	2						1	5
<i>Luscinia megarhynchos</i>	10	16	40	32	8	4	49	10	37	206
<i>Luscinia luscinia</i>		1							1	2
<i>Luscinia svecica</i>	62	101	13	12	22	29	81	23	17	360
<i>Cercotrichas galactotes</i>			1	2	17	6	5	2		33
<i>Phoenicurus phoenicurus</i>	1	1	6	7	11	5	13	29	23	96
<i>Oenanthe oenanthe</i>	2	1	10	2		1	12	8	22	58
<i>Oenanthe isabellina</i>		1	1	5			3	33	15	58
<i>Oenanthe deserti</i>								1		1
<i>Oenanthe hispanica</i>			1				2	2	1	6
<i>Oenanthe pleschanka</i>								1		1
<i>Saxicola rubetra</i>		4	6	3		28	18	10	1	70
<i>Saxicola rubicola</i>	2	1						5	12	20
<i>Monticola saxatilis</i>									2	2
<i>Turdus philomelos</i>								1		1
<i>Sylvia borin</i>	1	2		1	10		23	37	4	78

Table 2 continued...	Burullus		Wadi El Rayan		Ghazala		Hurghada		Wadi El Gemal	Total
	2006	2007	2001	2002	2004	2005	2007	2008	2005	
<i>Sylvia atricapilla</i>		4		3			5	12	27	51
<i>Sylvia curruca</i>	4	3	99	119	169	184	123	210	97	1008
<i>Sylvia melanocephala</i>	7	3		1	7	3	6	13	12	52
<i>Sylvia mystacea</i>								1		1
<i>Sylvia melanothorax</i>					1			1		2
<i>Sylvia rueppelli</i>			11	6			3	1		21
<i>Sylvia communis</i>	1	2	8	5	5		24	32	10	87
<i>Sylvia cantillans</i>	1		2	6			2	1		12
<i>Prinia gracilis</i>	7	3	3	8						21
<i>Acrocephalus schoenobaenus</i>	914	1529	104	132	9	3	632	201	18	3542
<i>Acrocephalus melanopogon</i>			1							1
<i>Locustella luscinioides</i>	8	9	75	40	3	7	139	33	23	337
<i>Acrocephalus scirpaceus</i>	221	618	535	830	335	207	827	610	124	4307
<i>Acrocephalus palustris</i>					1			1		2
<i>Acrocephalus arundinaceus</i>	152	87	20	18	4	3	28	20	2	334
<i>Acrocephalus stentoreus</i>	131	80	118	98	22	9				458
<i>Hippolais icterina</i>							1	1	1	3
<i>Hippolais pallida</i>			8	11	128	26		3	10	186
<i>Phylloscopus trochilus</i>	1	2	7	7			11	85	22	135
<i>Phylloscopus sibilatrix</i>		1	7	13			4		1	26
<i>Phylloscopus orientalis</i>			5	6	3		16		1	31
<i>Phylloscopus collybita</i>	189	150	70	122	1	3	143	152	30	860
<i>Muscicapa striata</i>			3	3	9	1	33	13	11	73
<i>Ficedula hypoleuca</i>			5	2	2				1	10
<i>Ficedula albicollis</i>		1	14	11	1			3	1	31
<i>Ficedula semitorquata</i>	1				1		1			3
<i>Lanius collurio</i>								1		1
<i>Lanius isabellinus</i>						1				1
<i>Lanius senator</i>			1	3			7	4		15
<i>Lanius nubicus</i>					71	10	5	6	6	98
<i>Anthreptes metallicus</i>					42	3				45
<i>Oriolus oriolus</i>							1		2	3
<i>Passer domesticus</i>	147	20								167
<i>Passer hispaniolensis</i>	6	3		6			11	1	15	42
<i>Ploceus manyar</i>	29	2								31
<i>Emberiza hortulana</i>			1							1
<i>Emberiza caesia</i>								1		1

Table 2 continued...	Burullus		Wadi El Rayan		Ghazala		Hurghada		Wadi El Gemal	Total
	2006	2007	2001	2002	2004	2005	2007	2008	2005	
Non-passerines										
<i>Ixobrychus minutus</i>	26	18		1			1			46
<i>Bubulcus ibis</i>							3			3
<i>Ardeola ralloides</i>	1	1					20	2	2	26
<i>Circus aeruginosus</i>							2		1	3
<i>Circus macrourus</i>								1		1
<i>Buteo rufinus</i>								1		1
<i>Buteo buteo</i>								2		2
<i>Accipiter nisus</i>		1					6	71	1	79
<i>Falco tinnunculus</i>		1					13	10		24
<i>Falco biarmicus</i>								1		1
<i>Coturnix coturnix</i>			7	8		1	64	10	4	94
<i>Porzana porzana</i>			1				10			11
<i>Gallinula chloropus</i>		2					2			4
<i>Porphyrio porphyrio</i>		2								2
<i>Glareola pratincola</i>	2						4	1		7
<i>Charadrius dubius</i>							16		1	17
<i>Hoplopterus spinosus</i>							3			3
<i>Calidris minuta</i>							31		7	38
<i>Calidris temminckii</i>							2			2
<i>Philomachus pugnax</i>							3			3
<i>Tringa glareola</i>							26			26
<i>Tringa ochropus</i>							6	2		8
<i>Actitis hypoleucos</i>	1				3		2	2	2	10
<i>Tringa totanus</i>		1					4	1		6
<i>Tringa nebularia</i>							1			1
<i>Tringa stagnatilis</i>							3			3
<i>Lymnocryptes minimus</i>							1			1
<i>Gallinago gallinago</i>	1	1					4			6
<i>Larus minutus</i>							2			2
<i>Chlidonias hybridus</i>							1			1
<i>Streptopelia decaocto</i>							1	4		5
<i>Streptopelia turtur</i>	1		1				10	9	5	26
<i>Streptopelia senegalensis</i>		3		1	9	2		2		17
<i>Oena capensis</i>							1	3		4
<i>Clamator glandarius</i>								1		1
<i>Centropus senegalensis</i>	1									1
<i>Athene noctua</i>	1									1
<i>Otus scops</i>		1	1	1	2	1			2	8
<i>Caprimulgus europaeus</i>							2			2

Table 2 continued...	Burullus		Wadi El Rayan		Ghazala		Hurghada		Wadi El Gemal	Total
	2006	2007	2001	2002	2004	2005	2007	2008	2005	
<i>Caprimulgus aegyptius</i>								1		1
<i>Upupa epops</i>	1	1		4	2	3	9	6	25	51
<i>Alcedo atthis</i>	13	37	3	4		1			3	61
<i>Halcyon smyrnensis</i>	12	6								18
<i>Ceryle rudis</i>		42		1						43
<i>Merops apiaster</i>	1				7	1	22	2	1	34
<i>Merops persicus</i>	3	6					1			10
<i>Merops orientalis</i>					6	1				7
<i>Jynx torquilla</i>		3	20	22	4	1	23	18	15	106
Seasonal total	2109	2938	1250	1643	935	545	6095	3184	1049	19748
Seasonal species number	42	48	43	45	37	28	76	69	53	
Total species number	58		52		42		95		53	117

Passerines

Crested Lark (*Galerida cristata*). This species was captured only in Burullus in 2007; in total 3 indiv. were captured: the first one on 20 Mar., while the other two – on 1 Apr.

Greater Short-toed Lark (*Calandrella brachydactyla*). (App. I: SDyn. 1).

It was captured only in Hurghada ringing station during spring 2007 and 2008; in total over 500 indiv. were captured with one high peak of captures on around 16 Mar.

Lesser Short-toed Lark (*Calandrella rufescens*). Only one individual was captured in Hurghada on 15 Mar. 2008.

Bimaculated Lark (*Melanocorypha bimaculata*). Only 8 indiv. were captured and ringed in Hurghada in 2007 and 2008 (4 each year). Three individuals were captured between 17-19 Mar. and one on 13 May 2007, while in 2008 four individuals were captured between 14-20 Mar.

Eurasian Crag Martin (*Ptyonoprogne rupestris*). It was captured only in Ghazala ringing station in 2004; 2 indiv. were captured on 9 and 28 Apr.

Sand Martin (*Riparia riparia*). (App. I: SMap 1, SDyn. 2).

The number of recorded Sand Martins varied in all ringing stations (2001-2008). The species was relatively numerous in three stations: Burullus, Hurghada and Wadi El Gemal. The highest seasonal average number of captured Sand Martins was 781 indiv. in Hurghada, while this species was captured occasionally in Wadi El Rayan and Ghazala ringing stations (3 and 2 indiv., resp.). The species migrated in Burullus from the middle of March until the end of April showing high fluctuations in numbers. In Hurghada and Wadi El Gemal, Sand Martins started to migrate from the middle / end of April.

Barn Swallow (*Hirundo rustica*). (App. I: SMap 1, SDyn. 3).

From 2001 to 2008 the number of swallows captured in all five ringing station strongly varied. A total of 1851 indiv. were captured. The Barn Swallow was more numerous in both Hurghada and Wadi El Gemal ringing stations compared to other stations. The highest seasonal average number of captured birds was recorded in Hurghada (about 800 indiv.), while the lowest in Wadi El Rayan and Ghazala (6 and 4 indiv., resp.). The species started migration in the second half of March at most of the stations and finished migration in the end of April / beginning of May with a clear, relatively strong peak of the passage from 15 Apr. to about 15 May in both Burullus and Hurghada ringing stations, while in Wadi El Gemal the peak was noted between 16 and 30 Mar.

Red-rumped Swallow (*Hirundo daurica*). (App. I: SMap 1, SDyn. 3).

It was recorded in three ringing stations (it was not captured in Burullus and Wadi El Rayan) with a total number of 55 indiv. The highest seasonal average number of captured birds was recorded in Hurghada (27 indiv.), while the lowest (only 1 indiv.) – in both Ghazala and Wadi El Gemal ringing stations. According to the data from Hurghada (2007-2008) the species migrated from the beginning of March till the end of April; the highest peak of migration was noted between 7 and 31 Mar.

House Martin (*Delichon urbica*). (App. I: SDyn. 3).

Total of 36 indiv. of the House Martin were captured in two stations, *i.e.* 2 indiv. were captured in Wadi El Rayan on 25 Apr. 2001, while 34 indiv. were captured in Hurghada in 2007. According to the data from Hurghada the House Martin migrated late in the season starting from 15 Apr. and most probably finishing migration after mid-May.

Tawny Pipit (*Anthus campestris*). (App. I: SDyn. 4).

Only 26 indiv. of the Tawny Pipit were captured, *i.e.* 2 indiv. in Wadi El Rayan (2002) and Wadi El Gemal (2005), while 24 indiv. in Hurghada (2007-2008). According to the data from Hurghada the species started to migrate at the beginning of March and migration lasted till mid-April.

Water Pipit (*Anthus spinoletta*). The Water Pipit was rare in all ringing stations. Only 4 indiv. were captured, *i.e.* in Wadi El Rayan 2 indiv. were captured on 11 Mar. 2001 and 12 Mar. 2002, while in Hurghada 2 indiv. were captured on 16 Mar. and 5 Apr. 2007.

Meadow Pipit (*Anthus pratensis*). The species was very rare – it was captured only once at Hurghada on 10 May 2007.

Tree Pipit (*Anthus trivialis*). (App. I: SMap 1, SDyn. 4).

This species was captured in all ringing stations in 2001-2008. The number of captured individuals varied; in total nearly 170 indiv. were captured mainly at Hurghada, Wadi El Gemal and Wadi El Rayan ringing stations. Only 2 indiv. of the Tree Pipit were captured on 5 and 20 April 2004 at Ghazala as well as 2 indiv. on 4 and 22 April 2006 at Burullus. The highest seasonal average number of the Tree Pipit was recorded in Hurghada 2007-2008 (52 indiv.), while the lowest in both Ghazala in 2004 and Burullus in 2006 (1 indiv.). The Tree Pipit passage in Hurghada, Wadi El Gemal and Wadi El Rayan showed one-wave pattern of migration. The passage started after mid-March and lasted to the end of April; the highest peak of migration was in the second week of April in all three stations.

Red-throated Pipit (*Anthus cervinus*). (App. I: SMap 2, SDyn. 4).

This species was captured only in two stations. In total nearly 160 indiv. were captured in Hurghada in 2007-2008 and Wadi El Gemal in 2005. The highest number of birds was recorded in Hurghada 2007 (148 indiv.). In Hurghada, the Red-throated Pipit migrated from the beginning to the end of April showing only one clear wave, with the highest peak of migration around 15 Apr.

White Wagtail (*Motacilla alba*). (App. I: SMap 2, SDyn. 5).

This species was captured in relatively small numbers, except Ghazala where the White Wagtail was not recorded at all. In total 75 indiv. were captured at four ringing stations, mostly in Hurghada and Wadi El Rayan; the seasonal average number of captured birds was 23 indiv. at the former and 12 indiv. at the latter station, while the lowest seasonal average was in Wadi El Gemal (1 indiv.). The White Wagtail migrated in Wadi El Rayan from the beginning of March (one clear peak – 1-15 Mar.) till mid-April, while in Hurghada the species started the passage about one week later than in Wadi El Rayan, *i.e.* in the second week / end of March (one clear peak) and another small wave from 1 to 15 Apr.

Yellow Wagtail (*Motacilla flava*). (App. I: SMap 2, SDyn. 5).

It was captured in a relatively high numbers in all ringing stations except Ghazala, where the species was not recorded. More than 1200 indiv. of the Yellow Wagtail were captured at four ringing stations. In Hurghada the seasonal average number of captured wagtails was over 450 indiv. (the highest), while the lowest was 31 indiv. in Wadi El Rayan. The Yellow Wagtail started migration from 16 Mar. in Burullus (two clear peaks on 16 Mar. and 15 Apr.), Hurghada and Wadi El Gemal, while in Wadi El Rayan there was one peak from the middle to the end of April; similar pattern was observed in Wadi El Gemal but with two small waves – one clear peak at the end of March and another at the end of April.

Common Bulbul (*Pycnonotus barbatus*). The species was rarely captured in two stations. In total 7 indiv. were captured: 6 in Ghazala in 2004-2005 and only 1 bird in Burullus in 2006. In 2004 in Ghazala two Bulbuls were captured on 19 and 21 Mar. and 3 indiv. on 1 and 2 Apr., while in 2005 only 1 indiv. was captured on 8 Mar. Another individual was captured on 21 Mar. 2006 at Burullus.

Robin (*Erithacus rubecula*). The Robin was rarely captured. The species was ringed only in three stations. *i.e.* Wadi El Rayan (on 3 Mar. and 14 Apr. 2001), Wadi El Gemal (2005) and Burullus (2006, 2007).

Nightingale (*Luscinia megarhynchos*). (App. I: SMap 2, SDyn. 6).

It was relatively common in all stations, more than 200 indiv. were captured. The highest seasonal average number of captured Nightingales was 36 in Wadi El Rayan and in Wadi El Gemal, while the lowest (6 indiv.) was in Ghazala. The Nightingale started migration in most of the stations in the third week of March (around 20 Mar.) and finished in the end of April (around 31 Apr.). However, in Hurghada the species was recorded one week later (about 31 Mar). In Ghazala, the species was captured in small numbers but there were some individuals captured in the first two weeks of May (1-15 May).

Thrush Nightingale (*Luscinia luscinia*). It was a very rare species, only 2 indiv. were captured at two stations. In Burullus 1 indiv. was captured on 11 Apr. 2007, while another was captured in Wadi El Gemal in 2005.

Bluethroat (*Luscinia svecica*). (App. I: SMap 3, SDyn. 7).

The species was regularly captured, although its number varied between the different stations. In total 360 indiv. were captured. The seasonal average number of captured Bluethroats was from 13 in Wadi El Rayan to 82 in Burullus, while in Hurghada the average number was relatively high (52 indiv. per season) compared to 26 indiv. in Ghazala and 17 in Wadi El Gemal. The Bluethroat started migration from 1 Mar. with one clear peak in two stations, *i.e.* Wadi El Rayan and Ghazala, while in Burullus (one peak) and Hurghada (two peaks) the species started to migrate on 10 Mar., and in Wadi El Gemal it started even later – on 16 Mar. Despite the fact that the Bluethroat showed variable time of the beginning of migration, it finished the passage at the same time in most of the stations (15 Apr.), except Wadi El Rayan, where it finished two weeks earlier (31 Mar.).

Rufous-tailed Scrub Robin (*Cercotrichas galactotes*). (App. I: SMap 3, SDyn. 8).

The species was captured in three stations in a relatively small numbers. Altogether 33 indiv. were captured in Wadi El Rayan, Hurghada and Ghazala stations. The seasonal average number of captured Rufous-tailed Scrub Robins varied from 2 to 12 indiv. in Wadi El Rayan and Ghazala, respectively, while in Hurghada the seasonal average number was only 4 indiv. At Ghazala the species migrated in a variable number from mid-March to mid-May, with the highest number of individuals (3) captured on 18 Apr. and 5 May 2004.

Redstart (*Phoenicurus phoenicurus*). (App. I: SMap 3, SDyn. 8).

The species was recorded in all ringing stations, where about 100 indiv. were captured. The seasonal average number of captured Redstarts ranged from 1 in Burullus to 21-23 indiv. in Hurghada and Wadi El Gemal, respectively. Both in Wadi El Rayan and Ghazala the average number was low (7 and 8 indiv., resp.). The Redstart migrated in one clear wave between the beginning and the end of April in Wadi El Rayan and Wadi El Gemal. In Hurghada, the Redstart migrated two weeks later (from 15 April to 15 May), which was similar to migration observed in Ghazala station – in the latter station there were three peaks of migration. In Burullus, the species was twice recorded on 15 May.

Northern Wheatear (*Oenanthe oenanthe*). (App. I: SMap 3, SDyn. 9).

The species was captured in all stations – the total number was about 60 indiv. The highest seasonal average number of captured Northern Wheatears was 22 indiv. in Wadi El Gemal, which was about double of that in Hurghada – 10 indiv. The lowest average was both in Ghazala and Burullus (1 and 2 indiv., resp.). The Northern Wheatear showed two small waves of migration in three stations (Wadi El Rayan, Wadi El Gemal and Hurghada) – the first wave from 16 to 31 Mar. and the second one from 15 to 30 Apr.

Isabelline Wheatear (*Oenanthe isabellina*). (App. I: SMap 4, SDyn. 9).

The species was captured in all stations except Ghazala. In total about 60 indiv. were captured. The highest seasonal average number of captured wheatears was in Hurg-

hada (18 indiv.), similar to Wadi El Gemal (15 indiv.); while the lowest average was in both Burullus and Wadi El Rayan stations (1 and 3 indiv., resp.). The Isabelline Wheatear showed one clear wave of migration in Hurghada in 2007-2008: from 5 to 16 Mar. The species finished migration at the end of March. While in Wadi El Gemal in 2005 its migration started from 16 Mar. and lasted to 10 Apr.

Desert Wheatear (*Oenanthe deserti*). One individual of the Desert Wheatear was captured on 12 Mar. 2008 at Hurghada ringing station.

Black-eared Wheatear (*Oenanthe hispanica*). The species was captured only in three stations; 6 indiv. were captured. 1 indiv. was captured at Wadi El Rayan in 2001 and at Wadi El Gemal in 2005, while 4 indiv. were captured on 27 and 31 Mar. 2007 and on 11 and 23 Apr. 2008 at Hurghada ringing station.

Pied Wheatear (*Oenanthe pleschanka*). One individual of the species was captured on 10 Mar. 2008 at Hurghada ringing station.

Whinchat (*Saxicola rubetra*). (App. I: SMap 4, SDyn. 8).

The Whinchat was captured in all stations and the total number was 70 indiv. The highest seasonal average number was 14 indiv. in both Hurghada and Ghazala. It was about three times higher than in Wadi El Rayan (5 indiv.), while the lowest average number was recorded in both Wadi El Gemal and Burullus (1 and 2 indiv., resp.). The Whinchat showed two waves of migration at Hurghada station, *i.e.* one from 12 to 30 Apr. and the second one from 1 to 10 May.

Common Stonechat (*Saxicola rubicola*). Until 2006 the species was treated as *Saxicola torquata* but then it was split into two species – *S. rubicola* and *S. maura*. Altogether 20 indiv. of the Common Stonechat were captured at 3 ringing stations, *i.e.* 3 indiv. in Burullus (2 indiv. of *Saxicola torquata* on 13 and 16 Mar. 2006 and 1 indiv. of *Saxicola rubicola* on 6 Mar. 2007), 5 indiv. of *Saxicola rubicola* in Hurghada (4 indiv. from 8 to 11 Mar. and 1 indiv. on 17 Mar. 2008), and 4 indiv. of *Saxicola torquata* in Wadi El Gemal in 2005.

Rock Thrush (*Monticola saxatilis*). The species was very rare in different ringing stations in Egypt; only 2 indiv. of the Rock Thrush were captured in Wadi El Gemal in 2005.

Song Thrush (*Turdus philomelos*). It was captured only once: one individual was captured on 24 Apr. 2008 at Hurghada ringing station.

Garden Warbler (*Sylvia borin*). (App. I: SMap 4, SDyn. 10).

About 80 indiv. of the Garden Warbler were captured in all ringing stations. The highest seasonal average number was 30 indiv. and it was recorded in Hurghada, while the average at the other stations was relatively low and varied between 1 indiv. at Wadi El Rayan to 5 indiv. at Ghazala. The Garden Warbler showed two migration waves at Hurghada ringing station: from 20 to 30 Apr. and from 1 to 10 May, while at Ghazala there was only one clear wave of migration from 30 Apr. to 10 May.

Blackcap (*Sylvia atricapilla*). (App. I: SMap 4, SDyn. 11).

The Blackcap was captured in all ringing stations, except Ghazala station. In total 51 indiv. were captured. The highest seasonal average number was recorded at Wadi El Gemal (27 indiv.), while the lowest was 2 indiv. at both Burullus and Wadi El Rayan

ringing stations. The migration dynamics of the Blackcap at Wadi El Gemal showed one clear wave from 15 to 25 Apr., while at Hurghada ringing station the species migrated in two waves: from 15 to 28 Apr. and from 2 to 7 May.

Lesser Whitethroat (*Sylvia curruca*). (App. I: SMap 5, SDyn. 12).

The species was relatively numerous at all ringing stations – over 1000 indiv. were captured. At four stations the seasonal average number of captured Lesser Whitethroats was relatively high – from 97 indiv. at Wadi El Gemal to 167 indiv. at Hurghada and 177 indiv. at Ghazala. The lowest average number, only 4 indiv., was recorded at Burullus station. The Lesser Whitethroat migration at Wadi El Rayan showed two waves from the beginning of March to the beginning of April. The first wave (highest peak) from 2 to 16 Mar. and the second wave (lower peak) from 17 Mar. to the 1 Apr. resembling the pattern observed at Ghazala station. At Hurghada the species showed two main waves from 5 to 31 Mar. (highest peak) and from 15 to 30 Apr. At Wadi El Gemal, the migration of the Lesser Whitethroat started late in March (from 16 to 31 Mar.) and finished at the end of April; the highest peak of migration at Wadi El Gemal was from 5 to 15 Apr. 2005.

Sardinian Warbler (*Sylvia melanocephala*). (App. I: SMap 5, SDyn. 12).

It was captured in relatively small numbers in all ringing stations. More than 50 indiv. of the species were captured. The highest seasonal average number of captured birds was at Wadi El Gemal station (12 indiv.), while the lowest, only 1 indiv., at Wadi El Rayan ringing station. The Sardinian Warbler migration at Hurghada showed an increase in the number of captured birds at the beginning of March, while in Wadi El Gemal the species migrated in the second half of March.

Ménétries's Warbler (*Sylvia mystacea*). Only 1 indiv. of the species was captured on 10 Mar. 2008 at Hurghada ringing station.

Cyprus Warbler (*Sylvia melanothorax*). Only 2 indiv. of the Cyprus Warbler were captured: on 12 May 2004 at Ghazala and on 8 Mar. 2008 at Hurghada.

Rüppell's Warbler (*Sylvia rueppelli*). It was captured in relatively small numbers at only two ringing stations. Altogether 21 indiv. were captured in Wadi El Rayan (17 indiv.) and Hurghada (4 indiv.) stations.

Whitethroat (*Sylvia communis*). (App. I: SMap 5, SDyn. 11).

It was not frequently captured in all stations during ringing activities. In total, about 90 indiv. of the Whitethroat were captured. Most of them were captured in Hurghada in 2007-2008, where the seasonal average number of captured birds was the highest (28 indiv.) compared to other stations such as: Wadi El Gemal (10 indiv.), Wadi El Rayan (7 indiv.), Ghazala (3 indiv.) and Burullus (2 indiv.). The Whitethroat generally migrated late in the season – it was captured at the end of March / beginning of April as in Wadi El Rayan and Wadi El Gemal (31 Mar. and 5 Apr., resp.). The species finished migration at both stations at the end of April (about 30 Apr.). At Hurghada ringing station the Whitethroat started migration two weeks later than at the other stations, and there was one clear migration wave from 15 April to 15 May (which had two strong peaks on 25 Apr. and 5 May).

Subalpine Warbler (*Sylvia cantillans*). Only 12 indiv. of this species were captured at three stations: 8 indiv. at Wadi El Rayan, 1 indiv. at Burullus and 3 indiv. in Hurghada. The Subalpine Warbler was not captured in Ghazala and Wadi El Gemal.

Graceful Prinia (*Prinia gracilis*). (App. I: SDyn. 13).

The species was captured only at two stations. Altogether 21 indiv. of the Graceful Prinia were captured in Wadi El Rayan (11 indiv.) and Burullus (10 indiv.). At Wadi El Rayan ringing station, the Graceful Prinia was captured only in March.

Sedge Warbler (*Acrocephalus schoenobaenus*). (App.I: SMap 5, SDyn. 14).

The Sedge Warbler was one of the most numerous species, except Ghazala and Wadi El Gemal, where the average seasonal number of these warblers was only 6 and 18 indiv., resp. The highest seasonal average number of captured birds was recorded in Burullus (1222 indiv.) compared to Hurghada (417 indiv.) and Wadi El Rayan (118 indiv.). In Burullus ringing station, the species started migration in the middle of March by one long wave with several peaks from 16 to 25 Mar. followed by smaller and shorter wave from 26 Mar. to 10 Apr. – most probably the Sedge Warbler might finish migration in that time. Similar pattern was observed in Hurghada but with only one long wave with high fluctuations and the number of birds decreasing regularly from 7 Mar. to 13 May. In Wadi El Rayan, the Sedge Warbler started migration at the beginning of March with relatively strong wave lasting for two weeks (1 to 15 Mar.) followed by two other smaller waves from 16 to 30 Mar. and from 1 to 25 Apr., *i.e.* when the species might finish migration. In both Ghazala and Wadi El Gemal stations, the Sedge Warbler migrated from 16 Mar. to the end of Apr. in very small waves compared to other stations.

Moustached Warbler (*Acrocephalus melanopogon*). Only 1 indiv. of this species was captured on 14 Mar. 2001 in Wadi El Rayan.

Savi's Warbler (*Locustella luscinioides*). (App. I: SMap 6, SDyn. 15).

The species was relatively frequent at all ringing stations, where about 340 indiv. were captured. The seasonal average number of captured Savi's Warblers was ranging from about 85 indiv. in Hurghada to only 5 indiv. in Ghazala, while 9 indiv. were captured yearly at Burullus, 23 indiv. at Wadi El Gemal and 58 indiv. at Wadi El Rayan station. The Savi's Warbler migrated at Wadi El Rayan from the beginning of March to mid-April showing one wave from 1 Mar. to 15 Apr., and this was similar to the other stations, but about two weeks shift in migration dates was observed in Burullus and Wadi El Gemal, where the Savi's Warbler started to migrate later, *i.e.* in the second week of March (16 Mar.) and finished at 15 Apr.

Reed Warbler (*Acrocephalus scirpaceus*). (App. I: SMap 6, SDyn. 16).

The Reed Warbler was the most numerous species captured at Egyptian ringing stations. It was regularly captured in high numbers at all stations and the total number was 4307 indiv. The seasonal average number of captured Reed Warblers was 124 indiv. (the lowest) in Wadi El Gemal, while the highest was recorded at both Hurghada and Wadi El Rayan stations, *i.e.* 719 and 683 indiv. resp., compared to that in Burullus (420 indiv.) and Ghazala (271 indiv.). At Burullus station, this species started migration at the beginning of March. The migration pattern showed one long wave with several peaks from 5 March to 15 May, when the Reed Warbler might finish migra-

tion. Similar pattern was observed at Hurghada and Ghazala ringing stations, where the species started and finished migration at similar time as at Burullus ringing station. In Wadi El Rayan, the Reed Warbler started migration at the beginning of March showing a relatively strong wave lasting for two weeks (1 to 15 Mar.) followed by the smaller waves from 16 Mar. to 10 Apr. and another relatively strong wave from 11 to 25 Apr. when the species might finish migration. In Wadi El Gemal, the Reed Warbler migrated late in the season compared to other stations. The passage comprised one small wave: from 25 Mar. to 15 Apr., the species might finish migration at the end of April.

Marsh Warbler (*Acrocephalus palustris*). The Marsh Warbler was rarely captured – only 2 indiv. were captured on 30 Mar. 2004 in Ghazala and on 26 Apr. 2008 in Hurghada.

Great Reed Warbler (*Acrocephalus arundinaceus*). (App. I: SMap 6, SDyn. 17).

The Great Reed Warbler was one of frequently captured species – at all stations there were nearly 340 indiv. The lowest average seasonal numbers of Great Reed Warblers were recorded at Wadi El Gemal and Ghazala stations (only 2 and 4 indiv., resp.), while the highest – in Burullus (120 indiv.). The average numbers of captured birds both at Hurghada (24 indiv.) and Wadi El Rayan (19 indiv.) were quite similar and much lower than that at Burullus ringing station. At Burullus station, the Great Reed Warbler started migration on 25 Mar. by one long wave with several small peaks, which lasted to 10 May. The number of captured birds increased regularly from 25 Mar. to its maximum at the end of April, then the number decreased to its minimum on 10 May, when the species might finish migration. The similar pattern was observed in Hurghada but the migration started about two weeks later (10 Apr.) and finished about 5 days later (15 May), while in Wadi El Rayan the Great Reed Warbler started migration earlier (25 Mar.), similarly to Burullus, and finished earlier (25 Apr.) compared to both Burullus and Hurghada stations.

Clamorous Reed Warbler (*Acrocephalus stentoreus*). (App. I: SMap 6, SDyn. 17).

The Clamorous Reed Warbler was one of the most frequently captured species at two ringing stations, while it was not captured at all in both Wadi El Gemal and Hurghada. More than 450 indiv. of the Clamorous Reed Warbler were captured at Burullus, Wadi El Rayan and Ghazala ringing stations. The highest average numbers of captured birds were recorded at both Burullus and Wadi El Rayan stations (106 and 108 indiv., resp.), while the lowest number was only 16 indiv. at Ghazala station. This species was captured in Burullus in variable numbers from 5 Mar. to *ca* 10 May, while in Wadi El Rayan it was captured in higher numbers in the first half of March and later the number gradually decreased till the end of April. In Ghazala the Clamorous Reed Warbler was captured from 16 Mar. to 15 May – about two weeks later than at both Burullus and Wadi El Rayan stations.

Icterine Warbler (*Hippolais icterina*). The species was captured only at two ringing stations. At Hurghada station 2 indiv. were captured on 27 Apr. 2007 and 21 Apr. 2008 and one individual was captured in Wadi El Gemal in 2005.

Eastern Olivaceous Warbler (*Hippolais pallida*). (App. I: SMap 7, SDyn. 1).

The Olivaceous Warbler was fairly numerous at Ghazala station compared to the other stations. The species was not captured in Burullus and only 3 indiv. were cap-

tured at Hurghada ringing station. Total of 186 indiv. were captured. The highest average number of captured Olivaceous Warblers was recorded in Ghazala (77 indiv.); the lowest was only 2 indiv. in Hurghada, while in both Wadi El Rayan and Wadi El Gemal the seasonal average number was the same (10 indiv.). The Olivaceous Warbler migrated in small numbers from 16 Mar. to 15 Apr. in Wadi El Rayan, while in Wadi El Gemal the species migrated from 5 to 30 Apr. In Ghazala, the Olivaceous Warbler migrated in larger numbers compared to other stations and showed one long wave of the passage with a relatively strong peak from 16 Mar. to 5 Apr., then the number of birds decreased with some fluctuations till the end of April, when another wave with three small peaks started until the middle of May (30 Apr. to 15 May).

Willow Warbler (*Phylloscopus trochilus*). (App. I: SMap 7, SDyn. 18).

This species was captured at four stations. Total of 135 indiv. were captured. The Willow Warbler was fairly numerous in Hurghada, while few individuals were captured at Burullus ringing station. The highest seasonal average number of captured Willow Warblers was recorded in Hurghada (48 indiv.), while the lowest was only 2 indiv. in Burullus. The average number of captured birds was also low in both Wadi El Rayan (7 indiv.) and Wadi El Gemal (22 indiv.). The Willow Warbler showed a strong wave of the passage from 16 to 30 Apr. in Hurghada, while both at Wadi El Rayan and Wadi El Gemal stations the species migrated in relatively small numbers from 31 Mar. to the end of April.

Wood Warbler (*Phylloscopus sibilatrix*). (App. I: SDyn. 13).

In total 26 indiv. of the Wood Warbler were captured at four ringing stations. Most of the birds (20 indiv.) were captured at Wadi El Rayan ringing station in 2001-2002, and only a few at Burullus (1 indiv. on 30 Apr. 2007), Hurghada (4 indiv. on 11 Mar., 12, 13, and 2 May 2007) and Wadi El Gemal (1 indiv.) ringing stations.

Balkan Warbler (*Phylloscopus orientalis*). (App. I: SDyn. 18).

In total 31 indiv. of the Balkan Warbler were captured from 2001 to 2008. The species was rarely or not at all (in Burullus) captured at ringing stations. The Balkan Warbler was a little bit more frequent at Wadi El Rayan and Hurghada ringing stations, where 11 and 16 indiv. were captured in 2001-2002 and in 2007, resp. Only 3 indiv. of this species were captured in Ghazala in 2004 and 1 indiv. in Wadi El Gemal in 2005. At Hurghada ringing station the Balkan Warbler showed a clear peak of migration from 20 to 31 Mar., while in Wadi El Rayan only a few individuals were captured during the whole season and the catching data were not concentrated into one clear peak as in Hurghada.

Chiffchaff (*Phylloscopus collybita*). (App. I: SMap 7, SDyn. 10).

The Chiffchaff was one of the most frequently captured species in all ringing stations, except Ghazala, where only 4 indiv. were captured. Over 850 indiv. of the species were captured at four stations. The average seasonal number of captured Chiffchaffs was the lowest in Ghazala – only 2 indiv., in Wadi El Gemal it was 30 indiv. per season, in Wadi El Rayan – 96 indiv., in Hurghada – 148 indiv., while the highest seasonal average was recorded in Burullus (170 indiv.). The Chiffchaff showed clear and relatively strong peak of migration at the beginning of March at three ringing stations, *i.e.* Burullus, Hurghada and Wadi El Rayan and finished migration around 31 Mar. At

Wadi El Gemal the Chiffchaff migrated in relatively small numbers compared to other stations and started around two weeks later (15 Mar.) and finished migration also two weeks later (15 Apr.).

Spotted Flycatcher (*Muscicapa striata*). (App. I: SMap 7, SDyn. 13).

The species was captured in low numbers in different ringing stations during 2001 to 2008, except Burullus, where it was not captured at all. Altogether more than 70 indiv. of the species were captured. The seasonal average number of captured Spotted Flycatchers varied between 3 indiv. at Wadi El Rayan and 23 indiv. at Hurghada stations, while in Wadi El Gemal it was 11 indiv. in 2005 and in Ghazala the seasonal average number of captured Spotted Flycatchers was only 5 indiv. per season. The Spotted Flycatcher migrates late in the season: from 15 Apr. to 15 May at both Hurghada and Ghazala stations. In Wadi El Rayan the species was recorded only during 10 days from 20 to 30 Apr.

Pied Flycatcher (*Ficedula hypoleuca*). Only 10 indiv. of the species were captured at three stations during ringing activities from 2001 to 2008. Seven of them were captured in Wadi El Rayan in 2001-2002 and 2 indiv. were captured in Ghazala in 2004, while one bird was captured in Wadi El Gemal in 2005.

Collared Flycatcher (*Ficedula albicollis*). (App. I: SDyn. 1).

The Collared Flycatcher was rarely captured in all ringing stations – in total 31 indiv. were ringed. The highest number of birds was 25 and these were captured in Wadi El Rayan, while only 1 indiv. was captured in each – Ghazala, Wadi El Gemal, and Burullus ringing stations in 2004, 2005 and 2007 resp.; only 3 indiv. were captured in Hurghada in 2008.

Semi-collared Flycatcher (*Ficedula semitorquata*). Only 3 indiv. of the Semi-collared Flycatcher were captured at three ringing stations, these were as follows: single individuals were captured on 15 Apr. 2004 in Ghazala, 1 Apr. 2006 in Burullus and on 22 Apr. 2007 in Hurghada.

Red-backed Shrike (*Lanius collurio*). The Red-backed Shrike was very rare. Only 1 indiv. of the species was captured on 28 Apr. 2008 at Hurghada ringing station.

Isabelline Shrike (*Lanius isabellinus*). It was very rare species – only 1 indiv. was captured on 9 Mar. 2005 at Ghazala ringing station.

Woodchat Shrike (*Lanius senator*). (App. I: SMap 8, SDyn. 19).

The species was captured only at two stations during the ringing activities. Altogether 15 indiv. were captured: in Wadi El Rayan (4 indiv.) and Hurghada (11 indiv.). The Woodchat Shrike started migration at Hurghada ringing station in mid-March, while on 15 Apr. it might have finished migration.

Masked Shrike (*Lanius nubicus*). (App. I: SMap 8, SDyn. 19).

The Masked Shrike was fairly common at Ghazala ringing station compared to other stations. About 100 indiv. of the species were captured at three stations; most of them at Ghazala ringing station (81 indiv.) and at Hurghada (11 indiv.), while the lowest number of individuals was recorded in Wadi El Gemal (only 6). The Masked Shrike was not captured in Wadi El Rayan and Burullus ringing stations. Migration of the Masked Shrike showed one small wave, which started on 20 Apr. and finished on 15 May

at Hurghada ringing station, while in Ghazala the species started to migrate from the beginning of March and finished migration on around 10 May, showing two small peaks from 31 Mar. to 15 Apr. and from 30 Apr. to 10 May.

Nile Valley Sunbird (*Anthreptes metallicus*). (App. I: SDyn. 19).

The species was captured only at Ghazala ringing station in 2004-2005, where a total of 45 indiv. was ringed. The Nile Valley Sunbird was recorded in two waves: from mid-March to the beginning of April, while the second peak started from 25 Apr. to 8 May, when it was frequently captured in relatively high numbers at Ghazala station.

Golden Oriole (*Oriolus oriolus*). The species was very rare and captured only at two ringing stations. Only 3 indiv. of the Golden Oriole were recorded: on 26 Apr. 2007 at Hurghada ringing station (1 indiv.) and the other 2 indiv. in Wadi El Gemal in 2005.

House Sparrow (*Passer domesticus*). (App. I: SDyn. 2).

It was captured in relatively high numbers only at one station, while the species was not recorded at the other stations. Nearly 170 indiv. of the House Sparrow were captured at Burullus station in 2006 and 2007 (147 and 20 indiv., respectively). In Burullus the species was mainly captured in March, *i.e.* from the second week of March to the first week of April with one peak of captures from 23 Mar. to 5 Apr. These were birds roosting in the reedbed.

Spanish Sparrow (*Passer hispaniolensis*). (App. I: SMap 8, SDyn. 19).

The Spanish Sparrow was rarely captured at four ringing stations (at Ghazala station it was not captured at all). More than 40 indiv. of the species were captured. The highest number of the Spanish Sparrow was recorded in Wadi El Gemal (15 indiv. in 2005), while the lowest average was recorded in Wadi El Rayan (3 indiv.). In both Wadi El Gemal and Hurghada stations, the Spanish Sparrow migrated only in March (16 to about 31 Mar.).

Streaked Weaver (*Ploceus manyar*). (App. I: SDyn. 2).

It was captured only in Burullus, where a total of 31 indiv. were recorded. They were captured throughout the whole season but in variable numbers. From the first week of March the number of Streaked Weavers was very low until the end of April but then it suddenly increased to its maximum in the first week of May.

Ortolan Bunting (*Emberiza hortulana*). The Ortolan Bunting was very rare. Only one individual was captured on 20 Apr. 2001, at Wadi El Rayan ringing station.

Cretzschmar's Bunting (*Emberiza caesia*). Only one individual of the species was captured on 14 Mar. 2007 at Hurghada ringing station.

Non-passerines

Little Bittern (*Ixobrychus minutus*). (App. I: SMap 8, SDyn. 20).

The species was relatively frequent only at one station, while it was very rare at the other stations. A total of 46 indiv. was recorded and the seasonal average number of captured birds was ranging from 1 indiv. at both Wadi El Rayan and Hurghada stations, to its maximum (22 indiv.) at Burullus ringing station. In Burullus it was captured in relatively higher numbers in March compared to April. A relatively high

number of captured birds was recorded from 16 to 31 Mar., then this number decreased to its minimum at the end of April.

Cattle Egret (*Bubulcus ibis*). Only 3 indiv. of the species were captured on 20, 25 Apr. and 1 May 2007 in Hurghada.

Squacco Heron (*Ardeola ralloides*). (App. I: SDyn. 20).

The Squacco Heron was not frequently captured at all ringing stations; in total 26 indiv. of the species were captured at three ringing stations. Most individuals were captured in 2007-2008 at Hurghada ringing station (22 indiv.), while only 4 indiv. were captured at Burullus and Wadi El Gemal ringing stations. In Hurghada the species was captured mainly in April and the number of captured birds increased to its maximum on 15 and 30 Apr., then the number decreased at the beginning of May but a few individuals were captured in the second week of May.

Marsh Harrier (*Circus aeruginosus*). The species was captured only at two stations. Two individuals of the Marsh Harrier were captured on 23 and 25 Apr. 2007 in Hurghada, while another individual was captured in Wadi El Gemal in 2005.

Pallid Harrier (*Circus macrourus*). It was captured only at one station – on 25 Apr. 2008 in Hurghada.

Long-legged Buzzard (*Buteo rufinus*). It was captured only at one station – on 15 Mar. 2008 in Hurghada.

Common Buzzard (*Buteo buteo*). It was captured only at one station – on 12 and 20 Apr. 2008 in Hurghada.

Sparrowhawk (*Accipiter nisus*). (App. I: SMap 9, SDyn. 20).

Almost 80 indiv. of the species were captured in Hurghada, Burullus and Wadi El Gemal. The seasonal average number of captured Sparrowhawks was ranging from 1 indiv. at both Burullus and Wadi El Gemal stations to 40 indiv. in Hurghada. In Hurghada the Sparrowhawk showed a clear wave of migration, which started from 31 Mar. to 30 Apr. (end of migration), while the highest peak of migration was in mid-April.

Kestrel (*Falco tinnunculus*). (App. I: SDyn. 20).

The Kestrel was rarely captured. 24 indiv. were captured only at two stations: Hurghada and Burullus (23 and 1 indiv., resp.). The Kestrel was captured in small numbers at Hurghada ringing station with high fluctuations from 10 Mar. to 15 Apr. in 2007-2008.

Lanner Falcon (*Falco biarmicus*). It was captured only at one station – on 3 Apr. 2008 in Hurghada.

Quail (*Coturnix coturnix*). (App. I: SMap 9, SDyn. 21).

The Quail was captured at four ringing stations, with almost 95 indiv. recorded. In Burullus the species was not captured. The highest average number of captured Quails was recorded in Hurghada (37 indiv. per season), while the lowest was recorded in Ghazala (1 indiv.). The seasonal average number of captured birds was relatively low at both Wadi El Gemal and Wadi El Rayan stations (4 and 8 indiv., resp.). In Wadi El Rayan, the Quail showed relatively intensive migration for about 2 weeks from the beginning of March (1 to 16 Mar.), followed by a decrease in the

number of captured birds to its minimum at the end of April. In Hurghada, the Quail started migration 2 weeks later than in Wadi El Rayan, showing maximum on 16 Mar., then the number of birds decreased gradually to its minimum on 10 May.

Spotted Crake (*Porzana porzana*). (App. I: SDyn. 22).

The species was captured only at two stations. 10 indiv. were captured in Hurghada in 2007 and only 1 indiv. on 23 Mar. in Wadi El Rayan in 2001. The Spotted Crake was captured in Hurghada from 15 to 25 Mar. and from 15 Apr. to 8 May; the species was captured in small numbers during the whole period.

Moorhen (*Gallinula chloropus*). It was captured only at two stations: 2 indiv. were captured in Hurghada (on 16 and 27 Mar. 2007) and 2 indiv. at Burullus station (on 23 and 31 Mar. 2007).

Purple Swamphen (*Porphyrio porphyrio*). The species was captured only at one station. Two individuals of the Purple Swamphen were captured on 17 and 31 Mar. 2007 at Burullus station.

Collared Pratincole (*Glareola pratincola*). The Collared Pratincole was very rarely captured – 5 indiv. in Hurghada in 2007-2008 and 2 in Burullus in 2006.

Little Ringed Plover (*Charadrius dubius*). (App. I: SDyn. 22).

Total of 16 indiv. of the Little Ringed Plover were captured only in Hurghada in 2007 and 1 in Wadi El Gemal. The Little Ringed Plover showed one main peak of migration from 15 to 25 Mar. in 2007 at Hurghada ringing station.

Spur-winged Lapwing (*Hoplopterus spinosus*). Only 3 indiv. of the Spur-winged Lapwing were captured on 12 and 14 Mar. and 11 Apr. 2007 at Hurghada station.

Little Stint (*Calidris minuta*). (App. I: SMap 9, SDyn. 20).

About 40 indiv. of the Little Stint was captured only at two stations: in Hurghada and Wadi El Gemal. The migration of the Little Stint in Hurghada started on 14 Mar. and lasted to 10 May (end of migration), the highest peak of migration was recorded on the third week of March.

Temminck's Stint (*Calidris temminckii*). Two individuals were captured at one station: Hurghada – on 29 Apr. and 12 May 2007.

Ruff (*Philomachus pugnax*). Three individuals were captured on 22 Mar., 12 Apr. and 2 May 2007 in Hurghada.

Wood Sandpiper (*Tringa glareola*). (App. I: SDyn. 20).

Altogether 26 indiv. of the Wood Sandpiper were captured in Hurghada in 2007. The species was captured in low numbers throughout the whole season. The migration of the species was fluctuating from the beginning of the season to the first week of May (8 May).

Green Sandpiper (*Tringa ochropus*). Only 8 indiv. of the species were captured at Hurghada ringing station.

Common Sandpiper (*Acititis hypoleucos*). It was very rarely recorded at most stations, except Wadi El Rayan. In total, 10 indiv. were captured, *i.e.* 3 indiv. in Ghazala in 2004, one individual in Burullus in 2006, 4 indiv. in Hurghada in 2007-2008 and 2 indiv. in Wadi El Gemal in 2005.

Redshank (*Tringa totanus*). The Redshank was very rarely captured. Five individuals were captured in Hurghada in 2007-2008 and one individual – in Burullus in 2007.

Greenshank (*Tringa nebularia*). Only one individual of the Greenshank was captured on 1 Apr. 2007 at Hurghada ringing station.

Marsh Sandpiper (*Tringa stagnatilis*). The Marsh Sandpiper was captured only at one station. 3 indiv. were captured on 12 (2 indiv.) and 22 Apr. (1 indiv.) 2007 at Hurghada ringing station.

Jack Snipe (*Lymnocyrtus minimus*). Only one individual of the Jack Snipe was captured on 27 Mar. 2007 at Hurghada ringing station.

Snipe (*Gallinago gallinago*). The species was captured only at two stations – 4 indiv. in Hurghada 2007 and 2 indiv. on 26 Mar. 2006 and 25 Mar. 2007 at Burullus ringing station.

Little Gull (*Larus minutus*). Only two individuals of the species were captured on 4 May 2007 in Hurghada.

Whiskered Tern (*Chlidonias hybridus*). Only one individual was captured on 12 Apr. 2007 at Hurghada ringing station.

Collared Dove (*Streptopelia decaocto*). Five individuals of the species were captured at Hurghada ringing station in 2007-2008.

Turtle Dove (*Streptopelia turtur*). (App. I: SMap 9, SDyn. 21).

The species was captured only at three stations in very low numbers. In total, less than 30 indiv. of the species were captured. The highest seasonal average number of captured Turtle Doves was 10 indiv. in Hurghada. The species started migration in Hurghada from 15 Apr., while at the beginning of May (7 May) it might have finished migration.

Laughing Dove (*Streptopelia senegalensis*). (App. I: SDyn. 21).

Only 17 indiv. of the Laughing Dove were captured at four stations. It was not captured in Wadi El Gemal. The highest number was 11 indiv. at Ghazala station, while at the other three stations number of captured individuals ranged from 1 indiv. in Wadi El Rayan to 3 indiv. and Burullus. At Ghazala station in 2004-2005 the catching dynamics showed variable number of Laughing Doves during the whole season from 1 Mar. until 15 May.

Namaqua Dove (*Oena capensis*). Four individuals of this species were captured at Hurghada ringing station in 2007-2008.

Great Spotted Cuckoo (*Clamator glandarius*). One individual was captured only at one station – in Hurghada in 2008.

Senegal Coucal (*Centropus senegalensis*). One individual was captured only at one station – on 4 Apr. 2006 in Burullus.

Little Owl (*Athene noctua*). Only one individual was captured on 12 Apr. 2006 at Burullus ringing station.

Scops Owl (*Otus scops*). Eight individuals of this species were captured at four stations – 2 indiv. in Wadi El Rayan in 2001-2002, 3 indiv. in Ghazala in 2004-2005, one owl in Burullus in 2007 and 2 indiv. at Wadi El Gemal ringing station in 2005.

Nightjar (*Caprimulgus europaeus*). Only two individuals of the Nightjar were captured on 22 and 28 Apr. 2007 at Hurghada ringing station.

Egyptian Nightjar (*Caprimulgus aegyptius*). Only one individual of the Egyptian Nightjar was captured on 16 Mar. 2008 in Hurghada.

Hoopoe (*Upupa epops*). (App. I: SMap 10, SDyn. 22).

The species was captured in small numbers at all stations. About 55 indiv. of the Hoopoe were captured. The highest seasonal average number of captured Hoopoes was 25 indiv. at Wadi El Gemal ringing station, while the lowest was similar in both Wadi El Rayan and Burullus (2 and 1 indiv., resp.). The species migrated from 10 to 31 Mar. in small numbers showing small waves in Hurghada, while in Wadi El Gemal it migrated in higher numbers from 16 Mar. to 10 May, showing relatively high peak of migration.

Common Kingfisher (*Alcedo atthis*). (App. I: SMap 10, SDyn. 23).

This species was captured at four stations, of which only in Burullus it was numerous: (altogether 50 indiv.). The highest seasonal average number of captured Kingfishers was 25 indiv. in Burullus, while the average was very low at Ghazala and Wadi El Rayan stations. The Common Kingfisher migrated in relatively high numbers in Burullus at the beginning of March showing obvious peak of migration from 5 to 12 Mar., then migration decreased and probably finished at the end of April.

White-throated Kingfisher (*Halcyon smyrnensis*). (App. I: SDyn. 21).

The species was captured only at Burullus station (18 indiv.) in 2006-2007. The species was captured only in March with one small wave from 5 to 31 Mar.

Pied Kingfisher (*Ceryle rudis*). (App. I: SMap 10, SDyn. 21).

The species was captured at two stations. About 45 indiv. of the Pied Kingfisher were captured at both Burullus and Wadi El Rayan ringing stations. The highest seasonal average number of captured Pied Kingfishers was 21 indiv. in Burullus, while in Wadi El Rayan it was one individual. In Burullus, the species was captured from 7 Mar. to 30 Apr. The highest number of captured birds was recorded in the first week of March, then it decreased to its minimum at the end of April.

European Bee-eater (*Merops apiaster*). (App. I: SDyn. 23).

The European Bee-eater was captured at four stations. Altogether 34 indiv. of the species were captured. The highest seasonal average number of the species was 12 indiv. recorded in Hurghada. In Hurghada, the species migrated late in the season (15 Apr. – 15 May).

Blue-Cheeked Bee-eater (*Merops persicus*). The species was captured only at two stations in very low numbers – in total 10 individuals were captured, *i.e.* on 6 (1 indiv.), 3 (2 indiv.) May 2006 and on 14 (4 indiv.), 18 and 23 (2 indiv.) Apr. 2007 in Burullus, while one individual was captured on 23 Mar. 2007 in Hurghada.

Little Green Bee-eater (*Merops orientalis*). Altogether 7 indiv. of the species were captured in Ghazala in 2004-2005.

Wryneck (*Jynx torquilla*). (App. I: SMap 10, SDyn. 23).

The species was frequently captured in low numbers at all stations. About 100 indiv.

of the Wryneck were captured. The highest seasonal average number of captured birds was 21 indiv. in Hurghada as well as in Wadi El Rayan while the lowest average was recorded at Burullus and Ghazala stations (2-3 indiv., resp.). This species started to migrate from 16 Mar. onwards, migration lasted to the end of April.

Autumn migration dynamics

During autumn migration from 2001 to 2007 birds were captured and ringed at six sites in Egypt, *i.e.* Burullus (2005-2007), Wadi El Rayan (2001-2002), Ghazala (2003-2005), Hurghada (2007), Sharm El Shiekh (2003) and Wadi El Gemal (2005) ringing stations (Table 3). The average number of captured birds varied between the ringing stations (Fig. 5). The highest seasonal average was about 2500 indiv. at Burullus ringing station, while the lowest was nearly 180 indiv. at Sharm El Shiekh ringing station. In Ghazala, Wadi El Rayan and Wadi El Gemal the seasonal average numbers of captured birds were relatively low (*ca* 520 indiv., 400 and 250 indiv., resp.), while in Hurghada the seasonal average was higher – about 870 indiv.

Table 3
Numbers of birds caught during autumn seasons 2001-2008 at different sites in Egypt

	Burullus			Wadi El Rayan		Ghazala			Hurghada	Sharm El Shiekh	Wadi El Gemal	Total
	2005	2006	2007	2001	2002	2003	2004	2005	2007	2003	2005	
Passerines												
<i>Galerida cristata</i>			3									3
<i>Calandrella brachydactyla</i>						1					1	2
<i>Riparia riparia</i>	160	54	73	3	15	3			6		5	319
<i>Hirundo rustica</i>	344	365	167	5	8	69	51	23	73	7	10	1122
<i>Anthus trivialis</i>									2		3	5
<i>Anthus cervinus</i>					1				11		1	13
<i>Motacilla alba</i>	4	11	4	2					7			28
<i>Motacilla flava</i>	65	47	22		2				14		4	154
<i>Motacilla citreola</i>	1											1
<i>Pycnonotus barbatus</i>						24	1	2				27
<i>Erithacus rubecula</i>	1	1	3									5
<i>Luscinia megarhynchos</i>	2		1	2	1	1	3		2	1		13
<i>Luscinia luscinia</i>	1	14	6	5	1	13	13	5	15	20	27	120
<i>Luscinia svecica</i>	76	92	39		5	22	1		20	4		259
<i>Cercotrichas galactotes</i>				1		1						2
<i>Phoenicurus phoenicurus</i>	2	2	2		1	19	3		76		27	132

Table 3 continued...	Burullus			Wadi El Rayan		Ghazala			Hurg- hada	Sharm El Shiekh	Wadi El Gemal	Total
	2005	2006	2007	2001	2002	2003	2004	2005	2007	2003	2005	
<i>Phoenicurus ochruros</i>									1	1	1	3
<i>Oenanthe oenanthe</i>	2	2			1	1					1	7
<i>Oenanthe isabellina</i>					1				2			3
<i>Oenanthe hispanica</i>		1	1		1						1	4
<i>Oenanthe cypriaca</i>				1								1
<i>Saxicola rubetra</i>	18	14	20	1	1			2	11	1	6	74
<i>Saxicola rubicola</i>	4	1			1							6
<i>Turdus philomelos</i>	4	1	1									6
<i>Sylvia borin</i>	1	7	4	2	1		2	1	5	4	1	28
<i>Sylvia atricapilla</i>	2	2		1	1	1	1		35	2	1	46
<i>Sylvia curruca</i>	8	6	9	7	23	152	95	97	80	3	14	494
<i>Sylvia melanocephala</i>				2	2	5	1	2	6		8	26
<i>Sylvia communis</i>	2	9	13	9	4	1	1	2	2	4	2	49
<i>Sylvia hortensis</i>			1			1		1		3	4	10
<i>Sylvia rueppelli</i>				2								2
<i>Prinia gracilis</i>	9	6	7	2								24
<i>Acrocephalus schoenobaenus</i>	442	591	386	29	54	6	5	7	21	2	8	1551
<i>Locustella fluviatilis</i>			2							1	1	4
<i>Locustella luscinioides</i>	13	9	5	1	5	2	2	2	6			45
<i>Acrocephalus scirpaceus</i>	121	197	111	204	229	91	76	50	312	1	7	1399
<i>Acrocephalus palustris</i>	2		3		1	1			5	2		14
<i>Acrocephalus arundinaceus</i>	14	12	12		1	1	2		1		1	44
<i>Acrocephalus stentoreus</i>	206	179	110	38	38	24	18	10				623
<i>Hippolais icterina</i>			4		2							6
<i>Hippolais olivetorum</i>										1		1
<i>Hippolais pallida</i>				1	4	26	26	10		4	1	72
<i>Phylloscopus trochilus</i>	499	357	234	25	37	4	9	10	74	2	25	1276

Table 3 continued...	Burullus			Wadi El Rayan		Ghazala			Hurg- hada	Sharm El Shiekh	Wadi El Gemal	Total
	2005	2006	2007	2001	2002	2003	2004	2005	2007	2003	2005	
<i>Phylloscopus sibilatrix</i>	2	2	4		2				1			11
<i>Phylloscopus orientalis</i>					1						1	2
<i>Phylloscopus collybita</i>	93	74	26	47	51				1			292
<i>Muscicapa striata</i>	11	10	10	1	1	12	4	3	27	10	16	105
<i>Ficedula albicollis</i>		2	3				1		1	1	2	10
<i>Ficedula hypoleuca</i>									1			1
<i>Ficedula parva</i>	1	1				1					3	6
<i>Lanius collurio</i>	29	52	28	15	6	42	24	12	13	57	6	284
<i>Lanius senator</i>	2					5						7
<i>Lanius nubicus</i>						3	121		9	12	6	151
<i>Lanius minor</i>						1				1	2	4
<i>Lanius excubitor</i>						91	1	59		1		152
<i>Anthreptes metallicus</i>						11	4					15
<i>Oriolus oriolus</i>	1								1	10	4	16
<i>Garrulus glandarius</i>		1										1
<i>Passer hispaniolensis</i>	11			4	3							18
<i>Passer domesticus</i>	83	125	32			59				15		314
<i>Carpodacus synoicus</i>								1				1
<i>Ploceus manyar</i>	34	35	12									81
<i>Emberiza hortulana</i>	1	1			1						1	4
<i>Emberiza schoeniclus</i>				1								1
<i>Amandava amandava</i>							6	1				7
Non-passerines												
<i>Ixobrychus minutus</i>	101	44	33									178
<i>Butorides striata</i>											1	1
<i>Ardeola ralloides</i>	2											2
<i>Anas crecca</i>											2	2
<i>Accipiter brevipes</i>										1		1

Table 3 continued...	Burullus			Wadi El Rayan		Ghazala			Hurg- hada	Sharm El Shiekh	Wadi El Gemal	Total
	2005	2006	2007	2001	2002	2003	2004	2005	2007	2003	2005	
<i>Falco tinnunculus</i>	1	6										7
<i>Falco concolor</i>											1	1
<i>Coturnix coturnix</i>	1											1
<i>Crex crex</i>										1		1
<i>Porzana porzana</i>	3											3
<i>Porzana parva</i>		1										1
<i>Gallinula chloropus</i>	1	1							1			3
<i>Charadrius dubius</i>									6		1	7
<i>Charadrius hiaticula</i>											1	1
<i>Burhinus oedicephalus</i>							3					3
<i>Hoplopterus spinosus</i>	2						2		2			6
<i>Calidris alpina</i>									1		1	2
<i>Calidris minuta</i>									8		16	24
<i>Philomachus pugnax</i>									1			1
<i>Tringa ochropus</i>						1	9					10
<i>Actitis hypoleucos</i>	1						1				1	3
<i>Tringa stagnatilis</i>							1					1
<i>Streptopelia turtur</i>		1	1				2			2		6
<i>Streptopelia senegalensis</i>	1					6	4			2		13
<i>Oena capensis</i>										1		1
<i>Cuculus canorus</i>									1		1	2
<i>Centropus senegalensis</i>	5	1										6
<i>Athene noctua</i>	1	1										2
<i>Otus scops</i>						1			1			2
<i>Caprimulgus europaeus</i>						4	3					7
<i>Upupa epops</i>		1				5	2	1	1	3	2	15
<i>Alcedo atthis</i>	552	382	214	43		9	11	6			22	1239
<i>Halcyon smyrnensis</i>	7	5	6									18
<i>Ceryle rudis</i>	22	10	15									47
<i>Merops apiaster</i>	1	2				12	1		5	3	2	26
<i>Merops persicus</i>	23	21	15									59
<i>Merops orientalis</i>						1	11	7				19
<i>Jynx troquilla</i>	2	4	3			2						11

Table 3 continued...	Burullus			Wadi El Rayan		Ghazala			Hurghada	Sharm El Shiekh	Wadi El Gemal	Total
	2005	2006	2007	2001	2002	2003	2004	2005	2007	2003	2005	
Seasonal total	2997	2763	1645	454	506	735	521	314	868	183	252	11238
Seasonal species number	54	48	41	27	28	32	45	23	42	35	45	
Total species number	63			41		51			42	35	45	103

Seasonal bird migration dynamics at different Egyptian ringing stations (Fig. 6) showed that autumn migration generally started at the beginning of September with relatively high peak of migration (from 1 to 30 Sep.) in Burullus, Wadi El Rayan, Ghazala, Wadi El Gemal and Sharm El Shiekh. However, in Hurghada there was one migration peak much later – from 25 Sep. to about 20 Oct. At the end of October birds generally finished migration and the number of migrants decreased gradually from 1 Oct. to its minimum in the last week of October, as in Burullus, Ghazala and Wadi El Gemal, while in Wadi El Rayan and Hurghada there were low peaks noted in the migration pattern in the last week of October. In Sharm El Shiekh there was no ringing activity from 30 Sep. to 29 Oct.

In Burullus and Ghazala stations, the yearly seasonal dynamics generally showed similar timing of the passage as in average total dynamics. High peak of migration was observed at the beginning (from 1 to 25 Sep.) in Burullus (2005-2007) and Ghazala (2003), followed by low migration from 29 Sep. to 1 Oct., while in Ghazala (2004-2005) the migration might have finished earlier – on 14 Oct. (Fig. 7).

Passerines

Crested Lark (*Galerida cristata*). Only 3 indiv. were captured in Burullus in 2007.

Greater Short-toed Lark (*Calandrella brachydactyla*). It was captured only at two stations – 2 indiv. were captured on 11 Sep. 2005 in Wadi El Gemal and on 11 Sep. 2003 in Ghazala.

Sand Martin (*Riparia riparia*). (App. II: AMap 1, ATDyn. 1).

The species was captured at most ringing stations from 2001 to 2007, except Sharm El Shiekh, where it was not recorded. In total about 320 indiv. were captured. The species was numerous at Burullus station, where the highest seasonal average number of captured Sand Martins was recorded (96 indiv.), while the lowest was only 1 indiv. in Ghazala (2003-2005). At Hurghada and Wadi El Gemal ringing stations just a few individuals were captured (6 and 5 indiv., resp.), and in Wadi El Rayan the seasonal average number was 9 indiv. The species migrated in Burullus from the end of August till the end of October, showing a peak from 30 Aug. to 14 Sep. followed by two smaller waves (from 15 to 28 Sep. and from 29 Sep. to 25 Oct.). In Wadi El Rayan, the Sand Martin started to migrate after the first week of September and continued to 27 Sep. showing one migration wave. The species finished migration at the end of September.

Barn Swallow (*Hirundo rustica*). (App. II: AMap 2, ATDyn. 2, AYDyn. 1).

The number of Barn Swallows captured at six ringing stations varied. In total over 1100 indiv. were captured. The Barn Swallow was relatively numerous at both Burullus and Hurghada ringing stations compared to the other stations. The species started migration in mid-August at both Burullus and Ghazala stations, with relatively high peak at the beginning, then the number of birds decreased gradually till the end of October, when these birds finished migration. However, at both Hurghada and Wadi El Gemal ringing stations the observed pattern was different. The Barn Swallow, started to migrate later in the season (on 15 and 29 Sep. in Wadi El Gemal and Hurghada) and the number of migrants increased to its maximum nearly at the end of October, when the species migration might have finished at Burullus and Ghazala stations.

Tree Pipit (*Anthus trivialis*). Only 5 indiv. of the Tree Pipit were captured during ringing activities in 2001-2007. Two individuals were captured on 3 and 13 Oct. in Hurghada in 2007 and 3 indiv. were captured on 16 Sep., 2 and 20 Oct. in Wadi El Gemal in 2005.

Red-throated Pipit (*Anthus cervinus*). (App. II: ATDyn. 1).

The species was captured only at three stations; in total 13 indiv. were ringed – in Hurghada in 2007 (11 indiv.), Wadi El Rayan in 2002 (1 indiv.) and Wadi El Gemal in 2005 (1 indiv.). The Red-throated Pipit started to migrate late in the season (in October) showing one obvious peak on *ca* 14 Oct. 2007 in Hurghada.

White Wagtail (*Motacilla alba*). (App. II: AMap 3, ATDyn. 3).

The species was captured in relatively low numbers at three ringing stations. Total of 28 indiv. were captured from 2001-2007, mostly in Burullus (19 indiv.), while in Hurghada and Wadi El Rayan it was 7 and 2 indiv., resp. This species migrated late in the season in Hurghada from 12 to 29 Oct., where it might have finished migration.

Yellow Wagtail (*Motacilla flava*). (App. II: AMap 4, ATDyn. 2, AYDyn. 2). More than 150 indiv. of the Yellow Wagtail were captured at four ringing stations during 2001-2007. The highest seasonal average number of captured Yellow Wagtails was 45 indiv. in Burullus, while the lowest was at Wadi El Rayan and Wadi El Gemal stations (1 and 4 indiv., resp.). The Yellow Wagtail migrated in one wave starting from 30 Aug. to 25 Sep. in Burullus (several peaks), while in Hurghada it migrated later with two obvious peaks (25 Sep. – 7 Oct. and 12-15 Oct.) It might have also finished migration two weeks later than in Burullus. The yearly migration dynamics of the Yellow Wagtail in Burullus showed the same pattern as the total average, although in 2006 the species finished migration one week earlier than in 2005 and 2007.

Citrine Wagtail (*Motacilla citreola*). Only 1 indiv. was captured in Burullus in 2006.

Common Bulbul (*Pycnonotus barbatus*). (App. II: ATDyn. 6).

In total 27 indiv. were captured in Ghazala in 2003-2005. The higher number of captured birds was recorded from 28 Aug. to 12 Sep. and from 22 Sep. to 10 Oct.

Robin (*Erithacus rubecula*). The species was captured only at one station: Burullus – in 2005 (1 indiv.), 2006 (1 indiv.), and 2007 (3 indiv.).

Nightingale (*Luscinia megarhynchos*). (App. II: AMap 5).

Only 13 indiv. were captured at five stations; the species was not captured in Wadi El Gemal.

Thrush Nightingale (*Luscinia luscinia*). (App. II: AMap 6, ATDyn. 4).

Total of 120 indiv. were captured at all stations. The highest seasonal average number of captured Thrush Nightingales was 27 indiv. in Wadi El Gemal, while the lowest was only 3 indiv. in Wadi El Rayan. The seasonal average number of captured birds in Burullus and Ghazala was similar (7 and 10 indiv., resp.) and lower than at Sharm El Shiekh and Hurghada stations (20 and 15 indiv., resp.). At most of the stations the Thrush Nightingale started migration in the last week of August / beginning of September, while in Hurghada – at the end of September. The migration finished in mid-October in Burullus, Ghazala, Hurghada and Wadi El Gemal. However, in Sharm El Shiekh the last individual was captured in mid-September – about one month earlier than at the other stations.

Bluethroat (*Luscinia svecica*). (App. II: AMap 6, ATDyn. 5, AYDyn. 3).

The species was regularly captured at most ringing stations, except Wadi El Gemal. A total of 259 indiv. were captured. The average number of captured Bluethroats was ranging from 3 to 84 indiv. per season at Wadi El Rayan and Burullus stations, respectively. In Hurghada the number was relatively high (20 indiv.) as compared to Ghazala and Sharm El Shiekh, where 8 and 4 indiv. were captured per season. The Bluethroat started migration in Burullus earlier than at the other stations. The number of birds gradually increased from 29 Sep. till the last week of October, while at Ghazala and Hurghada stations the migration was more intense in two short periods, *i.e.* 18-27, and 5-15 Oct., resp.

Rufous-tailed Scrub Robin (*Cercotrichas galactotes*). Only 2 indiv. were captured – in Wadi El Rayan in 2001 and Ghazala in 2003.

Redstart (*Phoenicurus phoenicurus*). (App. II: AMap 1, ATDyn. 3).

About 130 indiv. were captured at five stations, while the species was not captured in Sharm El Shiekh. The seasonal average number of captured Redstarts was ranging from 1 indiv. in Wadi El Rayan to 76 indiv. in Hurghada, while in Wadi El Gemal it was 27, and at Burullus and Ghazala stations: 2 and 7 indiv., resp. The Redstart started migration at the end of September and finished at the end of October in Hurghada, Wadi El Gemal and Ghazala.

Black Redstart (*Phoenicurus ochruros*). Only 3 indiv. were captured – in Sharm El Shiekh in 2003, Wadi El Gemal in 2005 and Hurghada in 2007.

Northern Wheatear (*Oenanthe oenanthe*). The species was captured at most stations but in very low numbers – only 7 indiv. altogether. Four Wheatears were captured in Burullus in 2005-2007, while only 1 indiv. was captured at each of the following stations: Wadi El Rayan, Wadi El Gemal and Ghazala. The species was not captured at Sharm El Shiekh and Hurghada stations.

Isabelline Wheatear (*Oenanthe isabellina*). The species was very rare, only 3 indiv. were captured – in Hurghada in 2007 (2 indiv.) and Wadi El Rayan in 2002 (1 indiv.).

Black-eared Wheatear (*Oenanthe hispanica*). Only 4 indiv. were captured at three stations. Two individuals were captured in Burullus in 2006-2007, 1 indiv. in Wadi El Rayan in 2002 and in Wadi El Gemal in 2005, while the species was not captured at Hurghada, Sharm El Shiekh and Ghazala ringing stations.

Cyprus Wheatear (*Oenanthe cypriaca*). Only one individual was captured at Wadi El Rayan station in 2001.

Whinchat (*Saxicola rubetra*). (App. II: AMap 4, ATDyn. 6).

The Whinchat was captured at all stations during the period from 2001 to 2007. Total number of about 75 indiv. were captured. The highest seasonal average numbers of captured Whinchats were 17 indiv. in Burullus and 11 in Hurghada. The lowest average was recorded at Wadi El Rayan, Ghazala and Sharm El Shiekh stations (1 indiv.), while in Wadi El Gemal the seasonal average number of captured Whinchats was 6 indiv. In Burullus, the Whinchat started migration at the beginning of September, then the number of captured birds decreased till 20 Oct., when it might have finished migration.

Stonechat (*Saxicola rubicola-maura*). For a very long time the species was treated as *Saxicola torquata*, but then it was split into two species: *Saxicola rubicola* and *S. maura*. Very few individuals were captured only at 2 ringing stations: 5 indiv. of the Stonechat (*Saxicola rubicola*) were captured in Burullus (4 indiv. in 2005 and 1 indiv. in 2006), while 1 indiv. of *Saxicola torquata* was captured in Wadi El Rayan in 2002.

Song Thrush (*Turdus philomelos*). The Song Thrush was captured only at one station – in Burullus 4 indiv. were captured in 2005 and 1 indiv. in both 2006 and 2007.

Garden Warbler (*Sylvia borin*). (App. II: AMap 7, ATDyn. 6).

The species was captured at all ringing stations in low numbers – about 30 indiv. of the Garden Warbler were captured during 2001-2007. The highest seasonal average number of captured birds was only 5 indiv. and it was recorded in Hurghada, while the average number at the other stations was also low and varied between 1 indiv. in Ghazala and Wadi El Gemal, 3 indiv. in Wadi El Rayan and 4 indiv. in both Burullus and Sharm El Shiekh. The Garden Warbler migrated at Burullus ringing station from 28 Aug., while it might have finished migration at the end of September.

Blackcap (*Sylvia atricapilla*). (App. II: AMap 4).

The Blackcap was captured at all ringing stations in relatively low numbers during 2004-2005, except Hurghada station, where it was fairly common. Total of 46 indiv. of the Blackcap were captured, and the highest seasonal average number of captured birds was recorded in Hurghada (35 indiv.), while the lowest was 1 indiv. at Burullus, Wadi El Rayan, Ghazala and Wadi El Gemal ringing stations. Two individuals were captured in Sharm El Shiekh.

Lesser Whitethroat (*Sylvia curruca*). (App. II: AMap 8, ATDyn. 7).

The species was relatively common at all ringing stations, particularly in Hurghada and Ghazala. Altogether about 500 indiv. of the Lesser Whitethroat were captured in 2001-2008. At Hurghada and Ghazala, the seasonal average number of captured Lesser Whitethroats was relatively high – 80 and 115 indiv., resp. The lowest seasonal average number was recorded in Sharm El Shiekh (only 3 indiv.), while at the other

three stations the average numbers were a bit higher – 8, 14 and 15 indiv. in Burullus, Wadi El Gemal and Wadi El Rayan, resp. At Ghazala station the species migrated from the last week of August (30 Aug.), showing one relatively numerous wave with several peaks, to the end of October. In Hurghada the observed pattern was different: the species migrated late at the end of September in one relatively short wave with one high peak in the first week of October. At the other stations, the Lesser Whitethroat migrated from 30 Aug. to 5 Sep. and finished migration from 20 to 25 Oct.

Sardinian Warbler (*Sylvia melanocephala*). (App. II: AMap 7).

It was captured in a relatively low numbers at four ringing stations, while it was not recorded at Burullus and Sharm El Shiekh ringing stations. More than 25 indiv. of the species were ringed and the highest seasonal average numbers of captured birds were 8 indiv. in Wadi El Gemal and 6 indiv. in Hurghada. At Ghazala ringing station the seasonal average was only 3 indiv., while in Wadi El Rayan it was 2 indiv..

Whitethroat (*Sylvia communis*). (App. II: AMap 7, ATDyn. 6).

It was commonly captured at all stations but in low numbers. About 50 indiv. of the Whitethroat were captured from 2001 to 2008. Most of them were captured in Burullus in 2005-2007, where the average seasonal number of captured Whitethroats was the highest (8 indiv.). In Wadi El Rayan it was 7 indiv. and in Sharm El Shiekh 4 indiv., while in both Hurghada and Wadi El Gemal it was only 2 indiv. The lowest seasonal average number of captured warblers was at Ghazala station (1 indiv.). The Whitethroat generally migrated only in September in both Burullus and Wadi El Rayan. The migration pattern showed small and relatively short wave at the beginning of September (1 and 3 Sep. resp.), then the number of captured birds decreased to the end of September, when the species might have finished migration.

Orphean Warbler (*Sylvia hortensis*). (App. II: AMap 8).

Only 10 indiv. were captured at four stations during 2001-2007. The highest seasonal average number of captured Orphean Warblers was 4 indiv. in Wadi El Gemal in 2005 and 3 indiv. in Sharm El Shiekh in 2003, while the lowest was at Ghazala and Burullus stations. The Orphean Warbler was not captured at Hurghada and Wadi El Rayan ringing stations.

Rüppell's Warbler (*Sylvia rueppelli*). Only 2 indiv. of the Rüppell's Warbler were captured in Wadi El Rayan in 2001.

Graceful Prinia (*Prinia gracilis*). (App. II: ATDyn. 6).

The species was captured only at two stations. A total of 24 indiv. of the Graceful Prinia were captured in both Burullus (22 indiv.) and Wadi El Rayan (2 indiv.), while the species was not captured at the other three stations. The Graceful Prinia was captured from 28 Aug. to 29 Sep. and a few individuals were captured at the end of October at Burullus station.

Sedge Warbler (*Acrocephalus schoenobaenus*). (App. II: AMap 2, ATDyn. 8, AYDyn. 1). The Sedge Warbler was one of the most numerous species captured at Egyptian ringing stations from 2001 to 2007, except Sharm El Shiekh, Ghazala and Wadi El Gemal. A total of about 1550 indiv. were captured. The average seasonal number of captured Sedge Warblers varied from only 2, 6 and 8 indiv. at Sharm El Shiekh, Ghazala and Wadi El Gemal stations, resp., to the highest seasonal average recorded in Burul-

lus (473 indiv.). In Hurghada the average was 21 indiv. and in Wadi El Rayan – 42 indiv. per season. At Burullus ringing station the species migration started at the end of August. The migration pattern showed one long wave from 30 Aug. to 29 Sep., then the number of birds decreased to the end of October; the Sedge Warbler might have finished migration in that time. Similar pattern of migration was observed in Wadi El Rayan but with only one longer wave from 30 Aug. to 14 Sep. followed by several smaller peaks from 27 Sep. to 18 Oct. Moreover, the similar migration dynamics occurred in Ghazala and Wadi El Gemal. In Hurghada the migration continued for about one month with one obvious peak from 25 Sep. to 20 Oct.

River Warbler (*Locustella fluviatilis*). Four individuals were caught at three stations – 2 indiv. in Burullus on 2007 and 2 indiv. at Sharm El Shiekh (2003) and Wadi El Gemal stations (2005).

Savi's Warbler (*Locustella luscinioides*). (App. II: AMap 7, ATDyn. 3).

The species was captured in low numbers only at four stations, while it was not captured at Sharm El Shiekh and Wadi El Gemal stations. In total 45 indiv. of the Savi's Warbler were captured. At two stations the seasonal average number of captured warblers was relatively low and ranging from about 2-3 indiv. in Ghazala and Wadi El Rayan, resp., to 9 indiv. in Burullus, while in Hurghada the average was 6 indiv. per season. The Savi's Warbler migrated in Burullus in the end of August, and the passage lasted to the end of October showing two small waves from 27 Aug. to 25 Sep. and from 5 to 25 Sep.

Reed Warbler (*Acrocephalus scirpaceus*). (App. II: AMap 2, ATDyn. 9, AYDyn. 4).

The Reed Warbler was one of the most numerous species (about 1400 indiv. were ringed) and it was regularly captured at all ringing stations. The seasonal average number of captured Reed Warblers was 1 indiv. (the lowest) and 7 indiv. in Sharm El Shiekh and Wadi El Gemal, resp., while the highest average numbers were recorded at Hurghada, Wadi El Rayan and Burullus stations (312, 217 and 143 indiv., resp.), compared to that noted in Ghazala, which was 72 indiv. In Burullus, migration of this species started at the end of August, with a high number and obvious peak, which lasted to mid-September, when the number of captured birds decreased to its minimum till the end of October, when the Reed Warbler might have finished migration. In Wadi El Rayan, the Reed Warbler started migration at the beginning of September with relatively strong wave lasting for two weeks (1 to 15 Sep.) followed by some smaller waves from 16 to 30 Sep. and another relatively high wave from 1 to 20 Oct.; the species might have finished migration at the end of October. Similar pattern of migration was observed at Ghazala station, but with only one obvious peak from 25 Aug. to 15 Sep. Here, the species migrated earlier than at the other stations and finished the passage at the end of October, while in Hurghada the Reed Warbler migrated late in the season and one wave with a relatively strong peak from 25 Sep. to 18 Oct. was observed.

Marsh Warbler (*Acrocephalus palustris*). (App. II: AMap 3).

The Marsh Warbler was captured at all ringing stations in 2001-2007, except Wadi El Gemal, where the species was not captured. Only 14 indiv. of this species were captured and the highest seasonal average number of captured birds was in Hurghada (5 indiv.).

Great Reed Warbler (*Acrocephalus arundinaceus*). (App. II: AMap 3, ATDyn. 9).

The Great Reed Warbler was relatively frequently captured only at Burullus ringing station in 2005-2007, while it was rarely captured at the other stations and it was not captured at Sharm El Shiekh station. A total of 44 indiv. were ringed mostly in Burullus, where the highest average number of captured Great Reed Warblers was recorded (13 indiv.). The species migration at Burullus station (2005-2007) started on 28 Aug. by one long wave lasting to 10 Oct. Then the number of captured birds decreased to its minimum at the end of October when the Great Reed Warbler might have finished migration.

Clamorous Reed Warbler (*Acrocephalus stentoreus*). (App. II: AMap 8, ATDyn. 10, AYDyn. 5).

The Clamorous Reed Warbler was one of the relatively numerous species only at three ringing stations (Burullus, Wadi El Rayan, Ghazala). Around 600 indiv. were captured. The highest seasonal average number of captured birds was recorded in Burullus (165 indiv.), while at both Wadi El Rayan and Ghazala stations the seasonal average numbers were lower (38 and 17 indiv., resp.). In Burullus the higher number of Great Reed Warblers was recorded at the end of August from 30 Aug. to 25 Sep., then the number decreased to its minimum at the end of the season (29 Oct.). In Wadi El Rayan, the number of captured individuals varied throughout the whole season from 30 Aug. to 25 Oct. In Ghazala, the Clamorous Reed Warbler was captured earlier in the season than at the previous stations, *i.e.* from 15 Aug. to 27 Oct., with obvious peaks of catching in the first three weeks (15 Aug. to 20 Sep.).

Icterine Warbler (*Hippolais icterina*). Only 6 indiv. were captured: 4 indiv. at Burullus station in 2007 and 2 indiv. in Wadi El Rayan in 2002.

Olive-tree Warbler (*Hippolais olivetorum*). Only 1 indiv. was captured in Sharm El Shiekh in 2003.

Olivaceous Warbler (*Hippolais pallida*). (App. II: AMap 4, ATDyn. 9, AYDyn. 2).

A total of 72 indiv. of the Olivaceous Warbler were captured at four stations from 2001 to 2007. The highest average number of captured birds was recorded in Ghazala (21 indiv.), while the lowest was only 1 indiv. in Wadi El Gemal and the seasonal averages were 3 and 4 indiv. at Wadi El Rayan and Sharm El Shiekh stations, resp. The species was not captured in Burullus and Hurghada. At Ghazala station in 2003, the Olivaceous Warbler was regularly captured from 30 Aug. to 15 Sep. (the highest peak) and another small peak was from 1 to 10 Oct., when the species finished migration. In 2004, the Olivaceous Warbler migrated earlier, *i.e.* at the end of August showing one long wave of migration with a strong peak from 15 to 25 Aug., then the number of birds decreased till the end of September. In 2005 one wave of migration was observed with a relatively high peak on 10 Sep. The species started migration later but finished nearly at the same time as in previous years.

Willow Warbler (*Phylloscopus trochilus*). (App. II: AMap 2, ATDyn. 11, AYDyn. 6).

It was one of the most numerous species at most stations. A total of about 1300 indiv. were captured. The highest seasonal average number of captured Willow Warblers was recorded in Burullus (363 indiv.), while the lowest was only 2 indiv. in Sharm El Shiekh. The seasonal average number was low in Wadi El Rayan (31 indiv.), Wadi El

Gemal (25 indiv.) and Ghazala (8 indiv.), while in Hurghada the species was relatively numerous (74 indiv.). In Burullus, the Willow Warbler migrated in relatively high numbers. The migration pattern showed a long wave from 30 Aug. to 29 Oct., with several peaks; the highest peak was in September. Both in Wadi El Rayan and Wadi El Gemal migration pattern was similar. The species migrated from 10 Sep. to 20 Oct., with two obvious peaks – one in September and another in October. At Hurghada and Ghazala stations the species started migration about three weeks later (25 Sep.) and finished migration one week earlier in Hurghada (15 Sep.). The Willow Warbler generally finished migration at the same time at all stations (about 20 Oct.).

Wood Warbler (*Phylloscopus sibilatrix*). A total of 11 indiv. of the Wood Warbler were captured. The species was not captured at Sharm El Shiekh, Wadi El Gemal and Ghazala ringing stations. Most birds were ringed in Burullus (8 indiv.), 2 indiv. were captured at Wadi El Rayan ringing station in 2002, while only 1 indiv. was captured in 2007 at Hurghada station.

Balkan Warbler (*Phylloscopus orientalis*). Only 2 indiv. of the Balkan Warbler were captured, *i.e.* one was captured at Wadi El Rayan (2002) and another one at Wadi El Gemal ringing station (2005).

Chiffchaff (*Phylloscopus collybita*). (App. II: AMap 6, ATDyn. 10, AYDyn. 3).

The Chiffchaff was one of the most numerous species at two ringing stations. About 300 indiv. were captured mostly at Burullus and Wadi El Rayan stations. The highest average seasonal number of ringed Chiffchaffs was 64 indiv. in Burullus and 49 in Wadi El Rayan. The lowest seasonal average was recorded in Hurghada (1 indiv.). The species was not captured in Sharm El Shiekh, Wadi El Gemal and Ghazala. The Chiffchaff migration showed a clear and relatively strong peak of the passage at the end of October. In Burullus and Wadi El Rayan the species started migration on 14 Oct. with a peak lasting for about one week from 24 to 30 Oct. and finished migration at the beginning of November (4 Nov.).

Spotted Flycatcher (*Muscicapa striata*). (App. II: AMap 6, ATDyn. 12, AYDyn. 7).

The species was fairly frequently captured at different ringing stations. A total of 105 indiv. of the Spotted Flycatcher were captured. The seasonal average number of captured birds varied between only 1 indiv. in Wadi El Rayan and 27 indiv. recorded in Hurghada. The average number of captured birds was 16 indiv. per season in Wadi El Gemal in 2005 and it was similar in Burullus and Sharm El Shiekh (10 indiv.). In Ghazala the seasonal average number of captured flycatchers was only 6 indiv. per season. This species generally migrated in September in Burullus, Sharm El Shiekh and Wadi El Gemal, where the Spotted Flycatcher passed in one migration wave from 1 to 30 Sep. In Hurghada and Ghazala the patterns were completely different from each other and also from the other stations. In Hurghada the migration was late in the season – from 25 Sep. to 20 Oct., while in Ghazala the species migrated early in the season: one wave from 30 Aug. to 10 Sep., and another from 22 Sep. to 15 Oct.

Pied Flycatcher (*Ficedula hypoleuca*). Only 1 indiv. was captured in Hurghada in 2007.

Collared Flycatcher (*Ficedula albicollis*). (App. II: AMap 5).

Altogether 10 indiv. were captured at all the ringing stations, except Wadi El Rayan, where the species was not recorded.

Red-breasted Flycatcher (*Ficedula parva*). The Red-breasted Flycatcher was rare and captured at only three stations during ringing activities from 2001 to 2007. Two individuals were captured in Burullus in 2005-2006 and 3 indiv. in Wadi El Gemal in 2005, while only 1 indiv. of the species was captured in Ghazala in 2003.

Red-backed Shrike (*Lanius collurio*). (App. II: AMap 8, ATDyn. 13, AYDyn. 8).

The Red-backed Shrike was relatively frequently captured at the ringing stations during 2001-2007, however only 6 indiv. were captured in Wadi El Gemal. About 300 indiv. of the species were captured mostly at Burullus and Sharm El Shiekh stations. The highest number in a season was 57 indiv. in Sharm El Shiekh and in Burullus the average was 36 indiv. per season. In Hurghada the average was half of that at Ghazala station (13 and 26 indiv., resp.). In Burullus and Wadi El Rayan the species migrated from 30 Aug. to 15 Oct. showing quite high number for about two weeks from 30 Aug. to around 14 Sep. In Hurghada, Sharm El Shiekh and Wadi El Gemal the species migrated in different times of the season. In Hurghada the passage started late in the season (25 Sep.) and finished in mid-October, while in Sharm El Shiekh the species showed one clear peak from 30 Aug. to 25 Sep., and in Wadi El Gemal the species showed a relatively short wave from 10 to 20 Sep. The pattern of migration in Ghazala was different from the other stations, *i.e.* the species started migration two weeks earlier and finished at the same time as at most stations (15 Aug. to 15 Oct.). The yearly dynamics of the Red-backed Shrike in Burullus showed generally the time of the start and end of migration on 30 Aug. and 29 Sep.

Woodchat Shrike (*Lanius senator*). The species was captured only at two stations – in total 7 indiv. were captured – in Burullus (2 indiv. in 2005) and in Ghazala (5 indiv. in 2003).

Masked Shrike (*Lanius nubicus*). (App. II: AMap 1, ATDyn. 14, AYDyn. 7).

About 150 indiv. of the species were captured at four stations. Most individuals were captured at Ghazala ringing station with the highest average number of captured birds – 90 indiv. per season. The averages in Sharm El Shiekh and Hurghada were much lower (12 and 9 indiv.), while the lowest seasonal average was in Wadi El Gemal (6 indiv.). The species was not captured at Burullus and Wadi El Rayan ringing stations. The Masked Shrike started migration on 25 Sep. and finished on 10 Oct. at Hurghada ringing station, while in Ghazala the species started to migrate from the end of August to around 25 Oct., showing one long wave with several peaks.

Lesser Grey Shrike (*Lanius minor*). The Lesser Grey Shrike was not captured at Burullus, Wadi El Rayan and Hurghada ringing stations. Only four individuals were captured at three stations: 1 indiv. at Sharm El Shiekh and Ghazala ringing stations, while 2 indiv. were captured in Wadi El Gemal.

Great Grey Shrike (*Lanius excubitor*). The Great Grey Shrike was fairly abundant at Ghazala ringing station, where 151 indiv. were captured. Only 1 indiv. was captured at Sharm El Shiekh in 2003. The Great Grey Shrike was not captured at other stations.

Nile Valley Sunbird (*Anthreptes metallicus*). (App. II: ATDyn. 14).

This species was captured only at Ghazala ringing station, where a total of 15 indiv. were ringed. The Nile Valley Sunbird showed one peak of catching from end of August to the beginning of September, while few individuals of the species were captured from 10 Sep. to 12 Oct.

Golden Oriole (*Oriolus oriolus*). (App. II: AMap 3).

The species was very rarely captured at four ringing stations. Altogether 16 indiv. of the Golden Oriole were captured; most of them in Sharm El Shiekh in 2003 (10 indiv.), while 4 indiv. were captured in Wadi El Gemal in 2005 and the lowest number of birds was at both Burullus and Hurghada ringing stations (1 indiv.). The species was not captured at Wadi El Rayan and Ghazala stations.

Jay (*Garrulus glandarius*). Only 1 indiv. was captured in Burullus in 2006.

Spanish Sparrow (*Passer hispaniolensis*). The Spanish Sparrow was rarely captured (18 indiv.). Eleven birds were captured in Burullus in 2005, while in Wadi El Rayan, only 7 indiv. of the species were ringed.

House Sparrow (*Passer domesticus*). (App. II: AMap 1, ATDyn. 1).

This species was relatively numerous only at three ringing stations. About 315 indiv. were captured mainly in Burullus in 2005-2007, where the highest average number of captured birds was recorded (80 indiv.). In Sharm El Shiekh and Ghazala the averages were similar (15 and 20 indiv., resp.). The species was not captured at Hurghada, Wadi El Rayan and Wadi El Gemal stations. The House Sparrow showed the high peak of catching from the end of August to the beginning of September, at both Burullus and Ghazala stations. The maximum catching of the species lasted for about one week (28 Aug. to 5 Sep.), then the number of birds decreased to its minimum at end of October in Burullus (2005-2007), while in Ghazala (2003) the species was not captured in October.

Sinai Rosefinch (*Carpodacus synoicus*). Only 1 indiv. was captured at Ghazala ringing station in 2005.

Streaked Weaver (*Ploceus manyar*). (App. II: ATDyn. 14).

A total of 81 indiv. of the Streaked Weaver were captured only in Burullus. The species was captured during the whole season, *i.e.* from the end of August to the end of October, and its number fluctuated. The highest numbers of captured birds were recorded at the beginning of the season: during the first two weeks (28 Aug. to 15 Sep.), and then from 15 Oct. to 5 Nov., while lower numbers were noted in-between.

Ortolan Bunting (*Emberiza hortulana*). The Ortolan Bunting was very rare and it was captured only at three ringing stations. Two individuals were captured in Burullus in 2005-2006 and 1 indiv. in both Wadi El Rayan in 2002 and Wadi El Gemal in 2005.

Reed Bunting (*Emberiza schoeniclus*). Only 1 indiv. of the Reed Bunting was captured at Wadi El Rayan ringing station in 2001.

Red Avadavat (*Amandava amandava*). Altogether 7 indiv. of the Red Avadavat were captured at Ghazala in 2003-2004.

Non-passerines

Little Bittern (*Ixobrychus minutus*). (App. II: ATDyn. 15, AYDyn. 9).

The species was relatively numerous only at Burullus ringing station, while it was not captured at the other stations. About 180 indiv. of the Little Bittern were captured in Burullus; the species was captured in relatively higher number in September. There was a clear peak of catching from 28 Aug. to 13 Sep., followed by some lower peaks to the end of October. The yearly dynamics of the Little Bittern showed high fluctuation of catching from 30 Aug. to the end of October (2005-2007).

Mangrove Heron (*Butorides striata*). Only 1 indiv. of the species was captured in Wadi El Gemal in 2005.

Squacco Heron (*Ardeola ralloides*). Only 2 indiv. of the species were captured in Burullus in 2005; the species was not captured at other ringing stations.

Teal (*Anas crecca*). Only 2 indiv. of the Teal were captured at Wadi El Gemal ringing station.

Levant Sparrowhawk (*Accipiter brevipes*). Caught only once at Sharm El Shiekh.

Kestrel (*Falco tinnunculus*). Only 7 indiv. of the species were captured in Burullus in 2005-2006.

Sooty Falcon (*Falco concolor*). One individual of the species was captured in Wadi El Gemal in 2005.

Quail (*Coturnix coturnix*). Only 1 indiv. of the species was captured in Burullus in 2005.

Corn Crake (*Crex crex*). Only 1 indiv. of the species was captured in Sharm El Shiekh in 2003.

Spotted Crake (*Porzana porzana*). Three individuals were captured in Burullus in 2005.

Little Crake (*Porzana parva*). One individual was captured in Burullus in 2006.

Moorhen (*Gallinula chloropus*). Only 3 indiv. of the Moorhen were captured: 2 indiv. were captured in Burullus in 2005-2006 and 1 indiv. in Hurghada in 2007.

Little Ringed Plover (*Charadrius dubius*). A total of 7 indiv. of the Little Ringed Plover were captured in Hurghada in 2007 (6 indiv.) and Wadi El Gemal in 2005 (1 indiv.).

Ringed Plover (*Charadrius hiaticula*). Only 1 indiv. was captured in Wadi El Gemal in 2005.

Stone-Curlew (*Burhinus oedicephalus*). Only 3 indiv. of the species were captured in Ghazala in 2004.

Spur-winged Lapwing (*Hoplopterus spinosus*). Only 6 indiv. of the Spur-winged Lapwing were captured in Burullus in 2005, Hurghada in 2007 and at Ghazala ringing station in 2004.

Dunlin (*Calidris alpina*). Only 2 indiv. were captured at two stations – Hurghada in 2007 and Wadi El Gemal in 2005.

Little Stint (*Calidris minuta*). (App. II: ATDyn. 15).

24 indiv. were captured in Hurghada and Wadi El Gemal, *i.e.* 8 indiv. were captured in Hurghada in 2007 and 16 indiv. in Wadi El Gemal in 2005. The Little Stint migrated only in September (from 1 to 30 Sep.).

Ruff (*Philomachus pugnax*). Only 1 indiv. was captured at Hurghada station in 2007.

Green Sandpiper (*Tringa ochropus*). Altogether 10 indiv. of this species were captured at Ghazala in 2003-2004.

Common Sandpiper (*Actitis hypoleucos*). It was captured at three stations – 3 indiv. were captured in Burullus in 2005, Wadi El Gemal in 2005 and Ghazala in 2004.

Marsh Sandpiper (*Tringa stagnatilis*). The species was captured only at one station – Ghazala in 2004.

Turtle Dove (*Streptopelia turtur*). Only 6 indiv. of the species were captured in Burullus (2006-2007), Sharm El Shiekh (2003) and Ghazala (2004) – 2 indiv. at each station.

Laughing Dove (*Streptopelia senegalensis*). A total of 13 indiv. were captured in Burullus (1 indiv.), Sharm El Shiekh (2 indiv.) and the highest number of birds was at Ghazala station (10 indiv.).

Namaqua Dove (*Oena capensis*). This species was captured only once at Sharm El Shiekh station in 2003.

Cuckoo (*Cuculus canorus*). Only 2 indiv. of the species were captured at each: Hurghada (2007) and Wadi El Gemal (2005) ringing stations.

Senegal Coucal (*Centropus senegalensis*). Altogether 6 indiv. of the species were captured in Burullus in 2005-2006.

Little Owl (*Athene noctua*). Only 2 indiv. of the Little Owl were captured at Burullus.

Scops Owl (*Otus scops*). Only 2 indiv. of the species were captured at both Hurghada and Ghazala stations.

European Nightjar (*Caprimulgus europaeus*). Seven individuals of the European Nightjar were captured at Ghazala station.

Hoopoe (*Upupa epops*). This species was recorded in very low numbers at all stations except Wadi El Rayan. A total of 15 indiv. of the Hoopoe were captured: 8 in Ghazala, 3 in Sharm El Shiekh, 2 in Wadi El Gemal, while at each: Hurghada and Burullus, 1 indiv. was captured.

European Kingfisher (*Alcedo atthis*). (App.II: AMap 5, ATDyn. 15, AYDyn. 9).

This species was captured at four stations. At Burullus station the Kingfisher was one of the most numerous species: almost 1150 indiv. were captured there. The highest seasonal average number of captured birds was recorded in Burullus: 383 indiv., while in Wadi El Rayan and Wadi El Gemal it was 22 indiv. The lowest average number was 9 indiv. at Ghazala ringing station. It was not captured at both Hurghada and Sharm El Shiekh stations. The European Kingfisher migrated in relatively

high number in Burullus at the beginning of September showing a strong peak of migration from 1 to 27 Sep., followed by very low peaks till the end of October, resembling the pattern in Wadi El Rayan, where the species finished migration around 15 Oct. In Ghazala, the Kingfisher started and finished migration earlier in the season showing one relatively strong peak from 30 Aug. to 22 of Sep., while in Wadi El Gemal migration started later and the passage finished in mid-October, with one obvious peak from 30 Sep. to 15 Oct. The yearly dynamics of the species in 2005 and 2007 was similar to the the total dynamics in Burullus. However, in 2006 there were two waves with several peaks of migration from 30 Aug. to 26 Sep. and from 30 Sep. to end of October.

White-throated Kingfisher (*Halcyon smyrnensis*). (App. II: ATDyn. 16).

A total of 18 indiv. of this species were captured in Burullus (2005-2007) and it was not captured at any of other station. In Burullus, the White-throated Kingfisher showed a small wave of catching from 5 to 10 Sep., while it was rarely captured from the end of September to the end of October.

Pied Kingfisher (*Ceryle rudis*). (App. II: ATDyn. 16).

It was captured only at one station in relatively small numbers. About 45 indiv. of the Pied Kingfisher were captured in Burullus (2005-2007). The species was captured during the whole season in Burullus, *i.e.* from 30 Aug. to 30 Oct. showing two relatively low waves of catching in both September and October.

European Bee-eater (*Merops apiaster*). (App. II: AMap 5).

The European Bee-eater was rarely captured at five stations. About 25 indiv. of this species were captured at Burullus, Ghazala, Sharm El Shiekh, Hurghada, and Wadi El Gemal ringing stations. The highest seasonal average number of the Bee-eater was 5 indiv. at Hurghada station.

Blue-cheeked Bee-eater (*Merops persicus*). (App. II: ATDyn. 16).

About 60 indiv. of this species were captured in Burullus in 2005-2007. The Blue-cheeked Bee-eater was captured mainly in September, in one wave with high fluctuations during the period from 28 Aug. to 5 Oct.

Little Green Bee-eater (*Merops orientalis*). (App. II: ATDyn. 16).

It was captured only at one station in small numbers. About 20 indiv. of this species were captured in Ghazala in 2003-2005. The species was captured in Ghazala from mid-August to mid-October and few individuals were captured at the end of October. The species showed obvious peak of catching at the beginning of September (27 Aug. to 15 Sep.), then the number of captured birds decreased.

Wryneck (*Jynx torquilla*).

A total of 11 indiv. of the Wryneck were captured: 9 in Burullus and 2 in Ghazala.

Species composition and abundance

A total of 19 748 birds from 117 species were captured in five studied areas during spring migration season. These values correspond to 11 238 birds from 103 species captured at six stations during autumn migration (Table 2 and 3).

The relative abundance and dominance classes of different species in the studied areas during spring and autumn migration are shown in Table 4 and 5, respectively. The summary is presented in Table 6. Some species were abundant and they could be met at every site only in spring (18 species), in autumn (15 species) or both (10 species). This does not mean, however, that they were dominants or subdominants according to classification into five classes (Engelmann 1978): **A** – *eudominant* (over 30% of share in the total), **B** – *dominant* (11-30%), **C** – *subdominant* (6-10%), **D** – *minor* (1-5%), and *rare* (less than 1% of individuals). All species with domination classified as **A** or **B** at a single site are shown at the right side of Table 6. Only the Reed Warbler was dominant or subdominant at every site in spring, but even this species was not dominant/subdominant at every site in autumn. There were species dominating at a single site, but not found at all the sites in the season (as in spring the Yellow Wagtail at Hurghada and the Olivaceous Warbler in Ghazala, while in autumn the Common Kingfisher at Burullus).

Table 4

Dominance status of birds during spring seasons at the studied ringing sites: **A** – *eudominant* (over 30% of share in the total), **B** – *dominant* (11-30%), **C** – *subdominant* (6-10%), **D** – *minor* (1-5%), dash – *rare* (less than 1% of individuals); classification according to Engelmann (1978)

	Burullus		Wadi El Rayan		Ghazala		Hurghada		Wadi El Gemal	
	2006-2007		2001-2002		2004-2005		2007-2008		2005	
	% share	status	% share	status	% share	status	% share	status	% share	status
Passerines										
<i>Galerida cristata</i>	0.1	-								
<i>Calandrella brachydactyla</i>							5.2	C		
<i>Calandrella rufescens</i>							0.1	-		
<i>Melanocorypha bimaculata</i>							0.1	-		
<i>Ptyonoprogne rupestris</i>					0.2	-				
<i>Riparia riparia</i>	1.4	D	0.1	-	0.1	-	16.8	B	15.4	B
<i>Hirundo rustica</i>	0.7	-	0.4	-	0.5	-	17.3	B	18.1	B
<i>Hirundo daurica</i>					0.1	-	0.5	-	0.1	-
<i>Delichon urbica</i>			0.1	-			0.4	-		
<i>Anthus campestris</i>							0.2	-	0.1	-
<i>Anthus spinoletta</i>			0.1	-			0.1	-		
<i>Anthus pratensis</i>							0.1	-		
<i>Anthus trivialis</i>	0.1	-	0.7	-	0.1	-	1.1	D	3.8	D
<i>Anthus cervinus</i>							1.7	D	0.3	-
<i>Motacilla alba</i>	0.1	-	0.8	-			0.5	-	0.1	-
<i>Motacilla flava</i>	3.4	D	2.1	D			10	B	3.0	D
<i>Pycnonotus barbatus</i>	0.1	-			0.4	-				
<i>Erithacus rubecula</i>	0.1	-	0.1	-					0.1	-

Table 4 continued...	Burullus		Wadi El Rayan		Ghazala		Hurghada		Wadi El Gemal	
	2006-2007		2001-2002		2004-2005		2007-2008		2005	
	% share	status	% share	status	% share	status	% share	status	% share	status
<i>Luscinia megarhynchos</i>	0.3	-	2.5	D	0.8	-	0.5	-	3.5	D
<i>Luscinia luscinia</i>	0.1	-							0.1	-
<i>Luscinia svecica</i>	3.1	D	0.9	-	3.4	D	1.1	D	1.6	D
<i>Cercotrichas galactotes</i>			0.1	-	1.6	D	0.1	-		
<i>Phoenicurus phoenicurus</i>	0.1	-	0.4	-	1.1	D	0.4	-	2.2	D
<i>Oenanthe oenanthe</i>	0.1	-	0.4	-	0.1	-	0.2	-	2.1	D
<i>Oenanthe isabellina</i>	0.1	-	0.1	-			0.3	-	1.4	D
<i>Oenanthe deserti</i>							0.1	-		
<i>Oenanthe hispanica</i>			0.1	-					0.1	-
<i>Oenanthe pleschanka</i>							0.1	-		
<i>Saxicola rubetra</i>	0.1	-	0.3	-	1.9	D	0.3	-	0.1	-
<i>Saxicola rubicola</i>	0.1	-					0.1	-	1.0	D
<i>Monticola saxatilis</i>									0.2	-
<i>Turdus philomelos</i>							0.1	-		
<i>Sylvia borin</i>	0.1	-	0.1	-	0.7	-	0.2	-	0.4	-
<i>Sylvia atricapilla</i>	0.1	-	0.1	-			0.1	-	2.6	D
<i>Sylvia curruca</i>	0.1	-	7.4	C	23.8	B	3.5	D	9.2	C
<i>Sylvia melanocephala</i>	0.2	-	0.1	-	0.7	-	0.1	-	1.1	D
<i>Sylvia mystacea</i>							0.1	-		
<i>Sylvia melanothorax</i>					0.1	-	0.1	-		
<i>Sylvia rueppelli</i>			0.5	-			0.1	-		
<i>Sylvia communis</i>	0.1	-	0.4	-	0.3	-	0.5	-	1.0	D
<i>Sylvia cantillans</i>	0.1	-	0.3	-			0.1	-		
<i>Prinia gracilis</i>	0.1	-	0.3	-						
<i>Acrocephalus schoenobaenus</i>	48.4	A	8.2	C	0.8	-	9	C	1.7	D
<i>Acrocephalus melanopogon</i>			0.1	-						
<i>Locustella luscinioides</i>	0.3	-	4	C	0.7	-	1.9	D	2.2	D
<i>Acrocephalus scirpaceus</i>	16.6	B	46	A	36.6	A	15.4	B	11.8	B
<i>Acrocephalus palustris</i>					0.1	-	0.1	-		
<i>Acrocephalus arundinaceus</i>	4.7	D	1.3	D	0.5	-	0.5	-	0.2	-
<i>Acrocephalus stentoreus</i>	4.1	D	7.5	C	2.1	D				
<i>Hippolais icterina</i>							0.1	-	0.1	-
<i>Hippolais pallida</i>			0.7	-	10.4	B	0.1	-	1	D
<i>Phylloscopus trochilus</i>	0.1	-	0.5	-			1	D	2	D
<i>Phylloscopus sibilatrix</i>	0.1	-	0.7	-			0.1	-	0.1	-
<i>Phylloscopus orientalis</i>			0.4	-	0.2	-	0.1	-	0.1	-
<i>Phylloscopus collybita</i>	6.4	C	6.5	C	0.3	-	2.8	D	2.9	D
<i>Muscicapa striata</i>			0.2	-	0.7	-	0.1	-	1	D

Table 4 continued...	Burullus		Wadi El Rayan		Ghazala		Hurghada		Wadi El Gemal	
	2006-2007		2001-2002		2004-2005		2007-2008		2005	
	% share	status	% share	status	% share	status	% share	status	% share	status
<i>Ficedula hypoleuca</i>			0.2	-	0.1	-			0.1	-
<i>Ficedula albicollis</i>	0.1	-	0.8	-	0.1	-	0.1	-	0.1	-
<i>Ficedula semitorquata</i>	0.1	-			0.1	-	0.1	-		
<i>Lanius collurio</i>							0.1	-		
<i>Lanius isabellinus</i>					0.1	-				
<i>Lanius senator</i>			0.1	-			0.1	-		
<i>Lanius nubicus</i>					5.5	C	0.1	-	0.6	-
<i>Anthreptes metallicus</i>					3.0	D				
<i>Oriolus oriolus</i>							0.1	-	0.2	-
<i>Passer domesticus</i>	3.2	D								
<i>Passer hispaniolensis</i>	0.1	-	0.1	-			0.1	-	1.4	D
<i>Ploceus manyar</i>	0.5	-								
<i>Emberiza hortulana</i>			0.1	-						
<i>Emberiza caesia</i>							0.1	-		
Non-passerines										
<i>Ixobrychus minutus</i>	0.7	-	2	D			0.1	-		
<i>Bubulcus ibis</i>							0.1	-		
<i>Ardeola ralloides</i>	0.1	-					0.1	-	0.2	-
<i>Circus aeruginosus</i>							0.1	-	0.1	-
<i>Circus macrourus</i>							0.1	-		
<i>Buteo rufinus</i>							0.1	-		
<i>Buteo buteo</i>							0.1	-		
<i>Accipiter nisus</i>	0.1	-					0.5	-	0.1	-
<i>Falco tinnunculus</i>	0.1	-					0.1	-		
<i>Coturnix coturnix</i>			0.1	-	0.1	-	0.6	-	0.4	-
<i>Porzana porzana</i>			0.1	-			0.1	-		
<i>Gallinula chloropus</i>	0.1	-					0.1	-		
<i>Porphyrio porphyrio</i>	0.2	-								
<i>Glareola pratincola</i>	0.1	-					0.1	-		
<i>Charadrius dubius</i>							0.1	-	0.1	-
<i>Hoplopterus spinosus</i>	0.1	-					0.1	-	0.1	-
<i>Calidris minuta</i>							0.1	-	0.7	-
<i>Calidris temminckii</i>							0.1	-		
<i>Philomachus pugnax</i>							0.1	-		
<i>Tringa glareola</i>							0.2	-		
<i>Tringa ochropus</i>							0.1	-	0.1	-
<i>Actitis hypoleucos</i>	0.1	-			0.2	-	0.1	-	0.2	-
<i>Tringa totanus</i>	0.1	-					0.2	-		
<i>Tringa nebularia</i>							0.1	-		
<i>Tringa stagnatilis</i>							0.1	-		
<i>Gallinago gallinago</i>	0.1	-					0.2	-		

Table 4 continued...	Burullus		Wadi El Rayan		Ghazala		Hurghada		Wadi El Gemal	
	2006-2007		2001-2002		2004-2005		2007-2008		2005	
	% share	status	% share	status	% share	status	% share	status	% share	status
<i>Lymnocyrtus minimus</i>							0.1	-		
<i>Larus minutus</i>							0.2	-		
<i>Chlidonias hybridus</i>							0.1	-		
<i>Streptopelia decaocto</i>							0.1	-		
<i>Streptopelia turtur</i>	0.1	-	0.1	-			0.3	-	0.5	-
<i>Streptopelia senegalensis</i>	0.1	-	0.1	-	0.7	-	0.1	-		
<i>Oena capensis</i>							0.1	-		
<i>Clamator glandarius</i>							0.1	-		
<i>Centropus senegalensis</i>	0.1	-								
<i>Athene noctua</i>	0.1	-								
<i>Otus scops</i>	0.1	-	0.1	-	0.2	-			0.2	-
<i>Caprimulgus europaeus</i>							0.1	-		
<i>Caprimulgus aegyptius</i>							0.1	-		
<i>Upupa epops</i>	0.1	-	0.2	-	0.3	-	0.1	-	2.4	D
<i>Alcedo atthis</i>	1.0	D	0.2	-	0.1	-			0.3	-
<i>Halcyon smyrnensis</i>	0.3	-								
<i>Ceryle rudis</i>	0.4	-	0.1	-						
<i>Merops apiaster</i>	0.1	-			0.4	-	0.1	-	0.1	-
<i>Merops persicus</i>	0.2	-					0.1	-		
<i>Merops orientalis</i>					0.5	-				
<i>Jynx torquilla</i>	0.2	-	1.4	D	0.3	-	0.4	-	1.4	D

Table 5

Dominance status of birds during autumn seasons at the studied ringing sites:

A – eudominant (over 30% of share in the total), **B** – dominant (11-30%),
C – subdominant (6-10%), **D** – minor (1-5%), dash – rare (less than 1% of individuals);
classification according to Engelmann (1978)

	Burullus		Wadi El Rayan		Ghazala		Hurghada		Sharm El Shiekh		Wadi El Gemal	
	2005-2007		2001-2002		2003-2005		2007		2003		2005	
	% share	status	% share	status	% share	status	% share	status	% share	status	% share	status
Passerines												
<i>Galerida cristata</i>	0.1	-										
<i>Calandrella brachydactyla</i>					0.1	-					0.4	-
<i>Riparia riparia</i>	3.9	D	1.9	D	0.2	-	0.7	-			2	D
<i>Hirundo rustica</i>	11.7	B	1.4	D	9.1	C	8.4	C	3.9	D	4	D
<i>Anthus trivialis</i>							0.2	-			1.2	D
<i>Anthus cervinus</i>			0.1	-			1.3	D			0.4	-

Table 5 continued...	Burullus		Wadi El Rayan		Ghazala		Hurghada		Sharm El Shiekh		Wadi El Gemal	
	2005-2007		2001-2002		2003-2005		2007		2003		2005	
	% share	status	% share	status	% share	status	% share	status	% share	status	% share	status
<i>Motacilla alba</i>	0.3	-	0.2	-			0.8	-				
<i>Motacilla flava</i>	1.8	D	0.2	-			1.6	D			1.6	D
<i>Motacilla citreola</i>	0.1	-										
<i>Pycnonotus barbatus</i>					1.7	D						
<i>Erithacus rubecula</i>	0.1	-										
<i>Luscinia megarhynchos</i>	0.1	-	0.3	-	0.3	-	0.2	-	0.6	-		
<i>Luscinia luscinia</i>	0.3	-	0.6	-	2	D	1.7	D	11.2	B	10.7	B
<i>Luscinia svecica</i>	2.7	D	0.5	-	1.5	D	2.3	D				
<i>Cercotrichas galactotes</i>			0.1	-	0.1	-						
<i>Phoenicurus phoenicurus</i>	0.1	-	0.1	-	1.4	D	8.8	C			10.7	B
<i>Phoenicurus ochruros</i>							0.1	-			0.4	-
<i>Oenanthe oenanthe</i>	0.1	-	0.1	-	0.1	-					0.4	-
<i>Oenanthe isabellina</i>			0.1	-			0.2	-				
<i>Oenanthe hispanica</i>	0.1	-	0.1	-							0.4	-
<i>Oenanthe cypriaca</i>			0.1	-								
<i>Saxicola rubetra</i>	0.7	-	0.2	-	0.1	-	1.3	D	0.6	-	2.4	D
<i>Saxicola rubicola</i>	0.1	-	0.1	-								
<i>Turdus philomelos</i>	0.1	-										
<i>Sylvia borin</i>	0.2	-	0.3	-	0.2	-	0.6	-	2.2	D	0.4	-
<i>Sylvia atricapilla</i>	0.1	-	0.2	-	0.1	-	4	D	1.1	D	0.4	-
<i>Sylvia curruca</i>	0.3	-	3.1	D	21.9	B	9.2	C	1.7	D	5.6	C
<i>Sylvia melanocephala</i>			0.4	-	0.5	-	0.7	-			3.2	D
<i>Sylvia communis</i>	0.3	-	1.4	D	0.3	-	0.2	-	2.2	D	0.8	-
<i>Sylvia hortensis</i>					0.1	-			2.2	D	1.6	D
<i>Sylvia rueppelli</i>			0.2	-								
<i>Prinia gracilis</i>	0.3	-	0.2	-								
<i>Acrocephalus schoenobaenus</i>	19.2	B	8.6	C	1.1	D	2.4	D	1.12	D	3.2	D
<i>Locustella fluviatilis</i>	0.1	-							0.6	-	0.4	-
<i>Locustella luscinioides</i>	0.4	-	0.6	-	0.4	-	0.7	-				
<i>Acrocephalus scirpaceus</i>	5.8	C	45.1	A	13.8	B	35.9	A	0.6	-	2.8	D
<i>Acrocephalus palustris</i>	0.1	-	0.1	-	0.1	-	0.6	-	1.1	D		

[illegible]

Table 5 continued...	Burullus		Wadi El Rayan		Ghazala		Hurghada		Sharm El Shiekh		Wadi El Gemal	
	2005-2007		2001-2002		2003-2005		2007		2003		2005	
	% share	status	% share	status	% share	status	% share	status	% share	status	% share	status
<i>Merops apiaster</i>	0.1	-			0.7	-	0.6	-	1.6	D	0.7	-
<i>Merops persicus</i>	0.7	-										
<i>Merops orientalis</i>					1.2	D						
<i>Jynx torquilla</i>	0.1	-			0.1	-						

Table 6

Abundance and dominance of species at five stations in spring and autumn.
 Abundance: + – the species was caught at all the five stations; species names
 in bold – abundant in spring and autumn. Dominance: A, B – *eudominant* and
dominant at one of stations (classified according to Tables 4 and 5).

	Abundance		Dominance	
	Spring	Autumn	Spring	Autumn
<i>Riparia riparia</i>	+	+	BB	
<i>Hirundo rustica</i>	+	+	BB	B
<i>Antus trivialis</i>	+			
<i>Motacilla flava</i>			B	
<i>Luscinia svecica</i>	+			
<i>Luscinia luscinia</i>		+		B
<i>Phoenicurus phoenicurus</i>	+	+		B
<i>Saxicola rubetra</i>	+	+		
<i>Sylvia borin</i>	+	+		
<i>Sylvia atricapilla</i>		+		
<i>Sylvia curruca</i>	+	+	B	B
<i>Sylvia melanocephala</i>	+			
<i>Sylvia communis</i>	+	+		
<i>Acrocephalus schoenobaenus</i>	+	+	A	B
<i>Acrocephalus scirpaceus</i>	+	+	AABBB	AAB
<i>Acrocephalus arundinaceus</i>	+	+		
<i>Locustella luscinioides</i>	+			
<i>Hippolais pallida</i>			B	
<i>Phylloscopus trochilus</i>		+		B
<i>Phylloscopus collybita</i>	+			
<i>Muscicapa striata</i>		+		
<i>Ficedula albicollis</i>	+			
<i>Lanius collurio</i>		+		
<i>Upupa epops</i>	+			
<i>Jynx torquilla</i>	+			
<i>Alcedo atthis</i>				B
Total species = 26	18	15	7	8

DISCUSSION

Millions of birds leave the breeding grounds in the northern hemisphere every autumn to migrate to the south and undergo a return migration during the spring with an estimate of about 300 000 birds/day/km³ (Biebach *et al.* 2000). Some species travel a little over 100 km, while others cover longer distances and can be on migration for about half a year (Alerstam 1990). To make these trips, birds need to cope with the large energy costs of long-distance flight, particularly when crossing ecological barriers, such as oceans, mountains and deserts.

The eco-physiological mechanisms adopted by the long-distance migrating Palaearctic birds for crossing ecological barriers have attracted the interest of ornithologists (Moreau 1961, 1972). Different ecological theories have been proposed to describe the seasonal migrations and flights for crossing such barriers (particularly the Sahara Desert). To date, the authors of each study have argued (to varying degrees) that birds use flight strategies based on the incorporation of step-wise and/or intermittent flights. These include a non-stop flight, short/long intermittent flight, migration oriented along a given route/site, broader front, stopover at oases, nocturnal flights, using shade to avoid heat in the day, loop migration, *etc.* (Bairlein *et al.* 1983, Biebach *et al.* 1986, Pearson *et al.* 1988, Biebach 1990, Bairlein 1991, Schmaljohann *et al.* 2007).

Palaearctic passerines that migrate through eastern and north eastern Africa are likely to belong to populations from different breeding grounds. The nocturnal passerine migrants breeding in central and southern Europe and Scandinavia have to cover a longer distance of inhospitable area (including the Arabian Desert and the Red Sea followed by the Sahara Desert) in their migration journey twice a year.

Some species as warblers migrate through the Iberian peninsula and cross a shorter stretch of the Mediterranean Sea, while the eastern populations cross the eastern section of the Mediterranean Sea and then cross the Sahara Desert (Biebach 1996). The eastern route provides limited opportunity for refueling and, hence, larger energy reserves need to be stored.

Many locations in the eastern and NE Africa serve as important fattening areas for Palaearctic migratory birds in both south- and northbound migration seasons. In autumn, birds show an increase in body mass in NE Africa before migrating to more southerly wintering grounds. In spring, birds gain considerable mass in NE Africa and immediately to the south of the Arabian/Sahara Desert before take off for trans-desert migration. Thus, the quality of these stopover sites may very well exert a significant influence over the success of the journey as well as the reproductive fitness of birds in their breeding grounds.

According to the results of the present study, passerine migration in spring starts earlier in the southern compared to the northern ringing stations in Egypt. Generally, passerines start to migrate at the beginning of March with relatively high peak of migration (16-31 March as in Burullus and Hurghada and 1-16 March as in Wadi El Rayan), but sometimes even earlier as in Ghazala (2004-2005), where passerines may

start to migrate in the end of February. Passerine species generally finish spring migration from the end of April to the second week of May as in Burullus, Hurghada and Ghazala. At a few stations catching was performed during two seasons and in figures in Appendix I one can see year-to-year differentiation of the migration intensity patterns. This differentiation is visible in both the number of captured migrants and in overall wave-pattern of migration. However, one can find a number of similarities from year-to-year at the same station. This is typical phenomenon, but some more detailed comments would be possible only after many years of study.

Diversity and similarity

There was not enough studies on migrating passerine bird assemblages in different locations and their relation to resident birds in Egypt. Most of the studies of wild birds in Egypt were focusing on certain topics such as studying parasites associated with wild migratory birds and some other studies were concerning the identification of the important bird areas regarding their importance as unique habitats encompassing high assemblages of birds species of international concern (Baha El Din 1999).

The species diversity at the ringing stations in Egypt may vary due to the site biotope, location on the passerine migration flyway and migration season, so in the present study is not treated in detail.

The site selection was mainly based on the value of these sites for birds as important areas located along the main migration flyways, moreover these are protected areas to avoid disturbance and interference of human activities to ensure reliable and systematic data collection.

More detailed studies at these and other localities in Egypt are needed to draw more clear picture of abundance, dominance and migration dynamics of birds migrating across Egypt. This will be of a great importance for protection of the most important stopover localities in Egypt.

Timing of migration

Spring

Spring passerine migration in Egypt starts at the beginning of March and lasts to mid-May. Passerines start migration from south, central and western Africa towards Europe early in February and arrive at southern Egypt at the end of February / beginning of March (as shown at Ghazala station). Then passerines move toward the middle part of Egypt, where migration starts about one week later (Wadi El Rayan), while in the northern part of Egypt (Hurghada and Burullus) passerine migration starts about two weeks later than in Ghazala and one week later than in Wadi El Rayan. These results support the study by Leshem *et al.* (1999) who reported that the migration in western Mediterranean across Palestine to Europe started at the end of March with main peak of migration in April (about one week later than in northern Egypt).

Unlike the situation for the Western Palaearctic migration route (*e.g.* Bairlein and Giessing 1997, Bairlein 1998), there has, to date, been no scientific network that has monitored birds along the Eastern Africa, the Middle Eastern and Arabian flyways to

make a detailed comparative study of migration along this route in autumn and spring. Thus, it is not well known when and where Palaearctic migrants prepare for migration between different locations in the autumn and spring migration (e.g. Berthold 1996) along this route. *Acrocephalus* and *Sylvia* species are known as broad-front long-distance migrants and different studies have addressed their migration from Europe to Africa (Ottosson *et al.* 2005, Miholcsa *et al.* 2009). Warblers generally start migration in spring at the end of February to the beginning of March from south-eastern part of sub-Sahara toward north-eastern Africa, about one week earlier than in Egypt. These species are the Sedge Warbler, Reed Warbler, Whitethroat, Lesser Whitethroat and Garden Warbler (Ash 1981; Pearson *et al.* 1988; Pearson and Lack 1992; Cramp and Perrins 1992, 1993; Yohannes *et al.* 2009).

Sedge Warbler. The species in Burullus, Hurghada, Ghazala and Wadi El Gemal starts migration in mid-March, which is about two weeks later than in Wadi El Rayan. The Sedge Warbler finishes migration in the second week of May in Burullus and Hurghada, *i.e.* about two weeks later than in Ghazala, Wadi El Gemal and Wadi El Rayan. In Egypt the Sedge Warbler starts to migrate one week later in Wadi El Rayan and two weeks later at the other stations than in south-eastern Africa, where it finishes migration earlier (Yohannes *et al.* 2009). The results suggest that the Sedge Warbler might need one-two weeks to arrive to Egypt.

Reed Warbler. The time of the beginning and the end of migration is similar in Burullus and Hurghada. The Reed Warbler starts migration at the beginning of March and finishes on 15 May. In Wadi El Rayan the species starts migration at the same time as at the stations mentioned above, but finishes about two weeks earlier (end of April), while in Wadi El Gemal it migrates late – at the end of March and finishes migration at the end of April. This may suggest that there are different populations migrating through different stations in Egypt coming from different wintering grounds in central and south-eastern Africa and vast breeding grounds in southern, central and eastern Europe (Zink 1973-1985, Busse 1987, Cramp and Perrins 1992, Hage-meijer and Blair 1997, Fransson and Stolt 2005).

Whitethroat. The species migration is well documented only in Hurghada, Wadi El Rayan and Wadi El Gemal. It starts migration late in the season – in April. The Whitethroat starts to migrate at the beginning of April at Wadi El Rayan and Wadi El Gemal and finishes migration at both stations at the end of April, while at Hurghada it starts migration two weeks later. According to Yohannes *et al.* 2009 in south-eastern Africa the species starts and finishes migration from wintering areas about two weeks later.

Lesser Whitethroat. The species migrates at the beginning of March in spring; in Ghazala station it starts to migrate about 3 days earlier than in Wadi El Rayan and finishes migration at the end of March at both stations. In Wadi El Gemal the Lesser Whitethroat starts migration about one week later than in Ghazala and Wadi El Rayan, but finishes at the same time. While in Hurghada, migration starts nearly at the same time as at the stations mentioned above but the end of the passage is one month later (end of April). The species was studied in Ethiopia, where it migrated at the same time as at Egyptian stations.

Garden Warbler. The migration of the species was well documented in Hurghada compared to the other stations. It starts migration late in the season – at the end of

April, about one week later than its migration time from southern areas in south-eastern and south-western Africa, where the species migrates later than other warbler species (Ottoosson *et al.* 2005, Yohannes *et al.* 2009).

Autumn

A lot of studies have been carried out to determine the timing of migratory movements of the species breeding in central, western and northern Europe, while little is known about other European regions, the Mediterranean region, Eastern Africa, the Middle East and Arabian flyways and sub-Sahara (Berthold 1996, Akriotis 1998, Yohannes *et al.* 2009). However, for the species with wide European breeding ranges, the timing of migration of populations breeding in southern parts is often masked by the passage of populations breeding further north (Akriotis 1998). The long-distance migrants, such as most warblers, are generally leaving breeding grounds in central, eastern and southern Europe from mid-July to the end of August (Akriotis 1998, Procházka and Reif 2002, Kesapli Can and Bilgin 2005, Miholcsa *et al.* 2009).

Autumn migration of passerines in Egypt starts at the beginning of September, about one week later than in southern and eastern Europe (Miholcsa *et al.* 2009), as in Burullus, Wadi El Rayan, Ghazala, Wadi El Gemal and Sharm El Shiekh (only one peak from 30 Aug. to 25 Sep.). However, in Hurghada the migration starts even later matching the pattern in the eastern Mediterranean, where the migration starts in mid-September (Leshem *et al.* 1999), *i.e.* about one week earlier than in Hurghada. Birds generally finish migration at the end of October.

Sedge Warbler. It is a widespread species in Europe; it migrates early – at the end of July in central Europe (Gyuracz and Bank 1996, Miholcsa *et al.* 2009). The species arrives in Egypt about one month later – at the end of August, when the beginning of migration is recorded in Burullus, Wadi El Rayan and Ghazala. The species finishes migration at these stations by the end of October, except Ghazala, where it finishes migration about one week earlier. In Wadi El Gemal the migration of the species is obvious only in the first two weeks of September and it finishes about one month and two weeks earlier than at the other stations.

Reed Warbler. This is a widespread breeding species in much of the western Palearctic, from southern Scandinavia in the north to North Africa and the Middle East in the south (Goodman and Meininger 1989, Akriotis 1998).

Migration of the species starts at the end of August and continues to the end of October following the general timing of passerine autumn migration in Egypt and matching the time of departure from breeding grounds in western and central Europe. Migration of the Reed Warbler in southern Britain starts by the end of August / early September while further east, in the Czech Republic, departure of the species starts in mid-July to the end of August. Arrival of the western and central European Reed Warblers in south-western Europe takes place from August to October (Akriotis 1998), resembling the arrival and departure time of the species in Burullus and Wadi El Rayan, while it is different from timing of migration in both Hurghada and Ghazala, where the Reed Warbler starts migration by the last week of August, *i.e.* about one week earlier and two weeks later, respectively, and finishes the passage at the end of October. In Hurghada, the Reed Warbler migrates about two weeks later

than in Burullus and Wadi El Rayan and three weeks later than in Ghazala and finishes migration about one week earlier than at other stations in Egypt. This could be due to different origin of passing birds and results from the latitude of breeding population which impacts the timing and distance of migration (Akriotis 1998).

Whitethroat. It shows clear migration pattern in both Burullus and Wadi El Rayan only in September, when it starts and finishes migration, *i.e.* about one month earlier than in other species. The species arrives about 2 months later to south-eastern Africa (Yohannes *et al.* 2009).

Lesser Whitethroat. The species migrates at the beginning of September, which is the starting time of passerine migration in both Wadi El Rayan and Wadi El Gemal, and one week earlier at Ghazala station. The species finishes migration by the end of October. In Hurghada, the species starts to migrate about three weeks later and finishes at the same time as at the other stations. The timing of the Lesser Whitethroat migration in Egypt matches the arrival time in south-eastern Africa. Most probably, the species migrates directly through Egypt to its winter areas in south-eastern Africa and does not spend longer time on migration as the Whitethroat does (Yohannes *et al.* 2009).

Garden Warbler. It is probably the best studied long-distance passerine migrant in the Old World and has been a focal species for many studies (*e.g.* Bairlein 1991; Fransson 1995; Grattarola *et al.* 1999; Schaub and Jenni 2000a, 2000b). However, the African, and especially the sub-Saharan part, of its migration are still comparatively little known (Ottosson *et al.* 2005). In Egypt the migration of the species is less obvious than in other *Sylvia* species. It starts migration in Burullus early in the season – by the end of August and also finishes migration early – by the end of September. Generally the species arrives to Egypt at the same time as the median date for their passage through the Baltic Sea region and about 3 weeks before their median passage date through southern Italy (Ottosson *et al.* 2005), while the species arrives in south-eastern Africa before the end of November (Yohannes *et al.* 2009)

Migration intensity

Birds crossing Egypt on their migration between the breeding and wintering grounds may divide their journey into phases of flights and stopovers before and after crossing the ecological barriers. The organization of the journey in flight bouts and stopovers is likely to depend on the availability and quality of potential stopover sites, on short-term environmental factors and on various selection pressures (Schaub and Jenni 2001).

The intensity of passerine migration, as shown by catching results, in Egypt varies between stations and season. In spring the intensity of passerine migration is higher than in autumn. According to the results of the present study the highest intensity of migration is on the northern Red Sea coast at Hurghada. This is twice as much as the intensity of passerine migration at the Mediterranean coast in Burullus and four times more than in western desert at Fayoum. The lowest intensity of migration is at the southern part of the Nile Valley at the edge of Sahara Desert (Ghazala). This suggests that there is a question to be solved in the future: whether this means “higher intensity of migration” or “different flight strategy” over the western to eastern deserts of Egypt.

In autumn the highest intensity of migration was recorded on the Mediterranean coast, at the middle part of the Nile Delta and it was different from the western coastal area, where there was lower migration density (Kiepenheuer and Linsenmair 1965), however, this needs further studies to be confirmed. Moving further south and east in the eastern desert and across the Nile Valley, the density of migration at the northern part of the western Red Sea coast in Hurghada is higher than in Sharm El Shiekh and along the Nile Valley and western desert in Fayoum, which confirms the results of Kiepenheuer and Linsenmair (1965), Biebach *et al.* (1991) and Bruderer (2001).

There is a considerable decline (less than half) in migratory densities from the eastern to western deserts in Egypt. It contrasts with the situation in the southern part of eastern Egypt, where the intensity of migration along the Red Sea at Wadi El Gemal was half the intensity of migration along the Nile Valley in Aswan, so that there is a considerable increase in migration intensity from the eastern to western desert. However, the migration intensity at the western Mediterranean coast in Egypt is little known, there is an obvious decrease in migration intensity from north to south along the Nile Valley and the Red Sea Coast and the higher intensity of migration in the eastern Egypt than in the western part. This is also confirmed by Biebach *et al.* (1991), Bruderer and Liechti (1995) and Bruderer (2001).

The observed pattern might indicate loop migration of passerines during both seasons, when they take more eastern direction in spring than in autumn or there are differences in migration strategy in both seasons. In spring passerines are concentrated in the northern and north-eastern part of Egypt for stopover just before crossing the second barrier (the Mediterranean Sea). This is consistent with Casement (1966), who suggested that passerines performed an intermittent migration strategy, which was also reported by Biebach *et al.* (2000), Schmaljohann *et al.* (2007) and Salewski *et al.* (2009).

Despite the fact that the intensity of passerine migration at different sites in spring is higher than in autumn, the difference in intensity of passerine migration between autumn and spring in north-eastern Egypt along the Mediterranean coast is minimum or nearly the same. There is a considerable decline of migration intensity in autumn along the Red Sea coast from Hurghada southward and along the Nile Valley southward. In both seasons there is an obvious decline in migration intensity from the Red Sea coast westward to the Nile Valley and western desert which was also noted by Biebach *et al.* (1991) and Bruderer (2001), while in autumn the opposite is true only in the southern part of eastern Egypt, where the intensity along the Nile Valley is twice as high as at the Red Sea coast.

In spring the highest intensity of passerine migration in Egypt is in Burrulus and Hurghada and it is at a level of the best Middle East stations. These are unique sites for the Sedge Warbler, Little Bittern, Pied Kingfisher and White-throated Kingfisher. The lowest intensity of migration is at Ghazala station. In contrary to most of the Middle East stations the intensity of passerine autumn migration in Burrulus is very high, while in Sharm El Shiekh the intensity of passerine migration in autumn is the lowest – the birds probably do not stop here and continue to fly to the northern Gulf of Akaba.

The spring migration of the Reed Warbler in Egypt is several times more intensive than the autumn migration. Similar phenomenon for this species was already reported from this region, *e.g.* from the Gulf States (Cramp and Perrins 1992) and Palestine (Yom-Tov 1984, Shirihai 1996, Morgan and Shirihai 1997). Moreover, this was observed for many different passerines and raptors (Morgan and Shirihai 1997, Yosef and Chernetsov 2004). The highest intensity of the species is in both Hurghada and Wadi El Rayan with obvious decline in migration intensity in southern Egypt. In contrary, there is higher intensity of the Sedge Warbler migration in northern Egypt in Burullus in both spring and autumn with considerable decline in intensity at all the other stations. On the other hand, the Lesser Whitethroat shows high intensity of migration in spring at all stations except Burullus, where the intensity is lower (possibly because of biotopes there), while in autumn the intensity of migration is several times higher at both Ghazala and Hurghada than at the other stations. This could indicate that Ghazala and Hurghada are the most attractive stopover sites for the Lesser Whitethroat compared to other sites. Similarly, Ghazala and Hurghada are considered as significant stopover sites for shrikes (*e.g.* the Masked Shrike), where the intensity of migration in both autumn and spring is considerably higher than at all the other stations in Egypt.

As it was said earlier, in Egypt the spring migration is more intensive for several species of the genus *Sylvia* and *Acrocephalus*, similarly to that in the western part of Africa, much farther to the south – in Nigeria (Ottoosson *et al.* 2002), but the exception is the Willow Warbler. The intensity of its migration is considerably higher in autumn than in spring, particularly in Burullus, where it is several times higher than at other stations in autumn.

This could be due to a loop migration, *i.e.* passerines use different migration route in autumn, while on return they cross the studied region heading more to east, which is consistent with Markovets and Yosef (2005). This has been already reported for several migrant species in Eilat (Israel), *e.g.* the Sedge Warbler (Yosef and Chernetsov 2004), Masked Shrike, Ortolan Bunting and the Cretzschmar's Bunting (Yosef and Tryjanowski 2002a, 2002b, 2002c). However, it is also possible that the pattern is caused by different flight strategies in spring and autumn.

ACKNOWLEDGEMENTS

The fieldwork over the years and sites was possible thanks to interest in the bird migration of many Polish ringers who devoted their both professional and free time to study birds on their flight along the eastern European flyway within the SEEN activity. We were supported very much by both managers and rangers of visited protected areas. A number of them started with professional ornithological education and reached the status of licensed ringers. These are potentially people that will be further active in bird ringing in Egypt. The very special thanks are to Dr Mohamed Fouda, who supported our work constantly and effectively – without his help the work would be probably impossible. We hope very much that the idea of the long term studies of the bird migration in Egypt will be alive for a long time. We thanks a lot to Dr Agnieszka

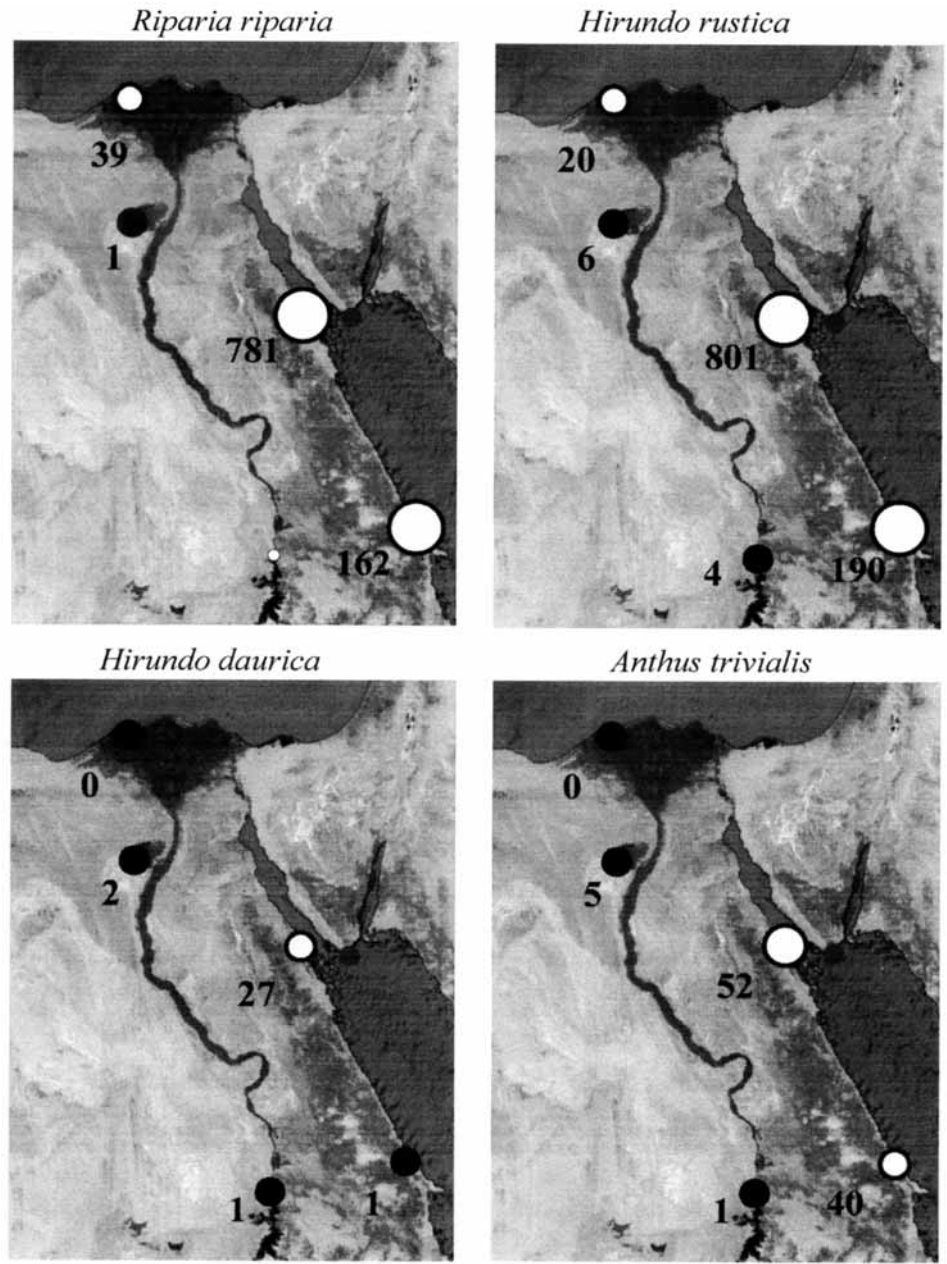
Ożarowska for her valuable help during the whole process of evaluating data and preparing the paper.

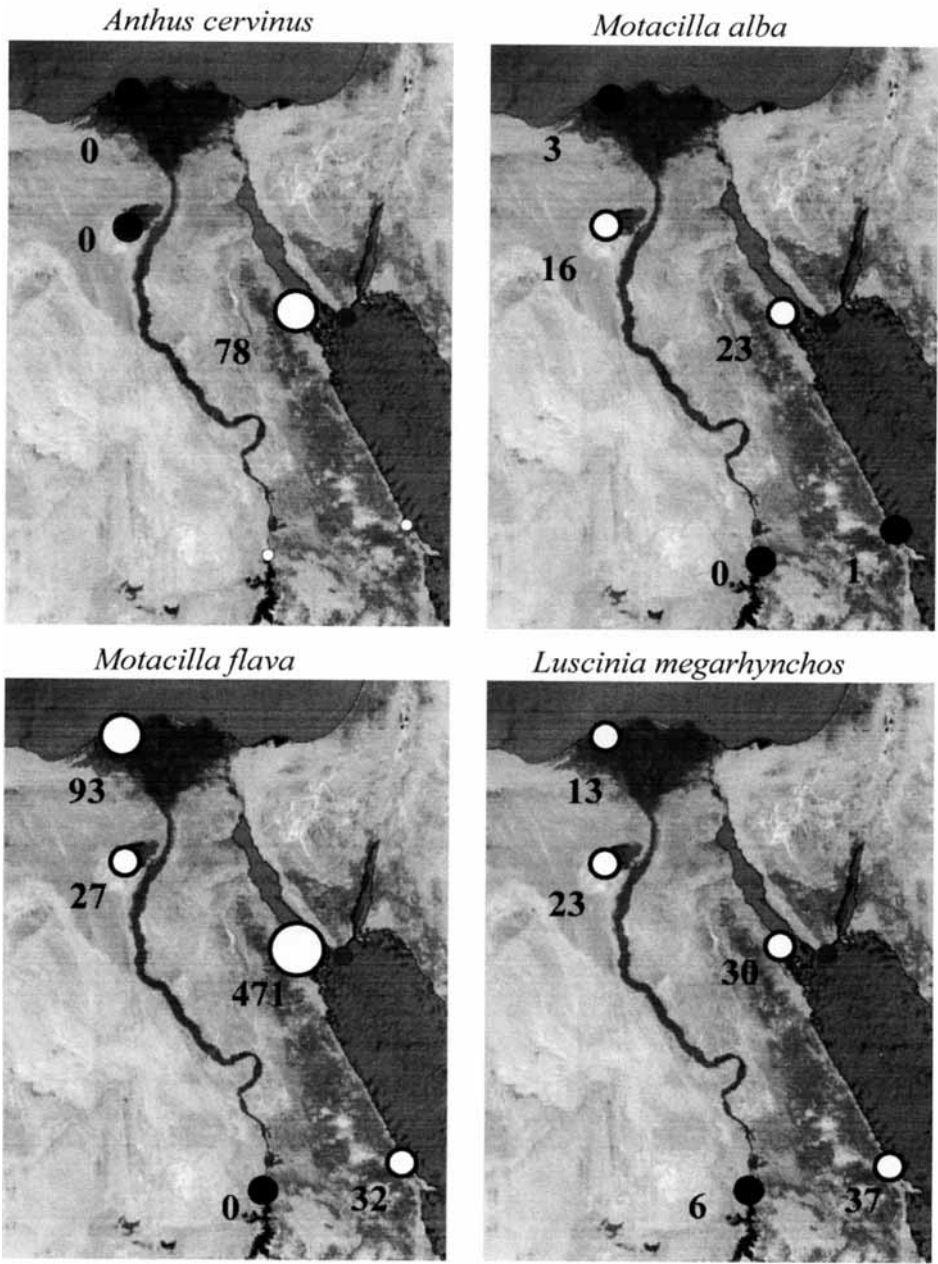
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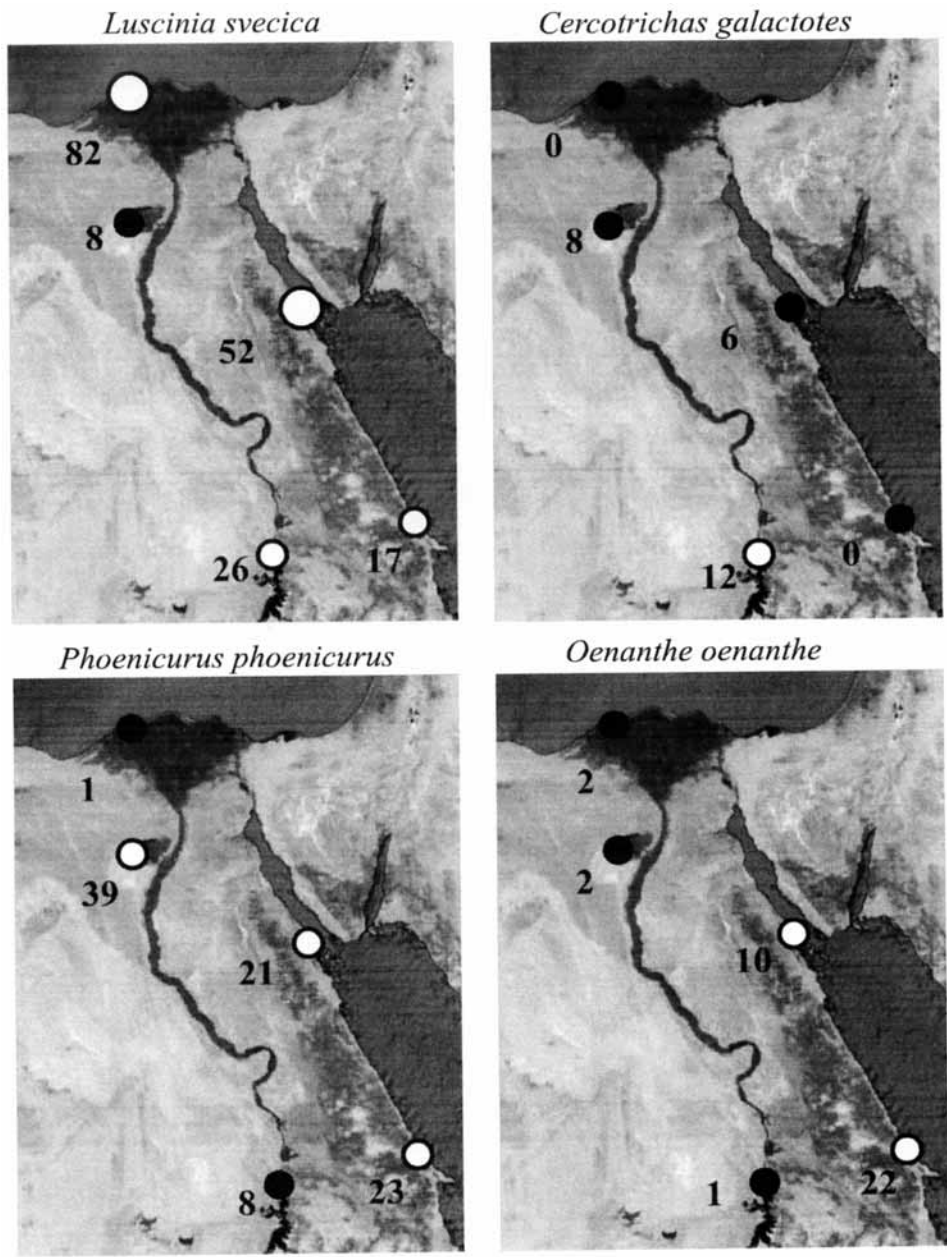
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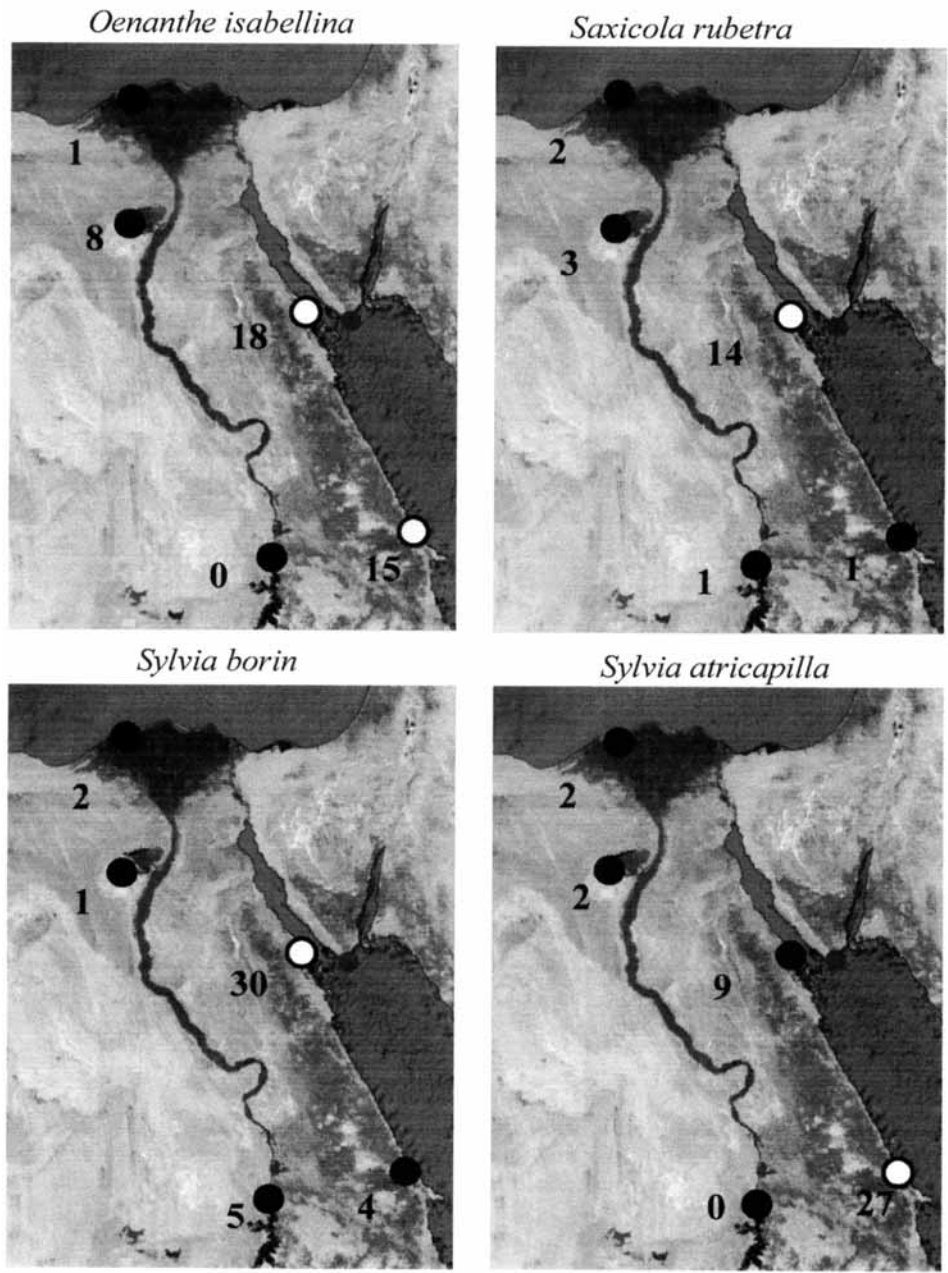
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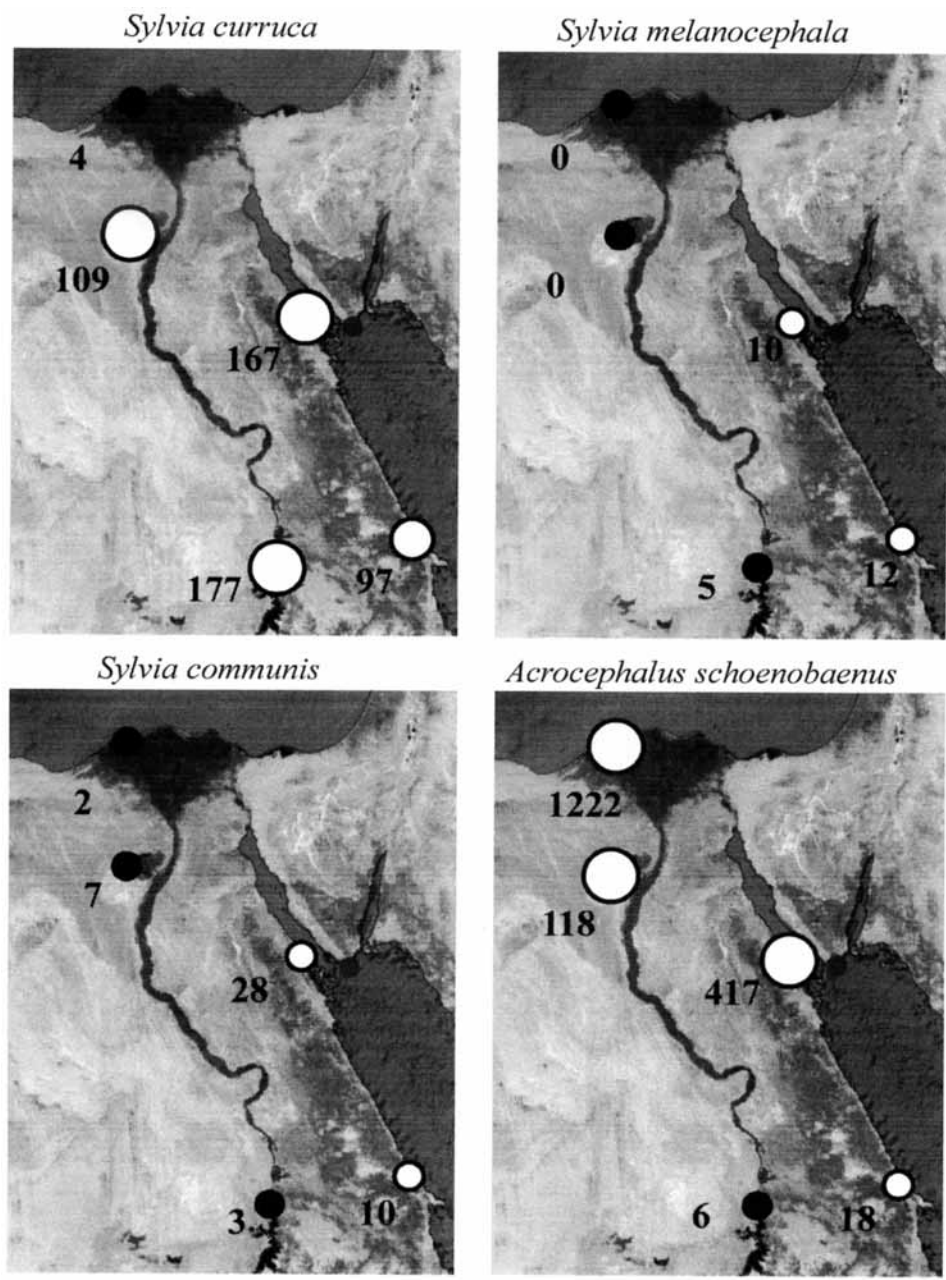
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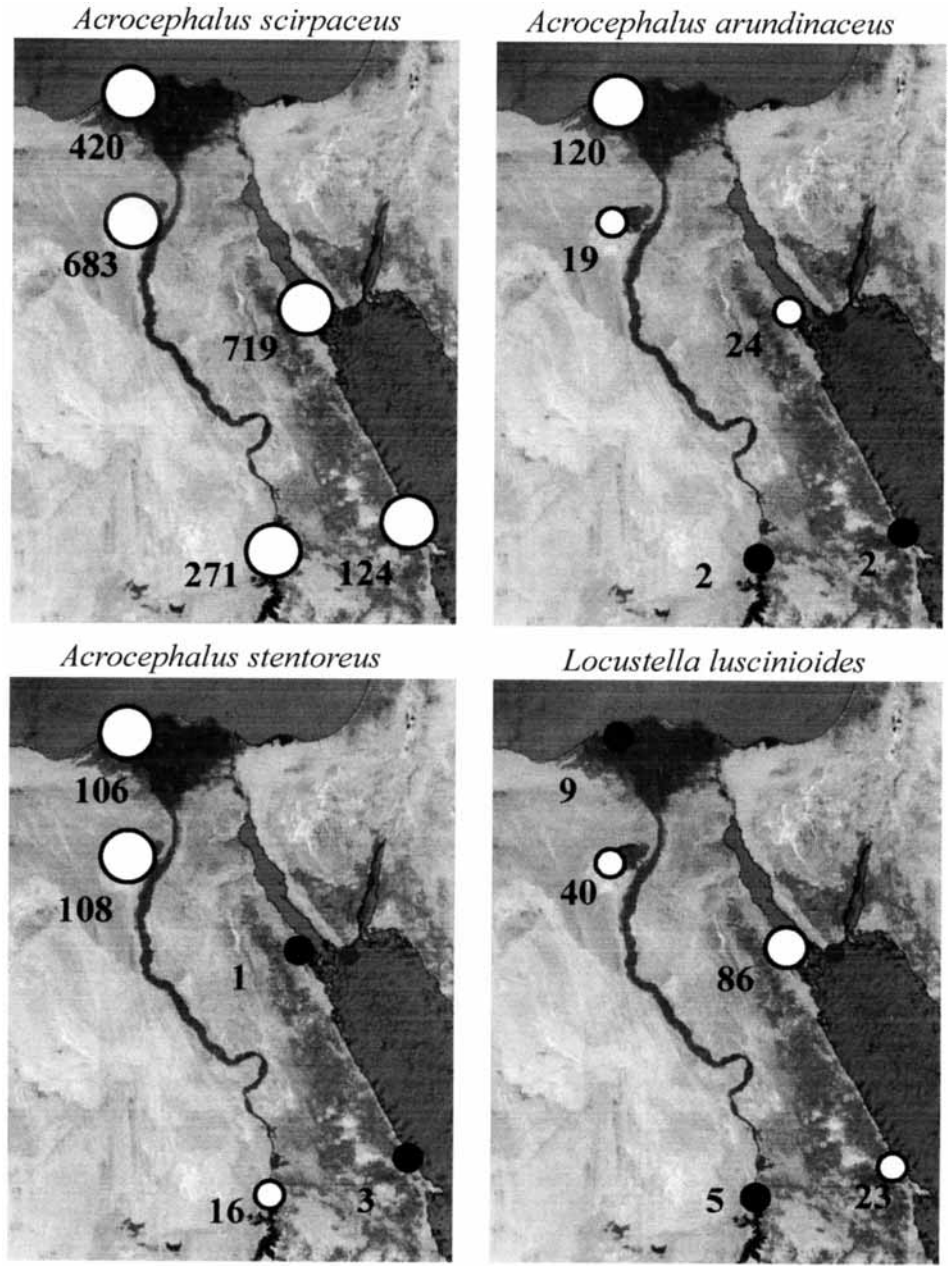


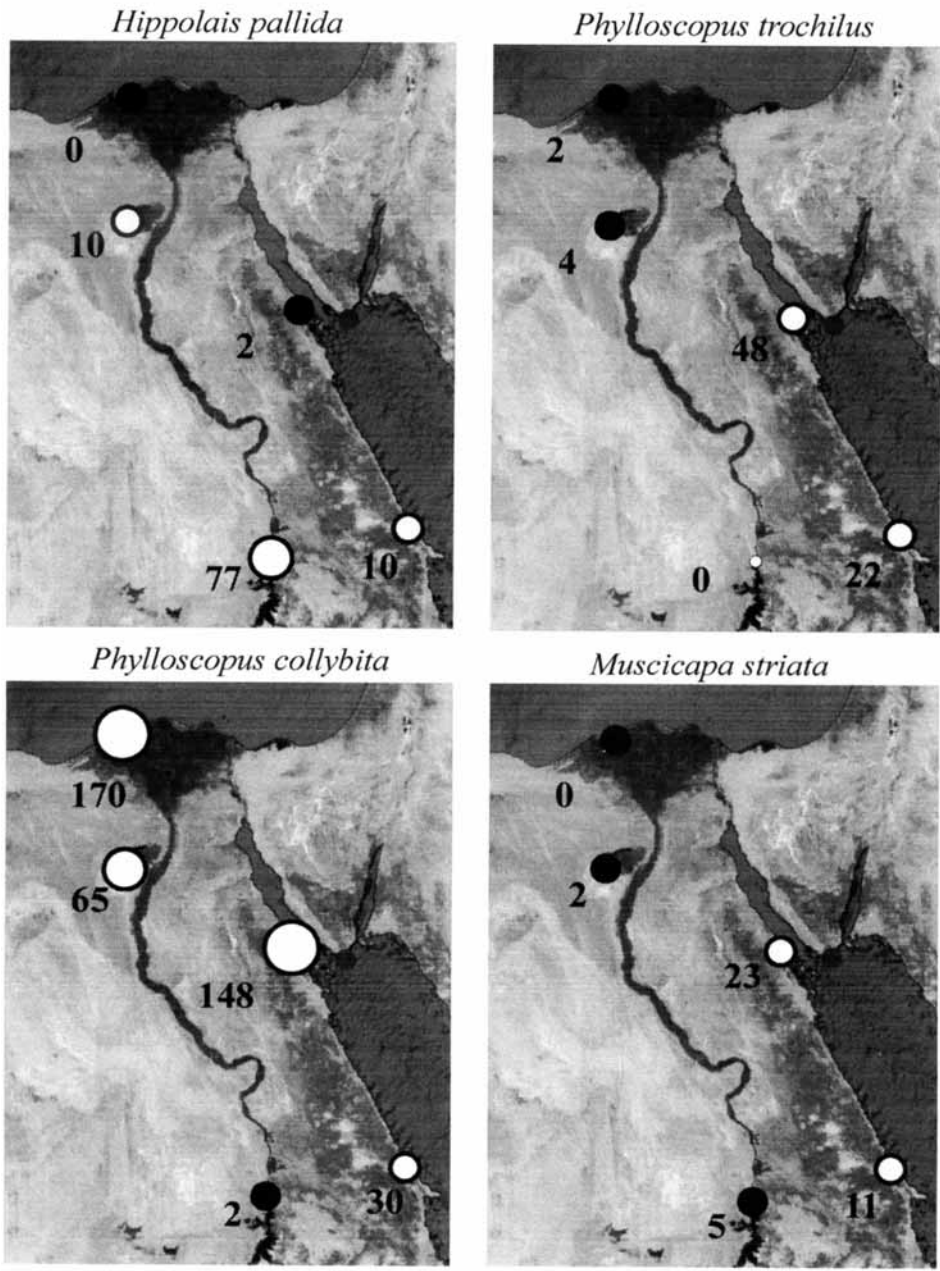






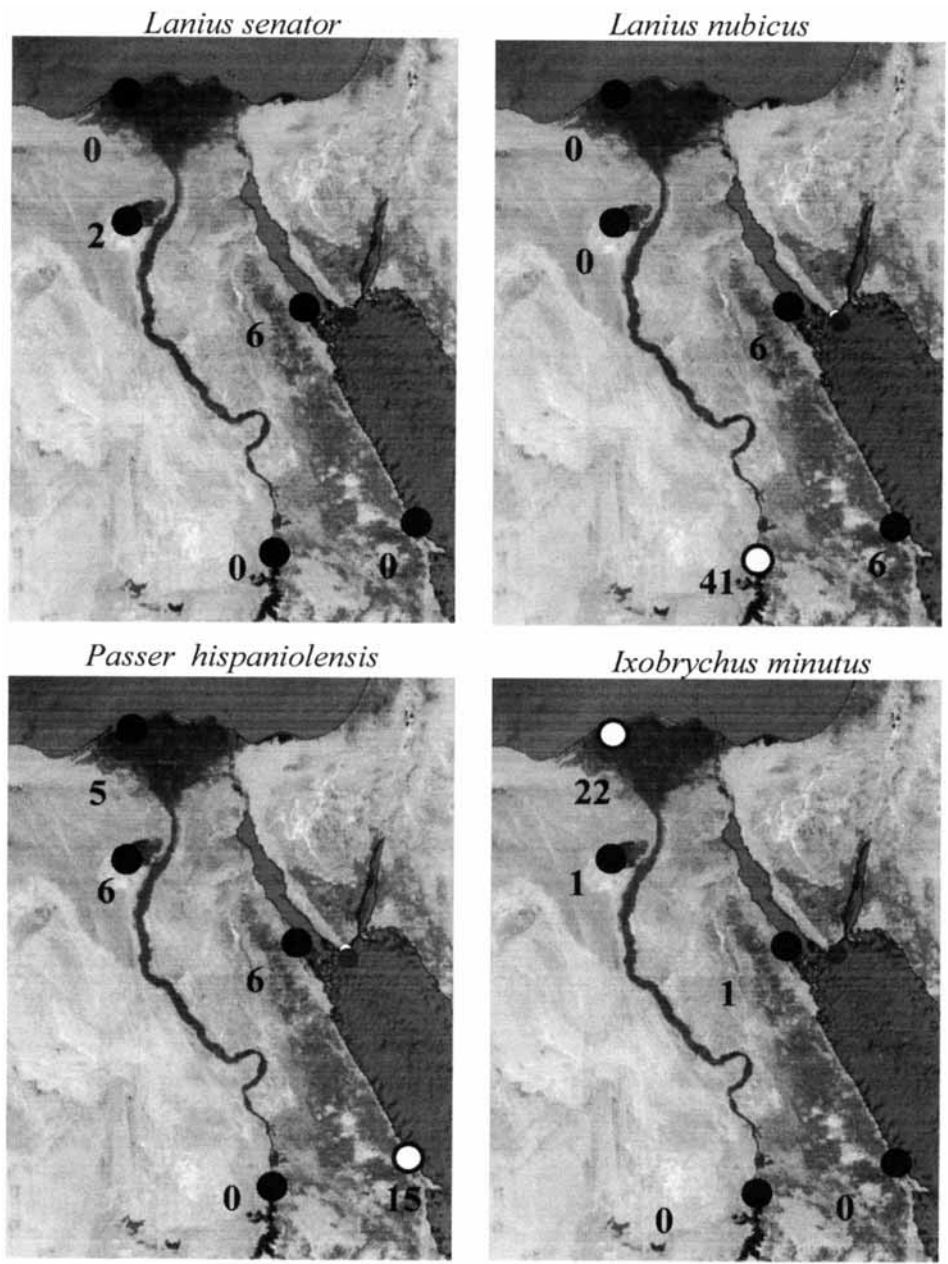


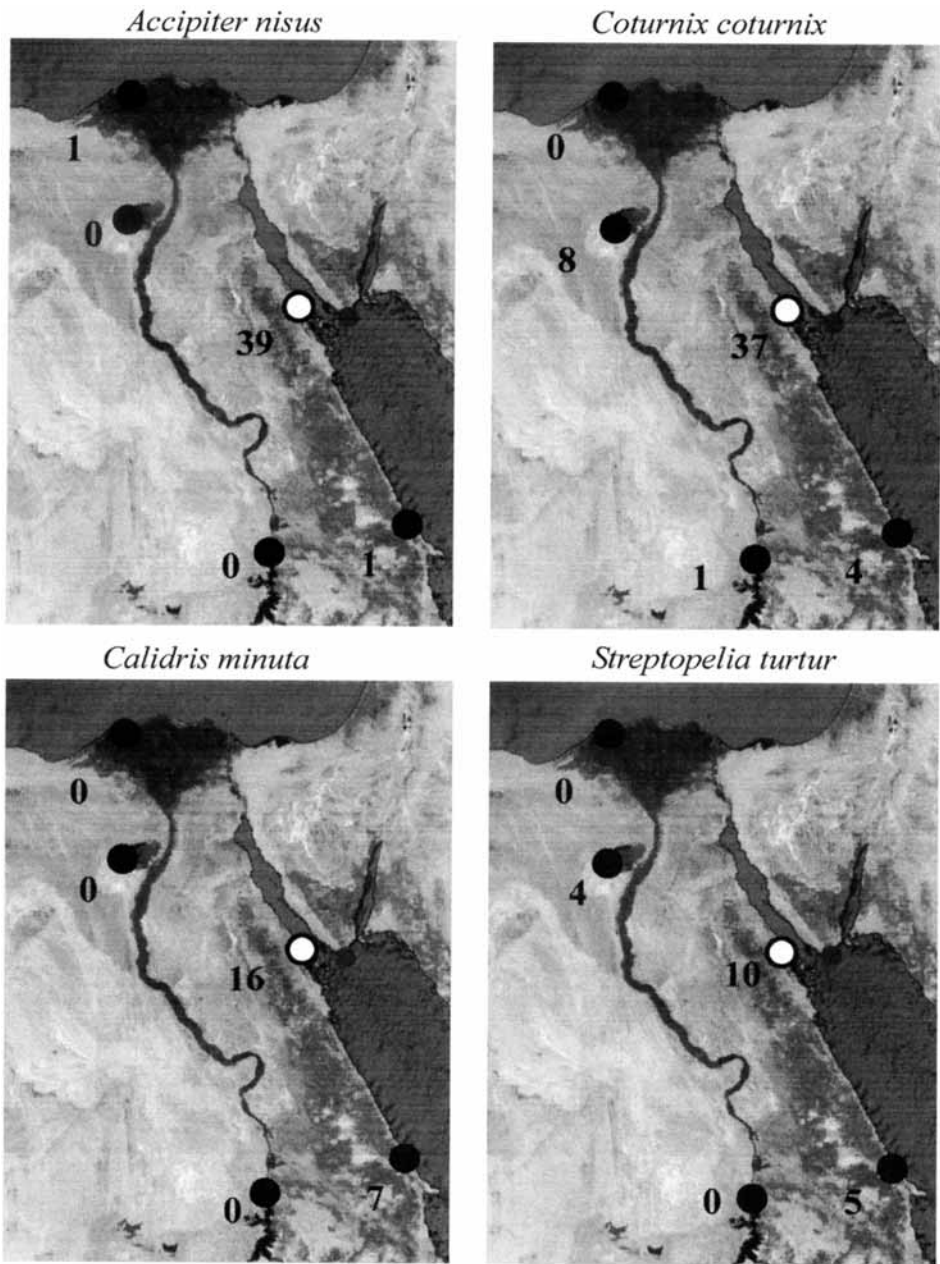


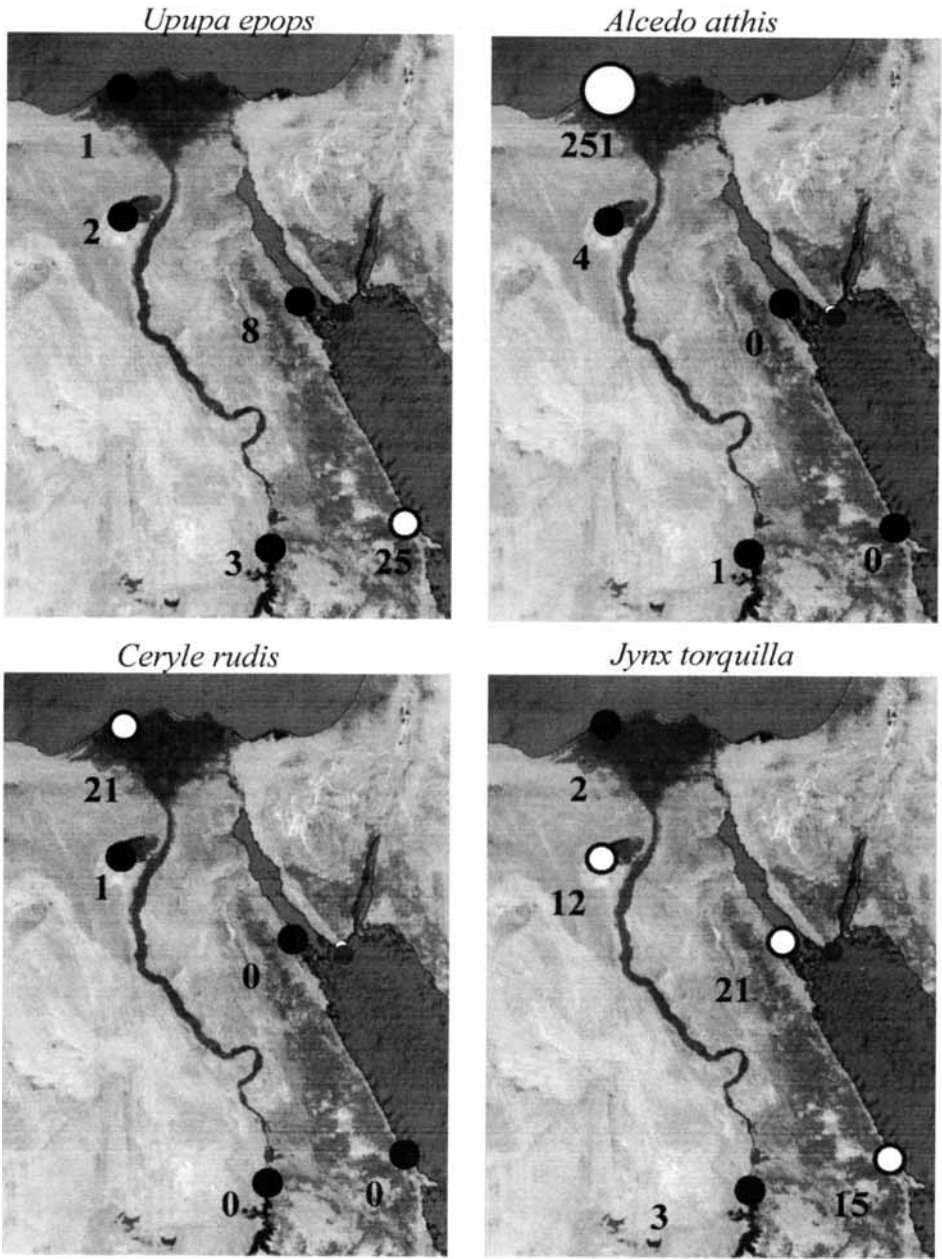


APPENDIX I – Spring distribution maps

SMap. 8



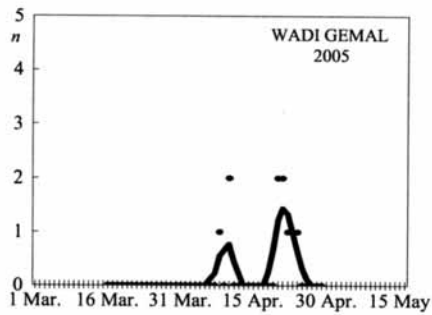
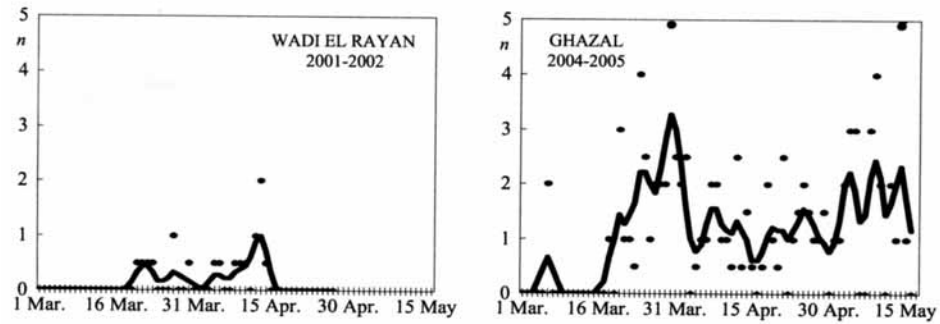




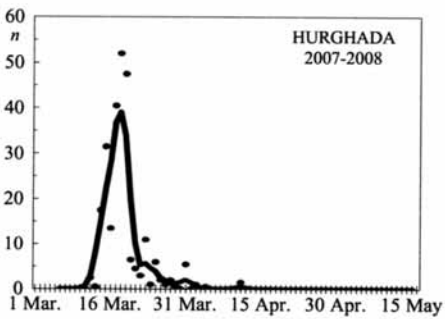
APPENDIX I – Spring migration dynamics

SDyn. 1

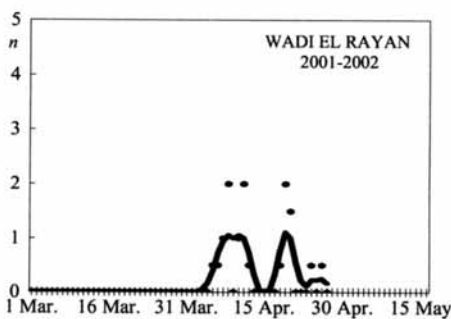
Hippolais pallida

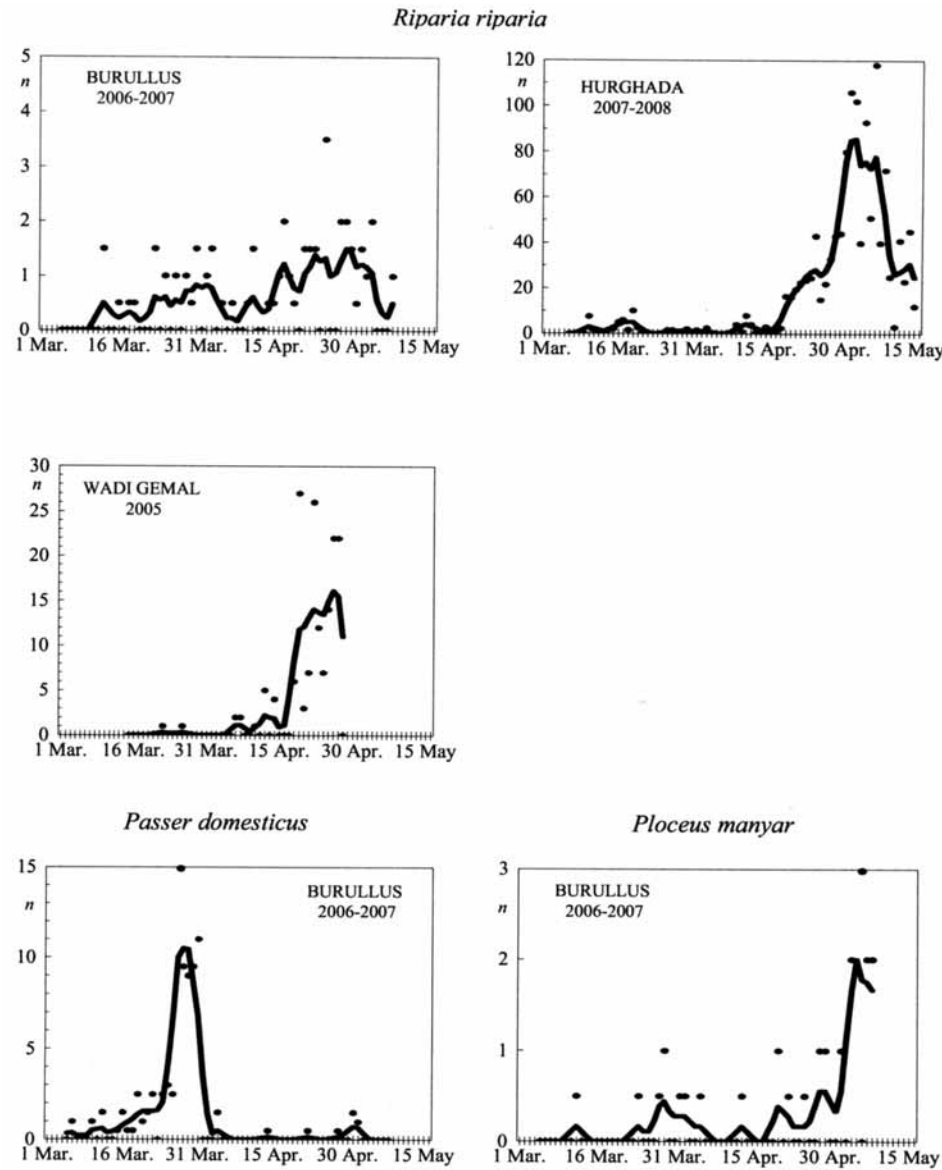


Calandrella brachydactyla

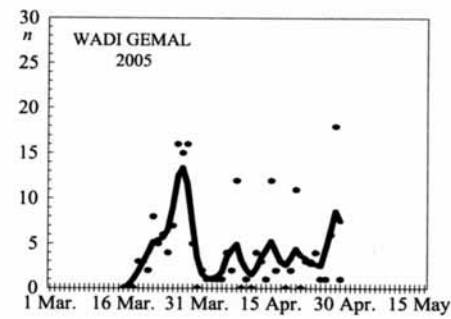
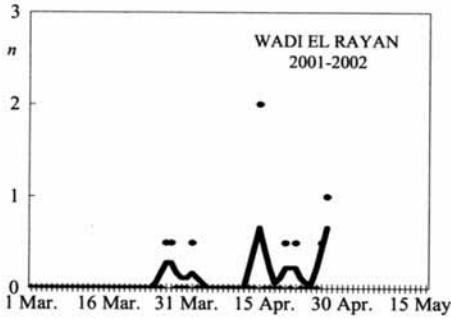
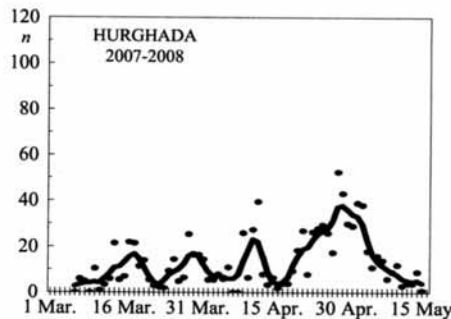
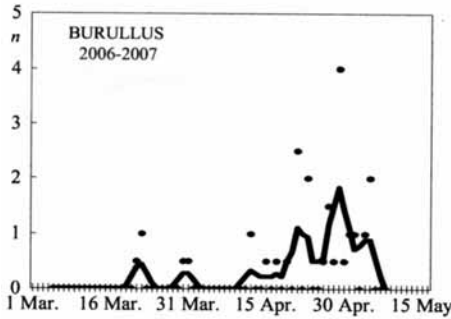


Ficedula albicollis

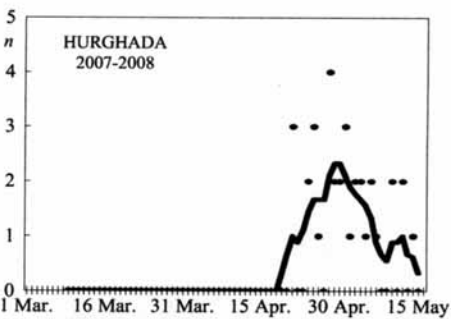
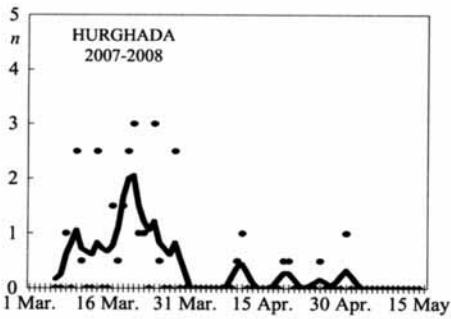




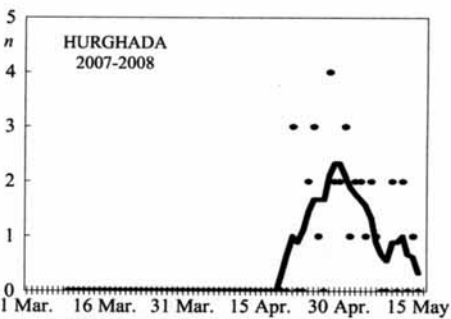
Hirundo rustica

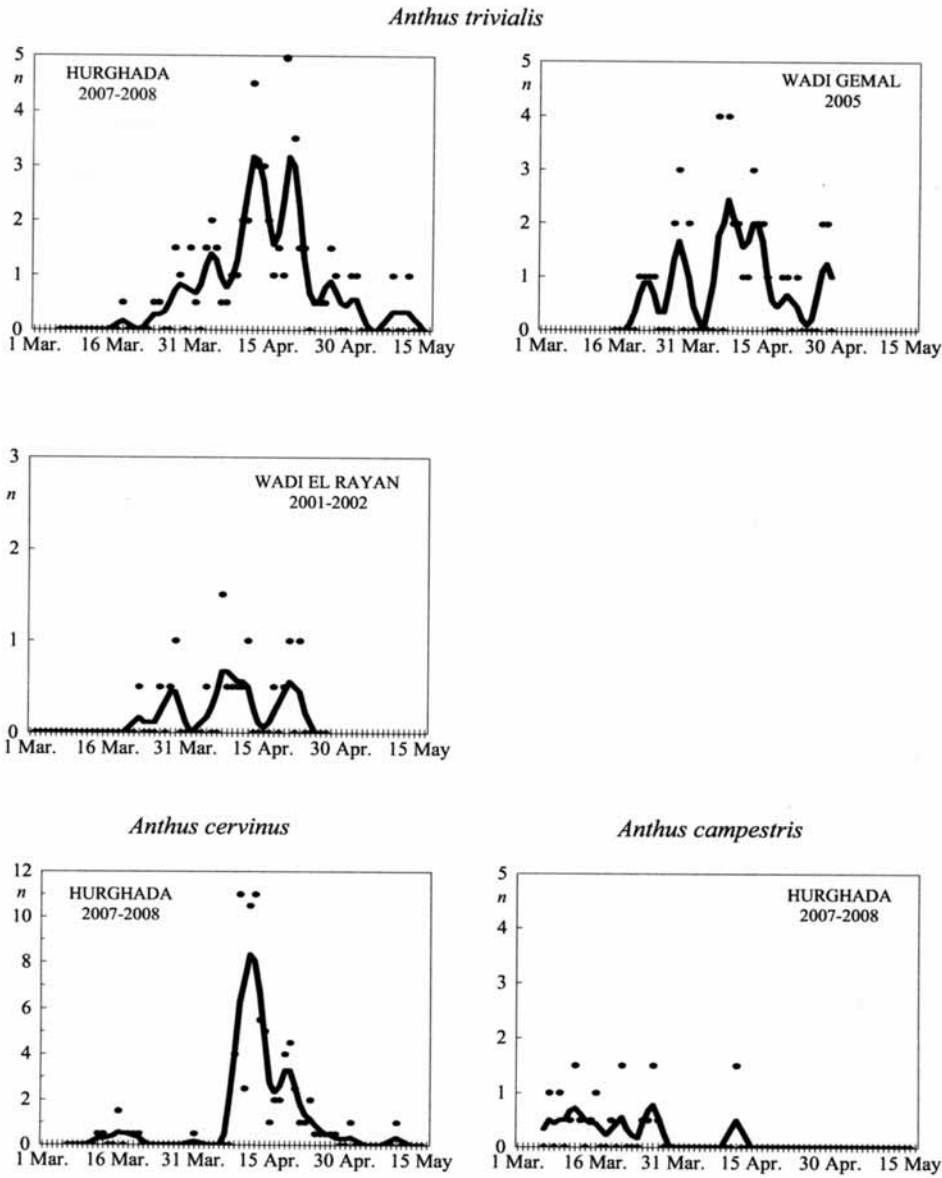


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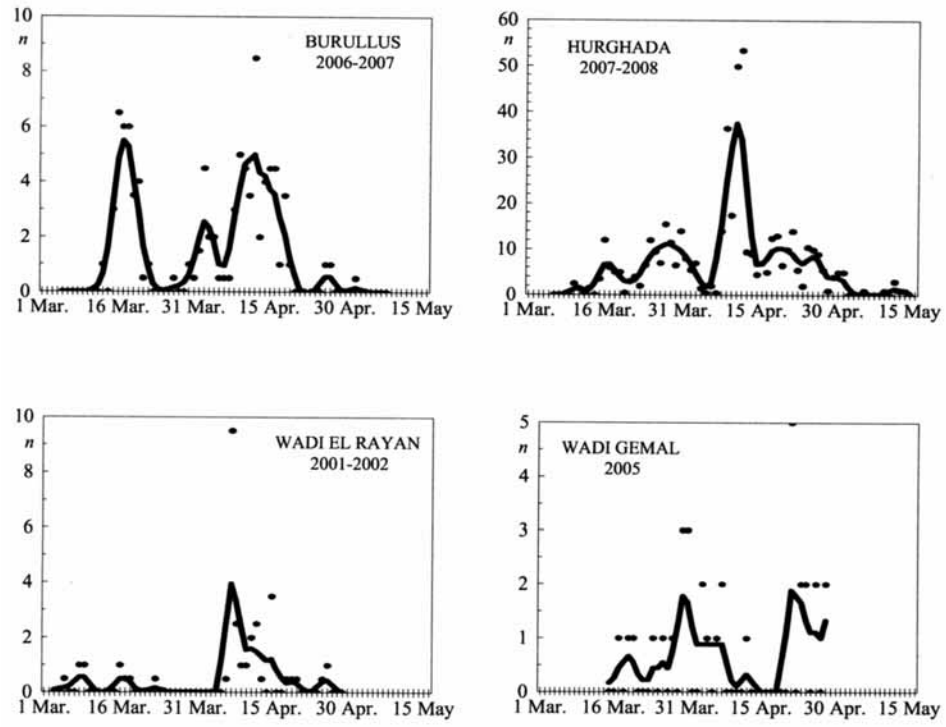


Delichon urbica

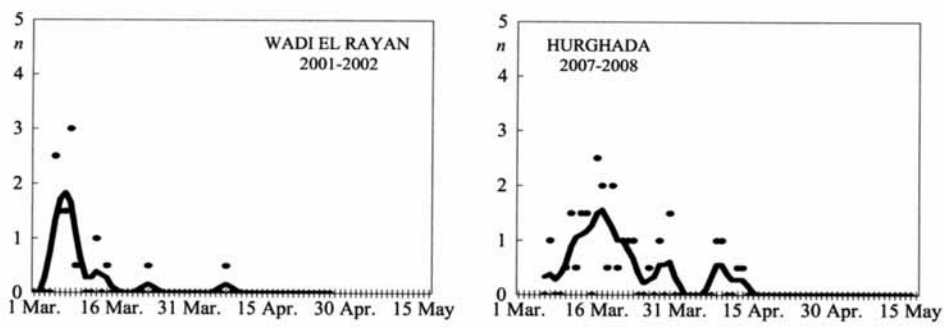


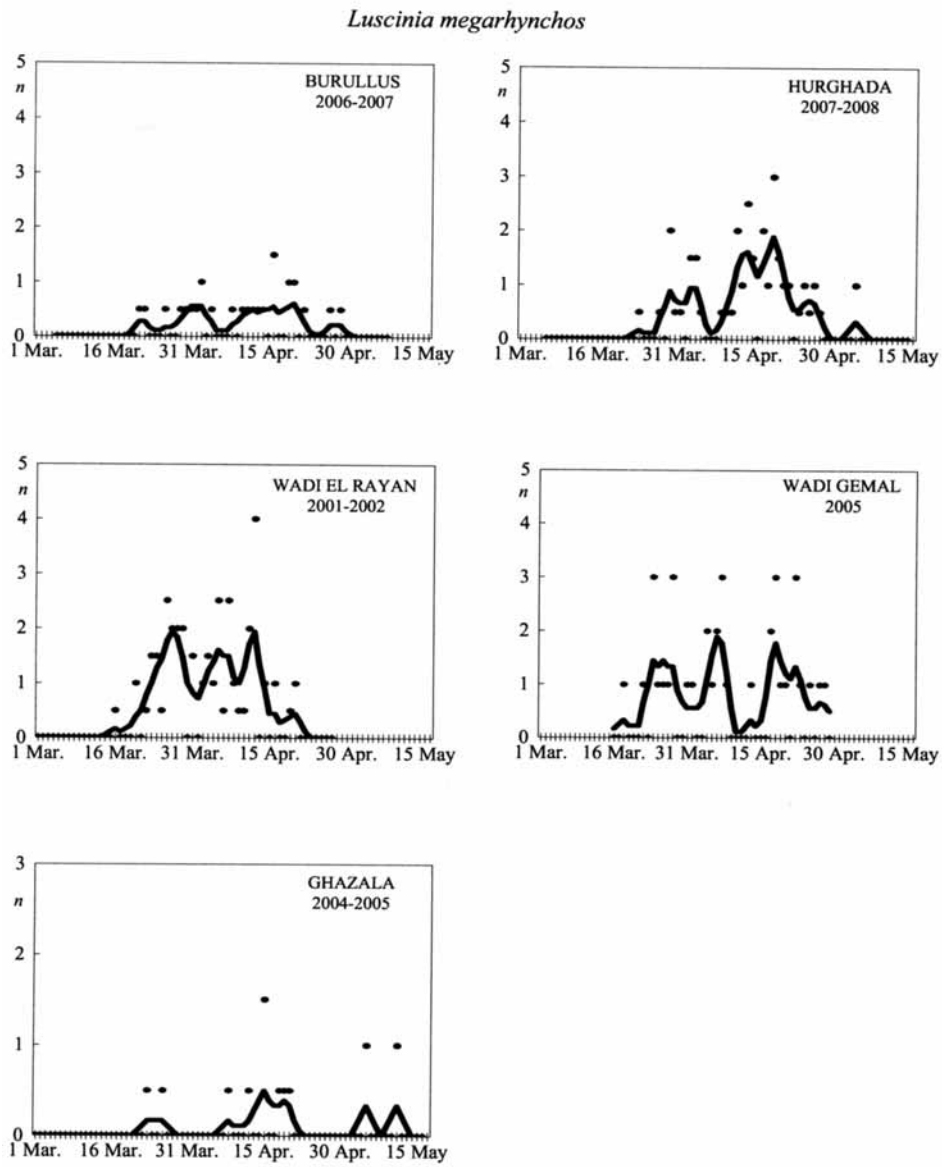


Motacilla flava

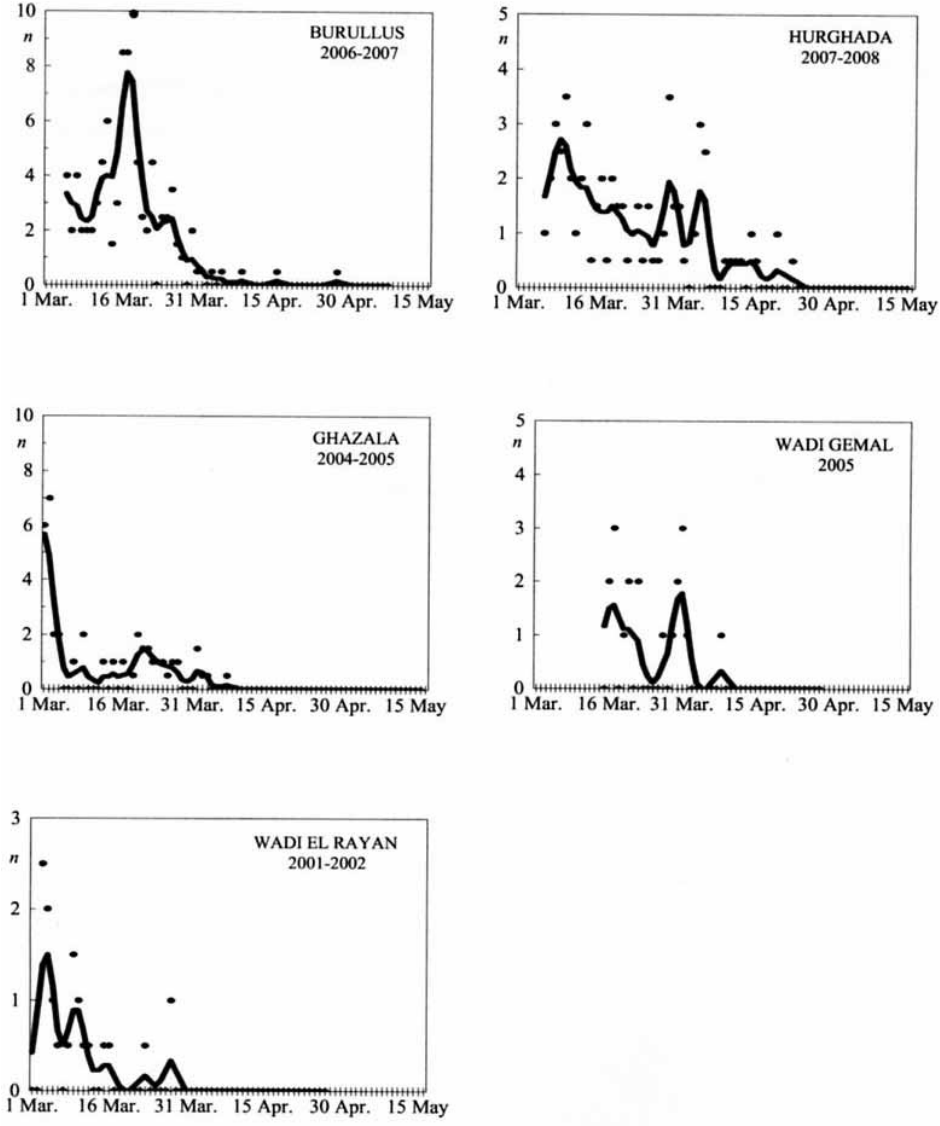


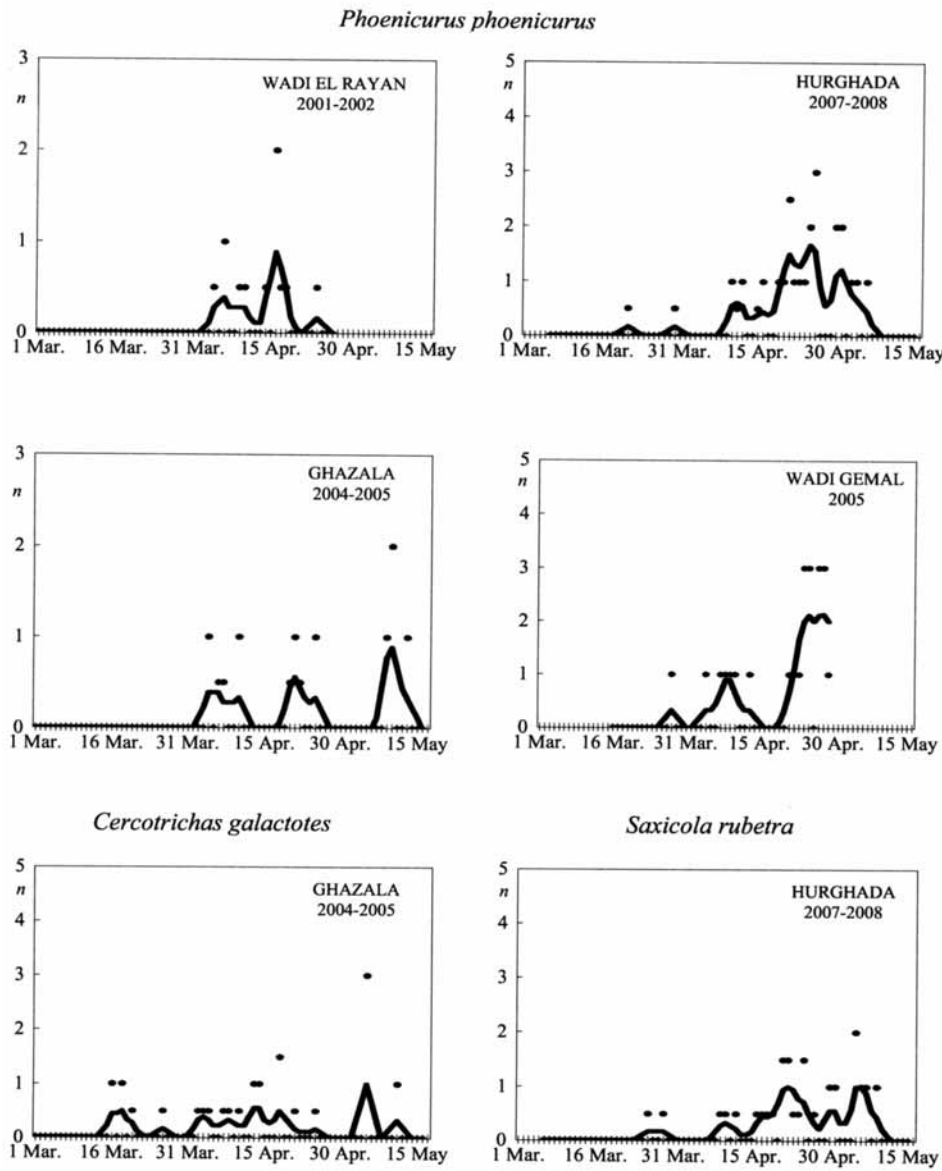
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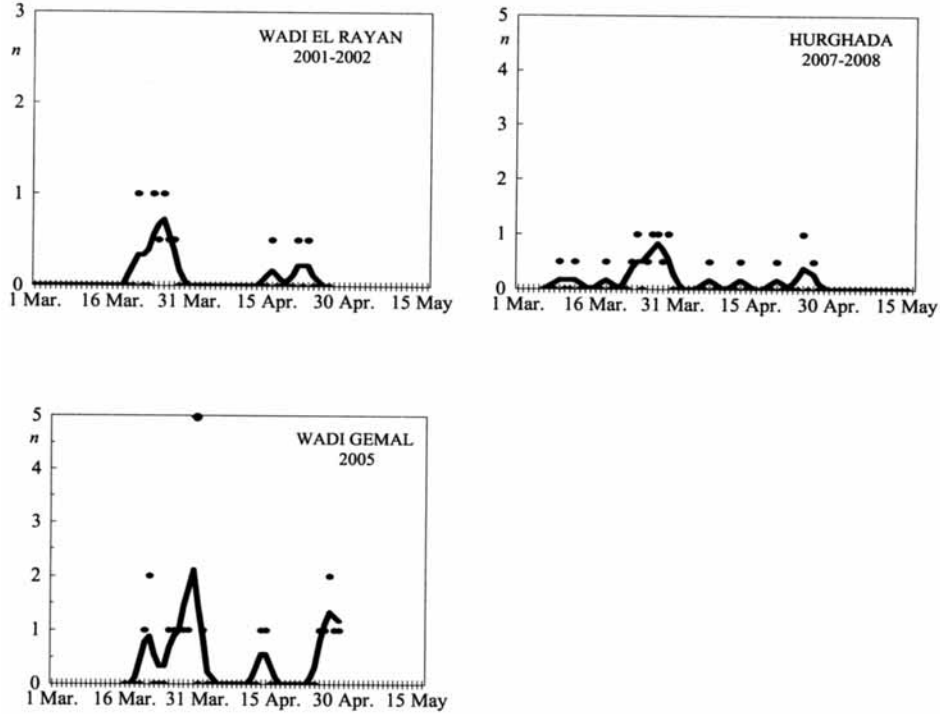


Luscinia svecica

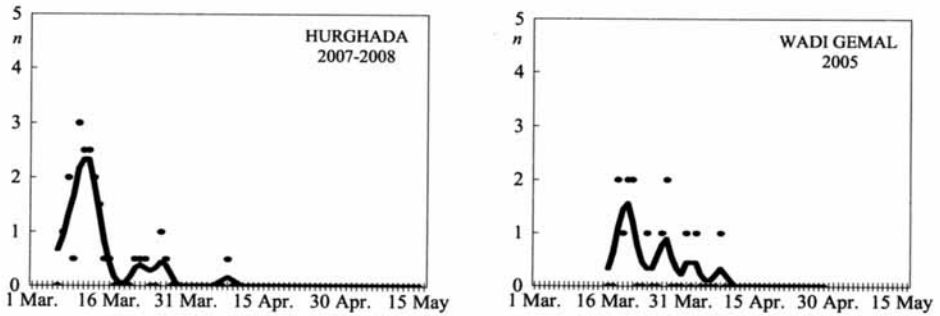


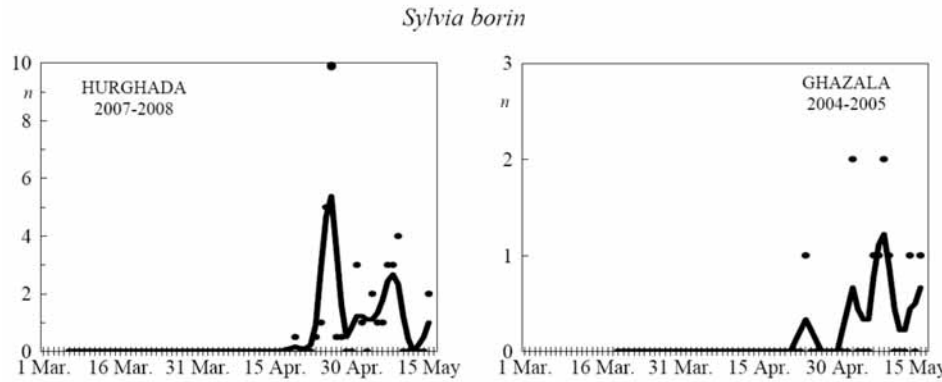
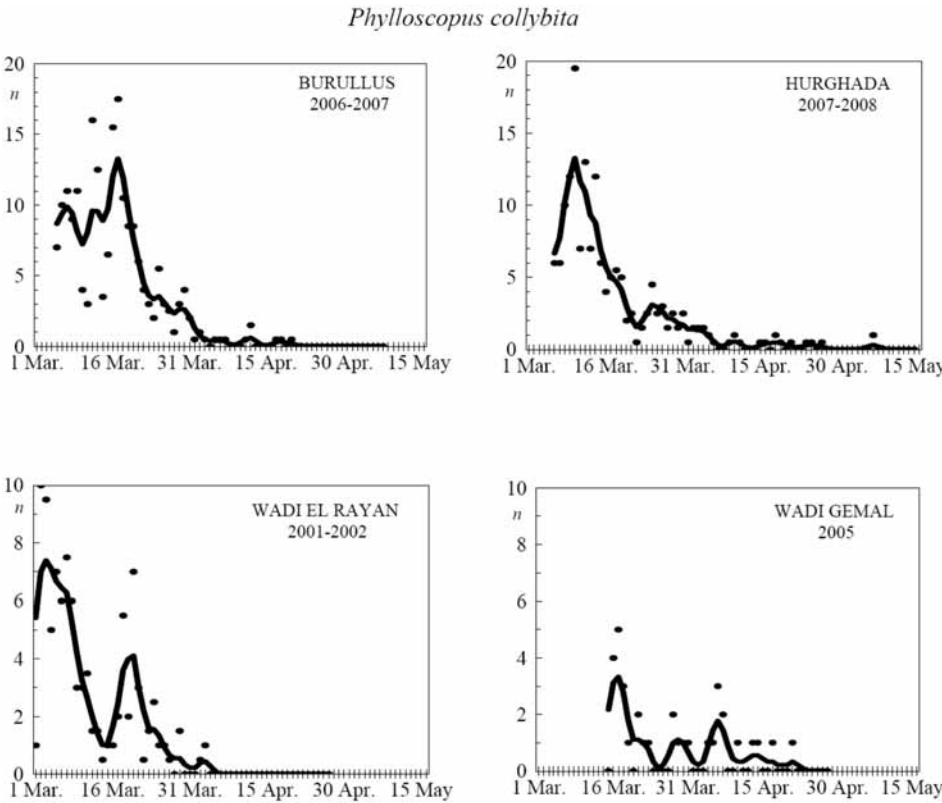


Oenanthe oenanthe

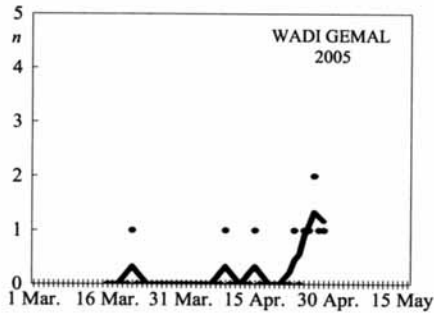
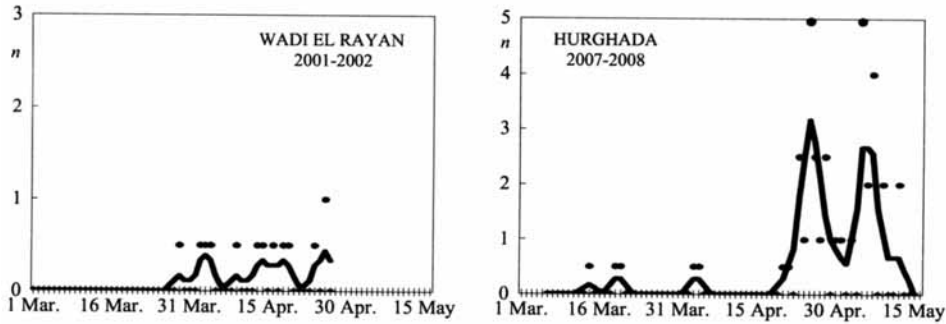


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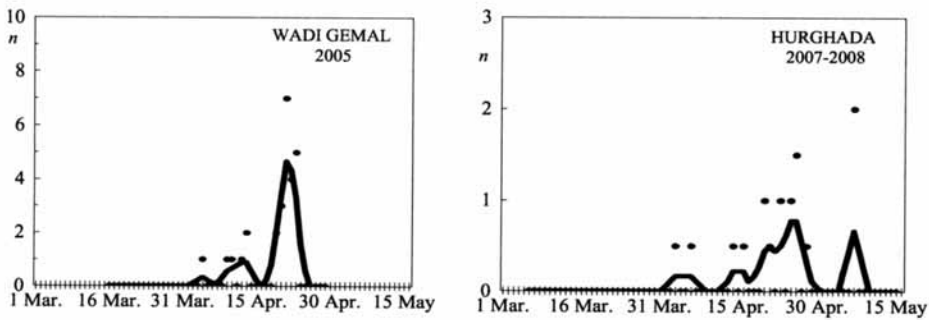


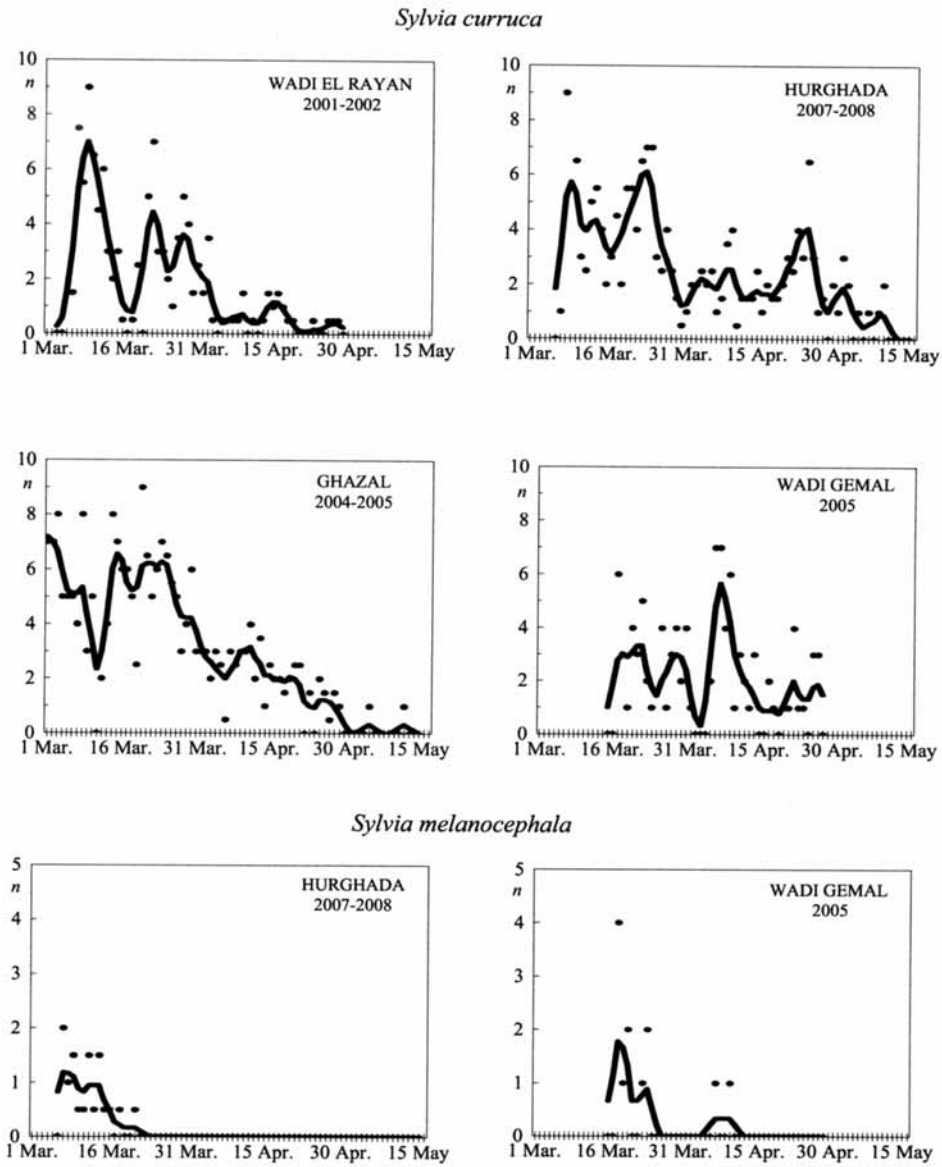


Sylvia communis

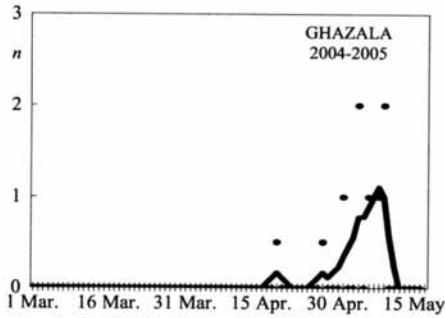
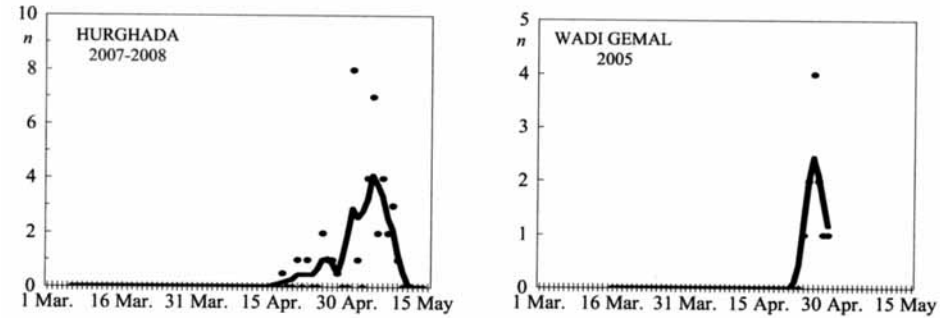


Sylvia atricapilla

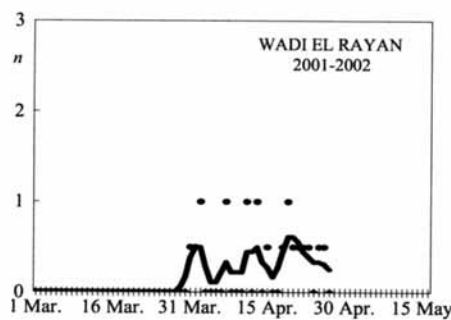




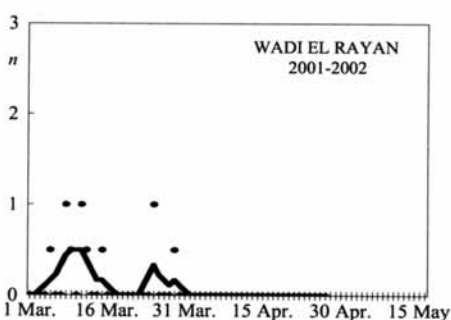
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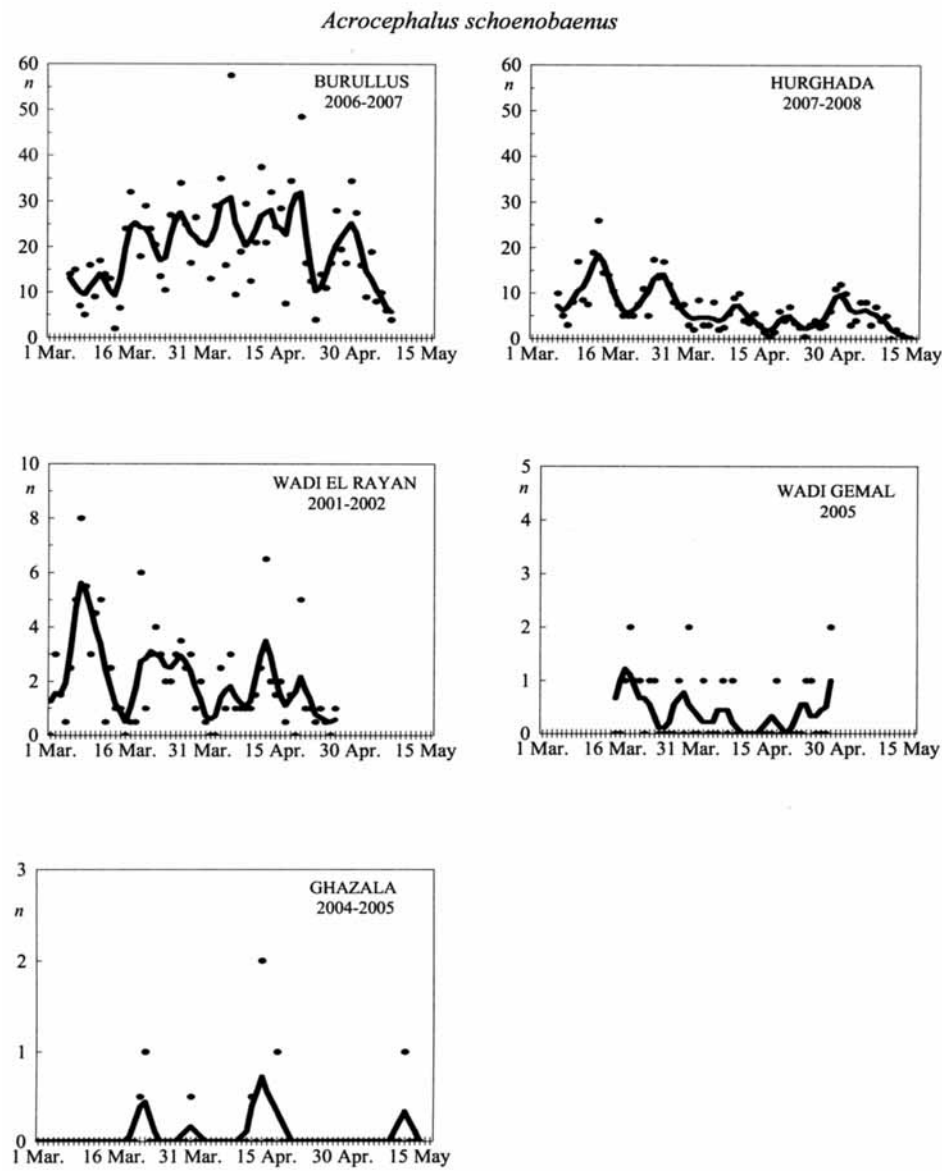


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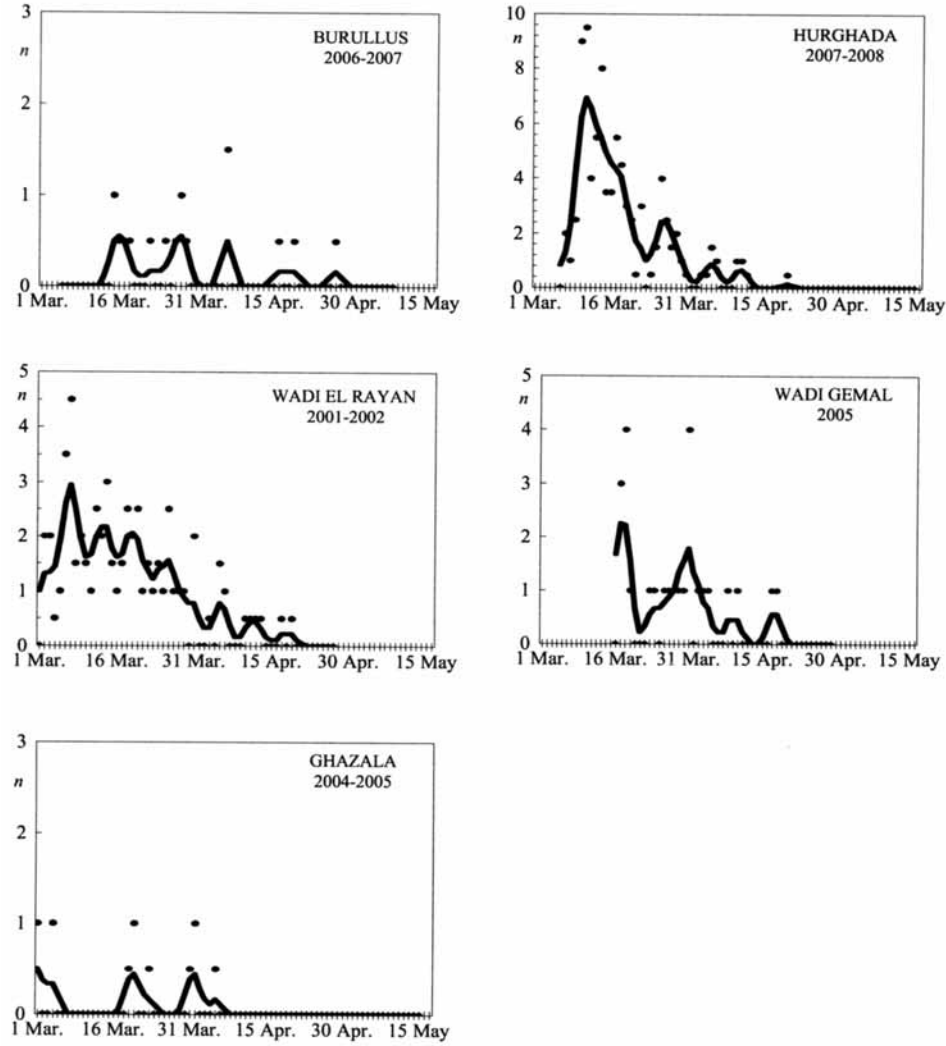


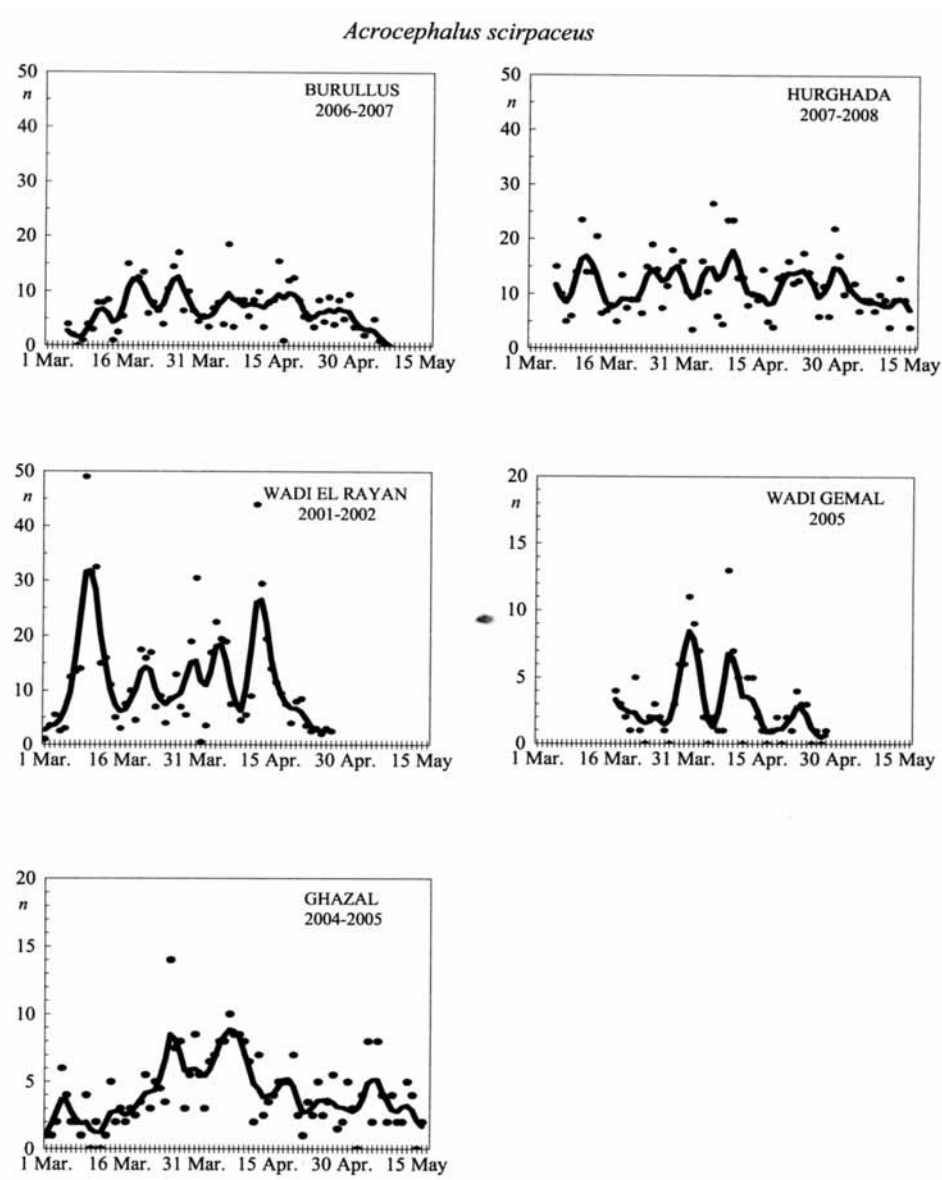
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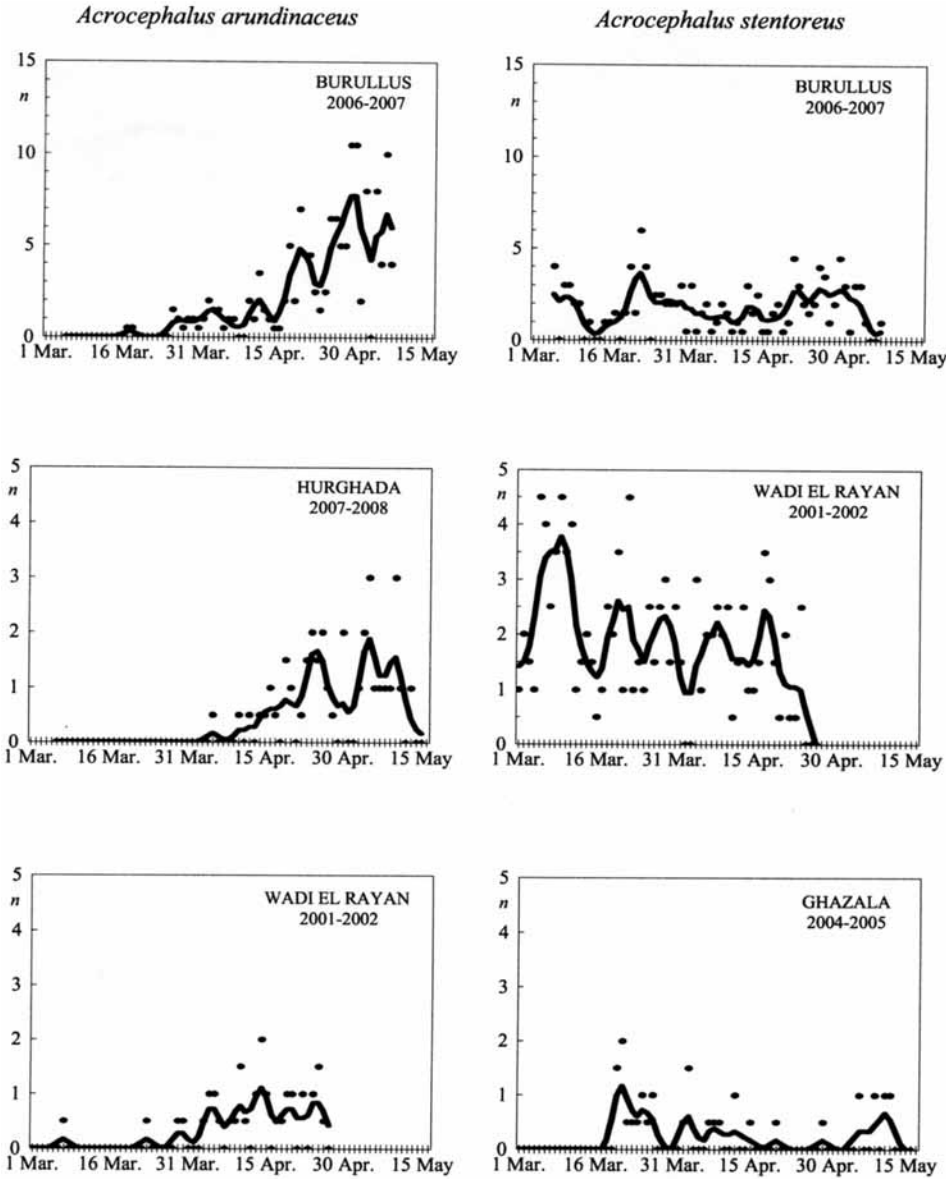


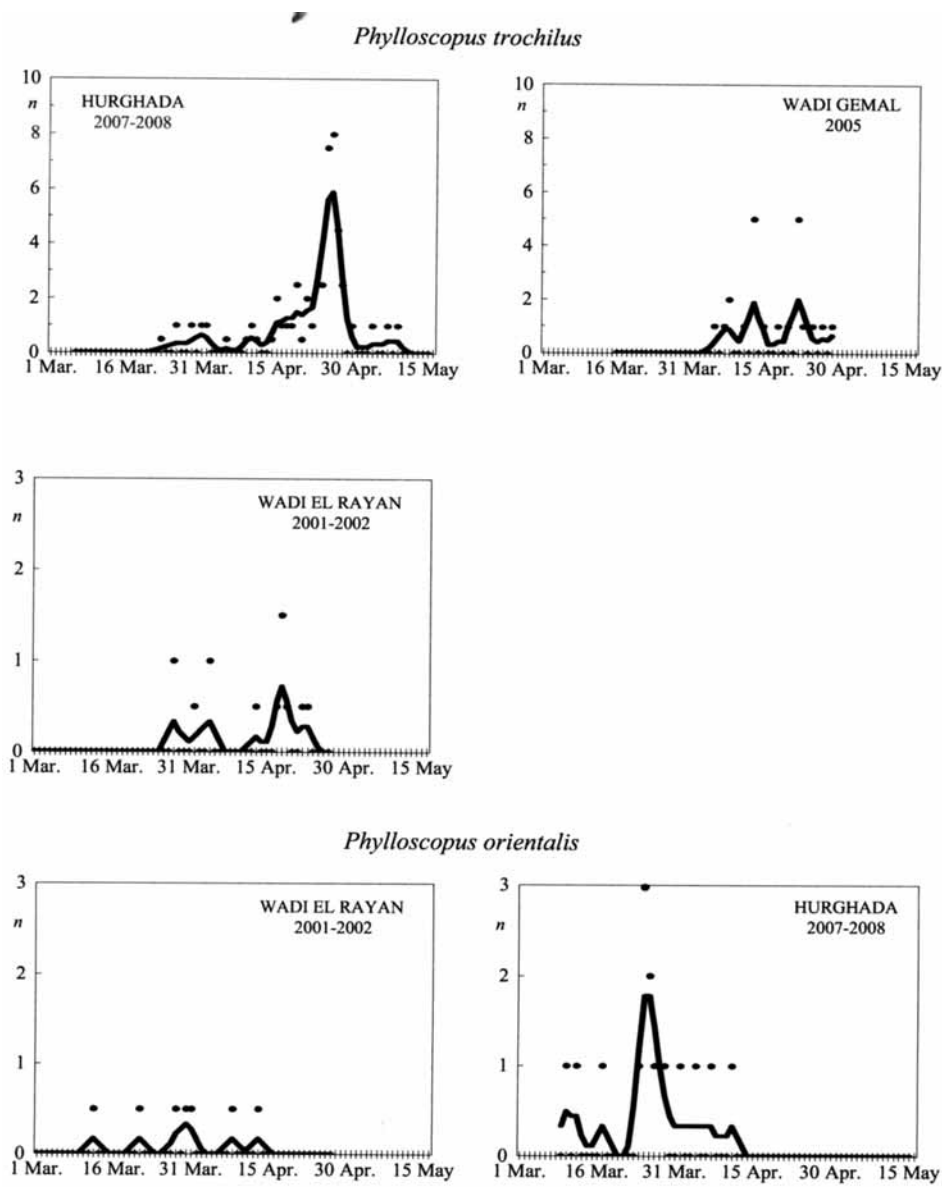


Locustella luscinioides

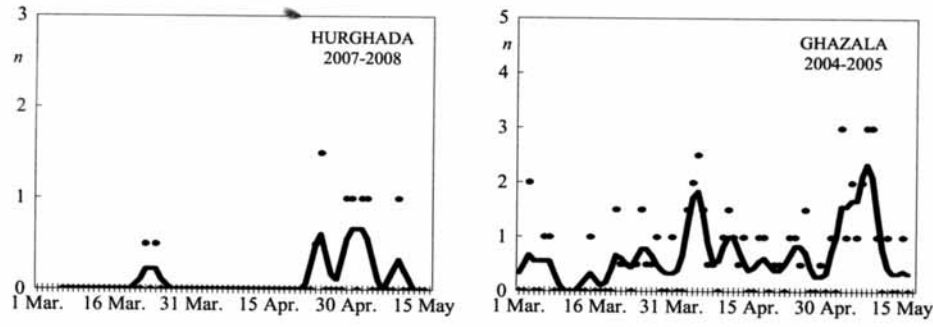




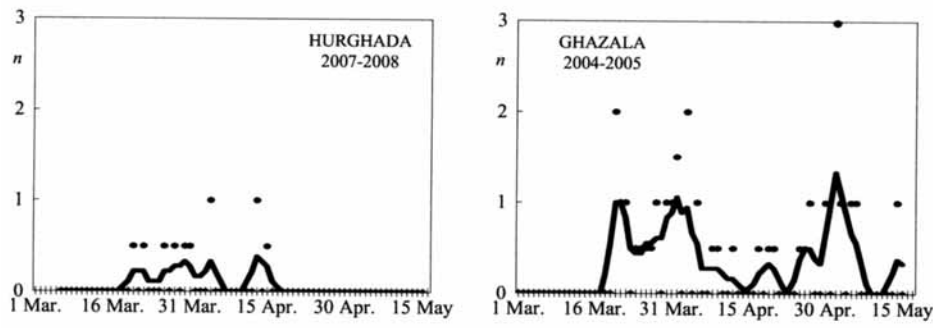




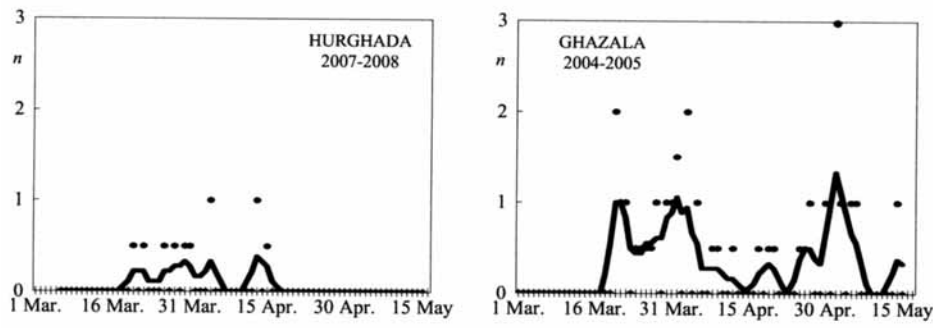
Lanius nubicus



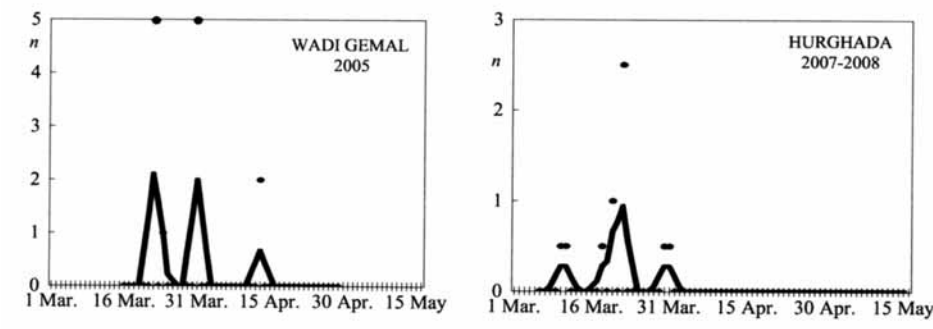
Lanius senator

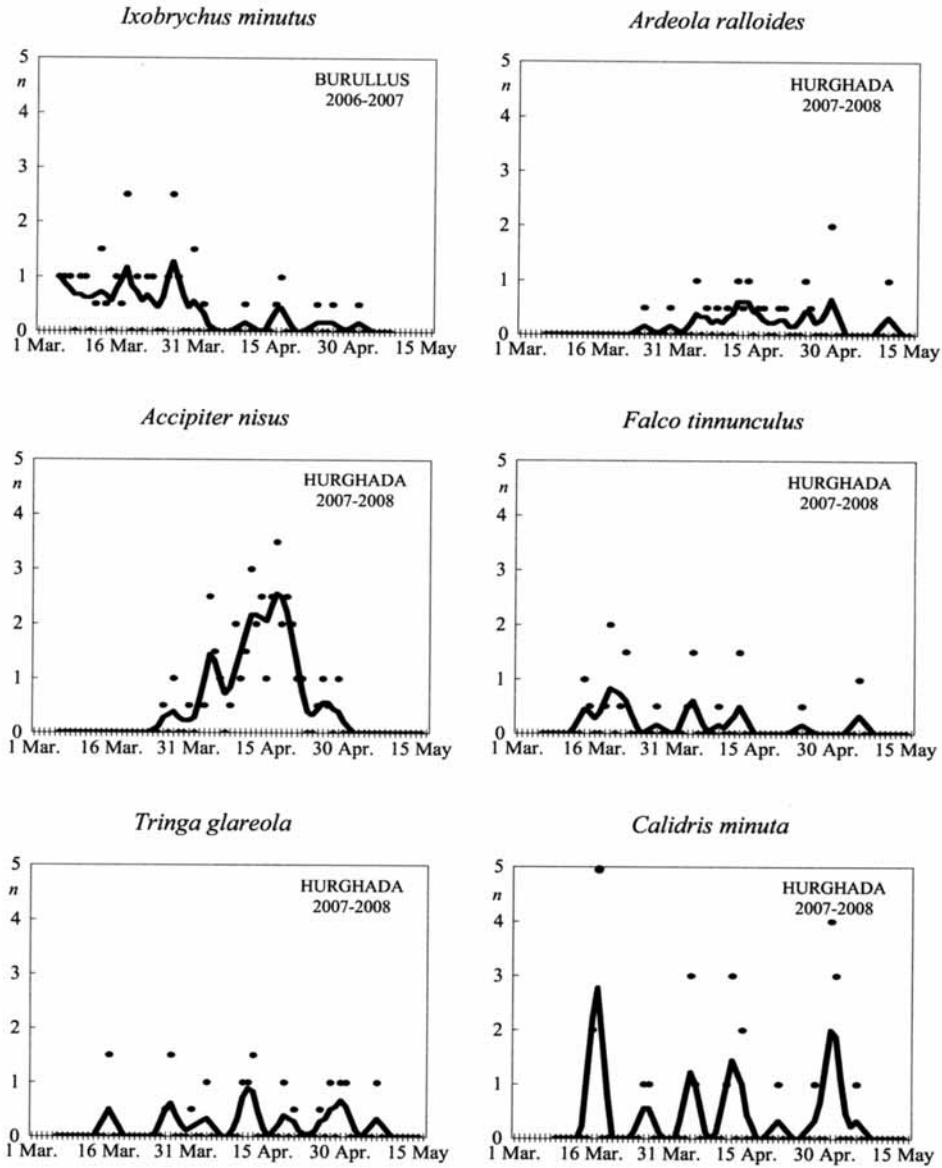


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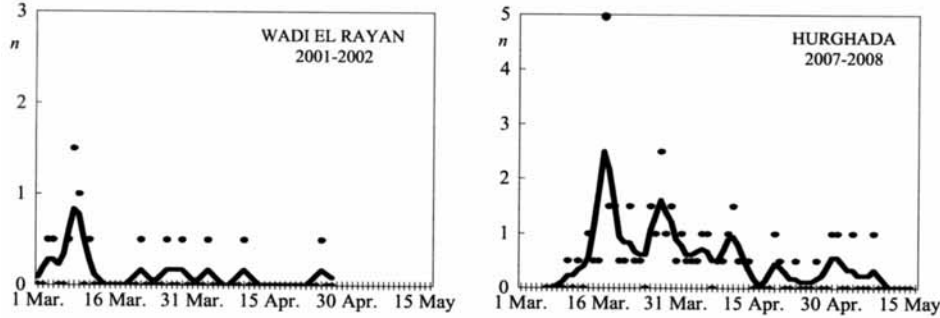


Passer hispaniolensis

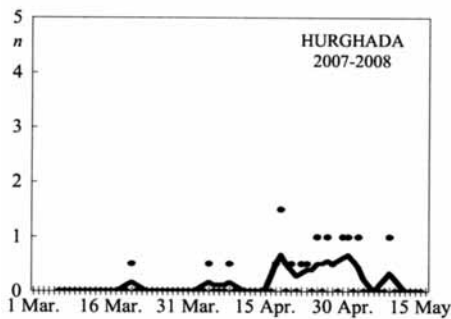




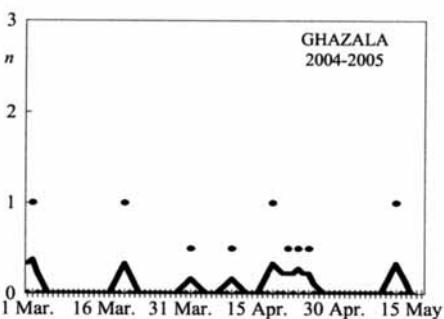
Coturnix coturnix



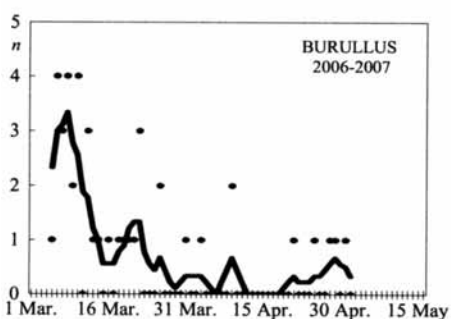
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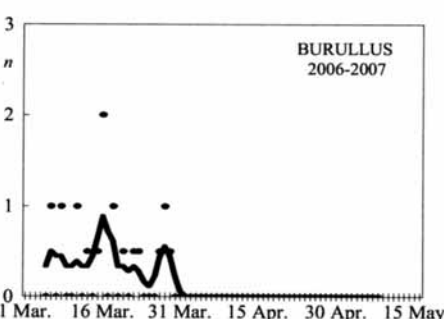
Streptopelia senegalensis

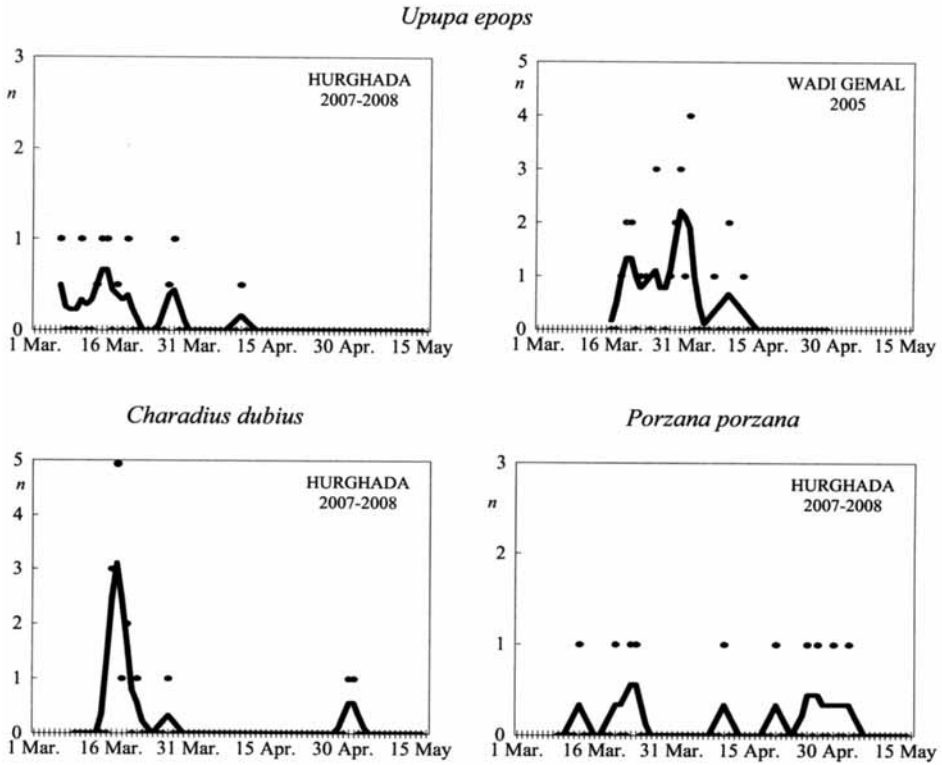


Ceryle rudis

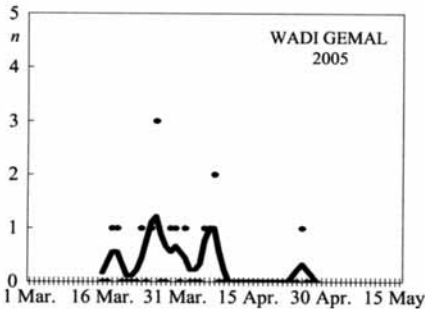
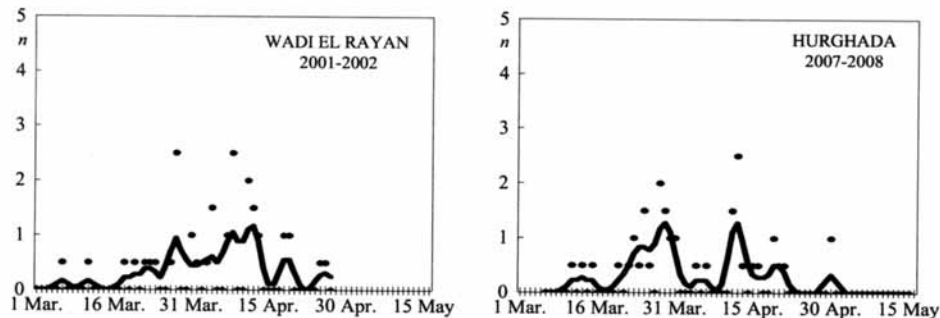


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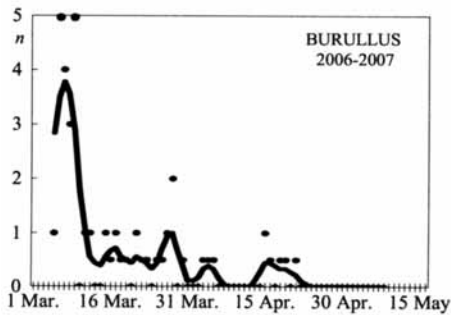




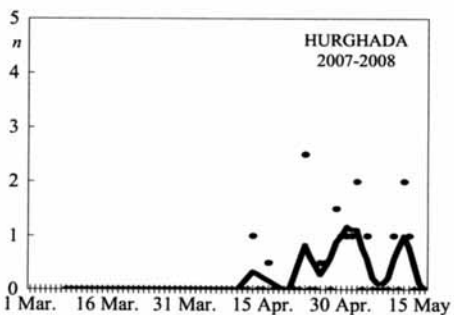
Jynx torquilla



Alcedo atthis

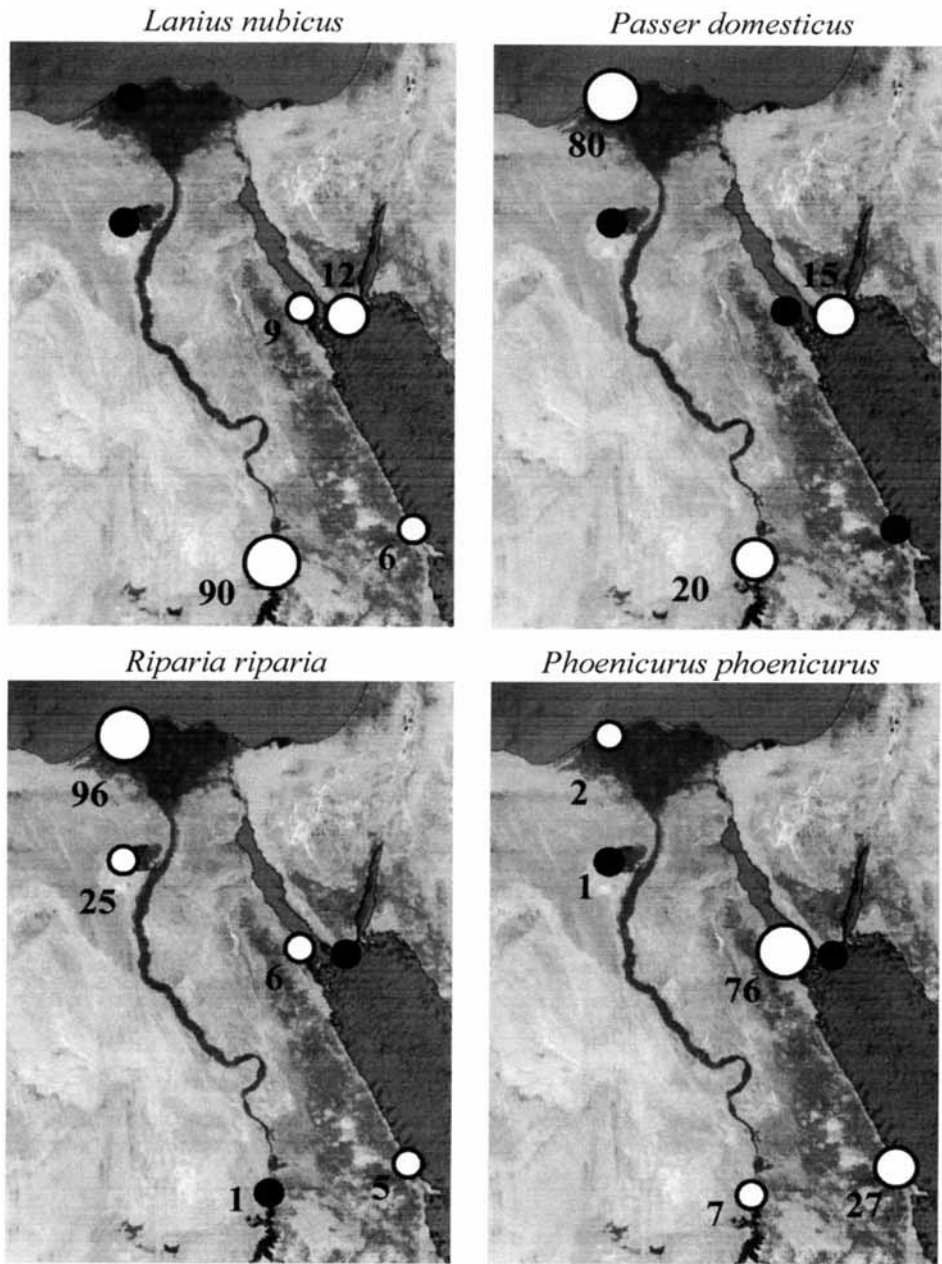


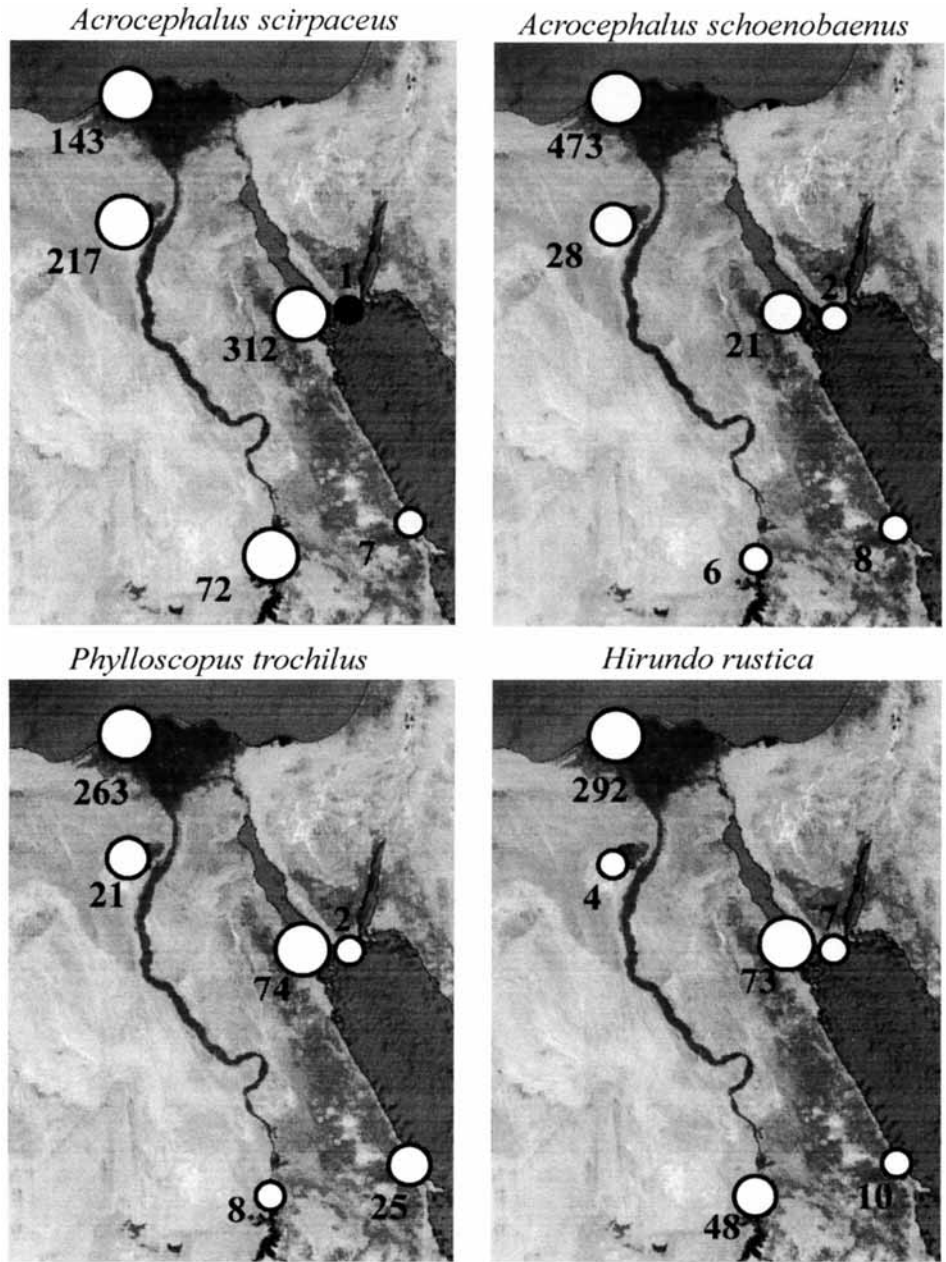
Merops apiaster



APPENDIX II – Autumn distribution maps

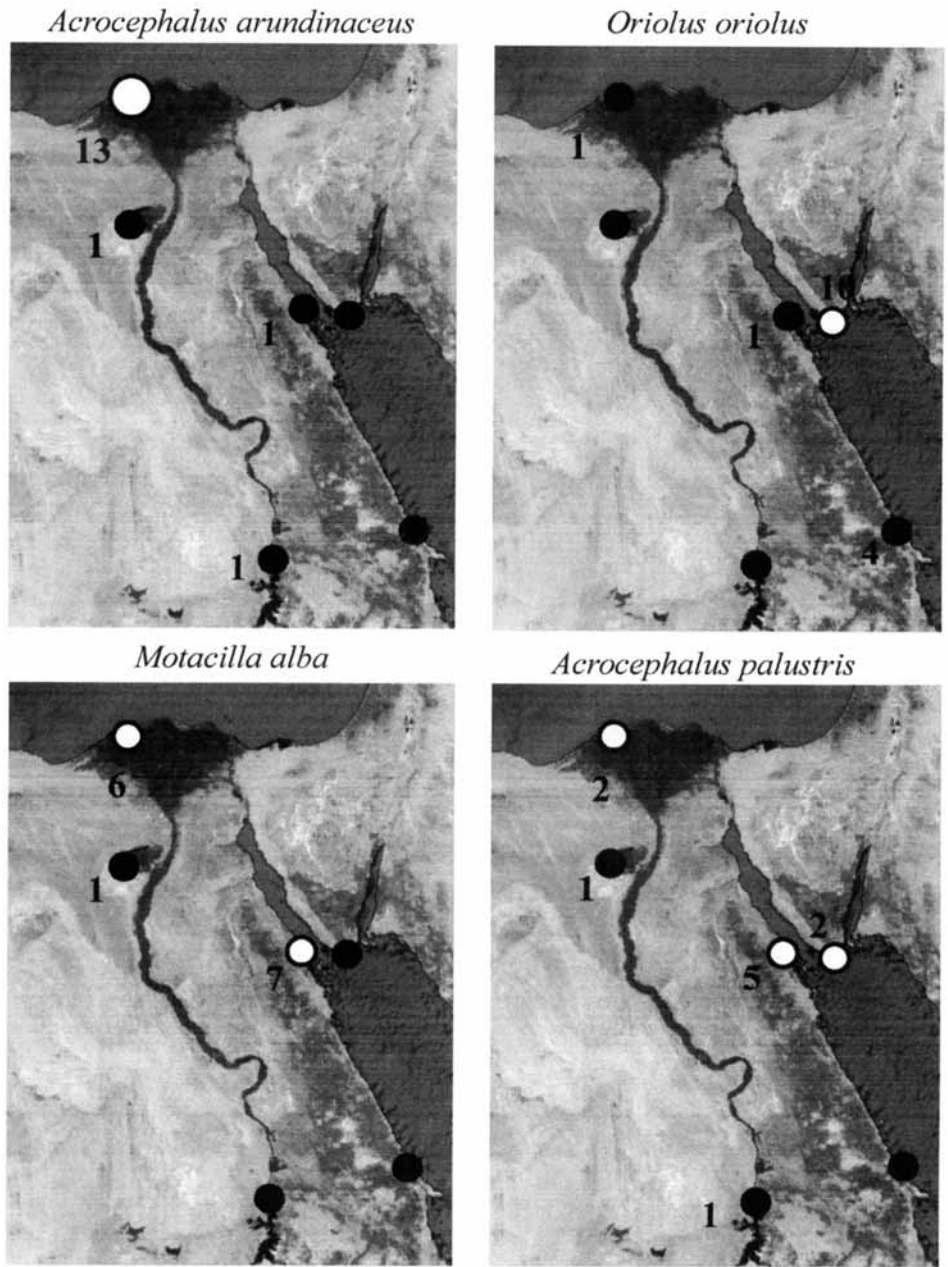
AMap. 1



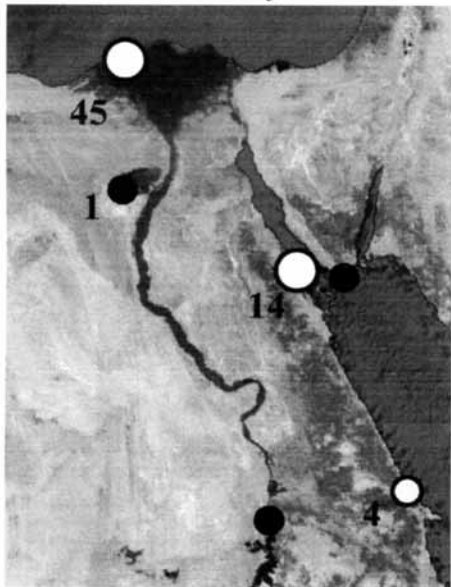


APPENDIX II – Autumn distribution maps

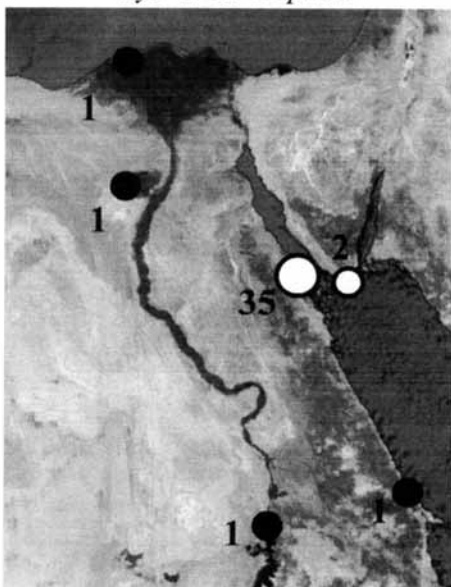
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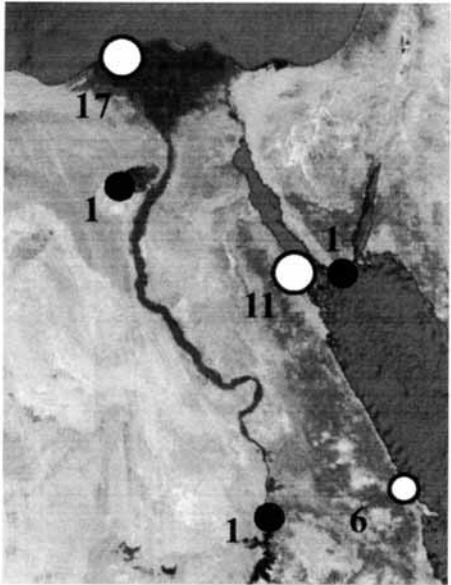
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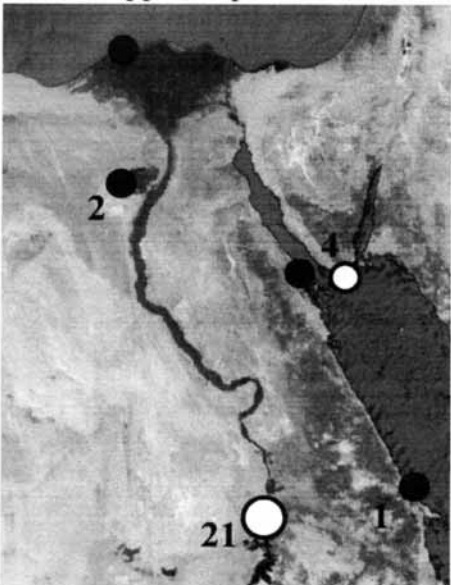
Sylvia atricapilla



Saxicola rubetra

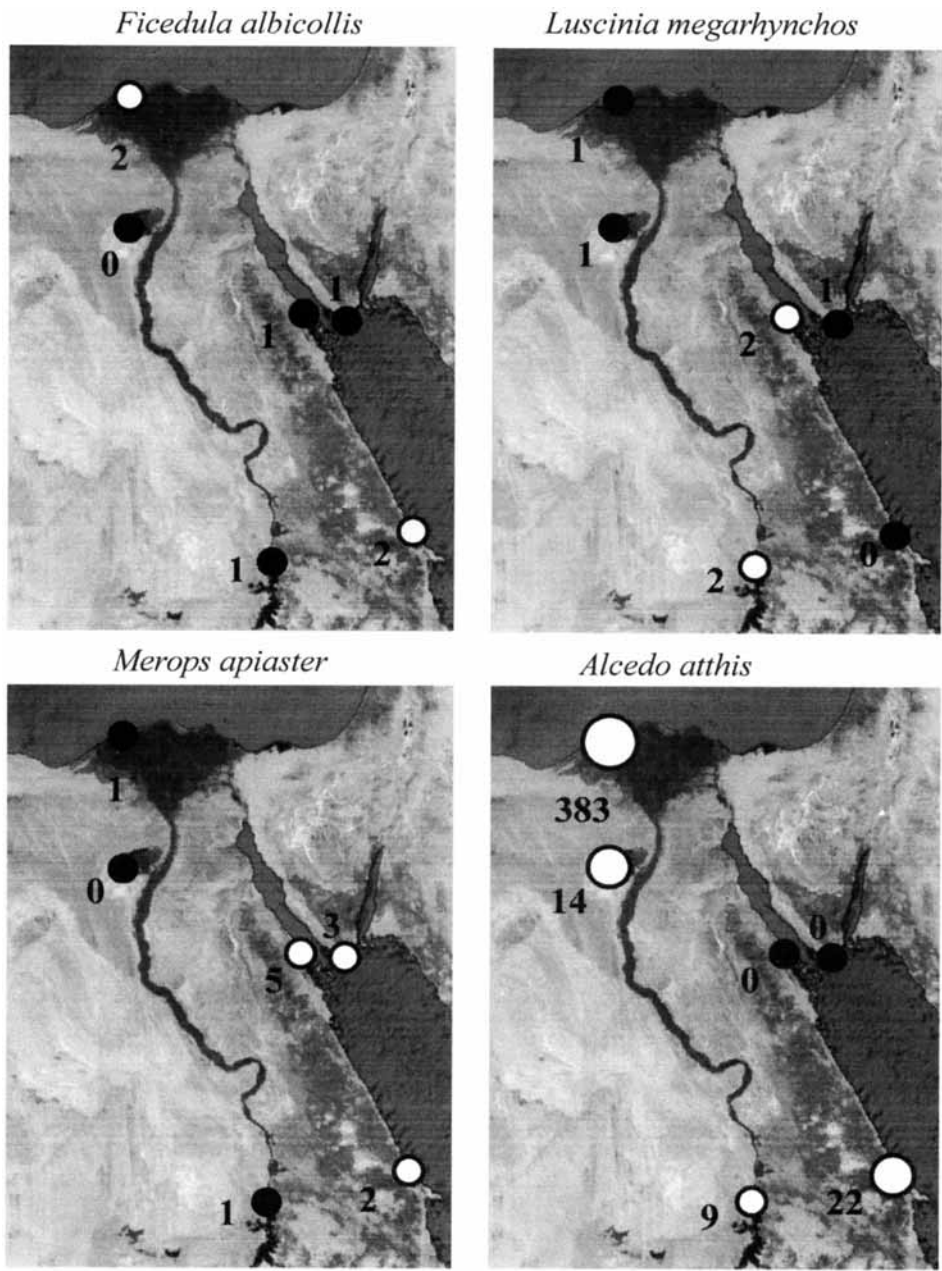


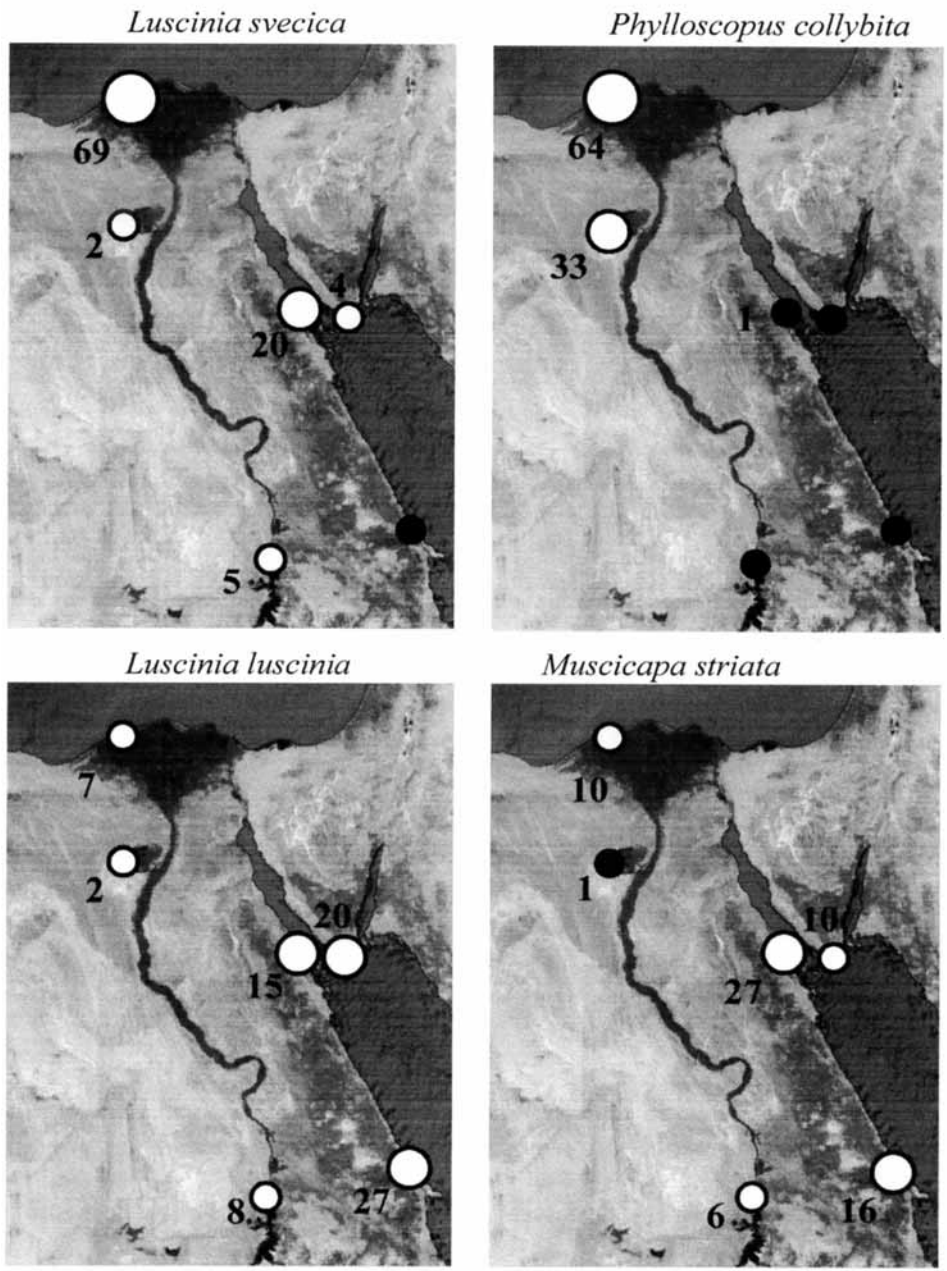
Hippolais pallida



APPENDIX II – Autumn distribution maps

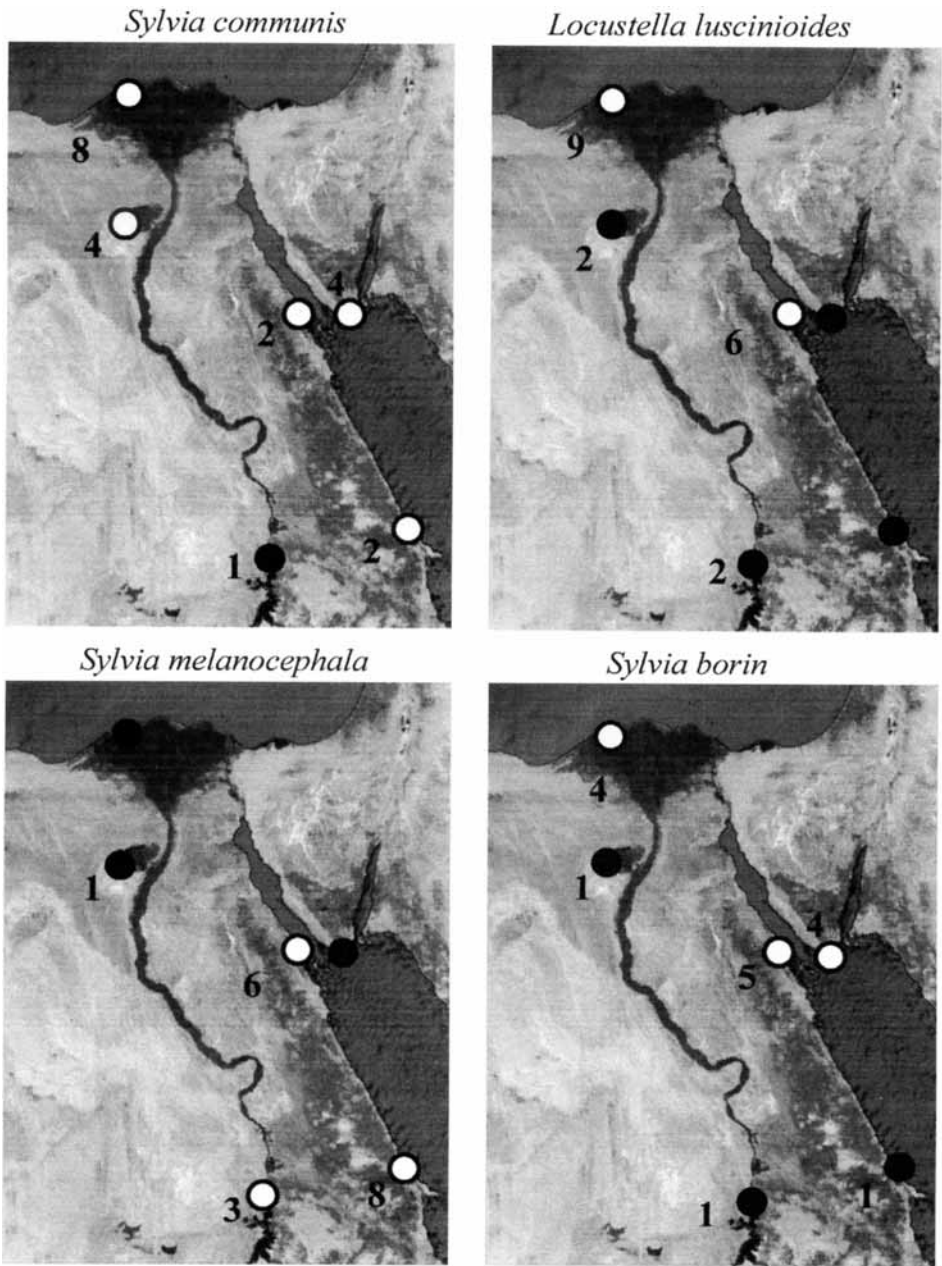
AMap. 5

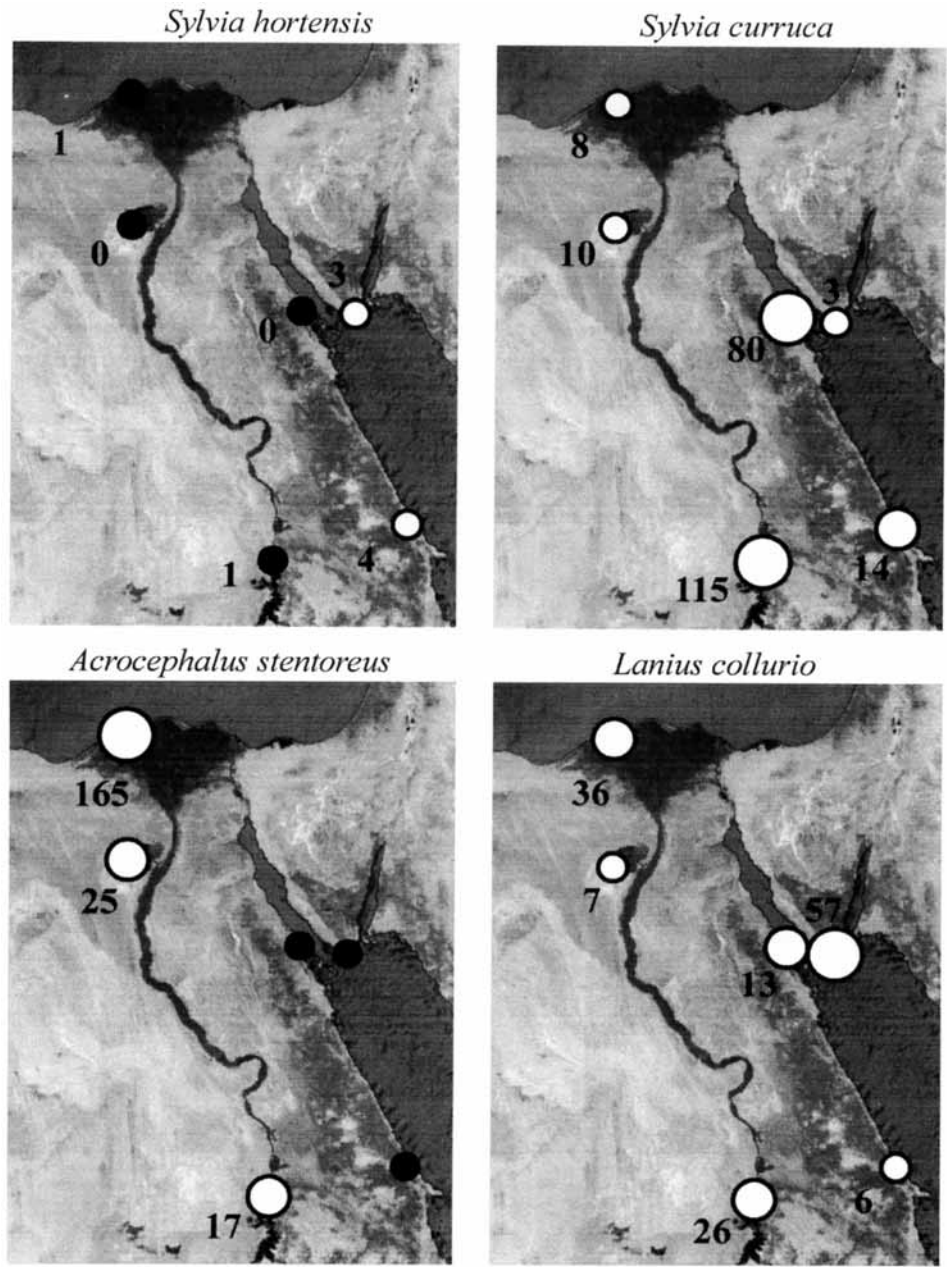


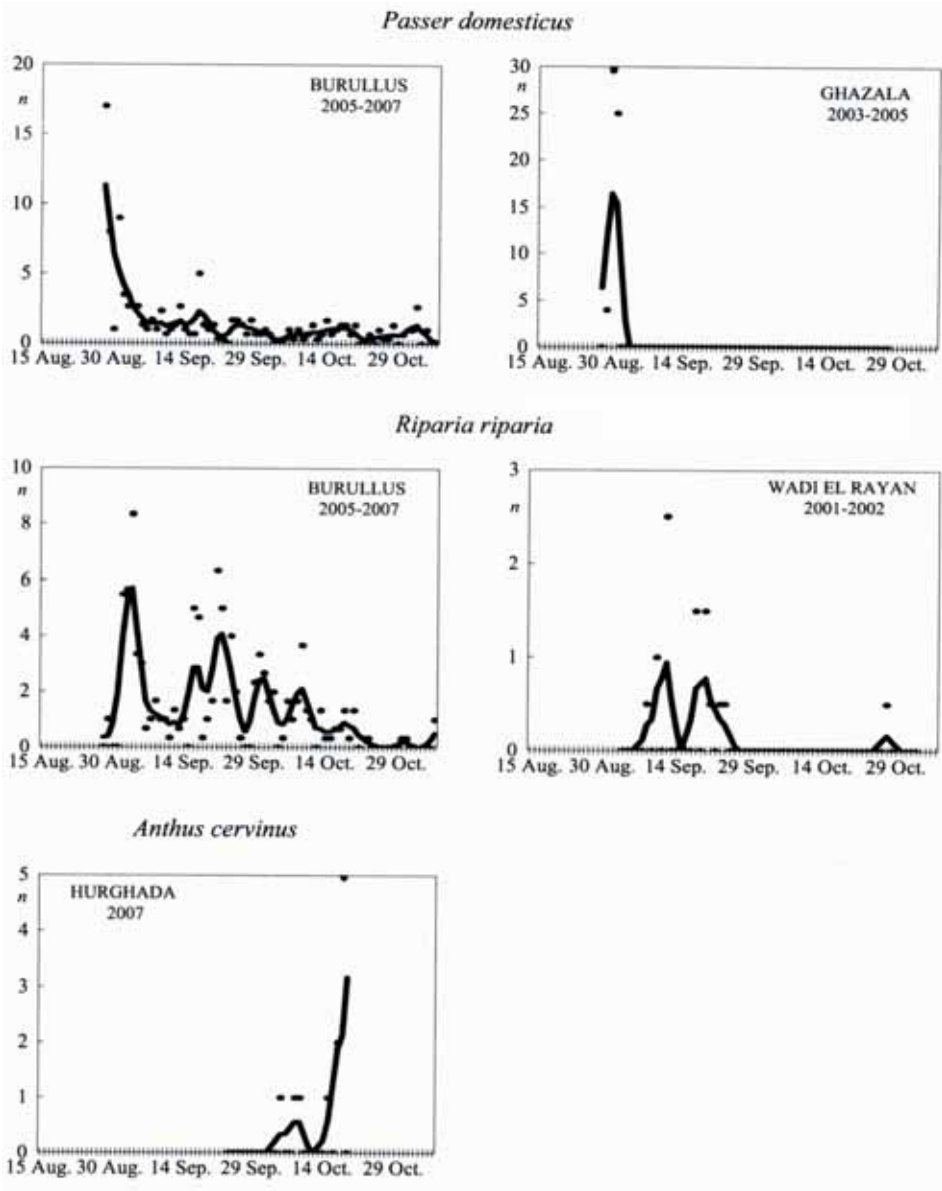


APPENDIX II – Autumn distribution maps

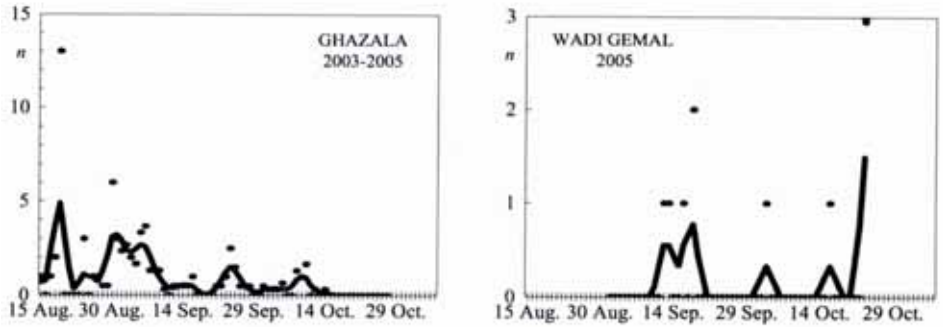
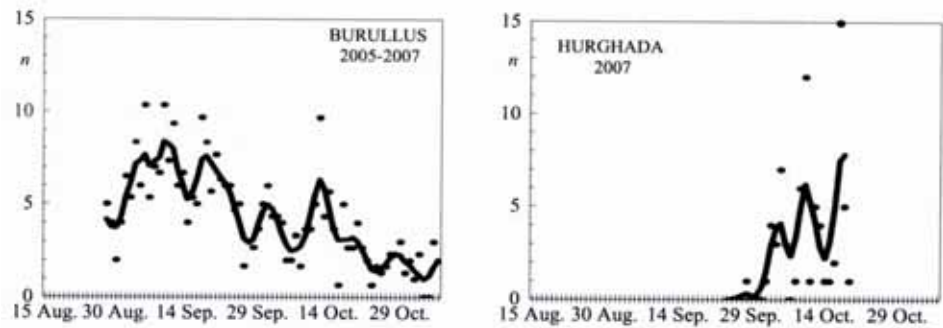
AMap. 7



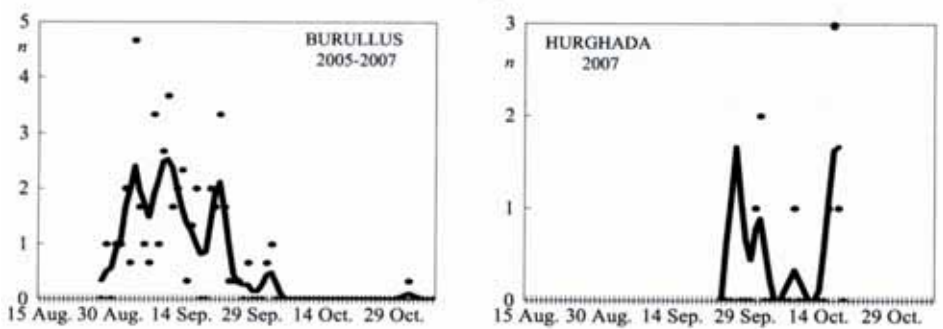


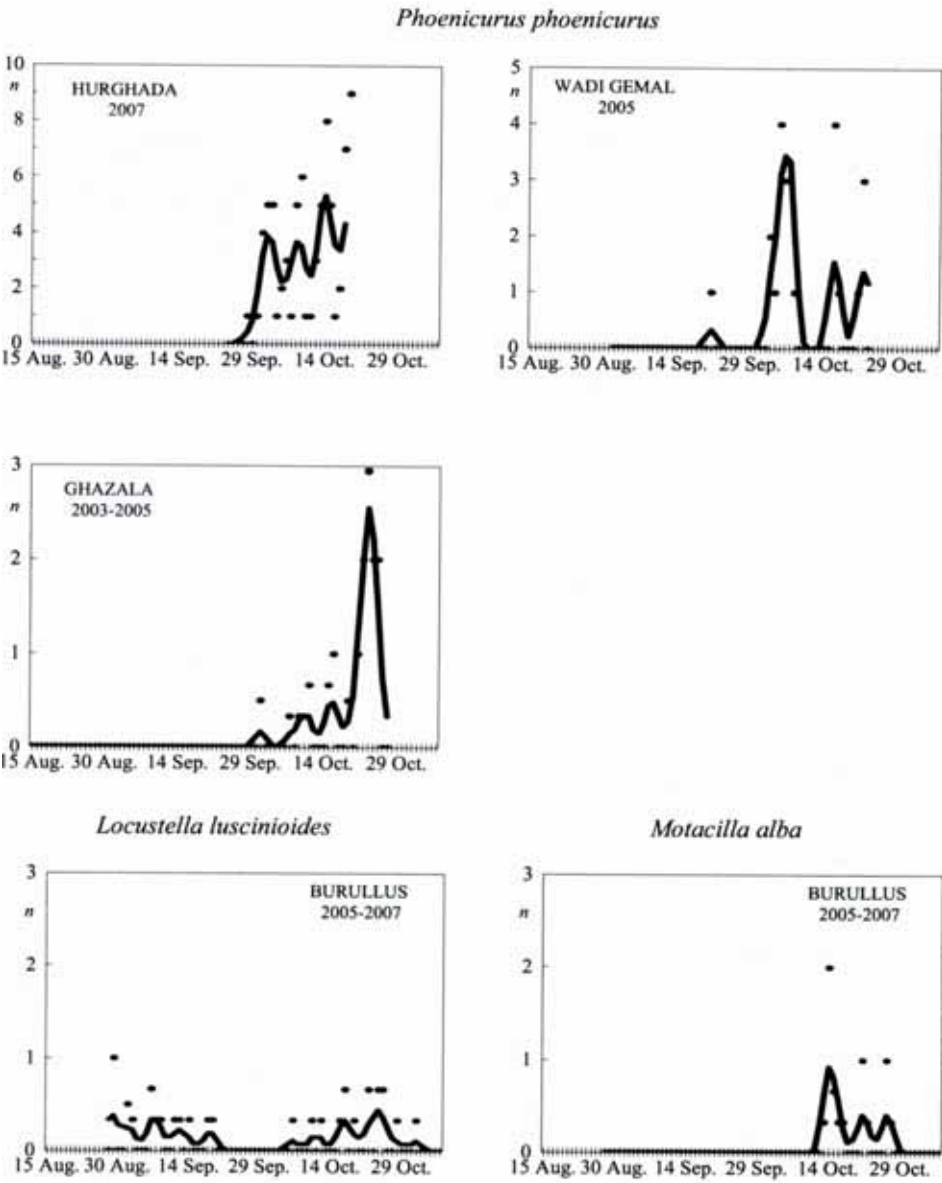


Hirundo rustica

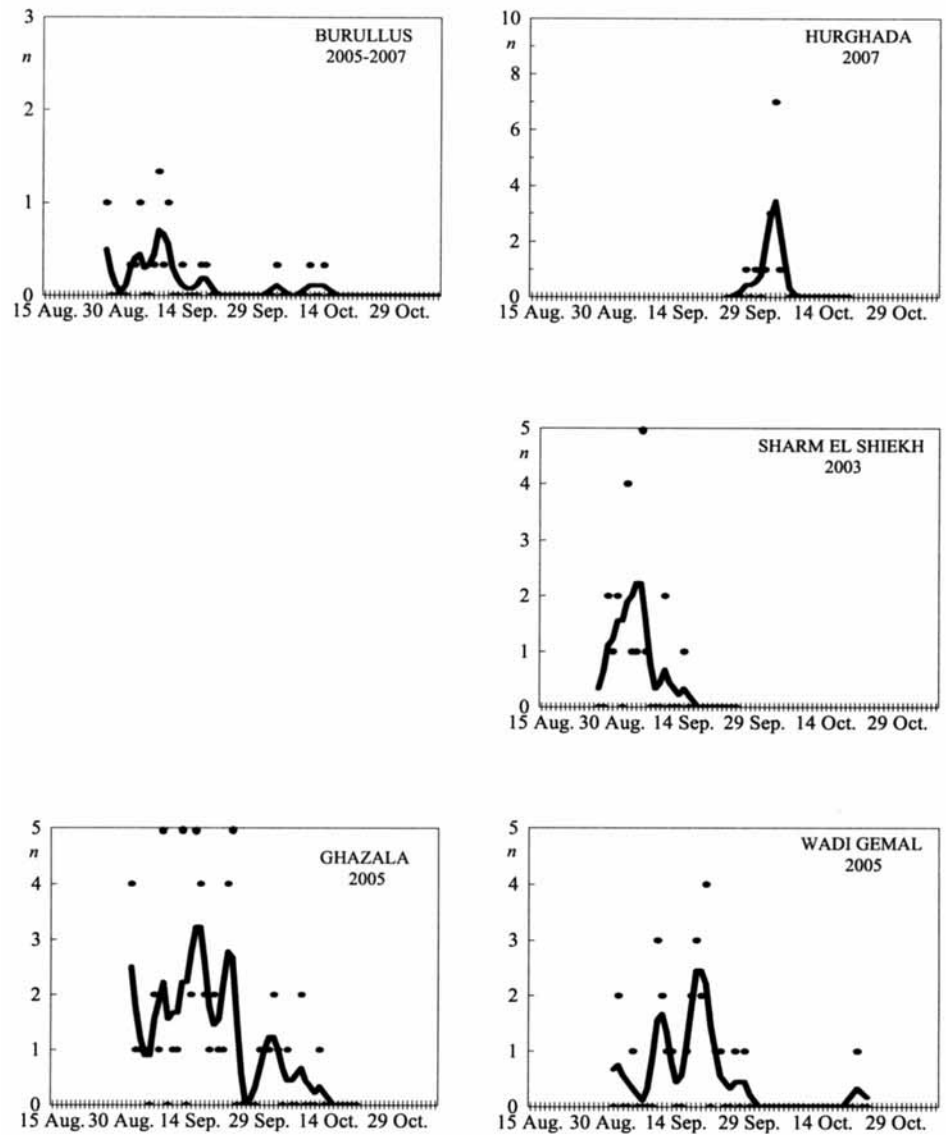


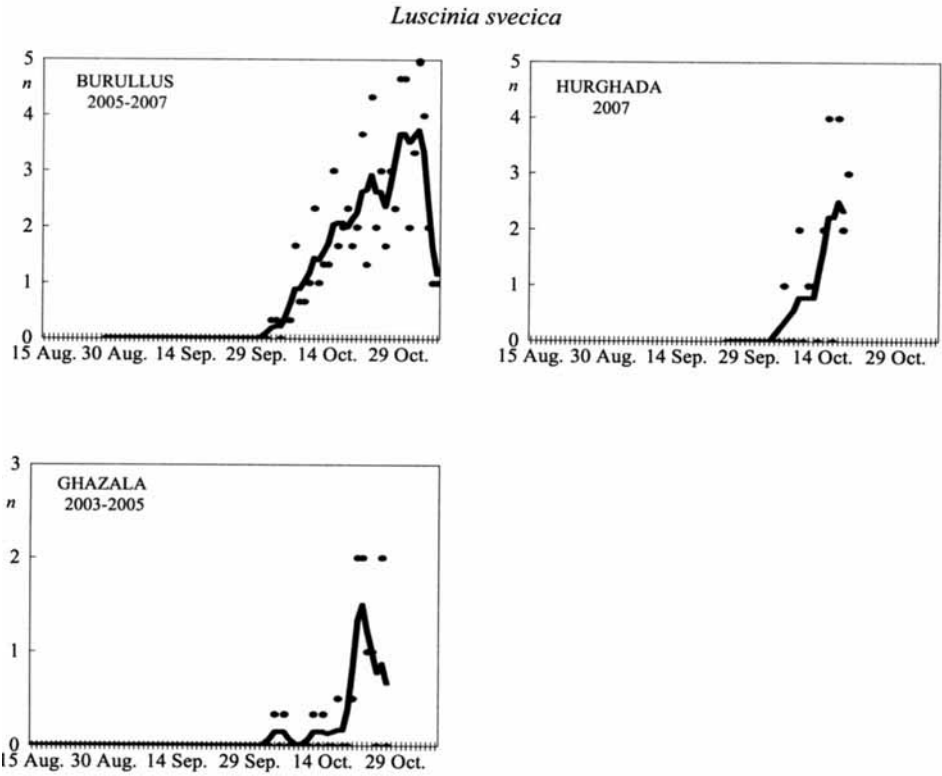
Motacilla flava



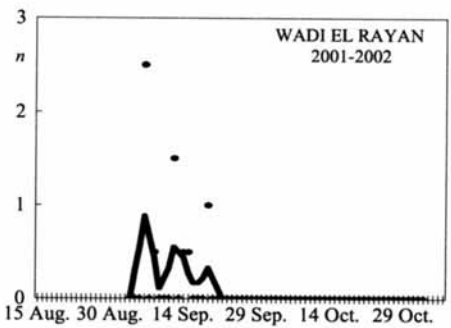
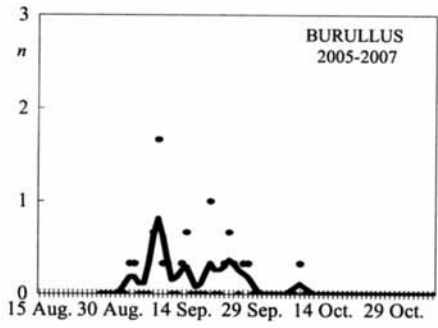


Luscinia luscinia

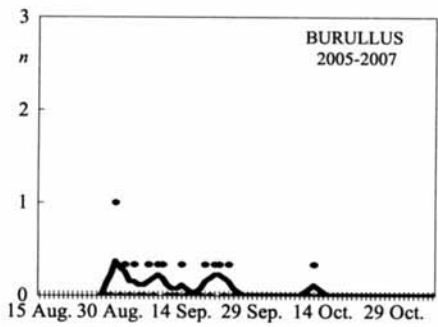




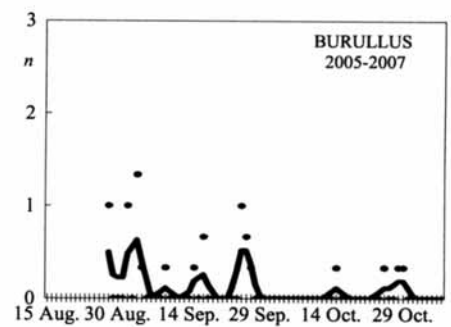
Sylvia communis



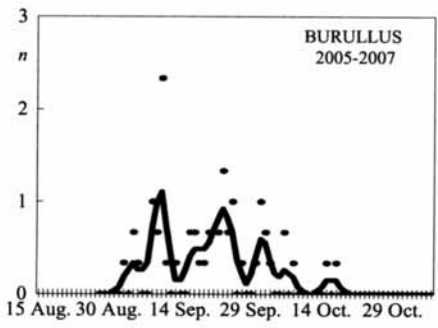
Sylvia borin



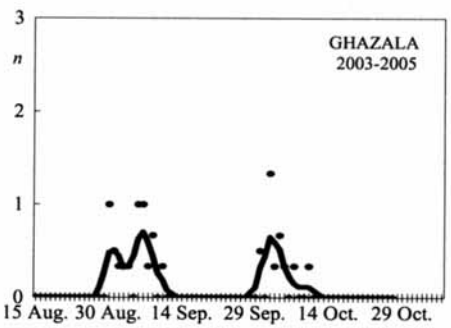
Prinia gracilis

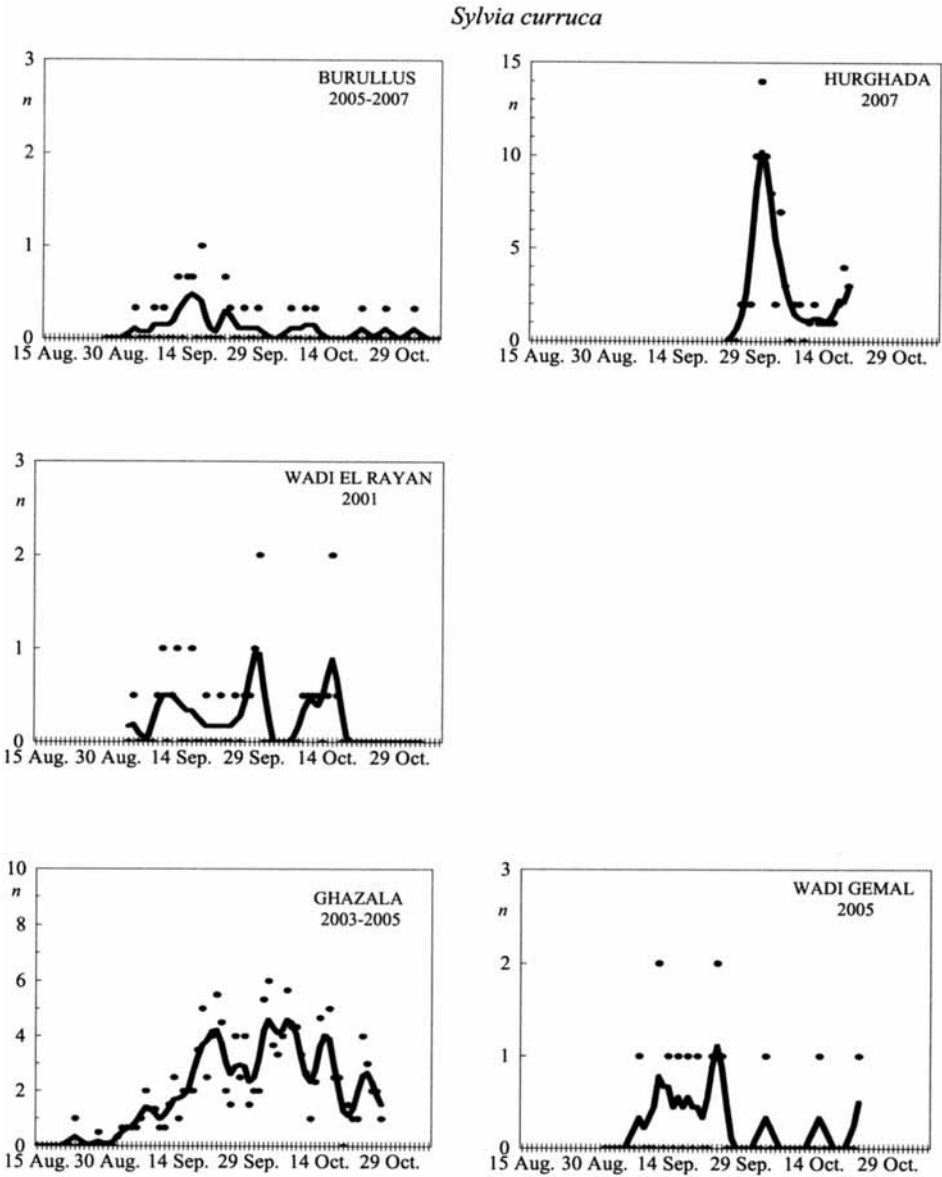


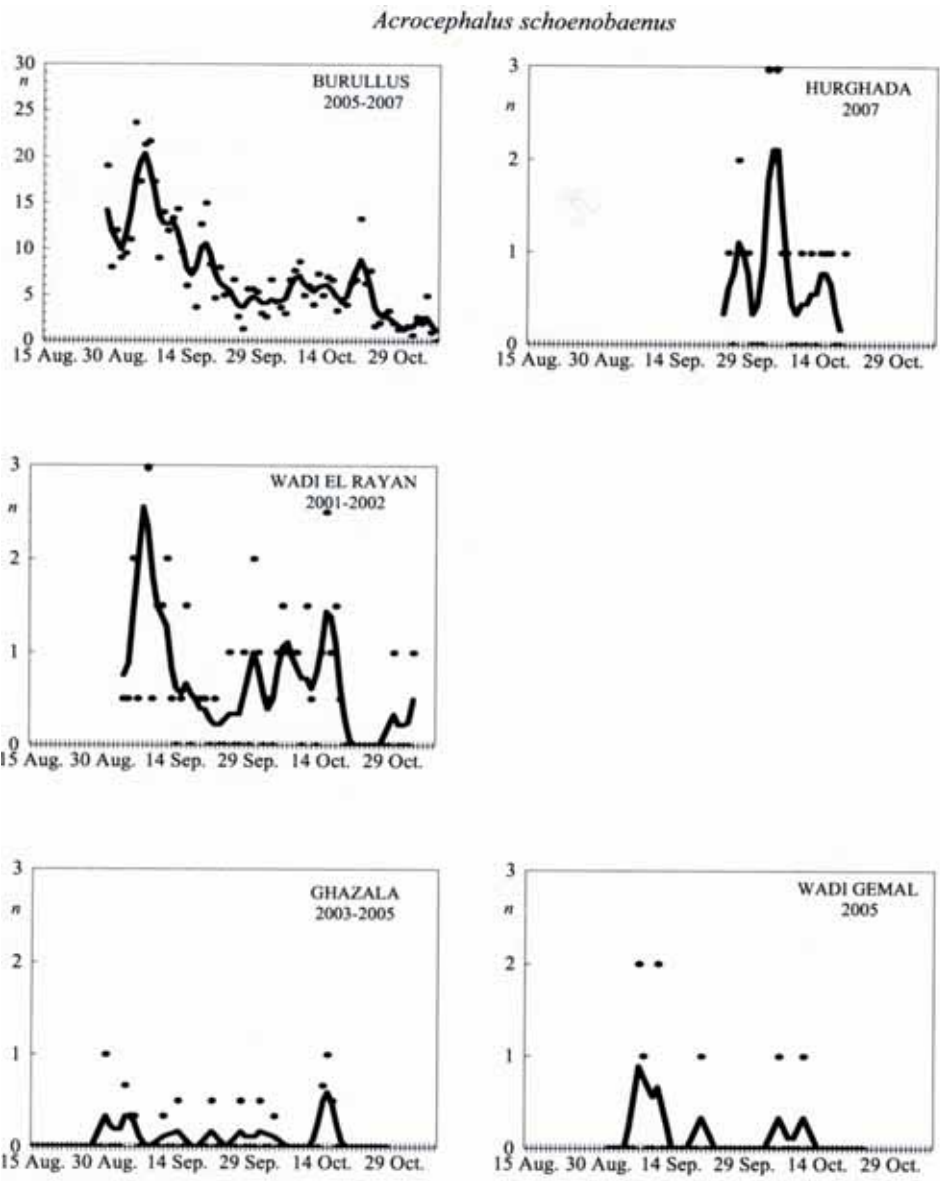
Saxicola rubetra

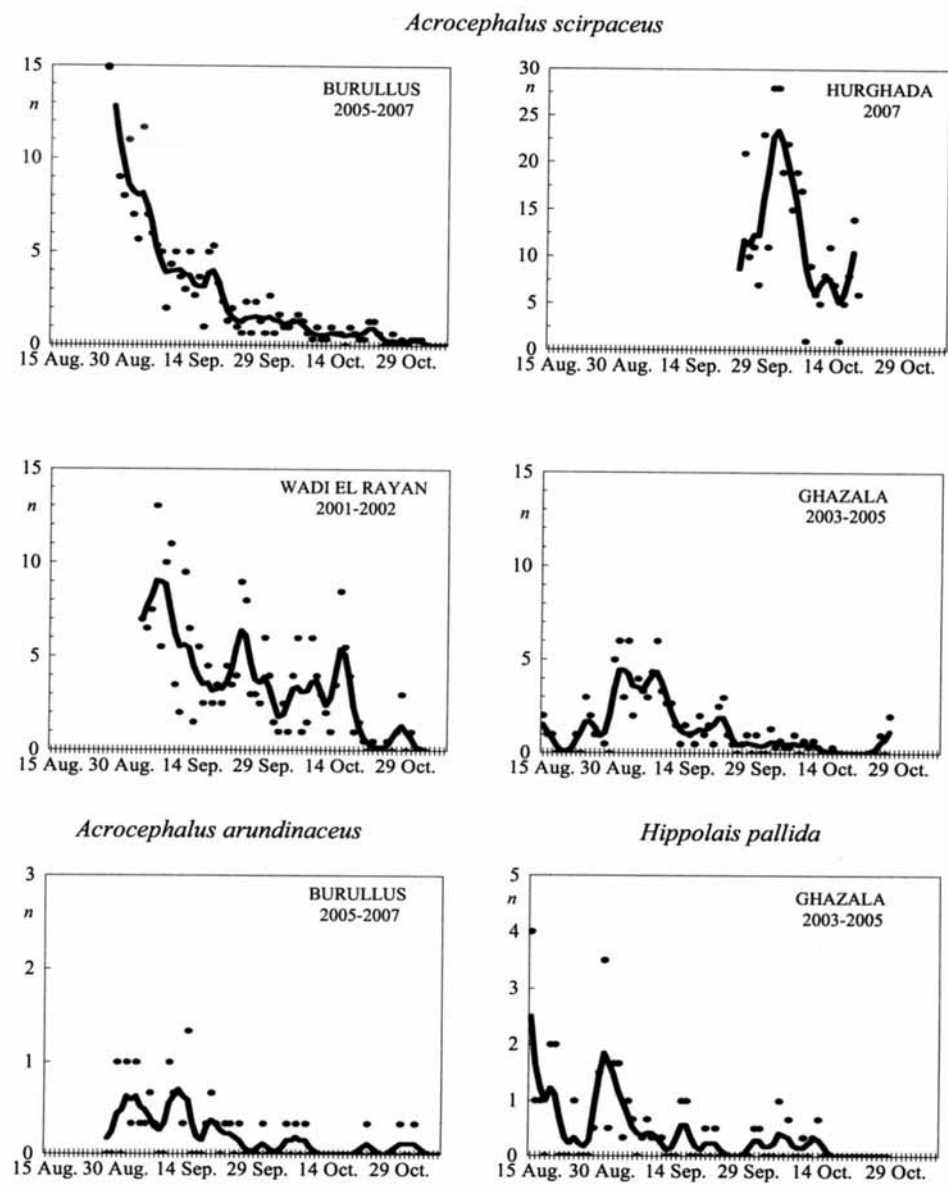


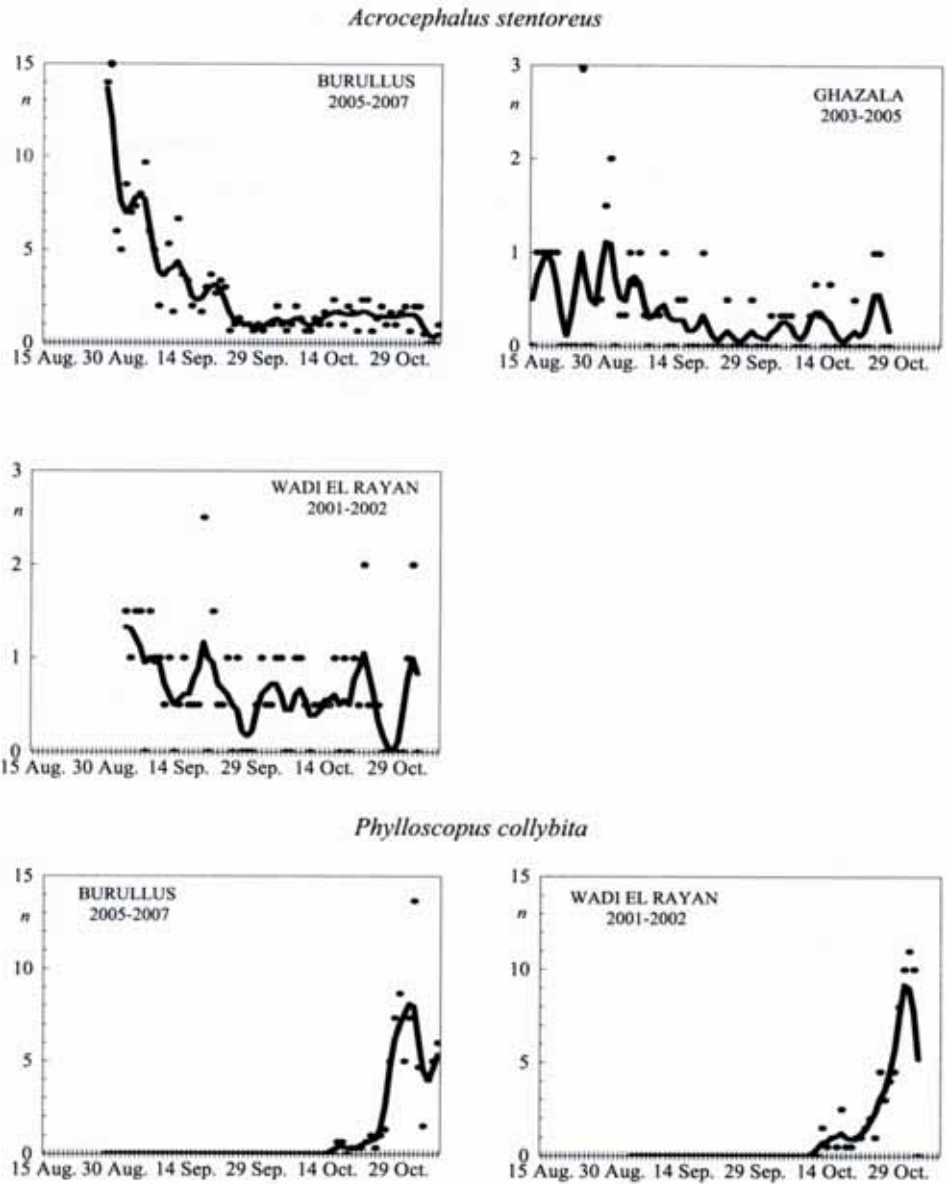
Pycnonotus barbatus

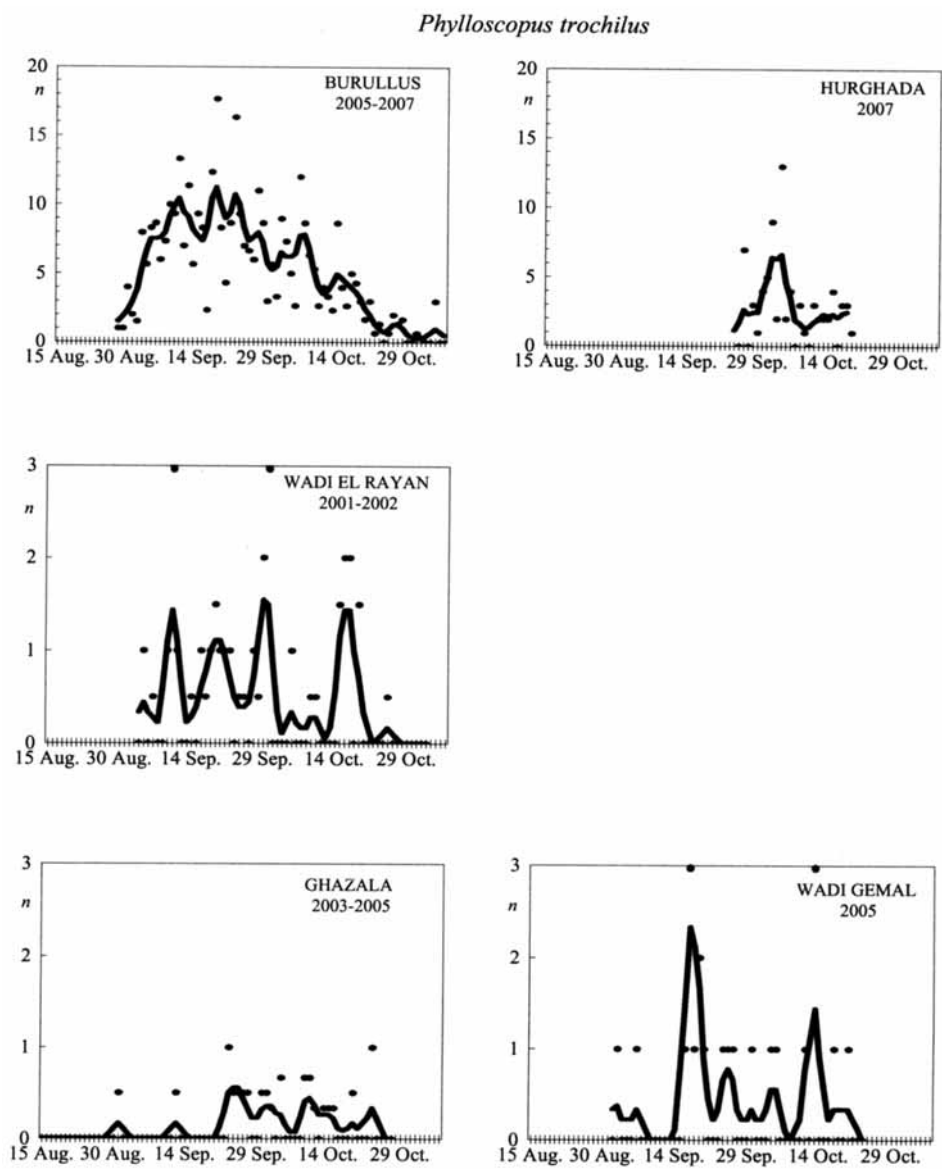




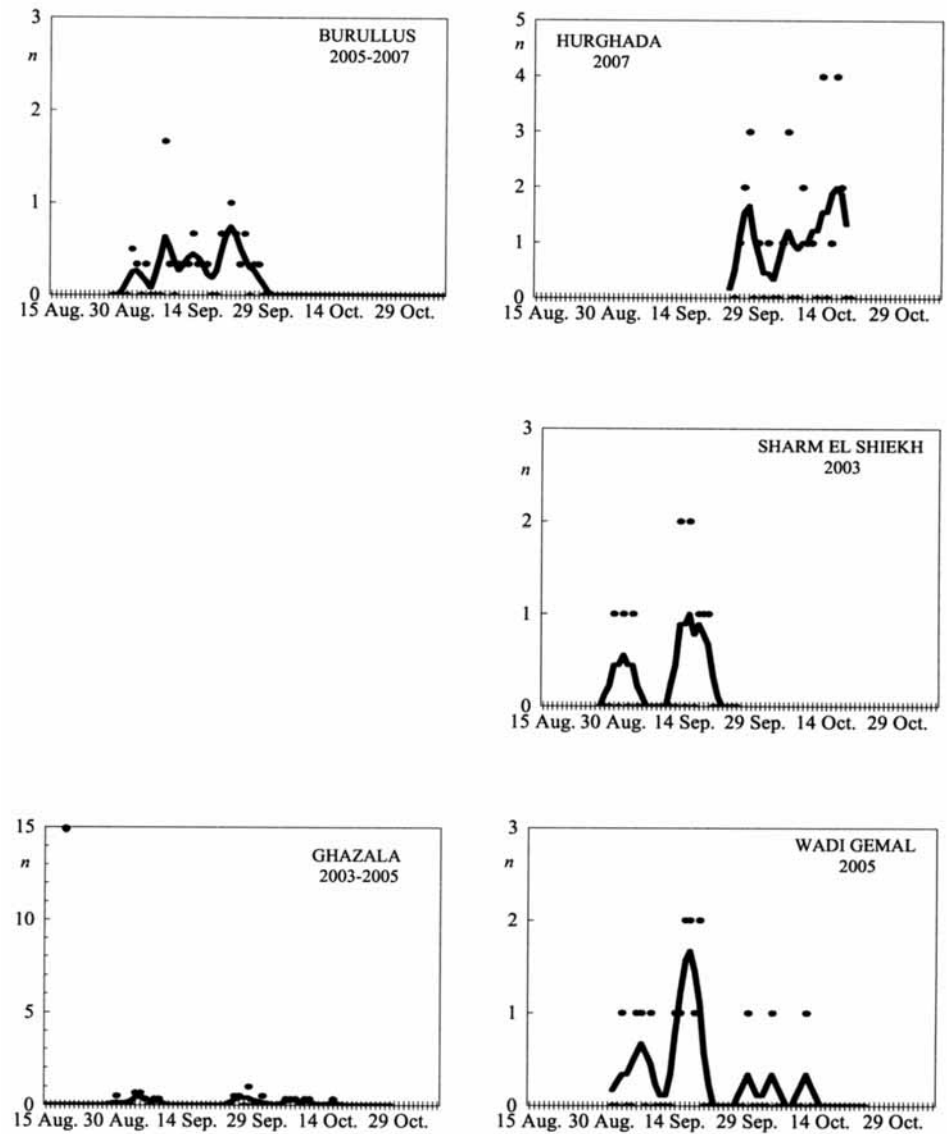


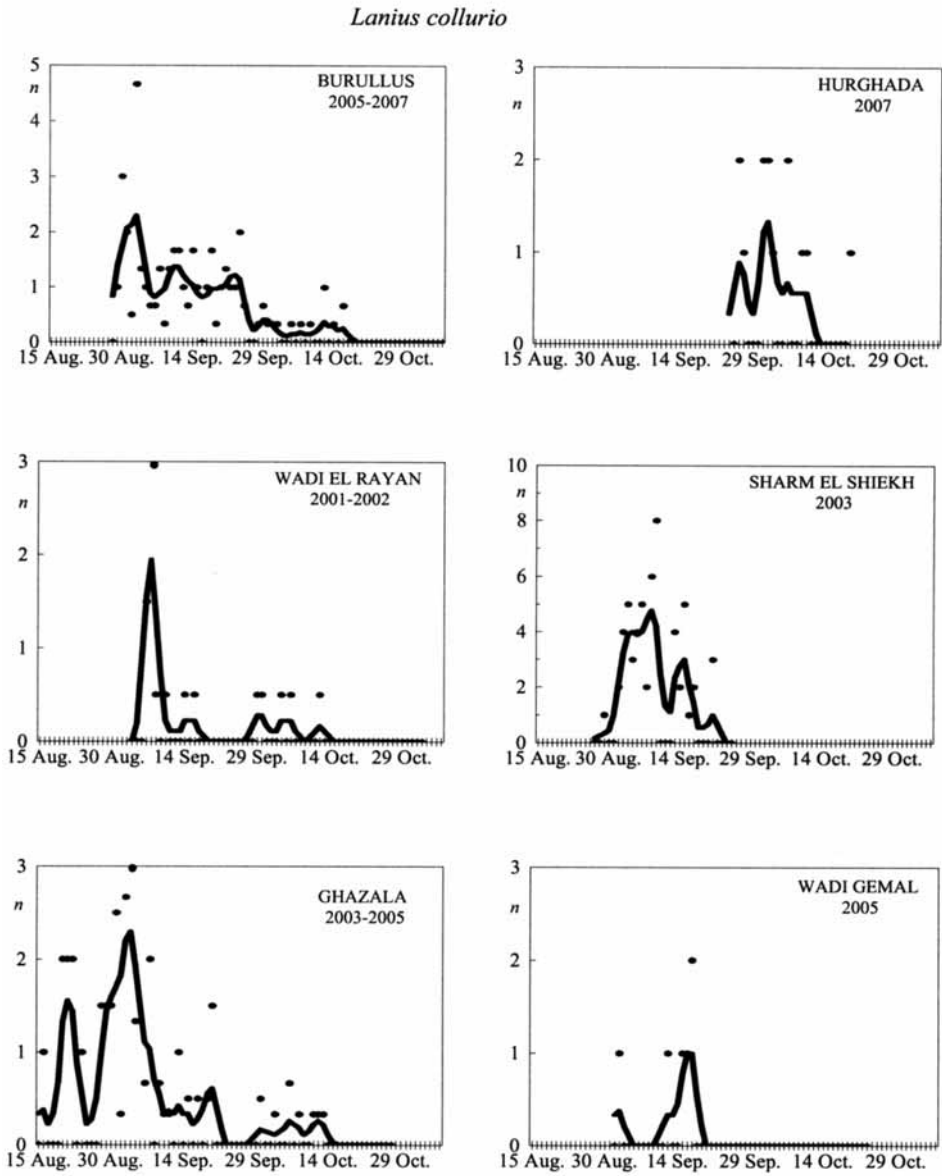


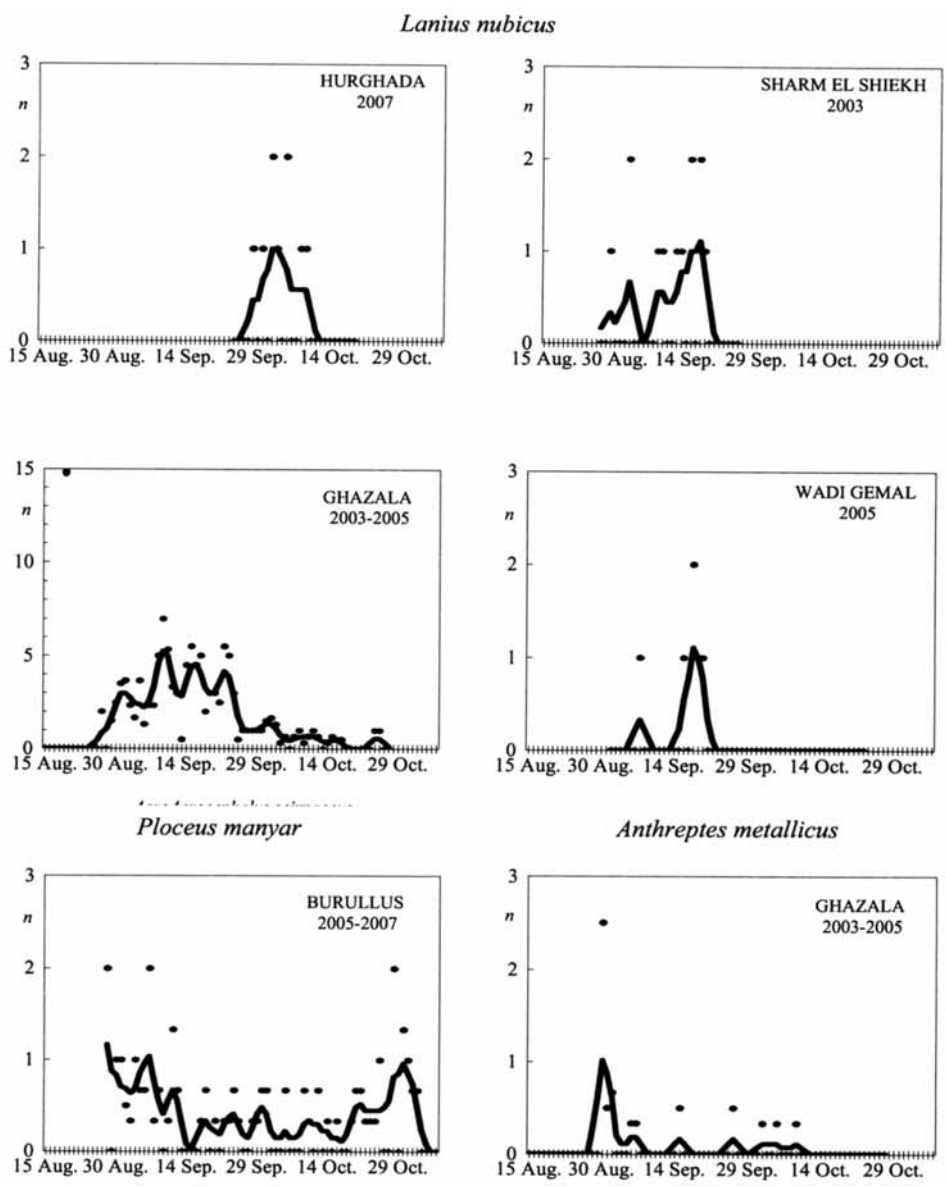


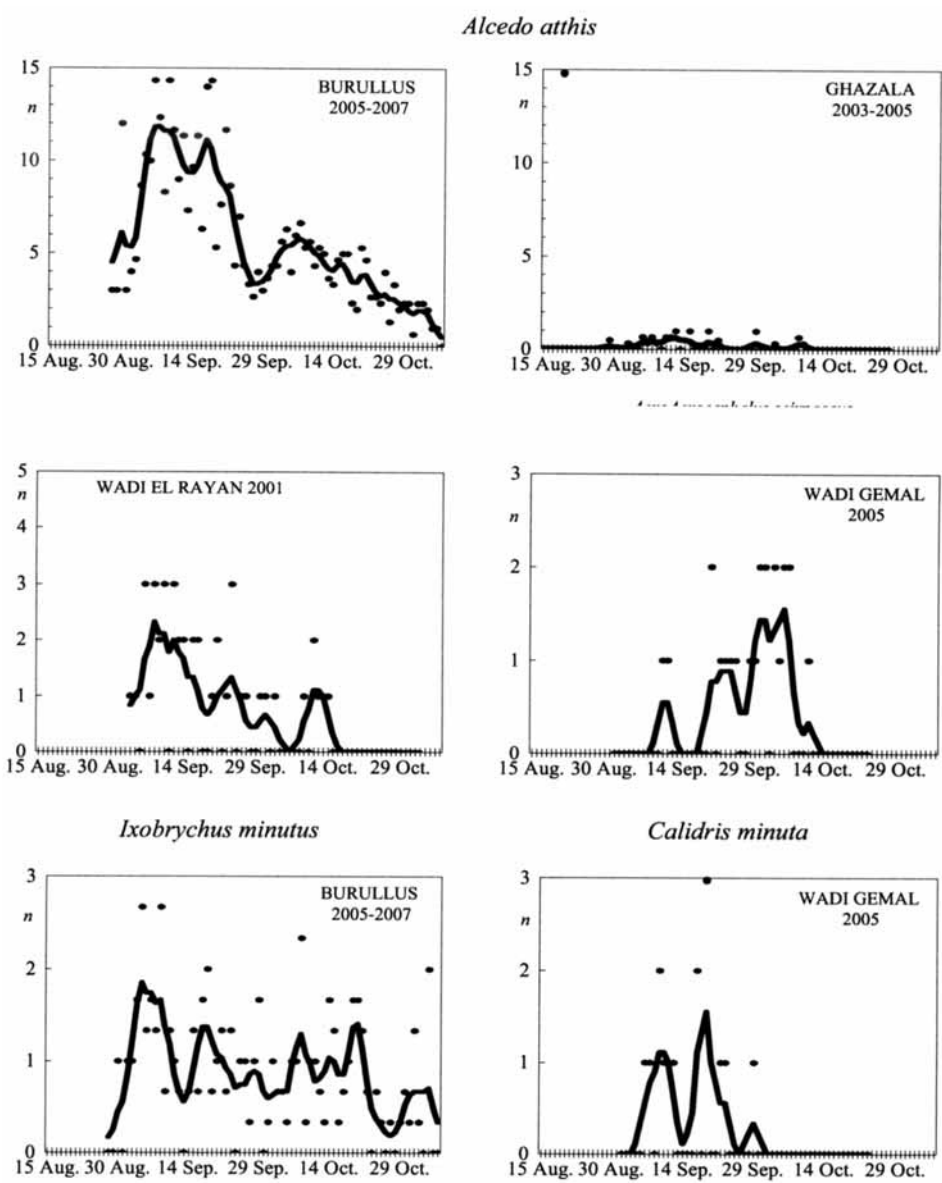


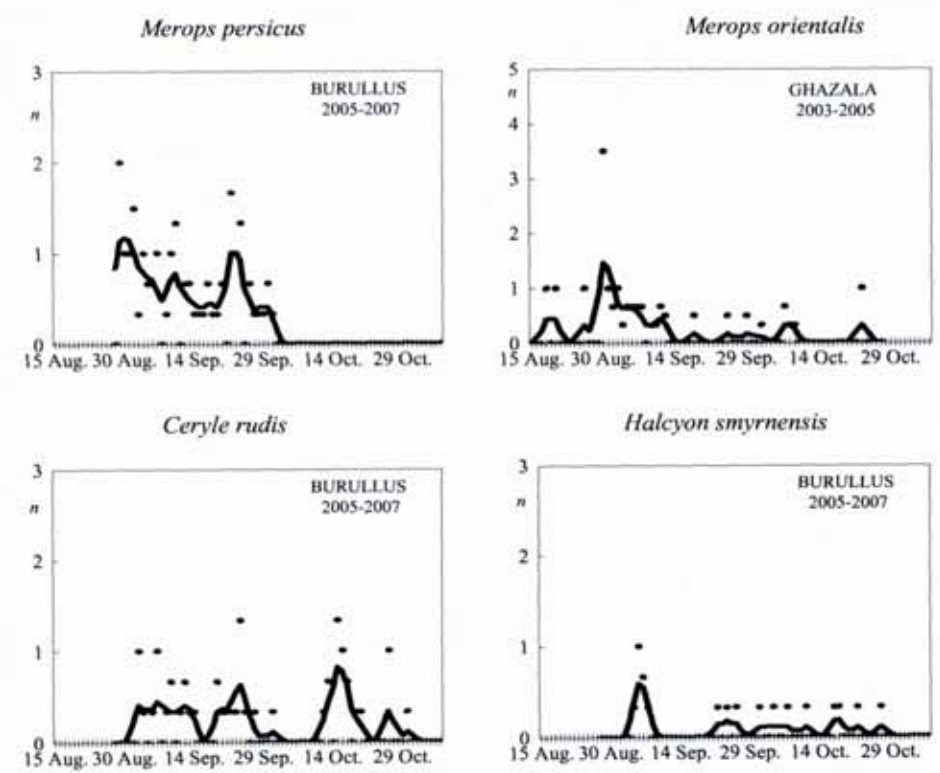
Muscicapa striata

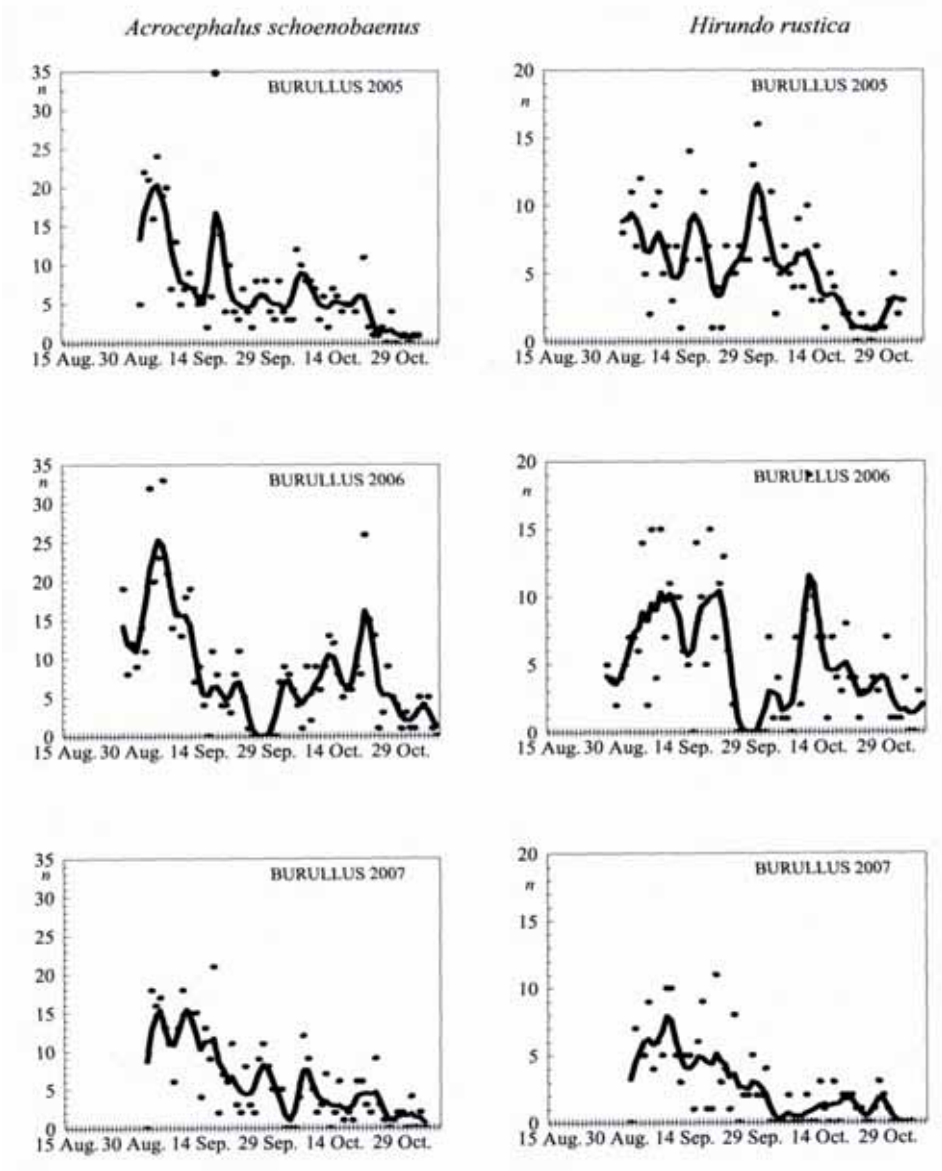












APPENDIX II – Autumn yearly migration dynamics

AYDyn. 2

